FINAL

UPLANDS FEASIBILITY STUDY REPORT

U.S. Government Moorings
Portland, Oregon

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ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirements
bgs	Below Ground Surface
BNSF	Burlington Northern Santa Fe
BTEX	benzene, toluene, ethylbenzene, xylene
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
cm/s	centimeter/second
CRBG	Columbia River Basalt Group
CRD	Columbia River Datum
CSM	Conceptual Site Model
CWA	Clean Water Act
DEQ	Oregon Department of Environmental Quality
DNAPL	Dense Non-Aqueous Phase Liquid
DOD	Department of Defense
ESA	Endangered Species Act
EPA	U.S. Environmental Protection Agency
FFS	Focused Feasibility Study
FS	Feasibility Study
GIS	Geographical Information System
gpm	gallons/minute
GRA	General Response Action
HHRA	Human Health Risk Assessment
HMTA	Hazardous Materials Transportation Act
J&E	Johnson and Ettinger
JSCS	Joint Source Control Strategy
JSCS SLVs	Joint Source Control Strategy Screening Level Values
LUC	Land Use Controls
MCL	Maximum Contaminant Level
μg/L	micrograms/liter
MIS	Multi-Increment Sampling
MGP	Manufactured Gas Products
MNA	Monitored Natural Attenuation
Moorings	U.S. Government Moorings
MOU	Memorandum of Understanding
msl	Mean Sea Level
MU	Management Unit
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
ODOT	Oregon Department of Transportation

O&M	Operation and Maintenance
ORS	Oregon Revised Statutes
OSHA	Occupational Safety and Health Act
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PP	Proposed Plan
PRG	Preliminary Remediation Goal
PRP	Potential Responsible Party
RACER	Remedial Action Cost Engineering and Requirements
RAIS	Risk Assessment Information System
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
RM	River Mile
SDWA	Safe Drinking Water Act
SLV	Screening Level Values
SWPCP	Stormwater Pollution Control Plan
TBC	To Be Considered
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total Petroleum Hydrocarbons
USACE	U.S. Army Corps of Engineers
WBZ	Water Bearing Zone

EXECUTIVE SUMMARY

This report presents the results of the Feasibility Study (FS) conducted for the upland portion of the U.S. Government Moorings (Moorings) site in Portland, Oregon. Site characterization studies summarized in the Remedial Investigation (RI) indicate that groundwater and erodible soils at the Moorings could be contributing contaminants to the Willamette River. The RI revealed the presence of contaminant concentrations on-site that resulted in elevated risks for: (1) groundwater due to potential exposure scenarios for future site occupants and exposure of river receptors, and (2) erodible soils due to potential exposure of river receptors. Evidence presented in the RI suggests that the source of groundwater contamination from the neighboring Gasco property is continuously entering the Moorings.

The Moorings Site would be managed through two operable units (OU), Groundwater OU 1 and Soil OU 2. This FS will evaluate alternatives for addressing risks and a final remedy for Soil OU 2. This FS describes interim actions that should be taken at Groundwater OU 1 to protect exposure to future site occupants, pending source control actions undertaken at Gasco. The FS will be used to generate the Proposed Plan (PP), which provides the public forum for involvement in the Moorings decision-making process. After the PPis completed, the Record of Decision (ROD) will select the remedial actions necessary for the Moorings.

SITE BACKGROUND

The Moorings is located on the west bank of the Willamette River at approximately river mile (RM) 6.08 through 6.21, within the industrial harbor of Portland, Oregon. It is owned and operated by the United States Army Corps of Engineers (USACE) Portland District. The Moorings consists of 13.14 acres and is partially covered by 26,700 square feet of dock. Use of the site began in 1903 to provide a centralized maintenance and supply facilities for the USACE Portland District. The Moorings currently provides port, supply, and repair facilities for the USACE Portland District fleet of dredges, hydrosurvey vessels, and other support vessels.

In addition to the original purchase of supplementary acres, over time fill material from dredging activities was used to expand the site footprint into the river. Three dredging events where river sediments were used for upland fill have been documented. Approximately one-half of the upland area on the southern end of the property is paved or covered by buildings. The northern portion of the site that is northwest of Building 17 is covered by buildings, gravel or pavement. The site is bounded on the northeast by the Willamette River, on the northwest by Advanced American Construction, on the southwest by Burlington Northern Santa Fe (BNSF) Railway and St. Helens Road, and on the southeast by the NW Natural property (formerly Gasco). The Gasco facility was a producer of Manufactured Gas Products (MGP).

The Moorings is located within a reach of the Willamette River identified by the United States Environmental Protection Agency (EPA) as a Superfund site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Portland Harbor Superfund site was listed on the National Priority List (NPL) on December 1, 2000 (65 Federal Register 75179-01). A Joint Source Control Strategy (JSCS) was created following a Memorandum of Understanding (MOU) between the Oregon Department of Environmental Quality (DEQ), EPA, and other governmental parties to provide a framework for making upland

source control decisions at the Portland Harbor Superfund site. Screening Level Values (SLVs) were included in the JSCS to screen and prioritize sources of contamination for several media and to assist in developing preliminary cleanup goals.

Portland Harbor JSCS SLVs summarize chemical concentrations in the environment that have the potential to increase risk to humans and ecological receptors based on scientific research and literature. EPA interprets concentrations above JSCS SLVs to be indicative of conditions causing deleterious impacts to humans or ecological receptors in the Willamette River. The JSCS SLVs are used within this FS as screening values to represent risk uncertainty until the EPA Portland Harbor RODs establish contaminant specific cleanup levels based on identified applicable or relevant and appropriate requirements (ARARs) or risk-based levels (DEQ 2005).

For the Moorings site, DEQ has deferred technical and legal responsibility for the upland contamination to EPA.

RECENT INVESTIGATIONS

The 2008/2009 RI included a human health risk assessment (HHRA) to determine site contaminants of concern (COCs). A screening level evaluation for ecological receptors using JSCS SLVs was used to determine contaminants of potential concern (COPCs) for river receptors. The HHRA presented in the RI evaluated the potential for human health impacts associated with environmental contaminants detected at the Moorings. The risk assessment provides a chemical- and site-specific risk analysis, assuming that no remedial action is conducted. The minimal upland habitat (which consisted of ruderal grasses) eliminated the requirement to conduct an ecological risk assessment for potential upland receptors. To identify potential risks to aquatic and aquatic-dependent receptors from the Moorings, a screening evaluation was completed using data collected during the RI for erodible soils, upland sediment, surface water, and groundwater. The results indicate that groundwater passing through the Moorings site and erodible soils are potentially contributing contaminants to the Willamette River. An ecological risk assessment for the in-water sediments is being conducted as part of Portland Harbor RI/FS.

SITE CONTAMINANTS AND MEDIA OF CONCERN

Since there are no drinking water wells currently located on the property, the Moorings site receives domestic potable water from the Portland Water Bureau. Results of the evaluations indicate the potential future exposure of Maintenance Workers and Office Workers to groundwater could present potential human health concerns. The following constituents are associated with a risk to human health greater than $1x10^{-4}$ or exceed the maximum contaminant level (MCL):

- Cyanide
- Benzo(a)pyrene
- Metals - aluminum, arsenic, cadmium, chromium, lead, and manganese

Exposure media of concern for ecological receptors are air, surface and subsurface soil, ground water, surface water, and sediment. The upland portion of the Moorings site is essentially covered with buildings, pavement, or gravel with minimal landscaping. The USACE and EPA concur that no ecologically important terrestrial habitat exists on the upland portion of the site. Accordingly, the on-site air, soil, and subsurface soil pathways are considered incomplete. Potential impacts to the Willamette River from on-site media (groundwater, erodible soils, upland surface water and upland sediments) were assessed using a screening evaluation against the Portland Harbor JSCS SLVs (DEQ 2005).

To evaluate impacts to the Willamette River from groundwater, twenty groundwater samples and a seep sample were screened against the JSCS SLVs for ecological receptors and fish consumption. Groundwater constituents identified by this process include:

- Carbon disulfide
- Polycyclic Aromatic Hydrocarbons (PAHs) – benzo(a)anthracene, chrysene, benzo(b)floranthene, benzo(k)floranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene
- Pesticides – Aldrin, DDE, DDx-total, Chlordane-total
- Cyanide
- Metals – arsenic, aluminum, cadmium, copper, lead, manganese, nickel, silver, zinc

Upland surface water samples were collected during the RI to determine if stormwater is impacting the Willamette River; either through infiltration or discharge via stormwater drains. Surface water constituents identified through the screening process include:

- Metals - arsenic, aluminum, copper, lead

Two upland sediment samples were collected, at the Oregon Department of Transportation (ODOT) catch basin and the on-site drywell. The drywell was removed and the ODOT catch basin collects off-site stormwater. Therefore, upland sediment samples were excluded from the screening evaluation.

Two on-site erodible soils samples were collected, the Fence Line Management Unit (MU) and the Runoff sample. These samples were screened against the JSCS SLVs for toxicity and bioaccumulation in sediments. Erodible soil constituents identified include:

- PAHs – flouranthene, pyrene, benzo(a)anthracene, chrysene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene, di-n-butyl phthalate, bis(2-ethylhexl)phthalate
- Polychlorinated Biphenyls (PCBs) - Aroclor 1248, total PCBs
- Pesticides – DDD, DDT, total DDx, total Endosulfan
- Metals – arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, zinc

As previously stated, the RI identified Gasco as an off-site source of groundwater contamination. Since source control at Gasco has yet to be implemented, groundwater Remedial Action Objectives (RAOs) at the Moorings focus on interim measures for reducing risks to human

health related to exposure of future usage of potable water. The reduction of risk from groundwater to ecological receptors is not addressed within this FS; however, the reduction of risk to ecological receptors based on erodible soils entering the Willamette River is address.

Site media determined to be of concern based on the risk assessment and ecological screening values include the following:

- Groundwater is retained as a medium of concern based on presence of contaminants in concentrations that exceed their respective MCLs and the risk estimated as greater than $1x10^{-4}$ for hypothetical future groundwater use. In addition, the JSCS screening evaluation indicated a potential for groundwater to impact the Willamette River.
- Erodible soils are carried forward as a medium of concern based on the JSCS screening evaluation and will be addressed under Soil OU 2.

Constituents in groundwater associated with an increased risk to human health greater than $1x10^{-4}$ and exceed MCLs are brought forward as groundwater COCs for the purposes of this FS. Constituents detected in erodible soils above JSCS SLVs are brought forward as soil COPCs for the purpose of this FS. The ROD for the Moorings will be reviewed after the harbor-wide Portland Harbor ROD is issued to determine that the remedy decision for the Moorings is consistent with other remedies in the Portland Harbor Superfund Site.

OPERABLE UNITS

The Moorings Site will be managed through two OUs, the Groundwater OU 1 and the Soil OU 2. This will allow an evaluation of alternatives for addressing risks resulting from erodible soils and a final remedy for Soil OU 2. Since off-site source control actions at Gasco are pending, the evaluation of alternatives at Groundwater OU 1 will only address interim remedies to limit potential risk of human exposure and ingestion of groundwater.

REMEDIAL ACTION OBJECTIVES (RAOs)

RAOs are identified for the media of concern based on the preliminary identification of possible ARARs and/or to be considered regulations.

Groundwater OU 1

- RAO 1 - to prevent dermal, inhalation, and ingestion exposure of potable groundwater within the Moorings boundaries to potential future drinking water users on-site until MCLs (preliminary remediation goals [PRGs]) are achieved.

The HHRA demonstrated that, at present, an unacceptable potable water exposure pathway from groundwater does not exist. However, the future use of groundwater as a potable water source at the Moorings would exceed the upper bound of the CERCLA acceptable risk management range of $1x10^{-4}$. RAO 1 will reduce potable water exposure from water wells to future site occupants. The area exceeding MCLs only extends across the Industrial Area; however, for the purpose of this FS, RAO 1 will apply to the entire Moorings site. Currently, there are no potable water wells at the Moorings. In addition, there are no Land Use Controls (LUCs) in place to prevent

this groundwater exposure pathway in the future. In order to achieve RAO 1, additional actions may be required. Such actions will need to remain in place until the source of groundwater contamination is permanently removed such that groundwater contamination is below MCLs and is protective of human health. RAO 1 will be implemented by use of a monitoring program to monitor the presence of contamination on-site and trends associated with off-site source control. COCs determined for groundwater include: cyanide, benzo(a)pyrene, and metals (aluminum, arsenic, cadmium, chromium, lead, and manganese).

Evidence from the RI suggests that contaminated groundwater entering the Moorings from the neighboring Gasco property is likely impacting receptors in the Willamette River. Contaminated groundwater on the Moorings site will need to be returned to its maximum beneficial use and chemical concentrations reduced to eliminate risks to river receptors. Therefore, this FS will evaluate interim measures to reduce human health risks pending comprehensive source control measures at Gasco that address all risks to human health and the environment presented by the contaminated groundwater.

Soil OU 2

- RAO 2 - prevent the transport of erodible soils with concentrations of contaminants above JSCS SLVs and final cleanup standards established in the ROD for the in-water portion of the Portland Harbor Superfund Site to the Willamette River.

The JSCS SLVs evaluation identified the Soil OU as containing erodible soils above toxicity and bioaccumulation SLVs. Stormwater runoff is the primary mechanism transporting contaminated erodible soils to the river. Areas with current risk of erosion are the North Logistics and Fence Line MUs as defined in the RI. Alternative development will focus on the areas landward of the 660 linear feet of perimeter fence that runs along the Fence Line and North Logistics MUs. COPCs determined using the JSCS screening evaluation include: PAHs (fluoranthene, pyrene, benzo(a)anthracene, chrysene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene, di-n-butyl phthalate, bis(2-ethylhexl)phthalate) , PCBs (Aroclor 1248, total PCBs), pesticides (DDD, DDT, Total DDx, total endosulfan) and metals (arsenic, cadmium, total chromium, copper, lead, manganese, nickel, mercury, and zinc).

GENERAL RESPONSE ACTIONS

General response actions (GRAs) are site-specific and medium-specific categories of actions that satisfy the RAOs. The media of concern to be addressed by GRAs are groundwater and erodible soil. The GRAs are comprised of technologies and process options. If no process options and/or technologies from a GRA are carried through, then that GRA is screened out from further consideration.

DEVELOPMENT AND DETAILED ANALYSIS OF ALTERNATIVES

The GRA alternative components are combined to form site remedial alternatives that represent either regulatory requirements or actions needed to meet RAOs. Each alternative is evaluated against effectiveness, implementability, and cost criteria to ensure preliminary alternatives are viable solutions prior to the completion of detailed analysis. These alternatives are then carried

forward into the detailed nine-criteria analysis of alternatives to determine a more favorable alternative. The following four alternatives evaluate interim remedies for Groundwater OU 1 and a final remedy for Soil OU 2.

Alternative 1 - No Action: The No-Action alternative is required by CERCLA as a baseline for comparison to other alternatives.

Alternative 2 – Gravel Layer: LUCs, Groundwater Monitoring, Gravel Placement, Limited Stormwater Collection, Erosion Control, Stormwater Treatment, Monitoring, and Erodible Soils Monitoring is comprised of the following:

- LUCs for groundwater (RAO 1)
- Groundwater monitoring (RAO 1)
    - Install eight groundwater monitoring wells (four wells to 75 feet below ground surface (bgs), four wells to 20 feet bgs)
    - Quarterly monitoring for the first two years and annual monitoring thereafter
- Raise Grade of North Logistics MU (RAO 2)
    - Remove fence in North Logistics MU
    - Install French drain ten feet landward of the bank top (if required)
    - Install and maintain stormwater metals treatment for French drain effluent (if required)
    - Install concrete curb along North Logistics MU to stabilize gravel placement
    - Raise grade using clean gravel for area 40 feet landward of bank
    - Replace fence line at new grade at North Logistics MU
    - Maintain gravel along bank as needed by additional gravel placement
    - Monitor erosion control measures
    - Monitor effluent from stormwater metals treatment for French drain effluent - one location, quarterly (if required)

Alternative 3 – Limited Concrete Cap: LUCs, Groundwater Monitoring, Concrete Cap, Stormwater Collection, Erosion Control, Stormwater Treatment, Monitoring and Erodible Soils Monitoring is comprised of the following:

- LUCs for groundwater (RAO 1)
- Groundwater monitoring (RAO 1)
    - Install eight groundwater monitoring wells (four wells to 75 feet bgs, four wells to 20 feet bgs)
    - Quarterly monitoring for the first two years and annual monitoring thereafter
- Limited Concrete Cap along Fence Line and North Logistics MU (RAO 2)
    - Remove fence in Fence Line and North Logistics MU
    - Install concrete curb along North Logistics MU to stabilize gravel placement
    - Install stormwater collection system along center line of 12-foot concrete cap
    - Install French drain 13 feet landward of the bank top (landward edge of cap)
    - Install 12 ft wide concrete cap once drainage systems have been placed

  - Install and maintain metals treatment system (Filterra Bioretention System) for water collected from the French drain
  - Raise Grade of North Logistics MU using clean gravel for area 40 feet landward of bank
  - Replace fence line at new grade in Fence Line and North Logistics MU
  - Maintain gravel along bank as needed by additional gravel placement for area 40 feet landward of North Logistics MU bank
  - Monitor erosion control measures
  - Monitor effluent from stormwater metals treatment for French drain effluent - four locations, quarterly (if required)

Alternative 4 – Vegetative Buffer: LUCs, Groundwater Monitoring, Erodible Soil Removal, Construction of Vegetative Buffer, Limited Stormwater Collection, Stormwater Treatment, Monitoring and Erodible Soil Monitoring is comprised of the following:

- LUCs for groundwater (RAO 1)
- Groundwater monitoring (RAO 1)
  - Install eight groundwater monitoring wells (four wells to 75 feet bgs, four wells to 20 feet bgs)
  - Quarterly monitoring for the first two years and annual monitoring thereafter
- Vegetative based stormwater erosion control measures at the North Logistics and Fence Line MU (RAO 2)
  - Remove fence in Fence Line and North Logistics MU.
  - Remove, transport and dispose of top six inches of contaminated soil
  - Install French drain ten feet landward of North Logistics MU bank top (if required)
  - Install and maintain stormwater metals treatment for French drain effluent (if required)
  - Install concrete curb along North Logistics MU to stabilize gravel placement
  - Raise grade of North Logistics MU using clean topsoil near bank and gravel beyond ten feet of bank
  - Place six inches clean topsoil in Fence Line MU near bank
  - Plant vegetative buffer (ten feet wide) using grass and shrubs less than eight inches tall as defined by the Portland Plant List (Portland 2004a)
  - Replace fence at new grade in North Logistics and Fence Line MU
  - Incorporate temporary sediment control measures (filtration silt/sediment fence) until vegetative buffer becomes effective
  - Monitor erosion control measures
  - Monitor effluent from stormwater metals treatment for French drain effluent - one location, quarterly (if required)

The detailed analysis of the Alternatives consists of the evaluation and comparison of the remedial Alternatives to provide decision makers with sufficient information to select an appropriate remedy to meet the CERCLA remedy selection requirements (EPA 1988). In the detailed analysis, each Alternative is evaluated against seven of the nine CERCLA required criteria.

The detailed analysis of the Alternatives revealed Alternative 4 (Vegetative Buffer) to be the most highly rated alternative. Alternative 4 received the highest rank for the following three criteria: (1) protection of human health and the environment, (4) long-term effectiveness, and (5) reduction of toxicity, mobility, or volume through treatment. The three criteria that Alternative 4 did not rank highest on included: (3) short-term effectiveness, (6) implementability, and (7) cost. Each of the Alternatives were compliant with most ARARs but all failed to meet Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) for specific chemicals and the Oregon Environmental Cleanup Law, Oregon Revised Statutes (ORS) 465.315 which requires groundwater hotspot treatment. Alternative 4 did not receive the lowest ranking on any single ranked criteria. Although Alternative 4 received moderate ratings for ARARs, short-term effectiveness, implementability, and cost, none of these moderate ratings are expected to affect the completion or the overall success of the project.

Alternative 1 (No Action) is not a viable option because it fails the threshold criteria test. Alternative 2 (Gravel Layer) was found to be almost as successful as Alternative 4 (Vegetative Buffer) at fulfilling the threshold criteria and should be considered a strong option. Alternative 2 receive the lowest ranking on the reduction of toxicity, mobility, & volume through treatment. Alternative 3 (Concrete Cap) received the lowest ranking of Alternatives 2, 3, and 4. Alternative 3 was ranked lowest on three of the seven criteria.

Table ES-1 illustrates the costs for Alternative 4. The present value costs for all actions for Alternative 4 is $3,415,955; however, a large portion of the present value costs for Alternative 4 are associated with the implementation of LUCs, Five Year Reviews and monitoring over 30 years. The present value costs for implementation of erosion control measures is $126,454.

CHAPTER 1 - INTRODUCTION

This report presents the results of the Feasibility Study (FS) conducted for the upland portion of the U.S. Government Moorings (Moorings) site in Portland, Oregon. The Moorings is located adjacent to the Willamette River within the industrial harbor of Portland, Oregon. As owners of the Moorings, the U.S. Army Corps of Engineers (USACE) was named a Potentially Responsible Party (PRP) for the Portland Harbor Superfund Site, as identified by the U.S. Environmental Protection Agency (EPA) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Remedial Investigation (RI) completed in 2008/2009 revealed the presence of contaminants in Moorings groundwater and in erodible soils along the riverbank at elevated concentrations relative to Federal and State guidelines and standards. Sediment investigations during the RI were completed to support the Lower Willamette Group (LWG) studies and USACE sediment management activities. Sediment contamination at the Moorings will be addressed under a separate FS.

The Seattle District, USACE conducted the FS. This report follows the guidelines to preparing a Feasibility Study report given in *Guidance for Conducting Remedial Investigations/Feasibility Studies Under CERCLA* dated October 1988 (EPA, 1988).

1.1 Purpose and Objectives

The FS for the Moorings is based on findings of the RI and the conceptual site model (CSM) developed for the site. The CSM assumed that the site will remain an industrial zoned property and will continue to be occupied by USACE. This FS evaluates potential remedial technologies and alternatives to mitigate risks from erodible soils and groundwater contamination at the site under the assumptions developed in the CSM.

The FS has two principal objectives:

- Develop and screen remedial alternatives that address human health risks from groundwater and potential ecological risks from erodible soil contamination at the site.
- Perform a detailed analysis of remedial alternatives for upland soils to allow for selection of an appropriate remedy in conformance with CERCLA remedy selection requirements.

The information provided in this report will be used to generate the Proposed Plan (PP), which will provide the forum for public involvement in the decision-making. The selection of the preferred alternative will be included in the Record of Decision (ROD).

1.2 Report Organization

This report is organized into an Executive Summary and eight sections as follows:

- Chapter 1 – Introduction – describes the purpose and objectives of the FS and outlines the organization of the FS report.
- Chapter 2 – Site Description – gives a description and history of the site, provides regional and site setting information, and geologic and hydrogeologic data.

- Chapter 3 – Conceptual Site Model – describes the site contaminants of concern (COCs), provides information on site contaminant fate and transport, and presents the findings of the risk assessment.
- Chapter 4 – Preliminary Remediation Goals (PRGs) and Remedial Action Objectives (RAOs) – presents the preliminary remediation goals based on the presented potential lists of applicable or relevant and appropriate requirements (ARARs) and RAOs that describe the site specific cleanup standards and provide a description of the remedial action evaluation process.
- Chapter 5 – General Response Action (GRA), Technologies, and Process Options – describes the proposed GRAs for the site, identifies all remedial technologies that are relevant to the site, and describes the initial screening process conducted to select the most effective alternatives.
- Chapter 6 – Development of Remedial Alternatives – provides the development of remedial alternatives where the GRAs and remedial technologies retained in the screening process from Chapter 5 are combined into appropriate remedial alternatives.
- Chapter 7 – Detailed Analysis of Alternatives – describes the screening of the remedial alternatives described in Chapter 6 through a set of evaluation criteria followed by comparative analysis between viable alternatives, provides the threshold requirements used in this screening process, describes the process used for selection of a interim cleanup action, if appropriate, and time frame for implementation of this selected remedial action.
- Chapter 8 – References – lists all references cited in the FS.

CHAPTER 2 - SITE DESCRIPTION

The following section provides an overview of the location, site history and land use, and detailed descriptions of the physiography, climate, and generalized geology and groundwater conditions associated with the Moorings.

2.1 Site Location

The Moorings is located on the west bank of the Willamette River at approximately river mile (RM) 6.08 through 6.21, within the industrial harbor of Portland, Oregon (Figure 2-1). The site address is 8010 Northwest St. Helens Road, Portland, Oregon, and is owned and operated by the USACE Portland District. The site is bounded on the northeast by the Willamette River, on the northwest by Advanced American Construction, on the southwest by Burlington Northern Santa Fe (BNSF) Railway and St. Helens Road, and on the southeast by NW Natural (formerly Gasco). The Gasco facility was a producer of Manufactured Gas Products (MGP) from 1913 to 1956. Koppers currently leases a portion of the NW Natural property for use as a coal tar pitch distribution facility.

The Moorings consists of 13.14 acres; the upland portion is approximately 10 acres. The submerged land is partially covered by 26,700 square feet of dock. Approximately one-half of the upland area on the southern end of the property is paved or covered by buildings. The remaining land surface, northwest of Building 17 is either covered by buildings or gravel and pavement. Figure 2-2 depicts the current physical layout of the site. The Moorings site was divided into two sections for the purpose of the RI based on differences of site uses and fill history: the Industrial Area and the Multi-Increment Sampling (MIS) Area. The Industrial Area is located on the southern portion of the site where the majority of light industrial activities occurred. Part of the Industrial Area was filled during the early history of the site. The MIS Area is located in the northern portion of the site and was historically used as a storage and warehouse area for dredge parts.

The majority of the riverbank at the site is a 1.5H:1V riprap-covered slope with a timber bulkhead at the toe of the slope, which generally follows the historic shoreline. Average river stages for the area range from 8.0 feet Columbia River Datum (CRD) in August and September to 12.5 feet CRD in May and June. The in-water vertical datum used at this site is the CRD, which was established for the Portland Harbor Superfund site. The upland vertical datum is the North American Vertical Datum of 1988 (NAVD88), which is derived from local mean sea level (msl) at Father Point/Rimouski, Quebec, Canada. CRD heights are approximately 4 to 5 feet below the NAVD88 heights. The staff gauge at the Moorings reports river stages in CRD, and is located northwest of the small boat dock (Dock B) (Figure 2-2). The land surface elevation for most of the site is approximately 30 feet NAVD (approximately 26 feet CRD).

2.2 Regulatory Status

The Moorings is located within the reach of the Willamette River identified by the EPA as a Superfund site under CERCLA. The Portland Harbor Superfund site assessment area extends from approximately RM 0/1 to 12, which includes part of the Multnomah Channel and upland portions of properties from which releases of hazardous substances have migrated or have the

potential to migrate to the river. The Portland Harbor Superfund site was listed on the National Priority List (NPL) on December 1, 2000 (65 Federal Register 75179-01). This reach of the Willamette River has served as a major industrial waterway since the early 1900s. The river provides habitat to wildlife, numerous fish, shellfish, and other aquatic species, including salmonid species listed under the Endangered Species Act (ESA). Additionally, several tribes have treaty-reserved rights and resources in the harbor.

In 2001, the Oregon Department of Environmental Quality (DEQ), EPA, and other governmental parties signed a Memorandum of Understanding (MOU) that provided a framework for management of the Portland Harbor Superfund Site. DEQ has the lead technical and legal responsibility for the upland contamination of the Portland Harbor Superfund Site and for coordinating with EPA on upland contamination that may impact the river. EPA has the lead technical and legal responsibility for the in-water contamination. For the Moorings site, DEQ has deferred responsibility for the upland contamination to EPA. Following the MOU, a Joint Source Control Strategy (JSCS) was created to define a process for identifying and controlling potential sources of contamination. Screening Level Values (SLVs) were included in the JSCS to screen and prioritize sources of contamination and assist in developing preliminary cleanup goals for source control measures.

2.3 Current Site Use

The Moorings currently provides port, supply, and repair facilities for the USACE Portland District fleet of dredges, hydrosurvey vessels, and other support vessels. The USACE Portland District warehouse is located at the site and mostly provides storage for the USACE operations. Shipyard operations are restricted to the southern area of the site south of the fence along Building 17. The remaining area is used for warehouse and storage. The Moorings is a registered small quantity hazardous waste generator.

The site contains a variety of permanent buildings plus docks for two ocean-going hopper dredges and a small boat dock for several survey boats. Site buildings include offices, a welding shop, machine shop, electronics shop, and storage. The site has supported the USACE Portland fleet of dredges and other vessels since its inception. The Portland District Operating Plan does not include any plans to modify the site in the future.

2.4 Site History

Use of the site began in 1903 to provide centralized maintenance and supply facilities for the USACE Portland District. The original boundaries contained what is now the southern portion of the site. In 1905, an additional tract was acquired to bring the area of the site to six acres. In 1940, a third parcel (5.29 acres) was acquired at the northwest end of the property, completing the land acquisition phase at the site. The site was further expanded with the use of fill materials to change the elevations of the site and by two phases of major construction.

2.4.1 Historical Site Use

While the industrial practices at the Moorings have been continuously updated and modernized since 1903, the site's primary use has remained as a shipyard facility, providing port, supply, and repair facilities for the USACE Portland District fleet of dredges, hydrosurvey vessels, and other

support vessels. The types of vessels served includes, or has included in the past, hopper dredges, pipeline dredges, bypasser dredges, service barges, oil barges, survey boats, tugs, and miscellaneous watercraft. The remaining area is used for warehouses and storage. The USACE North Pacific Division laboratory operated at the Moorings in Building 3 (currently the Carpentry Shop) from approximately 1939 until 1948, prior to the establishment of the Troutdale Laboratory. However, only physical testing of soil and geotechnical properties were conducted, rather than chemical testing that later took place at the Troutdale facility. Vehicle maintenance was conducted on government vehicles in Building 1 until 1986; however, the start date of this activity is unknown. The Vehicle Maintenance Shop conducted routine maintenance activities on site vehicles, which included oil changes, car washes, and general upkeep. Currently, government vehicles are taken off site for maintenance and car washes.

Normal activities adjacent to, and over the river have included fueling of vessels, delivery of and removal of lube oil, painting and paint removal, welding, metal cutting, vessel parts delivery and installation, supply delivery to vessels and solid waste removal from vessels. Historical records imply that new construction or refurbishing of some smaller vessels occurred in the early years of the site.

2.4.2 Building Construction

In 1913, new construction at the site included a bulkhead, housing for a watchman, and a water tank. The second phase of site expansion occurred from the late 1930s through the mid 1940s, and included the addition of a warehouse and garage in 1937. The office building, locker, soils laboratory, and pattern buildings were constructed between 1938 and 1939. In addition, three warehouses and the machine shop were constructed between 1940 and 1945. Dock B was reconstructed during the 1940s. The site was hooked up to the city sewer during the early 1940s. After the 1945 fill event (described below), a loading ramp was completed to facilitate loading and unloading of dredge pipe and other equipment. It was removed from this area sometime during the late 1950s to early 1960s. The last major renovation of the site was completed during the 1960s when the lumber and storage warehouse, overseer's quarters, carpentry shop, and sales storage building were demolished.

Additional construction activities included remodeling to convert the vehicle maintenance shop (Building 1) to office and conference space in 1986, and an emergency response vehicle garage was added in 1995.

2.4.3 Dredge and Fill Activities

In addition to the purchase of supplementary acres, fill material from dredging activities was used to expand the site footprint. Three dredging events where river sediment was used for upland fill have been documented. Documentation indicates that the fill material came from the basin directly in front of the site, between the shoreline and harbor line. Dredging activities are described in detail in the RI (KTA, TEC Inc. 2010). A summary is presented below:

- After the bulkhead was completed in 1913, an estimated 30,000 cubic yards of material was dredged from the Willamette River directly in front of the site and placed upland.

- In 1925, site development action created land to the north of the existing industrialized area where the three current warehouse buildings stand (Buildings 16, 17 and 20). A portion of the upland area south of the current Building 17 was likely shaved down to match the current site elevation of about 30 feet mean sea level (msl) (NGVD 88). The remainder of the central area was filled to an elevation of about 30 feet msl with sediment dredged from the river for navigational or berthing requirements. The central section of the site required approximately 15 feet of fill to reach the final elevation of 30 feet msl. Based on historic contours an estimated 205,000 cubic yards of material was dredged from the basin.

- In 1945, dredged sediment came from the basin in front of the site between the shoreline and harbor line and was used as fill material for the northwest end of the property, adding approximately 1.7 acres of land. The northwest section had approximately 10 to 14 feet of material added to the native soil to reach the final elevation of 30 feet msl.

- Maintenance dredging activities were documented in 1965 and 1981; however, the disposition of this material is unknown.

2.5 Groundwater Use

The Moorings receives domestic potable water from the Portland Water Bureau. The Moorings does not use any source of groundwater for a drinking water supply. There are currently no drinking water wells located on the property.

2.6 Climate

The Moorings is located approximately eight miles to the west and south of the Portland Airport, where the following climate description was compiled. The City of Portland is located at roughly 20 feet above mean sea level and approximately 65 miles inland from the Pacific near the convergence of the Willamette and Columbia Rivers. It lies midway between the Coast Range (west) and Cascade Range (east) at the northern end of the Willamette River Valley.

The Coast Range provides limited shielding from Pacific Ocean storms whereas the Cascade Range provides a barrier to cold air masses that migrate from Canada. The high Cascades provide an obstacle to moisture laden westerly winds, resulting in moderate rainfall for the region. On average, Portland has 155 days of measurable precipitation with 90 percent of the rainfall occurring within the months of October through May. Summers are relatively dry with an average of three percent rainfall in July and August. Precipitation varies across the Portland metropolitan area. The West Hills (which includes the area of the Moorings) receives 60 inches of rain per year, but the airport to the east only receives about 36 inches. An occasional arctic air mass does enter the region via the Columbia River Gorge resulting in freezing rain and snow in elevations above 500 feet. This occurs an average of four days per year. Temperatures are generally mild. Typical winter temperatures reach the 40s and lower 50s, with night lows in the 30s. As mentioned above, an occasional cold air blast does reach the area; however, temperatures below zero degrees are rare, occurring only six times since 1871.

Spring weather remains wet and cool with temperatures rising to the 60s and 70s at the start of the dry summer months. Afternoon highs in the 80s and low 90s are a regular occurrence during the summer months. Late summer remains warm and dry in general with fall temperatures returning to the 60s in October. On average, the last occurrence of 32 degrees is late March with the first of fall occurring in early-mid November.

Severe storms are rare in the area. Surface winds seldom exceed gale force (50 miles per hour [mph]). Average wind speeds at the Portland International Airport monitoring station range from a low of 6.5 mph in September to a high of 10 mph in January. Thunderstorms can occur throughout the year, but are uncommon. Summer thunderstorms can produce strong winds, large hail, and prolific lightening. Winter and spring thunderstorms are generally weak with brief gusty winds and light hail.

2.7 Topography

Figure 2-2 illustrates the current surface elevation contours at the site. In general, the site slopes from southwest to northeast with a local relief on site of approximately nine feet. Elevations range from approximately 38 feet at the flagpole in the southwest corner of the site to an elevation of approximately 29 feet at the bulkhead on the northeast side of the site.

2.8 Geology

The geology of the Portland area is generally characterized by a broad structural depression, or basin, bordered by the Cascade Mountains on the east and the Coast Range Mountains on the west. Geologic formations in the basin are folded and dissected by a number of northwest-trending faults. The Tualatin Mountains form a northwest-trending anticlinal ridge that is faulted along its eastern flank by the Portland Hills Fault. The Willamette River flows along the base of the eastern side of the Tualatin Mountains. The Moorings is located on the west bank of the river. A number of additional faults are located approximately parallel or perpendicular to the Portland Hills Fault and are mapped along or near the Tualatin Mountains (Tolan and Beeson 1984).

The Moorings is located within the Portland basin, which is a northwest trending structural feature that contains a thick sequence of alluvial deposits overlying the basalt flows of the Columbia River Basalt Group (CRBG) (Tolan and Beeson 1984). The basin is bounded on the northwest by the Tualatin Mountains that were formed by uplift along the Portland Hills fault zone (Tolan and Reidel 1989). From youngest to oldest, the alluvial deposits in the basin consist of Quaternary deposits (artificial fill, flood-plain and channel deposits of the Willamette and Columbia Rivers, and deposits from Ice-Age catastrophic floods from glacial Lake Missoula), and older alluvial deposits of Pliocene to Miocene age (Troutdale Formation and Sandy River Mudstone) (Tolan and Beeson 1984). The Miocene CRBG consists of a series of flood basalt flows of varying extent, thickness, structure, magnetic polarity, and geochemistry. The area surrounding the Moorings was previously dominated by lakes, including Kittridge and Doane Lakes. The lakes were connected by sloughs developed on the former flood plain of the Willamette River. The flood plain was buried beneath fill during industrial development.

Descriptions of the geologic formations (from youngest to oldest) of regional significance that are present at or near the site are presented below.

2.8.1 Surficial Fill Deposits

The recent Quaternary alluvium deposits are overlain by surficial fill deposits in many areas along the Willamette River near the Moorings property. As discussed in Section 2.4.3, there have been three documented dredging periods at the Moorings where the river sediment from the basin directly in front of the site was used for upland fill.

2.8.2 Recent Alluvium

Recent alluvium consists of Quaternary deposits of sands, silts, and gravels deposited by the Willamette and Columbia rivers. These deposits include the channel bottoms and floodplains of the rivers, and range in thickness up to 150 foot (Tolan and Beeson 1984).

The uppermost unit of the alluvium deposits is a laterally extensive fine-grained silt. The silt unit beneath the Gasco property and Siltronic property (located south of the Gasco property) has been found at elevations ranging from approximately 35 feet msl near the western Gasco boundary to approximately four feet msl near the riverbank. Thicknesses range from about 40 to 70 feet near the central portion of the properties to about one to three feet near the riverbank. At the Moorings property, the silt unit was encountered in 27 of the 31 borings completed in the Industrial Area at elevations ranging from 6 to 33 feet msl. Due to the shallow nature of the exploratory boreholes on the Moorings, the silt thickness was only determined at one location. The thickness of the silt at Borehole 20 (near the southeast boundary of the Moorings adjacent to the Gasco property boundary) was two feet, which is within the range observed at adjacent properties. It should be noted that although the silt until has been described as laterally extensive across a majority of the Gasco and adjacent Siltronic properties, it has been found to be absent at some near-shore areas on the Gasco property.

2.8.3 Catastrophic Flood Deposits

During the Pleistocene Era, thick deposits of boulders, gravels, sands, and silts accumulated throughout the Portland basin because of the repeated failures of glacial ice dams that impounded the ancient glacial Lake Missoula (Waitt 1985). These catastrophic flood deposits from the terrace surfaces in the eastern Portland area and are composed of three different facies. Coarse-grained pebble to boulder gravels and sand make up the core of these terraces, with fine-grained sand and silt deposits mantling the coarser-grained facies. A finer-grained, interlayered silt, sand, and gravel facies is found adjacent to the Columbia and Willamette River channels. The coarse-grained facies reach a maximum thickness of 60 to 100 feet, whereas the fine-grained facies reach a maximum thickness of 100 to 130 feet. The channel facies typically range in thickness from 15 to 45 feet (Tolan and Beeson 1984). Catastrophic flood deposits are not anticipated west of the Willamette River near the site; however, these deposits are regionally significant east of the Willamette River.

2.8.4 Troutdale Formation

The Troutdale Formation is of Miocene to Pliocene age and, in this area, consists of interbedded conglomerates and finer-grained deposits (Tolan and Beeson 1984). The Troutdale Formation is characterized by pebble to cobble conglomerates consisting primarily of Columbia River Basalt clasts with allocthonous clasts of volcanic, plutonic, and metamorphic rocks, and interbedded with micaceous arkosic and vitric sandstone (Tolan and Besson 1984; Tolan and Reidel 1989). Major regional aquifers in the Troutdale Formation underlie east Portland. The thickness of the Troutdale Formation ranges from 900 feet near Troutdale to 200 to 300 feet in the western parts of the basin east of the Willamette River (Tolan and Besson 1984). The Troutdale Formation is expected to be thin or locally absent at the Moorings and is not a significant aquifer in the vicinity of the Moorings.

2.8.5 Columbia River Basalt Group

The Portland basin is underlain by the CRBG, which consists of flood basalt erupted 6 to 17 million years ago. These Miocene-age flood basalts are characterized by a thick sequence of dense basalt flows separated by permeable interflow zones. These interflow zones may be characterized by productive aquifers. This unit has been folded and faulted and forms the Tualatin Mountain uplands southwest of the site. The CRBG dips steeply to the northeast near the site. The top of the CRBG is at the ground surface west of St. Helens Road about 0.2 miles west of the Moorings and is estimated to be at a depth of 65 to greater than 100 feet below the site (Geraghty & Miller 1991). On the east bank of the river, basalt depths are estimated to be 300 to 450 feet below ground surface (bgs) (Madin 1990). The Columbia River Basalt flows are overlain by fluvial sediments of the Troutdale Formation. Near the Tualatin Mountains, these deposits may be absent.

2.9 Hydrogeology

Previous work at adjacent properties (Gasco and Siltronic) has shown that groundwater occurs in three hydrologic zones: the unconfined surficial fill water-bearing zone (WBZ), the semi-confined alluvial WBZ, and the confined bedrock aquifers of the CRBG. For the purpose of this FS, it is assumed that similar conditions occur at the Moorings.

2.9.1 Groundwater Occurrence

At the regional scale, groundwater within the Portland Basin is expected to flow from recharge areas on the hills and ridges toward discharge areas along the stream valleys. Near the Moorings, groundwater likely flows to the northeast from the adjacent Tualatin Mountains (recharge area) toward the Willamette River (discharge area).

2.9.1.1 Surficial Fill Water Bearing Zone

The surficial fill WBZ is defined by the top of the laterally extensive silt unit described in Section 2.8.4. The thickness of surficial fill deposits at the Moorings is shown on Figure 2-3 and ranges from about 20 feet near the riverbank to less than one foot at the southwestern boundary, which is consistent with the historical fill activities at the site. The saturated thickness of the surficial fill during the RI ranged from one to ten feet. At the Gasco site, the saturated thickness

ranges between one and five feet at locations adjacent to the river, and between 10 and 25 feet at the central and western portions of the site. At some locations adjacent to the river, the saturated thickness seasonally becomes quite thin (2 to 3 feet); however, dry conditions within soil borings or monitoring wells completed across this zone have not been identified at any time of the year.

Groundwater Flow

Groundwater flow in the surficial fill WBZ is likely influenced by surface topography, which directs flow from a slight topographic high on the Gasco property toward the north across the Moorings property to the river. Figures 2-4 and 2-5 shows the groundwater elevations and flow directions measured during the RI in March and August of 2008.

The horizontal hydraulic gradient within the surficial fill WBZ at the Moorings was calculated using data collected during the RI. The gradient ranged from approximately 0.03 in March to 0.01 in August. This value is consistent with gradients calculated during similar studies at Gasco, which ranged between 0.015 to 0.020 (Hahn 2007).

A vertically downward hydraulic gradient has been observed at the Gasco and Siltronic properties. Values ranged from 0.052 to 0.392 (Hahn 2007). As such, groundwater in the surficial fill WBZ may be expected to migrate to the alluvial WBZ in areas where the underlying silt unit thins or does not otherwise impede downward flow.

Hydraulic Conductivity

Hydraulic conductivities were estimated at Gasco and Siltronic properties using slug test results. Values in the surficial WBZ ranged from 9.7×10^{-5} cm/sec to 9.1×10^{-3} centimeter/second (cm/sec) with one location exhibiting an anomalously low hydraulic conductivity of 2.4×10^{-6} cm/sec (Hahn 1998, Hahn 2005). The low hydraulic conductivity is likely a function of the tarry soils present at this well location within the former tar pond area.

2.9.1.2 Alluvial WBZ from the Gasco Site

The alluvial WBZ consists of interbedded sands and silts underlying the laterally extensive silt unit. Only one boring (Borehole 20) on the Moorings property was advanced through the alluvial WBZ. At this location, the alluvial WBZ was 65 feet thick, consisted mainly of silty sands, and poorly graded sands. At the Gasco/Siltronic properties, the thickness of the alluvial WBZ ranged from two to 25 feet at the central and western portions of the sites, up to 175 feet near the eastern corner of the Gasco site/northern corner of Siltronic site adjacent to the river. Although interbedded silts and sandy silts were present across various depth intervals within the alluvial WBZ at the Gasco/Siltronic areas, boring log data does not suggest the presence of separate hydrostratigraphic zones within the alluvial WBZ. Monitoring wells at the Gasco property have been subdivided into the following zones for the groundwater flow analysis: upper - typically shallower than 85 feet bgs; intermediate - typically 85 to 125 feet bgs; and lower - typically greater than 125 feet bgs.

Groundwater Flow

Groundwater flow within the alluvial WBZ at the Moorings likely follows the regional flow direction and is similar to the Gasco/Siltronic properties where groundwater flows north-northeast toward the Willamette River. A substantial flattening of the gradient has been observed within 300 feet of the riverbank where a very flat, tidally influenced, gradient exists. Very low gradients within this zone are common, with an occasional reversal of flow direction (i.e., away from the river). Overall, the groundwater flow direction within the intermediate-depth alluvial WBZ was found to be to the northeast towards the Willamette River, with an average hydraulic gradient of 0.010 in December 2005 (Hahn 2007). Lower alluvial WBZ wells are limited in number at the Gasco site, but indicate a more northerly component of groundwater flow than the shallower alluvial zones (Hahn 2005).

Vertical hydraulic gradients at the Gasco/Siltronic sites between the upper alluvial WBZ and intermediate depth alluvial WBZ have a predominantly downward gradient. Typical valuesl, range between 0.03 and 0.12 with several well pairs exhibiting an upward gradient of 0.002 to 0.03 (Hahn 2005). Consistent across both the Gasco and Siltronic sites is a predominantly upward vertical gradient between the lower and intermediate-depth intervals within the alluvial WBZ. The downward gradients ranged from approximately 0.005 and 0.04 on the Siltronic property and 0.0005 to 0.009 at the Gasco property.

Overall, water levels collected from the Gasco and Siltronic properties suggest that the vertical groundwater gradient in the alluvial WBZ is predominantly downward within the upper portions and upward across the lower portions of the alluvial WBZ. This characteristic of converging flow is typical of discharge areas. Groundwater in the alluvial WBZ is likely discharging to deeper portions of the river that the surficial fill WBZ.

Hydraulic Conductivity

Estimated hydraulic conductivities for the alluvial WBZ beneath the Gasco and Siltronic sites show less variability than the surficial fill WBZ. Conductivities based on slug test results ranged from a low of 9.7×10^{-5} cm/sec to a high of 5.3×10^{-4} cm/sec. Conductivities based on the pumping test results conducted in 2005 in the upper alluvial WBZ at the Gasco site ranged from 4.9×10^{-4} cm/sec to 1.9×10^{-3} cm/sec with an average of 1.1×10^{-3} cm/sec. Storativity values ranged from 7×10^{-4} to 2×10^{-2}, which suggest that the aquifer is semi-confined (Hahn 2007).

2.9.1.3 Columbia River Basalt Group

The Miocene-age CRBG, composed of a series of individual lava flows, generally forms the base (bedrock) of the Portland Basin and outcrops immediately to the southwest of the site in the Tualatin Mountains. Groundwater resources within the CRBG are typically limited to the interflow zones where sedimentation occurred between lava flows or within the rubble tops of the flows themselves, with these zones having the potential for relatively high horizontal permeability, but low vertical permeability due to overlying and underlying low permeability basalt flows (Hampton 1972). The presence of faulting can have the effect of isolating the more permeable inter-flow areas by positioning them against up-thrown or down-thrown basalt flows.

Although yields may be high within the interflow areas, the storativities tend to be low due to low amounts of recharge.

2.9.2 Relationship between Groundwater and River Elevations

Shoreline alluvial WBZ wells at the Gasco property show a direct and rapid response to tidally-influenced changes in Willamette River elevation. A similar, but dampened and delayed response was observed at alluvial WBZ wells at a greater distance from the river. Continuous water level monitoring indicates that the crest-to-crest time delay between peak river level and peak groundwater elevation at wells adjacent to the shoreline was approximately 15 to 30 minutes, while the delay at a well, 250 feet upland from the shoreline was approximately 4.5 hours. This suggests a direct hydraulic communication between the Willamette River and the alluvial WBZ, with river stage playing an important role in groundwater transport and brief periods of flow reversal observed at the peak of most high tide cycles.

In the surficial fill WBZ wells, continuous water level monitoring results did not identify a direct relationship between tidal fluctuations of the Willamette River; however, long-term, seasonal fluctuations in the river level were generally matched by similar fluctuations of groundwater level. This suggests that although discharge of groundwater from the surficial fill WBZ to the Willamette River is expected, it appears that a degree of isolation exists between these features, as daily fluctuations in river level do not appear to have an impact on groundwater levels or flow within the surficial fill WBZ.

A relatively thick (greater than ten feet) layer of silt is present in near shore sediments adjacent to the Gasco and Siltronic sites, extending 200 to 300 feet from the shoreline (MFA 2005, Anchor 2004). It is expected that the fine-grained silt materials impede near shore discharge of groundwater to the river from both the surficial fill and the upper portions of the alluvial unit. Although this silt may impede flow, the tidal response data would not suggest it acts as a barrier to flow.

CHAPTER 3 - CONCEPTUAL SITE MODEL

The following sections present the CSM based on data gathered during the RI (KTA, TEC Inc. 2010) and investigations conducted on the adjacent Gasco/Siltronic property. The CSM assumes that the site will remain an industrial property and provides the basis for the development and screening of remedial alternatives.

3.1 Geologic/Hydrogeologic Conceptual Site Model

The geologic/hydrogeologic CSM builds on the site description presented in Chapter 2. The conceptual geologic cross sections were developed for this updated CSM based on the RI interpretation and information available for the Gasco property. Figure 3-1 shows the locations of the cross-sections. Figures 3-2 through 3-4 present the cross-sections A-A', B-B', and C-C'.

Surficial fill deposits are present across the site and extend from groundwater surface to the top of the low permeability silt layer. Figure 2-3 shows the thickness of the surficial fill deposits. Due to the complexity of differentiating historical dredged materials from in-place deposits, the silt layer is considered to define the bottom of the surficial fill deposits. The cross-sections depict the silt layer as laterally extensive across the site as it was encountered in the majority of the borings advanced; however, it may be absent in some areas. Since most of the borings did not extend below the silt layer, the actual thickness of the silt layer is unknown. In areas on the cross-sections where the silt layer is shown to be very thin or below the bottom of a boring, it may actually be missing. Historic documentation suggests that there may have been a creek channel that entered the Moorings from the south between Buildings 2 and 14 and discharged to the river adjacent to Building 19. Borings completed during the RI did not reveal strong lithologic evidence of this historic creek channel. However, since it difficult to differentiate this type of fluvial deposit from the surficial fill and older alluvial deposits, the absence of direct evidence does not necessarily preclude the presence of the channel.

Water levels collected during the RI provide the basis for saturated zones presented on the cross-sections. Groundwater within the surficial fill WBZ at the Industrial Area flows toward the north and discharges to the Willamette River. Groundwater samples were not collected at the MIS Area; therefore, water elevations were based on saturated zones encountered during drilling. Cross-section C-C' (Figure 3-4) shows that surficial fill WBZ in the northern portion of the MIS Area may not be continuous. Since surficial fill deposits at the MIS Area are thickest near the shoreline and thin toward the northwestern property boundary, it is hypothesized, that shallow groundwater in the MIS Area is limited in extent. Localized sources of groundwater at the MIS Area include infiltration of precipitation and stormwater on the Moorings property, preferential pathways around the ODOT stormwater culvert, or the historical stream channel.

The alluvial WBZ is located beneath the silt layer. The thickness of the alluvial deposits at the Moorings is uncertain, as only one boring was advanced to bedrock during the RI. The bottom of the alluvial WBZ, or the top of bedrock, is assumed to range between 60 and 100 feet bgs (-30 and -70 feet msl). Cross-Section B-B' shows bedrock dips toward the southeast. This interpretation is based on geologic data collected nearby at the Gasco property.

3.2 Contaminant Nature and Extent

Based on differences in site uses and fill history, the Moorings was divided into two sections for the purpose of the RI: the Industrial Area and the MIS Area. Soil, groundwater, surface water, and sediment samples were collected during the RI. Detected concentrations of contaminants were screened against the Portland JSCS SLVs to facilitate screening-level risk assessments and help prioritize source control activities. The JSCS SLVs are presented in Appendix A for reference. Results of the screening evaluation are presented in Appendix B.

3.2.1 Soil

The Industrial Area was investigated using a traditional, discrete sampling approach to identify potential on-site sources. Soil samples were collected from 22 borehole locations during two separate field events and are shown on Figure 3-5. The MIS Area was investigated using a multi-incremental sampling approach. The method involved collecting a series of soil cores from the same depth at specific locations within a systematic random grid area and then compositing the soil aliquots into a single representative sample for physical and/or chemical analyses. The MIS Area was divided into seven Management Units (MUs) based on common physical, chemical, and operational characteristics.

Polycyclic aromatic hydrocarbons (PAHs) and metals were widely detected in soil across both the Industrial and MIS Areas (TEC, KTA Inc. 2010). Volatile organic compounds, in particular chlorinated solvents, pesticides and polychlorinated biphenyls (PCBs) were detected at low concentrations in limited numbers of samples, with no apparent distribution pattern and without obvious point sources. Cyanide was detected in soil at significant concentrations at the Industrial Area. Figure 3-6 shows the concentration of total cyanide in soil. The highest concentrations were detected at SB-16 and SB-17, located near the Gasco/Moorings boundary.

3.2.2 Groundwater

Groundwater samples were collected at the Industrial Area during two separate sampling events. Ten temporary monitoring wells were installed and sampled during the first event. All groundwater samples were collected from the surficial fill WBZ, with the exception of SB-20, which was installed in the lower alluvial WBZ. Review of the initial data showed elevated concentrations of cyanide in several wells. Subsequently ten additional temporary wells were installed and sampled to fill the data gaps. For this contingency sampling event, cyanide was analyzed using five different methods, to match similar protocols currently being conducted at the Gasco site. A third sampling event was conducted to verify detections of benzene, toluene, ethylbenzene, and xylene (BTEX) and total petroleum hydrocarbons (TPH) at SB15, located near a former underground storage tank.

Similar to soil, PAHs, metals, and cyanide were detected in groundwater samples throughout the Industrial Area. Contaminant concentrations were highest near the Moorings/Gasco boundary and decreased with distance from the boundary. Figure 3-7 shows the concentration of total cyanide in groundwater. The highest concentrations were detected at GW-16, at the Moorings/Gasco boundary and at GW-22, located near the shoreline. These wells lie within the central area of the cyanide plume, which may coincide with the location of a former stream

channel (KTA, TEC Inc. 2010). At the southeast Moorings/Gasco boundary near the river, cyanide was detected in the lower portion of the alluvial WBZ at a concentration of 200 micrograms/liter (μg/L) at GW-20. Elevated cyanide concentrations have been detected in the intermediate and lower portions of the alluvial WBZ nearby on the Gasco property.

Figures 3-8 through 3-11 show the extent of benzo(a)pyrene, aluminum, arsenic, and manganese in groundwater, which were identified in the Human Health Risk Assessment (HHRA) as having a risk greater than $1x10^{-4}$. Elevated concentrations were observed along the Moorings/Gasco boundary and the highest concentrations were observed at GW-11. In contrast to cyanide concentrations in groundwater, a distinct plume is not evident.

3.2.3 Upland Surface Water and Sediments

Upland surface water and sediments were sampled to determine if contaminants are exiting the site through direct discharges.

Surface water samples were collected from the French drain, Oregon Department of Transportation (ODOT) catch basin, and seep. The sample locations are shown on Figure 3-12. A brief summary of the surface water samples are as follows:

- The ODOT Catch Basin sample represents off-site stormwater from St. Helens Road that is discharged at the outfall on the Willamette River and is not considered further in this FS.

- The Seep sample contained low levels of PAHs, pesticides, and metals, similar to constituents detected in near-shore sediments. The sample was collected as an unfiltered grab sample from the riverbank in the MIS Area. Elevated turbidity in the sample may have cause biased concentrations for those contaminants with high partition coefficients. In addition, this sample was collected at the direction of EPA and it is not clear whether the sample represents groundwater, riverbank storage, or localized drainage. For these reasons, the validity of the Seep sample is questionable and it is not considered further in this FS since it may not be representative of upland groundwater conditions in the MIS Area.

- The French Drain sample was collected from the French drain installed following the 1996 flood and represents stormwater runoff that is transported from the Laydown MU. Low levels of metals were detected in the French Drain sample. Aluminum, arsenic, copper, and lead exceeded one or more of the JSCS SLVs.

For the purpose of this FS, upland sediments are considered as sediments that have accumulated in drywells or catch basins from stormwater runoff. Two samples were collected during the RI, at the drywell and the ODOT catch basin. Sample locations are shown on Figure 3-12. As stated above, the ODOT catch basin is an off-site source and is not considered further in this FS. The drywell was constructed with square steel, a welded grate on top, and a solid bottom plate with holes drilled for drainage. It was approximately one foot square by three feet deep. At the time, the drywell was sampled there were approximately 18 to 24 inches of sediment on top of the bottom plate. The sediment sample had elevated concentrations of PAHs, PCBs, TPH-Diesel,

TPH-Motor Oil, and metals. Soil samples collected nearby indicated that the contaminants had not migrated from the drywell to the surrounding subsurface soils. As a source control measure, the drywell was removed in 2009. Additional details on the removal are presented in Section 3.4.

Erodible soils are considered as surface soils that may be eroded and transported to the river due to overland stormwater flow. During the RI, the hard-packed northern portion of the site had a surficial layer of fine soils in several areas. Two areas were identified as containing erodible soils: the Fence Line MU sample and the North Logistics Runoff sample (Runoff sample). The sample locations are shown on Figure 3-13. The Fence Line MU is a one to three-foot wide gravel area at the northeast end of the property located between the hard packed gravel and the armored shoreline. The Fence Line MU sample was collected using a multi-increment sampling technique and is a composite of 25 individual soil samples collected from a depth of 0 to 6-inches. The Runoff sample is a soil grab sample collected from a depth of 0 to 1 feet at a location that showed evidence of sedimentation buildup from surface water runoff. The sample was collected to determine if conditions observed at the Fence Line MU continued into the North Logistics MU. The Fence Line and Runoff samples detected concentrations of PAHs, PCBs, pesticides and metals above JSCS SLVs. The Runoff sample confirmed that similar conditions exist along the fence line at the North Logistics and Fence Line MUs.

3.3 Source Characteristics

The primary sources of contamination at the Moorings include fill material from dredging activities, on-site operations and disposal of chemicals, stormwater discharges, and up-gradient groundwater sources.

3.3.1 Fill Material

The Moorings was divided into two sections for the RI based on the site uses and fill history. The majority of light industrial activities at the Moorings occurred at the Industrial Area. It was filled with dredge materials from the Willamette River to its present grade in 1913, before the general industrial character of the surrounding area really began to take shape. The surface was paved early on and has remained relatively unchanged over time. Accordingly, it was presumed that the fill placed in the Industrial Area was not grossly contaminated by off-site activities prior to its placement. In contrast, the MIS Area had limited industrial activities and has been primarily used as a storage and warehouse area for dredge parts. Fill was placed as a result of two separate dredging activities that occurred over a longer period of time and after the industrial nature of the area was well established for several decades.

A comparison of PAH concentrations during the RI indicated that concentrations in the MIS Area are two or more times greater than in the Industrial Area. Given that there are no obvious sources of PAH contamination in the MIS Area (except for possible runoff from paved areas), and several potential sources in the Industrial Area of the site, the data suggest that the sediment used as fill in the MIS area was potentially contaminated via alternate sources or pathways. Although no evidence exists to suggest that the dredge materials used to fill either location were grossly contaminated prior to placement on site, the MIS Area in particular was filled with

dredged material in both 1925 and 1945 during which there was substantial industrial activity in the overall area.

3.3.2 On-Site Operations and Disposal of Chemicals

The RI determined that contaminants associated with on-site operations and disposal of chemicals, such as former underground storage tanks (USTs), electrical transformers, drywells, and routine vessel maintenance activities, were limited in concentration and/or extent. Identified on-site sources with a potential to impact human health or the environment, such as the drywell, have been removed (see Section 3.4).

3.3.3 Direct Discharges

Direct discharges include stormwater point source discharges to the Willamette River and transport of erodible soils from overland stormwater flow. Current stormwater point source discharges from the Moorings were evaluated using the French drain sample, which transports runoff from the Laydown MU. The Moorings currently has a National Pollutant Discharge Elimination System (NPDES) General Permit for Industrial Stormwater Discharges (Permit #1436, GEN12Z Industrial Stormwater, Class: minor). A Stormwater Pollution Control Plan (SWPCP) has been developed for the site and includes best management practices and monitoring (USACE 2008). The French drain sample contained concentrations of aluminum, copper, and lead above JSCS SLVs, however, these, concentrations are below the benchmark values for the NPDES permit. The French drain sample did not contain detectable concentrations of PAHs, pesticides, or PCBs.

The French drain was installed in 1996 when a flood covered the site with several feet of water and caused the slope in the Laydown area to weaken and fail (French Drain 1, Figure 3-13). The drain was reportedly constructed about four feet below ground surface with perforated PVC piping and filter fabric to prevent sediment from entering the drain. Following completion of the RI sampling events in 2008, a new French drain system was installed at the northeastern edge of the Moorings property to help control soil erosion observed near the fence posts (French Drain 2, Figure 3-13). The drain was reportedly constructed about one-foot below ground surface with perforated PCV piping and filter fabric. During this construction, the fence line was moved inland approximately five feet at the northernmost end of the site and the area was overlain with gravel. These repairs have lowered the potential for soil erosion at the Fence Line MU. Potentially contaminated erodible soils that have not been overlain by gravel remain exposed near the Runoff sample located at the North Logistics MU.

3.3.4 Up-gradient Sources

One of the more significant potential up-gradient/off-site sources is the former MGP, Gasco, located adjacent to the southern boundary of the Moorings. A stockpile of spent oxide/gas purification materials was located at the northeast portion of the Gasco site, immediately adjacent to the Moorings property. This pile existed for a minimum of at least 36 years according to photographic records and reached a size of about 80,000 cubic yards (KTA/TEC Inc. 2010). The spent oxide materials are of concern because they may contain compounds with hydrocarbons, metals and cyanide that passed through the upstream gas processing equipment,

designed to remove sulfur from the gas. In addition to the preceding, spent oxide wastes have been found to contain varying amounts arsenic, chromium, copper, lead, nickel, and zinc (Hahn 2007).

Previous investigations conducted on the Gasco site show significant subsurface contamination. The Gasco RI confirmed the presence of process residuals such as purifier box wastes resulting from the use of lime and metal oxides to remove sulfur and cyanide from product gas (Hahn 2007). Contaminants identified in the Gasco RI associated with spent oxide wastes include non-aqueous phase liquids (NAPL), trace metals, cyanide (predominately as ferrocyanates), PAHs, and BTEX. Due to the location of the waste pile, contaminants have likely affected the Moorings site via airborne transport, physical transport due to erosion and runoff, or after leaching into groundwater.

3.4 Source Control Actions

3.4.1 Historical Source Control Actions

Historical source control activities at the Moorings are described in the RI (KTA/TEC Inc., 2010). Figure 3-14 shows the locations were source removals were conducted. A brief summary of these activities is presented below:

- A 1,000-gallon gasoline underground storage tank (UST) was reportedly removed from the southwest corner of Building 17 in about 1984. There are no records of the tank removal. USACE attempted to locate the tank in 1999; however, the contractor was unable to find the tank using visual, magnetometer, and soil probing methods.

- In 1993, surface soil was removed in four areas at the northwestern portion of the site where historic sandblast occurred. At two of the cleanup areas (Area 1, northwest corner of the site and Area 2, along the western bulkhead wall) visible sandblast grit was removed. Soils that were visually impacted with petroleum hydrocarbons were removed from the other two areas (Area 3, gravel storage yard and Area 4, east of and adjacent to warehouse storage Buildings 21 and 24). A total of 239 tons of soil were removed and disposed of off-site.

- A 5,000-gallon gasoline UST located immediately north of Building 1 was removed in 1994. In 1993, the UST was successfully tightness tested and appeared sound upon its removal. The two soil samples that were collected at either end of the tank were non-detect for hydrocarbons.

- In 1996, a storage shed historically used to store fuel and various hydraulic and lubricating oils associated with lawn maintenance equipment was removed. Associated stained soil in a 12-foot by 24-foot section, up to 18-inches deep was removed and disposed off-site. The results of three subsequent verification samples reported concentrations of semi volatile organic compounds (SVOCs) and arsenic above the cleanup standards.

3.4.2 Drywell Removal

The sediment sample collected from the drywell (i.e. material accumulated in the catch basin) contained elevated concentrations of PAHs, PCBs, metals, TPH-Diesel, and TPH-Motor Oil above JSCS SLVs. Soil samples collected at an adjacent borehole, SB-13, indicated that contamination was limited in extent (see Figure 3-5). Table 3-1 presents the concentrations of detected contaminants in the drywell sample and soil samples from borehole SB-13.

USACE elected to remove the drywell to control this potential on-site source. The drywell was excavated on August 20, 2009. The steel containment box (3 foot deep and 1 foot square) and the stained soil found directly beneath it were removed and contained in a 55-gallon drum. Toxicity Characteristic Leaching Produce (TCLP) results showed that the excavated materials were non-hazardous and were disposed of accordingly. An additional sample, collected from the bottom of the excavation, was analyzed for TCLP metals, diesel and residual range organics, TCLP volatiles, and PAHs to verify the contaminated soil was removed. The results of this verification sample are presented on Table 3-2. With the exception of barium, which had a TCLP extract concentration of 1.1 mg/L, no constituents were detected above their respective reporting limits. The laboratory report is presented in Appendix C.

3.4.3 Up-gradient Sources

To address groundwater and dense non-aqueous phase liquids (DNAPL) contamination at the Gasco site, NW Natural prepared a Focused Feasibility Study (FFS) that recommended an interim groundwater source control removal action. Groundwater pump and treat was selected as the preferred alternative. Ten extraction wells were proposed along the shoreline to hydraulically contain groundwater on-site (Anchor 2007). The northernmost extraction well for this proposed system is located approximately 175 feet from the Moorings/Gasco boundary. Groundwater modeling determined that a well spacing of 200 to 250 feet and pumping rate of 20 gallons/minute (gpm) would be sufficient to maintain capture of the full vertical extent of the aquifer. It is unknown when this system will be operational; however, it will likely influence groundwater flow near the Moorings/Gasco property boundary and the mass of contaminants migrating onto the Moorings property.

3.5 Contaminant Fate and Transport

The primary transport mechanisms through which upland contaminants could migrate to the Willamette River are shallow groundwater discharge, overland runoff, and soil erosion.

As discussed above, the most likely source of the groundwater contamination at the Industrial Area is leaching and infiltration to groundwater from soils impacted by the spent oxide waste pile located on the Gasco property. Cyanide contamination is frequently associated with the oxide materials. Cyanide in groundwater can occur in several forms: free cyanide, simple cyanides, complex cyanides, and organic cyanides. The most common form of cyanide at MGP sites is complex cyanide in the form of iron-cyanide solids, or Prussian blue (ferric-ferrocyanide). In acidic soil, transport is dominated by equilibrium with Prussian blue, which is sparingly soluble under acidic conditions and limits the concentration and mobility of dissolved cyanide. However, at pH levels higher than 7, the solubility of this precipitate increases, which

allows cyanide to be more mobile. Nevertheless, according to field observations, Prussian blue appears to persist for decades in alkaline soils (Meeussen 1995). During the RI, fine blue particulate matter was observed in the groundwater from sample SB-16, located down-gradient of the former waste pile, and suggests that Prussian blue is present at the site.

Cyanide can be used as a tracer of off-site sources since there are no potential on-site cyanide sources. The RI demonstrated that there is a correlation between concentrations of cyanide in soil and groundwater. Typically, the highest concentrations in soil were observed at depth (e.g. 12 to 16 feet bgs) within the saturated zone. This correlation supports the hypothesis of contaminant transport in groundwater either in solution or as a particulate. In areas where the low permeability silt layer is missing or very thin, cyanide could migrate vertically to the alluvial WBZ. Elevated concentrations of cyanide in groundwater at sampling locations near the shoreline indicate that contaminants could be discharging to the river. The highest concentrations of cyanide along the river were detected at GW-22 at a concentration of 2,320 µg/L. This is above the Maximum Contaminant Level (MCL) of 200 µg/L and the Ambient Water Quality Criteria (AWQC) of 5.2 µg/L.

Elevated concentrations of metals and PAHs were detected in groundwater near the Gasco/Moorings boundary. The mobility of these contaminants is controlled by many processes such as sorption onto mineral grains, sorption by organic carbon, chemical precipitation, abiotic or biodegradation, and oxidation-reduction reactions (Fetter 1992). Contaminant partitioning between the soil and aqueous phase is typically described using the partition coefficient, K_d. Using this relationship, the RI calculations suggest an off-site source or contribution to the observed groundwater contamination (KTA, TEC Inc. 2010). Concentrations of metals in groundwater were more widely spread over the Industrial Area; however, the highest concentrations were again located along the Gasco/Moorings border.

Erodible soils can be transported to the Willamette River by overland stormwater flow or riverbank erosion. Contaminants sorbed onto the erodible soils have the potential to affect the Willamette River. During the RI, erodible soils were noted in two areas, along the Fence Line MU and at the North Logistics MU (Runoff sample). The Runoff sample was collected from an area where stormwater runoff from the concrete surface near Buildings 20 and 21 appeared to flow. The Fence Line MU sample was a composite of 25 shallow soil samples. Since the RI sampling was completed, a new French drain system has been installed along a portion of the fence line and gravel placed along the fence line, thereby decreasing the potential for erodible soils in this area.

The potential for riverbank erosion over most of the site is low. Figure 3-15 shows the surface and bank materials at the site. Riprap or concrete currently covers the riverbank at the site. Vegetation obscures the riprap in some areas, particularly in a 150-foot section adjacent to the North Logistics MU. This section coincides with the location of the historical marine railway ramp, which was removed sometime between the late 1950s to early 1960s. Due to the historical ramp, there is no bulkhead present and the slope within this section appears to be shallower than the surrounding banks.

The upland area adjacent to the historical ramp slopes slightly downward towards the bank providing a natural runoff pathway for stormwater. This area contains a notably higher

percentage of fine soils on the surface, which are susceptible to stormwater erosion, as compared to MIS areas further north of the North Logistics MU. Figure 3-15 illustrates the extent of gravel cover over much of the northern portion of the site. Stormwater in areas covered by gravel will infiltrate quickly; however, during intense precipitation events it is possible that stormwater could transport erodible soils over gravel-covered areas via overland flow.

3.6 Risk Assessment Findings

The HHRA presented in the RI evaluated the potential for human health impacts associated with environmental contaminants detected at the Moorings. The risk assessment provides a chemical- and site-specific risk analysis, assuming that no remedial actions are conducted. The results provide one of the tools used to determine whether there are risks to human health at the site or whether remedial alternatives should be considered to protect human health.

No ecological risk assessment was conducted for the Moorings, as there are no upland receptors due to lack of habitat. To identify potential risks to aquatic and aquatic-dependent receptors from the Moorings, a screening evaluation was completed using data collected during the RI for erodible soils, upland sediment, surface water, and groundwater. The results indicate that the groundwater and erodible soils at the Moorings is likely contributing contaminants to the Willamette River. An ecological risk assessment for the in-water sediments will be conducted as part of Portland Harbor RI/FS.

3.6.1 HHRA

Human health risks associated with environmental contaminants detected during the RI were evaluated to assist decision makers in determining appropriate management options for the site. Complete or potentially complete exposure pathways that were evaluated include (KTA, TEC Inc. 2010):

- Incidental ingestion and dermal contact with shallow soils (to a depth of 5 feet) for upland Excavation Workers.
- Inhalation of volatile or particulate emissions from shallow soil by office, upland Excavation Workers, or Maintenance Workers.
- Potential future ingestion, dermal contact, and inhalation of volatiles from groundwater used as drinking water for office and Maintenance Workers.
- Incidental ingestion, dermal contact, and inhalation of volatiles or particulate matter of surface soil (upland sediment) for Maintenance Workers.

Contaminants that were detected at levels that exceeded SLVs were designated as contaminants of potential concern (COPC) and carried forward in the risk assessment. COPCs for risks associated with direct exposure to surface/shallow soil were identified by comparing analytical results for soil/upland sediment samples to EPA Region 6 preliminary remediation goals (PRGs) for industrial soils. COPCs for risks associated with direct exposure to water were identified by comparing RI data to drinking water maximum contaminant level (MCLs) and EPA Region 6 Preliminary PRGs for tap water.

Standard risk calculations using the risk assessment information system (RAIS) were performed using all COPCs and exposure pathways. The results of the HHRA indicate that cumulative cancer risk and hazard index is below levels of concern for the following exposure scenarios:

- Exposure of Maintenance Workers to COPCs surface soils.
- Exposure of Maintenance Workers and Office Workers to COPCs shallow soils.
- Exposure of Excavation Workers to COPCs in shallow soils.
- Exposure of Maintenance and Office Workers to COPCs volatilized from groundwater as a result of vapor intrusion into buildings, as estimated by the Johnson and Ettinger (J&E) model.

The EPA Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-30, Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, states that action is generally not warranted based on reasonable maximum exposure for both current and future land use if the cumulative cancer risk is less than $1x10^{-4}$ and the non-carcinogenic hazard quotient is less than 1 unless there are adverse environmental impacts. Results of the HHRA indicate the exposure of Maintenance Workers and Office Workers in a future land use scenario to groundwater used as a drinking water source present a cumulative cancer risk and hazard indices that are above the level of concern and present potential human health concerns. The following groundwater constituents are associated with a risk to human health greater than $1x10^{-4}$ or a hazard quotient greater than 1:

- Cyanide
- Benzo(a)pyrene
- Metals - aluminum, manganese, and arsenic

3.6.2 JSCS SLV Screening Evaluation

Exposure media of concern for ecological receptors are air, surface soil, subsurface soil, surface water, and sediment. The upland portion of the Moorings site is almost entirely covered with buildings, pavement, or gravel with minimal landscaping. The USACE and EPA concur that no ecologically important terrestrial habitat exists on the upland portion of the site. Accordingly, the on-site air, soil, and subsurface soil pathways are considered incomplete.

Potential impacts to the Willamette River from on-site groundwater, erodible soils, upland surface water and upland sediments were assessed using a screening evaluation against the Portland Harbor JSCS SLVs (DEQ 2005). Portland Harbor JSCS SLVs summarize the chemical concentrations in the environment that have the potential to increase risk to humans and ecological receptors based on scientific research and literature. EPA interprets concentrations above JSCS SLVs to be indicative of conditions causing negative impact to human health or ecological receptors in the Willamette River. The JSCS SLVs are used within this FS as screening values to represent risk uncertainty until the EPA Portland Harbor RODs establish contaminant specific cleanup levels based on identified ARARs or risk-based levels (DEQ 2005). The results of the evaluation are presented in Appendix B.

To evaluate impacts to the River from groundwater, twenty groundwater samples and the seep sample were screened against the JSCS SLVs for ecological receptors and fish consumption. Groundwater constituents identified by this process include:

- Carbon disulfide
- PAHs – benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene
- Pesticides – Aldrin, DDE, DDx-total, Chlordane-total
- Cyanide
- Metals – arsenic, aluminum, cadmium, copper, lead, manganese, nickel, silver, zinc

Groundwater samples were compared to JSCS SLVs to evaluate potential human health risks to future site occupants. These criteria include the Safe Water Drinking Act (SWDA) MCLs and secondary standards and Region 9 PRGs. Groundwater constituents identified by this process include:

- Benzene, tetrachloroethene, naphthalene
- PAHs - benzo(a)anthracene, benzo(b)fluorene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene fluorene, dibenz(g,h)anthracene
- Cyanide
- Metals – aluminum, arsenic, cadmium, chromium, lead, manganese, mercury, nickel, and zinc

It should be noted that only cyanide, cadmium, chromium and lead exceeded MCLs.

Upland surface water samples were collected during the RI to determine if stormwater is affecting the Willamette River; either through infiltration or direct discharge via stormwater drains. As stated above, the ODOT catch basin is not considered further in this FS. The French drain sample was screened against JSCS SLVs for ecological receptors and fish consumption. It should be noted that detected concentrations are below benchmark values for the site's NPDES permit. Surface water constituents identified by this screening process include:

- Metals - arsenic, aluminum, copper, lead

Upland sediment samples were collected from the ODOT catch basin and the on-site drywell. As discussed above, the drywell has been removed and the ODOT catch basin represents off-site stormwater sources. Therefore, these samples have been excluded from the screening evaluation.

On-site erodible soils are represented by two samples, the Fence Line MU sample and the Runoff sample. These samples and were screened against the JSCS SLVs for toxicity and bioaccumulation in sediments. Erodible soil constituents identified by this screening process include:

- PAHs – flouranthene, pyrene, benzo(a)anthracene, chrysene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene, di-n-butyl phthalate, bis-(2-Ethylhexl)phthalate
- PCBs - Aroclor 1248, total PCBs
- Pesticides – DDD, DDT, total DDx, total Endosulfan
- Metals – arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, zinc

3.7 Media of Concern

Site media were either ruled in or ruled out as a medium of concern based on the risk assessment and screening level assessment presented above.

- Groundwater is retained as a medium of concern based on presence of contaminants in concentrations that exceed their respective MCLs and the risk estimated as greater than $1x10^{-4}$ for hypothetical future groundwater use. In addition, the JSCS screening evaluation indicated a potential for groundwater to affect ecological receptors in the Willamette River.
- Indoor air is not carried forward as a medium of concern based on the values determined from the risk assessment.
- Upland surface water will be addressed through actions taken on erodible soils. Due to the low magnitude of JSCS SLV exceedances and the actions to be taken on erodible soils, upland surface water will not be carried forward as a medium of concern.
- Upland sediments are not carried forward as a medium of concern because the sources have been removed or are located off-site.
- Erodible soils are carried forward as a medium of concern based on the JSCS screening evaluation and will be addressed under upland soils.

3.8 Contaminants of Concern

The former Gasco property has been identified as an off-site source to the groundwater contamination at the Moorings. Since source control at the Gasco property is pending, this FS will focus on an interim measure for groundwater to reduce risks to human health from exposure to contaminated groundwater. Constituents in groundwater associated with an increased cancer risk to humans greater than $1x10^{-4}$ and exceed the MCL are brought forward as groundwater COCs for the purpose of this FS. Impacts to the river from groundwater will not be address in this FS. Constituents detected in erodible soils above JSCS SLVs are brought forward as soil COPCs for the purpose of this FS. The ROD for the Moorings will be reviewed after the harbor-wide Portland Harbor ROD is finalized to determine that the remedy decision for the Moorings is consistent with the remedy selected for the other Operable Units in the Portland Harbor Superfund Site.

CHAPTER 4 - REMEDIAL ACTION OBJECTIVES

Chapter 4 develops Remedial Action Objectives (RAOs), which are medium-specific goals for protecting human health and the environment. The RAOs are specific to site media of concern, COCs, exposure routes, and receptors and contain the acceptable contaminant level, or range of levels, for each exposure route. The target cleanup levels will be referenced in this FS as preliminary remediation goals (PRGs). PRGs for groundwater will be based on MCLs. PRGs for erodible soil will be based on JSCS SLVs. RAOs are used to develop a range of remedial alternatives intended to reduce receptor exposure to contaminated media and/or meet PRGs. Any final cleanup standards will be established in the harbor-wide Portland Harbor ROD..

4.1 Remedial Action Basis

EPA identified USACE as the PRP for contamination in the Portland Harbor Superfund Site due to releases of hazardous substances on and from the Moorings. Consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and EPA policy, a RI was warranted to evaluate if the Site is an ongoing source to the in-water portion of the Portland Harbor Superfund Site as well as for all other human health and potential ecological risks the Site may be presenting. The HHRA estimated the cancer risk as greater than $1x10^{-4}$, outside of the acceptable risk range, to hypothetical future groundwater users. Impacts to the River were assessed through a screening level evaluation of JSCS SLVs. Groundwater and erodible soils were identified as media of concern using this screening process.

4.2 Identification and Compilation of Applicable or Relevant and Appropriate Requirements and To Be Considered Regulations

ARARs include federal environmental or public health requirements and promulgated State environmental or public health requirements that are determined to be legally applicable or relevant and appropriate to the chemicals/contaminants, remedial activities, or other actions/circumstances at a CERCLA site. CERCLA mandates compliance with applicable requirements, and requirements deemed relevant and appropriate by the EPA for onsite activities, unless a waiver can be justified. Substantive requirements need to be fulfilled for onsite activities, but administrative requirements (e.g., Federal, state, and local permits; reporting requirements; etc.) do not need to be attained. The two types of ARARs, "applicable" and "relevant and appropriate" requirements are defined below.

40 Code of Federal Regulations (CFR) § 300.5 defines key terms:

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

> "Relevant and appropriate requirements means 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 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."

The three categories of ARARs and To Be Considered (TBC) regulations are chemical-, location-, and action-specific. Table 4-1 present potentially applicable laws, which are likely to be ARARs. The final determination of ARARs and TBCs will be made in the ROD.

Chemical-specific ARARs are typically health- or risk-based restrictions on the amount or concentration of a chemical that may remain in, or discharged to, the environment. In general, chemical-specific requirements are set for a single chemical compound or a closely related group of chemical compounds. Chemical-specific ARARs are employed to establish remediation goals. A key example of a chemical-specific ARAR is the Safe Drinking Water Act (SDWA) MCL for a contaminant such as cyanide. Examples of chemical-specific TBCs include EPA health advisories, reference doses, and cancer slope factors that indicate potentially unsafe levels of contaminant. The identified chemical-specific ARARs and TBCs and their consideration in the FS are presented in Table 4-1.

Location-specific ARARs place limitations or standards on the types of activities that can be performed or the concentrations of contaminants allowed based on location in specific areas. The preliminarily identified location-specific ARARs that may apply to the Moorings are presented in Table 4-1. Location-specific ARARs include regulations intended to minimize or prevent harm to sensitive areas such as wetlands, floodplains, fragile ecosystems, areas of endangered species, and historic features, such as Federal and state endangered species regulations, and the National Historic Preservation Act (NHPA). Other location-specific ARARs are intended to restrict activities that are potentially harmful because of where they take place. For example, Resource Conservation and Recovery Act (RCRA) and state hazardous and solid waste rules and policy restrict the sitting of facilities in geologically unstable areas.

Action-specific ARARs are typically activity- or technology-based regulations or restrictions on remedial actions or other activities related to mitigation of hazardous wastes. These action-specific requirements do not dictate what selected remedial alternatives are; however, they do regulate the way in which an alternative is implemented. The identified preliminary action-specific ARARs and TBCs are presented in Table 4-1. Action-specific ARARs include state and Federal regulations related to RCRA, the Clean Water Act (CWA), and the Clean Air Act (CAA). RCRA regulations include design and operating standards for facilities that treat, store, or dispose of hazardous wastes; groundwater monitoring requirements; and closure standards for treatment, storage, and disposal facilities. The CWA regulates the discharge of pollutants to surface waters, including direct discharges to surface water (e.g., of treated groundwater) and indirect discharges through publicly owned treatment works. The CAA regulates air emissions including those from hazardous waste treatment and/or remediation operations.

4.3 Operable Units

The Moorings Site will be managed through two operable units (OUs), the Groundwater OU 1 and the Soil OU 2. This will allow an evaluation of alternatives for addressing risks resulting from erodible soils and a final remedy for Soil OU 2. Since off-site source control actions at Gasco are pending, the evaluation of alternatives at Groundwater OU 1 will only address interim remedies to limit potential risk of human exposure and ingestion of groundwater. The remainder of this document is organized by OU.

4.4 OU 1 Remedial Action Objective Basis

Overall objectives for response actions at sites with contaminated groundwater are based on expectations presented in the NCP and are presented in the document *Presumptive Response Strategy and Ex-Situ Treatment Technologies for Contaminated Groundwater at CERCLA Sites* (EPA 1996). The overall objectives are listed as:

- Prevent exposure to contaminated groundwater and impacts from contaminated groundwater above their respective risk levels.
- Prevent or minimize further migration of the contaminant plume (plume containment).
- Prevent or minimize further migration of contaminants from source materials to groundwater (source control).

At the Moorings, concentrations of contaminants in groundwater are present that result in unacceptable risks to human health if used as a future drinking water source. Exceedances of SLVs at sampling locations closest to the river indicate that contaminated groundwater may be discharging to the river at levels that could potentially impact ecological receptors. The RI identified the former Gasco property as an off-site source of groundwater contamination at the Moorings. Since source control at the former Gasco property has yet to be implemented, a final objective of returning groundwater to its maximum beneficial use cannot currently be met. Therefore, groundwater RAOs at the Moorings will focus on interim measures for reducing risks to human health related to exposure to contaminated groundwater. PRGs for human health are based on MCLs. There is currently no risk to human health at the Moorings because the groundwater is not used for drinking water. The USACE will evaluate interim measures in this FS to prevent exposure to contaminated groundwater. A groundwater monitoring program will be proposed in this FS to determine when MCLs have been reached and aid in evaluating the success of remedial action at the former Gasco property.

4.5 OU 2 Remedial Action Objective Basis

The JSCS identified contaminants in erodible surface soils as a potential threat to aquatic receptors and river sediments. Since site specific numeric criteria have not been developed, JSCS SLVs were used to assess potential impacts.

In accordance with USACE Environmental Operating Principles, sustainable ways to implement each alternative will be considered. The preferred remedy will be implemented in the most sustainable way feasible while still ensuring the RAOs can be achieved. The selected remedy

will be required to comply with Department of Defense (DOD) security requirements as listed in section FM 3-19. 30 in the Field Manual.

4.6 Recommended Remedial Action Objectives

The recommended RAOs define what action will be conducted, where the specific action should take place, and when the action will be implemented and completed.

Groundwater OU 1

RAO 1: Prevent dermal, inhalation, and ingestion exposure of potable groundwater within the Moorings boundaries to potential future drinking water users on-site until PRGs (MCLs) are achieved.

At present, an unacceptable potable water exposure pathway from groundwater does not exist. However, the HHRA demonstrated that, the future use of groundwater as a potable water source at the Moorings could produce a pathway that would exceed the upper bound of the CERCLA acceptable risk management range of $1x10^{-4}$. RAO 1 will reduce potable water exposure scenarios from water wells to future site occupants.

Currently, there are no potable water wells at the Moorings. In addition, there are no Land Use Controls (LUCs) in place to prevent this groundwater exposure pathway in the future. In order to achieve RAO 1, additional actions may be required. Such actions will need to remain in place until the source of groundwater contamination is permanently removed or destroyed in a manner that leaves groundwater contamination below MCLs and is protective of human health. RAO 1 will be implemented by use of a monitoring program to monitor the presence of contamination on-site and trends associated with off-site source control.

COCs determined to be associated with a risk to human health greater than $1x10^{-4}$ or exceed the SWDA MCL include cyanide, benzo(a)pyrene, and metals (aluminum, arsenic, cadmium, chromium, lead, and manganese).

Soil OU 2

RAO 2: Prevent the transport of erodible soils with concentrations of contaminants above JSCS SLVs and final cleanup standards established in the harbor-wide Portland Harbor ROD to the Willamette River.

The JSCS screening evaluation identified the Soils OU 2 as containing erodible soils above toxicity and bioaccumulation SLVs. Stormwater runoff is the primary mechanism transporting contaminated erodible soils to the river.

COPCs determined using the JSCS screening evaluation include: PAHs (fluoranthene, pyrene, benzo(a)anthracene, chrysene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene, Di-n-butyl) phthalate, PCBs (Aroclor 1248, Total PCBs), pesticides (DDD, DDT, Total DDx, Total Endosulfan), and metals (arsenic, cadmium, total chromium, copper, lead, manganese, nickel, and zinc).

4.7 Areas to which Remedial Action Objectives Apply

Groundwater OU 1

RAO 1 will prevent exposure to COC contamination above human health PRGs. The RAO applies to all areas within the Moorings upland property boundaries where groundwater contamination exceeds PRGs (MCLs). Figures 3-6 through 3-11 show the extent of COC concentrations in groundwater at the Moorings. The area exceeding PRGs is only shown at the Industrial Area; however, for the purpose of this FS, RAO 1 will apply to the entire Moorings site.

Soil OU 2

RAO 2 will reduce the potential for transport of contaminated erodible soils to the river. The RAO applies to erodible soils exceeding JSCS SLVs for ecological toxicity and bioaccumulation. Areas with current risk of erosion have been designated as the North Logistics and Fence Line MUs as was defined in the RI. Erodible soils associated with the North Logistics and Fence Line MUs are illustrated in Figure 4-1. All other locations within the US Moorings uplands Soil OU 2 do not present a direct risk of erosion due to the presence of rip-rap, grass, asphalt, concrete, or building cover as shown in Figure 3-15. Limited areas within the Soil OU 2 which are covered by gravel or soil alone have been determined to be far enough back from the Willamette River bank that direct erosion or transport by overland stormwater flow from these areas will not present a potential threat of erosion. Alternative development within this FS will focus on the area that is landward of the 660 linear feet of perimeter fence that runs along the Fence Line and North Logistics MUs.

CHAPTER 5 - GENERAL RESPONSE ACTIONS, TECHNOLOGIES, AND PROCESS OPTIONS

This chapter will develop the initial evaluation of remedial technologies that can be effectively implemented at the Moorings. The development of GRAs for contaminated medium is described in Section 5.1. The screening, evaluation, and selection of remedial technologies and associated process options are carried out in Section 5.2. The term "remedial technologies" refers to the general categories of technologies within each GRA whereas process options are the specific processes within each technology type. The last subsection of Chapter 5 summarizes the elimination of technologies and process options.

5.1 General Response Actions

The first step toward defining remedial technologies and associated process options is to develop GRAs. GRAs are site-specific and medium-specific categories of actions that will satisfy the RAOs. The following GRAs are used to address groundwater and erodible soil as media of concern. GRAs initially considered are:

- No Action
- Removal, Transport, and Disposal
- Monitoring
- Monitored Natural Attenuation (MNA)
- LUCs
- Other Controls
- Treatment
- Containment
- Stormwater Collection, Erosion Control, and Treatment Measures

Table 5-1 demonstrates the connection between the OUs and RAOs identified in Chapter 4 with possible GRAs. Table 5-2 presents the GRAs along with preliminary technologies and process options. The following paragraphs describe typical GRA characteristics with some specifics of how they may be applied at the Moorings. The GRAs are narrowed down through technology and process option screening. If no process options and/or technologies from a GRA are carried through to the implementability screening for an RAO, then that GRA is screened out from further consideration in the FS.

5.1.1 No Action

No action is applicable to all media of concern. Pursuant to 40 § CFR 300.403(e)(6) of the revised NCP (8 March 1990) and the EPA's guidance for conducting a RI/FS (EPA 1988), a "No-Action" option must be developed and examined as a potential remedial action for all sites. Therefore, this action is retained for further consideration as a baseline comparison with other remedial actions.

5.1.2 Removal, Transport, and Disposal

Removal, transport and disposal are applicable to all media of concern. Contaminated media from the Moorings could be removed from the site through excavation, collection, or hydraulic pumping. The contaminated media could be transported and disposed of in a properly permitted facility. Confirmation sampling may be required to ensure that RAO objectives have been met.

5.1.3 Monitoring

Monitoring is applicable to all media of concern. Monitoring data is used to determine the effectiveness of the remedy. Groundwater monitoring can be used to evaluate groundwater conditions at the point of compliance or performance of a remedial system. A monitoring program would track groundwater contamination entering the Moorings associated with the neighboring Gasco property and leaving the Moorings along the Willamette River boundary. Monitoring wells would be installed in the surficial fill WBZ and alluvial WBZ, where contamination was identified in the RI. The monitoring program would evaluate data trends associated with off-site source control. Monitoring could be conducted for the Soil OU 2 to determine if erosion prevention practices are working or if additional contaminated erodible soils have been deposited.

5.1.4 Monitored Natural Attenuation

MNA is applicable to all media of concern. MNA refers specifically to the use of natural attenuation processes as part of overall site remediation. MNA refers to natural subsurface processes such as dilution, volatilization, biodegradation, adsorption, and chemical reactions with subsurface materials that reduce contaminant concentrations to acceptable site-specific remediation objectives in a reasonable time-period. When comparing MNA to other response actions, it may be selected alone or in combination with other more active remedies as the preferred remedial alternative.

5.1.5 Land Use Controls

LUCs, or Institutional Controls (ICs), include all non-engineered restrictions on activities, access, or exposure to land, groundwater, surface water, waste and waste disposal areas. LUCs, such as water use and land use restrictions, can be used to prevent exposure to groundwater and contaminated soil. There are four categories of ICs: governmental controls, proprietary controls, enforcement and permit tools with IC components, and informational devices (EPA 2000a). ICs are primarily used as a component of, or an enhancement to, a remedy which employs treatment that reduces toxicity, mobility, or volume as a principal element, or otherwise creates a permanent remedy (EPA 1998a).

Governmental controls are usually implemented and enforced by State or local government and can include zoning restrictions, ordinances, statutes, building permits, or other provisions that restrict land or resource use at a site. Governmental controls remain effective so long as they are not repealed and are enforced. The USACE Portland District is the landowner and operator of the installation at the Moorings site. At the current time, there are no land-use restriction policies and procedures in place.

Proprietary controls, such as easements and covenants, include private land use restrictions that typically result by agreement with the landowner and an enforcing party that may be a neighboring landowner, a state environmental agency, or a local civic association. These controls are sometimes referred to as "deed restrictions" because the restriction typically becomes placed within the chain of title to the restricted property. These types of controls can be binding on subsequent purchasers of the property (successors in title) and are transferable, which may make them more reliable in the long term than other types of LUCs. However, these controls are dependent upon real property common law and the state where the property is located and are often complex with respect to owners' rights and the ability of an owner to convey certain rights (such as a long-term access for groundwater monitoring) to other entities while keeping other rights to the property (EPA 2000a).

Additional measures, including enforcement tools (such as administrative orders and consent decrees) and informational devices (such as deed notices, state registries of hazardous waste sites, educational programs, and issued advisories), are also considered LUCs. However, these measures typically need to be combined with governmental and/or proprietary measures in order to be effective in preventing exposure.

At the Moorings site, only a few of the above ICs will be available for use. As acknowledged in EPA guidance, there are significant differences in the way ICs are applied at Federal facilities due to Federal ownership, including the unavailability of some proprietary or governmental controls at active Federal facilities (EPA 2000a). Per EPA Region 10's Final Policy on the Use of Institutional Controls at Federal Facilities, Federal facilities are not able to utilize the real property controls that are most effective in ensuring land use and access restrictions (EPA 1998a). "Covenants, easements and deed restrictions are not, in general, available for use at federally owned property." However, a deed notification and covenant will be utilized in the event that ownership of the Moorings is transferred sometime in the future. To transfer property to a non-federal agency, the deed will be required to contain a notification that hazardous substances were stored on the site. The deed must also contain a covenant mandated by CERCLA Section 120(h)(3)(A)(ii)(I) which warrants that "all remedial action necessary to protect human health and the environment with respect to any such substance remaining on the property has been taken before the date of transfer." The deed is also required to contain a covenant that any additional remedial action found to be necessary after the date of the transfer shall be conducted by the United States.

If the USACE were to transfer the Moorings site outside of the federal government, the agency would utilize the CERCLA Section 120(h)(3)(C) process. This includes either: 1) a covenant warranting that all remedial action has been taken, or will be taken if any additional action is found to be necessary, or 2) the USACE will be required to obtain EPA approval prior to the transfer of contaminated property by a deed containing the response action assurance required by CERCLA.

The USACE has written a procedure to ensure these LUCs requirements are met. Under Engineering Regulation (ER) ER 200-2-3 Environmental Compliance Policies, the USACE is required to evaluate the Environmental Condition of the Property (ECP) prior to any potential

real estate action. The ECP Report must comply with applicable standards for performing either a Phase I or Phase II Environmental Site Assessment as defined in American Society for Testing and Materials (ASTM) Standard E 1527–05 entitled, "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process," or ASTM E 1903 (Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process), as appropriate. This review includes a project file review and review of EPA and state compliance files to consider all actions taken under CERCLA. The reviewer, a certified Environmental Professional, will determine whether the above conditions regarding EPA and state approval have been met. The ER requires that the District Environmental Compliance Coordinator or Environmental Professional by the Chief of Operations certify that these requirements are met prior to completing a real estate transfer.

5.1.6 Other Controls

Other Controls relate to groundwater only. Other Controls for groundwater typically include alternate water supplies or individual well treatment. Alternate water supplies and individual well treatment are methods used to prevent exposure to contaminated groundwater. The Moorings does not use groundwater for a drinking water supply, but instead receives domestic potable water from the Portland Water Bureau. In addition, office workers and maintenance workers that occupy the site on a regular basis are not expected to contact groundwater or surface water during their daily activities. Swimming or fishing along the shore is prohibited at the Moorings (KTA, TEC Inc. 2010).

To implement a control for this purpose, the USACE will institute a Portland District Channels and Harbors Project, Plant Maintenance Section Standard Operating Procedure (002-2011). Under this procedure, Portland District will continue to contract with the City of Portland for drinking water at the site. The procedure will restrict use of groundwater of the site for any purpose including drinking. The procedure also requires as part of their job performance criteria the Plant Maintenance Foreman and Project Environmental Compliance Coordinator to enforce compliance. The procedure will restrict installation of groundwater control wells or barriers except in the rare emergency case where utility construction or emergency repair would require excavation dewatering. Excavation dewatering at the Moorings is not a common need or practice since utilities are buried above measured groundwater levels. Lifting of the restrictions on ground water use will only occur after the regulating agencies enforcing CERCLA and Oregon Cleanup Law approve lifting of the Land Use Control.

Under Engineering Regulation ER 200-2-3 Environmental Compliance Policies, the Corps of Engineers requires periodic environmental compliance assessments of operating facilities. Self-assessments are required yearly for facility Environmental Compliance Coordinators and periodic external audits are completed on a five-year basis. The audit tool, Total Environmental Assessment Manual is a comprehensive and continuously updated tool maintained by the national Civil Works Corps of Engineers Environmental Compliance program and provides desk, file and field checklists to ensure procedures are maintained and followed. This tool will evaluate whether land use controls are present and in force, and requires corrective action planning and implementation and for all non-complying violations.

5.1.7 Treatment

Treatment is a broad category that includes in-situ or ex-situ processes for either soil or water that chemically, physically or biologically reduce, immobilize or destroy contaminants. In-situ treatment includes those processes that occur onsite within the original location of the media; whereas, ex-situ treatment can occur on- or off-site but requires the media to be removed from its original location in order the help facilitate the treatment process. Ex-situ treatment includes groundwater or stormwater collection and treatment, or soil excavation followed by treatment. Some ecological treatment options provide erosion control and contaminant removal from groundwater or surface water. Ecological based treatment is attributed to: natural filtration provided by plant root systems and the soil matrix, plant facilitated contaminant breakdown, or direct contaminant uptake into the plant biomass. Treatment is applicable to all media of concern.

5.1.8 Containment

Containment is applicable to all media of concern. Containment measures can be implemented to prevent contact with contaminants in a medium or to prevent further migration of a medium. Containment can include hydraulic cutoff walls, physical barriers or capping of the contaminated media.

5.1.9 Stormwater Collection, Erosion Control and Treatment Measures

Stormwater collection, erosion control, and treatment measures are applicable to erodible soils, groundwater and stormwater. Stormwater erosion control measures are used to manage stormwater surface runoff and infiltration. Measures can include upland surface re-grading, installation of engineered structures such as stormwater collection and treatment systems, or ecological features that work to treat or direct the flow of water on the surface or underground.

5.2 Selection of Remedial Technologies and Process Options

The purpose of this section is to identify and evaluate potential remedial technologies for the media of concern at the Moorings. Based upon conclusions from the CSM and RAOs, actions are required to: (1) prevent potable water exposure from contaminated groundwater to future Moorings site occupants, and (2) reduce the potential for contaminated erodible soils from entering the Willamette River at the North Logistics and Fence Line MUs.

The selection of potentially feasible technologies is comprised of two steps:

- Identification and initial screening of potential remedial technologies and process options.
- Evaluation of remedial technologies and process options.

5.2.1 Technology and Process Option Identification and Screening

The initial step taken in the technology evaluation process consists of the identification of potentially applicable technologies and process options that may be used for the management,

containment, stabilization, treatment, and/or disposal of contaminated erodible soils and prevention of human exposure to potable water from site groundwater. Technologies selected for preliminary screening represent a wide range of responses commonly used to address contaminated groundwater, soil stabilization, reduction of surface water runoff related to soil erosion, and prevention of potable water exposure from site groundwater.

Initially identified technologies presented in Table 5-2 were screened to reduce the technologies to the most effective for the Moorings unique RAO criteria while still representing a larger set of process options. Process options are removed from further consideration if they are not technically feasible at the Moorings site based on site-specific conditions such as volume of media or chemical characteristics associated with the compounds of interest for each media. The method used to screen top-level technology and process options is described below. This explanation includes a description of the analysis used to select and eliminate technologies and process options from further consideration for each media. Conclusions from top-level technology and process option screening found to be potentially applicable to OU 1 and 2 for meeting the Moorings RAOs (either collectively or by individual RAO) are summarized in Table 5-3. Table 5-3 includes GRA categories, the Process Options for each GRA, a brief description of each Process Option, the applicable OU and RAO for each Process Option, and a brief statement of rationale as to why a Process Option was or was not further considered.

5.2.1.1 Removal, Transport, and Disposal

Removal, transport and disposal of groundwater would result in large volumes of water to transport to an appropriate disposal facility. In addition, the impact of source control measures at Gasco on the Moorings groundwater is uncertain. Removal, transport and disposal are eliminated for groundwater (OU 1).

For the purpose of this FS, only the top six inches of soils are classified as erodible soils within the Fence Line and North Logistics MUs. The removal of six inches of soils would only cause the six inches of underlying soils (that are likely contaminated) to become classified as erodible soils. Therefore, the alternatives focus on methods to stabilize this surface through covers and only focus on soil removal options as needed to facilitate the remedy. For instance, if a remedy were selected that required topsoil for plant growth, the alternative would need to balance the need to minimize sending "contaminated erodible soils to a landfill with the need to provide a surface cover that could support plant growth." For these the reasons, removal, transport and disposal is kept as a viable Process Option for erodible soils (OU 2).

5.2.1.2 Land Use Controls

LUCs have been used to control access to groundwater and are therefore kept as a viable option for RAO 1 (OU 1) (see Section 5.1.5). LUCs will not remove the potential for erodible soil transportation to the Willamette River; therefore, LUCs are eliminated for RAO 2 (OU 2).

5.2.1.3 Other Controls

Other Controls that were considered include alternate water supplies and individual well treatment. Currently, the Moorings receives alternative water supplies in the form of domestic potable water from the Portland Water Bureau. Since alternative water supplies are provided at

the Moorings and there are no drinking water wells on-site, alternate water supply and engineering controls related to drinking water are not necessary. It would be feasible to use individual well treatment in a future scenario instead of an alternative water supply. This option should be considered in the future if alternative water supplies are no longer available, but will not be considered further for this FS (OU 1).

5.2.1.4 Monitored Natural Attenuation

Monitored Natural Attenuation (MNA) is excluded from further evaluation. To date, there has been no data collected to support the occurrence of natural bioattenuation in either contaminated groundwater or contaminated soils at the Moorings (OU 1 and 2).

5.2.1.5 Treatment

Treatment is applicable to all media of concern. Both ex-situ and in-situ treatments would be a feasible option for groundwater. Numerous groundwater Treatment Process Options were initially considered for the following Technologies: both in-situ and ex-situ Physical /Chemical processes, Biological processes, and Passive Wall Reactive Barriers. Since the source of groundwater contamination occurs offsite at Gasco, these options were rated as potentially applicable but not to be further considered until source control measures are implemented and the impacts on the Moorings groundwater are better understood. Since implementation of other measures such as LUCs do not require physical construction, it was determined that LUCs would be the most logical interim action for groundwater. See Table 5-2 for a list of all potential Treatment options for groundwater and Table 5-3 for further detail regarding initial evaluation of these Process Options (OU 1).

Due to the extent of soil contamination throughout the Moorings site and the limited nature of erodible soils along the bank, erodible soils treatment focuses on stabilization techniques rather than classic Treatment. Although it would be possible to perform in-situ or ex-situ treatment of erodible soils, the wide variety of contaminants in erodible soils would require large cost and energy inputs versus other options such as ecological treatment or containment options. Therefore, in-situ and ex-situ treatment for erodible soils is not discussed further (OU 2), and the Treatment Process Option evaluation presented in Table 5-3 focuses on groundwater media. Ecological treatment options that provide erosion control and contaminant removal from groundwater or surface water are further considered under the Stormwater Collection, Erosion Control and Treatment GRA below.

5.2.1.6 Containment

Technologies that were considered for groundwater under the Containment GRA included Physical Barriers (sheet pile wall, slurry wall and grout curtain) and Groundwater Extraction / Collection. Although containment would be a feasible option for groundwater, these options were rated as potentially applicable but not to be further considered until source control measures are implemented and the impacts on Moorings groundwater are better understood. Containment is therefore eliminated for RAO 1 (OU 1).

Containment of erodible soils is considered potentially applicable. Due to the relative low risk and predictable nature of erodible soil migration as compared to other more complex

contaminants, only the least complex containment options were required or considered for the Fence Line and North Logistics MUs. Options considered include placement of a limited cap or a clean media layer over erodible surfaces. The purpose of either the limited cap or clean media layer would be to prevent the direct exposure and stabilization of erodible soils.

Caps are typically designed to completely cover a contaminated area. However, only areas determined to be at risk of erosion are associated with elevated risk for ecological receptors in the Willamette River. Therefore, only locations associated with erodible soils near the top of the bank are relevant to cap placement. The cap width would need to completely cover erodible soils on the exterior and interior of the security fence and prevent future erodible soils transport.

A clean media layer would need to be heavy enough or durable enough to prevent transportation during overland flow. A vegetative buffer on top of clean soil or a gravel layer were the two most optimal scenarios associated with a clean media layer. Although a vegetative layer is effectively a form of containment, this option is discussed under the separate GRA of Stormwater Collection, Erosion Control and Treatment.

The use of a clean gravel layer for erodible soils containment was considered since gravel placement is the Moorings current method to reduce transport of erodible soils along the bank. Although the Fence Line MU was determined to contain erodible soils within the 2009 RI, these soils are no longer exposed. Gravel placement during site maintenance activities since the RI has effectively lowered the risk associated with previously exposed erodible soils along the Fence Line MU. Gravel placement is the current site practice and would require limited additional action within the North Logistics MU to remove the remaining risk associated with erodible soils at the Moorings.

5.2.1.7 Stormwater Collection, Erosion Control and Treatment Measures

Technologies that were addressed within the Stormwater Collection, Erosion Control and Treatment Measures GRA include: Ecological Structures, Engineered Structures, Miscellaneous Erosion Prevention, Stormwater Infiltration, Stormwater Collection and Stormwater Treatment. Within Table 5-3, the Process Options in each of these Technologies are discussed with reasons why some options are removed and other options are carried forward. Overall, there are many types of ecological designs that could be used to reduce surface water overflow and stabilizing soils near the bank. Each design would need to include effectively some type of vegetative buffer along the length of the bank tops within the Fence Line and North Logistics MUs. The types of plants within these buffers would need to be compliant with the Portland Plant List (Portland 2004a) with a height that is less than eight inches in order to comply with DOD security requirements associated with the Moorings fence line.

The vegetative buffer would require a base of clean topsoil to support plant growth. General buffer designs include: (1) a raised area (berm) of which runoff would percolate through for treatment before leaving the site, (2) a lowered area (swale) which could provide a volume for stormwater collection to decrease runoff prior to infiltrating the vegetative layer, or (3) a flat area that does not divert the flow of water but allows infiltration and treatment as water runs over the vegetative surface. Each vegetative buffer design could treat stormwater runoff by increasing infiltration, providing solids removal, and some degree of contaminant removal.

The construction of a vegetative buffer may require removal, transport and disposal of contaminated erodible soils. The degree of disposal needed will depend on the selected type of buffer. If a lowered vegetative buffer area (swale) is desired, more removal of contaminated erodible soils would be required. Another aspect that could affect the selected type of vegetative buffers would be any potential impacts of the buffer on perimeter security. Many stormwater swales or berms contain soil that is non-compacted and is very permeable to allow for increased holding and treating capacity for infiltrating stormwater. Therefore, if a swale were proposed beneath the current perimeter fenceline, the current security fence may need to be replaced with a taller fence that could be buried below ground level to prevent intruders from easily burrowing under the non-compacted soils within the swale. In order to minimize security concerns associated with deep permeable soils near perimeter fences, only a flat vegetative buffer with a limited volume of non-compacted soil will be considered within this FS. However, the distinction between use of a raised, lowered or flat vegetative buffer could be re-addressed within the Design Phase.

Stormwater conveyance systems brought forward include a concrete pipe stormwater conveyance system that have a long life expectancy and minimal maintenance requirements. Concrete stormwater conveyance systems would be appropriate for containment options such as a concrete cap that would be difficult to remove if the stormwater conveyance system were to fail. French drain systems have historically been used within the site to collect infiltrated stormwater flow and brought forward for consideration in the areas that do not have proper drainage.

Any new point sources developed within FS Alternatives (that are not associated with runoff from a clean surface) required a stormwater treatment system to reduce heavy metals below JSCS screening levels. For a stormwater treatment system to be considered, it first had to have a relatively low maintenance requirement and had to be capable of meeting JSCS screening levels. Considered treatment systems included the Filterra Bioretention System (Filterra 2010) sized for enhanced treatment and the ecoStorm plus Stormwater Filtration System (Royal 2010). Although both systems would be capable of removing metals to JSCS levels, the Filterra system was carried forward for further analysis since this system did not require any chemical treatment and had a lower overall maintenance requirement than the ecoStorm plus system.

5.2.2 General Response Actions Evaluation Summary

The following discussions summarize the identification, screening, and comparative evaluation of technologies and process options as listed in Tables 5-3, and 5-4. The “No Action” GRA is retained as required and without evaluation.

5.2.2.1 Removal, transport and disposal

Removal, transport and disposal are retained for RAO 2 (OU 2). Contaminated erodible soils could be excavated from the site and transported to an appropriate off-site disposal facility. Confirmation sampling may be used to determine when the required volume of contaminated soil has been removed.

5.2.2.2 Monitoring

Monitoring is retained for RAO 1 (OU 1). For RAO 2 (OU 2), monitoring may include effluent point source monitoring from Stormwater Collection, Erosion Control and Treatment trains, or scheduled visual inspection and documentation to ensure measures put in place for erodible soils are working as designed.

5.2.2.3 Land Use Controls

LUCs are retained for RAO 1 (OU 1) (see Section 5.1.5). LUCs do not provide compliance, performance, or plume behavior data; nor do LUCs reduce contaminant concentrations. However, LUCs have proven to be effective for near-term prevention of exposure to a contaminated medium on Federal facilities.

5.2.2.4 Stormwater Collection, Erosion Control, and Treatment Measures

Stormwater collection, erosion control, and treatment measures are retained for RAO 2 (OU 2). Such techniques are considered in combination with or separately from contaminant removal, transport and disposal options. Control of stormwater can be used to prevent sediment runoff, minimize interaction of surface runoff water with contaminated surface materials, and increase soil stability.

5.3 Summary of Retained General Response Actions

The following paragraphs describe the technologies and process options that are recommended based on the comparison of potentially applicable technologies and process options selected in Sections 5.2.1 and 5.2.2. The goal of the evaluation is to select the best process options and bring them forward into the assembly of remedial alternatives. The recommended technologies/process options within a GRA are described for their relevant OUs (RAOs) and include site-specific discussions of what is to be achieved through the inclusion of these technologies. However, not all technologies/process options will be used to generate each alternative. Because the RAOs have distinct goals that may be reached by differing means, the process option evaluation is broken out by individual RAOs. Table 5-4 summarizes the information presented in this chapter.

5.3.1 Groundwater OU 1

RAO 1 will prevent future exposure to potable groundwater. Since the effects of source control actions at Gasco on groundwater at the Moorings are uncertain, groundwater treatment is not considered at this time.

LUCs. Currently, the only general response needed to meet RAO 1 is LUCs. For RAO 1, all types of LUCs are retained for use at the site, as needed. Prevention of exposure to the site potable water from groundwater by site occupants is achieved through access controls to the site aquifer until the long-term remediation of site groundwater has been achieved. The LUC boundary is the Moorings boundary shown on Figure 2-1.

Monitoring. Limited monitoring may be needed to determine when LUCs can be removed for RAO 1. Groundwater monitoring can be used to assess the impacts of source control at the Gasco property and estimate a timeframe for when MCLs may be attained.

5.3.2 Soil OU 2

RAO 2 will reduce the potential for contaminated erodible soils at the Fence Line and North Logistics MUs from entering the Willamette River. Stormwater runoff is the primary transport mechanism for erodible soils.

Removal, Transport and Disposal. Contaminated erodible soils can be excavated, transported off-site, and disposed of at a properly permitted facility. The excavation would be backfilled with clean material, either topsoil if vegetated cover is required or more permeable material to allow for stormwater drainage and increased stability.

Monitoring. Limited performance monitoring would be needed to ensure that the erosion control measures were working as intended. Monitoring may be required for any stormwater treatment systems that are installed as part of RAO 2.

Stormwater Collection, Erosion Control and Treatment Measures. Stormwater collection, erosion control, and treatment measures can be used to collect and convey stormwater runoff and infiltration to prevent erosion and transport of sediments. Stormwater erosion control measures may increase soil stability near the riverbank.

CHAPTER 6 - DEVELOPMENT OF REMEDIAL ALTERNATIVES

In this chapter, process options retained from Chapter 5 are discussed within the context of site needs and are organized into remedial alternatives. In a feasibility study, alternatives are evaluated against three screening criteria (effectiveness, implementability, and cost) to assure that they are viable prior to going into the detailed analysis of alternatives.

6.1 Alternative Component Details

The following sections provide specific details of the various GRA process options retained in Chapter 5.

Groundwater OU 1

- RAO 1 is to prevent future exposure to contaminated groundwater above acceptable risk range via:
  - LUCs
  - Monitoring

Soil OU 2

- RAO 2 is to reduce the potential for erodible soils above JSCS SLVs from entering the Willamette River via:
  - Removal, Transport and Disposal
  - Monitoring
  - Stormwater Collection, Erosion Control, and Treatment

6.1.1 Land Use Controls

LUCs are comprised of non-engineering measures designed to prevent or limit exposure to hazardous substances such as contaminated groundwater. Currently there are no drinking water wells at the Moorings; however, additional LUCs could be put in place to ensure that future groundwater access is sufficiently limited. The Moorings property boundary constitutes the limits of the LUCs (see Section 5.1.5).

Costs for LUCs are based on estimates for planning documents, implementation, monitoring and enforcement, modification/termination, Memorandum of Agreements, installation Master Plan modifications, Geographic Information Systems (GIS), meetings, access control signs, utility notification service, notice letters, reports and certification, site visits/inspections, document evaluation, and amendment of decision documents. The LUC sensitivity analysis compares costs associated with the frequency of monitoring (e.g. annual, biannual, or no monitoring) and enforcement.

6.1.2 Removal, Transport and Disposal

Removal, transport and disposal of contaminated erodible soils are used to prevent the exposure of receptors to contaminated erodible soils. Due to the industrial nature of the site and historic dredging activities that may have incorporated contaminated sediments from the river onto the uplands, removal of all soil that may potentially erode and contains contaminants

above JSCS SLVs is not a feasible option. Soil removal, transport and disposal will be done only to ensure erodible soils are not exposed in the final remedial design.

Costs of removal, transport and disposal are based on the volumes of erodible soils present at each MU. The required depth of removal is dependent on the desired final height of grade.

6.1.3 Monitoring

Groundwater monitoring will be used to track groundwater contamination entering the Moorings associated with the neighboring Gasco property and leaving the Mooring along the Willamette River boundary. Monitoring will track data trends associated with off-site source control. Conservative costs for monitoring were determined from costs associated with the installation and monitoring of eight monitoring wells. The proposed well design includes four well pairs with each pair consisting of one 75 foot and one 20 foot well. The shallow wells will be screened above the silt layer in the surficial fill WBZ and the deeper wells will be screened below the silt layer in the alluvial WBZ at similar elevation to the proposed groundwater extraction wells on the Gasco property. Monitoring costs include quarterly monitoring for the first two years and annual monitoring for the remaining 28 years. Proposed monitoring well locations are illustrated in Figure 6-1. The sensitivity analysis for groundwater monitoring is based on changes of cost associated with the number of chemical analysis to be completed.

Erodible soil monitoring ensures that the erosion control measures work as intended. Once solutions for erodible soils are in place, it is assumed that monitoring related to erodible soils can be accounted for during general site maintenance activities and therefore no costs have been included for monitoring of erodible soils.

6.1.4 Stormwater Collection, Erosion Control, and Treatment

Stormwater collection, erosion control, and treatment measures include costs associated with the required elements needed to ensure proper stormwater conveyance from surface and groundwater water (French drains and stormwater collection systems), stormwater infiltration (vegetative covers and barriers), temporary stormwater treatment (silt/sediment fences), stormwater metals treatment systems (Filterra system), and monitoring costs associated with effluent streams from metals treatment systems. Monitoring of the metals treatment system effluent streams is based on quarterly monitoring for metals, PAHs, and PCBs. Costs were determined through Remedial Action Cost Engineering and Requirements software (RACER) and manufacturer estimates based on requirements for each alternative.

6.2 Development of Alternatives

The alternative components presented earlier in this chapter are combined in this section to form site remedial alternatives that represent either regulatory requirements or actions needed to meet RAOs. These alternatives are carried forward into the detailed analysis of alternatives in Chapter 7 to determine a more favorable alternative. The alternatives are summarized in Table 6-1. Each alternative was evaluated against effectiveness, implementability, and cost criteria to ensure preliminary alternatives are viable solutions prior to completion of detailed analysis. Results from this analysis are summarized in Table 6-2.

6.2.1 Alternative 1 – No Action

The No-Action alternative is required by CERCLA for the purpose of comparison to all other alternatives. This alternative is retained as the baseline for the comparison of alternatives in Chapter 7. Although described as "No Action," Alternative 1 does have costs associated with it, namely the Five-Year review, which is required until it is demonstrated that ARARs have been met.

6.2.2 Alternative 2 – Gravel Layer: LUCs, Groundwater Monitoring, Gravel Placement, Limited Stormwater Collection, Erosion Control, Stormwater Treatment, Monitoring and Erodible Soils Monitoring

Alternative 2 is comprised of the following:

- LUCs for groundwater (RAO 1)
- Groundwater monitoring (RAO 1)
    - Install eight groundwater monitoring wells (four wells to 75 feet bgs, four wells to 20 feet bgs)
    - Quarterly monitoring for the first two years and annual monitoring thereafter
- Raise Grade of North Logistics MU (RAO 2, presented on Figure 6-2)
    - Remove fence in North Logistics MU
    - Install French drain 10 feet landward of the bank top (if required)
    - Install and maintain stormwater metals treatment for French drain effluent (if required)
    - Install concrete curb along North Logistics MU to stabilize gravel placement
    - Raise grade using clean gravel for area 40 feet landward of bank
    - Replace fence line at new grade at North Logistics MU
    - Maintain gravel along bank as needed by additional gravel placement
    - Monitor erosion control measures
    - Monitor effluent from stormwater metals treatment for French drain effluent - one location, quarterly (if required)

The components are organized below as to which OU and RAO the component is designed to meet.

<u>Groundwater OU 1</u>

RAO 1: LUCs

LUCs and monitoring will be used to help reduce contact of humans with groundwater and to track the concentration of COCs in groundwater at the site (see Section 5.1.5). LUCs costs are based on the degree of intensity of LUC implementation. At the Moorings site, the level of LUC intensity is set fairly low; however, costs associated with required travel, yearly letters, and site plans are still included in cost estimates. A sensitivity analysis compares costs associated with the frequency of monitoring and enforcement including annual, biannual, and

no monitoring and enforcement. LUC sensitivity analysis costs are summarized in Appendix D, Table D1-7.

RAO 1: Groundwater Monitoring

Conservative costs for groundwater monitoring are based on the installation of eight monitoring wells (four wells at 75 feet bgs, four wells at 20 feet bgs) and groundwater monitoring (quarterly for first two years and annually for remaining 28 years).

Soil OU 2

RAO 2: Gravel Placement, Limited Stormwater Collection, Erosion Control, Stormwater Treatment, Monitoring and Erodible Soil Monitoring

Alternative 2 consists of a gravel cover over any exposed erodible soils and installation of necessary stormwater drainage systems. Alternative 2 assumes the non-contaminated gravel will pose an acceptable reduction of risk to the Willamette River compared to the exposed contaminated erodible soils that are currently within the North Logistics MU. Since new gravel has already been placed along the Fence Line MU, the only cost associated with the Fence Line MU will be infrequent placement of additional gravel on an as-needed basis to ensure that contaminated erodible soils are not exposed. This alternative assumes that the French drains and gravel present at the Fence Line MU is sufficient to prevent contaminated erodible soils from entering the Willamette River. It is assumed that the only required maintenance of the Fence Line MU would include an additional four inches of gravel placement every 10 years to ensure erodible soils are not exposed.

The fence will be removed at the North Logistics MU. A concrete curb will be placed along the bank of the North Logistics MU to help stabilize additional gravel placement that will bring this area to grade with the Fence Line MU. The concrete curb consists of a 12-inch tall by eight-inch wide section along 80 feet of the North Logistics MU that has the lowest grade, and 120 feet of six inch tall curb for the remainder of the MU. French drains will be installed ten feet landward of the bank top along the length of the North Logistics MU if needed to ensure proper stormwater control within the gravel areas of the site. If French drains are required to be installed in the Remedial Action phase for the North Logistics MU, a metals treatment system such as a Filterra Bioretention System will be used to reduce metals concentrations exiting the system below required limits. A catch basin will be installed next to the French drain effluent location to ensure that stormwater collection meets the 90 percent treatment of annual precipitation runoff requirement from Portland Stormwater Management Manual (Portland BES, 2004).

Following placement of potential French drain systems within the North Logistics MU, gravel placement will bring the site up to grade. Once the North Logistics MU is brought to grade using clean gravel, the fence line will be replaced. Costs associated with security monitoring for two days during construction activities have been included in Alternative 2.

Monitoring will be used to ensure that implemented erosion control measures are proving effective. If a French drain and metals treatment system is necessary for the North Logistics MU, quarterly monitoring for metals, PAHs, and PCBs will be needed for the effluent from the

metals treatment system. Cost estimates include metal treatment system maintenance, and quarterly effluent monitoring for metals, PAHs, and PCBs.

6.2.3 Alternative 3 – Limited Concrete Cap: LUCs, Groundwater Monitoring, Concrete Cap, Stormwater Collection, Erosion Control, Stormwater Treatment, Monitoring and Erodible Soils Monitoring

Alternative 3 is comprised of the following:

- LUCs for groundwater (RAO 1)
- Groundwater monitoring (RAO 1)
    - Install eight groundwater monitoring wells (four wells to 75 feet bgs, four wells to 20 feet bgs)
    - Quarterly monitoring for the first two years and annual monitoring thereafter
- Concrete Cap along Fence Line and North Logistics MU (RAO 2, presented on Figure 6-3)
    - Remove fence in Fence Line and North Logistics MU
    - Install concrete curb along the edge of the bank to stabilize gravel placement
    - Install stormwater collection system along center line of 12-foot concrete cap
    - Install French drain 13 feet landward of the bank top (landward edge of concrete cap)
    - Install 12 ft wide concrete cap once drainage systems have been placed
    - Install and maintain metals treatment system (Filterra Bioretention System) for water collected from the French drain
    - Raise Grade of North Logistics MU using clean gravel for area 40 feet landward of bank
    - Replace fence line at new grade in Fence Line and North Logistics MU
    - Maintain gravel along bank as needed by additional gravel placement for area 40 feet landward of North Logistics MU bank
    - Monitor erosion control measures
    - Monitor effluent from stormwater metals treatment for French drain effluent - four location, quarterly

The components are organized below as to which OU and RAO the component is designed to meet.

<u>Groundwater OU 1</u>

RAO 1: LUCs

LUCs and monitoring will be used to help reduce contact of humans with groundwater and to track the concentration of COCs in groundwater at the site (see Section 5.1.5). LUCs costs are based on the degree of intensity of LUC implementation. At the Moorings site, the level of LUC intensity is set fairly low; however, costs associated with required travel, yearly letters, and site plans are still included in cost estimates. The LUC sensitivity analysis compares costs

associated with the frequency of monitoring (e.g. annual, biannual, or no monitoring) and enforcement. LUC sensitivity analysis costs are summarized in Appendix D, Table D1-7.

RAO 1: Monitoring

Conservative costs for monitoring are based on the installation of eight monitoring wells (four wells to 75 feet bgs, four wells to 20 feet bgs) and groundwater monitoring (quarterly for first two years and annually for remaining 28 years).

Soil OU 2

RAO 2: Concrete Cap, Erosion Control Monitoring & Limited Stormwater Collection, Erosion Control, Stormwater Treatment, Monitoring and Erodible Soil Monitoring

Alternative 3 will include construction of a 12-foot wide concrete cap along the Fence Line and North Logistics MU. The edge of the concrete cap will consist of a six-inch tall concrete curb place along the bank of the North Logistics and Fence Line MU. A 12-inch tall by eight-inch wide curb will be installed in an 80-foot section of the North Logistics MU that has the lowest grade. Prior to construction of this concrete cap, the North Logistics MU will be brought to grade using gravel. Two separate drainage systems will be included in the design. The first drainage system will collect clean runoff from the top of the concrete cap and will directly discharge to the river at three locations. To accomplish this, the concrete cap is sloped towards center drains to collect the clean runoff and to prevent run-on and runoff from the clean concrete cap. The second drainage system will collect groundwater at the landward edge of the concrete cap using a six inch perforated French drain system with sediment sock. The French drain system will discharge at four locations and will be treated for metals in four small passive stormwater treatment systems, called the Filterra Bioretention System. A catch basin will be installed next to each of the four French drain effluent locations to ensure that stormwater collection meets the 90 percent treatment of annual precipitation runoff requirement from Portland Stormwater Management Manual (Portland BES, 2004).

The 12-foot wide concrete cap will include five feet of cover on the exterior of the fence so that all erodible soils near the bank are protected from erosion. The remaining seven feet of cover will be located on the interior of the fence. General site maintenance will prevent the buildup of erodible soils on the concrete cap that might otherwise reach the river. The concrete cap slopes towards center drains to prevent run-on and runoff from the clean concrete cap. Current French drain systems that are installed at the site will remain if practical or will be removed prior to construction of the concrete cap.

The fence will be removed and placed into the concrete cap. Costs associated with temporary security personnel have been included for 7 days (168 hours) during construction activities while perimeter fences may be down.

Monitoring will be used to ensure that implemented erosion control measures are proving effective over time. Quarterly monitoring for metals, PAHs, and PCBs will be needed for the effluent from the metals treatment systems. Cost estimates include metals treatment system maintenance, and quarterly effluent monitoring for metals, PAHs, and PCBs.

6.2.4 Alternative 4 – Vegetative Buffer: LUCs, Groundwater Monitoring, Erodible Soil Removal, Construction of Vegetative Buffer, Limited Stormwater Collection, Stormwater Treatment, Monitoring and Erodible Soil Monitoring

Alternative 4 is comprised of the following:

- LUCs for groundwater (RAO 1)
- Groundwater monitoring (RAO 1)
    - Install eight groundwater monitoring wells (four wells to 75 feet bgs, four wells to 20 feet bgs)
    - Quarterly monitoring for the first two years and annual monitoring thereafter
- Vegetative based stormwater erosion control measures at the North Logistics and Fence Line MU (RAO 2, presented on Figure 6-4)
    - Remove fence in Fence Line and North Logistics MU.
    - Remove, transport, and dispose of top six inches of contaminated soil
    - Install French drain 10 feet landward of North Logistics MU bank top (if required)
    - Install and maintain stormwater metals treatment for French drain effluent (if required)
    - Install concrete curb along North Logistics MU to stabilize gravel placement
    - Raise grade of North Logistics MU using clean topsoil near bank and gravel beyond 10 feet of bank
    - Place six inches clean topsoil in Fence Line MU near bank
    - Plant vegetative buffer (10 feet wide) using grass and shrubs less than eight inches tall as defined by the Portland Plant List (Portland 2004a)
    - Replace fence at new grade in North Logistics and Fence Line MU
    - Incorporate temporary sediment control measures (filtration silt/sediment fence) until vegetative buffer becomes effective
    - Monitor erosion control measures
    - Monitor effluent from stormwater metals treatment for French drain effluent - one location, quarterly (if required)

The components are organized below as to which RAO the component is designed to meet.

<u>Groundwater OU 1</u>

RAO 1: LUCs

LUCs and monitoring will be used to help reduce contact of humans with groundwater and to track the concentration of COCs in groundwater at the site (see Section 5.1.5). LUCs costs are based on the degree of intensity of LUC implementation. At the Moorings site, the level of LUC intensity is set fairly low; however, costs associated with required travel, yearly letters, and site plans are still included in cost estimates. The LUC sensitivity analysis compares costs associated with the frequency of monitoring (e.g. annual, biannual, or no monitoring) and enforcement. LUC sensitivity analysis costs are summarized in Appendix D, Table D1-7.

RAO 1: Monitoring

Conservative costs for monitoring are based on the installation of eight monitoring wells (four wells to 75 feet bgs, four wells to 20 feet bgs) and groundwater monitoring (quarterly for first two years and annually for remaining 28 years). Sensitivity analysis includes changes of cost associated with the number of chemical analysis to be completed.

RAO 2: Erodible Soil Removal, Construction of Vegetative Buffer, Limited Stormwater Collection, Stormwater Treatment, Monitoring and Erodible Soil Monitoring

Alternative 4 consists of the removal of the top six inches of contaminated soil that is located 10 feet landward of the bank within the Fence Line and North Logistics MUs. Alternative 4 includes the construction of a vegetative buffer, and installation of necessary stormwater drainage systems within this footprint for erosion control (RAO 2, presented on Figure 6-3). The fence will be removed along the Fence Line and North Logistics MUs. Costs associated with temporary security personnel have been included for seven days (168 hours) during construction activities while perimeter fences may be down.

It is assumed that top six inches of contaminated soil will be excavated; however, the required soil excavation depth will be dependent on the final design and grade. All excavated soil will be transported to an appropriate disposal facility. TCLP tests will be completed at the time of the soil removal to determine if the soil is considered hazardous waste. Due to the low probability that soils would be classified as hazardous waste, disposal cost estimates assume the excavated soil is non-hazardous material. Additional cost information associated with potential hazardous disposal and stabilization costs are further discussed in Section 7.2.3.7.

French drains will be installed ten feet landward of the bank top along the length of the North Logistics MU if needed to ensure proper stormwater control within the gravel areas of the site. If French drains are required to be installed within the Remedial Action phase for the North Logistics MU, a metals treatment system such as a Filterra Bioretention System will be used to reduce metals concentrations exiting the system below required limits. A catch basin will be installed next to the French drain effluent location to ensure that stormwater collection meets the 90 percent treatment of annual precipitation runoff requirement from Portland Stormwater Management Manual (Portland BES, 2004).

Following removal of contaminated soils, gravel placement will bring the site up to grade for areas within the MUs that are further than ten feet landward of the bank top. For the areas that are within ten feet of the bank top, topsoil optimized for a vegetative buffer will be placed. The final grade of both Fence Line and North Logistics MUs will include at least six inches of clean topsoil fill. Following topsoil placement, the fence will be replaced. A 10-foot wide vegetative buffer will be planted with grasses and shrubs shorter than eight inches tall that are compliant with non-invasive native Portland Greenway species listings (Portland 2004a).

The vegetative cover associated with Alternative 4 will work to prevent erosion while providing potential phytoremediation characteristics (either contaminant destruction or immobilization) for stormwater and contaminated soils within the vicinity of the root systems of the cover. A potential plant type such as vetiver grass is both good for erosion control and

phytoremediator for metals and PAHs (Vetiver, 2010). Use of a vetiver grass or other phytoremediator grasses has the potential to reduce contaminant migration to groundwater.

Temporary stormwater treatment control measures will be implemented within the construction area to prevent erosion while plants stabilize within the vegetative buffer and ecological bank stability features.

Monitoring will be used to ensure that implemented erosion control measures are proving effective and that erodible soil buildup does not degrade the integrity of the erosion control design over time. If a French drain and metals treatment system is necessary for the North Logistics MU, quarterly monitoring for metals, PAHs, and PCBs will be needed for the effluent from the metals treatment system. Cost estimates include metals treatment system maintenance, and quarterly effluent monitoring for metals, PAHs, and PCBs.

CHAPTER 7 - DETAILED ANALYSIS OF ALTERNATIVES

The detailed analysis of alternatives consists of the evaluation and comparison of the remedial alternatives determined in Chapter 6 to provide decision makers with sufficient information to select an appropriate remedy to meet the CERCLA remedy selection requirements (EPA 1988). In the detailed analysis, each alternative is evaluated against seven of the nine CERCLA required criteria, as described in Section 7.1. The general evaluation of the three alternatives against those criteria is described in Section 7.2. The results of the evaluations are used in Section 7.3 to compare the alternatives to each other to identify the key tradeoffs. In Section 7.4, the comparison of the alternatives is summarized and the recommended alternative is presented.

7.1 Evaluation Criteria

To address CERCLA requirements, nine evaluation criteria were developed by the EPA (EPA 1988). The first two criteria are the "threshold" factors; these criteria are:

- Protection of human health and the environment.
- Compliance with ARARs.

Five "primary balancing" criteria are then used to evaluate and identify the major trade-offs amongst the remedial alternatives. The evaluation includes the following balancing criteria:

- Short-term effectiveness.
- Long-term effectiveness and permanence.
- Reduction of toxicity, mobility, or volume through treatment.
- Implementability.
- Cost.

The remaining two criteria are "modifying" factors, and are to be evaluated in the final ROD. The evaluation of these two factors can only be completed after the CERCLA PP is published for comment and the public comment period is completed. These modifying factors are:

- State acceptance.
- Community acceptance.

A more detailed discussion of the evaluation criteria is presented in the following paragraphs.

7.1.1 Protection of Human Health and the Environment

Remedial actions must be protective of human health and the environment (EPA 1988). Should the alternative not be deemed protective, then it cannot be selected as the preferred alternative. Each alternative is evaluated on its potential to limit exposure risk to humans and the environment during and after implementation of the remedial action. Alternatives providing the most short- and long-term protection of human health and the

environment are considered more desirable. Risks associated with construction and management of wastes generated during remedial actions will be considered in the evaluation under this criterion.

7.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Potential ARARs and TBCs for groundwater at the Site were identified in Chapter 4 in accordance with 40 CFR § 300.400(g). ARARs were categorized based upon whether the requirement specifically addresses a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. The identification and selection of potential ARARs and TBCs assist in evaluation of potential remedial alternatives by providing the necessary actions at the site. Alternatives must comply with ARARs or they cannot be considered for remedy selection unless an ARAR waiver can be justified in accordance with 40 CFR § 300.430 (f).

7.1.3 Short-Term Effectiveness

Short-term effectiveness for an alternative refers to its effect on human health and the environment during implementation of the remedial action until RAOs are met. This criterion consists of the consideration of the estimated timeframe required to achieve RAOs, the short-term reliability of the technology, and protection of the community and workers during remediation.

7.1.4 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence criterion evaluates the ability of an alternative to prevent or minimize risk to public health and the environment after RAOs have been met. Components considered when evaluating the long-term effectiveness and permanence of an alternative include examining the magnitude of residual risk and the adequacy and long-term reliability of controls that may be required to manage this residual risk (EPA 1988). Sustainability is an USACE Operating Principle and is mandated by the President through Executive Order 13423 and 13514. Sustainability promotes use of low impact and ecological based remedies and is a criterion used to evaluate long-term effectiveness and permanence. Residual risks may include the risks posed by treatment residuals and/or untreated residual contamination.

7.1.5 Reduction of Toxicity, Mobility, or Volume through Treatment

EPA has a statutory preference for selecting remedial actions that employ treatment technologies to permanently and significantly reduce toxicity, mobility, or volume of hazardous substances as their principal element (EPA 1988). Treatment technologies that focus on the destruction of toxic contaminants, the reduction of the total mass of toxic contaminants, the irreversible reduction in contaminant mobility, or the reduction of total volume of contaminated media are desired. Factors considered are the treatment processes; amount of hazardous materials to be destroyed or treated; order of magnitude expectation of overall reduction in toxicity, mobility, or volume through treatment; the degree to which the treatment will be irreversible; type and quantity of residuals that will remain after treatment;

and whether the alternative would treat the principle threat. These factors may be considered individually or combined for overall reduction when comparing alternatives.

7.1.6 Implementability

Implementability is used as a measure of both the technical and administrative feasibility of constructing, operating, and maintaining a remedial action alternative (EPA 1988).

Technical feasibility refers to the following factors:

- Ability to reliably construct, operate, and maintain the components of the alternative during remediation and after completion, as well as the ability to meet applicable technical regulatory requirements.
- Likelihood that technical problems associated with implementation will lead to schedule delays.
- Ability of remedial equipment to undertake additional remedial actions (e.g., increased flows or volumes) and/or phase in other interim remedial actions, if necessary.
- Ability to monitor the effectiveness of the implemented remedies.
- Administrative feasibility includes the following criteria:
- Ability to get approvals from appropriate agencies to implement the alternative.
- Availability of support services for the treatment, storage, and disposal of generated wastes.
- Availability of specialized equipment or technical experts to support the remedial actions.

7.1.7 Cost

Cost estimates are intended to provide a basis for alternative evaluation and comparison purposes. Detailed cost analysis tables and documents are presented in Appendix D. In accordance with 40 CFR § 300.430(g), the cost estimate is to calculate:

- Capital costs, including both direct and indirect costs.
- Annual operation and maintenance costs (O&M) costs.
- Net present value of capital and O&M costs.

Capital costs include design costs, equipment costs, construction costs, and other relevant short-term expenditures associated with the installation of the remedial action components. O&M costs include the expenses associated with equipment maintenance and repair, site and equipment monitoring, power, chemicals, and disposal of residues. Periodic costs associated with the administration and remedial action operations were calculated separately from the O&M costs.

Costs are used to eliminate alternatives that are significantly more expensive than others without proportional benefits or to choose among several alternatives offering similar protection to human health and the environment. The costs reflected in this document are within the EPA RI/FS guidance range of +50 percent to -30 percent when compared to actual project costs after the remedial design phase. The primary components of each alternative are sized prior to developing the cost estimates. Sizing is based on general guidelines found in technical literature, past experience, and general professional judgment. For the cost estimation process, data are gathered from cost proposals provided by subcontractors for each remedial alternative, prior expenses, and professional judgments. The level of detail is similar in all of the alternatives to avoid comparing estimates having different levels of accuracies. RACER™ 10.3 (Remedial Action Cost Engineering and Requirements) 2006 by Earth-Tech, Inc. was used for cost estimates.

For fair cost comparison, capital costs are assumed to be entirely expended in year zero, even though some alternatives may take longer to implement than others. Because expenditures occur over different periods of time in some of the alternatives, O&M and periodic costs are discounted to a common base year (i.e., year zero) and added to the capital costs to obtain the total present worth of each alternative. Costs included in this FS are not rounded up when referenced. Accuracy associated with number of significant digits shown in a calculation is not applicable to these values; cost estimate accuracy is better related to the guidance of +50 to -30 percent. With present worth analysis, alternatives can be compared based on a single value. Following EPA guidelines (EPA 2000b), the appropriate discount rate for Federal facilities (applicable to the Moorings) based on 30+ years of expenditures acquired from the current Office of Management and Budget web-site is set at 2.7 percent (OMB 2008).

7.1.8 State Acceptance

Assessment against this criterion is to be performed as part of the ROD development through the public comment process and incorporates the state's technical and administrative agency input regarding each of the remedial alternatives as part of the PP. For this site, the state is represented by the DEQ. The factors to be evaluated include features of the actions that the state supports, has reservations about, or opposes.

7.1.9 Community Acceptance

Assessment against this criterion is to be performed as part of the PP and ROD development and public comment process, and incorporates public input into the analysis of the remedial alternatives. Factors of community acceptance to be discussed include features of the support, reservations, and opposition of the community. Public and community inputs are a component of this criterion.

7.2 Alternative Criteria Evaluation

This section presents the evaluation of each of the four alternatives to the first seven of the CERCLA criteria. In this evaluation, alternatives are not compared against each other, but are described in terms of the specific criterion. Table 7-1 provides a summary of "baseline" details for the criteria evaluated in the FS for all four alternatives.

7.2.1 Alternative 1 – No Action

Alternative 1 is the No-Action alternative, which must consist of Five-Year Reviews until ARARs are met. Alternative 1 does nothing to prevent unacceptable human exposures and fails this threshold criterion test. Alternative 1 would not comply with the SDWA for protection of drinking water sources (groundwater in this case) and would not treat groundwater hotspots as defined by Oregon Environmental Cleanup Law, Oregon Revised Statues (ORS) 465.315, therefore, Alternative 1 fails the Compliance with ARARs threshold criterion test. The No-Action alternative would fail both the short and long-term effectiveness criteria and the reduction of toxicity, mobility, and volume through treatment criteria. Alternative 1 would pass the threshold criteria of implementability and cost since nothing would need to be done for this alternative and by definition there is no cost associated with the No Action Alternative. Costs would still be required for a 5-Year Review since contaminants would remain on the property, however, for the purpose of this FS the No Action Alternative is set at no cost.

The No-Action alternative is retained for the comparison of alternatives as a baseline to other alternatives, in accordance with CERCLA, despite failing the threshold criteria tests. No costs are calculated for this alternative given that no action would be taken.

7.2.2 Alternative 2 – Gravel Layer: LUCs, Groundwater Monitoring, Gravel Placement, Limited Stormwater Collection, Erosion Control, Stormwater Treatment, Monitoring and Erodible Soils Monitoring

Groundwater OU 1

Actions for Alternative 2 include groundwater monitoring and implementation of LUCs to prevent human contact with groundwater.

Soil OU 2

Additional actions include burying/covering of any exposed contaminated erodible soils using clean gravel, and raising the grade of areas within the North Logistics MU to match the Fence Line MU using clean gravel placement. Two-hundred feet of concrete curb will be added to stabilize the gravel placement along the bank (120 feet of six-inch high concrete curb and 80 feet of 12-inch high concrete curb). Alternative 2 includes additional limited stormwater conveyance and treatment systems as needed for the North Logistics MU.

7.2.2.1 Protection of Human Health and the Environment

Groundwater OU 1

RAO 1: Alternative 2 is protective of human health for RAO 1 due to implementation of LUCs, which are capable of preventing unacceptable exposures to site COCs in groundwater.

Soil OU 2

RAO 2: Alternative 2 is protective of the environment for RAO 2 since any exposed contaminated erodible soils will be stabilized and covered through the placement of clean gravel.

7.2.2.2 Compliance with ARARs

Groundwater OU 1

RAO 1: Alternative 2 does not comply with the chemical specific ARARs described in the Safe Drinking water Act because no final action to achieve MCLs will be taken. Alternative 2 does not comply with the action specific ARAR requiring treatment of groundwater hotspots defined by ORS 465.315 since the final remedy for groundwater will be completed by others. OU 1 is only an interim action to assure there is no exposure to contaminated groundwater pending source control actions taken on the Gasco property. Until the MCLs of the SDWA are attained, and until treatment of groundwater hotspots is achieved, groundwater use restrictions will remain in place. Monitoring will determine when MCLs and groundwater hotspot treatment has been attained and LUCs can be removed.

Soil OU 2

RAO 2: Alternative 2 complies with ARARs since all exposed contaminated erodible soils will be stabilized and covered through placement of clean gravel. This action will prevent the transport of contaminated soil into the adjacent Willamette River and comply with provisions and water quality standards established in the CWA. If a French drain system is installed as a Remedial Action, a Filterra Bioretention system will be installed to ensure any discharge generated by the action meet provisions of the CWA. Such a Filterra system will be installed down gradient along the slope or at the base of the bank. Alternative 2 will include a French drain and Filterra metals treatment system (if needed) which will comply with the CWA and Water Pollution Control Act, and therefore is ranked moderately compliant with ARARs.

7.2.2.3 Short-Term Effectiveness

Groundwater OU 1

RAO 1: Alternative 2 would be capable of meeting short-term effectiveness criteria for RAO 1 since currently there are no exposure scenarios to groundwater by site occupants. LUCs will prevent future contaminated groundwater exposure to site occupants within the Moorings boundaries. Monitoring will determine when LUCs can be removed.

Soil OU 2

RAO 2: Short-term effectiveness for RAO 2 will be attained since Alternative 2 will require minimal exposure of contaminated soils to construction workers and will quickly remove the risk of soil erosion to the Willamette River. Alternative 2 requires the least amount of fence and soil removal and replacement, so that erosion caused by construction activities will be insignificant.

7.2.2.4 Long-Term Effectiveness and Permanence

Groundwater OU 1

RAO 1: LUCs and groundwater monitoring will provide a long-term solution to reduce future dermal, inhalation, and ingestion exposure of potable water until the source of contamination at the neighboring Gasco property is treated. Therefore, Alternative 2 passes the forth threshold criteria for RAO 1.

Soil OU 2

RAO 2: Maintenance of a gravel layer over erodible contaminated soils will provide a long-term solution to prevent erosion of contaminated soils to the Willamette River. Therefore Alternative 2 passes the forth threshold criteria for RAO 2. One of the criteria for long-term effectiveness and permanence is sustainability, which promotes use of low impact and ecological based remedies. Alternative 2 does not use ecological measures for erosion control but provides the least intrusive design, and therefore is ranked moderately compliant with this criterion.

7.2.2.5 Reduction of Toxicity, Mobility, and Volume through Treatment

Groundwater OU 1

RAO 1: Alternative 2 would not be effective at reduction of toxicity, mobility and volume through LUCs or monitoring for RAO 1.

Soil OU 2

RAO 2: The implementation and maintenance of a gravel layer over all contaminated erodible soils within the Fence Line and North Logistics MUs would reduce the mobility of erodible soils associated with RAO 2. If a French drain system is installed as part of the Remedial Action, a Filterra system will be installed to ensure any new discharge produced by the Remedial Action would meet discharge requirements. If a French drain system is required, a Filterra water treatment system would be used to reduce metals in the groundwater collected within the North Logistics French drain system thereby reducing contaminant transport to the river.

7.2.2.6 Implementability

Groundwater OU 1

RAO 1: Alternative 2 is implementable for RAO 1 since it would be feasible to introduce LUCs that prevent groundwater use as a future source of potable water and conduct groundwater monitoring. Implementation of LUCs would not require any site construction, consequently, there is no likelihood of encountering issues with installation, construction schedule delays, startup, operation and maintenance, design failures, or performance monitoring issues.

Soil OU 2

RAO 2: The implementation of RAO 2 actions to address erodible soils stabilization associated with Alternative 2 are feasible.

The extent of construction activities is limited within Alternative 2 making possible implementability issues associated with construction activities unlikely. Additional debris removal may be necessary where concrete blocks are present along the riverbank. Possible design failures could include ineffectiveness of any French drain systems needed within the North Logistics MU. Since any French drain systems within the North Logistics MU will be installed below gravel at a shallow depth, alterations can easily be made to the French drain system if necessary.

Implementation of Alternative 2 would introduce the smallest footprint and would not require extensive chemical or energy inputs related to O&M. Alternative 2 would provide the least invasive method to prevent erosion of soils along the bank and would provide increased soil stability near the riverbank within the North Logistics MU.

The selected remedy will be required to comply with DOD security requirements as listed in FM 3-19.30 including limiting obstructions greater than eight inches in height near security fences. If a French drain system is installed as a Remedial Action, a metals treatment Filterra Bioretention system will be installed to ensure any discharged generated by the action meet requirements. Such a Filterra system will be installed down gradient along the slope or base of the bank. Filterra has stated that the variety of plant species can be adjusted to meet the eight-inch security requirement near fence lines. Detailed design of this system will need to ensure that the integrity of the bank is maintained. During construction activities, security fences will need to be removed. Costs have been included associated with security monitoring to ensure security requirements are met.

Given the general simplicity of the design for Alternative 2 and the minimal expected problems, Alternative 2 is considered implementable and therefore passes the sixth threshold criteria test.

7.2.2.7 Cost

Groundwater OU 1

Capital, periodic, and O&M costs are individually shown for primary actions: LUCs, Five Year Review, groundwater monitoring, gravel layer (which includes grading and any required drainage costs), and limited French drain treatment and monitoring (if needed). Costs are combined as marked-up costs and present value costs for Alternative 2. The timeframes used to determine cost for Alternative 2 was 30 years. Table 7-2 presents the costs for Alternative 2. The present value costs for all actions is $3,337,326.

RAO 1: LUCs (present value $893,886) - The range of present value costs for LUCs is $654,011 to $1,058,983. Groundwater monitoring (present value $1,392,179) - The range of present value costs for groundwater monitoring is $1,042,006 to $1,776,255.

Soil OU 2

RAO 2: The present value cost associated with Alternative 2 gravel layer construction actions is $47,825. The present value cost associated with installation and 30 years of O&M for a Filterra French drain treatment system is $21,556. Additional costs associated with monitoring the effluent of the metals treatment system over 30 years is $877,173. Filterra treatment system costs would only apply if a French drain system was installed for the North Logistics unit as part of the remedy.

Additional cost detail is available in Appendix D. Specifically, Appendix D - D1 includes a summary of items included in each category within Table 7-2 over the 30-year life. A sensitivity analysis estimated the range in costs associated with LUCs, Five Year Review and groundwater monitoring based on low versus medium complexity of the site and the number of analyses to be tested during ground water monitoring (Table D1-6). Additional details regarding the range of present value costs are available in Appendix D-D1 and are summarized as follows: LUCs ($654,011 to $1,058,983), Five Year Review ($104,708 to $167,759), and groundwater monitoring ($1,042,006 to $1,776,255).

7.2.3 Alternative 3 – Limited Concrete Cap: LUCs, Groundwater Monitoring, Concrete Cap, Stormwater Collection, Erosion Control, Stormwater Treatment, Monitoring and Erodible Soils Monitoring

Groundwater OU 1

Actions for Alternative 3 include groundwater monitoring and implementation of LUCs to prevent human contact with groundwater.

Soil OU 2

Additional actions for Alternative 3 include capping of any exposed contaminated erodible soils, and raising the grade of areas within the North Logistics MU to match the Fence Line MU. This cap will include the construction of a 12-foot wide concrete cap with two associated drainage systems that will convey clean surface water and contaminated groundwater on the landward edge of the concrete cap. The construction of a Filterra metals treatment system will be included for the treatment of the collected groundwater in the North Logistics and Fence Line MUs.

7.2.3.1 Protection of Human Health and the Environment

Groundwater OU 1

RAO 1: Alternative 3 is protective of human health for RAO 1 due to implementation of LUCs, which are capable of preventing unacceptable exposures to site COCs in groundwater.

Soil OU 2

RAO 2: Alternative 3 is protective of the environment for RAO 2 since a concrete cap will completely isolate and stabilize any contaminated erodible soils within the Fence Line and North Logistics MU.

7.2.3.2 Compliance with ARARs

Groundwater OU 1

RAO 1: Alternative 3 does not comply with the chemical specific ARARs described in the SDWA because no final action to achieve MCLs will be taken. Alternative 3 does not comply with the action specific ARAR requiring treatment of groundwater hotspots defined by ORS 465.315 since the final remedy for groundwater will be completed by others. OU 1 is only an interim action to assure there is no exposure to contaminated groundwater pending source control actions taken on the Gasco property. Until the MCLs of the SDWA are attained, and until treatment of groundwater hotspots is achieved, groundwater use restrictions will remain in place. Monitoring will determine when MCLs and groundwater hotspot treatment has been attained and LUCs can be removed.

Soil OU 2

RAO 2: Alternative 3 complies with ARARs since all exposed contaminated erodible soils within the Fence Line and North Logistics MU will be completely isolated and stabilized under the concrete cap. This action will prevent the transport of contaminated soil into the adjacent Willamette River and comply with provisions and water quality standards established in the CWA. Four 6 feet by 6 feet Filterra systems will be installed to ensure any discharge generated by the action meet provisions of the CWA. Such a Filterra system will be installed down gradient along the slope or at the base of the bank. Alternative 3 will include a stormwater collection system, French drain and four Filterra metals treatment systems to comply with the CWA. Therefore, Alternative 3 is ranked moderately compliant with ARARs.

7.2.3.3 Short-Term Effectiveness

Groundwater OU 1

RAO 1: Alternative 3 would be capable of meeting short-term effectiveness criteria for RAO 1 since there are currently no exposure scenarios to groundwater by site occupants. LUCs will prevent future contaminated groundwater exposure to site occupants within the Moorings boundaries. Monitoring will determine when LUCs can be removed.

Soil OU 2

RAO 2: Short-term effectiveness for RAO 2 will be attained since Alternative 3 includes temporary erosion control measures for the site locations that have the highest potential for erosion of contaminated soils. These temporary erosion control measures will remain in place until construction of the 12-foot wide concrete cap is completed.

7.2.3.4 Long-Term Effectiveness and Permanence

Groundwater OU 1

RAO 1: LUCs and groundwater monitoring will provide an effective long-term solution to prevent future dermal, inhalation, and ingestion exposure of potable water until the source of contamination at the neighboring Gasco property are treated. Therefore, Alternative 3 passes the forth threshold criteria for RAO 1.

Soil OU 2

RAO 2: The concrete cap will effectively cover and stabilize any erodible soils as a long-term solution to prevent erosion of contaminated soils to the Willamette River. One of the criteria for long-term effectiveness and permanence is sustainability, which promotes use of low impact and ecological based remedies. Alternative 3 does not use ecological measures for erosion control and has the largest footprint, but since the cap will effectively cover and stabilize erodible soils, Alternative 3 is ranked moderately compliant with this criterion. Alternative 3 passes the forth threshold criteria for RAO 2.

7.2.3.5 Reduction of Toxicity, Mobility, and Volume through Treatment

Groundwater OU 1

RAO 1: Alternative 3 would not be effective at reduction of toxicity, mobility and volume through LUCs or monitoring for RAO 1.

Soil OU 2

RAO 2: The implementation of a 12-foot wide concrete cap and drainage system within the Fence Line and North Logistics MUs in Alternative 3 would reduce the mobility of erodible soils associated with RAO 2. A Filterra system will be installed to ensure any new discharge produced by the Remedial Action would meet discharge requirements. The Filterra water treatment system would reduce metals in the groundwater collected within the North Logistics French drain system thereby reducing contaminant transport to the river. The Filterra systems would be sized to treat 90 percent of the annual runoff entering the Fence Line and North Logistics MUs. Alternative 3 is designed to filter stormwater runoff and increase soil stability near the riverbank.

7.2.3.6 Implementability

Groundwater OU 1

RAO 1: Alternative 3 is implementable for RAO 1 since it would be feasible to introduce LUCs that prevent groundwater use as a future source of potable water and conduct groundwater monitoring. Implementation of LUCs would not require any site construction, consequently, there is no likelihood of encountering issues with installation, construction schedule delays, startup, O&M, design failures, or performance monitoring issues.

Soil OU 2

RAO 2: The implementation of a 12-foot wide concrete cap and drainage system within the Fence Line and North Logistics MUs is possible. Filterra has stated that the variety of plant species can be adjusted to meet the eight-inch security requirement near fence lines. During construction activities, security fences will need to be removed. Costs have been included associated with security monitoring to ensure security requirements are met.

Alternative 3, is the most construction intensive action and would introduce the largest footprint of the alternatives. It requires implementation of four 6 feet by 6 feet Filterra systems riverward of the bank with respective catch basins for storage, two separate drainage systems, and an extensive cap across 7,900 square feet along the top of the bank. The concrete cap does not incorporate ecologically available solutions to prevent erosion and will be energy intensive if system alterations are ever needed. Although Alternative 3 is still fairly simple, additional design failures could include ineffectiveness of extensive French drain system and construction delays.

The four Filterra treatment systems or an equivalent will require installation down gradient of the French drain effluent point along the slope or at the base of the bank. Detailed design of this system will need to ensure that the integrity of the armoring along the bank or toe of the slope is maintained. The Filterra systems would increase the ruderal habitat within the site by 144 square feet due to Filterra system vegetation. Although, Alternative 3 treats a larger portion of stormwater across the site, overall the net effect from this alternative would be an increase in impervious surface area and lack of ecological-based erosion control measures.

The selected remedy will be required to comply with DOD security requirements as listed in FM 3-19.30 including limiting obstructions greater than eight inches in height near security fences. Potential obstructions could include plants within the Filterra system, however, Filterra has stated that the variety of plant species can be adjusted to meet the eight-inch security requirement near fence lines. During construction activities, security fences will need to be removed. Costs have been included associated with security monitoring to ensure Security requirements are met.

Even though there are some potential implementation issues associated with Alternative 3, this alternative is still considered implementable and therefore passes the sixth threshold criteria test.

7.2.3.7 Cost

Capital, periodic, and O&M costs are individually shown for primary actions: LUCs, Five Year Review, groundwater monitoring, concrete cap (which includes grading and drainage costs), and French drain treatment and monitoring. Costs are combined as marked-up costs and present value costs for Alternative 3. The timeframes used to determine cost for Alternative 3 was 30 years. Table 7-3 presents the costs for Alternative 3. The present value costs for all actions is $4,357,063.

Groundwater OU 1

RAO 1: LUCs (present value $893,886) - The range of present value costs for LUCs is $654,011 to $1,058,983. Groundwater monitoring (present value $1,392,179) The range of present value costs for groundwater monitoring is $1,042,006 to $1,776,255.

Soil OU 2

RAO 2: The present value cost associated with Alternative 3 concrete cap construction actions is $224,366. The present value cost associated with installation and 30 years of O&M for a Filterra French drain treatment system is $80,472. Additional costs associated with monitoring the effluent of the metals treatment system over 30 years is $1,661,452.

Additional cost detail is available in Appendix D. Specifically, Appendix D - D1 includes a summary of items included in each category within Table 7-3 over the 30-year life. A sensitivity analysis estimated the range in costs associated with LUCs, Five Year Review and groundwater monitoring based on low versus medium complexity of the site and the number of samples to be tested during ground water monitoring (Table D1-6). Additional detail regarding the range of present value costs are available in Appendix D-D1 and are summarized as follows: LUCs ($654,011 to $1,058,983), Five Year Review ($104,708 to $167,759), and groundwater monitoring ($1,042,006 to $1,776,255).

7.2.4 Alternative 4 – Vegetative Buffer: LUCs, Groundwater Monitoring, Erodible Soil Removal, Construction of Vegetative Buffer, Limited Stormwater Collection, Stormwater Treatment, Monitoring and Erodible Soil Monitoring

Actions for Alternative 4 include groundwater monitoring and implementation of LUCs to prevent human contact with groundwater (RAO 1), and the implementation of a 10-foot vegetative buffer for ecologically based erosion control in the North Logistics and Fence Line MUs. The vegetative buffer includes removal and replacement of the top six inches of any contaminated erodible soils, raising the grade of areas within the North Logistics MU to match the Fence Line MU, and adding limited stormwater conveyance and treatment systems as needed for the North Logistics MU (RAO 2).

7.2.4.1 Protection of Human Health and the Environment

Groundwater OU 1

RAO 1: Alternative 4 is protective of human health for RAO 1 due to implementation of LUCs, which are capable of preventing unacceptable exposures to site COCs in groundwater.

Soil OU 2

RAO 2: Alternative 4 is protective of the environment for RAO 2 as any contaminated erodible soils (up to six inches) will be removed and replaced with a 10-foot wide vegetative buffer that will stabilize erodible soils in the North Logistics and Fence Line MUs.

7.2.4.2 Compliance with ARARs

Groundwater OU 1

RAO 1: Alternative 4 does not comply with the chemical specific ARARs described in the SDWA because no final action to achieve MCLs will be taken. Alternative 4 does not comply with the action specific ARAR requiring treatment of groundwater hotspots defined by ORS 465.315 since the final remedy for groundwater will be completed by others. OU 1 is only an interim action to assure there is no exposure to contaminated groundwater pending source control actions taken on the Gasco property. Until the MCLs of the SDWA are attained, and until treatment of groundwater hotspots is achieved, groundwater use restrictions will remain in place. Monitoring will determine when MCLs and groundwater hotspot treatment has been attained and LUCs can be removed.

Soil OU 2

RAO 2: Alternative 4 complies with ARARs since soil removal and vegetative-based stormwater erosion control measures for the North Logistics and Fence Line MUs will address locations that have the highest potential for erosion of contaminated soils into the Willamette River. This action will prevent the transport of contaminated soil into the adjacent Willamette River and comply with provisions and water quality standards established in the CWA. If a French drain system is installed as a Remedial Action, a Filterra Bioretention system will be installed to ensure any discharge generated by the action meet provisions of the CWA. Such a Filterra system will be installed down gradient along the slope or at the base of the bank. Alternative 4 will include a French drain and Filterra metals treatment system, if needed, to comply with the CWA. Therefore, Alternative 4 is ranked moderately compliant with ARARs.

7.2.4.3 Short-Term Effectiveness

Groundwater OU 1

RAO 1: Alternative 4 would be capable of meeting short-term effectiveness criteria for RAO 1 since there are currently no exposure scenarios to groundwater by site occupants. LUCs will prevent future contaminated groundwater exposure to site occupants within the Moorings

Soil OU 2

RAO 2: Short-term effectiveness for RAO 2 will be attained since Alternative 4 includes temporary erosion control measures for all construction activities. These temporary erosion control measures will remain in place and effective until long-term ground cover, soil-stabilizing plants become effective.

7.2.4.4 Long-Term Effectiveness and Permanence

Groundwater OU 1

RAO 1: LUCs and groundwater monitoring will provide a long-term solution to reduce future dermal, inhalation, and ingestion exposure of potable water until the source of contamination at the neighboring Gasco property is treated. Therefore, Alternative 4 passes the forth threshold criteria for RAO 1.

Soil OU 2

RAO 2: The top six inches of any contaminated soil would be removed from the site and the vegetative buffer would effectively cover and stabilize any erodible soils as a long-term solution to prevent erosion of contaminated soils to the Willamette River. One of the criteria for long-term effectiveness and permanence is sustainability, which promotes use of low impact and ecological based remedies. Alternative 4 focuses on ecological measures for erosion control and expands the ecological habitat within the site; therefore, Alternative 4 is ranked most compliant with this criterion. Alternative 4 passes the forth threshold criteria for RAO 2.

7.2.4.5 Reduction of Toxicity, Mobility, and Volume through Treatment

Groundwater OU 1

RAO 1: Alternative 4 would not be effective at reduction of toxicity, mobility, and volume through LUCs for RAO 1.

Soil OU 2

RAO 2: The top six inches of any contaminated erodible soils would be removed from the site and replaced with clean soil for the implementation of a vegetative buffer. The vegetative cover associated with Alternative 4 would prevent erosion while providing potential phytoremediation characteristics (both contaminant destruction or immobilization) for stormwater and contaminated soils within the vicinity of the root systems of the cover. A potential plant type such as vetiver grass is good for erosion control and phytoremediator for metals and PAHs (Vetiver, 2010). Use of a vetiver grass or other phytoremediator grasses has the potential to reduce contaminant migration to groundwater.

If a French drain system is installed as part of the Remedial Action, a Filterra system will be installed to ensure any new discharge produced by the Remedial Action would meet discharge requirements. If a French drain system is required, a Filterra water treatment system would be used to reduce metals in the groundwater collected within the North Logistics French drain system thereby reducing contaminant transport to the river.

7.2.4.6 Implementability

Groundwater OU 1

RAO 1: Alternative 4 is implementable for RAO 1 since it would be feasible to introduce LUCs that prevent groundwater use as a future source of potable water and conduct groundwater monitoring. Implementation of LUCs would not require any site construction, and consequently, there is no likelihood of encountering issues with installation, construction schedule delays, startup, O&M, design failures, or performance monitoring issues.

Soil OU 2

RAO 2: The implementation of vegetative-based erosion control measures at the North Logistics and Fence Line MUs (RAO 2) is possible. The vegetative cover associated with Alternative 4 would prevent erosion while providing potential phytoremediation characteristics (both contaminant destruction or immobilization) for stormwater and contaminated soils within the vicinity of the root systems of the cover. A potential plant type such as vetiver grass is good for erosion control and phytoremediator for metals and PAHs (Vetiver, 2010). Use of a vetiver grass or other phytoremediator grasses has the potential to reduce contaminant migration to groundwater.

Although construction is required within Alternative 4, the vegetative-based erosion design is fairly simple making construction delays unlikely. Possible design failures could include ineffectiveness of the French drain system and failure for plants to stabilize within a timely manner. Additional debris removal may be necessary where concrete blocks are present along the riverbank. Alterations can easily be made to the French drain system if it is ineffective since the French drain will be installed at a shallow depth. The inclusion of a silt fence will reduce the potential design failures associated with precipitation events following construction, providing an extra window for plant stability.

If a French drain system is installed as a Remedial Action, a Filterra system will be installed to ensure any new discharge produced by the action meet discharge requirements. The selected remedy will be required to comply with DOD security requirements as listed in FM 3-19.30 including limiting obstructions greater than eight inches in height near security fences. Potential obstructions could include plants within the Filterra system, however, Filterra has stated that the variety of plant species can be adjusted to meet the eight-inch security requirement near fence lines.

A Filterra system will require installation down gradient of the collection point along the slope or base of the bank. Detailed design of this system will need to ensure that the integrity of the armoring and toe of the bank are maintained. During construction activities, security fences will need to be removed. Costs associated with security monitoring to ensure security requirements are met and have been included in the estimate.

Implementation of Alternative 4, would not introduce a large footprint on the site, and would not require extensive chemical or energy inputs related to O&M. Alternative 4 would filter stormwater runoff, decrease stormwater velocity, and increase soil stability near the riverbank. The design increases the ruderal habitat in the site by 6,000 square feet with additional aesthetic qualities along 600 feet of the Willamette River shoreline. For the reasons presented above, Alternative 4 is considered implementable and therefore passes the sixth threshold criteria test.

7.2.4.7 Cost

Capital, periodic, and O&M costs are individually shown for primary actions: LUCs, Five Year Review, groundwater monitoring, vegetative buffer (which includes grading and any required drainage costs), and limited French drain treatment and monitoring (if needed). Costs are combined as marked-up costs and present value costs for Alternative 4. The timeframes

used to determine cost for Alternative 4 was 30 years. Table 7-4 presents the costs for Alternative 4. The present value cost for all actions is $3,415,955.

Groundwater OU 1

RAO 1: LUCs (present value $893,886) - The range of present value costs for LUCs is $654,011 to $1,058,983. Groundwater monitoring (present value $1,392,179) - The range of present value costs for groundwater monitoring is $1,042,006 to $1,776,255.

Soil OU 2

RAO 2: The present value cost associated with Alternative 4 vegetative buffer actions is $126,454. The present value cost associated with installation and 30 years of O&M for a Filterra French drain treatment system is $21,556. Additional costs associated with monitoring the effluent of the metals treatment system over 30 years is $877,173. Filterra treatment system costs would only apply if a French drain system was installed as part of the remedy.

It is assumed that contaminated soil disposal costs would be classified as non-hazardous rather than hazardous waste. However, the additional cost associated with hazardous soil disposal was calculated in RACER for comparison. From this calculation it was determined that the disposal of soils classified as hazardous waste that require stabilization would increase the overall cost of Alternative 4 by $29,000.

Additional cost detail is available in Appendix D. Specifically, Appendix D - D1 includes a summary of items included in each category within Table 7-4 over the 30-year life. A sensitivity analysis estimated the range in costs associated with LUCs, Five Year Review and groundwater monitoring based on low versus medium complexity of the site and the number of samples to be tested during ground water monitoring (Table D1-6). Additional detail regarding the range of present value costs are available in Appendix D-D1 and are summarized as follows: LUCs ($654,011 to $1,058,983), Five Year Review ($104,708 to $167,759), and groundwater monitoring ($1,042,006 to $1,776,255).

7.3 Alternative Comparison

The following section provides the comparison between the three alternatives. This comparison is summarized in Tables 7-5. A summary of the cost comparison is presented in Table 7-6.

7.3.1 Protection of Human Health and the Environment

Groundwater OU 1

RAO 1: Alternatives 2, 3, and 4 are protective of human health and the environment during the interim because LUCs are capable of preventing unacceptable exposures to site COCs in groundwater.

Soil OU 2

RAO 2: Alternatives 2, 3, and 4 provide mechanisms to stabilize the erodible soils along the North Logistics and Fence Line MUs thereby removing the potential for erosion of contaminated soils into the Willamette River (RAO 2). Therefore, Alternatives 2, 3, and 4 pass the first threshold criterion test. Since the effectiveness of the gravel layer in Alternative 2 requires additional placement of gravel over time to ensure erodible soils are not exposed Alternative 2 is ranked slightly less protective than Alternatives 3 and 4. Alternative 1 did not pass the first threshold criterion test.

Comparative ranking of alternatives:

- Alternative 1 - ranked least protective of human health and environment
- Alternative 2 - ranked moderately protective of human health and environment
- Alternative 3 – ranked most protective of human health and environment
- Alternative 4 – ranked most protective of human health and environment

7.3.2 Compliance with Applicable or Relevant and Appropriate Requirements

Groundwater OU 1

RAO 1: Alternatives 1, 2, 3 and 4 do not comply with the chemical specific ARARs described in the SDWA because no final action to achieve MCLs will be taken. Alternatives 1, 2, 3 and 4 do not comply with the action specific ARAR requiring treatment of groundwater hotspots defined by ORS 465.315 since the final remedy for groundwater will be completed by others. OU 1 is only an interim action to assure there is no exposure to contaminated groundwater pending source control actions taken on the Gasco property. Until the MCLs of the SDWA are attained, and until treatment of groundwater hotspots is achieved, groundwater use restrictions will remain in place. Monitoring will determine when MCLs and groundwater hotspot treatment has been attained and LUCs can be removed.

Soil OU 2

RAO 2: Alternatives 2, 3, and 4 comply with interim ARARs through stormwater erosion control measures for the site locations that have a potential for erosion of contaminated soils into the Willamette River. Such actions will and comply with and water quality standards established in the CWA. Therefore, Alternatives 2, 3, and 4 pass the second threshold criterion test. If a French drain system is installed as a Remedial Action, a Filterra Bioretention system will be installed to ensure that any discharge generated by the action meets the provisions of the CWA. Filterra systems would be installed down gradient along the slope or at the base of the bank. Alternative 1 did not pass the second threshold criterion test.

Comparative ranking of alternatives:

- Alternative 1 - not compliant with ARARs
- Alternatives 2, 3 & 4 - ranked moderately compliant with ARARs

7.3.3 Short-Term Effectiveness

Groundwater OU 1

RAO 1: Alternatives 2, 3, and 4 would be capable of meeting short-term effectiveness criteria since there are currently no exposure scenarios to groundwater by site occupants and LUCs will prevent future groundwater exposure to site occupants. Monitoring would determine when LUCs can be removed.

Soil OU 2

RAO 2: Alternative 3 and 4 will include implementation of temporary erosion control measures to prevent erosion associated with construction activities. Since Alternative 2 does not include any excavation, temporary erosion controls are not needed. Temporary erosion control measures will remain in place and effective until construction is complete (Alternative 3) or until long-term ground cover and soil stabilizing plants become effective (Alternative 4). Alternatives 2, 3, and 4 pass the third threshold criterion test. Although a temporary erosion control fence will be in place to minimize erosion, the placement of clean soil for the vegetative buffer will have a temporary increased potential for erosion until stabilization occurs. Since Alternative 4 has a slight risk associated with short-term effectiveness, Alternative 4 is ranked moderately effective as compared to Alternatives 2 and 3 that are rated most effective in the short-term. Alternative 1 did not pass the third threshold criterion test.

Comparative ranking of alternatives:

- Alternative 1 - ranked least effective in the short-term
- Alternative 2 - ranked most effective in the short-term
- Alternative 3 – ranked most effective in the short-term
- Alternative 4 – ranked moderately effective in the short-term

7.3.4 Long-Term Effectiveness and Permanence

Groundwater OU 1

RAO 1: For Alternatives 2, 3, and 4, LUCs and groundwater monitoring would provide an effective long-term solution to prevent future dermal, inhalation, and ingestion exposure of potable water until the source of contamination at the Gasco property are treated.

Soil OU 2

RAO 2: Alternatives 2, 3, and 4 all include measures to prevent erosion of contaminated soils. Since Alternative 4 is based on a vegetative buffer that can incorporate small amounts of erodible soil that may accumulate over time, can self seed, and require minimal maintenance over time, Alternative 4 is considered the most effective long-term. The ecological elements of Alternative 4 also promote sustainability which supports long-term

effectiveness and permanence. Neither Alternative 2 or 3 include ecological elements within their design and both require some maintenance over time. Alternative 2 (Gravel Layer) will require infrequent additional gravel placement and Alternative 3 (Concrete Cap) will need to be swept clean to ensure that drains are not inhibited and erodible soils do not build up over time. Therefore, Alternative 2 and 3 are considered moderately effective. Alternative 1 did not passes the fourth threshold criteria.

Comparative ranking of alternatives:

- Alternative 1 - ranked least effective in the long term
- Alternative 2 – ranked moderately effective in the long term
- Alternative 3 – ranked moderately effective in the long term
- Alternative 4 – ranked most effective in the long term

7.3.5 Reduction of Toxicity, Mobility, and Volume through Treatment

Groundwater OU 1

RAO 1: Alternatives 2, 3, and 4 would not be effective at reduction of toxicity, mobility and volume through LUCs or monitoring for RAO 1.

Soil OU 2

RAO 2: Alternatives 2, 3, and 4 would provide treatment measures to reduce the mobility of the erodible soils. Alternatives 2 and 3 provide reduction in mobility for the erodible soils areas whereas Alternative 4 provides both reduction in mobility and reduction of volume of contaminants by removing the top six inches of any contaminated erodible soils from the site and replacing with clean soil for the implementation of a vegetative buffer. The vegetative cover associated with Alternative 4 would work to prevent erosion while providing potential phytoremediation characteristics (both contaminant destruction or immobilization) for stormwater and contaminated soils within the root systems of the cover plants. A potential plant type such as vetiver grass is good for erosion control and phytoremediator for metals and PAHs (Vetiver, 2010). Use of a vetiver grass or other phytoremediator grasses has the potential to reduce contaminant migration to groundwater.

If a French drain system is installed as part of the Remedial Action for Alternatives 2 and 4, a Filterra system would reduce metals in the groundwater collected within the North Logistics French drain system thereby reducing contaminant transport to the river. Alternative 3 would include four Filterra systems and would therefore reduce more contaminant transport to the river.

Alternative 4 is ranked most effective at reduction of toxicity mobility and volume through treatment. Alternative 3 is ranked more effective than Alternative 2 due to the additional Filterra treatment provided in Alternative 3.

Comparative ranking of alternatives:

- Alternative 1
  - Reduction capacity: none
  - Ranking: least reduction of toxicity, mobility, or volume through treatment
- Alternative 2
  - Reduction capacity: erodible soils reduction through placement of gravel layer and potential reduction in French drain effluent from one Filterra system.
  - Ranking: least reduction of toxicity, mobility, or volume through treatment
- Alternative 3
  - Reduction capacity: erodible soils reduction through placement of concrete cap and reduction in French drain effluent from four Filterra systems.
  - Ranking: moderate reduction of toxicity, mobility, or volume through treatment
- Alternative 4
  - Reduction capacity: erodible soils reduction through soil removal and placement of vegetative buffer, potential phytoremediation in vegetative buffer, and potential reduction in French drain effluent from one Filterra system.
  - Ranking: most reduction of toxicity, mobility, or volume through treatment

7.3.6 Implementability

Groundwater OU 1

RAO 1: Alternatives 2, 3, and 4 are implementable for RAO 1 since it would be feasible to introduce LUCs that prevent groundwater use as a future source of potable water and conduct groundwater monitoring. Implementation of LUCs would not require any site construction; consequently, there is little likelihood of encountering issues with installation, construction schedule delays, startup, O&M, design failures, or performance monitoring issues.

Soil OU 2

RAO 2: The implementation of a gravel layer, concrete cap, or vegetative buffer in the North Logistics and Fence Line MUs (RAO 2) is possible. Since an adequate gravel layer currently exists within the Fence Line MU, Alternative 2 would require the smallest area of construction of all the Alternatives (i.e. North Logistics MU only). Alternative 4 would require construction activities over both the Fence Line and North Logistics MUs but would be working to enhance the ecological habitat within these areas. Both Alternatives 2 and 4 would include installation of French drain collection and treatment systems as needed. Since the remedy of Alternative 4 works to enhance the current ecological habitat, Alternative 4 is ranked as the most environmentally sound design whereas Alternative 2 is ranked as a moderately environmentally sound design. Alternative 3 would require construction over both the Fence Line and North Logistics MUs, would incorporate two drainage systems and four treatment systems to the site footprint. Since implementation of Alternative 3 would introduce the largest footprint of all the alternatives on the site (a concrete cap with an area of 7,900 square feet along the bank), while not incorporating ecological elements within the remedy, it is considered least implementable.

Although construction is required within Alternatives 2, 3, and 4, each of these designs are fairly simple making construction delays unlikely. Possible design failures could include ineffectiveness of French drain systems and failure for plants to stabilize. The inclusion of temporary erosion control silt fences will reduce the potential design failures associated with precipitation events following construction for Alternatives 3 and 4.

Since Alternative 2 requires the least construction, Alternative 2 is ranked most implementable. Alternative 4 will require the second most intensive construction activities and is therefore ranked moderately implementable. Alternative 3 requires the most construction and is therefore ranked the least implementable.

Comparative ranking of alternatives:

- Alternative 1
  - Implementation needs: none
  - Ranking: no implementation necessary
- Alternative 2
  - Implementation needs: implementation of LUCs, installation of groundwater wells, removal and replacement of fence during construction in North Logistics unit, raise slope in North Logistics area using clean gravel placement and curb to stabilize the gravel, French drain collection, treatment and monitoring for North Logistics MU as needed.
  - Ranking: most implementable since Alternative 2 since requires least fence removal and construction.
- Alternative 3
  - Implementation needs: implementation of LUCs, installation of groundwater wells, removal and replacement of fence and fence poles during construction in Fence Line and North Logistics MU, install temporary erosion control fence, install French drain system thirteen feet back from top of bank, install concrete cap drain system six feet back from top of bank, install and monitor four Filterra stormwater runoff systems for French drains, raise slope in North Logistics area using clean gravel placement and curb to stabilize the gravel, install 12-foot wide concrete cap along Fence Line and North Logistics MU
  - Ranking: least implementable given Alternative 3 requires the removal and replacement of fencing and the most construction activities.
- Alternative 4
  - Implementation needs: implementation of LUCs, installation of groundwater wells, removal and replacement of fence and fence poles during construction in Fence Line and North Logistics MU, removal, disposal and replacement of top six inches of contaminated soil with clean top soil within Fence Line and North Logistics MUs, French drain collection, treatment and monitoring for North Logistics MU as needed. Raise grade of North Logistics unit, plant vegetative buffers within North Logistics and Fence Line MUs, install temporary erosion control fence.

- Ranking: moderately implementable given Alternative 4 requires the removal and replacement of fencing and a moderate amount of construction activities.

7.3.7 Cost

Present value costs are used to compare alternatives. Table 7-6 summarizes the costs of the four Alternatives presented in this FS. Costs for Alternative 1 are associated with the requirement for Five-Year Review until ARARs are met; however, costs of Alternative 1 are set at zero for comparison. Since source control is not within the scope of this FS, the cost analysis timeframe selected was 30 years; however, measures will need to continue until sources are controlled and contaminant concentrations are able to achieve limits set by ARARs.

Groundwater OU 1

The LUCs, Five Year Review and groundwater monitoring components of Alternatives 2, 3, and 4 have equivalent costs. The differences between alternative costs are based on the methods used to prevent erosion control and the amount of stormwater collection, treatment and monitoring to be included in each design.

RAO 1: Alternative 2, 3, and 4 include equivalent LUC components. The present value cost for LUCs is $893,886. The range of present value costs for LUCs is $654,011 to $1,058,983. The present value cost of groundwater monitoring is $1,392,179. The range of present value costs for groundwater monitoring is $1,042,006 to $1,776,255.

Soil OU 2

RAO 2:

Alternative 2: The present value cost associated with Alternative 2 gravel layer construction actions is $47,825.

Alternative 3: The present value cost associated with Alternative 3 concrete cap construction actions is $224,366.

Alternative 4: The present value cost associated with Alternative 4 vegetative buffer construction actions is $126,454.

The present value cost associated with installation and 30 years of O&M for a Filterra French drain treatment system for Alternatives 2 and 4 is $21,556 and for Alternative 3 is $80,472. Additional costs associated with monitoring the effluent of the metals treatment system over 30 years for Alternatives 2 and 4 are $877,173 and for Alternative 3 is $1,661,452. Filterra treatment system costs would only apply to Alternatives 2 and 4 if a French drain system was installed for the North Logistics MU as part of the remedy whereas four Filterra systems would be required for Alternative 3.

Only Alternative 4 includes cost estimates associated with soil disposal as part of the remedy. For Alternative 4, it was assumed that contaminated soil disposal costs would be classified as

non-hazardous rather than hazardous waste. However, the additional cost associated with hazardous soil disposal was calculated in RACER for comparison. From this calculation it was determined that the disposal of soils classified as hazardous waste that require stabilization would increase the overall cost of Alternative 4 by $29,000.

The costs of the Five Year Review components of Alternatives 2, 3 and 4 are equal ($104,708 to $167,759). A sensitivity analysis estimated the range in costs associated with LUCs, Five Year Review and groundwater monitoring based on low versus medium complexity of the site and the number of analyses tested during ground water monitoring (Table D1-6). Additional details regarding the range of present value costs are available in Appendix D-D1.

Compared to the costs of implementing LUCs, groundwater monitoring, and metals treatment system monitoring, the cost of implementing Five Year Reviews and implementing the erosion control measures are fairly minimal. Since Alternative 3 would require monitoring of four metals treatment system effluents rather than one, the overall cost associated with Alternative 3 is at least 27.6 percent greater than Alternatives 2 and 4. The overall cost of Alternative 4 (Vegetative Buffer) is only two percent greater than Alternative 2 (Gravel Layer).

The cost of implementing erosion control measures for Alternative 2 (Gravel Layer) are least expensive, whereas Alternative 4 (Vegetative Buffer) is ranked moderately expensive and Alternative 3 (Concrete Cap) is ranked most costly.

Comparative ranking of alternatives:

- Alternative 1 (No Action)
  - Present Value cost**: $0**
  - Ranking: no cost
- Alternative 2 (Gravel Layer)
  - Present Value cost: **$3,337,326**
  - Ranking: least costly
- Alternative 3 (Limited Concrete Cap)
  - Present Value cost: **$4,357,063**
  - Ranking: most costly
- Alternative 4 (Vegetative Buffer)
  - Present Value cost**: $3,415,955**
  - Ranking: more costly than Alternative 2 but less costly than Alternative 3

7.4 Detailed Analysis of Alternative Summary

The result of the detailed analysis of alternatives finds Alternative 4 (Vegetative Buffer) to be the more favorable alternative for the Moorings. This finding is based on Alternative 4 being the most highly rated alternative on the following criteria: (1) protection of human health and the environment, (4) long-term effectiveness and (5) reduction of toxicity, mobility, or volume through treatment. The only three criteria that Alternative 4 did not rank the highest on were (3) short-term effectiveness (6) implementability and (7) cost. Alternative 4 did not receive the lowest ranking on any one of the ranked criteria. Although Alternative 4 received moderate

ratings for compliance with ARARs, short-term effectiveness, implementability and cost, none of these moderate ratings are expected to affect the completion or the overall success of the project.

Alternative 1 (No Action) is not a viable option because it fails the threshold criteria test. Alternative 2 (Gravel Layer) was found to be almost as successful as Alternative 4 at fulfilling the threshold criteria and should be considered a strong option. Alternative 2 only received the lowest ranking on one criteria, the reduction of toxicity, mobility, & volume through treatment. Alternative 3 (Concrete Cap) received the lowest ranking of Alternatives 2, 3, and 4 and was ranked lowest on three of the seven criteria.

More Favorable Alternative – Alternative 4 (Vegetative Buffer)

Primary Actions:

- LUCs for groundwater (RAO 1)
- Groundwater monitoring (RAO 1)
    - Install eight groundwater monitoring wells (four wells to 75 feet bgs, four wells to 20 feet bgs)
    - Quarterly monitoring for the first two years and annual monitoring thereafter
- Vegetative based stormwater erosion control measures at the North Logistics and Fence Line MU (presented on Figure 6-4) (RAO 2)
    - Remove fence in Fence line and North Logistics MU
    - Remove, transport and dispose of top six inches of any contaminated soil
    - Install a French drain 10 feet landward of North Logistics MU bank top (if required)
    - Install, maintain and monitor stormwater metals treatment for French drain effluent (if required)
    - Raise grade of North Logistics MU using clean topsoil near bank and gravel beyond 10 feet of bank
    - Place six inches clean topsoil in Fence Line MU near bank
    - Plant vegetative buffer (10 feet wide) using grass and shrubs less than eight inches tall as defined by the Portland Plant List (Portland 2004a)
    - Replace fence at new grade in North Logistics and Fence Line MU
    - Incorporate temporary sediment control measures (filtration silt/sediment fence) until vegetative buffer becomes effective
    - Monitor erosion control measures
    - Monitor effluent from stormwater metals treatment for French drain effluent - one location, quarterly (if required)

Alternative 4 relies on implementation of LUCs to prevent future exposure to Moorings COCs in groundwater to attain RAO 1, the short-term goal. Currently there is no groundwater exposure at the Moorings. At the current time, there are no drinking water wells on the Mooring property and an alternative water supply is provided to the facility. LUC implementation will work to prevent future unauthorized well drilling in the aquifers of concern and preventing future Moorings groundwater use as drinking water. Alternative 4 will monitor groundwater conditions through compliance monitoring to determine when LUCs can be removed. Data will be used to determine the effect of source control measures at Gasco on Moorings groundwater.

Alternative 4 will meet RAO 2, the prevention of contaminated erodible soils into the Willamette River, through the removal and disposal of contaminated erodible soils and implementation of French drains and French drain treatment systems (as needed), and placement of gravel/surface soils, vegetative barriers, and temporary erosion control measures.

Costs have been included for extra security measures while construction activities require the security fence to be down. Vegetative barriers will work to filter stormwater thereby removing sediments before they enter the Willamette River. Vegetative barriers will reduce erosion along the bank through incorporation of vegetative surface covers and soil stabilizing plants that prevent erosion through the maturation of complex root systems.

The vegetative cover associated with Alternative 4 would prevent erosion while providing potential phytoremediation characteristics (both contaminant destruction or immobilization) for stormwater and contaminated soils within the vicinity of the root systems of the cover. A potential plant type such as vetiver grass is both good for erosion control and phytoremediator for metals and PAHs (Vetiver, 2010). Use of a vetiver grass or other phytoremediator grasses has the potential to reduce contaminant migration to groundwater.

Due to the natural precipitation within region of the site, watering systems will not be needed once the vegetation matures. In addition, once these vegetative buffers stabilize, they should be self-maintainable, naturally spreading through seeding and offshoots. Over time, regular site maintenance should check to ensure the design is working as intended and to remove noxious and non-native species. DOD security based requirements will require the vegetative buffer be at a height that is less than eight inches. Overall, Alternative 4 provides an environmentally conscious long-term solution for prevention of future exposure to groundwater and the reduction of erodible soils at the Moorings.

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Table ES-1. More Favorable Alternative 4.

Alternative Description of Primary Action	Capital Costs	Total Remedial Design Costs	Total Periodic Costs	Total O&M Costs	Total Marked-Up Costs (w/o escalation)	Present Value Costs
Alternative 4	$557,862	$83,679	$162,661	$3,691,613	$4,495,814	$3,415,955
Land Use Controls	$354,487	$53,173	-	$696,826	$1,104,485	$893,886
Five Year Review	-	-	$162,661	-	$162,661	$104,708
Groundwater Monitoring	$78,415	$11,762	-	$1,743,815	$1,833,993	$1,392,179
Metals Treatment System Monitoring (Filterra)	-	-	-	$1,244,707	$1,244,707	$877,173
Metals Treatment System Install (Filterra)	$15,000	$2,250	-	$6,264	$23,514	$21,556
Alt 4 - Vegetative Buffer	$109,960	$16,494	-	-	$126,454	$126,454

*See Table D1-7, of Appendix D1 for affect of sensitivity analysis on cost associated with Land Use Controls, Five Year Review, and Groundwater Monitoring.

Table 3-1. Concentrations of Detected Contaminants, Drywell Area

Constituent	Drywell[1] (µg/kg)	SB-13-1 1-4' (µg/kg)	SB-13-2 4-8' (µg/kg)	SB-13-3 8-12' (µg/kg)	SB-13-4 12-16' (µg/kg)
Naphthalene	290	0.92 J	0.92 J	1.4 J	0.89 J
2-Methylnaphthalene	190	1.3 J	ND	ND	ND
1-Methylnaphthalene	91	0.59 J	ND	ND	ND
Acenaphthylene	67	5.9	ND	0.29 J	0.93 J
Acenaphthene	850	1 J	0.23 J	0.26 J	ND
Fluorene	490	1.3 J	ND	ND	ND
Dibenzofuran	330	0.9 J	ND	ND	ND
Phenanthrene	6,300	39	1.7 J	2.7	2.9
Anthracene	1,000	8.6	ND	ND	1.8 J
Fluoranthene	15,000	140	4.5	7.7	6.5
Pyrene	15,000	200	5.9	11	12
Benzo(b)fluoranthene	19,000	210	6.5	14	8
Benzo(k)fluoranthene	6,600	68	2 J	4.3	2.7
Benzo(a)anthracene	10,000	72	3.4	4.4	9.3
Chrysene	12,000	90	3.3	5.7	12
Benzo(a)pyrene	15,000	180	4.7	10	7.3
Indeno(1,2,3-cd)pyrene	11,000	250	4.6	14	3.4
Dibenz(a,h)anthracene	2,800	20	0.65 J	1.7 J	0.84 J
Benzo(g,h,i)perylene	10,000	270	4.9	17	3.3
Phenol	510 J	72	ND	ND	ND
benzyl alcohol	2,400	6.6 J	2.9 J	ND	ND
benzoic acid	2,600 J	170 J	ND	ND	ND
dimethyl Phthalate	120 J	ND	ND	ND	ND
4-Chlorophenyl-phenyl ether	38 J	ND	ND	ND	ND
diethyl Phthalate	60 J	ND	1.7 J	1.4 J	2.5 J
N-nitrosodiphenylamine	140 J	ND	ND	ND	ND
carbazole	580	5.2 J	ND	ND	ND
di-n-butyl Phthalate	350	ND	ND	ND	ND
butyl Benzyl Phthalate	260	ND	ND	ND	ND
bis(2-Ethylhexyl) phthalate	9,200	17 J	23	41	ND
Aroclor 1254	130	ND	ND	ND	ND
Arsenic	6,970	3,500 J	2,200 J	2,330 J	1,890 J
Cadmium	8,280	201	ND	ND	ND
Chromium, total	369,000	18,800	16,200	17,500	15,300
Copper	3.65E+06	25700	16,600	18,000	14,800
Lead	761,000	139,000	3,450	3,470	3,900
Manganese	764,000	372,000	359,000	341,000	303,000
Mercury	157	203	13 B	19 B	22
Nickel	162,000	23,800	20,700	16,700	16,200

Table 3-1, cont.

Constituent	Drywell[1] (µg/kg)	SB-13-1 1-4' (µg/kg)	SB-13-2 4-8' (µg/kg)	SB-13-3 8-12' (µg/kg)	SB-13-4 12-16' (µg/kg)
Silver	1,100	159	11 B	47	56
Zinc	3.76E+06	74,100	54,500	46,900	56,300
TPH-Diesel	790,000	3,300 J	ND	2,200 J	ND
TPH-Motor Oil	450,000	51,000 J	7,000 J	32,000 J	ND

Notes:
[1] Drywell sample collected from the sediment accumulated at the bottom of the catch basin.

Table 3-2. Drywell Removal, Verification Sample Results

Constituent	Verification Sample
PAHs (mg/kg)	
Naphthalene	ND
2-Methylnaphthalene	ND
Acenaphthylene	ND
Dibenzofuran	ND
Fluoranthene	ND
Phenanthrene	ND
Anthracene	ND
Fluoranthene	ND
Pyrene	ND
Benzo(b)fluoranthene	ND
Benzo(k)fluoranthene	ND
Benzo(a)anthracene	ND
Chrysene	ND
Benzo(a)pyrene	ND
Indeno(1,2,3-cd)pyrene	ND
Dibenz(a,h)anthracene	ND
Benzo(g,h,i)perylene	ND
TCLP METALs (mg/L)	
Arsenic	ND
Barium	1.1
Cadmium	ND
Lead	ND
Mercury	ND
Selenium	ND
Silver	ND
TCLP VOCs (mg/L)	
Vinyl Chloride	ND
1,1-Dichloroethene	ND
2-Butanone	ND
Chloroform	ND
Carbon Tetrachloride	ND
1,2-Dichloroethane	ND
Benzene	ND
Trichloroethene	ND
Chlorobenzene	ND
1,4-Dichlorobenzene	ND
TPH (mg/kg)	
TPH-Diesel	ND
TPH-Motor Oil	ND

Table 4-1. Preliminary Identification of ARARs and TBCs

Regulation	Citation	Criteria/Standard	Chemical Specific	Location Specific	Action Specific	Applicability/Appropriateness
Federal ARARs						
Clean Water Act,	33 USCW 1313, 1314 Most recent 304(a) list, as updated up to issuance of the ROD	Under Section 304(a), minimal criteria are developed for water quality programs established by states. Two kinds of water quality criteria are developed: one for protection of human health, and one for protection of aquatic life.	X		X	POTENTIALLY SELECTED. Relevant and appropriate for cleanup standards for surface water and contaminated groundwater discharging to surface water if more stringent than promulgated state criteria. Relevant and Appropriate to short-term impacts to surface water from implementation of the remedial action that result in a discharge to navigable water, such as dredging and capping if more stringent than promulgated state criteria.
Clean Water Act, Section 402	33 USC 1342	Regulates discharges of pollutants from point sources to water of the U.S., and requires compliance with the standards, limitations and regulations promulgated per Sections 301, 304, 306, 307, 308 of the CWA.	X			POTENTIALLY SELECTED. Relevant and Appropriate to remedial activates that result in a discharge of pollutant from point sources to the river if more stringent than state promulgated point source requirements. The site is under NPDES Permit #1436GEN12Z.

Table 4-1. Preliminary Identification of ARARs and TBCs

Regulation	Citation	Criteria/Standard	Chemical Specific	Location Specific	Action Specific	Applicability/Appropriateness
Safe Drinking Water Act	42 USC 300f, 40 CFR Part 141, Subpart O, App. A. 40 CFR Part 143	Establishes national drinking water standards and MCLs to protect human health from contaminants in drinking water	X			POTENTIALLY SELECTED. Relevant and appropriate as a performance standard for groundwater and surface water which are potential drinking water sources. While not an ARAR or cleanup standard for USACE actions at the site, it may be identified as an ARAR for the Gasco cleanup.
Federal ARARs						
River and Harbors Act	33 USC 401 et seq. 33 CFR parts 320 to 323	Section 10 prohibits the unauthorized obstruction or alteration of any navigable water. Structures or work in, above, or under navigable water are regulated under Section 10.			X	POTENTIALLY SELECTED. Applicable requirements for how remedial actions are taken or constructed in or above the navigation channel. This would only be an ARAR if the remedy requires construction of a structure that would obstruct or hinder navigable water.
Toxic Substance Control Act	15 USC § 2605 et seq.	Regulation of hazardous chemical substances and mixtures.	X			POTENTIALLY SELECTED. Substantive requirements of TSCA related to soil remediation/disposal are applicable to contaminated material or surface water with PCB contamination

Table 4-1. Preliminary Identification of ARARs and TBCs

Regulation	Citation	Criteria/Standard	Chemical Specific	Location Specific	Action Specific	Applicability/Appropriateness
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, shooting, poisoning, wounding, killing, capturing, trapping and collecting.			X	POTENTIALLY SELECTED. Applicable to remedial actions that have the potential to affect a taking of migratory birds.
Endangered Species Act	16 USC 1531 et seq. 50 CFR 17, § 4(d)	Actions authorized, funded, or carried out by federal agencies may not jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their critical habitats. Agencies are to avoid jeopardy or take appropriate mitigation measures to avoid jeopardy.			X	POTENTIALLY SELECTED. Remedies on the upland portion of the Moorings may impact listed species in the Willamette River via discharges from the French drains. Only substantive requirements are ARARs. Administrative/procedural requirements such as formal consultations are not required.
State ARARs						

Table 4-1. Preliminary Identification of ARARs and TBCs

Regulation	Citation	Criteria/Standard	Chemical Specific	Location Specific	Action Specific	Applicability/Appropriateness
Oregon Environmental Cleanup Law ORS 465.315	Oregon Hazardous Substance Remedial Action Rules OAR 340-122-0040 and 0115	Sets standards for degree of cleanup required, including for oil and other petroleum products/wastes. Establishes acceptable risk levels for human health and $1x10^{-6}$ for individual carcinogens, $1x10^{-5}$ for multiple carcinogens, and Hazard Index of 1 for non-carcinogens; and protection of ecological receptors at the individual level for threatened or endangered species and the population level for all others.	X		X	POTENTIALLY SELECTED. A risk-based numerical value that, when applied to site-specific conditions, will establish concentrations of hazardous substances that may remain or be managed on-site in a manner avoiding unacceptable risk. Only substantive requirements apply. Acceptable risk range for cleanups must remain consistent with CERCLA risk range of 10^{-4} to 10^{-6}.
		For hot spots of contamination in water, requires treatment, if feasible, to concentrations avoiding significant adverse impacts to beneficial uses.			X	POTENTIALLY SELLECTED. Relevant and appropriate treatment requirement for groundwater which meet the State's definition of a hotspot. While not an ARAR or cleanup standard for USACE actions at the site, it may be identified as an ARAR for the Gasco cleanup.

Table 4-1. Preliminary Identification of ARARs and TBCs

Regulation	Citation	Criteria/Standard	Chemical Specific	Location Specific	Action Specific	Applicability/Appropriateness
Solid Waste: Oregon General Provisions	Solid Waste: Land Disposal Sites Other than Municipal Solid Waste Landfills, specific regulatory references to be supplied by ODEQ	Requirements for the management of solid wastes at land disposal sites other than municipal solid waste landfills.			X	POTENTIALLY SELECTED. Applicable to the on-site management and disposal of contaminated, soil and/or groundwater. Only substantive requirements apply.
Water Pollution Control Act ORS 468B.048	Water Quality Standards OAR 340-041-0001 and 340-041-0340,	DEQ is authorized to administer and enforce the CWA program in Oregon. DEQ rules designate beneficial uses for water bodies and narrative and numeric water quality criteria necessary to protect those uses. OAR 340-041-0340 designates beneficial uses that shall be protected in the Willamette Basin.	X		X	POTENTIALLY SELECTED. Applicable to any discharges to surface water from point sources, groundwater, overland flow of stormwater, and activities that may result in discharges to waters of the state. Only those state standards more stringent than federal standards are ARARs.

Table 4-1. Preliminary Identification of ARARs and TBCs

Regulation	Citation	Criteria/Standard	Chemical Specific	Location Specific	Action Specific	Applicability/Appropriateness
Water Pollution Control Act ORS 468B.048	Regulation Pertaining to NPDES Discharges 340-018-0010	Effluent limitations and management practices for point-source discharges into water of the State (otherwise subject to NPDES permit but for on-site permit exemption).	X		X	POTENTIALLY SELECTED. Applies to State water quality standards and effluent limitations to point-source discharges to the Willamette River. Only substantive requirements apply.

Table 5-1. RAOs and Possible GRAs

RAOs	Remedial Action Need	Area/ Volume of Application	Current Status	Possible GRAs to Address RAO
RAO 1 – OU 1 (Groundwater). On-site potable water exposure prevention	Prevent exposure of potable water from contaminated groundwater above PRGs for human health.	Applies to groundwater throughout the Moorings above PRGs for human health.	No groundwater wells currently installed on the property; no current unacceptable exposure to potable water from groundwater. No groundwater monitoring.	Removal, transport, disposal Monitoring MNA LUCs Other Controls Treatment Containment
RAO 2 – OU 2 (Soils), North Logistics and Fence Line MU. contaminated soil erosion prevention.	Actions to reduce the potential for contaminated erodible soils in Fence Line and North Logistics MUs from entering the Willamette River.	Applies to contaminated soils within the North Logistics and Fence Line MUs.	For the Fence Line MU, gravel placed on area and riprap prevents direct hazard of contaminated sediments For the North Logistics MU, contaminated sediments are currently exposed and no controls are in place to prevent erosion.	Removal, transport, disposal Monitoring MNA LUCs Containment Stormwater, Collection, Erosion Control & Treatment Measures

Key:

GRA	general response actions	PRG	preliminary remediation goal
LUC	land use control	RAO	remedial action objective
MNA	Monitored Natural Attenuation	MU	management unit

Table 5-2. Preliminary Technologies and Process Options

General Response Action	Technology	Process Option
No Action	No Action	No Action
Removal, Transport, Disposal	Groundwater Extraction	Install Extraction Wells Hydraulic Pumping Haul by Truck Disposal at permitted or non-permitted Hazardous Waste Facility
	Soil Excavation	Excavate Soil Haul by Truck Disposal at permitted or non-permitted Hazardous Waste Facility
Monitoring	Monitoring	Compliance Monitoring Performance Monitoring Visual Inspection
Monitored Natural Attenuation	Monitoring Natural Attenuation	Monitoring Natural Attenuation
Land Use Controls	Governmental	Zoning Restrictions Local Permits Police Power Ordinances Groundwater Use Restrictions Condemnation of Property
	Proprietary	Easements Covenants Equitable Servitude Reversionary Interest State Use Restrictions Conversation Easements
	Enforcement Tools	Administrative Orders Consent Decrees

Table 5-2. Preliminary Technologies and Process Options

General Response Action	Technology	Process Option
	Informational Devices	Deed Notices State registries of hazardous wastes sites Advisories Educational Programs
Other Controls	Alternate Water Supply	Municipal Water Other Water Purveyor Connections New Well Provided Water
	Individual Well Treatment	In-Situ Treatment Ex-Situ Treatment
Treatment, Ex-Situ (in combination with groundwater extraction or soil excavation)	Physical/ Chemical	Adsorption/Absorption Advanced Oxidation Processes (UV, ozone, hydrogen peroxide) Chemical Oxidation / Reduction Granulated Activated Carbon (GAC)/Liquid Phase Carbon Adsorption Ion Exchange Membrane Filtration: Micro/Ultra Filtration (MF/UF) Precipitation/Coagulation/Flocculation
	Biological Treatments	Bioreactors
Treatment, In-Situ	Passive Wall Reactive Barrier	Bio Barrier Zero Valent Iron Barrier Wood Chip Barrier
	Physical/ Chemical	Chemical Oxidation
	Biological Treatment	Enhanced Bioremediation
Containment	Physical Barrier	Sheet Pile Wall

Table 5-2. Preliminary Technologies and Process Options

General Response Action	Technology	Process Option
		Slurry Wall Grout Curtain Barrier Impermeable Cap
Containment (cont)	Groundwater Extraction and Collection	Pumping for Hydraulic Control
Stormwater Collection, Erosion Control & Treatment Measures	Stormwater Infiltration	Stormwater Swales Stormwater Planters Infiltration Garden Bioretention Cells Bioretention Swales Biodetention Vegetated Buffers Vegetative Covers
	Stormwater Collection	French Drain Stormwater Barriers Intercept Dikes and Swales
	Stormwater Treatment	Geotextile Fabric ecoStorm® plus Stormwater Filtration System Filterra® Bioretention System Check Dam Storm Drain Inlet Protection Silt / Sediment Fence Filtration Berm Filtration Bags, Socks & Rolls Composted Erosion Control Socks Fiber Rolls, Wattles and Fiber Core Logs

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
	GRA: REMOVAL, TRANSPORT AND DISPOSAL			
Groundwater Extraction	Extraction wells are installed to remove contaminated groundwater using hydraulic pumping. Transportation and off-site disposal are limited by the volume of groundwater necessary to remove contamination to required PRGs	RAO 1	OU 1	**Not applicable** due to the large quantities of contaminated groundwater and lack of off-site source control.
Soil Excavation	Contaminated soils are excavated and transported to an appropriate off-site disposal facility (permitted or non-permitted hazardous waste facility).	RAO 2	OU 2	Potentially Applicable
	GRA: MONITORING			
Monitoring	Monitoring is the collection of media specific samples and physical/chemical analysis. Monitoring includes compliance monitoring to ensure RAOs are met and performance monitoring to ensure that the remedy is working as designed. Groundwater monitoring may be applicable for OU 1. Visual monitoring may be used to check sediment buildup or erosion for OU 2.	RAO 1 & 2	OU 1 & 2	Potentially applicable.
	GRA: MONITORED NATURAL ATTENUATION			
MNA	Natural subsurface processes (i.e., dilution, volatilization, biodegradation, adsorption, and chemical reactions with subsurface materials) are allowed to reduce contaminant concentrations to acceptable levels. Consideration of this option usually requires modeling and evaluation of contaminant degradation rates and pathways and predicting contaminant concentration at down-gradient receptor points. The primary objective of site modeling is to demonstrate that natural processes of contaminant degradation will reduce contaminant concentrations below regulatory standards or risk-based levels before potential exposure pathways are completed. In addition, long-term monitoring must be conducted throughout the process to confirm that degradation is proceeding at rates consistent with meeting cleanup objectives. MNA would not be effective	RAO 1 & 2	OU 1 & 2	**Not applicable**. There have been no samples collected to provide evidence of natural bioattenuation occurring at the Moorings.

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
	for either cyanide or metals.			
	GRA: LAND USE CONTROLS			
Governmental	Controls using the regulatory authority of a governmental entity to impose restrictions on citizens or property under its jurisdiction.	RAO 1	OU 1	Potentially applicable for RAO 1. Not applicable for RAO 2 because erosion potential will not be removed.
Proprietary	Tools based on private property law used to restrict or affect the use of the property.			
Enforcement tools	Enforcement authority is used to either (1) prohibit a party from using land in certain ways or from carrying out certain activities at a specified property, or (2) require a settling party to put in place some other form of control.			
Informational devices	Tools, which often rely on property record systems, used to provide public information about risks from contamination. May effectively discourage inappropriate land users from acquiring the property.			
	GRA: OTHER CONTROLS			
Alternate water supply	Municipal water supply, other water purveyor, new wells, or provided (bottled water).	RAO 1	OU 1	**Not applicable**. Alternative water supplies currently in use and no drinking water wells exist on-site.
Individual well treatment	Engineering controls (i.e., In-Situ or Ex-Situ treatment methods) employed to treat groundwater on site prior to use.			
	GRA: TREATMENT, EX-SITU (in combination with groundwater extraction)			
	Technology: Physical/Chemical Treatments			
Adsorption/ absorption - Granulated Activated Carbon (GAC) / Liquid Phase	Adsorption by activated carbon has a long history of use in treating municipal, industrial, and hazardous wastes. Adsorption mechanisms are generally categorized as either physical adsorption, chemisorption, or electrostatic adsorption. Weak molecular forces (i.e., van der Waals forces) provide the driving force for physical adsorption, while a chemical reaction forms a chemical bond between the compound and the surface of the solid in	RAO 1	OU 1	Potentially applicable, **but not considered further** for due to uncertain off-site source

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
Carbon Adsorption	chemisorption. The most common adsorbent is GAC but others include: activated alumina, forage sponge, lignin adsorption, sorption clays, and synthetic resins. Ground water is pumped through a series of canisters or columns containing activated carbon to which dissolved organic contaminants adsorb. When the concentration of contaminants in the effluent from the bed exceeds a certain level, the carbon can be regenerated in place; removed and regenerated at an off-site facility; or removed and disposed. Applicable to cyanide, but not metals.			control effects.
Advanced oxidation processes	Advanced Oxidation Processes including ultraviolet (UV) radiation, ozone, and/or hydrogen peroxide are used to destroy organic contaminants as water flows into a treatment tank. If ozone is used as the oxidizer, an ozone destruction unit is used to treat collected off gases from the treatment tank and downstream units where ozone gas may collect, or escape. If complete mineralization is achieved, the final products of oxidation are carbon dioxide, water, and salts. The main advantage of oxidation is that it is a destruction process, as opposed to carbon adsorption, for which contaminants are extracted and concentrated in a separate phase. A disadvantage is that if incomplete mineralization occurs, cyanide and other metals can become demobilized from the iron. Would be applicable to cyanide, but not metals destruction.	RAO 1	OU 1	Potentially applicable, but **not considered further** due to uncertain off-site source control effects.
Chemical oxidation	The chemical oxidants most commonly employed to date include peroxide (including Fenton's Reagent), ozone, and permanganate ($KMnO_4$. $KMnO_4$ is the most applicable oxidizer for this site due to the others' need for acidic conditions (pH between 2 to 4). $KMnO_4$ systems are effective over a pH range of 3.5 to 12 (typical site pH range is between 7 and 8). Field applications have clearly affirmed that matching the oxidant and in-situ delivery system to the COCs and the site conditions is the key to successful implementation and achieving performance goals. Similar drawbacks as Ex-Situ advanced Oxidation techniques include if incomplete mineralization occur, demobilization can increase toxicity of contaminants. Applicable to cyanide.	RAO 1	OU 1	Potentially applicable, but **not considered further** due to uncertain off-site source control effects.

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
Ion Exchange	Electrostatic adsorption involves the adsorption of ions through Coulombic forces, and is normally referred to as ion exchange. Ion exchange removes ions from the aqueous phase by the exchange of cations or anions between the contaminants and the exchange medium. Ion exchange materials may consist of resins made from synthetic organic materials that contain ionic functional groups to which exchangeable ions are attached. They may be inorganic and natural polymeric materials. After the resin capacity has been exhausted, resins can be regenerated for re-use. Would be applicable to metals and cyanide if pretreatment is applied.	RAO 1	OU 1	Potentially applicable, but **not considered further** due to uncertain off-site source control effects.
Membrane Filtration: Micro/Ultra Filtration (MF/UF)	Membrane filtration processes can separate particles ranging from 0.0001 to 1.0 μm (turbidity, total suspended solids, bacteria, viruses to very small molecules and ions). Membranes can consist of thin skins with thickness of 0.2 to 0.25 μm supported by porous structure of 100 μm thickness in flat sheet or hollow fiber configurations. A pressure gradient is used to move water and constituents smaller than membrane rating to the treated permeate stream (effluent) while the concentrate stream condenses larger constituents into a waste stream that will need further processing or disposal. Membrane filtration processes would be applicable to metals and cyanide.	RAO 1	OU 1	Potentially applicable, but **not considered further** due to uncertain off-site source control effects.
Precipitation/ Coagulation/ Flocculation	This process transforms dissolved contaminants into an insoluble solid, facilitating the contaminant's subsequent removal from the liquid phase by sedimentation or filtration. The process usually uses pH adjustment, addition of a chemical precipitant, and flocculation. In the precipitation process, chemical precipitants, coagulants, and flocculants are used to increase particle size through aggregation. The precipitation process can generate very fine particles that are held in suspension by electrostatic surface charges. These charges cause clouds of counter-ions to form around the particles, giving rise to repulsive forces that prevent aggregation and reduce the effectiveness of subsequent solid-liquid separation processes. Therefore, chemical coagulants are often added to overcome the repulsive forces of the particles. The three main types of	RAO 1	OU 1	Potentially applicable, but **not considered further** due to uncertain off-site source control effects.

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
	coagulants are inorganic electrolytes (such as alum, lime, ferric chloride, and ferrous sulfate), organic polymers, and synthetic polyelectrolytes with anionic or cationic functional groups. The addition of coagulants is followed by low-sheer mixing in a flocculator to promote contact between the particles, allowing particle growth through the sedimentation phenomenon called flocculant settling. Flocculant settling refers to a rather dilute suspension of particles that coalesce, or flocculate, during the sedimentation operation. As coalescence or flocculation occurs, the particles increase in mass and settle at a faster rate. The amount of flocculation that occurs depends on the opportunity for contact, which varies with the overflow rate, the depth of the basin, the velocity gradients in the system, the concentration of particles, and the range of particles sizes. The effects of these variables can only be accomplished by sedimentation tests. Disadvantages include having to deal with chemical optimization, storage and handling, and sludge production. Applicable for metals and some cyanide species.			
	Technology: Biological Treatment			
Bioreactors	Bioreactors degrade contaminants in water with microorganisms. Such systems, as part of a pump and treat system, can include aerobic or anaerobic treatment, suspended or attached particles, and processed in continuous or batched processes. Contaminated groundwater is circulated in an aeration basin where a microbial population aerobically degrades cyanide compounds. Optimal microbial populations may need to be developed to ensure metabolic pathways that lead to desired degradation products. The cells form a sludge, which is settled out in a clarifier, and is either recycled to the aeration basin or disposed. Other microbial populations can be optimized to reduce the mobility of metals or metals removal, however, it may be difficult to optimize bioreactors for cyanide and metals simultaneously and two separate bioreactors may be required. Would require site-specific microbial study to optimize degradation/ removal capacity of system. Applicable for cyanide and metals.	RAO 1	OU 1	Potentially applicable, but **not considered further** due to uncertain off-site source control effects.

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
	GRA: TREATMENT, IN-SITU			
	Technology: Physical/Chemical Treatment			
Chemical oxidation	The chemical oxidants most commonly employed to date include peroxide (including Fenton's Reagent), ozone, and $KMnO_4$. $KMnO_4$ is the most applicable oxidizer for this site due to the others' need for acidic conditions (pH between 2 to 4). $KMnO_4$ systems are effective over a pH range of 3.5 to 12 (typical site pH range is between 7 and 8). Field applications have clearly affirmed that matching the oxidant and in-situ delivery system to the COCs and the site conditions is the key to successful implementation and achieving performance goals. Similar drawbacks as Ex-Situ advanced oxidation techniques include if incomplete mineralization occur, demobilization can increase toxicity of contaminants. Applicable to cyanide.	RAO 1	OU 1	Potentially applicable, but **not considered further** due to uncertain off-site source control effects.
	Technology: Biological Treatment			
Enhanced Bioremediation	The activity of naturally occurring microbes is stimulated by circulating water-based solutions through contaminated soils to enhance in situ biological degradation of organic contaminants or immobilization of inorganic contaminants. Nutrients, oxygen, or other amendments may be used to enhance bioremediation and contaminant desorption from subsurface materials. Applicable to both metals and cyanide.	RAO 1	OU 1	Potentially applicable, but **not considered further** due to uncertain off-site source control effects.
	GRA: CONTAINMENT			
	Technology: Physical Barrier			
Slurry Walls	Slurry walls have been used for decades, however, the process of designing the proper mix of wall materials to contain specific contaminants is less well developed. Excavation and backfilling of the trench is critical and requires experienced contractors. These subsurface barriers consist of a vertically excavated trench that is filled with slurry. The slurry hydraulically shores the trench to prevent collapse and forms a filter cake to reduce groundwater flow.	RAO 1	OU 1	Potentially applicable, but **not considered further** due to uncertain off-site source

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
	Slurry walls often are used where the waste mass is too large for treatment and where soluble and mobile constituents pose an imminent threat to a source of drinking water. Slurry walls are typically placed at depths up to 100 feet and are generally 2 to 4 feet in thickness. The most effective application of the slurry wall is to base (or key) the slurry wall 2 to 3 feet into a low permeability layer (i.e., clay or bedrock). This "keying-in" provides for an effective foundation with minimum leakage potential. Applicable to both metals and cyanide.			control effects.
Sheet pile walls	Sheet piles act as a barrier to groundwater movement in a manner similar to slurry walls. However, the construction and installation methods are different. Sheet pile walls are typically made of metal sheets driven from the surface into the subsurface soils. Heavy equipment is required to drive the piles. Sheet pile requires keying into a low permeability layer or bedrock. Lateral leakage at the wall component joints is a potential concern, especially if the soils have relatively high penetration resistance, which causes the walls to bend or twist as they are driven into the subsurface. Vibrations produced during construction have been identified as possible setback for neighboring businesses and will need considered. Applicable to both metals and cyanide.	RAO 1	OU 1	Potentially applicable, but **not considered further** due to uncertain off-site source control effects.
Grout Curtain	Grout curtains act as a barrier to groundwater movement in a manner similar to slurry walls. However, the construction and installation methods are different. Grout curtains are installed as individual boreholes filled in with bentonite or cement. For grout curtains, keying into a low permeability layer or bedrock is required. Leakage between boreholes is a potential concern. Applicable to both metals and cyanide.	RAO 1	OU 1	Potentially applicable, but **not considered further** due to uncertain off-site source control effects.
	Technology: Groundwater Extraction and Collection			
Pumping for hydraulic control	Possible objectives of groundwater pumping include removal of dissolved contaminants from the subsurface, containment of contaminated groundwater to prevent migration, and prevention of soil erosion. The criteria for well design, pumping system, and treatment are dependent on the physical site characteristics	RAO 1	OU 1	Difficult to ensure hydraulic control without

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
	and contaminant type. Components of any groundwater extraction system are a groundwater monitoring program to verify its effectiveness and a determination of the termination requirements. Monitoring the remediation with wells and piezometers allows the operator to make iterative adjustments to the system in response to changes in subsurface conditions caused by the remediation. Applicable to both metals and cyanide.			significant structures. Potentially applicable, but **not considered further** due to uncertain off-site source control effects.
	Technology: Impermeable Cap			
Gravel Layer	Placement of clean media layer over exposed erodible soils can stabilize soils and prevent erosion. To make grave placement effective a concrete curb would likely be needed retain the gravel. Additional gravel may need placed over time to ensure movement of gravel does not allow erodible soils to become exposed.	RAO 2	OU 2	Potentially applicable but not consistent with sustainable focused alternatives
Capping	Impervious caps such as concrete or pavement are used to cover a contaminated area so that the area is no longer exposed and susceptible to erodible forces such as overland flow, wind, or surface disturbance. The northern portion of the Moorings is currently gravel surfaced and could be capped. Stormwater conveyance and equipment storage loads will need to be considered in cap design.	RAO 2	OU 2	Potentially applicable but not consistent with sustainable focused alternatives
	GRA: STORMWATER COLLECTION, EROSION CONTROL & TREATMENT MEASURES			
	Technology: Stormwater Infiltration			
Stormwater Swales[3]	Swales are long, narrow, gently-sloping vegetated depressions in the landscape. They are primarily used to move stormwater runoff on the landscape surface. As water flows through a swale, plants and soils slow its flow, allowing sediments and pollutants to settle out. Some water soaks into the soil and is absorbed by plants or infiltrates into the ground if native soils are well drained. The water	RAO 2	OU 2	Potentially applicable but **not considered** optimal due to requirement of

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
	that continues to flow downstream travels more slowly than it would through pipes in a traditional storm drainage system. Swales can be planted with a variety of plants, ranging from turf grass or a simple palate of grasses, sedges, and rushes, to a mixture of trees, shrubs, and groundcovers. Swales are best implemented in areas of continuous landscape. A longer continuous swale allows more time for filtering to occur. Rural roads, arterial streets, and medians commonly offer this type of uninterrupted linear space. New subdivisions and parking lots can offer good opportunities for swale design. Stormwater swales are relatively inexpensive, simple to construct, and widely accepted as a stormwater management strategy.			additional contaminated soils removal to produce a lowered area.
Stormwater Planters[3]	Planters are long, narrow, often rectangular landscaped areas contained within vertical walls and with flat, unsloped bottoms. Planters slow the flow of water and absorb water into plants and soils, reducing the volume and intensity of water flowing downstream. Infiltration planters infiltrate stormwater, while flow-through planters absorb only as much water as they are designed to hold within their walls. Planters are best used where space is limited or where the cleaner look of a clearly defined rain garden is desirable. Flow-through planters are a viable alternative when infiltration is not possible, such as close to building foundations or in areas of poorly drained soils. Planters can store more water than swales because they are often deeper and have vertical side walls that provide additional capacity compared to side slopes. Water flows into the planter, absorbs into the topsoil, fills to a predetermined overflow elevation, and overflows into the overflow system provided.	RAO 2	OU 2	Potentially applicable and somewhat similar to a vegetative buffer. However, since the planters often include non-compacted soils with walls that define a storage capacity, this option is not ideal near a security fence such as within

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
				the Fence Line and North Logistics MUs.
Infiltration Gardens[3]	Infiltration gardens are shallow, vegetated depressions in the landscape. Like swales, they typically have side slopes and flat bottoms. They can be any size or shape and are often molded to fit in "leftover" landscape spaces in parking lots, at intersections with diagonal streets, or in underused areas around buildings. They can be designed as one connected space, rectilinear or rounded, and are often as wide as they are long. As the name suggests, infiltration gardens infiltrate stormwater and therefore are suitable primarily in locations with well-draining soil. Although infiltration gardens have similarities with swales and planters, they are categorized as a separate strategy based on the spaces in which they fit. Their primary advantage is their versatility in size and shape.	RAO 2	OU 2	Potentially applicable but **not retained** due to better fit of vegetative buffer within this situation, due to the long and narrow nature of the Fence Line and North Logistics MUs.
Bioretention cells[4]	Shallow depressions with a designed planting soil mix and a variety of plant material, including trees, shrubs, grasses and /or other herbaceous plants Bioretention cells may or may not have an under-drain and are not designed as a conveyance system.	RAO 2	OU 2	Potentially applicable but not retained due to height constrains next to fence
Bioretention swale[4]	Incorporate same design features as bioretention cells however are design has part of conveyance system and have relatively gentle side slopes and flow depths that are generally less than 12 inches.	RAO 2	OU 2	Potentially applicable but **not retained** due to better fit of vegetative buffer within this situation

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
Biodetention[4]	Design using vegetative barriers arranged in hedgerows across a slope to disperse infiltrate and treat stormwater.	RAO 2	OU 2	**Not applicable.** Will not address upland erodible soils.
Vegetated Buffers[2]	Vegetated buffers are swaths of preserved or established vegetation that act as perimeter controls for a project site. The rooted vegetation holds soils, acts as a windbreak, and filters runoff that may leave the site. Vegetation shall be at least 1 inch in height and provide 80 percent ground coverage. The purpose of vegetated buffers is to minimize offsite soil movement offsite by wind or surface runoff. May act as a supplemental measure to sediment barriers or silt fence.	RAO 2	OU 2	Potentially applicable and considered equivalent to vegetated covers for the purpose of this FS
Vegetative Covers[2]	Grasses are planted to help control erosion during construction activities because they sprout and provide protection quickly. Temporary grasses are meant to be replaced at the end of the project with permanent vegetative cover. Permanent vegetative cover consists of grasses or other plants that are intended to control erosion on the site as well as be part of the site's permanent landscaping. If appropriate species are selected, grasses used for temporary vegetation can be part of the permanent vegetation for the site. Vegetative Covers are used to minimize erosion and sedimentation by stabilizing exposed soils with vegetation and mulching.	RAO 2	OU 2	Potentially applicable and considered equivalent to vegetated buffers for the purpose of this FS
	Technology: Stormwater Collection			
French Drain	French drain systems are designed to collect stormwater infiltrate through underground pervious pipe installations, which then transfer the stormwater to effluent systems. Pervious pipes are often lined with socks or fabric to prevent the fines and soil particles from entering and plugging the drain system.	RAO 2	OU 2	Potentially applicable
Stormwater Barriers [2]	Stormwater barriers are a group of portable materials, including hay bales, triangular silt dikes, plastic dams, rock sack berms, and other materials, meant to impound stormwater and sediment-laden flows. These systems are often	RAO 2	OU 2	Potentially applicable for temporary

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
	manmade, can be modular and therefore replaced by sections, and may have sediment-settling abilities. Some systems are designed to dissipate flows.			erosion control measures. For the purpose of this FS a silt/sediment fence was selected but design phase may incorporate this element.
Intercept Dikes and Swales[2]	Dikes are temporary low ridges or dams, and swales are shallow ditches. In this application, they run across slopes to: catch and redirect stormwater runoff, intercept and/or divert storm runoff from onsite and offsite drainage areas, and convey runoff from above unprotected slopes or a disturbed site and direct it to a sediment trap, pond, or other approved stabilized outlet. Dikes and swales may be installed as permanent site drainage control features, while providing conveyance of temporary development flows.	RAO 2	OU 2	Potentially applicable but **not retained** due to small footprint available for treatment, vegetative barrier determined a more effective measure
	Technology: Stormwater Treatment			
Geotextile Fabric[6]	Geotextile materials typically made of polypropylene and polyester can be used to perform one or more of the following basic functions including: filtration, drainage, separation, erosion control, sediment control, reinforcement, and moisture barrier (when impregnated with asphalt).	RAO 2	OU 2	Potentially applicable but **not retained** since more relevant to sloped areas and

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
				similar function but additional cost as compared to vegetative buffer
ecoStorm® plus Stormwater Filtration System[7]	Stormwater system by Royal Enterprises America. This treatment system targets total suspended solids (> 80% removal), phosphorus, and heavy metals. Heavy metals removal is greater than 70% for Zinc Lead and Copper. ecoStorm systems do require solids removal as a maintenance item.	RAO 2	OU 2	Applicable for French drain collection systems but **not retained** because requires more chemicals and maintenance than Filterra system.
Filterra® Bioretention System[8]	Stormwater system by Filterra. This treatment system targets TSS, and metals removal (>40%). Filterra systems are designed to treat 90% of annual Stormwater Runoff. Stormwater runs into the bioretention system and metals are taken up by plants and remains within the plant biomass. A catch basin is designed to collect overflow water to ensure 90% annual precipitation is treated. Yearly O&M includes debris removal from the top of the system and minimal replacement of soil.	RAO 2	OU 2	Applicable and carried on for use as treatment system for French drain collection systems
Check Dams[2]	Check dams can be used to reduce the velocity of concentrated flows in swales, dikes, gutters, or ditches. Check dams reduce erosion and provide for sedimentation of suspended soil particles and other site pollutants. Check dams should not be used as permanent installations unless sufficiently keyed into side slopes.	RAO 2	OU 2	Potentially applicable but **not retained** since intercept dikes and

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
				swales are not brought forward
Storm Drain Inlet Protection[2]	Storm drain inlet protection can be used to minimize sediment entering storm drain systems or catch basins prior to permanent stabilization of disturbed areas. Inlet protection may consist of inlet barriers, inlet inserts, or a combination of both. Inlet barriers surround the inlet to prevent sediment from entering. Barriers can be made from plastic, geotextiles, or aggregate materials. Inlet inserts are devices designed to hang down into a catch basin or inlet and trap sediment and/or filter construction and stormwater flows entering the inlet. Inserts can include bags, racks, baskets, or other devices made from filter fabric, wire mesh, metal plates, various types of plastic products, and combinations of these and other materials.	RAO 2	OU 2	Potentially applicable but **not retained** since no storm drain inlets are present within area of concern.
Silt/Sediment Fence[2]	To minimize the transport of sediment from a construction site by providing a temporary physical barrier to sediment movement and reducing runoff velocities.	RAO 2	OU 2	Potentially applicable
Filtration Berms[2]	A variety of filtration media can be placed around the perimeter of the construction site as a sediment control berm, with or without a confining sock or bag. These berms are most commonly created of gravel and compost. They are usually continuous berms placed by machine. To act as a secondary perimeter sediment control measure.	RAO 2	OU 2	Potentially applicable but **not retained** due to small footprint available for treatment, vegetative barrier determined a more effective measure.
Filtration Bags, Socks and Rolls[2]	Filtration bags and socks are a series of contained filtration materials that can be used to slow flows and provide settling of sediments in runoff. This group	RAO 2	OU 2	Potentially applicable for

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
	includes biofilter bags, gravel socks, sand bags, compost socks, and wood fiber bags. Bags and socks are made in various sizes of plastic mesh or geotextile cloth and filled with a variety of organic or inorganic materials designed to filter and detain flows and sediment. The most common fill material is wood products, such as bark chips. To minimize the transport of sediment from a construction site by providing a temporary physical barrier to sediment and reducing runoff velocities.			temporary erosion control measures. For the purpose of this FS a silt/sediment fence was selected but design phase may incorporate this element.
Composted erosion control socks[5]	Mulching is the application of organic material to the soil surface to protect it from raindrop impact and overland flow. Mulch absorbs the erosive impact of rainfall and reduces the overland flow velocity, significantly reducing soil loss from a site. New technologies are available using composted mulch in conjunction with soil and seed that help stabilize an area. Geotextile/polynetting "socks" ranging in size from 6 to 24 inches in diameter are filled on-site with a compost/soil/seed mixture and can be built one on top of the other to stabilize an area. The socked organic mulches provide a nutrient-rich seedbed leading to quick vegetation establishment and coverage of an area.	RAO 2	OU 2	Potentially applicable for temporary erosion control measures. For the purpose of this FS a silt/sediment fence was selected but design phase may incorporate this element.
Fiber Rolls, Wattles and Fiber Coir logs[2,5]	Fiber rolls are circular, dense, vegetated fiber tubes that detain sediments and runoff flows. They are commonly made of rice and coconut fibers and can provide a planting medium for plug or potted plants. Wattles are plastic or rope mesh rolls that are usually filled with straw. These systems come in various lengths and are a good alternative to bag and sock products that can be used to	RAO 2	OU 2	Potentially applicable for temporary erosion control measures. For

Table 5-3. Screening of Technologies and Process Options for Each OU

Process Option	Description(s)	RAO	OU	Rationale/ Application
	shorten the length of slopes, to minimize the transport of sediment by providing a temporary physical barrier to sediment and reducing runoff velocities, or to help stabilize the ground surface and provide a bed for planting. Fiber logs have been developed to reduce overland flow along a slope helping to provide energy absorption and habitat for wetland species. It is common for some companies to offer the logs with native plants or seeds incorporated into the "biologs" for many wetland remediation efforts. To obtain such materials, it is necessary to go with a local company that can modify or construct the roll, log, or coir with species appropriate for the ecosystem and slopes.			the purpose of this FS a silt/sediment fence was selected but design phase may incorporate this element.

Table 5-3 Source materials:
Monitored Natural Attenuation through Impermeable Cap: FRTR 2008
[1] Klapproth and Johnson 2009.
[2] Portland 2008
[3] Ngan et al. 2009
[4] PSAT,WSU 2005
[5] USACE 2006
[6] Army and Air Force 1995
[7] Royal 2010
[8] Filterra 2010

Table 5-3 Key:

BMP	best management practice	μm	micrometer
COC	contaminant of concern	MNA	monitored natural attenuation
CSM	conceptual site model	MU	management unit
FRTR	Federal Remediation Technology Roundtable	pH	potential hydrogen
GAC	granulated activated carbon	PRB	permeable reactive barrier
GRA	general response action	RAO	Remedial Action Objective
$KMnO_4$	permanganate	UF	ultra filtration
LUC	land use control	UV	ultraviolet radiation
OU	Operable Unit	ZVI	zero-valent iron
MF	membrane filtration		

Table 5-4. RAOs and Possible GRAs with Recommended Technologies and Process Options

OU	RAO	Description	Area/ Volume of Application	Current Status	Possible GRAs	Most Favorable Technologies	Most Favorable Process Option	Recommendation Discussion
Not Applicable (relevant to the No-Action alternative)					No Action	No Action	No Action	Required to keep for baseline alternative.
OU 1	RAO 1	Prevent future exposure to potable groundwater until MCLs are achieved	Applies to all groundwater within Moorings property boundaries above PRGs/MCLs for human health.	Drinking water wells not currently on property; no current unacceptable exposure to groundwater, no groundwater monitoring	LUCs	LUCs	LUCs	Put LUCs in place to protect future groundwater users.
					Monitoring	Monitoring	Compliance Monitoring	Limited monitoring may be used to determine when LUCs can be removed
OU 2	RAO 2	Reduce the potential for contaminated erodible soils at North Logistics and Fence Line MUs area from entering the Willamette	Applies to contaminated erodible soils in North Logistics and Fence Line MUs.	The presence of gravel and riprap at Fence Line MU reduce potential for erosion. Erodible soils are currently exposed at the North Logistics MU.	Remove, transport & disposal	Soil Excavation	Excavate soil, haul by truck, and dispose at appropriate facility	Remove of contaminated erodible soils from site.
					Monitoring	Monitoring	Performance monitoring, Visual inspection	Limited monitoring to ensure performance of erosion control measures

Table 5-4. RAOs and Possible GRAs with Recommended Technologies and Process Options

OU	RAO	Description	Area/ Volume of Application	Current Status	Possible GRAs	Most Favorable Technologies	Most Favorable Process Option	Recommendation Discussion
		River.		Stormwater runoff is the primary transport mechanism.	Stormwater Erosion Control Measures	Stormwater Infiltration, Collection, and Treatment,	Vegetative buffers and covers; French Drain; Silt/sediment fence.	Incorporate vegetative cover for stormwater infiltration and control. Collect and convey stormwater infiltration. Include temporary stormwater treatment measures during and construction until stabilized.

Key:

GRA	general response action	PRG	preliminary remediation goal
LUC	land use control	RAO	remedial action objective
MU	management unit		

Table 6-1. Remedial Alternatives RAO Summary		
	OU 1	OU 2
Alternatives	RAO 1 Activities	RAO 2 Activities
1. No Action	None	None

2. **Gravel Layer:** Land Use Controls, Groundwater Monitoring, Gravel Placement, & Limited Stormwater Collection, Erosion Control and Stormwater Treatment	LUCs
	Groundwater Monitoring
	• Install eight groundwater monitoring wells (four wells to 75 feet bgs, four wells to 20 feet bgs)
	• Quarterly monitoring for the first two years and annual monitoring thereafter
		• Raise Grade of North Logistics MU (Figure 6-2)
		  ○ Remove fence in North Logistics MU.
		  ○ Install French drain 10 feet landward of the bank top (if required)
		  ○ Install and maintain stormwater metals treatment for French drain effluent (if required)
		  ○ Install concrete curb along North Logistics MU to stabilize gravel placement
		  ○ Raise grade using clean gravel for area 40 feet landward of bank
		  ○ Replace fence line at new grade at North Logistics MU
		  ○ Maintain gravel along bank as needed by additional gravel placement
		  ○ Monitor erosion control measures
		  ○ Monitor effluent from stormwater metals treatment for French drain effluent - one location, quarterly (if required)

Table 6-1. Remedial Alternatives RAO Summary		
	OU 1	OU 2
Alternatives	RAO 1 Activities	RAO 2 Activities

3. **Limited Concrete Cap:** Land Use Controls, Groundwater Monitoring, Concrete Cap, Stormwater Collection, Erosion Control & Stormwater Treatment	LUCs
	
	Groundwater Monitoring
	• Install eight groundwater monitoring wells (four wells to 75 feet bgs, four wells to 20 feet bgs)
	• Quarterly monitoring for the first two years and annual monitoring thereafter
		• 12-foot wide Concrete Cap along Fence Line and North Logistics MU (Figure 6-3)
		  ○ Remove fence in Fence Line and North Logistics MU.
		  ○ Install concrete curb along North Logistics MU to stabilize gravel placement
		  ○ Install stormwater collection system along center of 12-foot concrete cap
		  ○ Install French drain 13 feet landward of the bank top (landward edge of concrete cap)
		  ○ Install and maintain French drain metals treatment system (Filterra)
		  ○ Raise Grade of North Logistics MU using clean gravel for area 40 feet landward of bank
		  ○ Replace fence line at new grade in Fence Line and North Logistics MU
		  ○ Maintain gravel along bank as needed by additional gravel placement
		  ○ Monitor effluent from stormwater metals treatment for French drain effluent - four locations, quarterly

Table 6-1. Remedial Alternatives RAO Summary		
	OU 1	OU 2
Alternatives	RAO 1 Activities	RAO 2 Activities

4. **Vegetative Buffer:** Land Use Controls, Groundwater Monitoring, Erodible Soil Removal, Construction of Vegetative Buffer, Limited Stormwater Collection, Stormwater Treatment, and Erodible Soil Monitoring	LUCs
	
	Groundwater Monitoring
	• Install eight groundwater monitoring wells (four wells to 75 feet bgs, four wells to 20 feet bgs)
	• Quarterly monitoring for the first two years and annual monitoring thereafter
		• Vegetative based stormwater erosion control measures at the North Logistics and Fence Line MU (Figure 6-4)
		  ○ Remove fence in Fence Line and North Logistics MU.
		  ○ Remove, transport and dispose of top six inches of contaminated soil
		  ○ Install French drain ten feet landward of North Logistics MU bank top (if required)
		  ○ Install and maintain stormwater metals treatment for French drain effluent (if required)
		  ○ Raise grade of North Logistics MU using clean topsoil near bank and gravel beyond ten feet of bank
		  ○ Place six inches clean topsoil in Fence Line MU near bank
		  ○ Plant vegetative buffer (ten feet wide) using grass and shrubs less than 8 inches tall as defined by the Portland Plant List (Portland 2004a)
		  ○ Replace fence at new grade in North Logistics and Fence Line MU
		  ○ Incorporate temporary sediment control measures (filtration silt/sediment fence) until vegetative buffer becomes effective

Table 6-1. Remedial Alternatives RAO Summary		
	OU 1	OU 2
Alternatives	RAO 1 Activities	RAO 2 Activities
		○ Monitor erosion control measures ○ Monitor effluent from stormwater metals treatment for French drain effluent - one location, quarterly (if required)

Key:

LUC land use controls

MU management unit

Table 6-2. Remedial Alternative Effectiveness, Implementability, and Cost Evaluation

		Alternative 1 No Action	Alternative 2 Gravel Layer	Alternative 3 Limited Concrete Cap	Alternative 4 Vegetative Buffer
Remedial Actions	LUCs	No	Yes	Yes	Yes
	Stormwater: Collection, Erosion Control & Treatment	No	*Limited	**Yes	*Limited
	Groundwater Monitoring	No	Yes	Yes	Yes
EIC	Effectiveness	Bad	Good	Best	Best
	Implementability	Neutral	Best	Worst	Good
	Cost	Neutral	Best	Worst	Good

- *Limited stormwater / groundwater collection and treatment will be included as needed within the North Logistics MU.
- **Stormwater / groundwater collection and treatment will be included for Fence Line and North Logistics MUs.

Key:

EIC	Effectiveness, Implementability, Cost
LUC	land use controls
MU	management unit

Table 7-1. Alternative Comparison against Threshold Criteria

		Alternative 1 No Action		Alternative 2 Gravel Layer		Alternative 3 Limited Concrete Cap		Alternative 4 Vegetative Buffer	
	Threshold Criteria	RAO 1	RAO 2	RAO 1	RAO 2	RAO 1	RAO 2	RAO 1	RAO 2
1	Protection of Human Health & Environment	Fail	Fail	Pass	Pass	Pass	Pass	Pass	Pass
2	Compliance with ARARs	Fail	Fail	Fail	Pass	Fail	Pass	Fail	Pass
3	Short-Term Effectiveness	Fail	Fail	Pass	Pass	Pass	Pass	Pass	Pass
4	Long-Term Effectiveness	Fail	Fail	Pass	Pass	Pass	Pass	Pass	Pass
5	Reduction of Toxicity, Mobility, & Volume through Treatment	Fail	Fail	Fail	Pass	Fail	Pass	Fail	Pass
6	Implementability	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
7	Cost	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

Key:
ARARs Applicable or relevant and appropriate requirements
RAO Remedial Action Objective

Table 7-2. Summary of Alternative 2 Costs

Alternative Description of Primary Action	Capital Costs	Total Remedial Design Costs	Total Periodic Costs	Total O&M Costs	Total Marked-Up Costs (w/o escalation)	Present Value Costs
Alternative 2	$484,902	$72,735	$170,458	$3,691,613	$4,419,707	$3,337,326
Land Use Controls	$354,487	$53,173	-	$696,826	$1,104,485	$893,886
Five Year Review	-	-	$162,661	-	$162,661	$104,708
Groundwater Monitoring	$78,415	$11,762	-	$1,743,815	$1,833,993	$1,392,179
Metals Treatment System Monitoring (Filterra)	-	-	-	$1,244,707	$1,244,707	$877,173
Metals Treatment System Install (Filterra)	$15,000	$2,250	-	$6,264	$23,514	$21,556
Alt 2 - Gravel Layer	$37,000	$5,550	$7,797	-	$50,347	$47,825

*See Table D1-7, of Appendix D1 for affect of sensitivity analysis on cost associated with Land Use Controls, Five Year Review, and Groundwater Monitoring.

Key:
O&M operation and maintenance
w/o without

Table 7-3. Summary of Alternative 3 Costs

Alternative Description of Primary Action	Capital Costs	Total Remedial Design Costs	Total Periodic Costs	Total O&M Costs	Total Marked-Up Costs (w/o escalation)	Present Value Costs
Alternative 3	$683,003	$102,450	$162,661	$4,834,377	$5,782,492	$4,357,063
Land Use Controls	$354,487	$53,173	-	$696,826	$1,104,485	$893,886
Five Year Review	-	-	$162,661	-	$162,661	$104,708
Groundwater Monitoring	$78,415	$11,762	-	$1,743,815	$1,833,993	$1,392,179
Metals Treatment System Monitoring (Filterra)	-	-	-	$2,368,680	$2,368,680	$1,661,452
Metals Treatment System Install (Filterra)	$55,000	$8,250	-	$25,056	$88,306	$80,472
Alt 3 - Concrete Strip	$195,101	$29,265	-	-	$224,366	$224,366

*See Table D1-7, of Appendix D1 for affect of sensitivity analysis on cost associated with Land Use Controls, Five Year Review, and Groundwater Monitoring costs.

Key:
O&M operation and maintenance
w/o without

Table 7-4. Summary of Alternative 4 Costs

Alternative Description of Primary Action	Capital Costs	Total Remedial Design Costs	Total Periodic Costs	Total O&M Costs	Total Marked-Up Costs (w/o escalation)	Present Value Costs
Alternative 4	$557,862	$83,679	$162,661	$3,691,613	$4,495,814	$3,415,955
Land Use Controls	$354,487	$53,173	-	$696,826	$1,104,485	$893,886
Five Year Review	-	-	$162,661	-	$162,661	$104,708
Groundwater Monitoring	$78,415	$11,762	-	$1,743,815	$1,833,993	$1,392,179
Metals Treatment System Monitoring (Filterra)	-	-	-	$1,244,707	$1,244,707	$877,173
Metals Treatment System Install (Filterra)	$15,000	$2,250	-	$6,264	$23,514	$21,556
Alt 4 - Vegetative Buffer	$109,960	$16,494	-	-	$126,454	$126,454

*See Table D1-7, of Appendix D1 for affect of sensitivity analysis on cost associated with Land Use Controls, Five Year Review, and Groundwater Monitoring costs.

Key:
O&M operation and maintenance
w/o without

Table 7-5. Ranking of Alternative Comparison against Threshold Criteria

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	No Action	Gravel Layer	Limited Concrete Cap	Vegetative Buffer
Threshold Criteria	RAO 2	RAO 2	RAO 2	RAO 2
Protection of Human Health & Environment	Not Protective	Moderately Protective	Most Protective	Most Protective
Compliance with ARARs	Not Compliant	Compliant	Compliant	Compliant
Short-Term Effectiveness	Least Effective	Most Effective	Most Effective	Moderately Effective
Long-Term Effectiveness	Least Effective	Moderately Effective	Moderately Effective	Most Effective
Reduction of Toxicity, Mobility, & Volume through Treatment	No Reduction Capacity	Least Reduction	Moderate Reduction	Most Reduction
Implementability	No Requirement	Most Implementable	Least Implementable	Moderately Implementable
Cost	No Cost	Least Cost	Most Cost	Moderate Cost

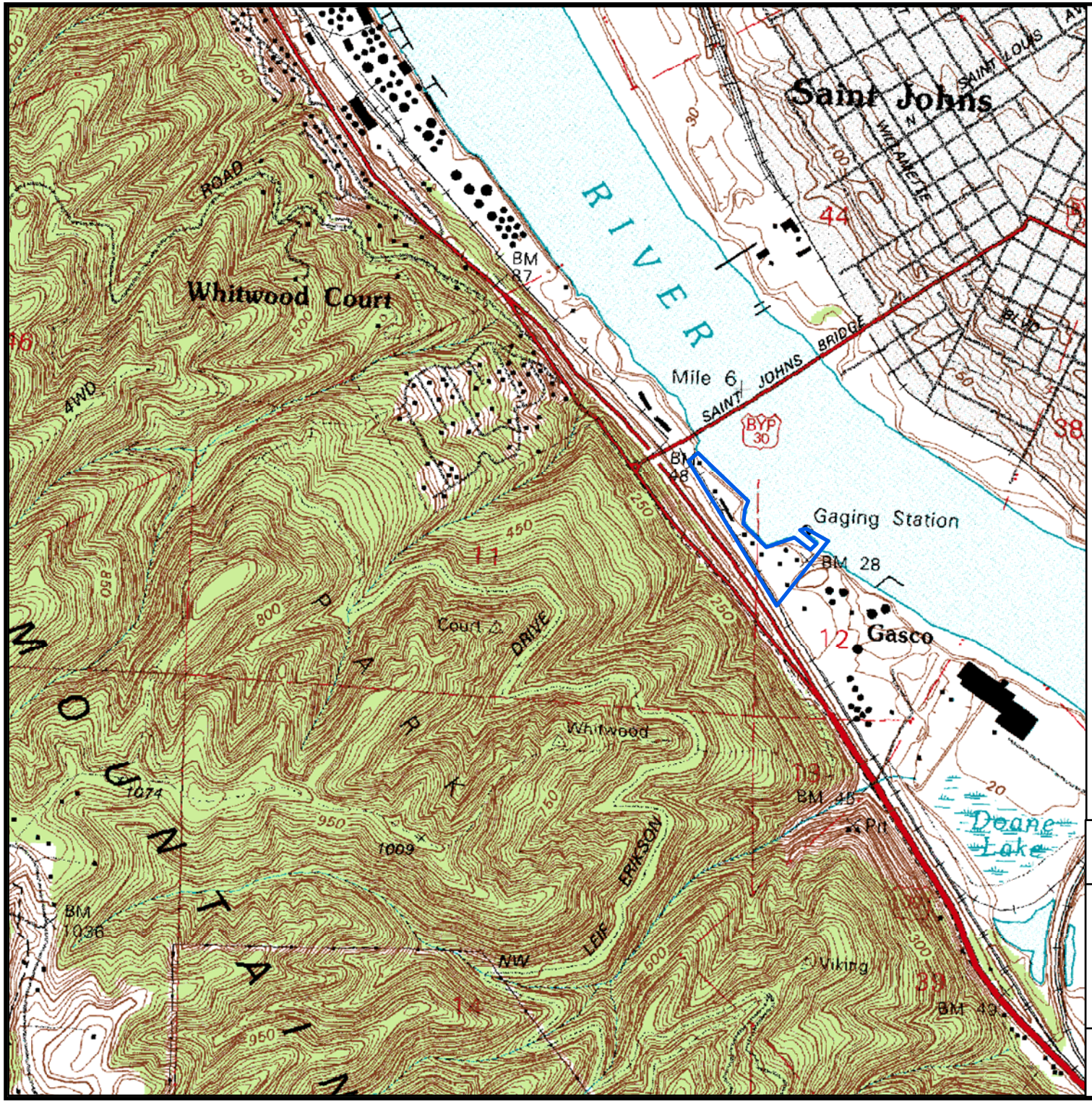
Table 7-6. Summary of Alternatives Costs

Alternative Description of Primary Action	Capital Costs	Total Remedial Design Costs	Total Periodic Costs	Total O&M Costs	Total Marked-Up Costs (w/o escalation)	Present Value Costs
Alternative 1	$ -	$ -	$ -	$ -	$ -	0
Alternative 2	$484,902	$72,735	$170,458	$3,691,613	$4,419,707	$3,337,326
Land Use Controls	$354,487	$53,173	-	$696,826	$1,104,485	$893,886
Five Year Review	-	-	$162,661	-	$162,661	$104,708
Groundwater Monitoring	$78,415	$11,762	-	$1,743,815	$1,833,993	$1,392,179
Metals Treatment System Monitoring (Filterra)	-	-	-	$1,244,707	$1,244,707	$877,173
Metals Treatment System Install (Filterra)	$15,000	$2,250	-	$6,264	$23,514	$21,556
Alt 2 - Gravel Layer	$37,000	$5,550	$7,797	-	$50,347	$47,825
Alternative 3	$683,003	$102,450	$162,661	$4,834,377	$5,782,492	$4,357,063
Land Use Controls	$354,487	$53,173	-	$696,826	$1,104,485	$893,886
Five Year Review	-	-	$162,661	-	$162,661	$104,708
Groundwater Monitoring	$78,415	$11,762	-	$1,743,815	$1,833,993	$1,392,179
Metals Treatment System Monitoring (Filterra)	-	-	-	$2,368,680	$2,368,680	$1,661,452
Metals Treatment System Install (Filterra)	$55,000	$8,250	-	$25,056	$88,306	$80,472
Alt 3 - Concrete Strip	$195,101	$29,265	-	-	$224,366	$224,366
Alternative 4	$557,862	$83,679	$162,661	$3,691,613	$4,495,814	$3,415,955
Land Use Controls	$354,487	$53,173	-	$696,826	$1,104,485	$893,886
Five Year Review	-	-	$162,661	-	$162,661	$104,708
Groundwater Monitoring	$78,415	$11,762	-	$1,743,815	$1,833,993	$1,392,179
Metals Treatment System Monitoring (Filterra)	-	-	-	$1,244,707	$1,244,707	$877,173
Metals Treatment System Install (Filterra)	$15,000	$2,250	-	$6,264	$23,514	$21,556
Alt 4 - Vegetative Buffer	$109,960	$16,494	-	-	$126,454	$126,454

*See Table D1-7, of Appendix D1 for affect of sensitivity analysis on cost associated with Land Use Controls, Five Year Review, and Groundwater Monitoring costs.

Key:

O&M operation and maintenance w/o without



LEGEND

U.S. MOORINGS

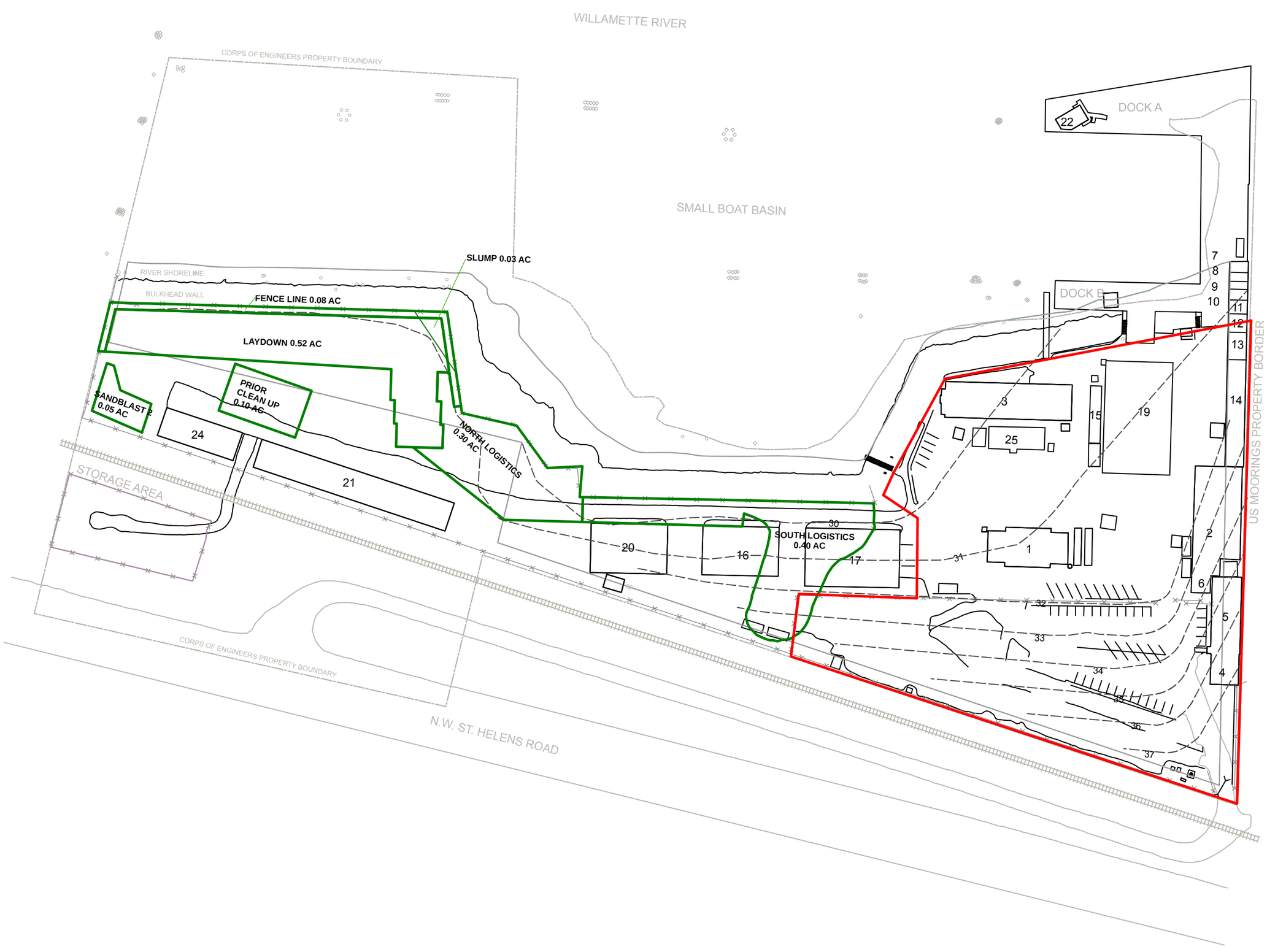
N

0 4,000 8,000 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 2-1
LOCATION MAP

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



LEGEND

INDUSTRIAL AREA

MIS AREAS

GROUND SURFACE ELEVATION (FEETL MSL)

N

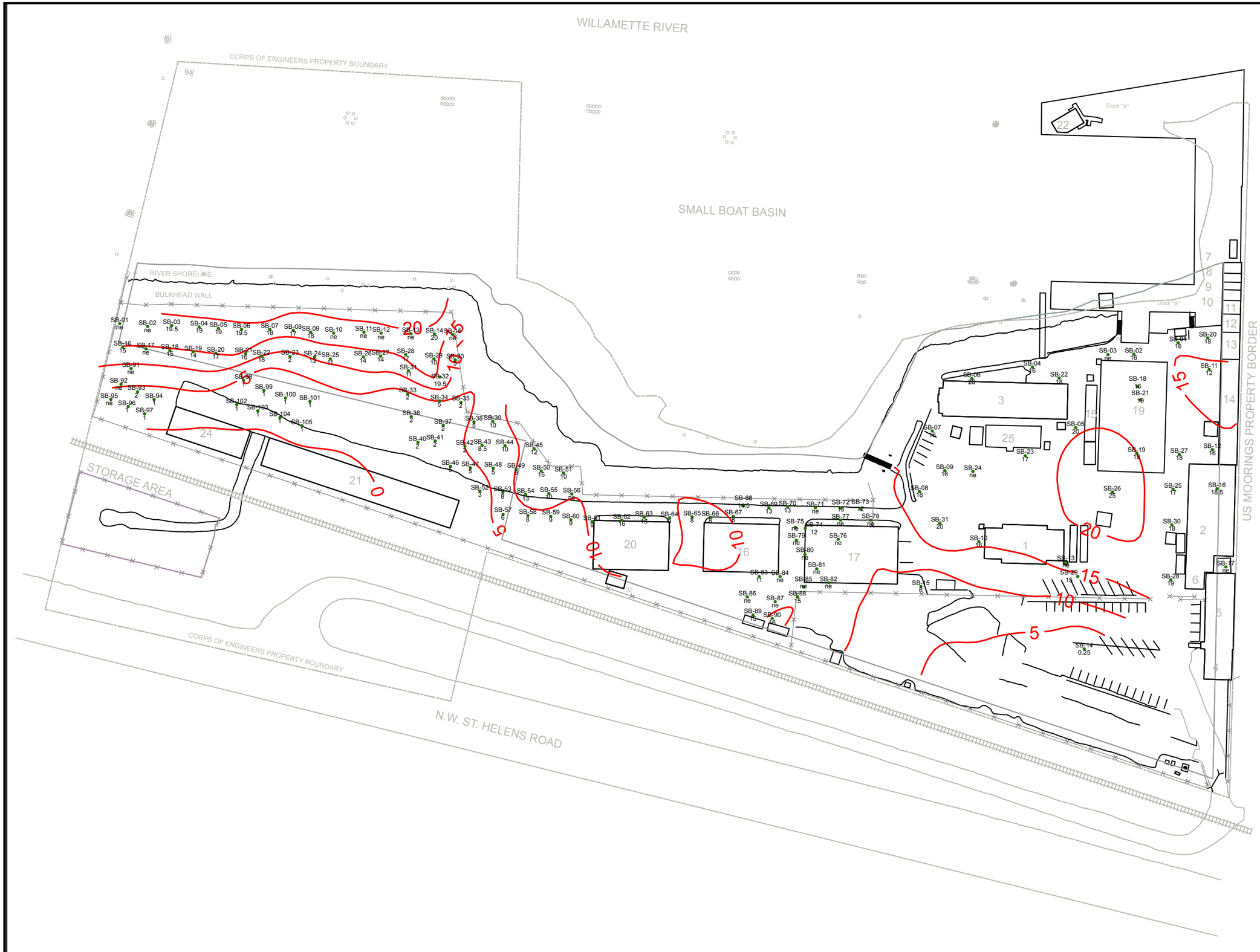
0 50 100 200 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 2-2

SITE MAP

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



LEGEND

SB-06 / 9.7 — BOREHOLE NAME / FILL THINCKNESS (FT)

ne - BOTTOM NOT ENCOUNTERED

SURFICIAL FILL THICKNESS CONTOUR (5-FT INTERVAL)

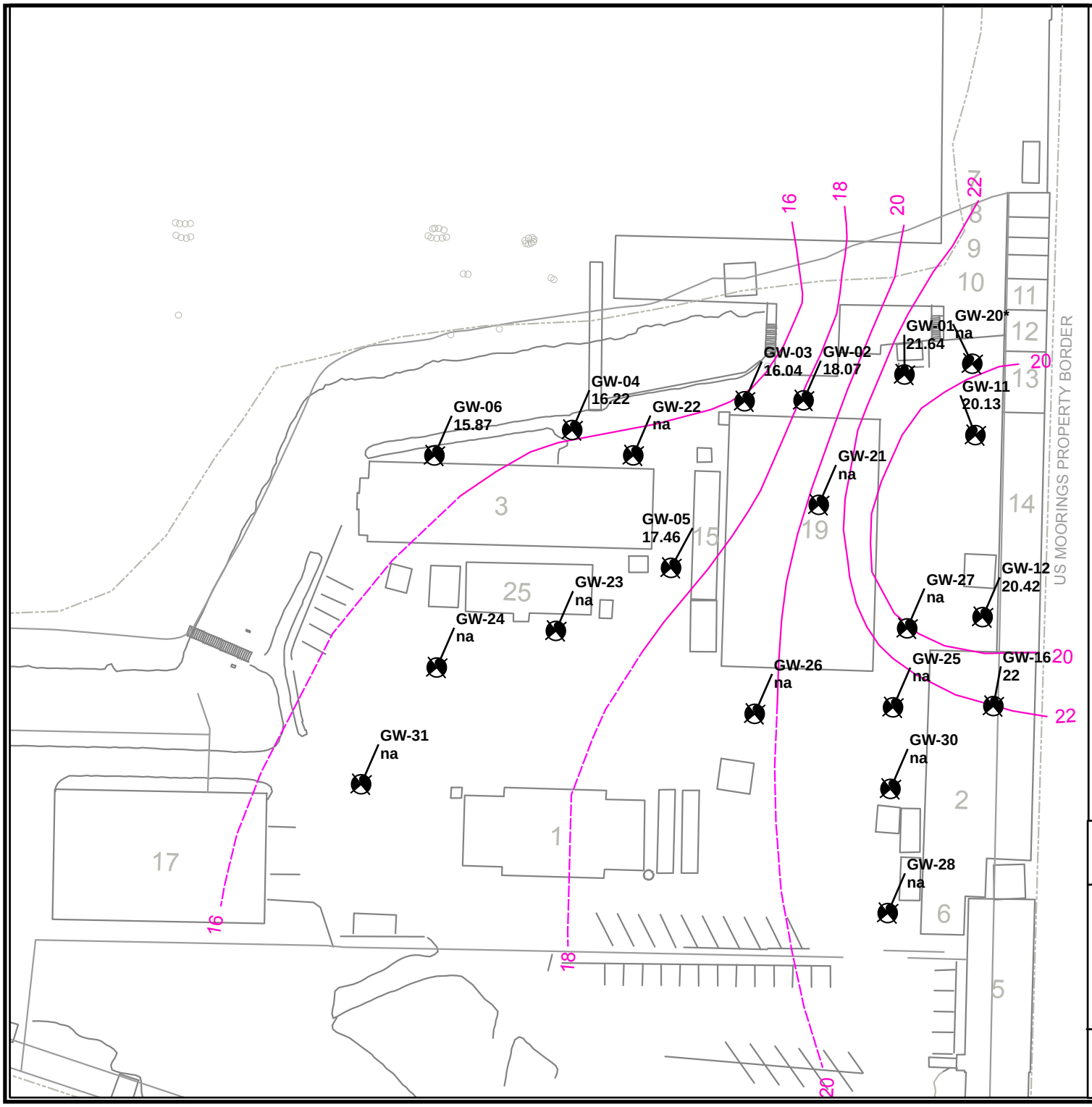
N

0 50 100 200 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 2-3
SURFICIAL FILL THICKNESS

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



Legend

GROUNDWATER SAMPLE

* WELL SCREENED IN ALLUVIAL WBZ

GW-06 — WELL NAME
16.02 — WATER ELEVATION (FT MSL)

GROUNDWATER ELEVATION CONTOUR (FEET MSL)

N

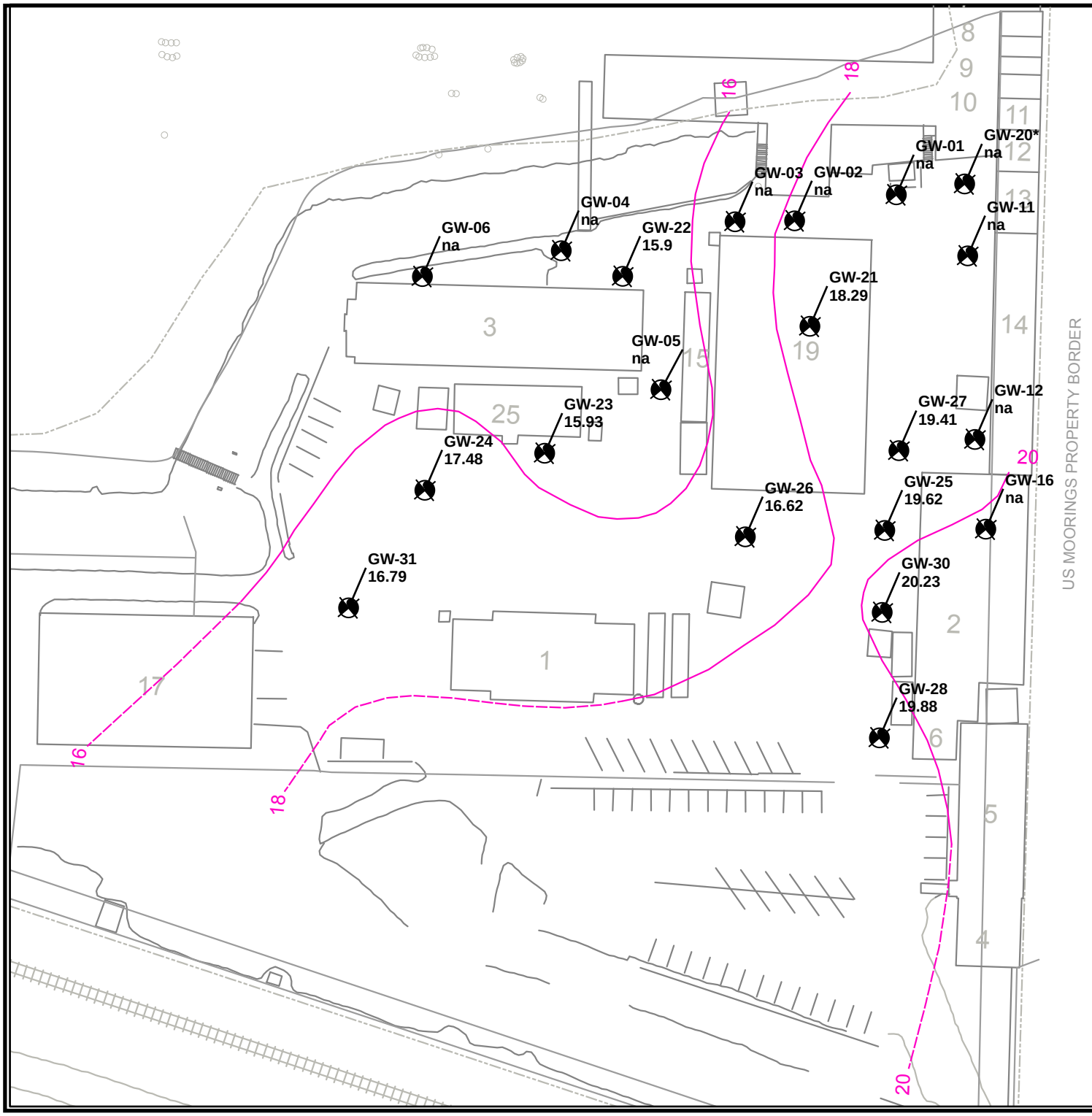
0 20 40 80 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 2-4

GROUNDWATER ELEVATIONS MARCH 2008

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



Legend

GROUNDWATER SAMPLE

* WELL SCREENED IN ALLUVIAL WBZ

GW-06 — WELL NAME
16.02 — WATER ELEVATION (FT MSL)

GROUNDWATER ELEVATION CONTOUR (FEET MSL)

N

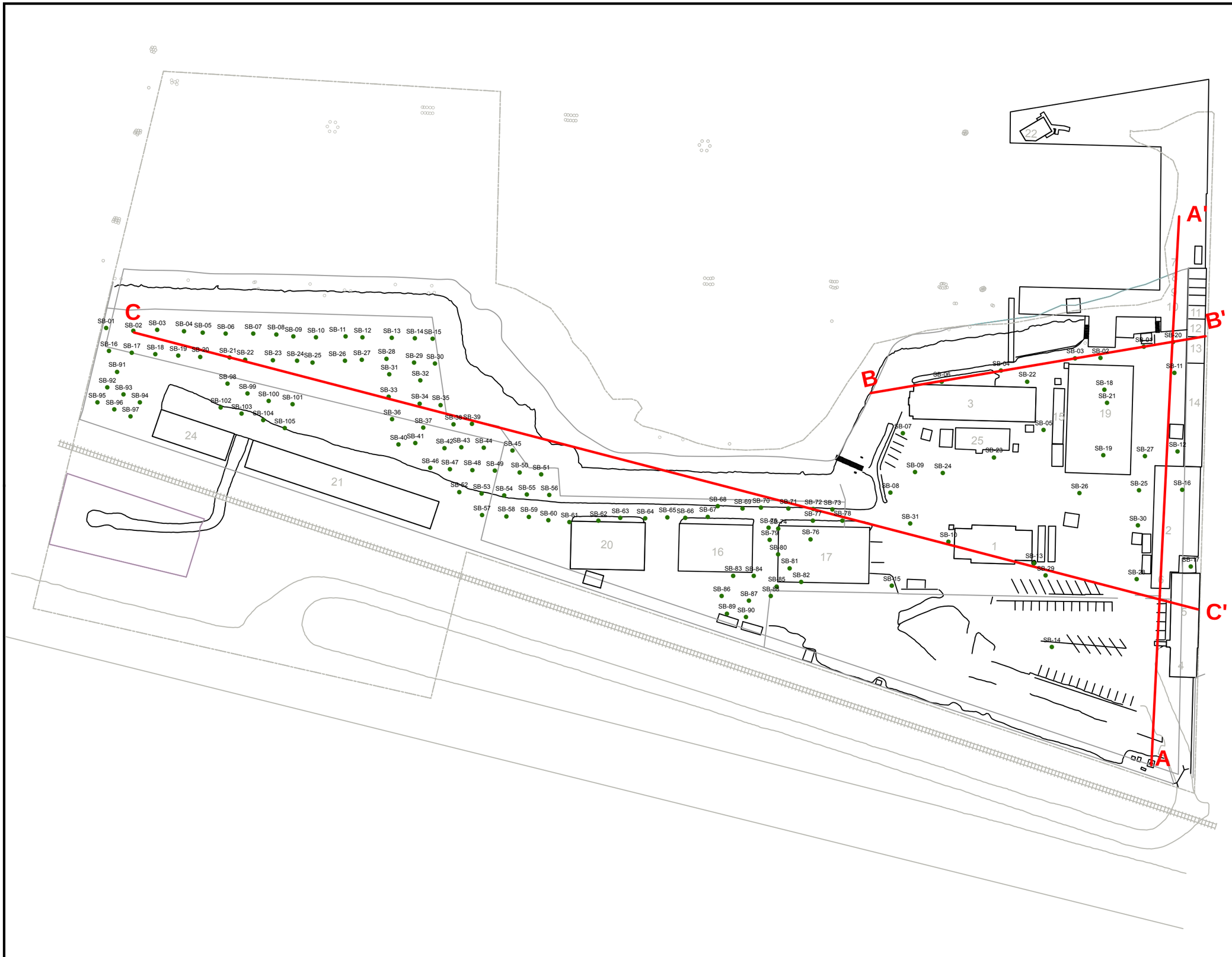
0 20 40 80 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 2-5

GROUNDWATER ELEVATIONS AUGUST 2008

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



LEGEND

- BOREHOLE LOCATION
- CROSS-SECTION

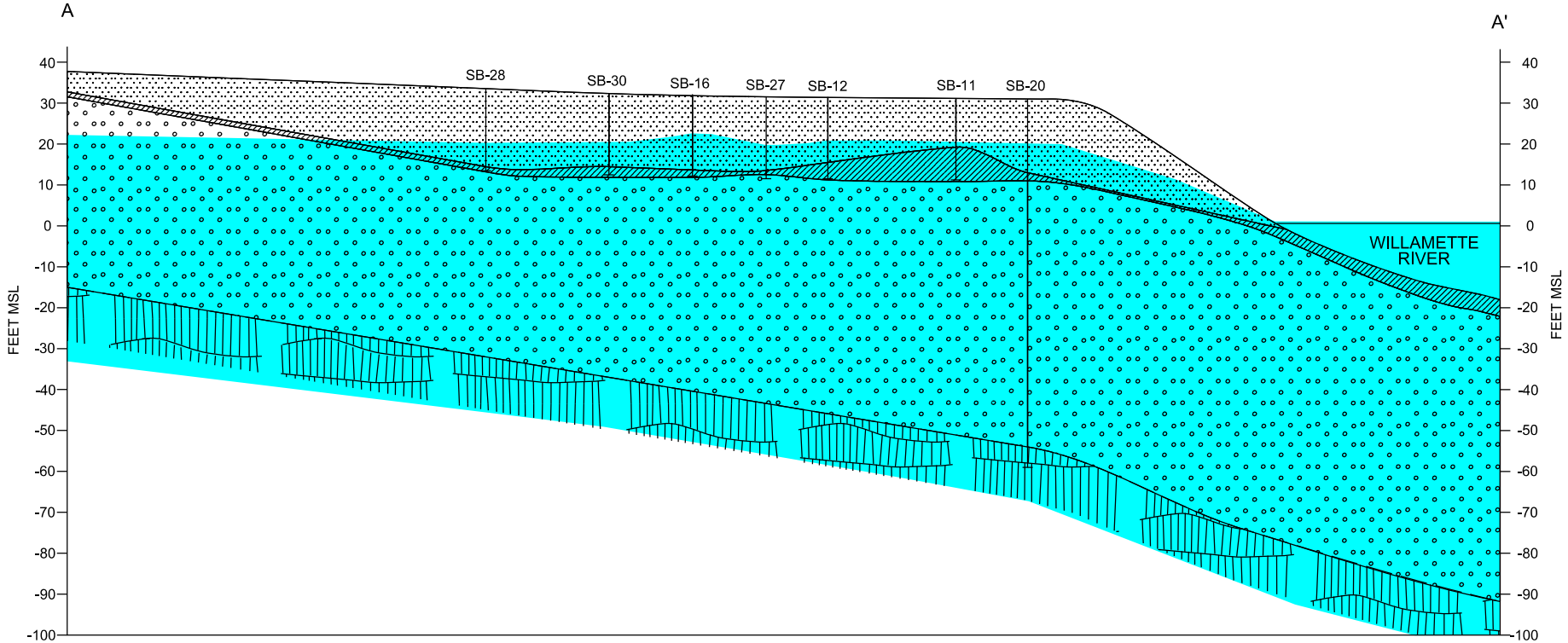
N

0 50 100 200 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-1
CROSS-SECTION LOCATIONS

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



LEGEND

- SURFICIAL FILL DEPOSITS
- SILT
- ALLUVIAL DEPOSITS
- BEDROCK
- SATURATED ZONE

SB-16 — RI TEMPORARY MONITORING WELL LOCATION

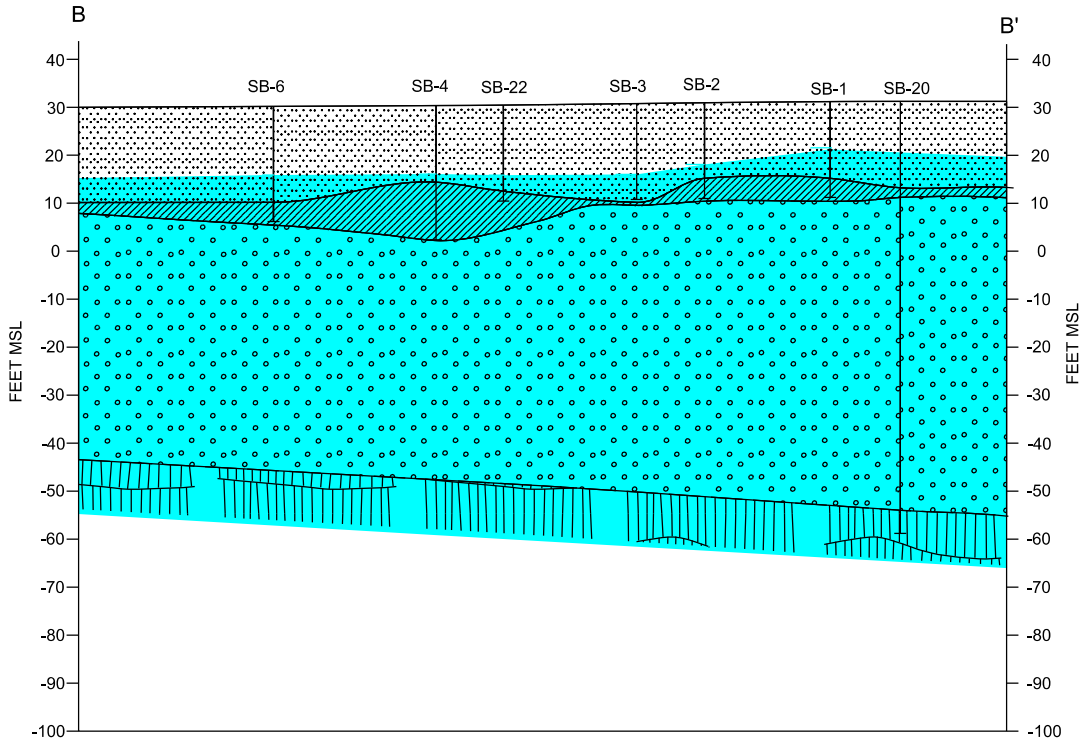
VERTICAL SCALE 1" = 40'

HORIZONTAL SCALE 1" = 80'

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-2
CONCEPTUAL GEOLOGIC
CROSS-SECTION A-A'

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



LEGEND

- SURFICIAL FILL DEPOSITS
- SILT
- ALLUVIAL DEPOSITS
- BEDROCK
- SATURATED ZONE

SB-16 — RI TEMPORARY MONITORING WELL LOCATION

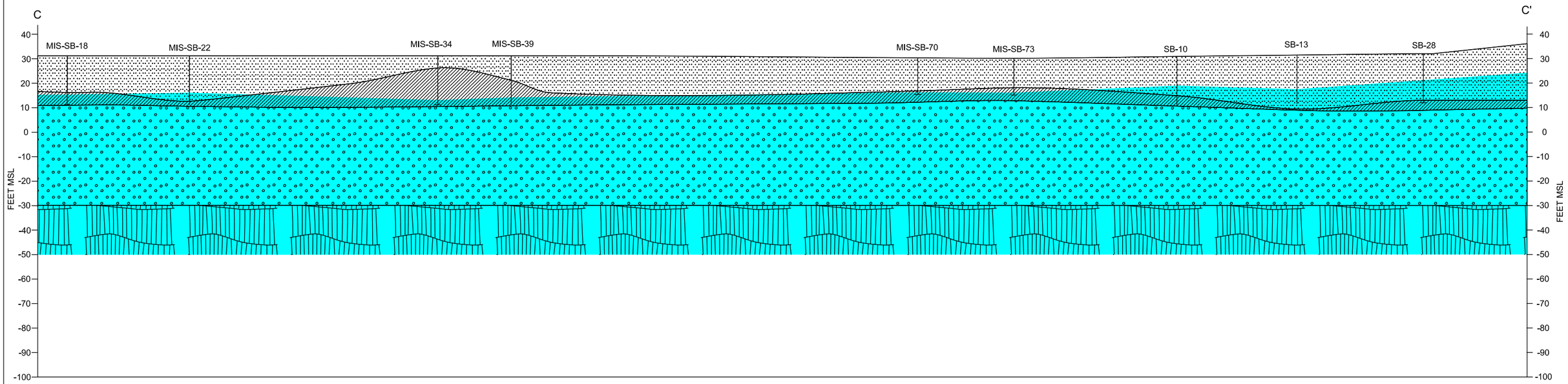
VERTICAL SCALE 1" = 40'

HORIZONTAL SCALE 1" = 80'

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-3
CONCEPTUAL GEOLOGIC
CROSS-SECTION B-B'

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



LEGEND

- SURFICIAL WBZ
- LOW PERMEABILITY SILT ZONE
- ALLUVIAL WBZ
- BEDROCK
- SATURATED ZONE

SB-16 — RI BOREHOLE/ TEMPORARY MONITORING WELL LOCATION

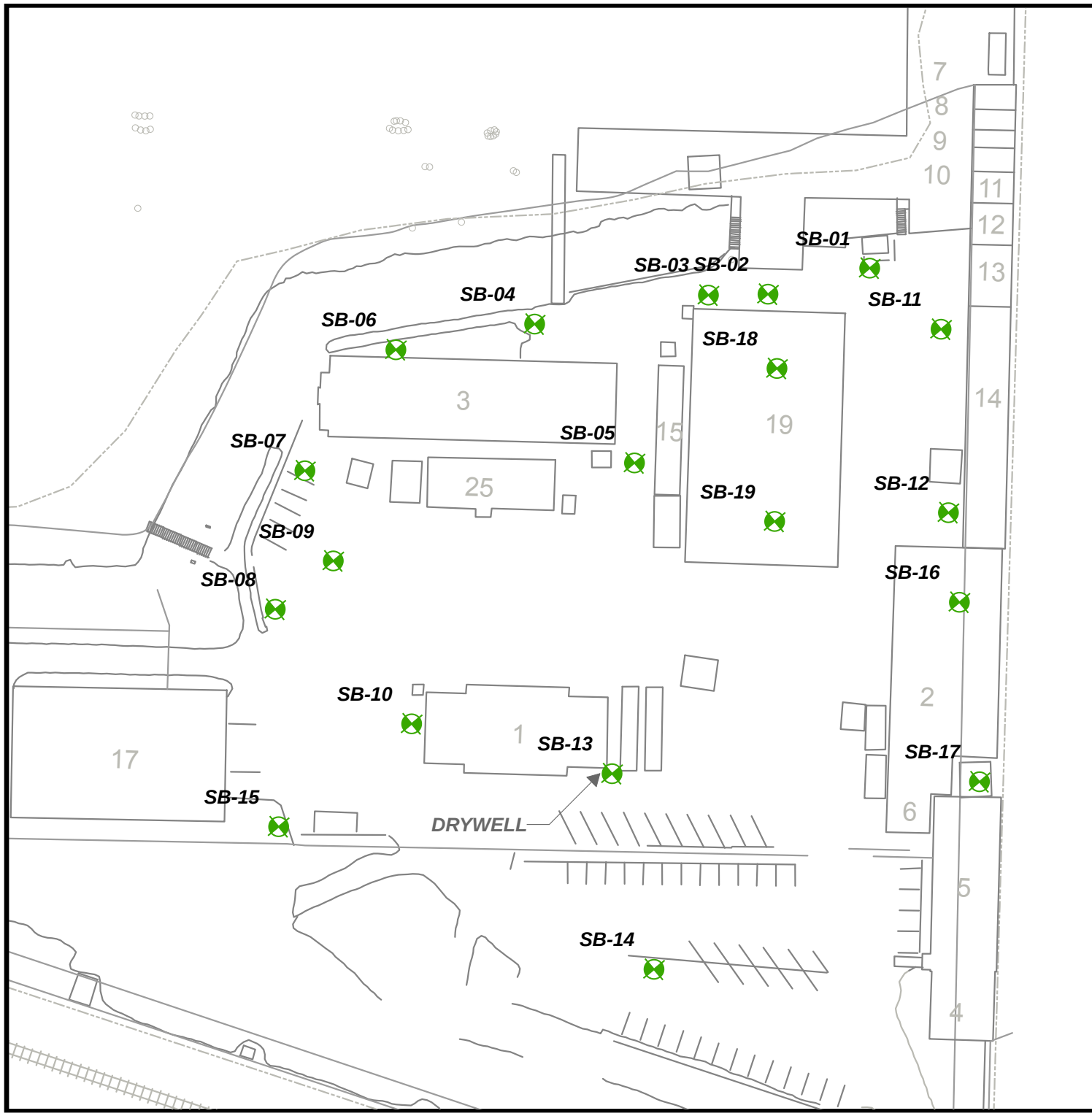
VERTICAL SCALE 1" = 40'

HORIZONTAL SCALE 1" = 80'

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-4
CONCEPTUAL GEOLOGIC
CROSS-SECTION C-C'

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



Legend

SOIL SAMPLE LOCATION

N

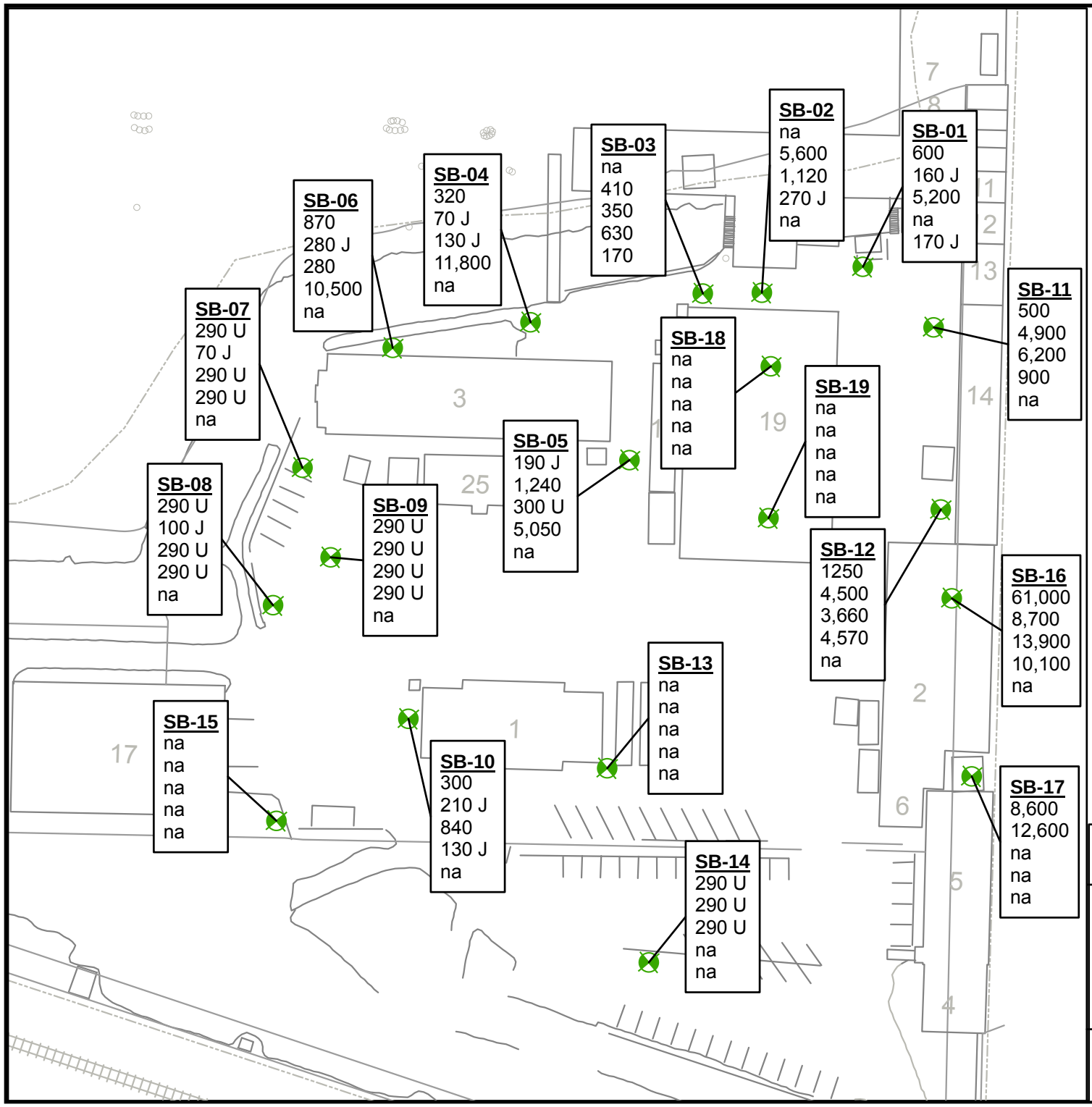
0 25 50 100 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-5

SOIL SAMPLE LOCATIONS
INDUSTRIAL AREA

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



Legend

SOIL SAMPLE

DEPTH HORIZON AND CONCENTRATION (ug/kg)

SB-11	
	Boring ID
500	1 - 4'
4,900	4 - 8'
6,200	8 - 12'
900	12 - 16'
na	16 - 20'

na - Not Analyzed
U - Non-Detect
J - Estimated Value

N

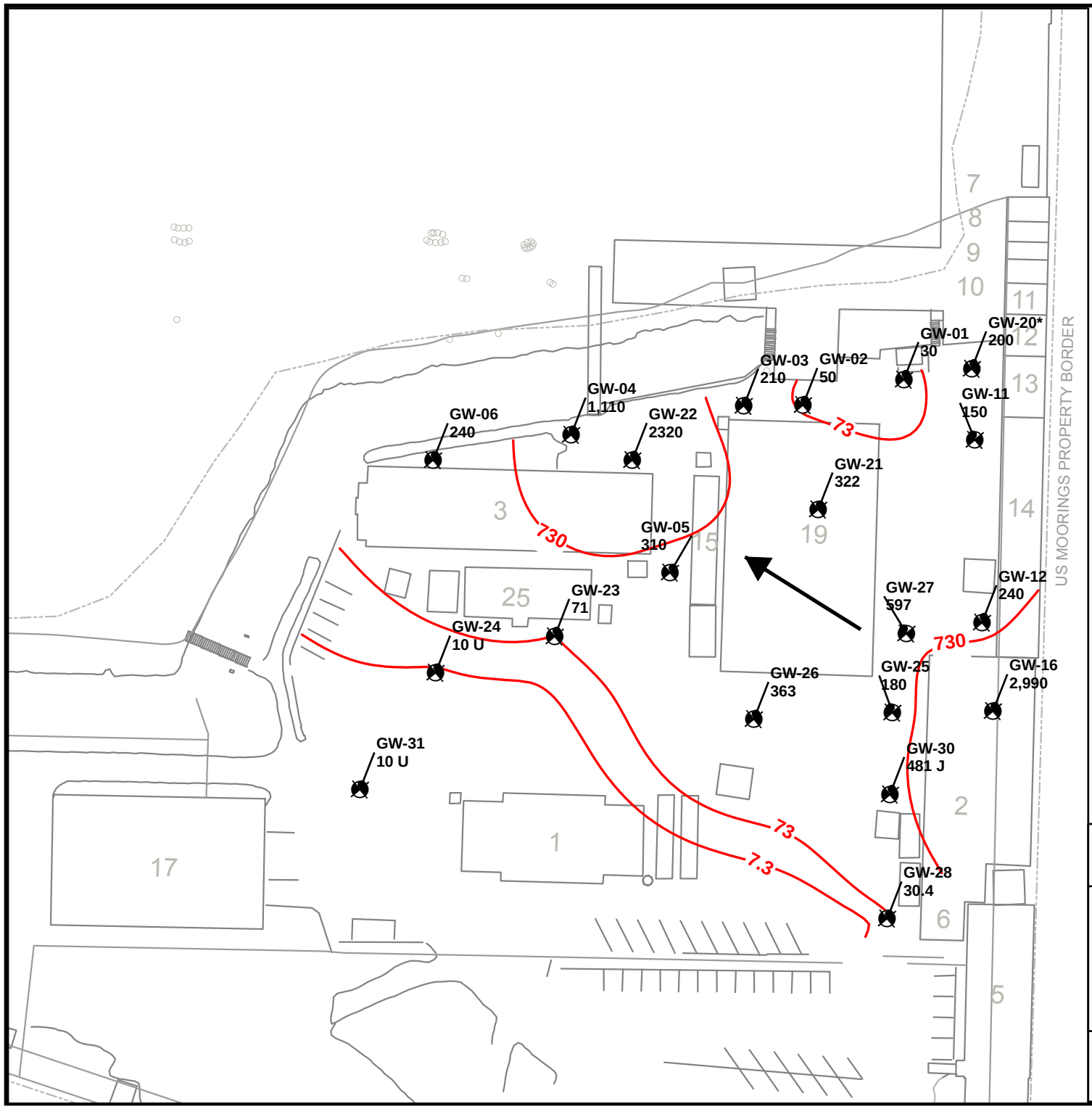
0 25 50 100 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-6

CYANIDE CONCENTRATIONS IN SOIL

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



Legend

GROUNDWATER SAMPLE

* WELL SCREENED IN ALLUVIAL WBZ

GW-06 — WELL NAME
240 — CONCENTRATION (ug/L)

TOTAL CYANIDE CONCENTRATION CONTOUR (ug/L)

APPROXIMATE GROUNDWATER FLOW DIRECTION IN THE SURFICIAL FILL WBZ

SCREENING LEVEL:
HUMAN HEALTH - 73 ug/L

N

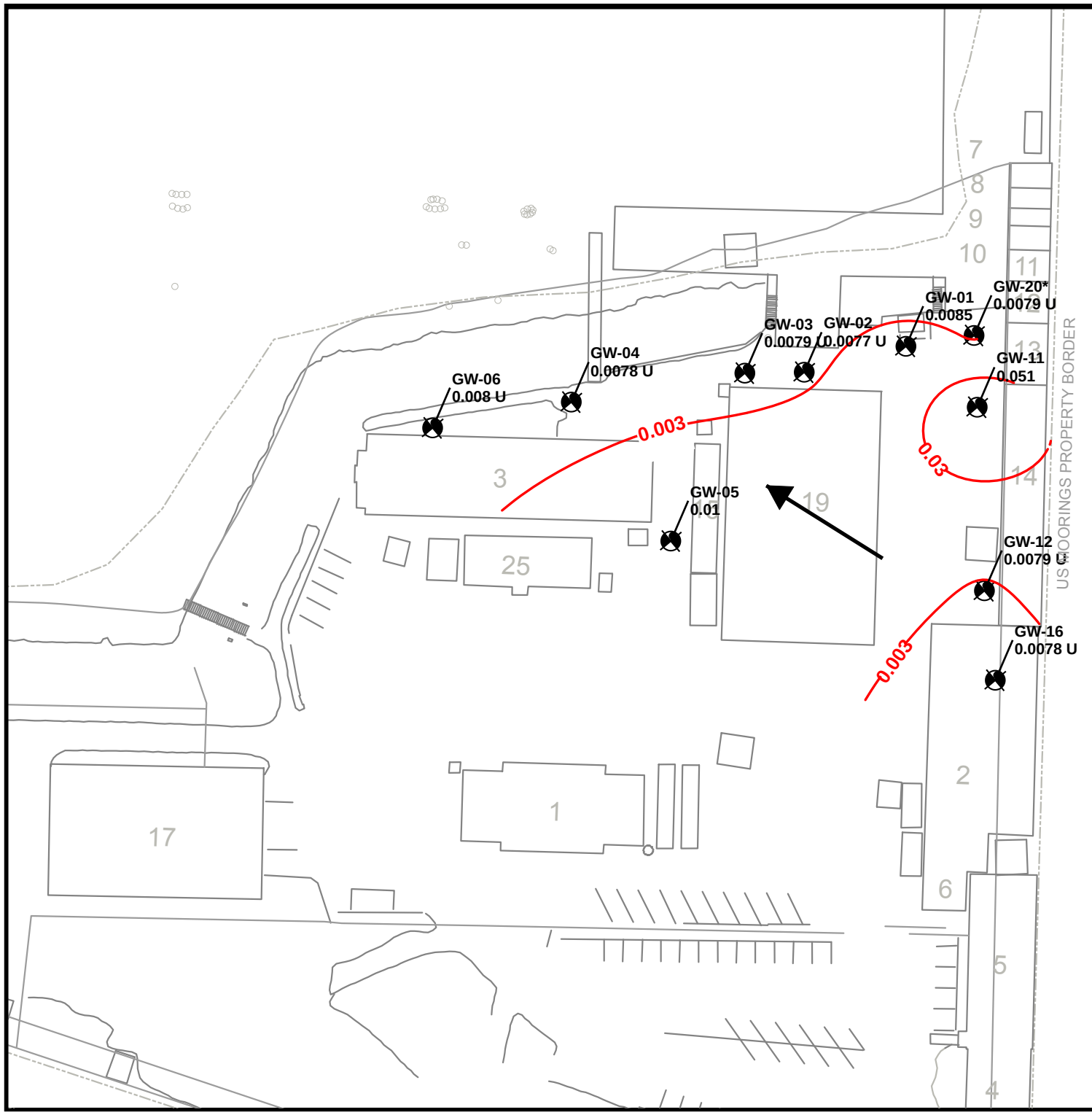
0 20 40 80 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-7

CYANIDE CONCENTRATIONS IN GROUNDWATER

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



Legend

SAMPLE LOCATION

* WELL SCREENED IN ALLUVIAL WBZ

GW-06 — WELL NAME
499 — CONCENTRAITON (ug/L)

BENZO(A)PYRENE CONCENTRATION CONTOUR (ug/L)

APPROXIMATE GROUNDWATER FLOW DIRECTION IN THE SURFICIAL FILL WBZ

SCREENING LEVELS:

HUMAN HEALTH - 0.003 ug/L

N

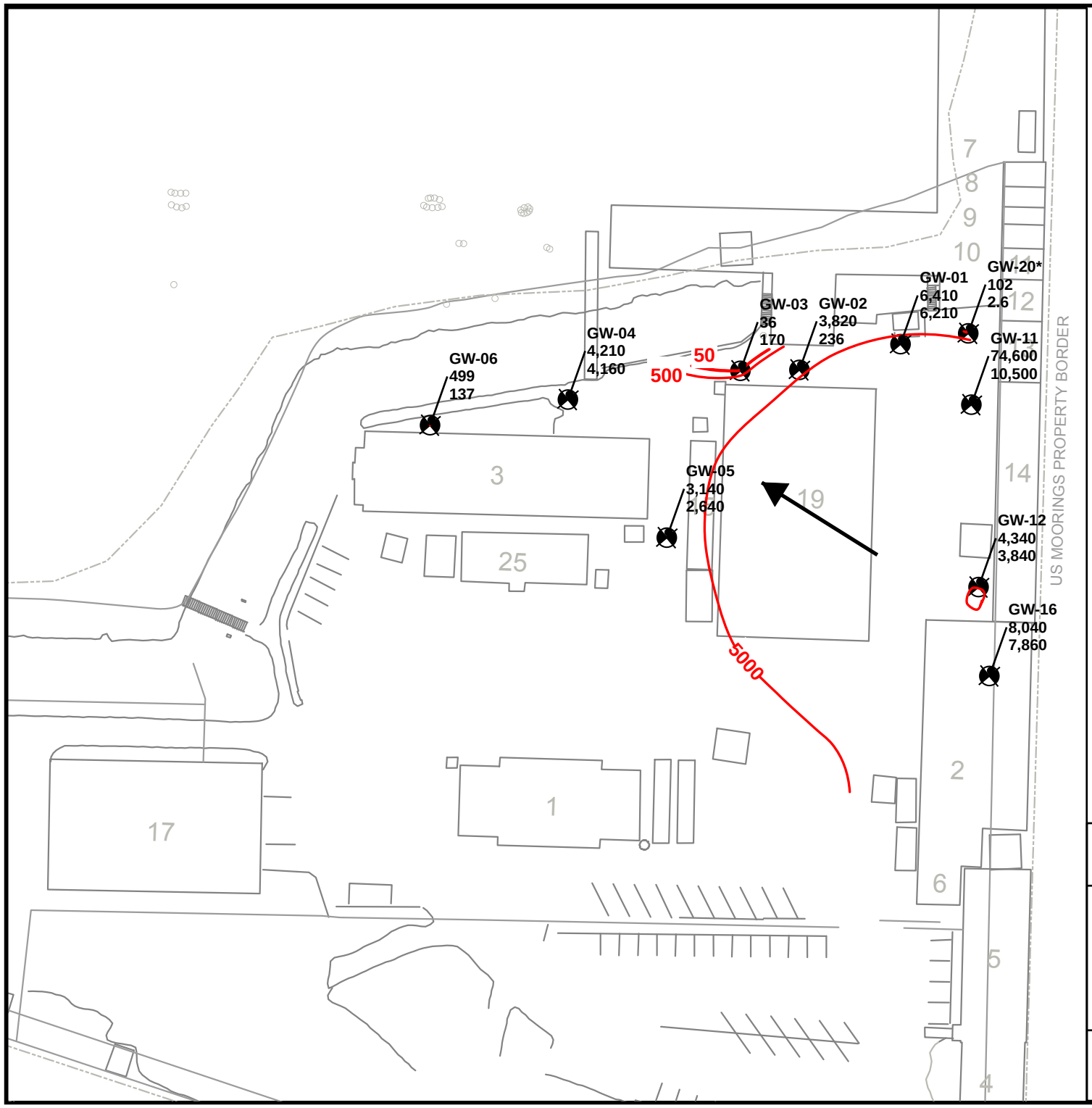
0 20 40 80 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-8

BENZO(A)PYRENE CONCENTRATIONS IN GROUNDWATER

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



Legend

SAMPLE LOCATION

* WELL SCREENED IN ALLUVIAL WBZ

GW-06 — WELL NAME
499 — TOTAL CONCENTRATION
137 — DISSOLVED CONCENTRAITON (ug/L)

TOTAL ALUMINUM CONCENTRATION CONTOUR (ug/L)

APPROXIMATE GROUNDWATER FLOW DIRECTION IN THE SURFICIAL FILL WBZ

SCREENING LEVELS:

HUMAN HEALTH - 50-200 ug/L

N

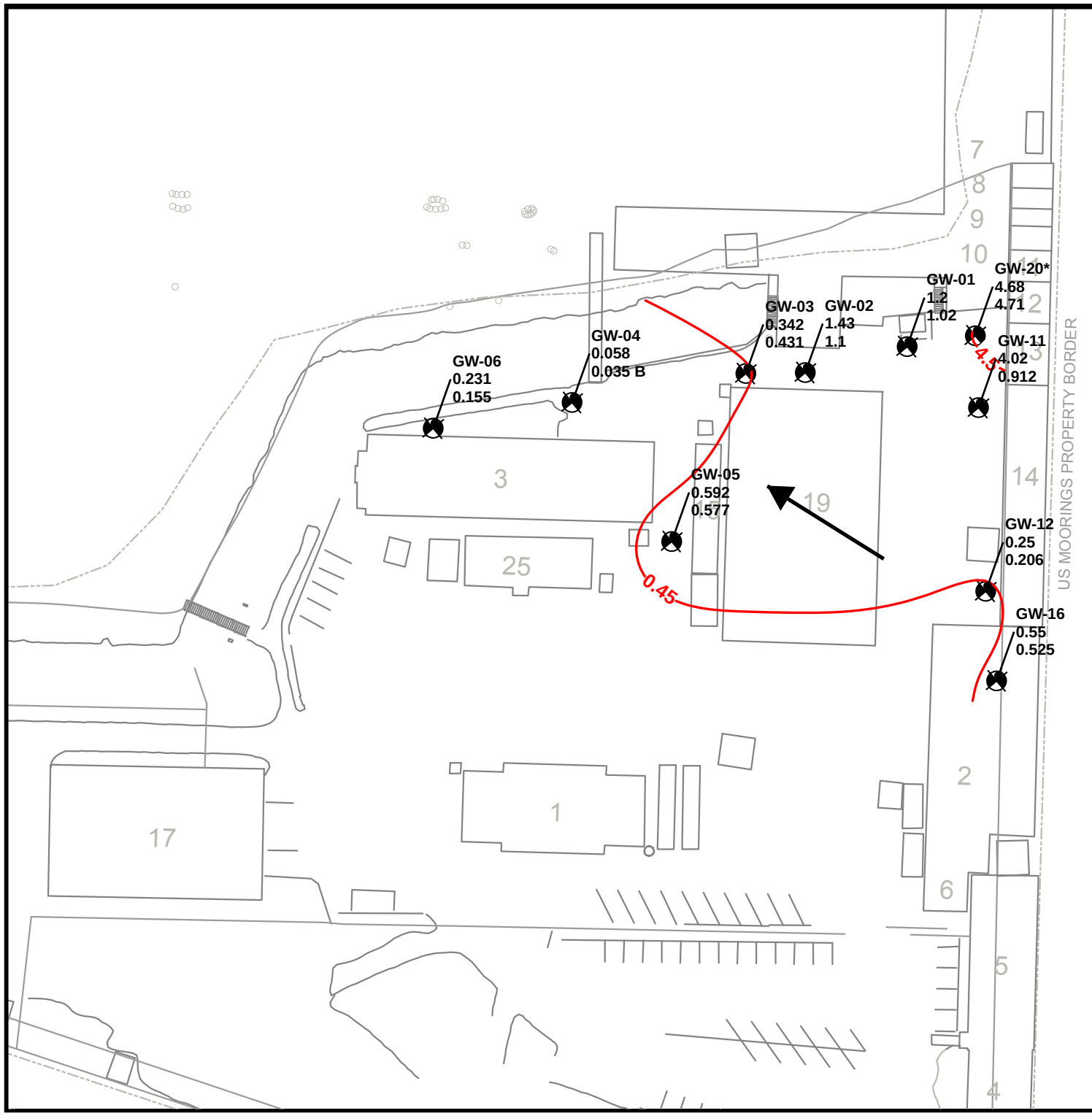
0 20 40 80 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-9

ALUMINUM CONCENTRATIONS IN GROUNDWATER

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



Legend

SAMPLE LOCATION

* WELL SCREENED IN ALLUVIAL WBZ

GW-06 — WELL NAME
499 — TOTAL CONCENTRATION
137 — DISSOLVED CONCENTRAITON (ug/L)

TOTAL ARSENIC CONCENTRATION CONTOUR (ug/L)

APPROXIMATE GROUNDWATER FLOW DIRECTION IN THE SURFICIAL FILL WBZ

SCREENING LEVELS:

HUMAN HEALTH - 0.045 ug/L

N

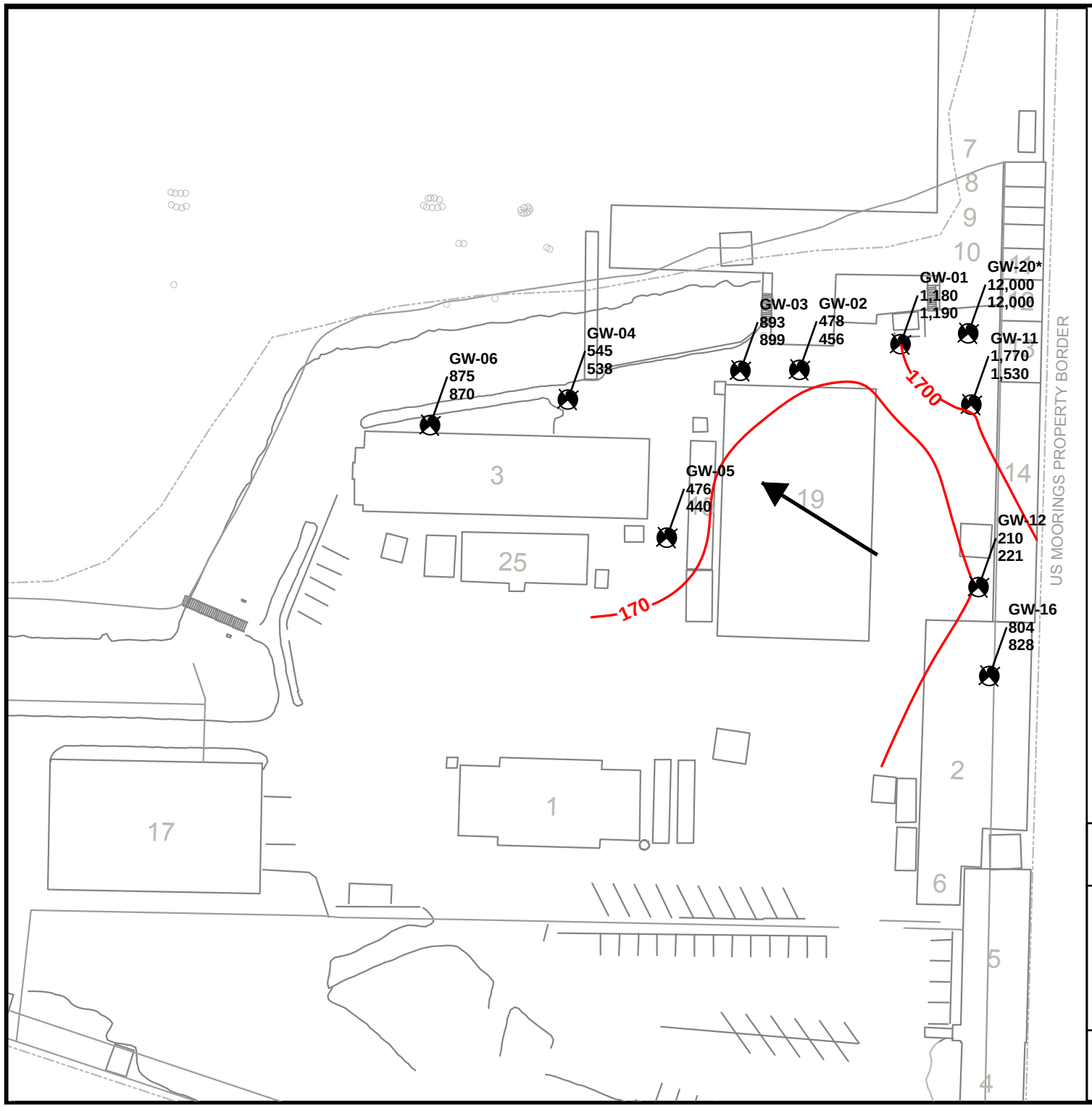
0 20 40 80 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-10

ARSENIC CONCENTRATIONS IN GROUNDWATER

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



Legend

SAMPLE LOCATION

* WELL SCREENED IN ALLUVIAL WBZ

GW-06 — WELL NAME
499 — TOTAL CONCENTRATION
137 — DISSOLVED CONCENTRAITON (ug/L)

TOTAL MANGANESE CONCENTRATION CONTOUR (ug/L)

APPROXIMATE GROUNDWATER FLOW DIRECTION IN THE SURFICIAL FILL WBZ

SCREENING LEVELS:

HUMAN HEALTH - 170.3 ug/L

N

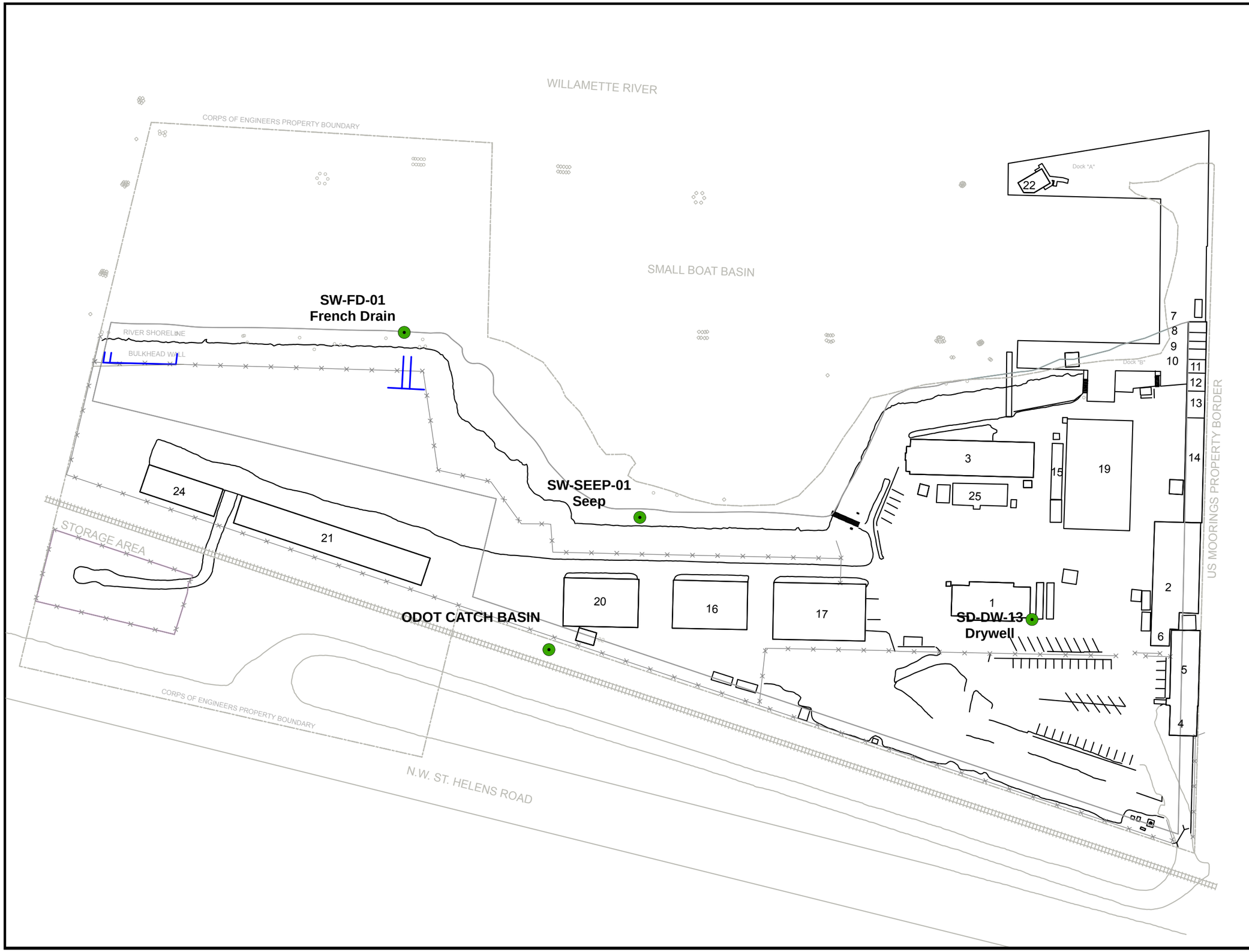
0 20 40 80 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-11

MANGANESE CONCENTRATIONS IN GROUNDWATER

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



LEGEND

Sample Location

APPROXIMATE LOCATION OF FRENCH DRAINS

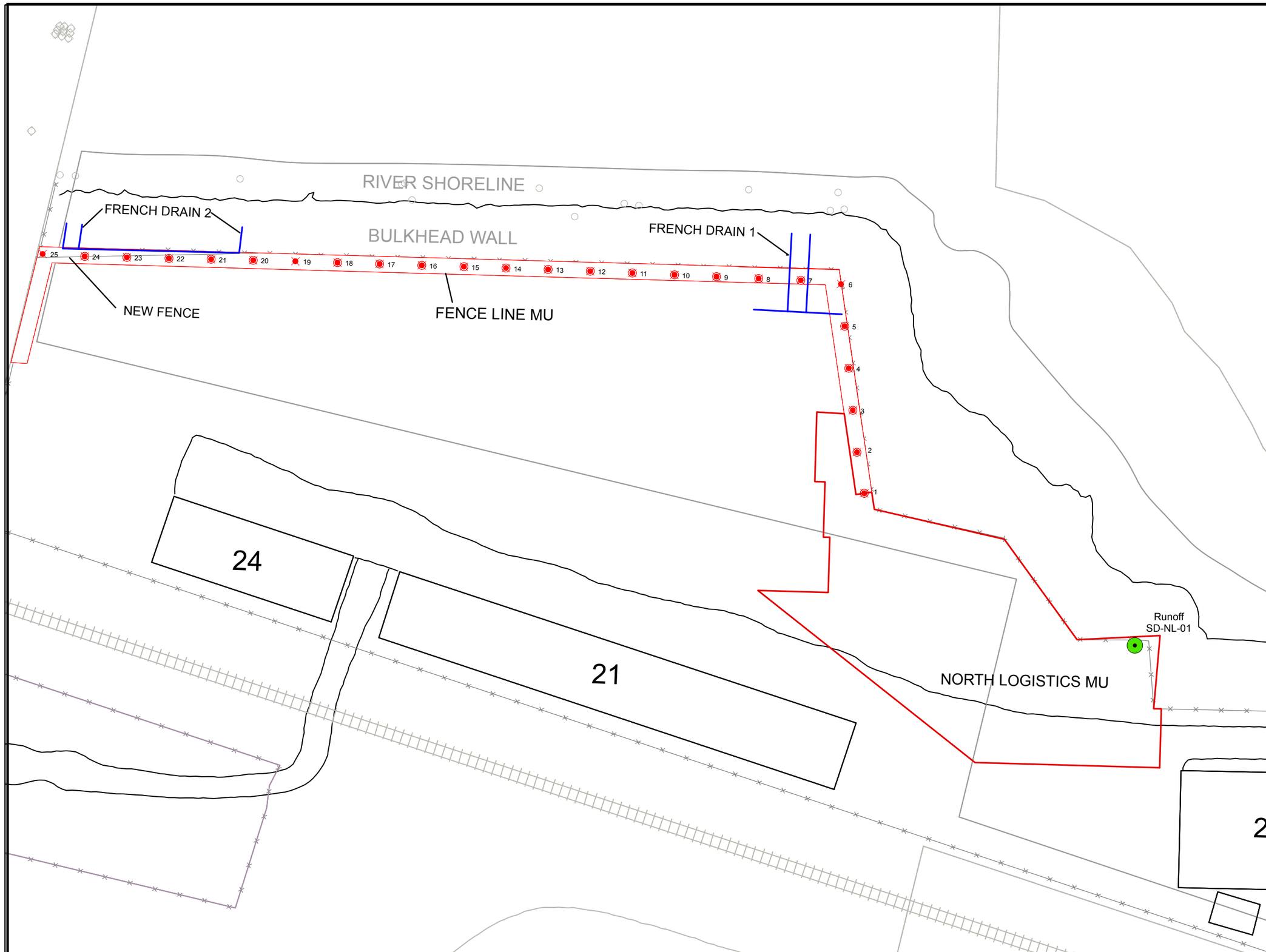
N

0 50 100 200 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-12
Upland Surface Water and Sediment Sample Locations

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



LEGEND

- RUNOFF SAMPLE
- FENCE LINE MU SAMPLE LOCATION
- APPROXIMATE LOCATION OF FRENCH DRAINS

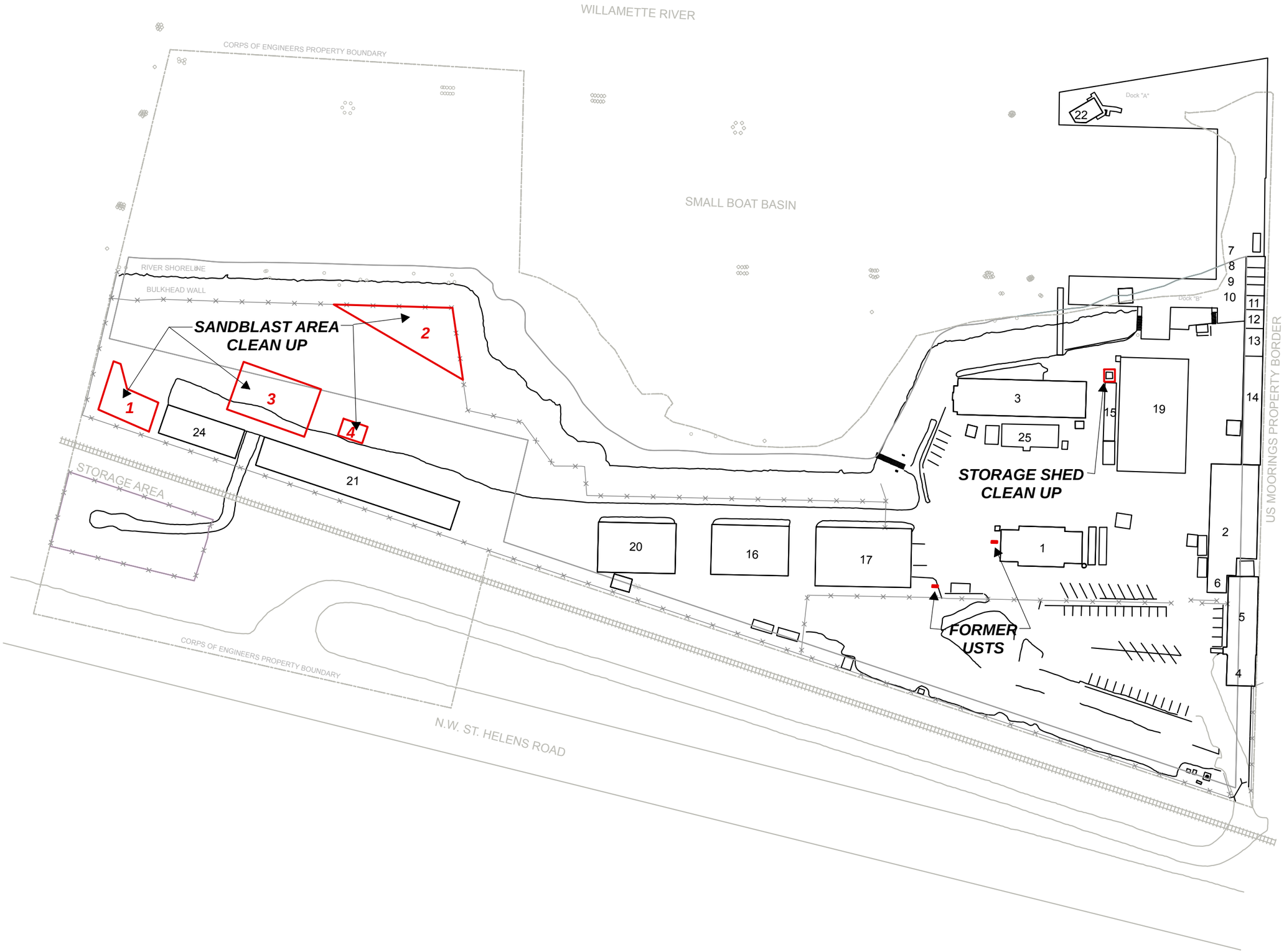
N

0 25 50 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-13
ERODIBLE SOILS SAMPLE LOCATIONS

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



LEGEND

REMOVAL AREA

N

0 50 100 200 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-14
HISTORICAL SOURCE CONTROL ACTIVITIES

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY

LEGEND

SURFACE

- GRASS/DIRT
- GRAVEL
- MIXED-CONCRETE, ASPHALT, GRAVEL
- PAVED/BUILDING

BANK MATERIAL

- CONCRETE PAD
- RIP-RAP

N

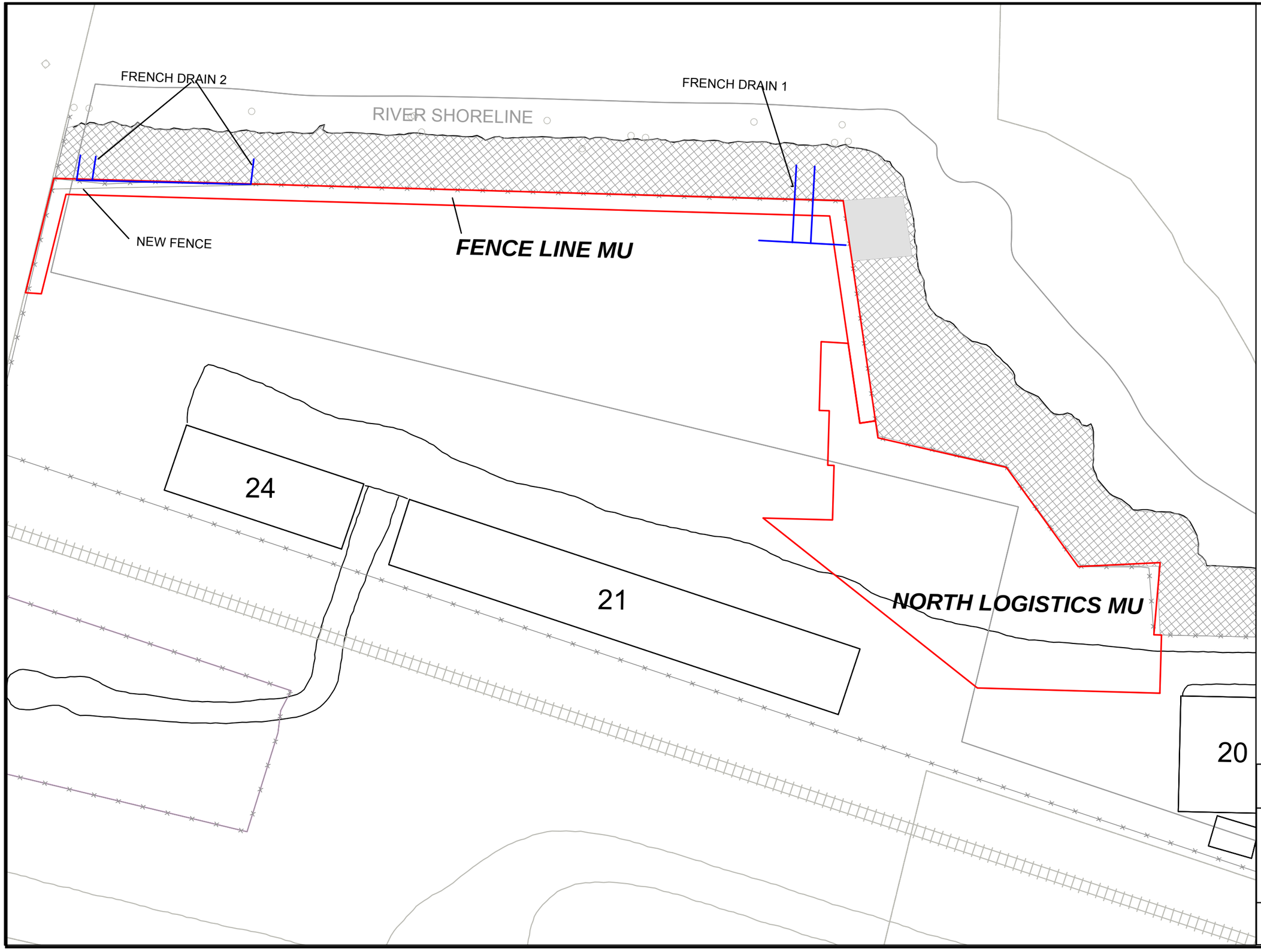
0 50 100 200 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 3-15

SITE SURFACE MATERIALS

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



LEGEND

MANAGEMENT UNIT (MU)

APPROXIMATE LOCATION OF FRENCH DRAINS

BANK MATERIAL

CONCRETE PAD

VEGETATED

RIP-RAP

N

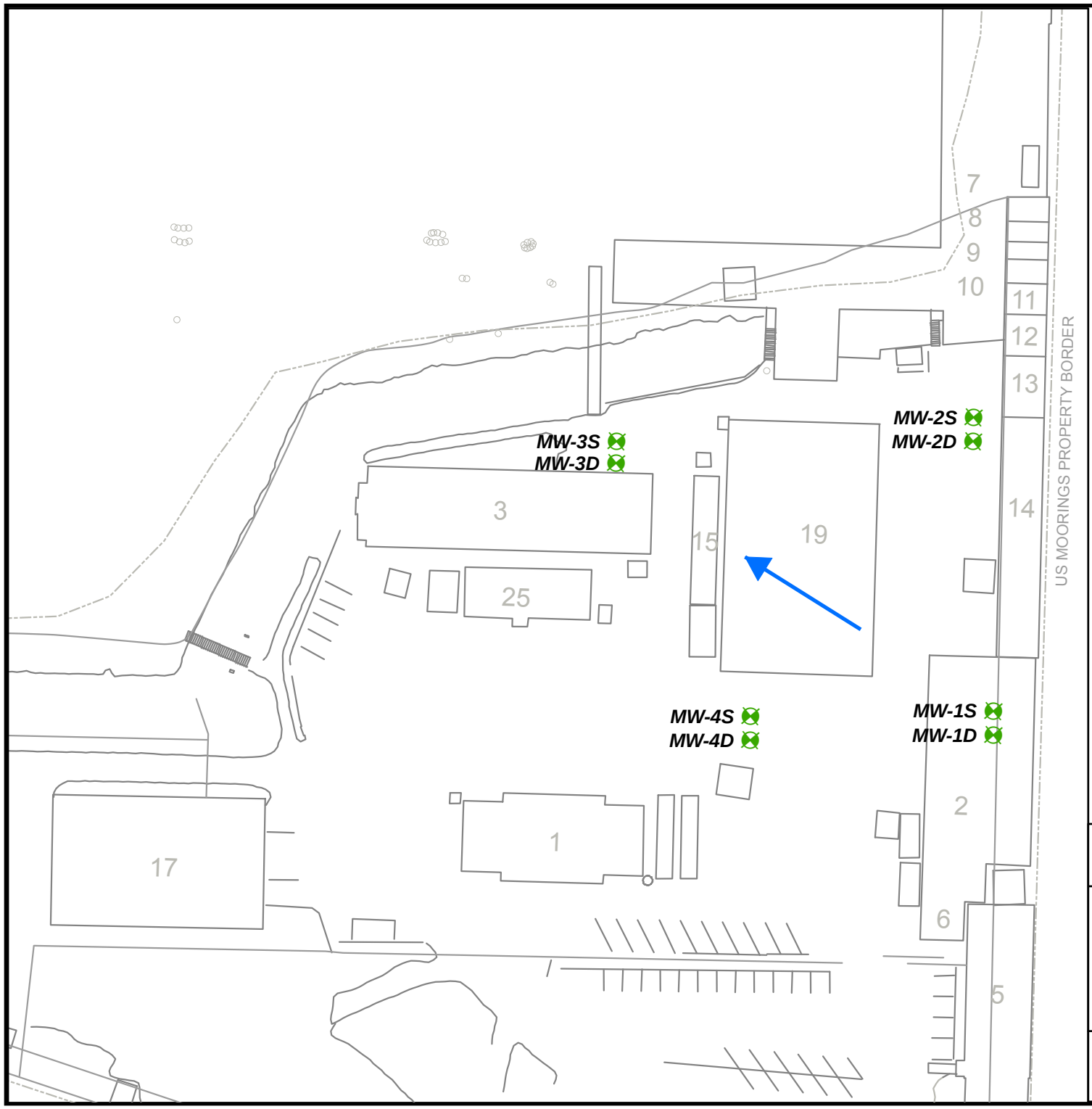
0 25 50 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 4-1

REMEDIAL ACTION AREA (OU 2)

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



Legend

PROPOSED MONITORING LOCATION

MW-#S : SHALLOW WELL INSTALLED IN SURFICIAL FILL WBZ

MW-#D : DEEP WELL INSTALLED IN ALLUVIAL WBZ

ESTIMATED GROUNDWATER FLOW DIRECTION IN SURFICIAL FILL WBZ

N

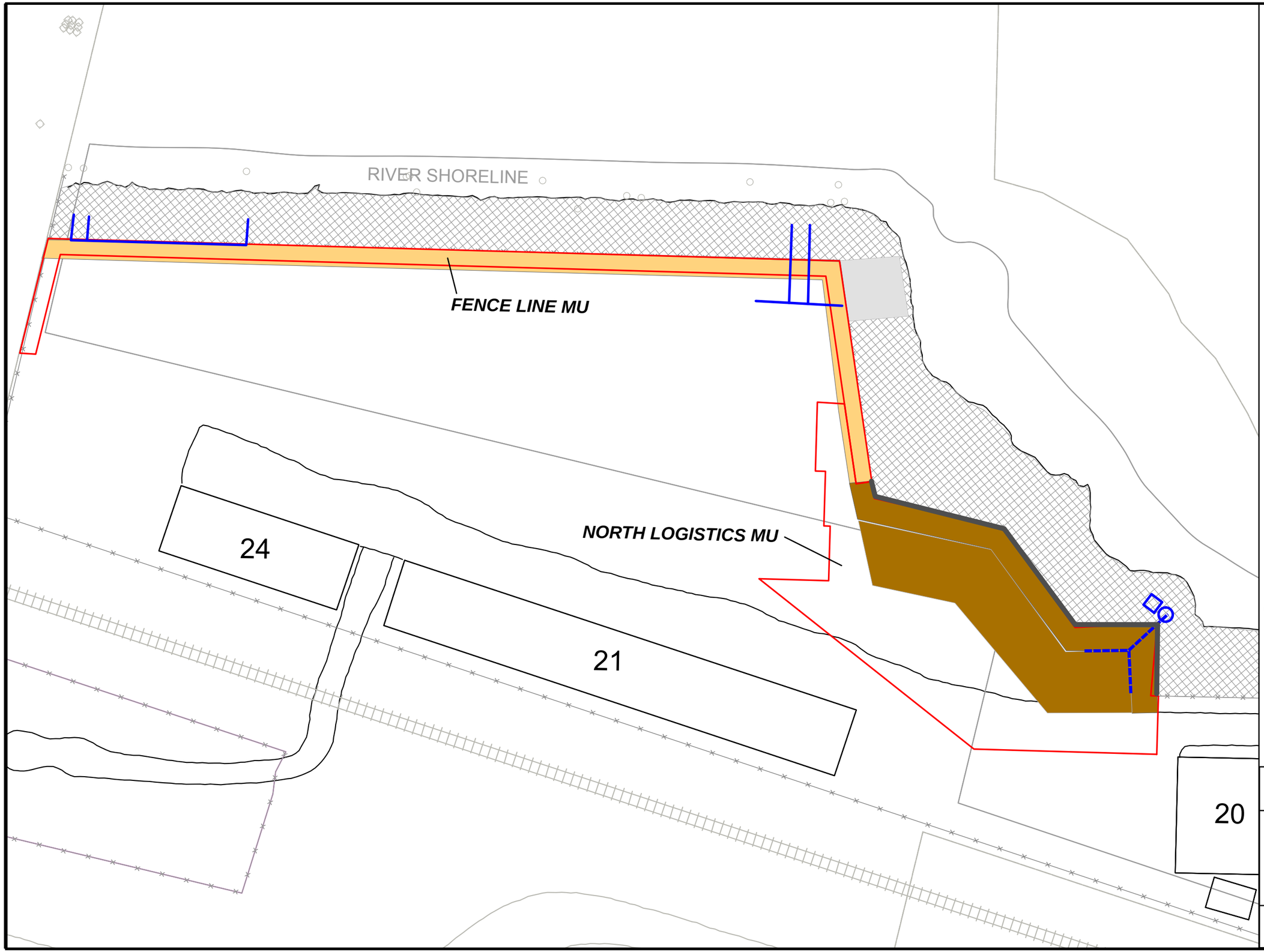
0 20 40 80 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 6-1

PROPOSED GROUNDWATER MONITORING LOCATIONS (OU 1)

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



LEGEND

MANAGEMENT UNIT (MU)

BANK MATERIAL

CONCRETE PAD

RIP-RAP

ALTERNATIVE 2

EXISTING FRENCH DRAINS

PROPOSED FRENCH DRAIN INCLUDES PASSIVE TREATMENT FOR METALS (AS NEEDED)

TREATMENT SYSTEM AND OVERFLOW CATCH BASIN

MAINTAIN EXISTING GRAVEL

FILL TO GRADE AND COVER WITH GRAVEL

CONCRETE CURB

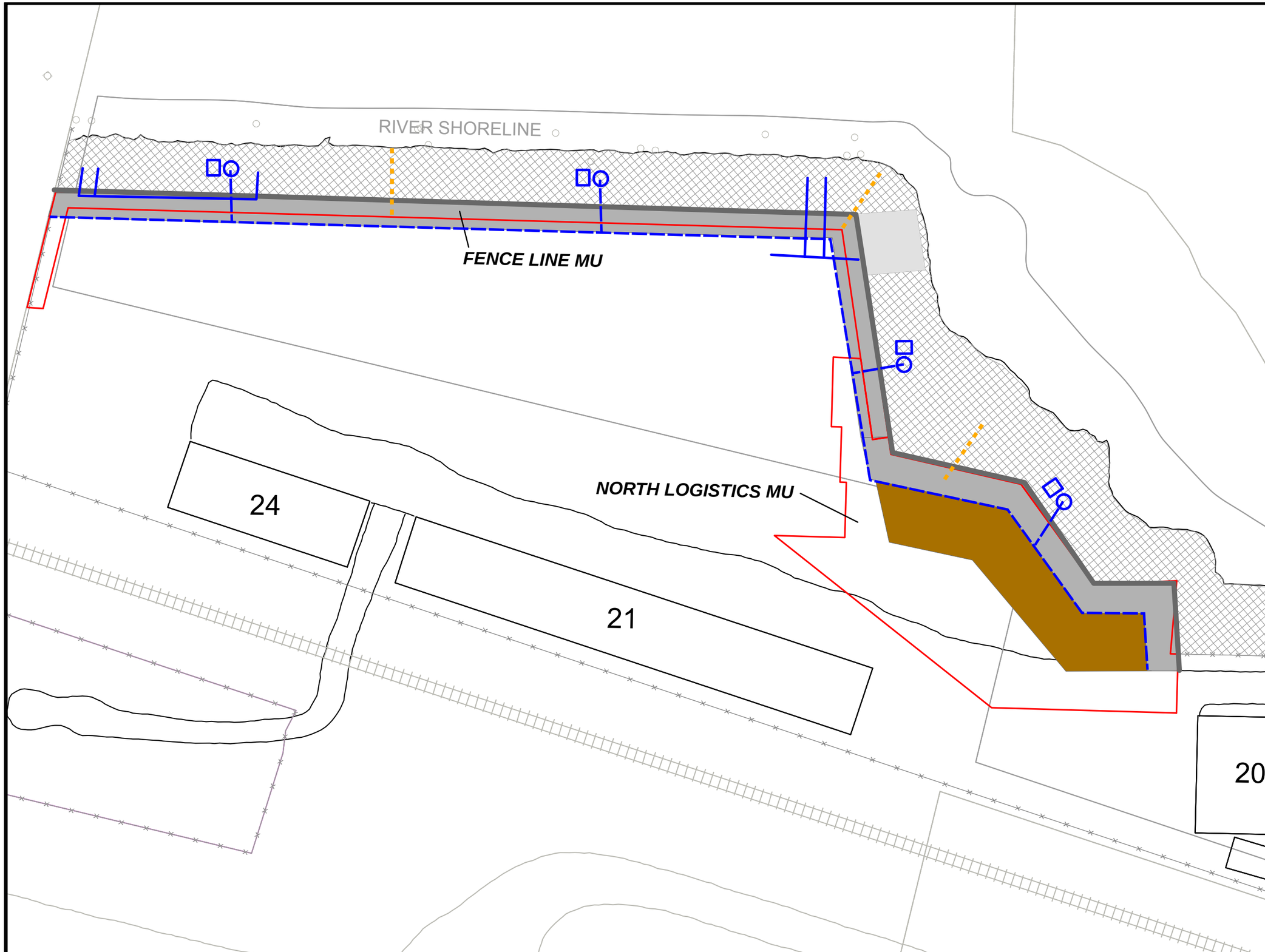
N

0 25 50 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 6-2
ALTERNATIVE 2
(OU 2)

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



LEGEND

MANAGEMENT UNIT (MU)

BANK MATERIAL

CONCRETE PAD

RIP-RAP

ALTERNATIVE 3

EXISTING FRENCH DRAINS

PROPOSED FRENCH DRAIN INCLUDES PASSIVE TREATMENT FOR METALS (AS NEEDED)

TREATMENT SYSTEM AND OVERFLOW CATCH BASIN

CONCRETE EROSION CAP WITH SURFACE DRAINAGE

FILL TO GRADE AND COVER WITH GRAVEL

CONCRETE CURB

SURFACE DRAINAGE EXIT LOCATION

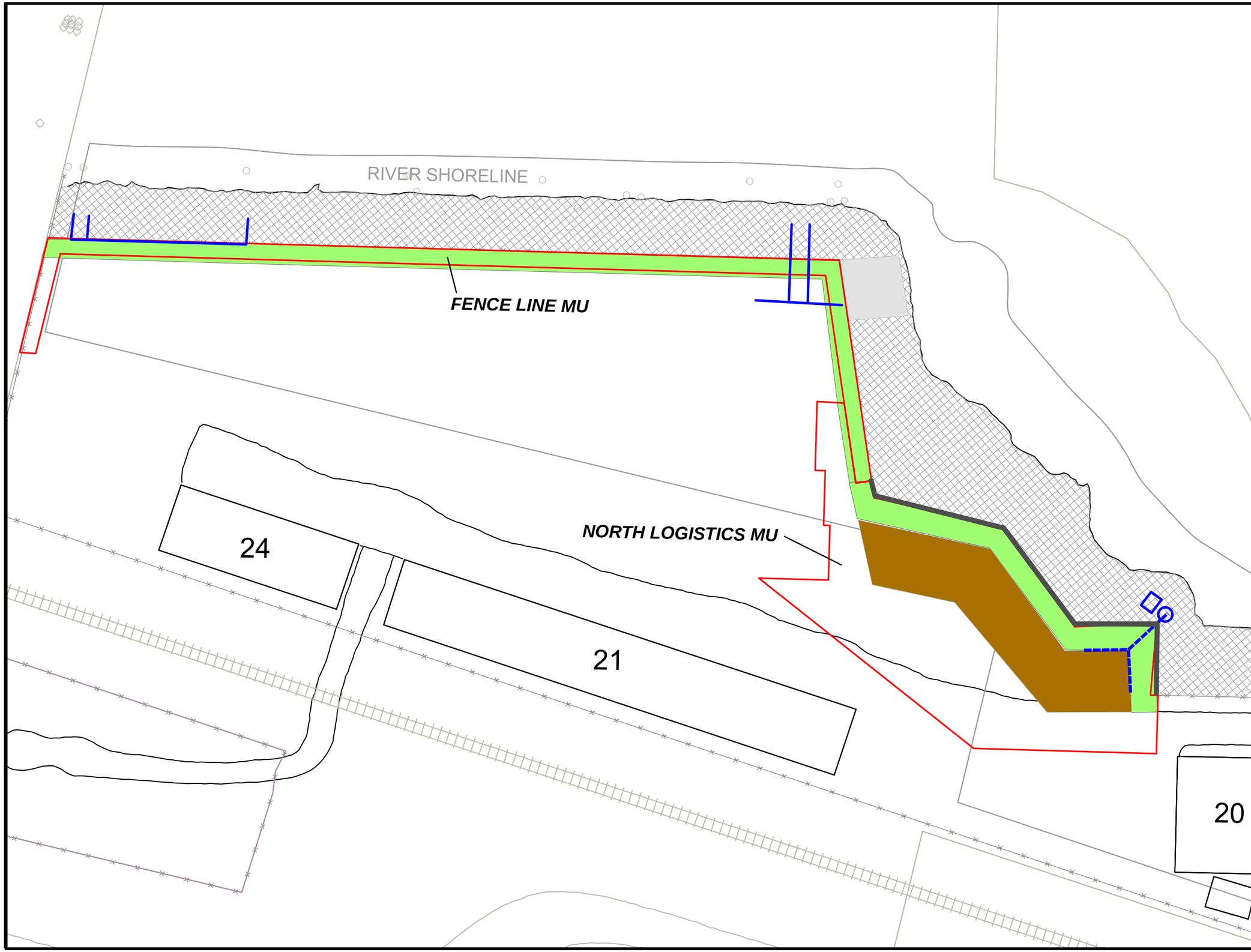
N

0 25 50 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 6-3
ALTERNATIVE 3
(OU 2)

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY



LEGEND

MANAGEMENT UNIT (MU)

BANK MATERIAL

CONCRETE PAD

RIP-RAP

ALTERNATIVE 4

EXISTING FRENCH DRAINS

PROPOSED FRENCH DRAIN INCLUDES PASSIVE TREATMENT FOR METALS (AS NEEDED)

TREATMENT SYSTEM AND OVERFLOW CATCH BASIN

VEGETATIVE BUFFER

FILL TO GRADE AND COVER WITH GRAVEL

CONCRETE CURB

N

0 25 50 Feet

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

FIGURE 6-4
ALTERNATIVE 4
(OU 2)

U.S. GOVERNMENT MOORINGS
FEASIBILITY STUDY

APPENDIX A

JOINT SOURCE CONTROL SCREENING LEVEL VALUES

Table 3-1 7/16/07 Revision

Table 3-1 Screening Level Values for Soil/Stormwater Sediment, Stormwater, Groundwater, and Surface Water[A]

Chemical		GROUNDWATER / SURFACE WATER / STORMWATER						GROUNDWATER / SURFACE WATER / STORMWATER			UPLAND SOIL / STORMWATER SEDIMENT [D]	
		Water [C]									Soil/Stormwater Sediment[D]	
		Human Health #						Ecological Receptors #			Toxicity	Bioaccumulation
		Fish Consumption				Drinking Water						
		EPA's 2004 NRWQC (organism only)	Portland Harbor specific fish consumption rate	DEQ's 2004 AWQC (organism only)	Portland Harbor specific fish consumption rate	MCL	Tap Water PRGs	EPA's 2004 NRWQC (chronic)	DEQ's 2004 AWQC (chronic)	Oak Ridge National Laboratory's (Tier II SCV)[j]	MacDonald PECs and other SQVs [1]	DEQ 2007 Bioaccumulative Sediment SLVs [E]
		17.5 g/day consumption rate	175 g/day consumption rate	17.5 g/day consumption rate	175 g/day consumption rate							
Units		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/kg	µg/kg
NOTE: Numbers highlighted in yellow are values to be used for initial upland source control screening evaluations for water.											**NOTE: Numbers highlighted in orange are to be used for initial upland source control screening evaluations for soil and stormwater sediment.**	
Metals/Inorganics	CAS #	Metals in these columns are expressed as dissolved metal in the water column except where noted		Metals in these columns are expressed in terms of total recoverable metal in the water coulmn				Metals in this column are expressed as dissolved metal in the water column except where noted	Metals in this column are expressed in terms of total recoverable metal in the water coulmn			
Aluminum (pH 6.5 - 9.0)[13]	7429-90-5					**(50-200)[29]**	37,000	87				
Antimony	7440-36-0	640	64	640	64	**6**	15		1600 [16]	30	**64,000 [3]**	
Arsenic	7440-38-2	0.14	0.014	0.14	0.014	10	**0.045**	150		3.1[a]	33,000 [2]	**7000 [31]**
Arsenic III	22569-72-8								**190 [14]**			
Cadmium[15]	7440-43-9					5	18	**0.094**	0.38 [14]		4,980 [2]	**1000[31]**
Chromium, total	7440-47-3					**100**					**111,000 [2]**	
Chromium, hexavalent	18540-29-9						110	**11**	11 [14]			
Copper[15]	7440-50-8					1,300 = TT	1,400	**2.7**	3.6 [14]		**149,000 [2]**	
Lead[15]	7439-92-1					15 = TT	15	**0.54**	0.54 [14]		128,000 [2]	**17000 [31]**
Manganese	7439-96-5	100	10	100	10	**(50)[29]**	1700			120	**1,100,000 [6,9]**	
Mercury	7439-97-6			0.146	0.0146	2	11	**0.77**	0.012	1.3[b]	1,060 [2]	**70 [31]**
Methyl Mercury	22967-92-6	300 µg/kg [20]	30 µg/kg [20]	300 µg/kg [20]	30 µg/kg [20]		3.7			**0.0028**		
Nickel[15]	7440-02-0	4,600	460	4,600	460		730	**16**	49 [14]		**48,600 [2]**	
Selenium	7782-49-2	4,200	420	4,200	420	50	180	**5 [19]**	35 [14]		5,000 [4]	**2000 [31]**
Silver [15]	7440-22-4					(100)[29]	180		**0.12 [14]**	0.36	**5,000 [5, 4]**	
Zinc[15]	7440-66-6	26,000	2,600	26,000	2,600	(5,000)[29]	11,000	**36**	33		**459,000 [2]**	
Perchlorate	14797-73-0						**<24.5**					
Cyanide[18]	57-12-5	140	14	140	14	200	730	**5.2**	5.2			

Table 3-1 Screening Level Values for Soil/Stormwater Sediment, Stormwater, Groundwater, and Surface Water[A]

Chemical		GROUNDWATER / SURFACE WATER / STORMWATER						GROUNDWATER / SURFACE WATER / STORMWATER			UPLAND SOIL / STORMWATER SEDIMENT [D]	
		Water [C]									**Soil/Stormwater Sediment[D]**	
		Human Health #						Ecological Receptors #			Toxicity	Bioaccumulation
		Fish Consumption				Drinking Water						
		EPA's 2004 NRWQC (organism only)	Portland Harbor specific fish consumption rate	DEQ's 2004 AWQC (organism only)	Portland Harbor specific fish consumption rate	MCL	Tap Water PRGs	EPA's 2004 NRWQC (chronic)	DEQ's 2004 AWQC (chronic)	Oak Ridge National Laboratory's (Tier II SCV)[J]	MacDonald PECs and other SQVs [1]	DEQ 2007 Bioaccumulative Sediment SLVs [E]
		17.5 g/day consumption rate	175 g/day consumption rate	17.5 g/day consumption rate	175 g/day consumption rate							
Units		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/kg	µg/kg
Butyltins [12]												
Monobutyltin	78763-54-9											
Dibutyltin	1002-53-5											
Tributyltin	56573-85-4						11	**0.072**				**2.3** [32]
Tetrabutyltin	1461-25-2											
PCBs Aroclors												
Aroclor 1016	12674-11-2						**0.96**				**530** [9]	
Aroclor 1221	11104-28-2						**0.034**			0.28		
Aroclor 1232	11141-16-5						**0.034**			0.58		
Aroclor 1242							**0.034**			0.053		
Aroclor 1248	12672-29-6						**0.034**			0.081	**1,500** [9]	
Aroclor 1254	11097-69-1						0.034			**0.033**	**300** [9]	
Aroclor 1260	11096-82-5						**0.034**			94	**200** [9]	
Aroclor 1262	37324-23-5											
Aroclor 1268	11100-14-4											
Total PCBs		**0.000064**	0.0000064	0.000064	0.0000064	0.5	0.034	0.014	0.014	0.14	676 [2]	**0.39** [33]
PCB Congeners												
All 209 PCB congener target analytes												
3,3',4,4'-TCB	32598-13-3											**0.052** [33]
3,4,4',5-TCB												**0.017** [33]
2,3,3',4,4'-PeCB	32598-14-4											**0.17** [33]
2,3,4,4',5-PeCB												**0.17** [33]
2,3',4,4',5-PeCB	31508-00-6											**0.12** [33]
2',3,4,4',5-PeCB												**0.21** [33]
3,3',4,4',5-PeCB												**0.00005** [33]
2,3,3',4,4',5'-HxCB												**0.21** [33]
2,3,3',4,4',5-HxCB												**0.21** [33]
2,3',4,4',5,5'-HxCB												**0.21** [33]
3,3',4,4',5,5'-HxCB	32774-16-6											**0.00021** [33]
2,3,3',4,4',5,5'-HpCB												**1.2** [33]
Chlorinated Herbicides												
Dalapon	75-99-0					**200**	1,100					

Table 3-1 Screening Level Values for Soil/Stormwater Sediment, Stormwater, Groundwater, and Surface Water[A]

Chemical		GROUNDWATER / SURFACE WATER / STORMWATER						GROUNDWATER / SURFACE WATER / STORMWATER			UPLAND SOIL / STORMWATER SEDIMENT [D]	
		Water [C]									**Soil/Stormwater Sediment[D]**	
		Human Health #						Ecological Receptors #			Toxicity	Bioaccumulation
		Fish Consumption				Drinking Water						
		EPA's 2004 NRWQC (organism only)	Portland Harbor specific fish consumption rate	DEQ's 2004 AWQC (organism only)	Portland Harbor specific fish consumption rate	MCL	Tap Water PRGs	EPA's 2004 NRWQC (chronic)	DEQ's 2004 AWQC (chronic)	Oak Ridge National Laboratory's (Tier II SCV)[j]	MacDonald PECs and other SQVs [1]	DEQ 2007 Bioaccumulative Sediment SLVs [E]
		17.5 g/day consumption rate	175 g/day consumption rate	17.5 g/day consumption rate	175 g/day consumption rate							
Units		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/kg	µg/kg
Dicamba	1918-00-9						**1,100**					
MCPA	94-74-6						**18**					
Dichlorprop	120-36-5						**370**					
2,4-D	94-75-7					**70**	370					
2,4,5-TP (Silvex)	93-72-1					**50**	370					
2,4,5-T	93-76-5						**370**					
2,4-DB	94-82-6						**290**					
Dinoseb	88-85-7					**7**	37					
MCPP	93-65-2						**37**					
Organochlorine Pesticides												
α - BHC	319-84-6	**0.0049**	0.00049	0.0049	0.00049		0.011			2.2[c]		
β - BHC	319-85-7	**0.017**	0.0017	0.017	0.0017		0.037					
γ - BHC (Lindane)	58-89-9	1.8	0.18	1.8	0.18		**0.052**		0.08		**4.99** [2]	
δ - BHC	319-86-8						**0.037**					
Heptachlor	76-44-8	**0.000079**	0.0000079	0.000079	0.0000079	0.4	0.015	0.0038	0.0038	0.0069	**10** [6]	
Heptachlor epoxide	102-45-73	**0.000039**	0.0000039	0.000039	0.0000039	0.2	0.0074	0.0038	0.0038		**16** [2]	
Aldrin	309-00-2	**0.00005**	0.000005	0.00005	0.000005		0.004				**40** [6]	
Chlordane	57-74-9	**0.00081**	0.000081	0.00081	0.000081	2	0.19	0.0043	0.0043		17.6 [2]	**0.37** [33]
Endosulfan alpha-	959-98-8	89	8.9	89	8.9		220	0.056	0.056	**0.051**		
Endosulfan beta-	33213-65-9	89	8.9	89	8.9		220	0.056	0.056	**0.051**		
Endosulfan sulfate	1031-07-8	**89**	8.9	89	8.9							
DDE [34]	72-55-9	**0.00022**	0.000022	0.00022	0.000022		0.2				31.3[2]	**0.33**
DDD [34]	72-54-8	**0.00031**	0.000031	0.00031	0.000031		0.28			0.011[d]	28[2]	**0.33**
DDT [34]	50-29-3	**0.00022**	0.000022	0.00022	0.000022		0.2	0.001	0.001	0.013[e]	62.9[2]	**0.33**
DDT - total [35]	50-29-3						**0.2**					**0.33** [33]
Dieldrin	60-57-1	**0.000054**	0.0000054	0.000054	0.0000054		0.0042	0.056	0.0019[14]		61.8 [2]	**0.0081** [33]
Endrin	72-20-8	0.06	0.006	0.06	0.006	2	11	**0.036**	0.0023 [14]	0.061	**207** [2]	
Endrin aldehyde	7421-93-4	0.3	0.03	0.3	0.03							
Endrin ketone	53494-70-5											
Methoxychlor	72-43-5					40	180	**0.03**	0.03	0.019		
Toxaphene	8001-35-2	0.00028	0.000028	0.00028	0.000028	3	0.061	**0.0002**	0.0002			
oxy chlordane							**0.19**					
cis - nonachlor	5103-73-1						**0.19**					
trans - nonachlor	39765-80-5						**0.19**					
Volatile Organic Compounds												

Table 3-1 Screening Level Values for Soil/Stormwater Sediment, Stormwater, Groundwater, and Surface Water[(A)]

Chemical		GROUNDWATER / SURFACE WATER / STORMWATER						GROUNDWATER / SURFACE WATER / STORMWATER			UPLAND SOIL / STORMWATER SEDIMENT [(D)]	
		Water [(C)]									**Soil/Stormwater Sediment[(D)]**	
		Human Health [#]						Ecological Receptors [#]			Toxicity	Bioaccumulation
		Fish Consumption				Drinking Water						
		EPA's 2004 NRWQC (organism only)	Portland Harbor specific fish consumption rate	DEQ's 2004 AWQC (organism only)	Portland Harbor specific fish consumption rate	MCL	Tap Water PRGs	EPA's 2004 NRWQC (chronic)	DEQ's 2004 AWQC (chronic)	Oak Ridge National Laboratory's (Tier II SCV)[(J)]	MacDonald PECs and other SQVs [(I)]	DEQ 2007 Bioaccumulative Sediment SLVs [(E)]
		17.5 g/day consumption rate	175 g/day consumption rate	17.5 g/day consumption rate	175 g/day consumption rate							
Units		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/kg	µg/kg
1,1,1,2- Tetrachloroethane	630-20-6						**2.5**					
1,1,1- Trichloroethane (TCA)	71-55-6					200	840			**11**		
1,1,2,2- Tetrachloroethane	79-34-5	4	0.4	4	0.4		**0.33**		2,400 [(16)]	**610**		
1,1,2- Trichloroethane	79-00-5	16	1.6	16	1.6	5	**1.2**		9,400 [(16)]	**1,200**		
1,1- Dichloroethane	75-34-3						1200			**47**		
1,2,3- Trichloropropane	96-18-4						**0.0095**					
1,2- Dichloroethane (EDC)	107-06-2	37	3.7	37	3.7	5	**0.73**		20,000 [(16)]	910		
cis-1,2-Dichloroethlyene	156-59-2					70	**61**					
1,2- Dichloropropane	78-87-5	15	1.5	15	1.5	5	**0.97**					
1,2- Dibromoethane (EDB)	106-93-4						**0.033**					
2- Butanone (MEK)	78-93-3						**7,100**			14,000		
2- Chloroethyl Vinyl Ether	110-75-8											
2- Hexanone	591-78-6									**99**		
4- Methyl-2-Pentanone (MIBK)	108-10-1						2000			**170**		
Acetone	67-64-1						5,500			**1,500**		
Acrolein	107-02-8	290	29	290	29		**0.042**		21 [(16)]			
Acrylonitrile	107-13-1	0.25	0.025	0.25	0.025		**0.12**		2,600 [(16)]			
Bromochloromethane	74-97-5											
Bromodichloromethane	75-27-4						**1.1**					
Bromoform	75-25-2	140	14	140	14		**8.5**					
Bromomethane	74-83-9						**8.7**					
Carbon Disulfide	75-15-0						1,000			**0.92**		
Carbon Tetrachloride	56-23-5	1.6	0.16	1.6	0.16	5	**0.51**			9.8		
Chlorobenzene	108-90-7	1600	160	1,600	160	100	91		**50 [(16)]**	64		
Chlorodibromomethane	124-48-1	13	1.3	13	1.3		**0.79**					
Chloroethane	75-00-3						**23**					
Chloroform	67-66-3	470	47	470	47		**0.17**		1,240 [(16)]	28		
Chloromethane	74-87-3						**2.1**					
cis-1,2-dichloroethylene	156-59-2									**590**		
cis-1,3-Dichloropropene	10061-01-5									**0.055**		
Dibromomethane	74-95-3						**61**					
Dichlorodifluoromethane	75-71-8						**390**					
Iodomethane (Methyl Iodide)	74-88-4											
Isopropylbenzene	98-82-8						**660**					
Methylene chloride	75-09-2	590	59	590	59		**8.9**			2,200		
Styrene	100-42-5					**100**	1,600					
trans-1,4-Dichloro-2-butene	110-57-6						**7100**					
Trichlorofluoromethane	75-69-4						**1,300**					
Vinyl Acetate	108-05-4						410			**16**		
Benzene	71-43-2	51	5.1	51	5.1	5	**1.2**			130		

Table 3-1 Screening Level Values for Soil/Stormwater Sediment, Stormwater, Groundwater, and Surface Water[A]

Chemical		GROUNDWATER / SURFACE WATER / STORMWATER						GROUNDWATER / SURFACE WATER / STORMWATER			UPLAND SOIL / STORMWATER SEDIMENT [D]	
		Water [C]									**Soil/Stormwater Sediment[D]**	
		Human Health #						Ecological Receptors #			Toxicity	Bioaccumulation
		Fish Consumption				Drinking Water						
		EPA's 2004 NRWQC (organism only)	Portland Harbor specific fish consumption rate	DEQ's 2004 AWQC (organism only)	Portland Harbor specific fish consumption rate	MCL	Tap Water PRGs	EPA's 2004 NRWQC (chronic)	DEQ's 2004 AWQC (chronic)	Oak Ridge National Laboratory's (Tier II SCV)[j]	MacDonald PECs and other SQVs [1]	DEQ 2007 Bioaccumulative Sediment SLVs [E]
		17.5 g/day consumption rate	175 g/day consumption rate	17.5 g/day consumption rate	175 g/day consumption rate							
Units		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/kg	µg/kg
EthylBenzene	100-41-4	2,100	210	2,100	210	700	1,300			**7.3**		
m,p-Xylene										**1.8[f]**		
o-Xylene	95-47-6						1400			**13[g]**		
Xylenes (total)	1330-20-7					10,000	**200**					
Methyltert-butyl ether	1634-04-4						**37**					
Tetrachloroethene (PCE)	127-18-4	3.3	0.33	3.3	0.33	5	**0.12**		840 [16]	98	**500[7]**	
Toluene	108-88-3	15,000	1,500	15,000	1,500	1,000	2300			**9.8**		
trans-1,2-Dichloroethene	156-60-5	10,000	1,000	10,000	1,000	100	**110**			590		
trans-1,3-Dichloropropene	10061-02-6						0.4			**0.055**		
Trichloroethene (TCE)	79-01-6	30	3	30	3	5	**0.17**		21,900 [16]	47	**2,100[7]**	
Vinyl Chloride	75-01-4	2.4	0.24	2.4	0.24	2	**0.015**					
Semivolatile Organic Compounds												
Halogenated Compounds												
1,2-Dichlorobenzene	95-50-1	1,300	130	1,300	130	600	**49**		763 [16]	14	**1,700 [7]**	
1,3-Dichlorobenzene	541-73-1	960	96	960	96		**14**		763 [16]	71	**300 [7]**	
1,4-Dichlorobenzene	106-46-7	190	19	190	19	75	**2.8**		763 [16]	15	**300 [7]**	
1,2,4-Trichlorobenzene	120-82-1	70	7	70	7	70	**8.2**			110	**9,200 [7]**	
Hexachlorobenzene	118-74-1	**0.00029**	0.000029	0.00029	0.000029	1	0.042				100 [6]	**19 [33]**
2-Chloronaphthalene	91-58-7	1,600	160	1,600	160		**490**					
Hexachloroethane	67-72-1	**3.3**	0.33	3.3	0.33		4.8		540 [16]	12		
Hexachlorobutadiene	87-68-3	18	1.8	18	1.8		**0.86**		9.3 [16]		**600 [8]**	
Hexachlorocyclopentadiene	77-47-4	1,100	110	1,100	110	50	220		**5.2 [16]**		**400 [8]**	
2,2'-oxybis(1-chloropropane)	108-60-1						**0.95**					
Bis-(2-chloroethoxy) methane	111-91-1											
Bis-(2-chloroethyl) ether	111-44-4	0.53	0.053	0.53	0.053		**0.06**					
4-Chlorophenyl-phenyl ether	7005-72-3						**0.06**					
4-bromophenyl-phenyl ether	101-55-3											
3,3'-Dichlorobenzidine	91-94-1	**0.028**	0.0028	0.028	0.0028		0.15		763 [16]			
4-Chloroaniline	106-47-8						**150**					
Organonitrogen Compounds												
Nitrobenzene	98-95-3	690	69	690	69		**3.4**					
Aniline	62-53-3						**12**					
2-Nitroaniline	88-74-4						**110.0**					
3-Nitroaniline	99-09-2						**3.2**					
4-Nitroaniline	100-01-6						**3.2**					

Table 3-1 Screening Level Values for Soil/Stormwater Sediment, Stormwater, Groundwater, and Surface Water[A]

Chemical		GROUNDWATER / SURFACE WATER / STORMWATER						GROUNDWATER / SURFACE WATER / STORMWATER			UPLAND SOIL / STORMWATER SEDIMENT [D]	
		Water [C]									**Soil/Stormwater Sediment[D]**	
		Human Health #						Ecological Receptors #			Toxicity	Bioaccumulation
		Fish Consumption				Drinking Water						
		EPA's 2004 NRWQC (organism only)	Portland Harbor specific fish consumption rate	DEQ's 2004 AWQC (organism only)	Portland Harbor specific fish consumption rate	MCL	Tap Water PRGs	EPA's 2004 NRWQC (chronic)	DEQ's 2004 AWQC (chronic)	Oak Ridge National Laboratory's (Tier II SCV)[j]	MacDonald PECs and other SQVs [1]	DEQ 2007 Bioaccumulative Sediment SLVs [E]
		17.5 g/day consumption rate	175 g/day consumption rate	17.5 g/day consumption rate	175 g/day consumption rate							
Units		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/kg	µg/kg
N-Nitrosodimethylamine	62-75-9	3	0.3	3	0.3		**0.00042**					
N-Nitroso-di-n-propylamine	621-64-7	0.51	0.051	0.51	0.051		**0.0096**					
N-Nitrosodiphenylamine	86-30-6	**6**	0.6	6	0.6		14			210		
2,4-Dinitrotoluene	121-14-2	**3.4**	0.34	3.4	0.34		73					
2,6-Dinitrotoluene	606-20-2						**37**					
Carbazole	86-74-8						**3.4**				**1,600 [5]**	
Oxygen-Containing Compounds												
Benzoic Acid	65-85-0						150,000			**42**		
Benzyl Alcohol	100-51-6						11,000			**8.6**		
Dibenzofuran	132-64-9						12			**3.7**		
Isophorone	78-59-1	960	96	960	96		**71**					
Phenols and Substituted Phenols												
Phenol	108-95-2	1,700,000	170,000	1,700,000	170,000		11,000		**2,560 [16]**		**50 [5, 6]**	
2-Methylphenol (o-Cresol)	95-48-7						1,800			**13**		
4-Methylphenol (p-Cresol)	106-44-5						**180**					
2,4-Dimethylphenol	105-67-9	850	85	850	85		**730**					
2-Chlorophenol	95-57-8	150	15	150	15		**30**		2,000 [16]			
2,4-Dichlorophenol	120-83-2	290	29	290	29		**110**		365 [16]			
2,4,5-Trichlorophenol	95-95-4	**3,600 [24]**	360 [24]	3,600	360		3,700					
2,4,6-trichlorophenol	88-06-2	**2.4**	0.24	2.4	0.24		6.1		970 [16]			
2,3,4,6-Tetrachlorophenol	58-90-2						**1,100**					
Pentachlorophenol	87-86-5	3	0.3	3	0.3	1	**0.56**	15 [22]	13 [14,23]		1,000 [8]	**250 [33]**
4-Chloro-3-methylphenol	59-50-7											
2-Nitrophenol	88-75-5						1100		**150 [16]**			
4-Nitrophenol	100-02-7						290		**150 [16]**	300		
2,4-Dinitrophenol	51-28-5	5,300	530	5,300	530		**73**		150 [16]			
Methyl-4,6-Dinitrophenol 2-	534-52-1	280	28	280	28				**150 [16]**			
Phthalate Esters												
Dimethylphthalate	131-11-3	1,100,000	110,000	1,100,000	110,000		370,000		**3 [16]**			
Diethylphthalate	84-66-2	44,000	4,400	44,000	4,400		29,000		**3 [16]**	210	**600 [7]**	
Di-n-butylphthalate	84-74-2	4,500	450	4,500	450		3,700		**3 [16]**		100 [6]	**60**
Butylbenzylphthalate	85-68-7	1900	190	1900	190		7,300		**3 [16]**	19		
Di-n-octylphthalate	117-84-0						1,500		**3 [16]**			
bis(2-Ethylhexyl)phthalate	117-81-7	**2.2**	0.22	2.2	0.22	6	4.8		3 [16]		800 [5, 6]	330

Table 3-1 Screening Level Values for Soil/Stormwater Sediment, Stormwater, Groundwater, and Surface Water[(A)]

Chemical		GROUNDWATER / SURFACE WATER / STORMWATER						GROUNDWATER / SURFACE WATER / STORMWATER			UPLAND SOIL / STORMWATER SEDIMENT [(D)]	
		Water [(C)]									**Soil/Stormwater Sediment[(D)]**	
		Human Health[#]						Ecological Receptors[#]			Toxicity	Bioaccumulation
		Fish Consumption				Drinking Water						
		EPA's 2004 NRWQC (organism only)	Portland Harbor specific fish consumption rate	DEQ's 2004 AWQC (organism only)	Portland Harbor specific fish consumption rate	MCL	Tap Water PRGs	EPA's 2004 NRWQC (chronic)	DEQ's 2004 AWQC (chronic)	Oak Ridge National Laboratory's (Tier II SCV)[(I)]	MacDonald PECs and other SQVs [(1)]	DEQ 2007 Bioaccumulative Sediment SLVs [(E)]
		17.5 g/day consumption rate	175 g/day consumption rate	17.5 g/day consumption rate	175 g/day consumption rate							
Units		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/kg	µg/kg
Polycyclic Aromatic Hydrocarbons												
Naphthalene	91-20-3					**0.2** [(26)]	6.2		620 [(16)]	12	**561** [(2)]	
2-Methylnaphthalene	91-57-6					**0.2** [(26)]				2.1[(h)]	**200** [(11)]	
Acenaphthylene	208-96-8					**0.2** [(26)]					**200** [(6)]	
Acenaphthene	83-32-9	990	99	990	99	**0.2** [(26)]	370		520 [(16)]		**300** [(6)]	
Fluorene	86-73-7	5,300	530	5,300	530	**0.2** [(26)]	240			3.9	**536** [(2)]	
Phenanthrene	85-01-8					**0.2** [(26)]					**1,170** [(2)]	
Anthracene	120-12-7	40,000	4,000	40,000	4,000	**0.2** [(26)]	1,800			0.73	**845** [(2)]	
Fluoranthene	206-44-0	140	14	140	14	**0.2** [(26)]	1,500				**2,230** [(2)]	37000 [(32)]
Pyrene	129-00-0	4,000	400	4,000	400	**0.2** [(26)]	180				**1,520** [(2)]	1900 [(32)]
Benzo(a)anthracene	56-55-3	**0.018**	0.0018	0.018	0.0018	0.2 [(26)]	0.092			0.027	**1,050** [(2)]	
Chrysene	218-01-9	**0.018**	0.0018	0.018	0.0018	0.2 [(26)]	9.2				**1,290** [(2)]	
Benzo(b)fluoranthene	205-99-2	**0.018**	0.0018	0.018	0.0018	0.2 [(26)]	0.092					
Benzo(k)fluoranthene	207-08-9	**0.018**	0.0018	0.018	0.0018	0.2 [(26)]	0.92				**13,000** [(6)]	
Benzo(a)pyrene	50-32-8	**0.018**	0.0018	0.018	0.0018	0.2	0.0092			0.014	**1,450** [(2)]	
Indeno(1,2,3-cd)pyrene	193-39-5	**0.018**	0.0018	0.018	0.0018	0.2 [(26)]	0.092				**100** [(10)]	
Dibenz(a,h)anthracene	53-70-3	**0.018**	0.0018	0.018	0.0018	0.2 [(26)]	0.0092				**1,300** [(9)]	
Benzo(g,h,i)perylene	191-24-2					**0.2** [(26)]					**300** [(16)]	
Chlorinated Dioxins and Furans												
2,3,7,8,-TCDD (Toxicity Equivalence Quotient	1746-01-6	**5.1E-09**	5.1E-10	5.1E-09	5.1E-10	0.00003	4.5E-07					
2,3,7,8,-TCDD	1746-01-6	**5.1E-09**	5.1E-10	5.1E-09	5.1E-10		4.5E-07		0.00038 [(16)]		0.009 [(6)]	**0.0000091** [(33)]
2,3,7,8,-TCDF												**0.00077** [(33)]
1,2,3,7,8,-PeCDD												**0.0026** [(33)]
1,2,3,7,8,-PeCDF												**0.0026** [(33)]
2,3,4,7,8,-PeCDF												**0.00003** [(33)]
2,3,4,7,8,-PeCDF												
1,2,3,6,7,8,-HxCDD												
1,2,3,7,8,9,-HxCDD												
1,2,3,4,7,8,-HxCDF												**0.0027** [(33)]
1,2,3,6,7,8,-HxCDF												**0.0027** [(33)]
1,2,3,7,8,9,-HxCDF												**0.0027** [(33)]

Table 3-1 Screening Level Values for Soil/Stormwater Sediment, Stormwater, Groundwater, and Surface Water[(A)]

		GROUNDWATER / SURFACE WATER / STORMWATER						GROUNDWATER / SURFACE WATER / STORMWATER			UPLAND SOIL / STORMWATER SEDIMENT [(D)]	
		Water [(C)]									**Soil/Stormwater Sediment[(D)]**	
		Human Health [#]						Ecological Receptors [#]			Toxicity	Bioaccumulation
		Fish Consumption				Drinking Water						
Chemical		EPA's 2004 NRWQC (organism only) 17.5 g/day consumption rate	Portland Harbor specific fish consumption rate 175 g/day consumption rate	DEQ's 2004 AWQC (organism only) 17.5 g/day consumption rate	Portland Harbor specific fish consumption rate 175 g/day consumption rate	MCL	Tap Water PRGs	EPA's 2004 NRWQC (chronic)	DEQ's 2004 AWQC (chronic)	Oak Ridge National Laboratory's (Tier II SCV)[(J)]	MacDonald PECs and other SQVs [(I)]	DEQ 2007 Bioaccumulative Sediment SLVs [(E)]
Units		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/kg	µg/kg
2,3,4,6,7,8,-HxCDF												**0.0027** [(33)]
1,2,3,4,6,7,8,-HpCDD												**0.69** [(33)]
1,2,3,4,6,7,8,-HpCDF												**0.69** [(33)]
1,2,3,4,7,8,9,-HpCDF												**0.69** [(33)]
OCDD	3268-87-9											**23** [(33)]
OCDF	39001-02-0											**23** [(33)]
Total tetrachlorinated dioxins												
Total pentachlorinated dioxins												
Total hexachlorinated dioxins												
Total heptachlorinated dioxins												
Total tetrachlorinated furans												
Total pentachlorinated furans												
Total hexachlorinated furans												
Total heptachlorinated furans												

Notes:

[A] Stormwater values in this table are intended for screening non-permitted discharges.

[C] EPA, under CERCLA authority, has identified the Sage Drinking Water Act's MCLs and AWQCs (federal and state, once approved) as potentialARARs under CERCLA. The final determination of whether MCLs or AWQC are ARARs will be made in the EPA Portland Harbor Record of Decision (ROD). Decisions to implement source control, prior to the EPA Portland Harbor ROD, due to an exceedance of an SLV in upland groundwater or stormwater will be prioritized and evaluated on a case-by-case basis.

[D] Stormwater sediment is defined as either catch basin sediment, conveyance line sediment, or stormwater particulates

[E] All values are from DEQ Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment, January 31, 2007.

[ ] a blank cell indicates an SLV was not available at the time of the last update. DEQ or EPA may develop additional SLVs as determined necessary, on a case-by-case basis.

[1] The values were chosen by first referring to the PEC's in the paper listed in footnote 2. If the analyte was not found, we then used the other literature listed in footnotes 3 through 11 to find the value.

[2] These values were taken MacDonald DD, Ingersoll C.G., Berger T.A. (2000) Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Environmental Contamination and Toxicity 39: 20-31.

[3] Sediment quality value (Hyalella), Washington State, quoted in MacDonald et al. (1999); Appendix 3-1.

[4] Quoted in MacDonald et al. (1999); Appendix 3-1

[5] Lowest Apparent Effects Threshold (LAET), Table 11, WDOE (1997)

[6] Upper Effects Threshold (UET), Freshwater Sediment (NOAA, 1999)

[7] USEPA sediment quality advisory level, quoted in MacDonald et al. (1999); Appendix 3-1

[8] New York State acute criterion, quoted in MacDonald et al. (1999); Appendix 3-1

[9] Severe effect level, British Columbia, quoted in MacDonald et al. (1999); Appendix 3-1

[10] 5x conversion from measured "LOW" to estimated "HIGH", NOAEL to chronic LOAEL per USEPA (1997b

[11] PEL, British Columbia, quoted in MacDonald et al. (1999); Appendix 3-1

[12] Based on Notice of Availability of Final Aquatic Life Criteria Document for Tributyltin (69 Fed. Reg. 2, 342). USGS web site (http://nwis.waterdata.usgs.gov/or/nwis/qwdata/?site_no=14211720&agency_cd=USGS)

[13] These values for aluminum are expressed in terms of "total recoverable" concentration of metal in the water column. The criterion applies at pH<6.6 and hardness<12 mg/L (as $CaCO_3$)

[14] These values were taken from OAR 340-41 Table 20 because they will remain the enforceable values for these particular analytes

[15] This is a hardness dependent metal. All values were calculated based on 25 mg/l of $CaCO_3$.

[16] Values were taken from Table 33c (OAR 340-41), which are Water Quality Guidance Values, not criteria, that can be used in the application of Oregon's Narrative Toxics Criteria to waters of the state in order to protect aquatic life.

[18] Cyanide value is based on a free cyanide value per DEQ OAR 340-41 Table 33, and EPA values are based on total Cyanide

[19] This metal is listed as the total recoverable metal in the water column

[20] This fish tissue residue criterion for methylmercury is based on a total fish consumption rate of 0.0175 kg/day

[22] Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows: Chronic = exp(1.005(ph)-5.134). The value displayed in the table corresponds to a pH of 7.8

[23] Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows: Chronic = exp(1.005(ph)-5.29). The value displayed in the table corresponds to a pH of 7.8

[24] Listed as a secondary pollutant by EPA

[#] Table 20 from OAR 340-40 was superceded by Tables 33A, 33B, and 33C. As noted above, 33A and 33C were adopted the Oregon Environmental Commission and were effective in February 2005. Implementation of Table 33B (i.e., metals) is pending EPA approval; Table 20 will be used for the compounds listed in Table 33B, pending approval and implementation.

Tier II SCV

(a) = value for Arsenic V

(b) = see notation for ORNL's Mercury value

(c) = SCV for BHC (other)

(d) = SCV for p,p' DDD

(e) = SCV for p,p' DDT

(f) = SCV for m-Xylene

General

AWQC = ambient water quality criteria

MRL = minimum reporting limit

NRWQC = National Recommended Water Quality Criteria

ORNL = Oak Ridge National Laboratory

PRG = preliminary remediation goals

(g) = SCV for Xylene mixture

(h) = SCV for 1-Methylnaphthalene

(!) Screening level values (SLVs) presented in this table may be revised or augmented as data become available from the Portland Harbor RI/FS or in the event the standards, criteria, guidelines or toxicological data are updated. Prior to using this Table, DEQ's website should be checked for updates to this table at http://www.deq.state.or.us/nwr/PortlandHarbor/jscs.

(j) = Tier II SCV values were taken from Suter II, G.W. and Tsao, C.L., 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. ORNL publication ES/ER/TM-96/R2

MCL

[26] MCL is based on benzo(a)pyrene

[29] National Secondary Drinking Water Standards

[31] Presumed background, per Table A-1, DEQ Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment, January, 31, 2007.

[32] Freshwater fish, per Table A-1, DEQ Guidance for Bioaccumulative Chemcials of Concern in Sediment, January 31, 2007.

[33] Human Health General Population, per Table A-1, DEQ Guidance for Bioaccumulative Chemicals of Concern in Sediment, January 31, 2007.

[34] This value represents the sum of the 2,4' and 4,4' isomers.

[35] This value represents the sum of DDE + DDD + DDT.

TT = see footnote 7 on EPA NPD Drinking Water Standards

APPENDIX B

JSCS SLV EVALUATION

U.S. Moorings Feasibility Study
Appendix B Table B-1
Industrial Area Shallow Soil Sampling Results
Screened to EPA Region 6 SLVs

Sample Number			SCREENING CRITERIA **		SB-17-1		SB-16-1		SB-12-1		SB-11-1		SB-04-1		SB-06-1		SB-07-1		SB-19-1		SB-18-1		SB-01-1		SB-05-1		FD of SB-05-1		SB-09-1		SB-08-1		SB-10-1		SB-15-1		SB-13-1		SB-14-1	
Blind ID Number			EPA Region 6 Industrial Soil		171		161		121		111		41		61		71		191		181		11		51		510		91		81		101		151		131		141	
Sample Depth (approx. feet/bgs)			0.1 of		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		0-4'		1-4'	
Date Collected			Non-cancer	Cancer	10-Mar		9-Mar		8-Mar		7-Mar		4-Mar		4-Mar		5-Mar		8-Mar		8-Mar		7-Mar		6-Mar		6-Mar		5-Mar		4-Mar		5-Mar		9-Mar		6-Mar		3-Mar	
Matrix					Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
Basis					Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry	
LAB Service Request ID #					K0802057		K0802056		K0802056		K0802031		K0801820		K0801820		K0801921		K0802056		K0802056		K0802031		K0801963		K0801963		K0801921		K0801820		K0801921		K0802057		K0801963		K0801820	
Analysis Group	**Chemical**	**CAS #**	**µg/kg**	**µg/kg**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**
VOCs																																								
	cis-1,2-Dichloroethlyene	156-59-2	16,290		6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Dichlorodifluoromethane	75-71-8	34,301		6.8	U	7.8	U	5.7	U	0.26	J	1.6	J	6.2	U	0.36	J	5.6	U	5.2	U	5.5	U	6.9	U	5	J	5.9	U	0.58	J	5.8	U	5.8	U	7.4	U	0.25	J
	Chloromethane	74-87-3	17,252		6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Vinyl Chloride	75-01-4	16,065	863	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Bromomethane	74-83-9	1,456		6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Chloroethane	75-00-3	2,053,820	7,221	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Trichlorofluoromethane	75-69-4	142,086		6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	0.18	J	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	0.26	J	4.4	U
	Acetone	67-64-1	6,047,980		28	U	32	U	39	U	35	U	28	U	56	U	62	=	51	U	34	U	22	U	29	U	32	U	32	U	25	U	39	U	24	=	42	U	18	U
	Iodomethane (Methyl Iodide)	74-88-4			28	U	32	U	23	U	27	U	28	U	25	U	7.3	J	23	U	21	U	22	U	28	U	27	U	24	U	25	U	24	U	24	U	30	U	18	U
	1,1-Dichloroethene (1,1-DCE)	75-35-4			6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Carbon Disulfide	75-15-0	133,805		6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	1.9	J	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Methylene chloride (Dichloromethane)	75-09-2	1,007,795	22,254	14	U	16	U	12	U	14	U	14	U	13	U	0.42	J	12	U	11	U	11	U	14	U	14	U	12	U	13	U	12	U	12	U	15	U	8.8	U
	Acrylonitrile	107-13-1	2,851	546	28	U	32	U	23	U	27	U	28	U	25	U	22	U	23	U	21	U	22	U	28	U	27	U	24	U	25	U	24	U	24	U	30	U	18	U
	Methyltert-butyl ether	1634-04-4	2,237,923	78,582	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	trans-1,2-Dichloroethene	156-60-5	20,362		6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	1,1-Dichloroethane	75-34-3	320,034		6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Vinyl Acetate	108-05-4	155,487		28	U	32	U	23	U	27	UJ	28	U	25	U	22	U	23	U	21	U	22	U	28	U	27	U	24	U	25	U	24	U	24	U	30	U	18	U
	2-Butanone (MEK)	78-93-3	12,816,822		28	U	32	U	23	U	27	U	28	U	25	U	5.6	J	23	U	21	U	22	U	28	U	27	U	24	U	25	U	4.3	J	24	U	30	U	18	U
	Chloroform	67-66-3	21,058	580	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Chloroform	74-97-5	113,334	2,559	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	1,1,1-Trichloroethane (TCA)	71-55-6	1,926,660		6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Bromodichloromethane	75-27-4	113,334	2,559	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Carbon Tetrachloride	56-23-5	79,489	582	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	1,2-Dichloroethane (EDC)	107-06-2	3,916	841	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Benzene	71-43-2	13,186	1,598	6.8	U	7.8	U	1	J	6.6	U	6.8	U	2	J	2.7	J	2.3	J	5.2	U	1.2	J	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Trichloroethene (TCE)	79-01-6	11,267	102	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	1,2-Dichloropropane	78-87-5	2,350	847	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	2-Chloroethyl Vinyl Ether	110-75-8			14	U	16	U	12	U	14	UJ	14	U	13	U	11	U	12	U	11	U	11	U	14	U	14	U	12	U	13	U	12	U	12	U	15	U	8.8	U
	Dibromomethane	74-95-3	59,281		6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	2-Hexanone	591-78-6			28	U	32	U	23	U	27	U	28	U	25	U	22	U	23	U	21	U	22	U	28	U	27	U	24	U	25	U	24	U	24	U	30	U	18	U
	cis-1,3-Dichloropropene	10061-01-5	5,275	1,747	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Toluene	108-88-3	2,191,388		6.8	U	7.80	U	0.45	J	0.96	J	6.8	U	6.2	U	5.5	U	0.57	J	0.14	J	0.34	J	0.38	J	0.45	J	5.90	U	6.2	U	5.8	U	0.36	J	1.00	J	4.4	U
	trans-1,3-Dichloropropene	10061-02-6	5,275	1,747	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	1,1,2-Trichloroethane	79-00-5	16,633	2,078	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	4-Methyl-2-Pentanone (MIBK)	108-10-1	5,219,940		28	U	32	U	23	U	27	U	28	U	25	U	22	U	23	U	21	U	22	U	28	U	27	U	24	U	25	U	24	U	24	U	30	U	18	U
	Tetrachloroethene (PCE)	127-18-4	242,593	1,735	6.8	U	7.8	U	0.82	J	6.6	U	6.8	U	6.2	U	5.5	U	4.7	J	1.2	J	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	2.6	J	5.8	U	7.4	U	4.4	U
	Dibromochloromethane	124-48-1	154,091	2,568	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Chlorobenzene	108-90-7	50,344		6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	1,1,1,2-Tetrachloroethane	630-20-6	210,696	7,591	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Ethylbenzene	100-41-4	646,145		6.8	U	7.8	U	5.7	U	6.6	U	0.3	J	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	m,p-Xylene	1330-20-7	70,995		6.8	U	7.8	U	0.22	J	0.33	J	1.1	J	0.32	J	0.27	J	5.6	U	5.2	U	5.5	U	0.69	J	0.89	J	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	o-Xylene	95-47-6	227,111,111		6.8	U	7.8	U	5.7	U	6.6	U	0.33	J	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	0.33	J	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Styrene	100-42-5	2,167,228		6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Bromoform	75-25-2	1,368,014	242,444	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	Isopropylbenzene	98-82-8	57,989		28	U	32	U	23	U	27	U	28	U	25	U	22	U	23	U	21	U	22	U	28	U	27	U	24	U	25	U	24	U	24	U	30	U	18	U
	1,1,2,2-Tetrachloroethane	79-34-5	421,392	970	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	trans-1,4-Dichloro-2-butene	110-57-6		20	28	U	32	U	23	U	27	U	28	U	25	U	22	U	23	U	21	U	22	U	28	U	27	U	24	U	25	U	24	U	24	U	30	U	18	U
	1,2,3-Trichloropropane	96-18-4	1,230	1,590	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
	1,4-Dichlorobenzene	106-46-7	1,127,833		6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	0.21	J	5.8	U	7.4	U	4.4	U
	Naphthalene	91-20-3	20,898		28	U	32	U	23	U	27	U	28	U	25	U	22	U	23	U	21	U	22	U	28	U	27	U	24	U	25	U	24	U	24	U	30	U	18	U
	Acrolein	107-02-8	37		140	U	160	U	120	U	140	U	140	UJ	130	U	110	UJ	120	U	110	UJ	110	UJ	140	U	140	U	120	U	130	U	120	U	120	U	150	U	88	U
	1,2-Dibromoethane (EDB)	106-93-4	13,311	70	6.8	U	7.8	U	5.7	U	6.6	U	6.8	U	6.2	U	5.5	U	5.6	U	5.2	U	5.5	U	6.9	U	6.6	U	5.9	U	6.2	U	5.8	U	5.8	U	7.4	U	4.4	U
SVOCs																																								
	Phenols and Substituted Phenols																																							
	2,4,6-trichlorophenol	88-06-2	68,407	174,111	5.4	U	0.42	J	5.4	U	5.5	UJ	6	U	5.9	U	6.4	U	5.4	U	5.5	U	5.4	U	5.8	U	5.8	U	6.4	U	6.7	U	5.6	U	6.2	U	5.7	U	5.8	U
	2,4,5-Trichlorophenol	95-95-4	6,840,070	-	5.4	U	6	U	5.4	U	5.5	U	3.4	J	5.9	U	6.4	U	5.4	U	5.5	U	5.4	U	5.8	U	5.8	U	4.3	J	6.7	U	5	J	6.2	U	5.7	U	5.8	U
	2,3,4,5-Tetrachlorophenol	4901-51-3	-	-	5.4	U	6	U	5.4	U	5.5	U	6	U	5.9	U	6.4	U	5.4	U	5.5	U	5.4	U	5.8	U	5.8	U	6.4	U	6.7	U	5.6	U	6.2	U	5.7	U	5.8	U
	2,3,5,6-Tetrachlorophenol	935-95-5	-	-	5.4	U	6	U	5.4	U	5.5	U	6	U	5.9	U	6.4	U	5.4	U	5.5	U	5.4	U	5.8	U	5.8	U	6.4	U	6.7	U	5.6	U	6.2	U	5.7	U	5.8	U
	Pentachlorophenol	87-86-5	1,285,461	9,998	5.4	U	5.2	J	5.4	U	0.26	J	0.26	J	5.9	U	6.4	U	0.34	J	5.5	U	0.28	= J	0.39	J	0.41	J	6.4	U	6.7	U	0.44	J	0.21	J	5.7	U	5.8	U

** Screening Values updated from Region 6 Human Health Medium-Specific Screening Levels 2008; March 2008, Industrial Soils, Outdoor Worker, Integrated.
Yellow Shading may indicate an exceedance of either SLV

U.S. Moorings Feasibility Study
Appendix B Table B-1
Industrial Area Shallow Soil Sampling Results
Screened to EPA Region 6 SLVs

Sample Number			**SCREENING CRITERIA ****		SB-17-1		SB-16-1		SB-12-1		SB-11-1		SB-04-1		SB-06-1		SB-07-1		SB-19-1		SB-18-1		SB-01-1		SB-05-1		FD of SB-05-1		SB-09-1		SB-08-1		SB-10-1		SB-15-1		SB-13-1		SB-14-1	
Blind ID Number			EPA Region 6 Industrial Soil		171		161		121		111		41		61		71		191		181		11		51		510		91		81		101		151		131		141	
Sample Depth (approx. feet/bgs)			0.1 of		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		0-4'		1-4'	
Date Collected			Non-cancer	Cancer	10-Mar		9-Mar		8-Mar		7-Mar		4-Mar		4-Mar		5-Mar		8-Mar		8-Mar		7-Mar		6-Mar		6-Mar		5-Mar		4-Mar		5-Mar		9-Mar		6-Mar		3-Mar	
Matrix					Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
Basis					Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry	
LAB Service Request ID #					K0802057		K0802056		K0802056		K0802031		K0801820		K0801820		K0801921		K0802056		K0802056		K0802031		K0801963		K0801963		K0801921		K0801820		K0801921		K0802057		K0801963		K0801820	
Analysis Group	**Chemical**	**CAS #**	**µg/kg**	**µg/kg**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**
	Polycyclic Aromatic Hydrocarbons (PAHs)																																							
	Naphthalene	91-20-3	20,898	-	7.9	=	150	=	120	=	43	=	14	=	17	=	2.6	U	17	=	15	=	13	=	1.3	J	8.3	=	3.9	U	6.3	=	2.5	U	19	=	0.92	J	2.4	=
	2-Methylnaphthalene	91-57-6	-	-	1.6	J	53	=	38	=	35	=	2.7	=	2.9	=	1.6	U	4.5	=	7.6	=	3.5	=	1.9	J	1.8	J	2.4	U	2.1	J	1.9	U	6.6	=	1.3	J	0.59	J
	1-Methylnaphthalene	90-12-0	-	-	0.89	J	26	=	19	=	20	=	1.4	J	1.9	J	1.6	U	3.4	=	4.4	=	2.1	= J	1.1	J	1.1	J	1.9	J	1.1	J	1.9	U	4.7	=	0.59	J	2.4	U
	Acenaphthylene	208-96-8	-	-	3.6	=	110	=	30	=	9.1	=	13	=	13	=	2.8	=	13	=	9.6	=	6.2	=	5.8	=	6.2	=	9.5	=	12	=	6.1	=	15	=	5.9	=	0.8	J
	Acenaphthene	83-32-9	3,250,282	-	2.5	U	11	=	2.7	=	1.2	J	1.4	J	5.4	=	1.2	J	1.2	J	0.66	J	2.3	= J	2.1	J	1.7	J	4.4	=	2.9	=	10	=	8.8	=	1	J	2.4	U
	Fluorene	86-73-7	2,622,198	-	0.65	J	26	=	10	=	3	=	2.1	J	3.9	=	0.79	J	4.2	=	1.6	J	1.8	= J	1.4	J	1.5	J	5.7	=	2.4	J	7.3	=	6.1	=	1.3	J	2.4	U
	Dibenzofuran	132-64-9	173,789	-	2.5	U	9.9	=	8.3	=	4.4	=	0.61	J	1.4	J	1.6	U	2.2	J	1.3	J	1.1	= J	0.86	J	0.69	J	2.2	U	0.65	J	2.6	=	2.6	=	0.9	J	2.4	U
	Phenanthrene	85-01-8	-	-	26	=	1,400	=	270	=	100	=	70	=	110	=	33	=	100	=	49	=	44	=	46	=	38	=	130	=	86	=	160	=	140	=	39	=	4.3	=
	Anthracene	120-12-7	26,494,973	-	3.6	=	94	=	45	=	10	=	14	=	20	=	6.6	=	16	=	8.7	=	7.2	=	10	=	11	=	63	=	23	=	33	=	24	=	8.6	=	0.84	J
	Fluoranthene	206-44-0	2,444,484	-	89	=	3,500	=	460	=	220	=	300	=	390	=	130	=	320	=	190	=	78	=	150	=	140	=	220	=	230	=	400	=	480	=	140	=	15	=
	Pyrene	129-00-0	3,197,938	32,000,000	130	=	4,200	=	670	=	380	=	500	=	570	=	190	=	450	=	300	=	130	=	230	=	210	=	290	=	290	=	560	=	670	=	200	=	25	=
	Benzo(b)fluoranthene	205-99-2	-	2,344	120	=	4,500	=	540	=	410	=	440	=	480	=	120	=	450	=	320	=	150	=	190	=	170	=	160	=	180	=	440	=	560	=	210	=	23	=
	Benzo(k)fluoranthene	207-08-9	-	23,441	38	=	1,500	=	160	=	110	=	130	=	140	=	36	=	140	=	98	=	39	=	56	=	56	=	53	=	56	=	150	=	170	=	68	=	6.3	=
	Benzo(a)anthracene	56-55-3	-	2,344	40	=	1,500	=	230	=	140	=	180	=	230	=	53	=	180	=	120	=	55	=	87	=	84	=	100	=	110	=	280	=	250	=	72	=	8.5	=
	Chrysene	218-01-9	-	234,414	52	=	2,200	=	350	=	190	=	280	=	310	=	74	=	280	=	150	=	100	=	120	=	120	=	130	=	130	=	360	=	320	=	90	=	11	=
	Benzo(a)pyrene	50-32-8	-	234	74	=	1,700	=	470	=	360	=	450	=	490	=	130	=	370	=	310	=	110	=	170	=	160	=	170	=	180	=	430	=	540	=	180	=	21	=
	Indeno(1,2,3-cd)pyrene	193-39-5	-	2,300	150	=	4,500	=	820	=	450	=	520	=	520	=	150	=	470	=	410	=	180	=	200	=	180	=	160	=	160	=	410	=	600	=	250	=	26	=
	Dibenz(a,h)anthracene	53-70-3	-	234	12	=	520	=	72	=	45	=	50	=	47	=	11	=	46	=	43	=	20	=	22	=	19	=	15	=	16	=	71	=	61	=	20	=	2	J
	Benzo(g,h,i)perylene	191-24-2		-	160	=	4,000	=	850	=	530	=	570	=	540	=	160	=	510	=	480	=	210	=	210	=	190	=	180	=	170	=	380	=	640	=	270	=	28	=
	Organonitrogen Compounds, Halogenated Compounds, Phenols and Substituted Phenols, Oxygen-Containing Compounds																																							
	n-Nitrosodimethylamine	62-75-9	547	38	45	U	500	U	100	U	50	UJ	49	U	49	U	32	U	98	U	250	U	50	U	50	U	50	U	43	U	50	U	37	U	47	U	50	U	48	U
	Aniline	62-53-3	477,777	336,003	18	U	200	U	40	U	20	UJ	20	UJ	20	U	13	U	39	U	100	U	20	U	20	U	20	U	17	U	20	U	15	U	19	U	20	U	20	U
	bis (2-Chloroethyl) ether	111-44-4	-	616	9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	Phenol	108-95-2	20,522,088		27	U	300	U	60	U	30	U	30	U	30	U	20	U	59	U	150	U	30	U	73	=	62	=	26	U	30	U	23	U	28	U	72	=	11	J
	2-Chlorophenol	95-57-8	26,250		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	1,3-Dichlorobenzene	541-73-1	14,422		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	1,4-Dichlorobenzene	106-46-7	1,127,833		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	1,2-Dichlorobenzene	95-50-1	4,479	8,067	9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	Benzyl Alcohol	100-51-6	20,520,210		9	U	99	U	20	U	9.9	U	4.3	J	2.8	J	2.8	J	20	U	50	U	10	U	10	U	10	U	8.5	U	3.7	J	7.4	U	9.4	U	6.6	J	3.3	J
	bis (2-Chloroisopropyl) ether	108-60-1	449,642	8,183	9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	UJ	10	UJ	8.5	U	10	U	7.4	U	9.4	U	10	UJ	9.6	U
	2-Methylphenol	95-48-7	3,420,348		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	Hexachloroethane	67-72-1	68,401	136,801	9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	n-Nitroso-di-n-propylamine	621-64-7		274	9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	4-Methylphenol (p-Cresol)	106-44-5	342,003		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	Nitrobenzene	98-95-3	11,456		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	Isophorone	78-89-1	13,680,140	2,016,021	9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	2-Nitrophenol	88-75-5			9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	2,4-Dimethylphenol	120-83-2	1,368,014		18	U	200	U	40	U	20	U	20	U	20	U	13	U	39	U	100	U	20	U	20	U	20	U	17	U	20	U	15	U	19	U	20	U	20	U
	bis (2-Chloroethoxy) methane	111-91-1			9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	2,4-Dichlorophenol	120-83-2	205,202		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	Benzoic Acid	65-85-0	273,602,796		180	U	2,000	U	400	U	200	UJ	200	U	200	U	130	U	390	U	1,000	U	200	UJ	210	=	210	=	170	U	200	U	150	U	190	U	170	J	200	U
	1,2,4-Trichlorobenzene	120-82-1	26,478		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	4-Chloroaniline	106-47-8	273,603		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	2.2	J
	Hexachlorobutadiene	87-68-3	68,407	24,554	9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	4-Chloro-3-methylphenol	59-50-7			9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	Hexachlorocyclopentadiene	77-47-4	406,524		45	U	500	U	100	U	50	U	49	U	49	U	32	U	98	U	250	U	50	U	50	U	50	U	43	U	50	U	37	U	47	U	50	U	48	U
	2-Chloronaphthalene	91-58-7	2,602,071		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	2-Nitroaniline	88-74-4	203,267		18	U	200	U	40	U	20	U	20	U	20	U	13	U	39	U	100	U	20	U	20	U	20	U	17	U	20	U	15	U	19	U	20	U	20	U
	Dimethyl Phthalate	131-11-3	684,006,990		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	2,6-Dinitrotoluene	606-20-2	68,401		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	3-Nitroaniline	99-09-2			18	U	200	U	40	U	20	U	20	U	20	U	13	U	39	U	100	U	20	U	20	U	20	U	17	U	20	U	15	U	19	U	20	U	20	U
	2,4-Dinitrophenol	51-28-5	136,801		180	U	2,000	U	400	U	200	U	200	U	200	U	130	U	390	U	1,000	U	200	U	200	U	200	U	170	U	200	U	150	U	190	U	200	U	200	U
	4-Nitrophenol	100-02-7	547,206		90	U	990	U	200	U	99	U	98	U	98	U	64	U	200	U	500	U	100	U	100	U	100	U	85	U	100	U	74	U	94	U	100	U	96	U
	2,4-Dinitrotoluene	121-14-2	136,801		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	4-Chlorophenyl-phenyl ether	7005-72-3			9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	Diethyl Phthalate	84-66-2	54,720,559		1.6	J	99	U	20	U	1.6	J	1.7	J	1.3	J	1.5	J	20	U	50	U	3.7	J	1.3	J	2.4	J	8.5	U	10	U	1.6	J	1.7	J	10	U	9.6	U
	4-Nitroaniline	100-01-6			18	U	200	U	40	U	20	U	20	U	20	U	13	U	39	U	100	U	20	U	20	U	20	U	17	U	20	U	15	U	19	U	20	U	20	U
	2-Methyl-4,6-dinitrophenol	534-52-1			90	U	990	U	200	U	99	U	98	U	98	U	64	U	200	U	500	U	100	U	100	U	100	U	85	U	100	U	74	U	94	U	100	U	96	U
	N-Nitrosodiphenylamine	86-30-6		390,861	9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	4-Bromophenyl-phenyl ether	101-55-3			9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	Hexachlorobenzene	118-74-1	54,721	1,197	9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	Carbazole	86-74-8		95,761	9	U	110	=	18	J	10	=	8.5	J	12	=	6.4	U	14	J	8.1	J	4.3	J	6	J	5.3	J	2.9	J	10	U	21	=	19	=	5.2	J	9.6	U
	di-n-butyl Phthalate	84-74-2	6,840,070		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	7.9	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	11	=	9.4	U	10	U	9.6	U
	Butyl Benzyl Phthalate	85-68-7	13,680,140		9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	12	J	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U
	3,3'-Dichlorobenzidine	91-94-1		4,256	90	U	990	U	200	U	99	U	98	UJ	98	U	64	U	200	U	500	U	100	U	100	U	100	U	85	U	100	U	74	U	94	U	100	U	96	U
	bis (2-Ethylhexyl) phthalate	117-81-7	1,368,014	136,801	18	U	200	U	40	U	30	=	11	J	20	U	7.9	J	16	J	100	U	120	=	10	J	12	J	7.5	J	14	J	16	=	8.5	J	17	J	20	U
	di-n-octyl Phthalate	117-84-0			9	U	99	U	20	U	9.9	U	9.8	U	9.8	U	6.4	U	20	U	50	U	10	U	10	U	10	U	8.5	U	10	U	7.4	U	9.4	U	10	U	9.6	U

** Screening Values updated from Region 6 Human Health Medium-Specific Screening Levels 2008; March 2008, Industrial Soils, Outdoor Worker, Integrated.
Yellow Shading may indicate an exceedance of either SLV

U.S. Moorings Feasibility Study
Appendix B Table B-1
Industrial Area Shallow Soil Sampling Results
Screened to EPA Region 6 SLVs

Sample Number			**SCREENING CRITERIA ****		SB-17-1		SB-16-1		SB-12-1		SB-11-1		SB-04-1		SB-06-1		SB-07-1		SB-19-1		SB-18-1		SB-01-1		SB-05-1		FD of SB-05-1		SB-09-1		SB-08-1		SB-10-1		SB-15-1		SB-13-1		SB-14-1	
Blind ID Number			EPA Region 6 Industrial Soil		171		161		121		111		41		61		71		191		181		11		51		510		91		81		101		151		131		141	
Sample Depth (approx. feet/bgs)			0.1 of		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		1-4'		0-4'		1-4'	
Date Collected			Non-cancer	Cancer	10-Mar		9-Mar		8-Mar		7-Mar		4-Mar		4-Mar		5-Mar		8-Mar		8-Mar		7-Mar		6-Mar		6-Mar		5-Mar		4-Mar		5-Mar		9-Mar		6-Mar		3-Mar	
Matrix					Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
Basis					Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry	
LAB Service Request ID #					K0802057		K0802056		K0802056		K0802031		K0801820		K0801820		K0801921		K0802056		K0802056		K0802031		K0801963		K0801963		K0801921		K0801820		K0801921		K0802057		K0801963		K0801820	
Analysis Group	**Chemical**	**CAS #**	**µg/kg**	**µg/kg**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**
PCBs																																								
	Aroclor 1016	12674-11-2		24,000	2.4	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	1.6	U	2.6	U	2.5	U	2.5	U	2.5	U	2.5	U	2.2	U	2.5	U	1.9	U	2.4	U	2.5	U	2.5	U
	Aroclor 1221	11104-28-2		830	4.8	U	16	U	5	U	5	U	5	U	4.9	U	3.2	U	5.1	U	5	U	5	U	5	U	5	U	4.3	U	5	U	3.7	U	4.8	U	5	U	5	U
	Aroclor 1232	11141-16-5		830	2.4	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	1.6	U	2.6	U	2.5	U	2.5	U	2.5	U	2.5	U	2.2	U	2.5	U	1.9	U	2.4	U	2.5	U	2.5	U
	Aroclor 1242	53469-21-9		830	2.4	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	1.6	U	2.6	U	2.5	U	2.5	U	2.5	U	2.5	U	2.2	U	2.5	U	1.9	U	2.4	U	2.5	U	2.5	U
	Aroclor 1248	12672-29-6		830	2.4	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	1.6	U	2.6	U	2.5	U	2.5	U	2.5	U	2.5	U	2.2	U	2.5	U	1.9	U	2.4	U	2.5	U	2.5	U
	Aroclor 1254	11097-69-1	1,180	830	2.4	U	11	U	2.5	U	2.5	U	2.5	U	2.5	U	1.6	U	2.6	U	2.5	U	2.5	U	2.5	U	2.5	U	2.2	U	2.5	U	1.9	U	2.4	J	2.5	U	2.5	U
	Aroclor 1260	11096-82-5		830	2.4	U	28	=	2.5	U	2.5	U	2.5	U	2.5	U	1.6	U	81	=	5.3	=	2.5	U	2.5	U	2.5	U	2.2	U	2.5	U	1.9	U	5.5	=	2.5	U	2.5	U
	Aroclor 1262	37324-23-5			2.4	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	1.6	U	2.6	U	2.5	U	2.5	U	2.5	U	2.5	U	2.2	U	2.5	U	1.9	U	2.4	U	2.5	U	2.5	U
	Aroclor 1268	11100-14-4			2.4	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	1.6	U	2.6	U	2.5	U	2.5	U	2.5	U	2.5	U	2.2	U	2.5	U	1.9	U	2.4	U	2.5	U	2.5	U
	Total PCBs			830	**ND**		**28**		**ND**		**ND**		**ND**		**ND**		**ND**		**81**	=	**5.3**	=	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**7.9**		**ND**		**ND**	
Pesticides																																								
	α -BHC	319-84-6		399	0.2	U	0.99	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	Hexachlorobenzene	118-74-1	54,721	1,197	0.2	U	0.99	U	0.2	U	0.2	U	0.18	J	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	β -BHC	319-85-7		1,397	0.2	U	2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	γ -BHC (Lindane)	58-89-9	26,948	1,935	0.2	U	5	=	0.2	U	0.2	U	0.11	J	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	δ -BHC	319-86-8		1,397	0.2	U	0.99	J	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.21	J	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	Heptachlor	76-44-8	34,200	426	0.2	U	0.99	U	0.61	=	0.88	=	0.2	U	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	Aldrin	309-00-2	2,052	113	0.2	U	0.99	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	Heptachlor epoxide	102-45-73	889	210	0.2	U	0.99	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	gamma-Chlordane	5103-74-2			0.2	U	0.99	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.31	=	0.2	U	0.053	J	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.068	J	0.2	U	0.2	U
	Endosulfan alpha-	959-98-8			0.2	U	0.99	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.06	J	0.059	J	0.03	J	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	alpha-Chlordane	5103-74-2			0.2	U	0.99	U	0.22	U	0.2	U	0.2	U	0.2	U	0.13	U	0.14	J	0.061	J	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	Dieldrin	60-57-1	3,420	120	0.2	U	0.99	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.16	U	0.2	U	0.2	U	0.2	U
	4,4'-DDE	72-55-9			0.2	U	3.3	=	0.2	U	0.22	J	0.83	=	1.2	=	0.07	J	0.36	=	0.12	J	0.36	=	0.15	J	0.17	J	0.17	U	0.2	U	0.19	=	3.5	=	0.2	U	0.2	U
	Endrin	72-20-8	20,520		0.2	U	0.99	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	Endosulfan beta-	33213-65-9			0.2	U	0.28	J	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.21	U	0.091	J	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	J	0.2	U	0.2	U	0.2	U
	4,4'-DDD	72-54-8			0.2	U	2.2	U	0.2	U	0.2	U	0.2	U	0.057	J	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.29	=	0.2	U	0.2	U
	Endrin aldehyde	7421-93-4			0.2	U	0.99	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	Endosulfan sulfate	1031-07-8			0.2	U	0.99	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	4,4'-DDT	50-29-3			0.2	U	43	=	0.65	J	0.74	J	1.5	=	1.5	=	0.31	=	5.7	=	1.4	=	1.2	=	0.9	=	0.99	=	0.17	U	0.2	U	1	=	6.4	=	0.2	U	0.2	U
	Endrin ketone	53494-70-5			0.2	U	1.6	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	1.9	U	0.2	U	0.11	J	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	Methoxychlor	72-43-5	342,003		0.2	U	0.99	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.93	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.16	J	0.2	U	0.2	U
	Toxaphene	8001-35-2		1,741	9.6	U	110	U	10	U	9.9	U	10	U	9.8	U	6.4	U	54	U	12	U	10	U	9.9	U	10	U	8.5	U	10	U	7.4	U	9.6	U	10	U	10	U
	oxy chlordane				0.2	U	2.5	=	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.074	J	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	2,4'-DDE	3424-82-6			0.2	U	22	U	0.2	U	0.2	J	0.2	U	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	cis -nonachlor	5103-73-1			0.2	U	1.8	J	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	2.9	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.21	U	0.2	U	0.2	U
	2,4'-DDD	53-19-0			0.2	U	2.3	U	0.2	U	0.11	J	0.048	J	0.2	U	0.13	U	2	J	0.24	=	0.12	J	0.058	J	0.11	J	0.17	U	0.2	U	0.065	J	0.31	J	0.2	U	0.2	U
	trans -nonachlor	39765-80-5			0.2	U	0.99	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.21	U	0.2	U	0.043	J	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.071	J	0.2	U	0.2	U
	2,4'-DDT	789-02-6			0.2	U	12	=	0.38	=	0.39	J	0.36	=	0.47	=	0.13	U	0.78	U	0.2	U	0.32	=	0.22	=	0.24	=	0.17	U	0.2	U	0.34	J	1.7	=	0.2	U	0.2	U
	Mirex	2385-85-5	13,680	1,064	0.2	U	0.99	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	Hexachloroethane	67-72-1	68,401	136,801	0.2	U	0.99	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	Hexachlorobutadiene	87-68-3	68,407	24,554	0.2	U	0.99	U	0.2	U	0.2	U	0.2	U	0.2	U	0.13	U	0.21	U	0.2	U	0.2	U	0.2	U	0.2	U	0.17	U	0.2	U	0.15	U	0.2	U	0.2	U	0.2	U
	DDE [1]	**72-55-9**		**7,800**	**ND**		**3.3**	**=**	**ND**		**0.22**		**0.83**	**=**	1.2	**=**	**0.07**	**J**	**0.36**		**0.12**		**0.36**	**=**	0.15	J	0.17		**ND**		**ND**		**0.19**		**3.5**	**=**	**ND**		**ND**	
	DDD [1]	**72-54-8**		**11,000**	**ND**		**ND**		**ND**		**0.11**		**0.048**	**J**	**0.057**	**J**	**ND**		**2**		**0.24**		**0.12**	**J**	**0.058**	**J**	**0.11**		**ND**		**ND**		**0.065**		**0.6**	**J**	**ND**		**ND**	
	DDT [1]	**50-29-3**		**7,800**	**ND**		**55**	**=**	**1.03**	**J**	**1.13**		**1.86**	**=**	**1.97**	**=**	**0.31**	**=**	**5.7**		**1.4**		**1.52**	**=**	**1.12**	**=**	**1.23**		**ND**		**ND**		**1.34**		**8.1**	**=**	**ND**		**ND**	
	DDx-total [2]	**50-29-3**			**ND**		**58.3**	**=**	**1.03**	**J**	**1.46**		**2.74**	**J**	**3.23**		**0.38**	**J**	**8.06**		**1.76**		**2**	**J**	**1.33**	**J**	**1.51**		**ND**		**ND**		**1.6**		**12.2**	**J**	**ND**		**ND**	
	Chlordane-total [3]		**44,906**	**7,186**	**ND**		**4.3**	**J**	**ND**		**ND**		**ND**		**ND**		**ND**		**0.524**		**0.061**		**0.096**	**J**	**ND**		**ND**		**ND**		**ND**		**ND**		**0.139**	**J**	**ND**		**ND**	
	Endosulfan-total [4]		**410,404**		**ND**		**0.28**	**J**	**ND**		**ND**		**ND**		**ND**		**ND**		**0.06**		**0.15**		**0.03**	**J**	**ND**		**ND**		**ND**		**ND**		**0.15**		**ND**		**ND**		**ND**	
Cyanide																																								
	Cyanide (Total) (15)	57-12-5	1,368,139		8,600	=	61,000	=	1,250	=	500	=	320	=	870	=	290	U	*Not Analyzed*		*Not Analyzed*		600	=	190	J	230	J	290	U	290	U	300	=	*Not Analyzed*		*Not Analyzed*		290	U
Metals																																								
	Aluminum (pH 6.5 - 9.0)[13]	7429-90-5	102,636,259		1.21E+07	=	1.10E+07	=	1.06E+07	=	1.25E+07	=	1.45E+07	=	1.47E+07	=	1.57E+07	=	1.12E+07	=	1.02E+07	=	8.E+06	=	1.26E+07	=	1.31E+07	=	1.70E+07	=	1.61E+07	=	1.24E+07	=	1.79E+07	=	1.49E+07	*	2.77E+07	=
	Antimony	7440-36-0	45,422		90	=	5,860	J	642,000	J	1,200	J	190	=	150	=	110	J	4,930	J	340	J	210	J	180	J	360	J	150	J	150	=	180	J	280	=	200	=	320	=
	Arsenic	7440-38-2	28,436	1,767	3,460	=	4,560	=	3,700	=	2,250	=	3,100	=	2,700	=	2,400	=	3,770	=	2,940	=	14,900	=	1,870	J	1,930	J	2,600	=	2,400	=	2,000	=	4,560	=	3,500	J	8,800	=
	Cadmium[15]	7440-43-9	56,406	3,320,869	71	=	443	=	872	=	76	=	107	=	104	=	73	=	298	=	160	=	163	=	195	J	579	J	85	=	84	=	94	=	326	=	201	=	*47*	*U*
	Chromium, total	7440-47-3		498,130	20,300	=	35,100	=	30,600	=	20,200	=	21,800	=	20,900	=	22,000	=	25,900	=	31,800	=	16,900	=	23,400	=	24,600	=	23,400	=	22,600	=	17,100	=	22,600	=	18,800	=	25,400	=
	Copper[15]	7440-50-8	4,217,778		16,700	=	73,300	J	528,000	J	80,200	J	25,800	=	20,600	=	21,500	=	54,500	J	88,900	J	24,600	J	23,100	=	20,300	=	24,300	=	22,300	=	17,300	=	22,200	=	25,700	=	28,500	=
	Lead[15]	7439-92-1	80,000		8,430	=	*429,000*	J	2.E+06	J	85,400	=	20,800	=	18,100	=	6,680	=	117,000	J	78,900	J	79,900	=	31,800	=	38,800	=	8,100	=	9,050	=	14,900	=	46,500	=	139,000	=	11,400	=
	Manganese	7439-96-5	3,517,063		207,000	=	277,000	=	402,000	=	396,000	=	336,000	=	368,000	=	367,000	=	328,000	=	320,000	=	304,000	=	336,000	=	329,000	=	402,000	=	398,000	=	300,000	=	623,000	=	372,000	=	364,000	=
	Mercury	7439-97-6	34,067		20	=	197	=	477	=	21	=	42	=	2,790	=	41	=	142	=	62	=	29	=	83	=	123	=	52	=	93	=	18	B	44	=	203	=	43	=
	Nickel[15]	7440-02-0	2,271,111		16,900	=	32,800	=	46,900	=	22,500	=	33,400	=	27,100	=	21,600	=	32,800	=	31,800	=	24,700	=	31,200	=	29,300	=	19,200	=	22,400	=	29,700	=	39,700	=	23,800	=	16,300	=
	Selenium	7782-49-2	567,778		*0.11*	*U*	*100*	*U*	*110*	*U*	*110*	*U*	20	B	50	B	*130*	*U*	*100*	*U*	*110*	*U*	*100*	*U*	*110*	*U*	*120*	*U*	*120*	*U*	70	B	*110*	*U*	*0.12*	*U*	*110*	*U*	180	=
	Silver [15]	7440-22-4	567,778		39	J	120	=	4,620	=	136	J	166	J	*45*	*U*	21	B	58	=	91	=	1,670	J	94	J	35	J	73	=	83	J	24	=	92	J	159	=	*71*	*U*
	Zinc[15]	7440-66-6	34,066,667		57,700	=	142,000	=	399,000	=	75,000	=	88,100	=	83,500	=	59,300	=	138,000	=	135,000	=	71,500	=	113,000	=	76,400	=	64,100	=	58,900	=	63,000	=	144,000	=	74,100	=	70,300	=
Organobutyltins																																								
	Tetrabutyltin	1461-25-2			*Not Analyzed*		*Not Analyzed*		*Not Analyzed*		*Not Analyzed*		1.2	U	1.3	U	1.3	U	*Not Analyzed*		*Not Analyzed*		*Not Analyzed*		1.2	U	1.2	U	1.3	U	1.4	U	1.1	U	*Not Analyzed*		1.2	U	1.2	U
	Tributyltin	56573-85-4											1.2	U	1.3	U	1.3	U							1.2	U	1.2	U	1.3	U	1.4	U	1.1	U			1.2	U	1.2	U
	Dibutyltin	1002-53-5											1.2	U	0.22	J	3.8	=							0.85	J	1.1	J	0.41	J	0.62	=	1.1	U			1.2	U	1.2	U
	Monobutyltin	78763-54-9											1.2	U	1.3	U	1.3	U							1.2	U	1.2	U	1.3	U	2.3	J	1.1	U			1.2	U	1.2	U
TPH																																								
	TPH-Diesel				2,100	J	35,000	=	34,000	=	13,000	=	57,000	=	4,800	J	8,800	J	7,700	J	37,000	=	37,000	=	6,900	J	7,200	J	2,800	J	1,800	J	16,000	=	4,600	J	3,300	J	12,000	U
	TPH-Motor Oil				120,000	U	130,000	=	190,000	=	140,000	=	250,000	=	15,000	J	110,000	J	40,000	J	200,000	=	280,000	=	68,000	J	68,000	J	12,000	J	6,000	J	190,000	=	22,000	J	51,000	J	6,300	J

** Screening Values updated from Region 6 Human Health Medium-Specific Screening Levels 2008; March 2008, Industrial Soils, Outdoor Worker, Integrated.
Yellow Shading may indicate an exceedance of either SLV

U.S. Moorings Feasibility Study
Appendix B Table B-2
MIS Shallow Soil Sampling Results
Screened to EPA Region 6 SLV

					SOUTH LOGISTICS		NORTH LOGISTICS		LAYDOWN		FENCE LINE		SLUMP		PRIOR CLEAN UP		SANDBLAST		Laydown Triplicate Samples				**Run-off** (Sediment)	
Sample Number			**SCREENING CRITERIA ****		SB-SL-001		SB-NL-01		SB-LD-01		SB-FL-01		SB-SP-01		PC-SB-01		SB-SB-01		SB-MIS-T1-01		SB-MIS-T1-02		SD-NL-01	
Blind ID Number			EPA Region 6 Industrial Soil		3000		5000		6000		11000		7000		4000		9000		8000		8001		10000	
Sample Depth (approx. feet/bgs)			0.1 of Non-cancer	Cancer	1 - 5'		1 - 5'		1 - 5'		0-6"		1 - 5'		1-5'		1-5'		1 - 5'		1 - 5'		0 - ~1'	
Date Collected					14-Mar		26-Mar		31-Mar		9-Apr		31-Mar		25-Mar		8-Apr		5-Apr		5-Apr		4-Apr	
Matrix					Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Sediment	
Basis					Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry	
LAB Service Request ID #					K0802299		K0802299A		K0802299A		K0802299A		K0802299A		K0802299		K0802299A		K0802299A		K0802299A		K0803345	
Analyis Group	**Chemical**	**CAS #**	**µg/kg**	**µg/kg**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**
VOCs (Not Analyzed)																								
SVOCs																								
	Phenols and Substituted Phenols																							
	2,4,6-trichlorophenol	88-06-2	68,407	174,111	5.3	U	5	U	5.1	U	5	U	5	U	6.2	U	5	U	5	U	5.1	U	6.7	U
	2,4,5-Trichlorophenol	95-95-4	6,840,070		5.3	U	5	U	5.1	U	5	U	5	U	6.2	U	5	U	5	U	5.1	U	6.7	U
	2,3,4,5-Tetrachlorophenol	4901-51-3			5.3	U	5	U	5.1	U	5	U	5	U	6.2	U	5	U	5	U	5.1	U	6.7	U
	2,3,5,6-Tetrachlorophenol	935-95-5			5.3	U	5	U	5.1	U	0.34	J	5	U	6.2	U	5	U	5	U	5.1	U	0.97	J
	Pentachlorophenol	87-86-5	1,285,461	9,998	5.3	U	1.9	J	5.1	U	21	=	5	U	6.2	U	5	U	5	U	5.1	U	21	=
	Polycyclic Aromatic Hydrocarbons (PAHs)																							
	Naphthalene	91-20-3	20,898		3.9	=	96	=	85	=	20	=	1	J	17	=	33	=	71	=	75	=	26	=
	2-Methylnaphthalene	91-57-6			0.91	J	61	=	17	=	13	=	0.6	J	9.8	=	14	=	21	=	19	=	15	=
	1-Methylnaphthalene	90-12-0			0.62	J	58	=	11	=	12	=	1.7	U	7.3	=	6.6	=	11	=	7.5	=	9.6	=
	Acenaphthylene	208-96-8			3.7	=	55	=	15	=	13	=	0.3	J	15	=	13	=	24	=	23	=	17	=
	Acenaphthene	83-32-9	3,250,282		2.7	=	51	=	33	=	160	=	0.33	J	65	=	13	=	51	=	36	=	34	=
	Fluorene	86-73-7	2,622,198		1.8	J	69	=	26	=	100	=	1.7	U	77	=	14	=	51	*J*	28	*J*	110	=
	Dibenzofuran	132-64-9	173,789		2.5	U	41	=	5	=	79	=	1.7	U	32	=	7	=	16	*J*	6.5	*J*	55	=
	Phenanthrene	85-01-8			39	=	600	=	270	=	1,200	=	2.8	=	710	=	150	=	430	=	280	=	930	=
	Anthracene	120-12-7	26,494,973		8.2	=	110	=	51	=	120	=	1.7	U	210	=	31	=	79	=	59	=	150	=
	Fluoranthene	206-44-0	2,444,484		110	=	1,000	=	520	=	2,700	=	5.8	=	910	=	390	=	920	=	730	=	2500	=
	Pyrene	129-00-0	3,197,938	32,000,000	160	=	1,500	=	710	=	2,400	=	6.5	=	1,100	=	570	=	1200	=	930	=	2600	=
	Benzo(b)fluoranthene	205-99-2		2,344	110	=	980	=	310	=	2,000	=	3.7	=	620	=	380	=	560	=	480	=	3400	=
	Benzo(k)fluoranthene	207-08-9		23,441	36	=	280	=	100	=	630	=	1.2	J	190	=	110	=	170	=	150	=	1200	=
	Benzo(a)anthracene	56-55-3		2,344	57	=	530	=	180	=	1,100	=	2.5	=	420	=	200	=	350	=	290	=	1700	=
	Chrysene	218-01-9		234,414	80	=	740	=	240	=	1,400	=	2.5	=	530	=	280	=	460	=	390	=	2100	=
	Benzo(a)pyrene	50-32-8		234	98	=	960	=	360	=	1,500	=	3.5	=	630	=	380	=	620	=	540	=	2700	=
	Indeno(1,2,3-cd)pyrene	193-39-5		2,300	110	=	980	=	330	=	1,200	=	3.1	=	580	=	370	=	570	=	500	=	2200	=
	Dibenz(a,h)anthracene	53-70-3		234	13	=	120	=	33	=	250	=	0.44	J	72	=	41	=	60	=	53	=	550	=
	Benzo(g,h,i)perylene	191-24-2		-	120	=	1,100	=	350	=	970	=	3.1	=	570	=	390	=	590	=	530	=	2000	=

** Screening Values updated from Region 6 Human Health Medium-Specific Screening Levels 2008; March 2008, Industrial Soils, Outdoor Worker, Integrated.

U.S. Moorings Feasibility Study
Appendix B Table B-2
MIS Shallow Soil Sampling Results
Screened to EPA Region 6 SLV

					SOUTH LOGISTICS		NORTH LOGISTICS		LAYDOWN		FENCE LINE		SLUMP		PRIOR CLEAN UP		SANDBLAST		Laydown Triplicate Samples				**Run-off** (Sediment)	
Sample Number			**SCREENING CRITERIA ****		SB-SL-001		SB-NL-01		SB-LD-01		SB-FL-01		SB-SP-01		PC-SB-01		SB-SB-01		SB-MIS-T1-01		SB-MIS-T1-02		SD-NL-01	
Blind ID Number			EPA Region 6 Industrial Soil		3000		5000		6000		11000		7000		4000		9000		8000		8001		10000	
Sample Depth (approx. feet/bgs)			0.1 of Non-cancer	Cancer	1 - 5'		1 - 5'		1 - 5'		0-6"		1 - 5'		1-5'		1-5'		1 - 5'		1 - 5'		0 - ~1'	
Date Collected					14-Mar		26-Mar		31-Mar		9-Apr		31-Mar		25-Mar		8-Apr		5-Apr		5-Apr		4-Apr	
Matrix					Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Sediment	
Basis					Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry	
LAB Service Request ID #					K0802299		K0802299A		K0802299A		K0802299A		K0802299A		K0802299		K0802299A		K0802299A		K0802299A		K0803345	
Analyis Group	**Chemical**	**CAS #**	**µg/kg**	**µg/kg**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**
	Organonitrogen Compounds, Halogenated Compounds, Phenols and Substituted Phenols, Oxygen-Containing Compounds																							
	n-Nitrosodimethylamine	62-75-9	547	38	49	UJ	32	U	37	U	290	U	34	U	49	U	170	U	34	U	170	U	340	U
	Aniline	62-53-3	477,777	336,003	20	UJ	13	U	15	U	120	U	14	U	20	U	65	U	14	U	66	U	140	U
	bis (2-Chloroethyl) ether	111-44-4	-	616	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	Phenol	108-95-2	20,522,088	-	30	U	2.6	J	22	U	180	U	20	U	5.2	J	97	U	20	U	21	J	210	U
	2-Chlorophenol	95-57-8	26,250	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	1,3-Dichlorobenzene	541-73-1	14,422	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	1,4-Dichlorobenzene	106-46-7	1,127,833	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	1,2-Dichlorobenzene	95-50-1	4,479	8,067	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	Benzyl Alcohol	100-51-6	20,520,210	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	3.2	J	33	U	6.7	U	33	U	68	U
	bis (2-Chloroisopropyl) ether	108-60-1	449,642	8,183	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	UJ	33	U	6.7	U	33	U	68	U
	2-Methylphenol	95-48-7	3,420,348	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	Hexachloroethane	67-72-1	68,401	136,801	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	n-Nitroso-di-n-propylamine	621-64-7	-	274	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	4-Methylphenol (p-Cresol)	106-44-5	342,003	-	9.7	U	1.7	J	5.1	J	58	U	6.7	U	5.6	J	33	U	6.6	J	12	J	68	U
	Nitrobenzene	98-95-3	11,456	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	Isophorone	78-89-1	13,680,140	2,016,021	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	2-Nitrophenol	88-75-5	-	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	2,4-Dimethylphenol	120-83-2	1,368,014	-	20	U	13	U	15	U	120	U	14	U	20	U	65	U	14	U	66	U	140	U
	bis (2-Chloroethoxy) methane	111-91-1	-	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	2,4-Dichlorophenol	120-83-2	205,202	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	Benzoic Acid	65-85-0	273,602,796	-	200	UJ	130	U	150	U	1200	U	140	U	200	U	650	U	140	U	660	U	1,400	U
	1,2,4-Trichlorobenzene	120-82-1	26,478	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	4-Chloroaniline	106-47-8	273,603	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	Hexachlorobutadiene	87-68-3	68,407	24,554	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	4-Chloro-3-methylphenol	59-50-7	-	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	Hexachlorocyclopentadiene	77-47-4	406,524	-	49	UJ	32	U	37	U	290	U	34	U	49	U	170	U	34	U	170	U	340	U
	2-Chloronaphthalene	91-58-7	2,602,071	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	2-Nitroaniline	88-74-4	203,267	-	20	U	13	U	15	U	120	U	14	U	20	U	65	U	14	U	66	U	140	U
	Dimethyl Phthalate	131-11-3	684,006,990		9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	2,6-Dinitrotoluene	606-20-2	68,401	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	3-Nitroaniline	99-09-2	-	-	20	U	13	U	15	U	120	U	14	U	20	U	65	U	14	U	66	U	140	U
	2,4-Dinitrophenol	51-28-5	136,801	-	200	U	130	U	150	U	1200	U	140	U	200	U	650	U	140	U	660	U	1,400	U
	4-Nitrophenol	100-02-7	547,206	-	97	U	63	U	73	U	580	U	67	U	98	U	330	U	67	U	330	U	680	U
	2,4-Dinitrotoluene	121-14-2	136,801	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	4-Chlorophenyl-phenyl ether	7005-72-3	-	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	Diethyl Phthalate	84-66-2	54,720,559		9.7	U	2.9	J	2.4	J	58	U	4.1	J	5.9	J	7.3	J	2.6	J	33	U	68	U
	4-Nitroaniline	100-01-6	-	-	20	U	13	U	15	U	120	U	14	U	20	U	65	U	14	U	66	U	140	U
	2-Methyl-4,6-dinitrophenol	534-52-1	-	-	97	U	63	U	73	U	580	U	67	U	98	U	330	U	67	U	330	U	680	U
	N-Nitrosodiphenylamine	86-30-6	-	390,861	9.7	U	18	=	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	41	J
	4-Bromophenyl-phenyl ether	101-55-3	-	-	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	Hexachlorobenzene	118-74-1	54,721	1,197	9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U
	Carbazole	86-74-8	-	95,761	3.8	J	28	=	6.5	J	270	=	6.7	U	71	=	17	J	18	=	12	J	150	=
	di-n-butyl Phthalate	84-74-2	6,840,070	-	9.7	U	7.9	U	7.9	U	100	=	7.9	U	10	=	40	U	7.9	U	40	U	79	U
	Butyl Benzyl Phthalate	85-68-7	13,680,140	-	9.7	U	6.3	U	7.3	U	38	J	6.7	U	9.8	U	33	U	6.7	U	33	U	41	J
	3,3'-Dichlorobenzidine	91-94-1	-	4,256	97	U	63	U	73	U	580	U	67	U	98	U	330	U	67	U	330	U	680	U
	bis (2-Ethylhexyl) phthalate	117-81-7	1,368,014	136,801	9500	=	1,600	=	54	=	140	=	18	=	4100	=	350	=	1,000	J	250	J	210	=
	di-n-octyl Phthalate	117-84-0			9.7	U	6.3	U	7.3	U	58	U	6.7	U	9.8	U	33	U	6.7	U	33	U	68	U

** Screening Values updated from Region 6 Human Health Medium-Specific Screening Levels 2008; March 2008, Industrial Soils, Outdoor Worker, Integrated.

U.S. Moorings Feasibility Study
Appendix B Table B-2
MIS Shallow Soil Sampling Results
Screened to EPA Region 6 SLV

					SOUTH LOGISTICS		NORTH LOGISTICS		LAYDOWN		FENCE LINE		SLUMP		PRIOR CLEAN UP		SANDBLAST		Laydown Triplicate Samples				**Run-off** (Sediment)	
Sample Number			**SCREENING CRITERIA ****		SB-SL-001		SB-NL-01		SB-LD-01		SB-FL-01		SB-SP-01		PC-SB-01		SB-SB-01		SB-MIS-T1-01		SB-MIS-T1-02		SD-NL-01	
Blind ID Number			EPA Region 6 Industrial Soil		3000		5000		6000		11000		7000		4000		9000		8000		8001		10000	
Sample Depth (approx. feet/bgs)			0.1 of Non-cancer	Cancer	1 - 5'		1 - 5'		1 - 5'		0-6"		1 - 5'		1-5'		1-5'		1 - 5'		1 - 5'		0 - ~1'	
Date Collected					14-Mar		26-Mar		31-Mar		9-Apr		31-Mar		25-Mar		8-Apr		5-Apr		5-Apr		4-Apr	
Matrix					Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Sediment	
Basis					Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry	
LAB Service Request ID #					K0802299		K0802299A		K0802299A		K0802299A		K0802299A		K0802299		K0802299A		K0802299A		K0802299A		K0803345	
Analyis Group	**Chemical**	**CAS #**	**µg/kg**	**µg/kg**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**
PCBs																								
	Aroclor 1016	12674-11-2		24,000	2.5	U	1.7	U	2	U	1.4	U	1.7	U	2.4	U	1.7	U	1.7	U	1.7	U	17	U
	Aroclor 1221	11104-28-2		830	4.9	U	3.3	U	3.9	U	2.8	U	3.4	U	4.8	U	3.3	U	3.3	U	3.4	U	34	U
	Aroclor 1232	11141-16-5		830	2.5	U	1.7	U	2	U	1.4	U	1.7	U	2.4	U	1.7	U	1.7	U	1.7	U	17	U
	Aroclor 1242	53469-21-9		830	2.5	U	1.7	U	2	U	1.4	U	1.7	U	2.4	U	1.7	U	1.7	U	1.7	U	17	U
	Aroclor 1248	12672-29-6		830	2.5	U	68	=	2	U	1.4	U	1.7	U	2.4	U	1.7	U	1.7	U	1.7	U	1,600	=
	Aroclor 1254	11097-69-1	1,180	830	2.5	U	1.7	U	2	U	11	U	1.7	U	2.4	U	1.7	U	1.7	U	1.7	U	17	U
	Aroclor 1260	11096-82-5		830	1.2	J	1.7	U	2	U	14	=	1.7	U	2.4	U	1.7	U	2.2	U	1.7	U	17	U
	Aroclor 1262	37324-23-5			2.5	U	1.7	U	2	U	1.4	U	1.7	U	2.4	U	50	=	1.7	U	1.7	U	17	U
	Aroclor 1268	11100-14-4			2.5	U	1.7	U	2	U	1.4	U	1.7	U	2.4	U	10	U	1.7	U	1.7	U	17	U
	Total PCBs				**1.2**	**J**	**68**	**=**	**ND**		**14**		**ND**		**ND**		**50**		**ND**		**ND**		**1,600**	**=**
Pesticides																								
	α-BHC	319-84-6		399	0.2	U	0.13	U	0.16	U	0.12	U	0.14	U	0.19	U	0.14	U	0.13	U	0.14	U	0.68	U
	Hexachlorobenzene	118-74-1	54,721	1,197	0.2	U	0.18	U	0.16	U	0.2	U	0.14	U	0.19	U	0.14	U	0.13	U	0.14	U	1.2	U
	β-BHC	319-85-7		1,397	0.2	U	0.13	U	0.16	U	0.12	U	0.14	U	0.19	U	0.14	U	0.34	U	0.14	U	0.68	U
	γ-BHC (Lindane)	58-89-9	26,948	1,935	0.2	U	0.47	J	0.18	U	2.6	U	0.14	U	0.17	J	0.22	U	0.21	U	0.22	=	2.4	=
	δ-BHC	319-86-8		1,397	0.2	U	0.14	U	0.16	U	4.9	U	0.14	U	0.19	U	0.14	U	0.15	U	0.14	U	1.2	U
	Heptachlor	76-44-8	34,200	426	0.2	U	0.13	U	0.16	U	0.12	U	0.14	U	0.19	U	0.14	U	0.13	U	0.14	U	0.68	U
	Aldrin	309-00-2	2,052	113	0.2	U	0.13	U	0.16	U	0.12	U	0.14	U	0.19	U	0.14	U	0.13	U	0.14	U	0.68	U
	Heptachlor epoxide	102-45-73	889	210	0.2	U	1.3	U	0.16	U	0.43	U	0.14	U	0.19	U	0.14	U	0.13	U	0.14	U	4	U
	gamma-Chlordane	5103-74-2			0.2	U	0.15	U	0.16	U	0.27	U	0.14	U	0.19	U	0.08	J	0.13	U	0.14	U	0.74	U
	Endosulfan alpha-	959-98-8			0.2	U	0.13	U	0.16	U	0.23	U	0.14	U	0.19	U	0.14	U	0.13	U	0.14	U	1.1	U
	alpha-Chlordane	5103-74-2			0.2	U	0.14	U	0.16	U	0.19	U	0.14	U	0.19	U	0.12	J	0.13	U	0.14	U	0.74	U
	Dieldrin	60-57-1	3,420	120	0.2	U	0.22	U	0.16	U	0.19	U	0.14	U	0.19	U	0.14	U	0.13	U	0.14	U	0.68	U
	4,4'-DDE	72-55-9			0.26	=	2.7	J	0.18	=	4.2	J	0.14	U	0.19	U	0.26	=	0.34	=	0.37	=	0.99	U
	Endrin	72-20-8	20,520		0.2	U	0.08	J	0.16	U	0.12	U	0.14	U	0.19	U	0.14	U	0.13	U	0.14	U	1.9	U
	Endosulfan beta-	33213-65-9			0.2	U	0.13	U	0.16	U	0.12	U	0.14	U	0.19	U	0.14	U	0.13	U	0.14	U	0.68	U
	4,4'-DDD	72-54-8			0.2	U	4.5	=	0.16	U	0.44	J	0.14	U	0.19	U	0.71	=	0.27	J	0.59	J	0.68	U
	Endrin aldehyde	7421-93-4			0.2	U	0.13	U	0.16	U	0.12	U	0.14	U	0.19	U	0.14	U	0.15	U	0.14	U	1.8	U
	Endosulfan sulfate	1031-07-8			0.2	U	0.21	U	0.16	U	0.12	U	0.14	U	0.19	U	0.14	U	0.13	U	0.14	U	1.4	J
	4,4'-DDT	50-29-3			1.1	=	7.7	J	0.56	J	8.7	J	0.14	U	0.52	J	0.34	U	0.28	J	0.58	J	23	=
	Endrin ketone	53494-70-5			0.2	U	0.2	U	0.16	U	0.66	J	0.14	U	0.19	U	3.4	U	0.13	U	0.14	U	1.1	J
	Methoxychlor	72-43-5	342,003		0.2	U	0.19	U	0.42	U	0.38	U	0.14	U	0.19	U	0.61	U	0.13	U	0.14	U	0.68	U
	Toxaphene	8001-35-2		1,741	9.8	U	14	U	7.8	U	16	U	6.7	U	9.5	U	14	U	15	U	6.7	U	250	U
	oxy chlordane				0.2	U	0.13	U	0.16	U	0.16	U	0.14	U	0.19	U	0.14	U	0.13	U	0.14	U	0.68	U
	2,4'-DDE	3424-82-6			0.2	U	0.15	U	0.16	U	0.76	U	0.14	U	0.094	J	0.17	U	0.13	U	0.14	U	2	U
	cis-nonachlor	5103-73-1			0.2	U	1.3	U	0.16	U	0.34	U	0.14	U	0.097	J	0.87	J	0.13	U	0.17	J	3.4	U
	2,4'-DDD	53-19-0			0.2	U	2.7	J	0.16	U	0.38	U	0.14	U	0.19	U	0.3	=	0.29	J	0.17	J	0.68	U
	trans-nonachlor	39765-80-5			0.2	U	0.064	J	0.16	U	0.21	=	0.14	U	0.19	U	0.056	J	0.13	U	0.14	U	6.9	U
	2,4'-DDT	789-02-6			0.24	=	2.9	J	0.16	U	3.3	J	0.14	U	0.19	U	0.23	U	0.17	U	0.25	U	14	U
	Mirex	2385-85-5	13,680	1,064	0.2	U	0.13	U	0.065	J	0.12	U	0.14	U	0.19	U	0.14	U	0.13	U	0.14	U	0.68	U
	Hexachloroethane	67-72-1	68,401	136,801	0.2	U	0.13	U	0.16	U	0.12	U	0.14	U	0.19	U	0.14	U	0.13	U	0.14	U	0.68	U
	Hexachlorobutadiene	87-68-3	68,407	24,554	0.2	U	0.13	U	0.16	U	0.12	U	0.14	U	0.19	U	0.14	U	0.13	U	0.14	U	0.68	U
	DDE [1]	**72-55-9**		**7,800**	**0.26**	**=**	**2.7**	**J**	**0.18**	**=**	**4.2**	**J**	**ND**		**0.094**	**J**	**0.26**	**=**	**0.34**	**=**	**0.37**	**=**	**ND**	
	DDD [1]	**72-54-8**		**11,000**	**ND**		**7.2**	**J**	**ND**		**0.44**	**J**	**ND**		**ND**		**1.01**	**=**	**0.29**	**J**	**0.76**	**J**	**ND**	
	DDT [1]	**50-29-3**	**47,388**	**7,800**	**1.34**	**=**	**10.6**	**J**	**0.56**	**J**	**12**	**J**	**ND**		**0.52**	**J**	**ND**		**0.28**	**J**	**0.58**	**J**	**23**	**J**
	DDx-total [2]	**50-29-3**			**1.6**	**=**	**20.5**	**J**	**0.74**	**J**	**16.64**	**J**	**ND**		**0.61**	**J**	**1.27**	**=**	**0.91**	**J**	**1.71**	**J**	**23**	**J**
	Chlordane-total [3]		**44,906**	**7,186**	**ND**		**0.064**	**J**	**ND**		**0.21**	**=**	**ND**		**0.097**	**J**	**1.126**	**J**	**ND**		**0.17**	**J**	**ND**	
	Endosulfan-total [4]		**410,404**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**1.4**	**J**
Cyanide (Not Analyzized)																								
Metals																								
	Aluminum (pH 6.5 - 9.0)[13]	7429-90-5	102,636,259		1.07E+07	=	2.07E+07	=	2.08E+07	=	1.12E+07	=	1.28E+06	=	2.35E+07	=	2.14E+07	=	1.99E+07	=	1.88E+07	=	1.38E+07	=
	Antimony	7440-36-0	45,422		80	=	710	=	180	=	6,800	=	70	=	380	J	320	=	180	=	200	=	1,050	=
	Arsenic	7440-38-2	28,436	2	3,110	=	6,160	=	4,140	=	62,900	=	1,060	=	7,180	=	8,200	=	3,740	=	4,150	=	5,270	=
	Cadmium[15]	7440-43-9	56,406	500,000	94	=	358	=	134	=	1,500	=	43	=	171	=	224	=	163	=	134	=	2,190	=
	Chromium, total	7440-47-3	-	500,000	17,400	J	30,400	=	36,400	=	508,000	=	18,100	=	30,600	=	48,800	=	35,500	=	37,500	=	76,600	=
	Copper[15]	7440-50-8	4,217,778		16,000	=	132,000	=	34,000	=	226,000	=	3,000	=	239,000	J	46,800	=	81,700	=	51,200	=	377,000	=
	Lead[15]	7439-92-1	80,000		28,200	=	203,000	J	36,700	J	585,000	J	5,080	J	75,800	=	62,800	J	93,100	J	57,800	J	340,000	=
	Manganese	7439-96-5	3,517,063		320,000	=	612,000	=	429,000	=	896,000	=	92,900	=	772,000	=	728,000	=	379,000	=	378,000	=	1,230,000	=
	Mercury	7439-97-6	34,067		32	=	104	=	101	=	52	=	4	B	88	=	101	=	117	=	118	=	112	=
	Nickel[15]	7440-02-0	2,271,111		20,200	=	79,600	=	30,300	=	213,000	=	7,000	=	23,200	=	38,100	=	28,800	=	28,900	=	50,400	=
	Selenium	7782-49-2	567,778		100	U	100	U	100	U	100	U	100	U	100	B	120	=	100	U	120	U	100	J
	Silver [15]	7440-22-4	567,778		117	=	173	=	90	=	270	=	12	B	333	J	94	=	107	=	76	=	249	=
	Zinc[15]	7440-66-6	34,066,667		77,000	=	182,000	=	84,600	=	1.12E+06	=	10,800	=	148,000	=	155,000	=	110,000	=	104,000	=	749,000	=
Organobutyltins																								
	Tetrabutyltin	1461-25-2			*Not Analyzed*		1.2	U	1.3	U	1.2	U	1.1	U	1.3	U	1.2	U	1.2	U	1.2	U	*Not Analyzed*	
	Tributyltin	56573-85-4					1.2	U	1.3	U	14	=	1.1	U	1.3	U	1.2	U	1.8	=	1.2	U		
	Dibutyltin	1002-53-5					0.19	J	0.38	J	32	=	0.23	J	1.3	U	1.2	U	2	=	1.2	U		

** Screening Values updated from Region 6 Human Health Medium-Specific Screening Levels 2008; March 2008, Industrial Soils, Outdoor Worker, Integrated.

U.S. Moorings Feasibility Study
Appendix B Table B-2
MIS Shallow Soil Sampling Results
Screened to EPA Region 6 SLV

					SOUTH LOGISTICS		NORTH LOGISTICS		LAYDOWN		FENCE LINE		SLUMP		PRIOR CLEAN UP		SANDBLAST		Laydown Triplicate Samples				**Run-off** (Sediment)	
Sample Number			**SCREENING CRITERIA ****		SB-SL-001		SB-NL-01		SB-LD-01		SB-FL-01		SB-SP-01		PC-SB-01		SB-SB-01		SB-MIS-T1-01		SB-MIS-T1-02		SD-NL-01	
Blind ID Number			EPA Region 6 Industrial Soil		3000		5000		6000		11000		7000		4000		9000		8000		8001		10000	
Sample Depth (approx. feet/bgs)			0.1 of Non-cancer	Cancer	1 - 5'		1 - 5'		1 - 5'		0-6"		1 - 5'		1-5'		1-5'		1 - 5'		1 - 5'		0 - ~1'	
Date Collected					14-Mar		26-Mar		31-Mar		9-Apr		31-Mar		25-Mar		8-Apr		5-Apr		5-Apr		4-Apr	
Matrix					Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Sediment	
Basis					Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry		Dry	
LAB Service Request ID #					K0802299		K0802299A		K0802299A		K0802299A		K0802299A		K0802299		K0802299A		K0802299A		K0802299A		K0803345	
Analyis Group	**Chemical**	**CAS #**	**µg/kg**	**µg/kg**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**
	Monobutyltin	78763-54-9					0.64	J	1.3	U	25	=	1.1	U	1.3	U	1.2	U	1.2	U	1.2	U		
TPH																								
	TPH-Deisel				5,200	J	140,000	=	5,200	J	22,000	=	3,000	J	44,000	=	22,000	=	58,000	=	40,000	=	49,000	=
	TPH-Motor Oil				60,000	J	450,000	=	60,000	J	130,000	=	*100,000*	*U*	180,000	=	76,000	J	230,000	=	140,000	=	380,000	=

** Screening Values updated from Region 6 Human Health Medium-Specific Screening Levels 2008; March 2008, Industrial Soils, Outdoor Worker, Integrated.

U.S. Moorings Feasibility Study
Appendix B Table B-3
Groundwater Sampling Results
Screened to MCLs and Secondary Standards as listed in the JSCS

Sample Number			SCREENING	GW-16		GW-12		GW-11		GW-1		GW-2		GW-3		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			CRITERIA	165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			Water (C)	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			JSCS**	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			Drinking Water	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis			MCL	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #				K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Analysis Group	**Chemical**	**CAS #**	**µg/L**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
VOCs																											
	cis-1,2-Dichloroethlyene	156-59-2	70	0.5	U	0.5	U	0.5	U	0.5	U	0.31	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Dichlorodifluoromethane	75-71-8		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	*UJ*	0.5	U	0.5	U	0.5	U	0.5	U
	Chloromethane	74-87-3		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Vinyl Chloride	75-01-4	2	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromomethane	74-83-9		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Chloroethane	75-00-3		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Trichlorofluoromethane	75-69-4		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Acetone	67-64-1		20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	Iodomethane (Methyl Iodide)	74-88-4		5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
	1,1-Dichloroethene (1,1-DCE)	75-35-4		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Carbon Disulfide	75-15-0		0.40	J	0.5	U	2.3	=	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.35	J
	Methylene chloride (Dichloromethane)	75-09-2		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	*UJ*	2	U	2	U	2	U	2	U
	Acrylonitrile	107-13-1		5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
	Methyltert-butyl ether	1634-04-4		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	trans-1,2-Dichloroethene	156-60-5		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1-Dichloroethane	75-34-3		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Vinyl Acetate	108-05-4		5	U	5	U	5	U	5	U	5	U	5	U	5	U	5.0	U	5	U	5	U	5	U	5	U
	2-Butanone (MEK)	78-93-3		20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	Chloroform	67-66-3		0.5	U	0.5	U	0.5	U	0.5	U	0.3	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromochloromethane	74-97-5		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1,1-Trichloroethane (TCA)	71-55-6	200	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromodichloromethane	75-27-4		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Carbon Tetrachloride	56-23-5	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,2-Dichloroethane (EDC)	107-06-2		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Benzene	71-43-2	5	0.56	=	0.5	U	0.22	J	0.94	=	0.5	U	0.24	J	0.19	J	0.4	J	0.85	=	0.5	U	0.73	=	0.58	=
	Trichloroethene (TCE)	79-01-6	5	0.5	U	0.5	U	0.5	U	0.5	U	0.67	=	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,2-Dichloropropane	78-87-5	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2-Chloroethyl Vinyl Ether	110-75-8		5	*R*	5	*R*	5	*R*	5	*R*	5	*R*	5	*R*	5	*R*	5	*R*	5	*R*	5	*R*	5	*R*	5	*R*
	Dibromomethane	74-95-3		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2-Hexanone	591-78-6		20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	cis-1,3-Dichloropropene	10061-01-5		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Toluene	108-88-3	1000	0.33	J	0.5	U	0.21	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.27	J
	trans-1,3-Dichloropropene	10061-02-6		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1,2-Trichloroethane	79-00-5	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	4-Methyl-2-Pentanone (MIBK)	108-10-1		20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	Tetrachloroethene (PCE)	127-18-4	5	0.5	U	0.5	U	0.5	U	0.5	U	0.22	J	0.5	U	0.14	J	0.5	U	0.5	U	0.5	U	0.13	J	0.5	U
	Dibromochloromethane	124-48-1		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,2-Dibromoethane (EDB)	106-93-4		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	Chlorobenzene	108-90-7	100	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1,1,2-Tetrachloroethane	630-20-6		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Ethylbenzene *	100-41-4	700	0.14	J	0.5	U	0.14	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.14	J
	m,p-Xylene	1330-20-7		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	o-Xylene	95-47-6		*0.5*	*U*	0.5	U	*0.5*	*U*	*0.5*	*U*	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	*0.5*	*U*
	Styrene	100-42-5	100	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromoform	75-25-2		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Isopropylbenzene	98-82-8		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	1,1,2,2-Tetrachloroethane	79-34-5		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	trans-1,4-Dichloro-2-butene	110-57-6		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
	1,2,3-Trichloropropane	96-18-4		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,4-Dichlorobenzene	106-46-7		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Naphthalene	91-20-3		5.9	=	2.2	=	3.9	=	2	U	2	U	0.8	J	2	U	2	U	1.9	J	2	U	1.8	J	6.3	=
	Acrolein	107-02-8		20	*UJ*	20	*UJ*	20	*UJ*	20	*UJ*	20	*UJ*	20	*UJ*	20	*UJ*	20	*UJ*	20	*UJ*	20	U	20	*UJ*	20	*UJ*
SVOCs																											
	Phenols and Substituted Phenols																										
	2,4,6-trichlorophenol	88-06-2		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2,4,5-Trichlorophenol	95-95-4		1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U
	2,3,4,5-Tetrachlorophenol	4901-51-3		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2,3,5,6-Tetrachlorophenol	935-95-5		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Pentachlorophenol	87-86-5	1	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.1	J

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-3
Groundwater Sampling Results
Screened to MCLs and Secondary Standards as listed in the JSCS

Sample Number			SCREENING	GW-16		GW-12		GW-11		GW-1		GW-2		GW-3		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			CRITERIA	165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			Water (C)	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			JSCS**	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			Drinking Water	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis			MCL	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #				K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Polycyclic Aromatic Hydrocarbons (PAHs)																											
Naphthalene	91-20-3	0.2 (26)		6	=	1.5	=	3.3	=	0.15	=	0.0079	=	0.84	=	0.19	=	0.16	=	1.4	=	0.012	U	0.93	=	6.1	=
2-Methylnaphthalene	91-57-6	0.2 (26)		0.19	=	0.046	=	0.056	=	0.0035	J	0.0077	U	0.0053	J	0.0044	J	0.008	U	0.064	J	0.0042	J	0.038	J	0.16	=
1-Methylnaphthalene	90-12-0			0.29	=	0.06	=	0.11	=	0.0065	J	0.0077	U	0.0075	J	0.01	=	0.0043	J	0.1	=	0.0079	U	0.06	=	0.25	=
Acenaphthylene	208-96-8	0.2 (26)		0.014	=	0.0079	U	0.012	=	0.0079	U	0.0077	U	0.0079	U	0.0086	=	0.008	U	0.0074	J	0.0079	U	0.0049	J	0.012	=
Acenaphthene	83-32-9	0.2 (26)		0.11	=	0.013	=	0.019	=	0.0074	J	0.0077	U	0.011	=	0.088	=	0.0064	J	0.096	=	0.0079	U	0.058	=	0.093	=
Fluorene	86-73-7	0.2 (26)		0.39	=	0.023	=	0.058	=	0.0079	U	0.0077	U	0.0085	=	0.3	=	0.012	=	0.23	=	0.0079	U	0.17	=	0.32	=
Dibenzofuran	132-64-9			0.019	=	0.0079	U	0.0067	J	0.0079	U	0.0077	U	0.0079	U	0.022	=	0.008	U	0.021	=	0.0079	U	0.014	=	0.016	=
Phenanthrene	85-01-8	0.2 (26)		0.17	=	0.027	=	0.035	=	0.0078	J	0.0077	U	0.0059	J	0.066	=	0.014	=	0.13	=	0.0079	U	0.1	=	0.14	=
Anthracene	120-12-7	0.2 (26)		0.18	=	0.06	=	0.038	=	0.017	=	0.0062	J	0.0043	J	0.049	=	0.013	=	0.051	=	0.0079	U	0.04	=	0.13	=
Fluoranthene	206-44-0	0.2 (26)		0.045	=	0.013	=	0.079	=	0.005	J	0.0077	U	0.01	=	0.0078	U	0.009	=	0.028	=	0.0079	U	0.016	=	0.041	=
Pyrene	129-00-0	0.2 (26)		0.06	=	0.017	=	0.098	=	0.01	=	0.0099	=	0.022	=	0.0078	U	0.017	=	0.034	J	0.0079	U	0.017	J	0.049	=
Benzo(a)anthracene	56-55-3	0.2 (26)		0.0082	=	0.0079	U	0.056	=	0.004	J	0.0077	U	0.0035	J	0.0078	U	0.003	J	0.011	=	0.0079	U	0.0039	J	0.0074	J
Chrysene	218-01-9	0.2 (26)		0.0034	J	0.0079	U	0.018	=	0.0044	J	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.011	=	0.0079	U	0.0078	U	0.0078	U
Benzo(b)fluoranthene	205-99-2	0.2 (26)		0.024	=	0.0077	J	0.034	=	0.011	=	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.011	=	0.0079	U	0.0078	U	0.017	=
Benzo(k)fluoranthene	207-08-9	0.2 (26)		0.0054	J	0.0079	U	0.041	=	0.0029	J	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.0034	J	0.0079	U	0.0078	U	0.0051	J
Benzo(a)pyrene	50-32-8	0.2		0.0078	U	0.0079	U	0.051	=	0.0085	=	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.01	=	0.0079	U	0.0078	U	0.0052	J
Indeno(1,2,3-cd)pyrene	193-39-5	0.2 (26)		0.005	J	0.0079	U	0.047	=	0.015	=	0.0077	U	0.0079	U	0.0078	U	0.0032	J	0.0068	J	0.0079	U	0.0078	U	0.0053	J
Dibenz(a,h)anthracene	53-70-3	0.2 (26)		0.0078	U	0.0079	U	0.0052	J	0.0079	U	0.0077	U	0.0079	U	0.0078	U	0.0037	J	0.0078	U	0.0079	U	0.0078	U	0.0078	U
Benzo(g,h,i)perylene	191-24-2	0.2 (26)		0.0054	J	0.0079	U	0.055	=	0.019	=	0.0077	U	0.0079	U	0.0078	U	0.0034	J	0.0067	J	0.0079	U	0.0078	U	0.0053	J
Organonitrogen Compounds, Halogenated Compounds, Phenols and Substituted Phenols, Oxygen-Containing Compounds																											
n-Nitrosodimethylamine	62-75-9			2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	U	2	UJ	2	UJ
Aniline	62-53-3			0.98	UJ	0.97	UJ	0.97	UJ	0.97	UJ	0.98	UJ	0.98	UJ	0.98	UJ	0.96	UJ	0.99	UJ	0.98	U	0.99	UJ	0.98	UJ
bis (2-Chloroethyl) ether	111-44-4			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Phenol	108-95-2			0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
2-Chlorophenol	95-57-8			0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
1,3-Dichlorobenzene	541-73-1			0.039	J	0.039	J	0.042	J	0.049	J	0.053	J	0.2	U	0.2	U	0.045	J	0.046	J	0.2	U	0.04	J	0.032	J
1,4-Dichlorobenzene	106-46-7	75		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.053	J	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
1,2-Dichlorobenzene	95-50-1	600		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Benzyl Alcohol	100-51-6			4.9	U	4.9	U	4.9	U	0.089	J	4.9	U	4.9	U	4.9	U	4.8	U	5	U	4.9	U	5	U	4.9	U
bis (2-Chloroisopropyl) ether	108-60-1			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	U
2-Methylphenol	95-48-7			0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
Hexachloroethane	67-72-1			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
n-Nitroso-di-n-propylamine	621-64-7			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
4-Methylphenol (p-Cresol)	106-44-5			0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
Nitrobenzene	98-95-3			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Isophorone	78-89-1			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2-Nitrophenol	88-75-5			0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
2,4-Dimethylphenol	120-83-2			3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	4	U	3.9	U
bis (2-Chloroethoxy) methane	111-91-1			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2,4-Dichlorophenol	120-83-2			0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
Benzoic Acid	65-85-0			1.1	J	4.9	U	4.9	U	4.9	U	1.2	J	1.2	J	1.2	J	4.8	U	1.2	J	4.9	U	5	U	1.1	J
1,2,4-Trichlorobenzene	120-82-1	70		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
4-Chloroaniline	106-47-8			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Hexachlorobutadiene	87-68-3			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
4-Chloro-3-methylphenol	59-50-7			0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
Hexachlorocyclopentadiene	77-47-4	50		0.98	R	0.97	R	0.97	R	0.97	R	0.98	R	0.98	R	0.98	R	0.96	R	0.99	R	0.98	R	0.99	R	0.98	R
2-Chloronaphthalene	91-58-7			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2-Nitroaniline	88-74-4			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Dimethyl Phthalate	131-11-3			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2,6-Dinitrotoluene	606-20-2			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
3-Nitroaniline	99-09-2			0.98	U	0.97	U	0.97	U	0.97	U	0.98	U	0.98	U	0.98	U	0.96	U	0.99	U	0.98	U	0.99	U	0.98	U
2,4-Dinitrophenol	51-28-5			3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	4	U	3.9	U
4-Nitrophenol	100-02-7			2	U	2	U	2	U	2	U	2	UJ	2	U	2	U	2	U	2	UJ	2	U	2	U	2	U
2,4-Dinitrotoluene	121-14-2			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
4-Chlorophenyl-phenyl ether	7005-72-3			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Diethyl Phthalate	84-66-2			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
4-Nitroaniline	100-01-6			0.98	U	0.97	U	0.97	U	0.97	U	0.98	U	0.98	U	0.98	U	0.96	U	0.99	U	0.98	U	0.99	U	0.98	U
2-Methyl-4,6-dinitrophenol	534-52-1			2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
N-Nitrosodiphenylamine	86-30-6			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
4-Bromophenyl-phenyl ether	101-55-3			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Hexachlorobenzene	118-74-1	1		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Carbazole	86-74-8			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.036	J	0.2	U	0.025	J	0.2	U	0.2	U	0.2	U
di-n-butyl Phthalate	84-74-2			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Butyl Benzyl Phthalate	85-68-7			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
3,3'-Dichlorobenzidine	91-94-1			2	R	2.0	R	2.0	R	2	R	2	R	2	R	2	R	2	R	2	R	2	U	2	R	2	R
bis (2-Ethylhexyl) phthalate	117-81-7	6		0.98	U	0.97	U	0.97	U	0.97	U	0.98	U	0.98	U	0.98	U	0.96	U	0.99	U	0.98	U	1.2	U	0.98	U
di-n-octyl Phthalate	117-84-0			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-3
Groundwater Sampling Results
Screened to MCLs and Secondary Standards as listed in the JSCS

Sample Number			**SCREENING**	GW-16		GW-12		GW-11		GW-1		GW-2		GW-3		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			**CRITERIA**	165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			**Water** (C)	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			**JSCS****	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			Drinking Water	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis			MCL	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #				K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
PCBs																											
	Aroclor 1016	12674-11-2		0.0054	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1221	11104-28-2		0.059	U	0.029	U	0.023	U	0.0099	U	0.0099	U	0.0097	U	0.0099	U	0.0097	U	0.0098	U	0.0098	U	0.0098	U	0.044	U
	Aroclor 1232	11141-16-5		0.0064	U	0.008	U	0.011	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.015	U
	Aroclor 1242	53469-21-9		0.011	U	0.0054	U	0.007	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.0085	U
	Aroclor 1248	12672-29-6		0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1254	11097-69-1		0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1260	11096-82-5		0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1262	37324-23-5		0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1268	11100-14-4		0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Total PCBs		0.5	**ND**		**ND**		**ND**		**ND**	**U**	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
Pesticides																											
	α -BHC	319-84-6		0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00036	J	0.0005	U
	Hexachlorobenzene	118-74-1	1	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0007	*J*	0.00049	U	0.00062	=	0.00049	U	0.00081	U	0.00049	U	0.00049	U	0.0005	U
	β -BHC	319-85-7		0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.00081	U	0.00049	U	0.0013	*J*	0.00049	U	0.00049	*UJ*	0.0005	U
	γ -BHC (Lindane)	58-89-9	0.2	0.0005	*J*	0.00071	=	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.00054	U	0.00049	*UJ*	0.00049	U	0.00049	*UJ*	0.00052	U	0.00052	U
	δ -BHC	319-86-8		0.0012	*UJ*	0.00073	*UJ*	0.0005	*UJ*	0.00058	U	0.0005	U	0.00049	*UJ*	0.00052	U	0.00049	*UJ*	0.00049	*UJ*	0.00049	*UJ*	0.00049	U	0.0015	*UJ*
	Heptachlor	76-44-8	0.4	0.00049	*UJ*	0.00049	*UJ*	0.0005	*UJ*	0.0005	U	0.0005	U	0.00049	U	0.00059	U	0.00049	*UJ*	0.00049	U	0.00049	*UJ*	0.00049	U	0.00041	*UJ*
	Aldrin	309-00-2		0.00099	U	0.00027	J	0.00059	U	0.00087	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.0007	U	0.00049	U	0.00049	U	0.00098	*J*
	Heptachlor epoxide	102-45-73	0.2	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00062	U	0.0005	U	0.00051	U	0.0018	U	0.00049	U	0.00049	U	0.0005	U
	gamma-Chlordane	5103-74-2		0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0006	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.0005	U
	Endosulfan alpha-	959-98-8		0.00076	U	0.00063	U	0.0005	U	0.00071	U	0.00082	*NJ*	0.00063	=	0.0007	U	0.0013	*J*	0.00049	U	0.00049	U	0.00049	U	0.0012	=
	alpha-Chlordane	5103-74-2		0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Dieldrin	60-57-1		0.00049	U	0.00049	U	0.0005	U	0.0012	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	4,4'-DDE	72-55-9		0.00051	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00025	J	0.0005	U
	Endrin	72-20-8	2	0.00049	U	0.00049	U	0.00055	U	0.0012	U	0.0005	U	0.00049	U	0.0014	U	0.00049	U	0.00092	U	0.00049	U	0.00077	U	0.0005	U
	Endosulfan beta-	33213-65-9		0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00052	U	0.0005	U	0.00054	U	0.00049	U	0.00053	U	0.00049	U	0.0005	U
	4,4'-DDD	72-54-8		0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.00074	U	0.0021	U	0.0035	U	0.00049	U	0.00049	U	0.0005	U
	Endrin aldehyde	7421-93-4		0.00049	U	0.00049	U	0.00032	J	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Endosulfan sulfate	1031-07-8		0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00046	J	0.00061	U	0.00049	U	0.0015	U	0.00049	U	0.00049	U	0.0005	U
	4,4'-DDT	50-29-3		0.0016	U	0.0022	U	0.0005	U	0.0013	U	0.0011	U	0.00055	U	0.0005	U	0.00049	U	0.0012	U	0.0005	U	0.00068	U	0.0029	U
	Endrin ketone	53494-70-5		0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Methoxychlor	72-43-5	40	0.00049	U	0.00049	U	0.00053	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Toxaphene	8001-35-2	3	0.092	U	0.028	U	0.028	U	0.032	U	0.025	U	0.025	U	0.06	U	0.042	U	0.056	U	0.025	U	0.025	U	0.18	U
	oxy chlordane			0.00098	U	0.00097	U	0.00099	U	0.00099	U	0.00099	U	0.00097	U	0.0013	U	0.0049	*J*	0.0054	*J*	0.00098	U	0.00098	*UJ*	0.00099	U
	2,4'-DDE	3424-82-6		0.00049	U	0.0011	=	0.0005	U	0.00055	U	0.0005	U	0.00054	U	0.0014	U	0.00049	U	0.00049	U	0.0005	U	0.00049	U	0.00064	U
	cis -nonachlor	5103-73-1		0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.00058	U	0.00091	U	0.0005	U	0.0018	*J*	0.0044	U	0.00049	U	0.00049	U	0.0005	U
	2,4'-DDD	53-19-0		0.0011	U	0.00049	U	0.00083	U	0.0005	U	0.0005	U	0.00049	U	0.00084	U	0.00061	U	0.00071	U	0.00049	U	0.00049	U	0.0014	U
	trans -nonachlor	39765-80-5		0.0017	U	0.00076	U	0.00093	U	0.0024	*J*	0.00035	*J*	0.00061	U	0.0012	U	0.0018	*J*	0.0013	U	0.00049	U	0.0006	U	0.0015	U
	2,4'-DDT	789-02-6		0.0037	U	0.00049	U	0.00078	U	0.0017	U	0.00087	U	0.00049	U	0.002	U	0.00059	U	0.00049	U	0.00049	U	0.0011	U	0.0057	U
	Mirex	2385-85-5		0.00049	U	0.00057	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.00089	U
	Hexachloroethane	67-72-1		0.00049	U	0.00049	U	0.00029	J	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00038	J	0.00049	U	0.00009	J	0.00032	J
	Hexachlorobutadiene	87-68-3		0.00049	U	0.00049	U	0.0008	=	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	DDE (1)	**72-55-9**		**ND**		**0.0011**	**=**	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**0.00025**	**J**	**ND**	
	DDD (1)	**72-54-8**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
	DDT (1)	**50-29-3**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
	DDx-total (2)	**50-29-3**		**ND**		**0.0011**	**=**	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**0.00025**	**J**	**ND**	
	Chlordane -total (3)		2	**ND**		**ND**		**ND**		**0.0024**	**J**	**0.00035**	**J**	**ND**		**ND**		**0.0085**	**J**	**0.0054**	**J**	**ND**		**ND**		**ND**	
	Endosulfan -total (4)			**ND**		**ND**		**ND**		**ND**		**0.00082**		**0.00109**		**ND**		**0.0013**	**J**	**ND**		**ND**		**ND**		**0.0012**	**=**

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-3
Groundwater Sampling Results
Screened to MCLs and Secondary Standards as listed in the JSCS

Sample Number			SCREENING	GW-16		GW-12		GW-11		GW-1		GW-2		GW-3		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			CRITERIA	165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			Water (C)	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			JSCS**	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			Drinking Water	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis			MCL	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #				K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Cyanide																											
	Cyanide[18]	57-12-5	200	2,990	=	240	=	150	=	30	=	50	=	210	=	1,110	=	240	=	310	=	200	=	290	=	2,970	=
Total Susspended Solids																											
	Total Suspended Solids			5,000	U	35,000	=	1,180,000	=	5000	U	385,000	=	5,000	U	5,000	U	117	=	75,000	J	86,000	=	32,000	J	5,000	U
Metals		CAS #																									
	Aluminum (pH 6.5 - 9.0)[13]	7429-90-5	(50-200)[29]	8,040	=	4,340	=	74600	=	6,410	=	3,820	=	36	=	4,210	=	499	=	3,140	=	102	=	2,770	=	8,410	=
	Antimony	7440-36-0	6	0.12	=	0.28	=	0.1	B	0.05	U	0.03	B	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.12	=
	Arsenic	7440-38-2	10	0.55	=	0.25	=	4.02	=	1.2	=	1.43	=	0.342	=	0.058	=	0.231	=	0.592	=	4.68	=	0.583	=	0.53	=
	Cadmium[15]	7440-43-9	5	2.17	=	1.22	=	20.9	=	0.16	=	0.023	=	0.02	U	0.039	=	0.017	B	0.019	B	0.02	U	0.018	B	2.13	=
	Chromium, total	7440-47-3	100	7.07	=	4.3	=	100	=	2.03	=	3.63	=	0.24	=	0.65	=	0.77	=	1.56	=	0.46	U	1.17	=	6.88	=
	Copper[15]	7440-50-8	1,300 = TT	2.66	=	11.1	=	108	=	1.54	=	4.04	=	0.2	=	1.80	=	0.63	=	0.99	=	1.5	=	0.65	=	2.66	=
	Lead[15]	7439-92-1	15 = TT	14.1	=	1.5	=	92.3	=	3.28	=	2.51	=	0.042	=	0.04	=	0.105	=	0.154	J	0.146	=	0.06	J	14.2	=
	Manganese	7439-96-5	(50)[29]	804	=	210	=	1770	=	1,180	=	478	=	893	=	545	=	875	=	476	=	12,000	=	448	=	798	=
	Mercury	7439-97-6	2	0.2	U	0.2	U	0.07	B	0.2	U	0.2	U	0.2	U	0.20	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Nickel[15]	7440-02-0		71.5	=	54.1	=	212	=	153	=	25.4	=	2.55	=	8.3	=	5.88	=	17.4	=	2.12	=	16.3	=	69.2	=
	Selenium	7782-49-2	50	1.1	B	0.2	U	0.1	U	0.3	B	1	U	1	U	1	U	1	U	1	U	0.3	B	1	U	5	U
	Silver [15]	7440-22-4	(100)[29]	0.02	U	0.003	U	0.269	=	0.02	U	0.02	U	0.02	U	0.02	U	0.03	U	0.02	U	0.02	U	0.02	U	0.02	U
	Zinc[15]	7440-66-6	(5,000)[29]	1,250	=	3,250	=	5,510	=	3580	=	281	=	10.3	=	58.8	=	52.8	=	121	=	33.4	=	115	=	1,250	=
	Aluminum, Dissolved		(50-200)[29]	7,860	=	3,840	=	10,500	=	6,210	=	236	=	170	=	4,160	=	137	=	2,640	=	2.6	=	2,620	=	7,870	=
	Antimony, Dissolved		6	0.13	=	0.18	=	0.04	B	0.03	B	0.05	B	0.05	=	0.05	U	0.02	B	0.03	B	0.03	B	0.05	U	0.13	=
	Arsenic, Dissolved		10	0.525	=	0.206	=	0.912	=	1.02	=	1.1	=	0.431	=	0.035	B	0.155	=	0.577	=	4.71	=	0.558	=	0.499	=
	Cadmium, Dissolved		5	2	=	1.18	=	1.92	=	0.153	=	0.02	U	0.009	B	0.037	=	0.01	B	0.02	=	0.02	U	0.017	B	1.89	=
	Chromium, Dissolved		100	7.17	=	3.18	=	5.15	=	1.69	=	0.37	=	0.5	=	0.62	=	0.34	=	1.08	=	0.28	U	0.95	=	6.74	=
	Copper, Dissolved		1,300 = TT	0.74	=	0.4	=	0.43	=	1.1	=	0.2	=	0.43	=	1.77	=	0.18	=	0.56	=	0.8	=	0.51	=	0.77	=
	Lead, Dissolved		15 = TT	11.5	=	1.49	=	1.96	=	2.66	=	0.026	=	0.335	=	0.174	=	0.018	B	0.022	=	0.028	=	0.017	B	10.2	=
	Manganese, Dissolved		(50)[29]	828	=	221	=	1,530	=	1,190	=	456	=	899	=	538	=	870	=	440	=	12,000	=	441	=	805	=
	Mercury, Dissolved		2	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.20	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Nickel, Dissolved			76.6	=	51.7	=	72.7	=	145	=	11.7	=	2.61	=	8.10	=	5.35	=	16.4	=	2.12	=	16	=	74.9	=
	Selenium, Dissolved		50	0.4	B	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	0.3	B	1	U	1	U
	Silver, Dissolved		(100)[29]	0.004	B	0.003	B	0.006	B	0.027	=	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U
	Zinc, Dissolved		(5,000)[29]	1,130	=	3,120	=	3,340	=	3,550	=	200	=	10.6	=	59.9	=	55.3	=	114	=	31	=	113	=	1,080	=
TPH																											
	TPH-Diesel			13	J	260	U	13	J	260	U	260	U	250	U	260	U	250	U	270	U	250	U	260	U	12	J
	TPH-Motor Oil			510	U	520	U	500	U	21	J	520	U	500	U	520	U	490	U	530	U	500	U	520	U	520	U

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-4
Groundwater Sampling Results
Screened to EPA Region 6 Tap Water PRGs

Sample Number			SCREENING	CRITERIA	GW-16		GW-12		GW-11		GW-1		GW-2		GW-3		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			EPA Region 6		165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			Tap Water	Tap Water	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			PRG	0.1*PRG	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			Cancer	Non Cancer	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis					NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #					K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
Volatile Organic Compounds (VOCs)																												
	cis-1,2-Dichloroethlyene	156-59-2		6.1	0.5	U	0.5	U	0.5	U	0.5	U	0.31	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Dichlorodifluoromethane	75-71-8		39.5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	UJ	0.5	U	0.5	U	0.5	U	0.5	U
	Chloromethane	74-87-3		18.8	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Vinyl Chloride	75-01-4	0.015	7.2	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromomethane	74-83-9		0.87	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Chloroethane	75-00-3	3.864	859	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Trichlorofluoromethane	75-69-4		129	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Acetone	67-64-1		548	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	Iodomethane (Methyl Iodide)	74-88-4			5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
	1,1-Dichloroethene (1,1-DCE)	75-35-4		34	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Carbon Disulfide	75-15-0		104	0.40	J	0.5	U	2.3	=	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.35	J
	Methylene chloride (Dichloromethane)	75-09-2	4.276	162	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	UJ	2	U	2	U	2	U	2	U
	Acrylonitrile	107-13-1	0.039	0.374	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
	Methyltert-butyl ether	1634-04-4	10.588	521	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	trans-1,2-Dichloroethene	156-60-5		11	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1-Dichloroethane	75-34-3		122	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Vinyl Acetate	108-05-4		41	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5.0	U	5	U	5	U	5	U	5	U
	2-Butanone (MEK)	78-93-3		706	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	Chloroform	67-66-3	0.167	7.5	0.5	U	0.5	U	0.5	U	0.5	U	0.3	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromochloromethane	74-97-5			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1,1-Trichloroethane (TCA)	71-55-6		913	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromodichloromethane	75-27-4	0.181	12.2	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Carbon Tetrachloride	56-23-5	0.171	2.6	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,2-Dichloroethane (EDC)	107-06-2	0.123	1.0	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Benzene	71-43-2	0.354	4.4	0.56	=	0.5	U	0.22	J	0.94	=	0.5	U	0.24	J	0.19	J	0.4	J	0.85	=	0.5	U	0.73	=	0.58	=
	Trichloroethene (TCE)	79-01-6	0.028	0.97	0.5	U	0.5	U	0.5	U	0.5	U	0.67	=	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,2-Dichloropropane	78-87-5	0.165	0.69	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2-Chloroethyl Vinyl Ether	110-75-8			5.0	R	5	R	5	R	5	R	5	R	5	R	5	R	5	R	5	R	5	R	5	R	5	R
	Dibromomethane	74-95-3		6.08	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2-Hexanone	591-78-6			20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	cis-1,3-Dichloropropene	10061-01-5	0.395	4.02	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Toluene	108-88-3		228	0.33	J	0.5	U	0.21	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.27	J
	trans-1,3-Dichloropropene	10061-02-6	0.395	4.02	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1,2-Trichloroethane	79-00-5	0.200	2.4	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	4-Methyl-2-Pentanone (MIBK)	108-10-1		199	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	Tetrachloroethene (PCE)	127-18-4	0.105	28.2	0.5	U	0.5	U	0.5	U	0.5	U	0.22	J	0.5	U	0.14	J	0.5	U	0.5	U	0.5	U	0.13	J	0.5	U
	Dibromochloromethane	124-48-1	0.133	12.2	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,2-Dibromoethane (EDB)	106-93-4	0.006	1.8	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	Chlorobenzene	108-90-7		9.1	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1,1,2-Tetrachloroethane	630-20-6	0.432	18.3	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Ethylbenzene	100-41-4		134	0.14	J	0.5	U	0.14	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.14	J
	m,p-Xylene	1330-20-7		20.8	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	o-Xylene	95-47-6		7300	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Styrene	100-42-5		164	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromoform	75-25-2	8.510	73.0	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Isopropylbenzene	98-82-8		65.8	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	1,1,2,2-Tetrachloroethane	79-34-5	0.055	36.5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	trans-1,4-Dichloro-2-butene	110-57-6	0.001		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
	1,2,3-Trichloropropane	96-18-4	0.034	0.995	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,4-Dichlorobenzene	106-46-7	0.467	66.2	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Naphthalene	91-20-3		0.620	5.9	=	2.2	=	3.9	=	2	U	2	U	0.8	J	2	U	2	U	1.9	J	2	U	1.8	J	6.3	=
	Acrolein	107-02-8		0.004	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	U	20	UJ	20	UJ
SVOCs																												
	Phenols and Substituted Phenols																											
	2,4,6-trichlorophenol	88-06-2	6.112	3.65	0.5	U	0.5	U	0.5	U	2	UJ	2	UJ	2	UJ	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2,4,5-Trichlorophenol	95-95-4		365	1.3	U	1.3	U	1.3	U	0.97	UJ	0.98	UJ	0.98	UJ	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U
	2,3,4,5-Tetrachlorophenol	4901-51-3			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2,3,5,6-Tetrachlorophenol	935-95-5			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Pentachlorophenol	87-86-5	0.560	110	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.1	J

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007, and updated from Region 6 Human Health Medium-Specific Screening Levels, March 2008.

U.S. Moorings Feasibility Study
Appendix B Table B-4
Groundwater Sampling Results
Screened to EPA Region 6 Tap Water PRGs

Sample Number			SCREENING	CRITERIA	GW-16		GW-12		GW-11		GW-1		GW-2		GW-3		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			EPA Region 6		165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			Tap Water	Tap Water	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			PRG	0.1*PRG	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			Cancer	Non Cancer	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis					NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #					K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
	Polycyclic Aromatic Hydrocarbons (PAHs)																											
	Naphthalene	91-20-3		0.620	6	=	1.5	=	3.3	=	0.15	=	0.0079	=	0.84	=	0.19	=	0.16	=	1.4	=	0.012	U	0.93	=	6.1	=
	2-Methylnaphthalene	91-57-6			0.19	=	0.046	=	0.056	=	0.0035	J	0.0077	U	0.0053	J	0.0044	J	0.008	U	0.064	J	0.0042	J	0.038	J	0.16	=
	1-Methylnaphthalene	90-12-0			0.29	=	0.06	=	0.11	=	0.0065	J	0.0077	U	0.0075	J	0.01	=	0.0043	J	0.1	=	0.0079	U	0.06	=	0.25	=
	Acenaphthylene	208-96-8			0.014	=	0.0079	U	0.012	=	0.0079	U	0.0077	U	0.0079	U	0.0086	=	0.008	U	0.0074	J	0.0079	U	0.0049	J	0.012	=
	Acenaphthene	83-32-9		36.5	0.11	=	0.013	=	0.019	=	0.0074	J	0.0077	U	0.011	=	0.088	=	0.0064	J	0.096	=	0.0079	U	0.058	=	0.093	=
	Fluorene	86-73-7		24.3	0.39	=	0.023	=	0.058	=	0.0079	U	0.0077	U	0.0085	=	0.3	=	0.012	=	0.23	=	0.0079	U	0.17	=	0.32	=
	Dibenzofuran	132-64-9		1.217	0.019	=	0.0079	U	0.0067	J	0.0079	U	0.0077	U	0.0079	U	0.022	=	0.008	U	0.021	=	0.0079	U	0.014	=	0.016	=
	Phenanthrene	85-01-8			0.17	=	0.027	=	0.035	=	0.0078	J	0.0077	U	0.0059	J	0.066	=	0.014	=	0.13	=	0.0079	U	0.1	=	0.14	=
	Anthracene	120-12-7		183	0.18	=	0.06	=	0.038	=	0.017	=	0.0062	J	0.0043	J	0.049	=	0.013	=	0.051	=	0.0079	U	0.04	=	0.13	=
	Fluoranthene	206-44-0		146	0.045	=	0.013	=	0.079	=	0.005	J	0.0077	U	0.01	=	0.0078	U	0.009	=	0.028	=	0.0079	U	0.016	=	0.041	=
	Pyrene	129-00-0		18.3	0.06	=	0.017	=	0.098	=	0.01	=	0.0099	=	0.022	=	0.0078	U	0.017	=	0.034	J	0.0079	U	0.017	J	0.049	=
	Benzo(a)anthracene	56-55-3	0.029		0.0082	=	0.0079	U	0.056	=	0.004	J	0.0077	U	0.0035	J	0.0078	U	0.003	J	0.011	=	0.0079	U	0.0039	J	0.0074	J
	Chrysene	218-01-9	2.950		0.0034	J	0.0079	U	0.018	=	0.0044	J	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.011	=	0.0079	U	0.0078	U	0.0078	U
	Benzo(b)fluoranthene	205-99-2	0.029		0.024	=	0.0077	J	0.034	=	0.011	=	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.011	=	0.0079	U	0.0078	U	0.017	=
	Benzo(k)fluoranthene	207-08-9	0.295		0.0054	J	0.0079	U	0.041	=	0.0029	J	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.0034	J	0.0079	U	0.0078	U	0.0051	J
	Benzo(a)pyrene	50-32-8	0.003		0.0078	U	0.0079	U	0.051	=	0.0085	=	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.01	=	0.0079	U	0.0078	U	0.0052	J
	Indeno(1,2,3-cd)pyrene	193-39-5	0.029		0.005	J	0.0079	U	0.047	=	0.015	=	0.0077	U	0.0079	U	0.0078	U	0.0032	J	0.0068	J	0.0079	U	0.0078	U	0.0053	J
	Dibenz(a,h)anthracene	53-70-3	0.003		0.0078	U	0.0079	U	0.0052	J	0.0079	U	0.0077	U	0.0079	U	0.0078	U	0.0037	J	0.0078	U	0.0079	U	0.0078	U	0.0078	U
	Benzo(g,h)perylene	191-24-2			0.0054	J	0.0079	U	0.055	=	0.019	=	0.0077	U	0.0079	U	0.0078	U	0.0034	J	0.0067	J	0.0079	U	0.0078	U	0.0053	J
	Organonitrogen Compounds, Halogenated Compounds, Phenols and Substituted Phenols, Oxygen-Containing Compounds																											
	n-Nitrosodimethylamine	62-75-9	0.0004	0.029	2	U	2	U	2	U	2	U	2	U	2	U	2	UJ	2	UJ	2	UJ	2	U	2	UJ	2	UJ
	Aniline	62-53-3	11.795	25.6	0.98	U	0.97	U	0.97	U	0.97	U	0.98	U	0.98	U	0.98	UJ	0.96	UJ	0.99	UJ	0.98	U	0.99	UJ	0.98	UJ
	bis (2-Chloroethyl) ether	111-44-4	0.010		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Phenol	108-95-2		1095	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	2-Chlorophenol	95-57-8		3.04	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	1,3-Dichlorobenzene	541-73-1		1.45	0.039	J	0.039	J	0.042	J	0.049	J	0.053	J	0.2	U	0.2	U	0.045	J	0.046	J	0.2	U	0.04	J	0.032	J
	1,4-Dichlorobenzene	106-46-7	0.467	66.2	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.053	J	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	1,2-Dichlorobenzene	95-50-1		4.93	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Benzyl Alcohol	100-51-6		1095	4.9	U	4.9	U	4.9	U	0.089	J	4.9	U	4.9	U	4.9	U	4.8	U	5	U	4.9	U	5	U	4.9	U
	bis (2-Chloroisopropyl) ether	108-60-1	0.274	24	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	U
	2-Methylphenol	95-48-7		183	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	Hexachloroethane	67-72-1	4.80	3.650	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	n-Nitroso-di-n-propylamine	621-64-7	0.010		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Methylphenol (p-Cresol)	106-44-5		18.3	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	Nitrobenzene	98-95-3		0.340	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Isophorone	78-89-1	70.770	730	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2-Nitrophenol	88-75-5			0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	2,4-Dimethylphenol	120-83-2		10.950	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	4	U	3.9	U
	bis (2-Chloroethoxy) methane	111-91-1			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2,4-Dichlorophenol	120-83-2		11.0	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	Benzoic Acid	65-85-0		14600	1.1	J	4.9	U	4.9	U	4.9	U	1.2	J	1.2	J	1.2	J	4.8	U	1.2	J	4.9	U	5	U	1.1	J
	1,2,4-Trichlorobenzene	120-82-1		0.816	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Chloroaniline	106-47-8		14.6	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Hexachlorobutadiene	87-68-3	0.862	3.65	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Chloro-3-methylphenol	59-50-7			0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	Hexachlorocyclopentadiene	77-47-4		21.9	0.98	U	0.97	U	0.97	U	0.97	R	0.98	R	0.98	R	0.98	R	0.96	R	0.99	R	0.98	R	0.99	R	0.98	R
	2-Chloronaphthalene	91-58-7		48.7	0.98	R	0.97	R	0.97	R	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2-Nitroaniline	88-74-4		11.0	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Dimethyl Phthalate	131-11-3		36500	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2,6-Dinitrotoluene	606-20-2		3.7	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	3-Nitroaniline	99-09-2			0.98	U	0.97	U	0.97	U	0.97	U	0.98	U	0.98	U	0.98	U	0.96	U	0.99	U	0.98	U	0.99	U	0.98	U
	2,4-Dinitrophenol	51-28-5		7.3	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	4	U	3.9	U
	4-Nitrophenol	100-02-7		29.2	2	U	2	U	2	U	2	U	2	UJ	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	2,4-Dinitrotoluene	121-14-2		7.3	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Chlorophenyl-phenyl ether	7005-72-3			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Diethyl Phthalate	84-66-2		2920	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Nitroaniline	100-01-6			0.98	U	0.97	U	0.97	U	0.97	U	0.98	U	0.98	U	0.98	U	0.96	U	0.99	U	0.98	U	0.99	U	0.98	U
	2-Methyl-4,6-dinitrophenol	534-52-1			2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	N-Nitrosodiphenylamine	86-30-6	13.721		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Bromophenyl-phenyl ether	101-55-3			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Hexachlorobenzene	118-74-1	0.042	2.920	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Carbazole	86-74-8	3.362		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.036	J	0.2	U	0.025	J	0.2	U	0.2	U	0.2	U
	di-n-butyl Phthalate	84-74-2		37	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Butyl Benzyl Phthalate	85-68-7		73	0.2	U	0.2	U	0.2	U	0.05	J	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	3,3'-Dichlorobenzidine	91-94-1	0.149		2	R	2	R	2	R	2	R	2	R	2	R	2	R	2	R	2	R	2	U	2	R	2	R
	bis (2-Ethylhexyl) phthalate	117-81-7	4.802	73	0.98	U	0.97	U	0.97	U	0.97	U	0.98	U	0.98	U	0.98	U	0.96	U	0.99	U	0.98	U	1.2	U	0.98	U
	di-n-octyl Phthalate	117-84-0			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007, and updated from Region 6 Human Health Medium-Specific Screening Levels, March 2008.

U.S. Moorings Feasibility Study
Appendix B Table B-4
Groundwater Sampling Results
Screened to EPA Region 6 Tap Water PRGs

Sample Number			SCREENING	CRITERIA	GW-16		GW-12		GW-11		GW-1		GW-2		GW-3		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			EPA Region 6		165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			Tap Water	Tap Water	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			PRG	0.1*PRG	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			Cancer	Non Cancer	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis					NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #					K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
PCBs																												
	Aroclor 1016	12674-11-2	0.960	0.256	0.0054	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1221	11104-28-2	0.034		0.059	U	0.029	U	0.023	U	0.0099	U	0.0099	U	0.0097	U	0.0099	U	0.0097	U	0.0098	U	0.0098	U	0.0098	U	0.044	U
	Aroclor 1232	11141-16-5	0.034		0.0064	U	0.008	U	0.011	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.015	U
	Aroclor 1242	53469-21-9	0.034		0.011	U	0.0054	U	0.007	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.0085	U
	Aroclor 1248	12672-29-6	0.034		0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1254	11097-69-1	0.034	0.073	0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1260	11096-82-5	0.034		0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1262	37324-23-5			0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1268	11100-14-4			0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Total PCBs			0.0034	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
Pesticides																												
	α -BHC	319-84-6	0.011		0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00036	J	0.0005	U
	Hexachlorobenzene	118-74-1	0.042	2.920	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0007	J	0.00049	U	0.00062	=	0.00049	U	0.00081	U	0.00049	U	0.00049	U	0.0005	U
	β -BHC	319-85-7	0.037		0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.00081	U	0.00049	U	0.0013	J	0.00049	U	0.00049	UJ	0.0005	U
	γ -BHC (Lindane)	58-89-9	0.052	1.095	0.0005	J	0.00071	=	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.00054	U	0.00049	UJ	0.00049	U	0.00049	UJ	0.00052	U	0.00052	U
	δ -BHC	319-86-8			0.0012	UJ	0.00073	UJ	0.0005	UJ	0.00058	U	0.0005	U	0.00049	UJ	0.00052	U	0.00049	UJ	0.00049	UJ	0.00049	UJ	0.00049	U	0.0015	UJ
	Heptachlor	76-44-8	0.015	1.825	0.00049	UJ	0.00049	UJ	0.0005	UJ	0.0005	U	0.0005	U	0.00049	U	0.00059	U	0.00049	UJ	0.00049	U	0.00049	UJ	0.00049	U	0.00041	UJ
	Aldrin	309-00-2	0.004	0.110	0.00099	U	0.00027	J	0.00059	U	0.00087	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.0007	U	0.00049	U	0.00049	U	0.00098	J
	Heptachlor epoxide	102-45-73	0.007	0.047	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00062	U	0.0005	U	0.00051	U	0.0018	U	0.00049	U	0.00049	U	0.0005	U
	gamma-Chlordane ●	5103-74-2	0.192	1.825	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0006	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.0005	U
	Endosulfan alpha-	959-98-8		21.9	0.00076	U	0.00063	U	0.0005	U	0.00071	U	0.00082	NJ	0.00063	=	0.0007	U	######	J	0.00049	U	0.00049	U	0.00049	U	0.0012	=
	alpha-Chlordane●	5103-74-2	0.192	1.825	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Dieldrin	60-57-1	0.004	0.183	0.00049	U	0.00049	U	0.0005	U	0.0012	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	4,4'-DDE	72-55-9	0.198		0.00051	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00025	J	0.0005	U
	Endrin	72-20-8		1.10	0.00049	U	0.00049	U	0.00055	U	0.0012	U	0.0005	U	0.00049	U	0.0014	U	0.00049	U	0.00092	U	0.00049	U	0.00077	U	0.0005	U
	Endosulfan beta-	33213-65-9		21.9	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00052	U	0.0005	U	0.00054	U	0.00049	U	0.00053	U	0.00049	U	0.0005	U
	4,4'-DDD	72-54-8	0.280		0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.00074	U	0.0021	U	0.0035	U	0.00049	U	0.00049	U	0.0005	U
	Endrin aldehyde	7421-93-4			0.00049	U	0.00049	U	0.00032	J	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Endosulfan sulfate	1031-07-8			0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00046	J	0.00061	U	0.00049	U	0.0015	U	0.00049	U	0.00049	U	0.0005	U
	4,4'-DDT	50-29-3	0.198	1.83	0.0016	U	0.0022	U	0.0005	U	0.0013	U	0.0011	U	0.00055	U	0.0005	U	0.00049	U	0.0012	U	0.0005	U	0.00068	U	0.0029	U
	Endrin ketone	53494-70-5		1.10	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Methoxychlor	72-43-5		18.3	0.00049	U	0.00049	U	0.00053	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Toxaphene	8001-35-2	0.061		0.092	U	0.028	U	0.028	U	0.032	U	0.025	U	0.025	U	0.06	U	0.042	U	0.056	U	0.025	U	0.025	U	0.18	U
	oxy chlordane		0.192	1.8	0.00098	U	0.00097	U	0.00099	U	0.00099	U	0.00099	U	0.00097	U	0.0013	U	0.0049	J	0.0054	J	0.00098	U	0.00098	U	0.00099	U
	2,4'-DDE	3424-82-6	0.198		0.00049	U	0.0011	=	0.0005	U	0.00055	U	0.0005	U	0.00054	U	0.0014	U	0.00049	U	0.00049	U	0.0005	U	0.00049	U	0.00064	U
	cis -nonachlor	5103-73-1			0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.00058	U	0.00091	U	0.0005	U	0.0018	J	0.0044	U	0.00049	U	0.00049	U	0.0005	U
	2,4'-DDD	53-19-0	0.280		0.0011	U	0.00049	U	0.00083	U	0.0005	U	0.0005	U	0.00049	U	0.00084	U	0.00061	U	0.00071	U	0.00049	U	0.00049	U	0.0014	U
	trans -nonachlor	39765-80-5			0.0017	U	0.00076	U	0.00093	U	0.0024	J	0.00035	J	0.00061	U	0.0012	U	0.0018	J	0.0013	U	0.00049	U	0.0006	U	0.0015	U
	2,4'-DDT	789-02-6	0.198		0.0037	U	0.00049	U	0.00078	U	0.0017	U	0.00087	U	0.00049	U	0.002	U	0.00059	U	0.00049	U	0.00049	U	0.0011	U	0.0057	U
	Mirex	2385-85-5	0.037	0.730	0.00049	U	0.00057	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.00089	U
	Hexachloroethane	67-72-1	4.802	3.65	0.00049	U	0.00049	U	0.00029	J	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00038	J	0.00049	U	0.00009	J	0.00032	J
	Hexachlorobutadiene	87-68-3	0.862	3.65	0.00049	U	0.00049	U	0.0008	=	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	DDE [1]	**72-55-9**	0.198		**ND**		**0.0011**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**0.00025**		**ND**	
	DDD [1]	**72-54-8**	**0.280**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
	DDT [1]	**50-29-3**	0.198	1.825	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
	DDx-total [2]	**50-29-3**	0.198	1.825	**ND**		**0.0011**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**0.00025**	**J**	**ND**	
	Chlordane -total [3]		0.192	1.825	**ND**		**ND**		**ND**		**0.0024**	**J**	**0.00035**	**J**	**ND**		**ND**		**0.0085**	**J**	**0.0054**	**J**	**ND**		**ND**		**ND**	
	Endosulfan -total [4]			21.9	**ND**		**ND**		**ND**		**ND**		**0.00082**	**NJ**	**0.00109**		**ND**		**0.0013**	**J**	**ND**		**ND**		**ND**		**0.0012**	**=**

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007, and updated from Region 6 Human Health Medium-Specific Screening Levels, March 2008.

U.S. Moorings Feasibility Study
Appendix B Table B-4
Groundwater Sampling Results
Screened to EPA Region 6 Tap Water PRGs

Sample Number			SCREENING	CRITERIA	GW-16		GW-12		GW-11		GW-1		GW-2		GW-3		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			EPA Region 6		165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			Tap Water	Tap Water	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			PRG	0.1*PRG	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			Cancer	Non Cancer	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis					NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #					K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
Cyanide																												
	Cyanide[18]	57-12-5		73	2,990	=	240	=	150	=	30	=	50	=	210	=	1,110	=	240	=	310	=	200	=	290	=	2,970	=
Total Susspended Solids																												
	Total Suspended Solids				5,000	U	35,000	=	1,180,000	=	5000	U	385,000	=	5,000	U	5,000	U	117	=	75,000	J	86,000	=	32,000	J	5,000	U
Metals																												
	Aluminum (pH 6.5 - 9.0)[13]	7429-90-5		3650	8,040	=	4,340	=	74,600	=	6410	=	3,820	=	36	=	4,210	=	499	=	3,140	=	102	=	2,770	=	8,410	=
	Antimony	7440-36-0		1.460	0.12	=	0.28	=	0.1	B	0.05	U	0.03	B	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.12	=
	Arsenic	7440-38-2	0.045	1.095	0.55	=	0.25	=	4.02	=	1.2	=	1.43	=	0.342	=	0.058	=	0.231	=	0.592	=	4.68	=	0.583	=	0.53	=
	Cadmium[15]	7440-43-9		1.825	2.17	=	1.22	=	20.9	=	0.16	=	0.023	=	0.02	U	0.039	=	0.017	B	0.019	B	0.02	U	0.018	B	2.13	=
	Chromium, total	7440-47-3			7.07	=	4.3	=	100	=	2.03	=	3.63	=	0.24	=	0.65	=	0.77	=	1.56	=	*0.46*	*U*	1.17	=	6.88	=
	Copper[15]	7440-50-8		135.571	2.66	=	11.1	=	108	=	1.54	=	4.04	=	0.2	=	1.80	=	0.63	=	0.99	=	1.5	=	0.65	=	2.66	=
	Lead[15]	7439-92-1			14.1	=	1.5	=	92.3	=	3.28	=	2.51	=	0.042	=	0.04	=	0.105	=	0.154	J	0.146	=	0.06	J	14.2	=
	Manganese	7439-96-5		170.309	804	=	210	=	1,770	=	1,180	=	478	=	893	=	545	=	875	=	476	=	12,000	=	448	=	798	=
	Mercury	7439-97-6		0.063	0.2	U	0.2	U	0.07	B	0.2	U	0.2	U	0.2	U	0.20	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Nickel[15]	7440-02-0		73	71.5	=	54.1	=	212	=	153	=	25.4	=	2.55	=	8.3	=	5.88	=	17.4	=	2.12	=	16.3	=	69.2	=
	Selenium	7782-49-2		18.3	1.1	B	0.2	U	0.1	U	0.3	B	*1*	*U*	1	U	*1*	*U*	*1*	*U*	1	U	0.3	B	1	U	5	U
	Silver [15]	7440-22-4		18.3	0.02	U	0.003	U	0.269	=	*0.02*	*U*	*0.02*	*U*	0.02	U	0.02	U	*0.03*	*U*	0.02	U	*0.02*	*U*	0.02	U	*0.02*	*U*
	Zinc[15]	7440-66-6		1095	1,250	=	3,250	=	5,510	=	3,580	=	281	=	10.3	=	58.8	=	52.8	=	121	=	33.4	=	115	=	1,250	=
	Aluminum, Dissolved			3650	7,860	=	3,840	=	10,500	=	6,210	=	236	=	170	=	4,160	=	137	=	2,640	=	2.6	=	2,620	=	7,870	=
	Antimony, Dissolved			1.460	0.13	=	0.18	=	0.04	B	0.03	B	0.05	B	0.05	=	0.05	U	0.02	B	0.03	B	0.03	B	0.05	U	0.13	=
	Arsenic, Dissolved		0.045	1.095	0.525	=	0.206	=	0.912	=	1.02	=	1.1	=	0.431	=	0.035	B	0.155	=	0.577	=	4.71	=	0.558	=	0.499	=
	Cadmium, Dissolved			1.825	2	=	1.18	=	1.92	=	0.153	=	0.02	U	0.009	B	0.037	=	0.01	B	0.02	=	0.02	U	0.017	B	1.89	=
	Chromium, Dissolved				7.17	=	3.18	=	5.15	=	1.69	=	0.37	=	0.5	=	0.62	=	0.34	=	1.08	=	0.28	*U*	0.95	=	6.74	=
	Copper, Dissolved			135.571	0.74	=	0.4	=	0.43	=	1.1	=	0.2	=	0.43	=	1.77	=	0.18	=	0.56	=	0.8	=	0.51	=	0.77	=
	Lead, Dissolved				11.5	=	1.49	=	1.96	=	2.66	=	0.026	=	0.335	=	0.174	=	0.018	B	0.022	=	0.028	=	0.017	B	10.2	=
	Manganese, Dissolved			170.309	828	=	221	=	1,530	=	1,190	=	456	=	899	=	538	=	870	=	440	=	12,000	=	441	=	805	=
	Mercury, Dissolved			0.063	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Nickel, Dissolved			73.0	76.6	=	51.7	=	72.7	=	145	=	11.7	=	2.61	=	8.1	=	5.35	=	16.4	=	2.12	=	16	=	74.9	=
	Selenium, Dissolved			18.3	0.4	B	1	U	1	U	1	U	1	U	1	U	*1*	*U*	1	U	*1*	*U*	0.3	B	0.2	B	1	U
	Silver, Dissolved			18.3	0.004	B	0.003	B	0.006	B	0.027	=	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	*1*	*U*	0.02	U
	Zinc, Dissolved			1095	1,130	=	3,120	=	3,340	=	3,550	=	200	=	10.6	=	59.9	=	55.3	=	114	=	31	=	113	=	1,080	=
TPH																												
	TPH-Diesel				13	J	260	U	13	J	260	U	260	U	250	U	260	U	250	U	270	U	250	U	260	U	12	J
	TPH-Motor Oil				510	U	520	U	500	U	21	J	520	U	500	U	520	U	490	U	530	U	500	U	520	U	520	U

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007, and updated from Region 6 Human Health Medium-Specific Screening Levels, March 2008.

U.S. Moorings Feasibility Study
Appendix B Table B-5
Groundwater Sampling Results
Screened to Fish Consumption

Sample Number			SCREENING CRITERIA		GW-16		GW-12		GW-11		GW-1		GW-2		GW-3		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			Fish Consumption**		165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			EPA 2004	DEQ 2004	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			NRWQC	AWQC	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			(organism only)		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis					NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #					K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
VOCs																												
	cis-1,2-Dichloroethlyene	156-59-2			0.5	U	0.5	U	0.5	U	0.5	U	0.31	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Dichlorodifluoromethane	75-71-8			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	UJ	0.5	U	0.5	U	0.5	U	0.5	U
	Chloromethane	74-87-3			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Vinyl Chloride	75-01-4			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromomethane	74-83-9			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Chloroethane	75-00-3			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Trichlorofluoromethane	75-69-4			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Acetone	67-64-1			20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	Iodomethane (Methyl Iodide)	74-88-4			5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
	1,1-Dichloroethene (1,1-DCE)	75-35-4			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Carbon Disulfide	75-15-0			0.40	J	0.5	U	2.3	=	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.35	J
	Methylene chloride (Dichloromethane)	75-09-2	590	590	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	UJ	2	U	2	U	2	U	2	U
	Acrylonitrile	107-13-1	0.25	0.25	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
	Methyltert-butyl ether	1634-04-4			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	trans-1,2-Dichloroethene	156-60-5	10,000	10,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1-Dichloroethane	75-34-3			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Vinyl Acetate	108-05-4			5	U	5	U	5	U	5	U	5	U	5	U	5	U	5.0	U	5	U	5	U	5	U	5	U
	2-Butanone (MEK)	78-93-3			20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	Chloroform	67-66-3	470	470	0.5	U	0.5	U	0.5	U	0.5	U	0.3	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromochloromethane	74-97-5			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1,1-Trichloroethane (TCA)	71-55-6			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromodichloromethane	75-27-4			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Carbon Tetrachloride	56-23-5	1.6	1.6	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,2-Dichloroethane (EDC)	107-06-2			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Benzene	71-43-2	51	51	0.56	=	0.5	U	0.22	J	0.94	=	0.5	U	0.24	J	0.19	J	0.4	J	0.85	=	0.5	U	0.73	=	0.58	=
	Trichloroethene (TCE)	79-01-6	30	30	0.5	U	0.5	U	0.5	U	0.5	U	0.67	=	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,2-Dichloropropane	78-87-5			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2-Chloroethyl Vinyl Ether	110-75-8			5	R	5	R	5	R	5	R	5	R	5	R	5	R	5	R	5	R	5	R	5	R	5	R
	Dibromomethane	74-95-3			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2-Hexanone	591-78-6			20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	cis-1,3-Dichloropropene	10061-01-5			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Toluene	108-88-3	15,000	15,000	0.33	J	0.5	U	0.21	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.27	J
	trans-1,3-Dichloropropene	10061-02-6			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1,2-Trichloroethane	79-00-5	16	16	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	4-Methyl-2-Pentanone (MIBK)	108-10-1			20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	Tetrachloroethene (PCE)	127-18-4	3.3	3.3	0.5	U	0.5	U	0.5	U	0.5	U	0.22	J	0.5	U	0.14	J	0.5	U	0.5	U	0.5	U	0.13	J	0.5	U
	Dibromochloromethane	124-48-1			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,2-Dibromoethane (EDB)	106-93-4			2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	Chlorobenzene	108-90-7	1,600	1,600	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1,1,2-Tetrachloroethane	630-20-6			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Ethylbenzene	100-41-4	2,100	2,100	0.14	J	0.5	U	0.14	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.14	J
	m,p-Xylene	1330-20-7			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	o-Xylene	95-47-6			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Styrene	100-42-5			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromoform	75-25-2	140	140	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Isopropylbenzene	98-82-8			2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	1,1,2,2-Tetrachloroethane	79-34-5	4	4	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	trans-1,4-Dichloro-2-butene	110-57-6			10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
	1,2,3-Trichloropropane	96-18-4			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,4-Dichlorobenzene	106-46-7			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Naphthalene	91-20-3			5.9	=	2.2	=	3.9	=	2	U	2	U	0.8	J	2	U	2	U	1.9	J	2	U	1.8	J	6.3	=
	Acrolein	107-02-8	290	290	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	U	20	UJ	20	UJ
SVOCs																												
	Phenols and Substituted Phenols																											
	2,4,6-trichlorophenol	88-06-2	2.4	2.4	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2,4,5-Trichlorophenol	95-95-4	3,600 [1,24)]	3600	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U
	2,3,4,5-Tetrachlorophenol	4901-51-3			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2,3,5,6-Tetrachlorophenol	935-95-5			0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Pentachlorophenol	87-86-5	3	3	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.1	J

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-5
Groundwater Sampling Results
Screened to Fish Consumption

Sample Number			SCREENING CRITERIA		GW-16		GW-12		GW-11		GW-1		GW-2		GW-3		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			Fish Consumption**		165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			EPA 2004	DEQ 2004	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			NRWQC	AWQC	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			(organism only)		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis					NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #					K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
	Polycyclic Aromatic Hydrocarbons (PAHs)																											
	Naphthalene	91-20-3			6	D	1.5	=	3.3	=	0.15	=	0.0079	=	0.84	=	0.19	=	0.16	=	1.4	=	0.012	U	0.93	=	6.1	D
	2-Methylnaphthalene	91-57-6			0.19	=	0.046	=	0.056	=	0.0035	J	0.0077	U	0.0053	J	0.0044	J	0.008	U	0.064	J	0.0042	J	0.038	J	0.16	=
	1-Methylnaphthalene	90-12-0			0.29	=	0.06	=	0.11	=	0.0065	J	0.0077	U	0.0075	J	0.01	=	0.0043	J	0.1	=	0.0079	U	0.06	=	0.25	=
	Acenaphthylene	208-96-8			0.014	=	0.0079	U	0.012	=	0.0079	U	0.0077	U	0.0079	U	0.0086	=	0.008	U	0.0074	J	0.0079	U	0.0049	J	0.012	=
	Acenaphthene	83-32-9	990	990	0.11	=	0.013	=	0.019	=	0.0074	J	0.0077	U	0.011	=	0.088	=	0.0064	J	0.096	=	0.0079	U	0.058	=	0.093	=
	Fluorene	86-73-7	5,300	5,300	0.39	=	0.023	=	0.058	=	0.0079	U	0.0077	U	0.0085	=	0.3	=	0.012	=	0.23	=	0.0079	U	0.17	=	0.32	=
	Dibenzofuran	132-64-9			0.019	=	0.0079	U	0.0067	J	0.0079	U	0.0077	U	0.0079	U	0.022	=	0.008	U	0.021	=	0.0079	U	0.014	=	0.016	=
	Phenanthrene	85-01-8			0.17	=	0.027	=	0.035	=	0.0078	J	0.0077	U	0.0059	J	0.066	=	0.014	=	0.13	=	0.0079	U	0.1	=	0.14	=
	Anthracene	120-12-7	40,000	40,000	0.18	=	0.06	=	0.038	=	0.017	=	0.0062	J	0.0043	J	0.049	=	0.013	=	0.051	=	0.0079	U	0.04	=	0.13	=
	Fluoranthene	206-44-0	140	140	0.045	=	0.013	=	0.079	=	0.005	J	0.0077	U	0.01	=	0.0078	U	0.009	=	0.028	=	0.0079	U	0.016	=	0.041	=
	Pyrene	129-00-0	4,000	4,000	0.06	=	0.017	=	0.098	=	0.01	=	0.0099	=	0.022	=	0.0078	U	0.017	=	0.034	J	0.0079	U	0.017	=	0.049	=
	Benzo(a)anthracene	56-55-3	0.018	0.018	0.0082	=	0.0079	U	0.056	=	0.004	J	0.0077	U	0.0035	J	0.0078	U	0.003	J	0.011	=	0.0079	U	0.0039	J	0.0074	J
	Chrysene	218-01-9	0.018	0.018	0.0034	J	0.0079	U	0.018	=	0.0044	J	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.011	=	0.0079	U	0.0078	U	0.0078	U
	Benzo(b)fluoranthene	205-99-2	0.018	0.018	0.024	=	0.0077	J	0.034	=	0.011	=	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.011	=	0.0079	U	0.0078	U	0.017	=
	Benzo(k)fluoranthene	207-08-9	0.018	0.018	0.0054	J	0.0079	U	0.041	=	0.0029	J	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.0034	J	0.0079	U	0.0078	U	0.0051	J
	Benzo(a)pyrene	50-32-8	0.018	0.018	0.0078	U	0.0079	U	0.051	=	0.0085	=	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.01	=	0.0079	U	0.0078	U	0.0052	J
	Indeno(1,2,3-cd)pyrene	193-39-5	0.018	0.018	0.005	J	0.0079	U	0.047	=	0.015	=	0.0077	U	0.0079	U	0.0078	U	0.0032	J	0.0068	J	0.0079	U	0.0078	U	0.0053	J
	Dibenz(a,h)anthracene	53-70-3	0.018	0.018	0.0078	U	0.0079	U	0.0052	J	0.0079	U	0.0077	U	0.0079	U	0.0078	U	0.0037	J	0.0078	U	0.0079	U	0.0078	U	0.0078	U
	Benzo(g,h)perylene	191-24-2			0.0054	J	0.0079	U	0.055	=	0.019	=	0.0077	U	0.0079	U	0.0078	U	0.0034	J	0.0067	J	0.0079	U	0.0078	U	0.0053	J
	Organonitrogen Compounds, Halogenated Compounds, Phenols and Substituted Phenols, Oxygen-Containing Compounds																											
	n-Nitrosodimethylamine	62-75-9	3	3	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	U	2	UJ	2	UJ
	Aniline	62-53-3			0.98	UJ	0.97	UJ	0.97	UJ	0.97	UJ	0.98	UJ	0.98	UJ	0.98	UJ	0.96	UJ	0.99	UJ	0.98	U	0.99	UJ	0.98	UJ
	bis (2-Chloroethyl) ether	111-44-4	0.53	0.53	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Phenol	108-95-2	1,700,000	1,700,000	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	2-Chlorophenol	95-57-8	150	150	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	1,3-Dichlorobenzene	541-73-1	960	960	0.039	J	0.039	J	0.042	J	0.049	J	0.053	J	0.2	U	0.2	U	0.045	J	0.046	J	0.2	U	0.04	J	0.032	J
	1,4-Dichlorobenzene	106-46-7	190	190	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.053	J	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	1,2-Dichlorobenzene	95-50-1	70	70	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Benzyl Alcohol	100-51-6			4.9	U	4.9	U	4.9	U	0.089	J	4.9	U	4.9	U	4.9	U	4.8	U	5	U	4.9	U	5	U	4.9	U
	bis (2-Chloroisopropyl) ether	108-60-1	0.53	0.53	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	U
	2-Methylphenol	95-48-7			0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	Hexachloroethane	67-72-1	3.3	3.3	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	n-Nitroso-di-n-propylamine	621-64-7	0.51	0.51	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Methylphenol (p-Cresol)	106-44-5			0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	Nitrobenzene	98-95-3	690	690	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Isophorone	78-89-1	960	960	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2-Nitrophenol	88-75-5			0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	2,4-Dimethylphenol	120-83-2	850	850	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	4	U	3.9	U
	bis (2-Chloroethoxy) methane	111-91-1			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2,4-Dichlorophenol	120-83-2	290	290	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	Benzoic Acid	65-85-0			1.1	J	4.9	U	4.9	U	4.9	U	1.2	J	1.2	J	1.2	J	4.8	U	1.2	J	4.9	U	5	U	1.1	J
	1,2,4-Trichlorobenzene	120-82-1	70	70	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Chloroaniline	106-47-8			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Hexachlorobutadiene	87-68-3	18	18	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Chloro-3-methylphenol	59-50-7			0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	Hexachlorocyclopentadiene	77-47-4	1,100	1,100	0.98	R	0.97	R	0.97	R	0.97	R	0.98	R	0.98	R	0.98	R	0.96	R	0.99	R	0.98	R	0.99	R	0.98	R
	2-Chloronaphthalene	91-58-7	1,600	1,600	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2-Nitroaniline	88-74-4			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Dimethyl Phthalate	131-11-3	1,100,000	1,100,000	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2,6-Dinitrotoluene	606-20-2			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	3-Nitroaniline	99-09-2			0.98	U	0.97	U	0.97	U	0.97	U	0.98	U	0.98	U	0.98	U	0.96	U	0.99	U	0.98	U	0.99	U	0.98	U
	2,4-Dinitrophenol	51-28-5	5,300	5,300	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	4	U	3.9	U
	4-Nitrophenol	100-02-7			2	U	2	U	2	U	2	U	2	UJ	2	U	2	U	2	U	2	UJ	2	U	2	U	2	U
	2,4-Dinitrotoluene	121-14-2	3.4	3.4	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Chlorophenyl-phenyl ether	7005-72-3			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Diethyl Phthalate	84-66-2	44,000	44,000	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Nitroaniline	100-01-6			0.98	U	0.97	U	0.97	U	0.97	U	0.98	U	0.98	U	0.98	U	0.96	U	0.99	U	0.98	U	0.99	U	0.98	U
	2-Methyl-4,6-dinitrophenol	534-52-1	280	280	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	N-Nitrosodiphenylamine	86-30-6	6	6	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Bromophenyl-phenyl ether	101-55-3			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Hexachlorobenzene	118-74-1	0.00029	0.00029	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Carbazole	86-74-8			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.036	J	0.2	U	0.025	J	0.2	U	0.2	U	0.2	U
	di-n-butyl Phthalate	84-74-2			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Butyl Benzyl Phthalate	85-68-7	1,900	1,900	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	3,3'-Dichlorobenzidine	91-94-1	0.028	0.028	2	R	2	R	2	R	2	R	2	R	2	R	2	R	2	R	2	R	2	U	2	R	2	R
	bis (2-Ethylhexyl) phthalate	117-81-7	2.2	2.2	0.98	U	0.97	U	0.97	U	0.97	U	0.98	U	0.98	U	0.98	U	0.96	U	0.99	U	0.98	U	1.2	U	0.98	U
	di-n-octyl Phthalate	117-84-0			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-5
Groundwater Sampling Results
Screened to Fish Consumption

Sample Number			SCREENING CRITERIA		GW-16		GW-12		GW-11		GW-1		GW-2		GW-3		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			Fish Consumption**		165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			EPA 2004	DEQ 2004	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			NRWQC	AWQC	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			(organism only)		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis					NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #					K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
PCBs																												
	Aroclor 1016	12674-11-2			0.0054	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1221	11104-28-2			0.059	U	0.029	U	0.023	U	0.0099	U	0.0099	U	0.0097	U	0.0099	U	0.0097	U	0.0098	U	0.0098	U	0.0098	U	0.044	U
	Aroclor 1232	11141-16-5			0.0064	U	0.008	U	0.011	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.015	U
	Aroclor 1242	53469-21-9			0.011	U	0.0054	U	0.007	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.0085	U
	Aroclor 1248	12672-29-6			0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1254	11097-69-1			0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1260	11096-82-5			0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1262	37324-23-5			0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1268	11100-14-4			0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Total PCBs		0.000064	0.000064	**ND**		**ND**		**ND**		**ND**	**U**	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
Pesticides																												
	α -BHC	319-84-6	0.0049	0.0049	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00036	J	0.0005	U
	Hexachlorobenzene	118-74-1			0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0007	J	0.00049	U	0.00062	=	0.00049	U	0.00081	U	0.00049	U	0.00049	U	0.0005	U
	β -BHC	319-85-7	0.017	0.017	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.00081	U	0.00049	U	0.0013	J	0.00049	U	0.00049	UJ	0.0005	U
	γ -BHC (Lindane)	58-89-9	1.8	1.8	0.0005	J	0.00071	=	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.00054	U	0.00049	UJ	0.00049	U	0.00049	UJ	0.00052	U	0.00052	U
	δ -BHC	319-86-8			0.0012	UJ	0.00073	UJ	0.0005	UJ	0.00058	U	0.0005	U	0.00049	UJ	0.00052	U	0.00049	UJ	0.00049	UJ	0.00049	UJ	0.00049	U	0.0015	UJ
	Heptachlor	76-44-8	0.000079	0.000079	0.00049	UJ	0.00049	UJ	0.0005	UJ	0.0005	U	0.0005	U	0.00049	U	0.00059	U	0.00049	UJ	0.00049	U	0.00049	UJ	0.00049	U	0.00041	UJ
	Aldrin	309-00-2	0.00005	0.00005	0.00099	U	0.00027	J	0.00059	U	0.00087	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.0007	U	0.00049	U	0.00049	U	0.00098	J
	Heptachlor epoxide	102-45-73	0.000039	0.000039	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00062	U	0.0005	U	0.00051	U	0.0018	U	0.00049	U	0.00049	U	0.0005	U
	gamma-Chlordane	5103-74-2			0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0006	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.0005	U
	Endosulfan alpha-	959-98-8	89	89	0.00076	U	0.00063	U	0.0005	U	0.00071	U	0.00082	NJ	0.00063	=	0.0007	U	0.0013	=	0.00049	U	0.00049	U	0.00049	U	0.0012	=
	alpha-Chlordane	5103-74-2			0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Dieldrin	60-57-1	0.000054	0.000054	0.00049	U	0.00049	U	0.0005	U	0.0012	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	4,4'-DDE	72-55-9			0.00051	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00025	J	0.0005	U
	Endrin	72-20-8	0.06	0.06	0.00049	U	0.00049	U	0.00055	U	0.0012	U	0.0005	U	0.00049	U	0.0014	U	0.00049	U	0.00092	U	0.00049	U	0.00077	U	0.0005	U
	Endosulfan beta-	33213-65-9	89	89	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00052	U	0.0005	U	0.00054	U	0.00049	U	0.00053	U	0.00049	U	0.0005	U
	4,4'-DDD	72-54-8			0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.00074	U	0.0021	U	0.0035	U	0.00049	U	0.00049	U	0.0005	U
	Endrin aldehyde	7421-93-4	0.3	3	0.00049	U	0.00049	U	0.00032	J	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Endosulfan sulfate	1031-07-8	89	89	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00046	J	0.00061	U	0.00049	U	0.0015	U	0.00049	U	0.00049	U	0.0005	U
	4,4'-DDT	50-29-3			0.0016	U	0.0022	U	0.0005	U	0.0013	U	0.0011	U	0.00055	U	0.0005	U	0.00049	U	0.0012	U	0.0005	U	0.00068	U	0.0029	U
	Endrin ketone	53494-70-5			0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Methoxychlor	72-43-5			0.00049	U	0.00049	U	0.00053	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Toxaphene	8001-35-2	0.00028	0.00028	0.092	U	0.028	U	0.028	U	0.032	U	0.025	U	0.025	U	0.06	U	0.042	U	0.056	U	0.025	U	0.025	U	0.18	U
	oxy chlordane		.	.	0.00098	U	0.00097	U	0.00099	U	0.00099	U	0.00099	U	0.00097	U	0.0013	U	0.0049	J	0.0054	J	0.00098	U	0.00098	U	0.00099	U
	2,4'-DDE	3424-82-6			0.00049	U	0.0011	=	0.0005	U	0.00055	U	0.0005	U	0.00054	U	0.0014	U	0.00049	U	0.00049	U	0.0005	U	0.00049	U	0.00064	U
	cis -nonachlor	5103-73-1			0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.00058	U	0.00091	U	0.0005	U	0.0018	J	0.0044	U	0.00049	U	0.00049	U	0.0005	U
	2,4'-DDD	53-19-0			0.0011	U	0.00049	U	0.00083	U	0.0005	U	0.0005	U	0.00049	U	0.00084	U	0.00061	U	0.00071	U	0.00049	U	0.00049	U	0.0014	U
	trans -nonachlor	39765-80-5			0.0017	U	0.00076	U	0.00093	U	0.0024	J	0.00035	J	0.00061	U	0.0012	U	0.0018	J	0.0013	U	0.00049	U	0.0006	U	0.0015	U
	2,4'-DDT	789-02-6			0.0037	U	0.00049	U	0.00078	U	0.0017	U	0.00087	U	0.00049	U	0.002	U	0.00059	U	0.00049	U	0.00049	U	0.0011	U	0.0057	U
	Mirex	2385-85-5			0.00049	U	0.00057	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.00089	U
	Hexachloroethane	67-72-1			0.00049	U	0.00049	U	0.00029	J	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00038	J	0.00049	U	0.00009	J	0.00032	J
	Hexachlorobutadiene	87-68-3			0.00049	U	0.00049	U	0.0008	=	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	DDE (1)	**72-55-9**	**0.00022**	**0.00022**	ND		0.0011		ND		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**0.00025**	**J**	**ND**	
	DDD (1)	**72-54-8**	**0.00031**	**0.00031**	ND		ND		ND		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
	DDT (1)	**50-29-3**	**0.00022**	**0.00022**	ND		ND		ND		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
	DDx-total (2)	**50-29-3**	**0.00075**	**0.00075**	ND		0.0011	=	ND		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**0.00025**	**J**	**ND**	
	Chlordane -total (3)		**0.00081**	**0.00081**	ND		ND		ND		**0.0024**	**J**	**0.00035**	**J**	**ND**		**ND**		**0.0085**	**J**	**0.0054**	**J**	**ND**		**ND**		**ND**	
	Endosulfan -total (4)		**267**	**267**	ND		ND		ND		**ND**		**0.00082**	**NJ**	**0.00109**		**ND**		**0.0013**	**J**	**ND**		**ND**		**ND**		**0.0012**	**=**

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-5
Groundwater Sampling Results
Screened to Fish Consumption

Sample Number			SCREENING CRITERIA		GW-16		GW-12		GW-11		GW-1		GW-2		GW-3		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			Fish Consumption**		165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			EPA 2004	DEQ 2004	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			NRWQC	AWQC	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			(organism only)		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis					NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #					K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
Cyanide																												
	Cyanide[18]	57-12-5	140	140	2,990	=	240	=	150	=	30	=	50	=	210	=	1,110	=	240	=	310	=	200	=	290	=	2,970	=
Total Suspended Solids																												
	Total Suspended Solids				5,000	U	35,000	=	1,180,000	=	5000	U	385,000	=	5,000	U	5,000	U	117	=	75,000	*J*	86,000	=	32,000	*J*	5,000	U
Metals		*CAS #*																										
	Aluminum (pH 6.5 - 9.0)[13]	7429-90-5			8,040	=	4,340	=	74,600	=	6410	=	3,820	=	36	=	4,210	=	499	=	3,140	=	102	=	2,770	=	8,410	=
	Antimony	7440-36-0	640	640	0.12	=	0.28	=	0.1	B	0.05	U	0.03	B	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.12	=
	Arsenic	7440-38-2	0.14	0.14	0.55	=	0.25	=	4.02	=	1.2	=	1.43	=	0.342	=	0.058	=	0.231	=	0.592	=	4.68	=	0.583	=	0.53	=
	Cadmium[15]	7440-43-9			2.17	=	1.22	=	20.9	=	0.16	=	0.023	=	0.02	U	0.039	=	0.017	B	0.019	B	0.02	U	0.018	B	2.13	=
	Chromium, total	7440-47-3			7.07	=	4.3	=	100	=	2.03	=	3.63	=	0.24	=	0.65	=	0.77	=	1.56	=	*0.46*	*U*	1.17	=	6.88	=
	Copper[15]	7440-50-8			2.66	=	11.1	=	108	=	1.54	=	4.04	=	0.2	=	1.80	=	0.63	=	0.99	=	1.5	=	0.65	=	2.66	=
	Lead[15]	7439-92-1			14.1	=	1.5	=	92.3	=	3.28	=	2.51	=	0.042	=	0.04	=	0.105	=	0.154	*J*	0.146	=	0.06	=	14.2	=
	Manganese	7439-96-5	100	100	804	=	210	=	1,770	=	1,180	=	478	=	893	=	545	=	875	=	476	=	12,000	=	448	=	798	=
	Mercury	7439-97-6		0.146	0.2	U	0.2	U	0.07	B	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Nickel[15]	7440-02-0	4,600	4,600	71.5	=	54.1	=	212	=	153	=	25.4	=	2.55	=	8.3	=	5.88	=	17.4	=	2.12	=	16.3	=	69.2	=
	Selenium	7782-49-2	4,200	4,200	1.1	B	0.2	U	0.1	U	0.3	B	0.2	B	1	U	*1*	*U*	*1*	*U*	1	U	0.3	B	1	U	5	U
	Silver [15]	7440-22-4			0.02	U	0.003	U	0.269	=	0.007	B	0.004	B	0.02	U	0.02	U	*0.03*	*U*	0.02	U	*0.02*	*U*	0.02	U	*0.02*	*U*
	Zinc[15]	7440-66-6	26,000	26,000	1,250	=	3,250	=	5,510	=	3,580	=	281	=	10.3	=	58.8	=	52.8	=	121	=	33.4	=	115	=	1,250	=
	Aluminum, Dissolved				7,860	=	3,840	=	10,500	=	6,210	=	236	=	170	=	4,160	=	137	=	2,640	=	2.6	=	2,620	=	7,870	=
	Antimony, Dissolved		640	640	0.13	=	0.18	=	0.04	B	0.03	B	0.05	B	0.05	=	0.05	U	0.02	B	0.03	B	0.03	B	0.05	U	0.13	=
	Arsenic, Dissolved		0.14	0.14	0.525	=	0.206	=	0.912	=	1.02	=	1.1	=	0.431	=	0.035	B	0.155	=	0.577	=	4.71	=	0.558	=	0.499	=
	Cadmium, Dissolved				2	=	1.18	=	1.92	=	0.153	=	0.02	U	0.009	B	0.037	=	0.01	B	0.02	=	0.02	U	0.017	B	1.89	=
	Chromium, Dissolved				7.17	=	3.18	=	5.15	=	1.69	=	0.37	=	0.5	=	0.62	=	0.34	=	1.08	=	0.28	*U*	0.95	=	6.74	=
	Copper, Dissolved				0.74	=	0.4	=	0.43	=	1.1	=	0.2	=	0.43	=	1.770	=	0.18	=	0.56	=	0.8	=	0.51	=	0.77	=
	Lead, Dissolved				11.5	=	1.49	=	1.96	=	2.66	=	0.026	=	0.335	=	0.174	=	0.018	B	0.022	=	0.028	=	0.017	B	10.2	=
	Manganese, Dissolved		100	100	828	=	221	=	1,530	=	1,190	=	456	=	899	=	538	=	870	=	440	=	12,000	=	441	=	805	=
	Mercury, Dissolved			0.146	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.20	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Nickel, Dissolved		4,600	4,600	76.6	=	51.7	=	72.7	=	145	=	11.7	=	2.61	=	8.10	=	5.35	=	16.4	=	2.12	=	16	=	74.9	=
	Selenium, Dissolved		4,200	4,200	0.4	B	1	U	1	U	1	U	1	U	1	U	*1*	*U*	1	U	*1*	*U*	0.3	B	*1*	*U*	1	U
	Silver, Dissolved				0.004	B	0.003	B	0.006	B	0.027	=	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U
	Zinc, Dissolved		26,000	26,000	1,130	=	3,120	=	3,340	=	3550	=	200	=	10.6	=	59.9	=	55.3	=	114	=	31	=	113	=	1,080	=
TPH																												
	TPH-Diesel				13	J	260	U	13	J	260	U	260	U	250	U	260	U	250	U	270	U	250	U	260	U	12	J
	TPH-Motor Oil				510	U	520	U	500	U	21	=	520	U	500	U	520	U	490	U	530	U	500	U	520	U	520	U

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-6
Groundwater Sampling Results
Screened to Ecological Receptor Values

Sample Number			SCREENING CRITERIA			GW-16		GW-12		GW-11		GW-01		GW-02		GW-03		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			Ecological Receptors ** #			165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			EPA's 2004	DEQ's 2004	Oak Ridge	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			NRWQC	AWQC	National	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			(chronic)	(chronic)	Laboratory's	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis					(Tier II SCV)[j]	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #						K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Analysis Group	Chemical	CAS #	(µg/L)	(µg/L)	(µg/L)	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q
VOCs																													
	cis-1,2-Dichloroethlyene	156-59-2			590	0.5	U	0.5	U	0.5	U	0.5	U	0.31	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Dichlorodifluoromethane	75-71-8				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	UJ	0.5	U	0.5	U	0.5	U	0.5	U
	Chloromethane	74-87-3				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Vinyl Chloride	75-01-4				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromomethane	74-83-9				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Chloroethane	75-00-3				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Trichlorofluoromethane	75-69-4				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Acetone	67-64-1			1,500	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	Iodomethane (Methyl Iodide)	74-88-4				5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
	1,1-Dichloroethene (1,1-DCE)	75-35-4				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Carbon Disulfide	75-15-0			0.92	0.4	J	0.5	U	2.3	=	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.35	J
	Methylene chloride (Dichloromethane)	75-09-2			2,200	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	UJ	2	U	2	U	2	U	2	U
	Acrylonitrile	107-13-1		2,600 [16]		5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
	Methyltert-butyl ether	1634-04-4				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	trans-1,2-Dichloroethene	156-60-5			590	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1-Dichloroethane	75-34-3			47	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Vinyl Acetate	108-05-4			16	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5.0	U	5	U	5	U	5	U	5	U
	2-Butanone (MEK)	78-93-3			14,000	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	Chloroform	67-66-3		1,240 [16]	28	0.5	U	0.5	U	0.5	U	0.5	U	0.3	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromochloromethane	74-97-5				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1,1-Trichloroethane (TCA)	71-55-6			11	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromodichloromethane	75-27-4				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Carbon Tetrachloride	56-23-5			9.8	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,2-Dichloroethane (EDC)	107-06-2		20,000 [16]	910	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Benzene	71-43-2				0.56	=	0.5	U	0.22	J	0.94	=	0.5	U	0.24	J	0.19	J	0.4	J	0.85	=	0.5	U	0.73	=	0.58	=
	Trichloroethene (TCE)	79-01-6		21,900 [16]	47	0.5	U	0.5	U	0.5	U	0.5	U	0.67	=	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,2-Dichloropropane	78-87-5				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2-Chloroethyl Vinyl Ether	110-75-8				5	R	5	R	5	R	5	R	5	R	5	R	5	R	5.0	R	5	R	5	R	5	R	5	R
	Dibromomethane	74-95-3				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2-Hexanone	591-78-6			99	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	cis-1,3-Dichloropropene	10061-01-5			0.055	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Toluene	108-88-3			9.8	0.33	J	0.5	U	0.21	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.27	J
	trans-1,3-Dichloropropene	10061-02-6			0.055	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1,2-Trichloroethane	79-00-5		9,400 [16]	1,200	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	4-Methyl-2-Pentanone (MIBK)	108-10-1			170	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
	Tetrachloroethene (PCE)	127-18-4		840 [16]	98	0.5	U	0.5	U	0.5	U	0.5	U	0.22	J	0.5	U	0.14	J	0.5	U	0.5	U	0.5	U	0.13	J	0.5	U
	Dibromochloromethane	124-48-1				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,2-Dibromoethane (EDB)	106-93-4				2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	Chlorobenzene	108-90-7		50 [16]	64	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1,1,2-Tetrachloroethane	630-20-6				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Ethylbenzene	100-41-4				0.14	J	0.5	U	0.14	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.14	J
	m,p-Xylene	1330-20-7				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	o-Xylene	95-47-6			13[g]	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Styrene	100-42-5				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromoform	75-25-2				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Isopropylbenzene	98-82-8				2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	1,1,2,2-Tetrachloroethane	79-34-5		2,400 [16]	610	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	trans-1,4-Dichloro-2-butene	110-57-6				10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
	1,2,3-Trichloropropane	96-18-4				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,4-Dichlorobenzene	106-46-7				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Naphthalene	91-20-3				5.9	=	2.2	=	3.9	=	2	U	2	U	0.8	J	2	U	2	U	1.9	J	2	U	1.8	J	6.3	=
	Acrolein	107-02-8		21 [16]		20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ	20	U	20	UJ	20	UJ
SVOCs																													
	Phenols and Substituted Phenols																												
	2,4,6-trichlorophenol	88-06-2		970 [16]		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2,4,5-Trichlorophenol	95-95-4				1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U
	2,3,4,5-Tetrachlorophenol	4901-51-3				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	2,3,5,6-Tetrachlorophenol	935-95-5				0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Pentachlorophenol	87-86-5	15 [22]	13 [14,23]		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.1	J

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U.S. Moorings Feasibility Study
Appendix B Table B-6
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Sample Number			SCREENING CRITERIA			GW-16		GW-12		GW-11		GW-01		GW-02		GW-03		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			Ecological Receptors ** #			165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			EPA's 2004	DEQ's 2004	Oak Ridge	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			NRWQC	AWQC	National	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			(chronic)	(chronic)	Laboratory's	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis					(Tier II SCV)[j]	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #						K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Analysis Group	Chemical	CAS #	(µg/L)	(µg/L)	(µg/L)	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q	Result (µg/L)	Q
	Polycyclic Aromatic Hydrocarbons (PAHs)																												
	Naphthalene	91-20-3		620 [16]	12	6	=	1.5	=	3.3	=	0.15	=	0.0079	=	0.84	=	0.19	=	0.16	=	1.4	=	0.012	U	0.93	=	6.1	=
	2-Methylnaphthalene	91-57-6			2.1[h]	0.19	=	0.046	=	0.056	=	0.0035	J	0.0077	U	0.0053	J	0.0044	J	0.008	U	0.064	J	0.0042	J	0.038	J	0.16	=
	1-Methylnaphthalene	90-12-0				0.29	=	0.06	=	0.11	=	0.0065	J	0.0077	U	0.0075	J	0.01	=	0.0043	J	0.1	=	0.0079	U	0.06	=	0.25	=
	Acenaphthylene	208-96-8				0.014	=	0.0079	U	0.012	=	0.0079	U	0.0077	U	0.0079	U	0.0086	=	0.008	U	0.0074	J	0.0079	U	0.0049	J	0.012	=
	Acenaphthene	83-32-9		520 [16]		0.11	=	0.013	=	0.019	=	0.0074	J	0.0077	U	0.011	=	0.088	=	0.0064	J	0.096	=	0.0079	U	0.058	=	0.093	=
	Fluorene	86-73-7			3.9	0.39	=	0.023	=	0.058	=	0.0079	U	0.0077	U	0.0085	=	0.3	=	0.012	=	0.23	=	0.0079	U	0.17	=	0.32	=
	Dibenzofuran	132-64-9				0.019	=	0.0079	U	0.0067	J	0.0079	U	0.0077	U	0.0079	U	0.022	=	0.008	U	0.021	=	0.0079	U	0.014	=	0.016	=
	Phenanthrene	85-01-8				0.17	=	0.027	=	0.035	=	0.0078	J	0.0077	U	0.0059	J	0.066	=	0.014	=	0.13	=	0.0079	U	0.1	=	0.14	=
	Anthracene	120-12-7			0.73	0.18	=	0.06	=	0.038	=	0.017	=	0.0062	J	0.0043	J	0.049	=	0.013	=	0.051	=	0.0079	U	0.04	=	0.13	=
	Fluoranthene	206-44-0				0.045	=	0.013	=	0.079	=	0.005	J	0.0077	U	0.01	=	0.0078	U	0.009	=	0.028	=	0.0079	U	0.016	=	0.041	=
	Pyrene	129-00-0				0.06	=	0.017	=	0.098	=	0.01	=	0.0099	=	0.022	=	0.0078	U	0.017	=	0.034	J	0.0079	U	0.017	J	0.049	=
	Benzo(a)anthracene	56-55-3			0.027	0.0082	=	0.0079	U	0.056	=	0.004	J	0.0077	U	0.0035	J	0.0078	U	0.003	J	0.011	=	0.0079	U	0.0039	J	0.0074	J
	Chrysene	218-01-9				0.0034	J	0.0079	U	0.018	=	0.0044	J	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.011	=	0.0079	U	0.0078	U	0.0078	U
	Benzo(b)fluoranthene	205-99-2				0.024	=	0.0077	J	0.034	=	0.011	=	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.011	=	0.0079	U	0.0078	U	0.017	=
	Benzo(k)fluoranthene	207-08-9				0.0054	J	0.0079	U	0.041	=	0.0029	J	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.0034	J	0.0079	U	0.0078	U	0.0051	J
	Benzo(a)pyrene	50-32-8			0.014	0.0078	U	0.0079	U	0.051	=	0.0085	=	0.0077	U	0.0079	U	0.0078	U	0.008	U	0.01	=	0.0079	U	0.0078	U	0.0052	J
	Indeno(1,2,3-cd)pyrene	193-39-5				0.005	J	0.0079	U	0.047	=	0.015	=	0.0077	U	0.0079	U	0.0078	U	0.0032	J	0.0068	J	0.0079	U	0.0078	U	0.0053	J
	Dibenz(a,h)anthracene	53-70-3				0.0078	U	0.0079	U	0.0052	J	0.0079	U	0.0077	U	0.0079	U	0.0078	U	0.0037	J	0.0078	U	0.0079	U	0.0078	U	0.0078	U
	Benzo(g,h,i)perylene	191-24-2				0.0054	J	0.0079	U	0.055	=	0.019	=	0.0077	U	0.0079	U	0.0078	U	0.0034	J	0.0067	J	0.0079	U	0.0078	U	0.0053	J
	Organonitrogen Compounds, Halogenated Compounds, Phenols and Substituted Phenols, Oxygen-Containing Compounds																												
	n-Nitrosodimethylamine	62-75-9				2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	U	2	UJ	2	UJ
	Aniline	62-53-3				0.98	UJ	0.97	UJ	0.97	UJ	0.97	UJ	0.98	UJ	0.98	UJ	0.98	UJ	0.96	UJ	0.99	UJ	0.98	U	0.99	UJ	0.98	UJ
	bis (2-Chloroethyl) ether	111-44-4				0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Phenol	108-95-2		2,560 [16]		0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	2-Chlorophenol	95-57-8		2,000 [16]		0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	1,3-Dichlorobenzene	541-73-1		763 [16]	71	0.039	J	0.039	J	0.042	J	0.049	J	0.053	J	0.2	U	0.2	U	0.045	J	0.046	J	0.2	U	0.04	J	0.032	J
	1,4-Dichlorobenzene	106-46-7		763 [16]	15	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.053	J	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	1,2-Dichlorobenzene	95-50-1		763 [16]	14	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Benzyl Alcohol	100-51-6			8.6	4.9	U	4.9	U	4.9	U	0.089	J	4.9	U	4.9	U	4.9	U	4.8	U	5	U	4.9	U	5	U	4.9	U
	bis (2-Chloroisopropyl) ether	108-60-1				0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ	0.2	U	0.2	U
	2-Methylphenol	95-48-7			13	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	Hexachloroethane	67-72-1		540 [16]	12	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	n-Nitroso-di-n-propylamine	621-64-7				0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Methylphenol (p-Cresol)	106-44-5				0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	Nitrobenzene	98-95-3				0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Isophorone	78-89-1				0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2-Nitrophenol	88-75-5		150 [16]		0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	2,4-Dimethylphenol	120-83-2				3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	4	U	3.9	U
	bis (2-Chloroethoxy) methane	111-91-1				0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2,4-Dichlorophenol	120-83-2		365 [16]		0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	Benzoic Acid	65-85-0			42	1.1	J	4.9	U	4.9	U	4.9	U	1.2	J	1.2	J	1.2	J	4.8	U	1.2	J	4.9	U	5	U	1.1	J
	1,2,4-Trichlorobenzene	120-82-1			110	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Chloroaniline	106-47-8				0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Hexachlorobutadiene	87-68-3		9.3 [16]		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Chloro-3-methylphenol	59-50-7				0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U	0.48	U	0.5	U	0.49	U	0.5	U	0.49	U
	Hexachlorocyclopentadiene	77-47-4		5.2 [16]		0.98	R	0.97	R	0.97	R	0.97	R	0.98	R	0.98	R	0.98	R	0.96	R	0.99	R	0.98	R	0.99	R	0.98	R
	2-Chloronaphthalene	91-58-7				0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2-Nitroaniline	88-74-4				0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Dimethyl Phthalate	131-11-3		3 [16]		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	2,6-Dinitrotoluene	606-20-2				0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	3-Nitroaniline	99-09-2				0.98	U	0.97	U	0.97	U	0.97	U	0.98	U	0.98	U	0.98	U	0.96	U	0.99	U	0.98	U	0.99	U	0.98	U
	2,4-Dinitrophenol	51-28-5		150 [16]		3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	3.9	U	4	U	3.9	U	4	U	3.9	U
	4-Nitrophenol	100-02-7		150 [16]	300	2	U	2	U	2	U	2	U	2	UJ	2	U	2	U	2	U	2	UJ	2	U	2	U	2	U
	2,4-Dinitrotoluene	121-14-2				0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Chlorophenyl-phenyl ether	7005-72-3				0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Diethyl Phthalate	84-66-2			210	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Nitroaniline	100-01-6				0.98	U	0.97	U	0.97	U	0.97	U	0.98	U	0.98	U	0.98	U	0.96	U	0.99	U	0.98	U	0.99	U	0.98	U
	2-Methyl-4,6-dinitrophenol	534-52-1		150 [16]		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
	N-Nitrosodiphenylamine	86-30-6			210	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	4-Bromophenyl-phenyl ether	101-55-3				0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Hexachlorobenzene	118-74-1		3 [16]		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Carbazole	86-74-8				0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.036	J	0.2	U	0.025	J	0.2	U	0.2	U	0.2	U
	di-n-butyl Phthalate	84-74-2		3 [16]		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Butyl Benzyl Phthalate	85-68-7		3 [16]	19	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	3,3'-Dichlorobenzidine	91-94-1		763 [16]		2	R	2	R	2	R	2	R	2	R	2	R	2	R	2	R	2	R	2	U	2	R	2	R
	bis (2-Ethylhexyl) phthalate	117-81-7		3 [16]		0.98	U	0.97	U	0.97	U	0.97	U	0.98	U	0.98	U	0.98	U	0.96	U	0.99	U	0.98	U	1.2	U	0.98	U
	di-n-octyl Phthalate	117-84-0		3 [16]		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
PCBs																													
	Aroclor 1016	12674-11-2				0.0054	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1221	11104-28-2			0.28	0.059	U	0.029	U	0.023	U	0.0099	U	0.0099	U	0.0097	U	0.0099	U	0.0097	U	0.0098	U	0.0098	U	0.0098	U	0.044	U
	Aroclor 1232	11141-16-5			0.58	0.0064	U	0.008	U	0.011	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.015	U
	Aroclor 1242	53469-21-9			0.053	0.011	U	0.0054	U	0.007	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.0085	U
	Aroclor 1248	12672-29-6			0.081	0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1254	11097-69-1			0.033	0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-6
Groundwater Sampling Results
Screened to Ecological Receptor Values

Sample Number			SCREENING CRITERIA			GW-16		GW-12		GW-11		GW-01		GW-02		GW-03		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			Ecological Receptors ** #			165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			EPA's 2004	DEQ's 2004	Oak Ridge	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			NRWQC	AWQC	National	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			(chronic)	(chronic)	Laboratory's	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis					(Tier II SCV)[j]	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #						K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Analysis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
	Aroclor 1260	11096-82-5			94	0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1262	37324-23-5				0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Aroclor 1268	11100-14-4				0.0049	U	0.0049	U	0.005	U	0.005	U	0.005	U	0.0049	U	0.005	U	0.0049	U	0.0049	U	0.0049	U	0.0049	U	0.005	U
	Total PCBs		0.014	0.014	0.14	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
Pesticides																													
	α -BHC	319-84-6			2.2[c]	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00036	J	0.0005	U
	Hexachlorobenzene	118-74-1				0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0007	J	0.00049	U	0.00062	=	0.00049	U	0.00081	U	0.00049	U	0.00049	U	0.0005	U
	β -BHC	319-85-7				0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.00081	U	0.00049	U	0.0013	J	0.00049	U	0.00049	UJ	0.0005	U
	γ -BHC (Lindane)	58-89-9		0.08		0.0005	J	0.00071	=	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.00054	U	0.00049	UJ	0.00049	U	0.00049	UJ	0.00052	U	0.00052	U
	δ -BHC	319-86-8				0.0012	UJ	0.00073	UJ	0.0005	UJ	0.00058	U	0.0005	U	0.00049	UJ	0.00052	U	0.00049	UJ	0.00049	UJ	0.00049	UJ	0.00049	U	0.0015	UJ
	Heptachlor	76-44-8	0.0038	0.0038	0.0069	0.00049	UJ	0.00049	UJ	0.0005	UJ	0.0005	U	0.0005	U	0.00049	U	0.00059	U	0.00049	UJ	0.00049	U	0.00049	UJ	0.00049	U	0.00041	UJ
	Aldrin	309-00-2				0.00099	U	0.00027	J	0.00059	U	0.00087	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.0007	U	0.00049	U	0.00049	U	0.00098	J
	Heptachlor epoxide	102-45-73	0.0038	0.0038		0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00062	U	0.0005	U	0.00051	U	0.0018	U	0.00049	U	0.00049	U	0.0005	U
	gamma-Chlordane	5103-74-2				0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0006	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.0005	U
	Endosulfan alpha-	959-98-8	0.056	0.056	0.051	0.00076	U	0.00063	U	0.0005	U	0.00071	U	0.00082	NJ	0.00063	=	0.0007	U	0.0013	J	0.00049	U	0.00049	U	0.00049	U	0.0012	=
	alpha-Chlordane	5103-74-2				0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Dieldrin	60-57-1	0.056	0.0019[14]		0.00049	U	0.00049	U	0.0005	U	0.0012	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	4,4'-DDE	72-55-9				0.00051	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00025	J	0.0005	U
	Endrin	72-20-8	0.036	0.0023 [14]	0.061	0.00049	U	0.00049	U	0.00055	U	0.0012	U	0.0005	U	0.00049	U	0.0014	U	0.00049	U	0.00092	U	0.00049	U	0.00077	U	0.0005	U
	Endosulfan beta-	33213-65-9	0.056	0.056	0.051	0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00052	U	0.0005	U	0.00054	U	0.00049	U	0.00053	U	0.00049	U	0.0005	U
	4,4'-DDD	72-54-8				0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.00074	U	0.0021	U	0.0035	U	0.00049	U	0.00049	U	0.0005	U
	Endrin aldehyde	7421-93-4				0.00049	U	0.00049	U	0.00032	J	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Endosulfan sulfate	1031-07-8				0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00046	J	0.00061	U	0.00049	U	0.0015	U	0.00049	U	0.00049	U	0.0005	U
	4,4'-DDT	50-29-3				0.0016	U	0.0022	U	0.0005	U	0.0013	U	0.0011	U	0.00055	U	0.0005	U	0.00049	U	0.0012	U	0.0005	U	0.00068	U	0.0029	U
	Endrin ketone	53494-70-5				0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Methoxychlor	72-43-5	0.03	0.03	0.019	0.00049	U	0.00049	U	0.00053	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	Toxaphene	8001-35-2	0.0002	0.0002		0.092	U	0.028	U	0.028	U	0.032	U	0.025	U	0.025	U	0.06	U	0.042	U	0.056	U	0.025	U	0.025	U	0.18	U
	oxy chlordane					0.00098	U	0.00097	U	0.00099	U	0.00099	U	0.00099	U	0.00097	U	0.0013	U	0.0049	J	0.0054	J	0.00098	U	0.00098	UJ	0.00099	U
	2,4'-DDE	3424-82-6				0.00049	U	0.0011	=	0.0005	U	0.00055	U	0.0005	U	0.00054	U	0.0014	U	0.00049	U	0.00049	U	0.0005	U	0.00049	U	0.00064	U
	cis -nonachlor	5103-73-1				0.00049	U	0.00049	U	0.0005	U	0.0005	U	0.00058	U	0.00091	U	0.0005	U	0.0018	J	0.0044	U	0.00049	U	0.00049	U	0.0005	U
	2,4'-DDD	53-19-0				0.0011	U	0.00049	U	0.00083	U	0.0005	U	0.0005	U	0.00049	U	0.00084	U	0.00061	U	0.00071	U	0.00049	U	0.00049	U	0.0014	U
	trans -nonachlor	39765-80-5				0.0017	U	0.00076	U	0.00093	U	0.0024	J	0.00035	J	0.00061	U	0.0012	U	0.0018	J	0.0013	U	0.00049	U	0.0006	U	0.0015	U
	2,4'-DDT	789-02-6				0.0037	U	0.00049	U	0.00078	U	0.0017	U	0.00087	U	0.00049	U	0.002	U	0.00059	U	0.00049	U	0.00049	U	0.0011	U	0.0057	U
	Mirex	2385-85-5				0.00049	U	0.00057	U	0.0005	U	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.00089	U
	Hexachloroethane	67-72-1				0.00049	U	0.00049	U	0.00029	J	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00038	J	0.00049	U	0.00009	J	0.00032	J
	Hexachlorobutadiene	87-68-3				0.00049	U	0.00049	U	0.0008	=	0.0005	U	0.0005	U	0.00049	U	0.0005	U	0.00049	U	0.00049	U	0.00049	U	0.00049	U	0.0005	U
	DDE [1]	**72-55-9**				**ND**		**0.0011**	**=**	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**0.00025**	**J**	**ND**	
	DDD [1]	**72-54-8**			**0.011[d]**	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
	DDT [1]	**50-29-3**	**0.001**	**0.001**	**0.013[e]**	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**	
	DDx-total [2]	**50-29-3**	**0.001**	**0.001**	**0.013[e]**	**ND**		**0.0011**	**=**	**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**ND**		**0.00025**	**J**	**ND**	
	Chlordane -total [3]		**0.0043**	**0.0043**		**ND**		**ND**		**ND**		**ND**		**0.00035**	**J**	**ND**		**ND**		**0.0085**	**J**	**0.0054**	**J**	**ND**		**ND**		**ND**	
	Endosulfan -total [4]		**0.112**	**0.112**	**0.102**	**ND**		**ND**		**ND**		**ND**		**0.00082**	**NJ**	**0.00109**		**ND**		**0.0013**	**J**	**ND**		**ND**		**ND**		**0.0012**	**=**

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-6
Groundwater Sampling Results
Screened to Ecological Receptor Values

Sample Number			SCREENING CRITERIA			GW-16		GW-12		GW-11		GW-01		GW-02		GW-03		GW-04		GW-06		GW-05		GW-20		FD-GW-05		FD-GW-16	
Blind ID Number			Ecological Receptors ** #			165		125		115		16		25		36		45		65		55		202		56		166	
Screened Interval (approx. feet/bgs)			EPA's 2004	DEQ's 2004	Oak Ridge	10-20		10-18		8-18		8-18		10-20		8-18		13-28		9-24		10-20		75-85		10-20		10-20	
Date Collected			NRWQC	AWQC	National	3/10/08		3/9/08		3/8/08		3/8/08		3/7/08		3/6/08		3/6/08		3/5/08		3/7/08		3/13/08		3/7/08		3/10/08	
Matrix			(chronic)	(chronic)	Laboratory's	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis					(Tier II SCV)[j]	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
LAB Service Request ID #						K0802048		K0802048		K0802048		K0802048		K0801926		K0801926		K0801926		K0801926		K0801926		K0802291		K0801926		K0802048	
Analysis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
Cyanide																													
	Cyanide[18]	57-12-5	5.2	5.2		2,990	=	240	=	150	=	30	=	50	=	210	=	1,110	=	240	=	310	=	200	=	290	=	2,970	=
Total Suspended Solids																													
	Total Suspended Solids					5,000	U	35,000	=	1.18E+06	=	5,000	U	385,000	=	5,000	U	5,000	U	117	=	75,000	J	86,000	=	32,000	J	5,000	U
Metals																													
	Aluminum (pH 6.5 - 9.0)[13]	7429-90-5	87			8,040	=	4,340	=	74,600	=	6,410	=	3,820	=	36	=	4,210	=	499	=	3,140	=	102	=	2,770	=	8,410	=
	Antimony	7440-36-0		1,600 [16]	30	0.12	=	0.28	=	0.1	B	0.05	U	0.03	B	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.12	=
	Arsenic	7440-38-2	150		3.1[a]	0.55	=	0.25	=	4.02	=	1.2	=	1.43	=	0.342	=	0.058	=	0.231	=	0.592	=	4.68	=	0.583	=	0.53	=
	Cadmium[15]	7440-43-9	0.094	0.38 [14]		2.17	=	1.22	=	20.9	=	0.16	=	0.023	=	0.02	U	0.039	=	0.017	B	0.019	B	0.02	U	0.018	B	2.13	=
	Chromium, total	7440-47-3				7.07	=	4.3	=	100	=	2.03	=	3.63	=	0.24	=	0.65	=	0.77	=	1.56	=	0.46	U	1.17	=	6.88	=
	Copper[15]	7440-50-8	2.7	3.6 [14]		2.66	=	11.1	=	108	=	1.54	=	4.04	=	0.2	=	1.80	=	0.63	=	0.99	=	1.5	=	0.65	=	2.66	=
	Lead[15]	7439-92-1	0.54	0.54 [14]		14.1	=	1.5	=	92.3	=	3.28	=	2.51	=	0.042	=	0.04	=	0.105	=	0.154	J	0.146	=	0.06	J	14.2	=
	Manganese	7439-96-5			120	804	=	210	=	1,770	=	1,180	=	478	=	893	=	545	=	875	=	476	=	12,000	=	448	=	798	=
	Mercury	7439-97-6	0.77	0.012	1.3[b]	0.2	U	0.2	U	0.07	B	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Nickel[15]	7440-02-0	16	49 [14]		71.5	=	54.1	=	212	=	153	=	25.4	=	2.55	=	8.3	=	5.88	=	17.4	=	2.12	=	16.3	=	69.2	=
	Selenium	7782-49-2	5 [19]	35 [14]		1.1	B	0.2	U	0.1	U	0.3	B	1	U	1	U	1	U	1	U	1	U	0.3	B	1	U	5	U
	Silver [15]	7440-22-4		0.12 [14]	0.36	0.02	U	0.003	U	0.269	=	0.02	U	0.02	U	0.02	U	0.02	U	0.03	U	0.02	U	0.02	U	0.02	U	0.02	U
	Zinc[15]	7440-66-6	36	33		1,250	=	3,250	=	5,510	=	3,580	=	281	=	10.3	=	58.8	=	52.8	=	121	=	33.4	=	115	=	1250	=
	Aluminum, Dissolved		87			7,860	=	3,840	=	10,500	=	6,210	=	236	=	170	=	4,160	=	137	=	2,640	=	2.6	=	2,620	=	7,870	=
	Antimony, Dissolved			1,600 [16]	30	0.13	=	0.18	=	0.04	B	0.03	B	0.05	B	0.05	=	0.05	U	0.02	B	0.03	B	0.03	B	0.05	U	0.13	=
	Arsenic, Dissolved		150		3.1[a]	0.525	=	0.206	=	0.912	=	1.02	=	1.1	=	0.431	=	0.035	B	0.155	=	0.577	=	4.71	=	0.558	=	0.499	=
	Cadmium, Dissolved		0.094	0.38 [14]		2	=	1.18	=	1.92	=	0.153	=	0.02	U	0.009	B	0.037	=	0.01	B	0.02	=	0.02	U	0.017	B	1.89	=
	Chromium, Dissolved					7.17	=	3.18	=	5.15	=	1.69	=	0.37	=	0.5	=	0.62	=	0.34	=	1.08	=	0.28	U	0.95	=	6.74	=
	Copper, Dissolved		2.7	3.6 [14]		0.74	=	0.4	=	0.43	=	1.1	=	0.2	=	0.43	=	1.77	=	0.18	=	0.56	=	0.8	=	0.51	=	0.77	=
	Lead, Dissolved		0.54	0.54 [14]		11.5	=	1.49	=	1.96	=	2.66	=	0.026	=	0.335	=	0.174	=	0.018	B	0.022	=	0.028	=	0.017	B	10.2	=
	Manganese, Dissolved				120	828	=	221	=	1530	=	1,190	=	456	=	899	=	538	=	870	=	440	=	12,000	=	441	=	805	=
	Mercury, Dissolved		0.77	0.012	1.3[b]	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Nickel, Dissolved		16	49 [14]		76.6	=	51.7	=	72.7	=	145	=	11.7	=	2.61	=	8.1	=	5.35	=	16.4	=	2.12	=	16	=	74.9	=
	Selenium, Dissolved		5 [19]	35 [14]		0.4	B	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	0.3	B	1	U	1	U
	Silver, Dissolved			0.12 [14]	0.36	0.004	B	0.003	B	0.006	B	0.027	=	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U
	Zinc, Dissolved		36	33		1,130	=	3,120	=	3,340	=	3,550	=	200	=	10.6	=	59.9	=	55.3	=	114	=	31	=	113	=	1,080	=
TPH																													
	TPH-Diesel					13	J	260	U	13	J	260	U	260	U	250	U	260	U	250	U	270	U	250	U	260	U	12	J
	TPH-Motor Oil					510	U	520	U	500	U	21	J	520	U	500	U	520	U	490	U	530	U	500	U	520	U	520	U

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-7
Groundwater Sampling Results
Cyanide Contingency Sampling - Screened to Multiple SLVs

Sample Number		**SCREENING**	GW 21		GW-22		GW-23		GW-24		FD-GW-24		GW-25		GW 26		GW-27		GW-28		GW-30		GW-31		
Blind ID Number		**CRITERIA**	210		220		230		240		245		250		260		270		280		300		310		
Screened Interval (ft bgs)		**EPA****	9-19		10-20		17-17		10-20		10-20		10-20		12-22		8-18		10-20		15-20		8-18		
Date Collected		Tap Water	8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		
Matrix		0.1*PRG	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		
Basis			N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		
LAB Service Request ID #			W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566		
	Chemical	**µg/L**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	
Cyanide																									
	Cyanide (WAD)		26	=	51.5	=	10	=	10	U	10	U	13.2	=	37.8	=	19.3	=	10	U	10	U	10	U	
	Cyanide (Free)		100	U	100	U	100	=	100	U	100	U	100	U	100	U	199	=	100	U	100	U	100	U	
	Cyanide (total)	73	322	=	2320	=	71	=	10	U	10	U	180	=	363	=	597	=	30.4	=	481	*J*	10	U	
	Cyanide (WAD)		18.6	=	22.5	=	10	=	10	U	10	U	10	U	20.1	=	11.2	=	10	U	10	U	10	U	
	Cyanide (amemable)		360	=	2020	=	57.8	=	32.2	=	44	=	372	=	503	=	255	=	19.3	=	70.5	=	107	=	
*	Screening Values updated from Region 6 Human Health Medium-Specific Screening Levels 2008; March 2008, Industrial Soils, Outdoor Worker, Integrated.																								
Sample Number		**SCREENING**	GW 21		GW-22		GW-23		GW-24		FD-GW-24		GW-25		GW 26		GW-27		GW-28		GW-30		GW-31		
Blind ID Number		**CRITERIA ****	210		220		230		240		245		250		260		270		280		300		310		
Screened Interval		**Water** (C)																							
Date Collected		**JSCS**	8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		
Matrix		Drinking Water	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		
Basis		MCL	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		
LAB Service Request ID #			W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566		
	Chemical	**µg/L**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	
Cyanide																									
	Cyanide (WAD)		26	=	51.5	=	10	=	10	U	10	U	13.2	=	37.8	=	19.3	=	10	U	10	U	10	U	
	Cyanide (Free)		100	U	100	U	100	=	100	U	100	U	100	U	100	U	199	=	100	U	100	U	100	U	
	Cyanide (total)	200	322	=	2320	=	71	=	10	U	10	U	180	=	363	=	597	=	30.4	=	481	*J*	10	U	
	Cyanide (WAD)		18.6	=	22.5	=	10	=	10	U	10	U	10	U	20.1	=	11.2	=	10	U	10	U	10	U	
	Cyanide (amemable)		360	=	2020	=	57.8	=	32.2	=	44	=	372	=	503	=	255	=	19.3	=	70.5	=	107	=	

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-7
Groundwater Sampling Results
Cyanide Contingency Sampling - Screened to Multiple SLVs

Sample Number		**SCREENING CRITERIA ****			GW 21		GW-22		GW-23		GW-24		FD-GW-24		GW-25		GW 26		GW-27		GW-28		GW-30		GW-31	
Blind ID Number		**Ecological Receptors #**			210		220		230		240		245		250		260		270		280		300		310	
Screened Interval (ft bgs)		EPA's 2004	ODEQ	PRM	9-19		10-20		17-17		10-20		10-20		10-20		12-22		8-18		10-20		15-20		8-18	
Date Collected		NRWQC	2004	(Tier II	8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08	
Matrix		(chronic)	AWQC	SCV)[i]	Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis			(chronic)		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
LAB Service Request ID #					W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566	
	Chemical	**µg/L**	**µg/L**	**µg/L**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
Cyanide																										
	Cyanide (WAD)				26	=	51.5	=	10	=	10	U	10	U	13.2	=	37.8	=	19.3	=	10	U	10	U	10	U
	Cyanide (Free)				100	U	100	U	100	=	100	U	100	U	100	U	100	U	199	=	100	U	100	U	100	U
	Cyanide (total)	5.2	5.2		322	=	2320	=	71	=	10	U	10	U	180	=	363	=	597	=	30.4	=	481	J	10	U
	Cyanide (WAD)				18.6	=	22.5	=	10	=	10	U	10	U	10	U	20.1	=	11.2	=	10	U	10	U	10	U
	Cyanide (amemable)				360	=	2020	=	57.8	=	32.2	=	44	=	372	=	503	=	255	=	19.3	=	70.5	=	107	=

Sample Number		**SCREENING CRITERIA ****			GW 21		GW-22		GW-23		GW-24		FD-GW-24		GW-25		GW 26		GW-27		GW-28		GW-30		GW-31	
Blind ID Number		**Fish Consumption**			210		220		230		240		245		250		260		270		280		300		310	
Screened Interval		EPA's 2004	ODEQ		9-19		10-20		17-17		10-20		10-20		10-20		12-22		8-18		10-20		15-20		8-18	
Date Collected		NRWQC	2004		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08		8/7/08	
Matrix		(organism only)	AWQC		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Basis					N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
LAB Service Request ID #					W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566		W804566	
	Chemical	**µg/L**	**µg/L**		**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
Cyanide																										
	Cyanide (WAD)				26	=	51.5	=	10	=	10	U	10	U	13.2	=	37.8	=	19.3	=	10	U	10	U	10	U
	Cyanide (Free)				100	U	100	U	100	=	100	U	100	U	100	U	100	U	199	=	100	U	100	U	100	U
	Cyanide (total)	5.2	5.2		322	=	2320	=	71	=	10	U	10	U	180	=	363	=	597	=	30.4	=	481	J	10	U
	Cyanide (WAD)				18.6	=	22.5	=	10	=	10	U	10	U	10	U	20.1	=	11.2	=	10	U	10	U	10	U
	Cyanide (amemable)				360	=	2020	=	57.8	=	32.2	=	44	=	372	=	503	=	255	=	19.3	=	70.5	=	107	=

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study

Appendix B Table B-8

Surface Water Sampling Results

Screened to JCSC Tap Water MCL

			SCREENING	FRENCH DRAIN		ODOT CACH BASIN		SEEP	
Sample Number			CRITERIA	SW-FD-01		SW-ODOT-01		SW-SEEP-01	
Blind ID Number			JSCS **	1052		1051		12000	
Screened Interval (approx. feet/bgs)			Drinking Water	N/A		N/A		N/A	
Date Collected			MCL	3/13/2008		3/13/2008		4/3/2008	
Matrix				Water		Water		Water	
Basis				N/A		N/A		N/A	
LAB Service Request ID #				K0802291		K0802291		K0802942	
Analyis	**Chemical**	**CAS #**	**(µg/L)**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
VOCs (Not Analyzed)									
SVOCs									
	Phenols and Substituted Phenols								
	2,4,6-trichlorophenol	88-06-2		0.5	U	0.5	U	0.5	U
	2,4,5-Trichlorophenol	95-95-4		1.4	U	1.3	U	1.3	U
	2,3,4,5-Tetrachlorophenol			0.5	U	0.5	U	0.5	U
	2,3,5,6- Tetrachlorophenol			0.5	U	0.5	U	0.5	U
	Pentachlorophenol	87-86-5		0.5	U	0.5	U	0.5	U
			1						
	Polycyclic Aromatic Hydrocarbons (PAHs)								
	Naphthalene	91-20-3	0.2 (26)	*0.0078*	*U*	0.026	*U*	*0.0078*	*U*
	2-Methylnaphthalene	91-57-6	0.2 (26)	0.0028	J	0.0041	J	0.0078	U
	1-Methylnaphthalene			0.0078	U	0.0045	J	0.0078	U
	Acenaphthylene	208-96-8	0.2 (26)	0.0078	U	0.0077	U	0.005	J
	Acenaphthene	83-32-9	0.2 (26)	0.0069	J	0.017	=	0.0078	U
	Fluorene	86-73-7	0.2 (26)	0.0078	U	0.0089	=	0.0078	U
	Dibenzofuran			0.0078	U	0.0049	J	0.0078	U
	Phenanthrene	85-01-8	0.2 (26)	*0.0078*	*U*	0.034	*U*	0.013	*U*
	Anthracene	120-12-7	0.2 (26)	0.0078	U	0.011	=	0.0045	J
	Fluoranthene	206-44-0	0.2 (26)	0.0078	U	0.049	=	0.034	=
	Pyrene	129-00-0	0.2 (26)	0.0052	J	0.051	=	0.049	=
	Benzo(a)anthracene	56-55-3	0.2 (26)	0.0078	U	0.017	=	0.021	=
	Chrysene	218-01-9	0.2 (26)	0.0078	U	0.025	=	0.027	=
	Benzo(b)fluoranthene	205-99-2	0.2 (26)	0.0028	J	0.03	=	0.04	=
	Benzo(k)fluoranthene	207-08-9	0.2 (26)	0.0078	U	0.0097	=	0.013	=
	Benzo(a)pyrene	50-32-8	0.2	0.0078	U	0.023	=	0.031	=
	Indeno(1,2,3-cd)pyrene	193-39-5	0.2 (26)	0.0078	U	0.018	=	0.036	=
	Dibenz(a,h)anthracene	53-70-3	0.2 (26)	0.0078	U	0.0036	J	0.0048	J
	Benzo(g,h)perylene	191-24-2	0.2 (26)	0.0078	U	0.022	=	0.039	=

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study

Appendix B Table B-8

Surface Water Sampling Results

Screened to JCSC Tap Water MCL

			SCREENING	FRENCH DRAIN		ODOT CACH BASIN		SEEP	
Sample Number			CRITERIA	SW-FD-01		SW-ODOT-01		SW-SEEP-01	
Blind ID Number			JSCS **	1052		1051		12000	
Screened Interval (approx. feet/bgs)			Drinking Water	N/A		N/A		N/A	
Date Collected			MCL	3/13/2008		3/13/2008		4/3/2008	
Matrix				Water		Water		Water	
Basis				N/A		N/A		N/A	
LAB Service Request ID #				K0802291		K0802291		K0802942	
Analyis	**Chemical**	**CAS #**	**(µg/L)**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
	Organonitrogen Compounds, Halogenated Compounds, Phenols and Substituted Phenols, Oxygen-Containing Compounds								
	n-Nitrosodimethylamine	62-75-9		2	U	2	U	2	U
	Aniline	62-53-3		0.99	U	0.97	U	0.96	U
	bis (2-Chloroethyl) ether	111-44-4		0.2	U	0.2	U	0.2	U
	Phenol	108-95-2		0.5	U	0.49	U	0.48	U
	2-Chlorophenol	95-57-8		0.5	U	0.49	U	0.48	U
	1,3-Dichlorobenzene	541-73-1		0.2	U	0.2	U	0.2	U
	1,4-Dichlorobenzene	106-46-7	75	0.2	U	0.2	U	0.2	U
	1,2-Dichlorobenzene	95-50-1	600	0.2	U	0.2	U	0.2	U
	Benzyl Alcohol	100-51-6		5	U	0.08	J	0.22	J
	bis (2-Chloroisopropyl) ether	108-60-1		0.2	*UJ*	0.2	*UJ*	0.2	U
	2-Methylphenol	95-48-7		0.5	U	0.49	U	0.48	U
	Hexachloroethane	67-72-1		0.2	U	0.2	U	0.2	U
	n-Nitroso-di-n-propylamine	621-64-7		0.2	U	0.2	U	0.2	U
	4-Methylphenol (p-Cresol)	106-44-5		0.5	U	0.49	U	0.48	U
	Nitrobenzene	98-95-3		0.2	U	0.2	U	0.2	U
	Isophorone	78-89-1		0.2	U	0.2	U	0.2	U
	2-Nitrophenol	88-75-5		0.5	U	0.49	U	0.48	U
	2,4-Dimethylphenol	120-83-2		4	U	3.9	U	3.9	U
	bis (2-Chloroethoxy) methane	111-91-1		0.2	U	0.2	U	0.2	U
	2,4-Dichlorophenol	120-83-2		0.5	U	0.49	U	0.48	U
	Benzoic Acid	65-85-0		5	U	1.3	J	4.8	U
	1,2,4-Trichlorobenzene	120-82-1	70	0.2	U	0.2	U	0.2	U
	4-Chloroaniline	106-47-8		0.2	U	0.2	U	0.2	U
	Hexachlorobutadiene	87-68-3		0.2	U	0.2	U	0.2	U
	4-Chloro-3-methylphenol	59-50-7		0.5	U	0.49	U	0.48	U
	Hexachlorocyclopentadiene	77-47-4	50	0.99	*R*	0.97	*R*	0.96	U
	2-Chloronaphthalene	91-58-7		0.2	U	0.2	U	0.2	U
	2-Nitroaniline	88-74-4		0.2	U	0.2	U	0.2	U
	Dimethyl Phthalate	131-11-3		0.2	U	0.2	U	0.2	U
	2,6-Dinitrotoluene	606-20-2		0.2	U	0.2	U	0.2	U
	3-Nitroaniline	99-09-2		0.99	U	0.97	U	0.96	U
	2,4-Dinitrophenol	51-28-5		4	U	3.9	U	3.9	U
	4-Nitrophenol	100-02-7		2	U	2	U	2	U
	2,4-Dinitrotoluene	121-14-2		0.2	U	0.2	U	0.2	U
	4-Chlorophenyl-phenyl ether	7005-72-3		0.2	U	0.2	U	0.2	U
	Diethyl Phthalate	84-66-2		*0.2*	*U*	*0.2*	*U*	*0.2*	*J*
	4-Nitroaniline	100-01-6		0.99	U	0.97	U	0.96	U
	2-Methyl-4,6-dinitrophenol	534-52-1		2	U	2	U	2	U
	N-Nitrosodiphenylamine	86-30-6		0.2	U	0.2	U	0.2	U
	4-Bromophenyl-phenyl ether	101-55-3		0.2	U	0.2	U	0.2	U
	Hexachlorobenzene	118-74-1	1	0.2	U	0.2	U	0.2	U
	Carbazole	86-74-8		0.2	U	0.2	U	0.2	U
	di-n-butyl Phthalate	84-74-2		*0.2*	*U*	*0.2*	*U*	*0.2*	*J*
	Butyl Benzyl Phthalate	85-68-7		*0.2*	*U*	0.2	U	*0.2*	*J*
	3,3'-Dichlorobenzidine	91-94-1		2	U	2	U	2	U
	bis (2-Ethylhexyl) phthalate	117-81-7	6	0.99	U	*0.97*	*U*	*0.96*	*U*
	di-n-octyl Phthalate	117-84-0		0.2	U	0.2	U	0.2	U

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study

Appendix B Table B-8

Surface Water Sampling Results

Screened to JCSC Tap Water MCL

			SCREENING	FRENCH DRAIN		ODOT CACH BASIN		SEEP	
Sample Number			CRITERIA	SW-FD-01		SW-ODOT-01		SW-SEEP-01	
Blind ID Number			JSCS **	1052		1051		12000	
Screened Interval (approx. feet/bgs)			Drinking Water	N/A		N/A		N/A	
Date Collected			MCL	3/13/2008		3/13/2008		4/3/2008	
Matrix				Water		Water		Water	
Basis				N/A		N/A		N/A	
LAB Service Request ID #				K0802291		K0802291		K0802942	
Analyis	**Chemical**	**CAS #**	**(µg/L)**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
PCBs									
	Aroclor 1016	12674-11-2		0.005	U	0.0049	U	0.005	U
	Aroclor 1221	11104-28-2		0.0099	U	0.0098	U	0.01	U
	Aroclor 1232	11141-16-5		0.005	U	0.0049	U	0.005	U
	Aroclor 1242	53469-21-9		0.005	U	0.0054	U	0.005	U
	Aroclor 1248	12672-29-6		0.005	U	0.0049	U	0.005	U
	Aroclor 1254	11097-69-1		0.005	U	0.0071	U	0.005	U
	Aroclor 1260	11096-82-5		0.005	U	0.0049	U	0.005	U
	Aroclor 1262	37324-23-5		0.005	U	0.0049	U	0.005	U
	Aroclor 1268	11100-14-4		0.005	U	0.0049	U	0.005	U
	Total PCBs		0.5	**ND**		**ND**		**ND**	
Pesticides									
	α - BHC	319-84-6		0.0099	U	0.00049	U	0.0005	U
	Hexachlorobenzene	118-74-1	1	0.0099	U	0.00049	U	0.0005	U
	β - BHC	319-85-7		0.0099	U	0.0007	U	0.0005	U
	γ - BHC (Lindane)	58-89-9	0.2	0.0099	*UJ*	0.00074	*UJ*	0.0005	U
	δ - BHC	319-86-8		0.055	*UJ*	0.00049	*UJ*	0.0005	U
	Heptachlor	76-44-8	0.4	0.0099	*UJ*	0.00049	*UJ*	0.0005	U
	Aldrin	309-00-2		0.0099	U	0.00049	U	0.00015	J
	Heptachlor epoxide	102-45-73	0.2	0.0099	U	0.00049	U	0.0005	U
	gamma-Chlordane	5103-74-2		0.0099	U	0.00049	U	0.0005	U
	Endosulfan alpha-	959-98-8		0.0099	U	0.00049	U	0.0005	U
	alpha-Chlordane	5103-74-2		0.0099	U	0.00049	U	0.0005	U
	Dieldrin	60-57-1		0.0099	U	0.00049	U	0.0005	U
	4,4'-DDE	72-55-9		0.0099	U	0.00049	U	0.00031	J
	Endrin	72-20-8	2	0.0099	U	0.00049	U	0.0005	U
	Endosulfan beta-	33213-65-9		0.0099	U	0.00055	U	0.0005	U
	4,4'-DDD	72-54-8		0.0099	U	0.00049	U	0.0005	*UJ*
	Endrin aldehyde	7421-93-4		0.0099	U	0.00042	J	0.0005	U
	Endosulfan sulfate	1031-07-8		0.0099	U	0.00098	U	0.0005	U
	4,4'-DDT	50-29-3		0.0099	U	0.0013	U	0.0019	*J*
	Endrin ketone	53494-70-5		0.0099	U	0.00049	U	0.0005	U
	Methoxychlor	72-43-5	40	0.0099	U	0.00088	U	0.0005	U
	Toxaphene	8001-35-2	3	0.5	U	0.025	U	0.031	U
	oxy chlordane			0.031	U	0.00098	U	0.001	U
	2,4'-DDE	3424-82-6		0.0099	U	0.00049	U	0.0005	U
	cis - nonachlor	5103-73-1		0.0099	U	0.00049	U	0.0005	U
	2,4'-DDD	53-19-0		0.0190	U	0.00084	U	0.0005	U
	trans - nonachlor	39765-80-5		0.0099	U	0.00049	U	0.0005	U
	2,4'-DDT	789-02-6		0.0099	U	0.00049	U	0.0005	U
	Mirex	2385-85-5		0.0099	U	0.00049	U	0.0005	U
	Hexachloroethane	67-72-1		0.0099	U	0.00049	U	0.0005	U
	Hexachlorobutadiene	87-68-3		0.0099	U	0.0005	U	0.0005	U
	DDE (1)	**72-55-9**		**ND**		**ND**		**0.00031**	**J**
	DDD (1)	**72-54-8**		**ND**		**ND**		**ND**	
	DDT (1)	**50-29-3**		**ND**		**ND**		**0.0019**	**J**
	DDx-total (2)	**50-29-3**		**ND**		**ND**		**0.00221**	**J**
	Chlordane - total (3)		2	**ND**		**ND**		**ND**	
	Endosulfan - total (4)			**ND**		**ND**		**ND**	

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study

Appendix B Table B-8

Surface Water Sampling Results

Screened to JCSC Tap Water MCL

			SCREENING	FRENCH DRAIN		ODOT CACH BASIN		SEEP	
Sample Number			CRITERIA	SW-FD-01		SW-ODOT-01		SW-SEEP-01	
Blind ID Number			JSCS **	1052		1051		12000	
Screened Interval (approx. feet/bgs)			Drinking Water	N/A		N/A		N/A	
Date Collected			MCL	3/13/2008		3/13/2008		4/3/2008	
Matrix				Water		Water		Water	
Basis				N/A		N/A		N/A	
LAB Service Request ID #				K0802291		K0802291		K0802942	
Analyis	**Chemical**	**CAS #**	**(µg/L)**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Cyanide (Not Analyzed)									
Total Suspended Solids (Not Analyzed)									
Metals									
	Aluminum (pH 6.5 - 9.0)[13]	7429-90-5	(50-200)[29]	132	=	832	=	679	=
	Antimony	7440-36-0	6	0.26	=	0.19	=	0.11	=
	Arsenic	7440-38-2	10	0.58	=	0.16	=	0.22	=
	Cadmium[15]	7440-43-9	5	0.017	B	0.038	=	0.02	U
	Chromium, total	7440-47-3	100	0.72	*U*	1.27	*U*	2.1	=
	Copper[15]	7440-50-8	1,300 = TT	10.6	=	2.66	=	3.12	=
	Lead[15]	7439-92-1	15 = TT	1.09	=	2.03	=	4.05	=
	Manganese	7439-96-5	(50)[29]	2.23	=	27	=	17.5	=
	Mercury	7439-97-6	2	0.2	U	0.2	U	0.2	U
	Nickel[15]	7440-02-0		0.7	=	1	=	0.84	=
	Selenium	7782-49-2	50	0.6	B	0.2	B	1	U
	Silver [15]	7440-22-4	(100)[29]	0.024	*U*	*0.02*	*U*	0.023	*U*
	Zinc[15]	7440-66-6	(5,000)[29]	2.42	=	13.8	=	4.62	=
	Aluminum, Dissolved		(50-200)[29]	30.8	=	374	=	34.8	=
	Antimony, Dissolved		6	0.24	=	0.2	=	0.38	=
	Arsenic, Dissolved		10	0.6	=	0.14	=	0.08	=
	Cadmium, Dissolved		5	0.02	U	0.056	=	0.02	U
	Chromium, Dissolved		100	0.71	*U*	0.63	*U*	0.39	=
	Copper, Dissolved		1,300 = TT	9.85	=	1.59	=	1.36	=
	Lead, Dissolved		15 = TT	0.3	=	0.486	=	0.113	=
	Manganese, Dissolved		(50)[29]	1.58	=	37.6	=	0.95	=
	Mercury, Dissolved		2	0.2	U	0.2	U	0.2	U
	Nickel, Dissolved			0.8	=	0.91	=	0.42	=
	Selenium, Dissolved		50	0.6	B	1	U	1	U
	Silver, Dissolved		(100)[29]	*0.02*	*U*	0.022	*U*	0.02	U
	Zinc, Dissolved		(5,000)[29]	1.74	*U*	9.11	=	6.18	=
TPH									
	TPH-Diesel			260	U	41	J	250	U
	TPH Motor Oil			510	U	170	J	*500,000*	*U*

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-9
Surface Water Sampling Results
Screened to EPA Region 6 PRGs

			SCREENING	CRITERIA	ODOT CACH BASIN		FRENCH DRAIN		SEEP LOCATION	
Sample Number			Region 6		SW-ODOT-01		SW-FD-01		SW-SEEP-01	
Blind ID Number			Tap Water	Tap Water	1051		1052		12000	
Screened Interval (approx. feet/bgs)			PRG	0.1*PRG	N/A		N/A		N/A	
Date Collected			Cancer	Non Cancer	3/13/2008		3/13/2008		4/3/2008	
Matrix					Water		Water		Water	
Basis					N/A		N/A		N/A	
LAB Service Request ID #					K0802291		K0802291		K0802942	
Analyis	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result**	**Qualifie**	**Result**	**Qualifie**	**Result**	**Qualifie**
VOCs (Not Analyzed)										
SVOCs										
	Phenols and Substituted Phenols									
	2,4,6-trichlorophenol	88-06-2	6.112	3.65	0.5	U	0.5	U	0.5	U
	2,4,5-Trichlorophenol	95-95-4		365	1.3	U	1.4	U	1.3	U
	2,3,4,5-Tetrachlorophenol	4901-51-3			0.5	U	0.5	U	0.5	U
	2,3,5,6- Tetrachlorophenol	935-95-5			0.5	U	0.5	U	0.5	U
	Pentachlorophenol	87-86-5	0.560	110	0.5	U	0.5	U	0.5	U
	Polycyclic Aromatic Hydrocarbons (PAHs)									
	Naphthalene	91-20-3		0.620	0.026	*U*	*0.0078*	*U*	*0.0078*	*U*
	2-Methylnaphthalene	91-57-6			0.0041	J	0.0028	J	0.0078	U
	1-Methylnaphthalene	90-12-0			0.0045	J	0.0078	U	0.0078	U
	Acenaphthylene	208-96-8			0.0077	U	0.0078	U	0.005	J
	Acenaphthene	83-32-9		36.5	0.017	=	0.0069	J	0.0078	U
	Fluorene	86-73-7		24.3	0.0089	=	0.0078	U	0.0078	U
	Dibenzofuran	132-64-9		1.217	0.0049	J	0.0078	U	0.0078	U
	Phenanthrene	85-01-8			0.034	*U*	*0.0078*	*U*	0.013	*U*
	Anthracene	120-12-7		183	0.011	=	0.0078	U	0.0045	J
	Fluoranthene	206-44-0		146	0.049	=	0.0078	U	0.034	=
	Pyrene	129-00-0		18.3	0.051	=	0.0052	J	0.049	=
	Benzo(a)anthracene	56-55-3	0.029		0.017	=	0.0078	U	0.021	=
	Chrysene	218-01-9	2.950		0.025	=	0.0078	U	0.027	=
	Benzo(b)fluoranthene	205-99-2	0.029		0.03	=	0.0028	J	0.04	=
	Benzo(k)fluoranthene	207-08-9	0.295		0.0097	=	0.0078	U	0.013	=
	Benzo(a)pyrene	50-32-8	0.003		0.023	=	0.0078	U	0.031	=
	Indeno(1,2,3-cd)pyrene	193-39-5	0.029		0.018	=	0.0078	U	0.036	=
	Dibenz(a,h)anthracene	53-70-3	0.003		0.0036	J	0.0078	U	0.0048	J
	Benzo(g,h)perylene	191-24-2			0.022	=	0.0078	U	0.039	=

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007, and updated from Region 6 Human Health Medium-Specific Screening Levels, March 2008.

U.S. Moorings Feasibility Study
Appendix B Table B-9
Surface Water Sampling Results
Screened to EPA Region 6 PRGs

			SCREENING	CRITERIA	ODOT CACH BASIN		FRENCH DRAIN		SEEP LOCATION	
Sample Number			Region 6		SW-ODOT-01		SW-FD-01		SW-SEEP-01	
Blind ID Number			Tap Water	Tap Water	1051		1052		12000	
Screened Interval (approx. feet/bgs)			PRG	0.1*PRG	N/A		N/A		N/A	
Date Collected			Cancer	Non Cancer	3/13/2008		3/13/2008		4/3/2008	
Matrix					Water		Water		Water	
Basis					N/A		N/A		N/A	
LAB Service Request ID #					K0802291		K0802291		K0802942	
Analyis	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result**	**Qualifie**	**Result**	**Qualifie**	**Result**	**Qualifie**
	Organonitrogen Compounds, Halogenated Compounds, Phenols and Substituted Phenols, Oxygen-Containing Compounds									
	n-Nitrosodimethylamine	62-75-9	0.0004	0.029	2	U	2	U	2	U
	Aniline	62-53-3	11.795	25.6	0.97	U	0.99	U	0.96	U
	bis (2-Chloroethyl) ether	111-44-4	0.010		0.2	U	0.2	U	0.2	U
	Phenol	108-95-2		1095	0.49	U	0.5	U	0.48	U
	2-Chlorophenol	95-57-8		3.04	0.49	U	0.5	U	0.48	U
	1,3-Dichlorobenzene	541-73-1		1.45	0.2	U	0.2	U	0.2	U
	1,4-Dichlorobenzene	106-46-7	0.467	66.2	0.2	U	0.2	U	0.2	U
	1,2-Dichlorobenzene	95-50-1		4.93	0.2	U	0.2	U	0.2	U
	Benzyl Alcohol	100-51-6		1095	0.08	J	5	U	0.22	J
	bis (2-Chloroisopropyl) ether	108-60-1	0.274	24	0.2	*UJ*	0.2	*UJ*	0.2	U
	2-Methylphenol	95-48-7		183	0.49	U	0.5	U	0.48	U
	Hexachloroethane	67-72-1	4.80	3.650	0.2	U	0.2	U	0.2	U
	n-Nitroso-di-n-propylamine	621-64-7	0.010		0.2	U	0.2	U	0.2	U
	4-Methylphenol (p-Cresol)	106-44-5		18.3	0.49	U	0.5	U	0.48	U
	Nitrobenzene	98-95-3		0.340	0.2	U	0.2	U	0.2	U
	Isophorone	78-89-1	70.770	730	0.2	U	0.2	U	0.2	U
	2-Nitrophenol	88-75-5			0.49	U	0.5	U	0.48	U
	2,4-Dimethylphenol	120-83-2		10.950	3.9	U	4	U	3.9	U
	bis (2-Chloroethoxy) methane	111-91-1			0.2	U	0.2	U	0.2	U
	2,4-Dichlorophenol	120-83-2		11.0	0.49	U	0.5	U	0.48	U
	Benzoic Acid	65-85-0		14600	1.3	J	5	U	4.8	U
	1,2,4-Trichlorobenzene	120-82-1		0.816	0.2	U	0.2	U	0.2	U
	4-Chloroaniline	106-47-8		14.6	0.2	U	0.2	U	0.2	U
	Hexachlorobutadiene	87-68-3	0.862	3.65	0.2	U	0.2	U	0.2	U
	4-Chloro-3-methylphenol	59-50-7			0.49	U	0.5	U	0.48	U
	Hexachlorocyclopentadiene	77-47-4		21.9	0.97	*R*	0.99	*R*	0.96	U
	2-Chloronaphthalene	91-58-7		48.7	0.2	U	0.2	U	0.2	U
	2-Nitroaniline	88-74-4		11.0	0.2	U	0.2	U	0.2	U
	Dimethyl Phthalate	131-11-3		36500	0.2	U	0.2	U	0.2	U
	2,6-Dinitrotoluene	606-20-2		3.7	0.2	U	0.2	U	0.2	U
	3-Nitroaniline	99-09-2			0.97	U	0.99	U	0.96	U
	2,4-Dinitrophenol	51-28-5		7.3	3.9	U	4	U	3.9	U
	4-Nitrophenol	100-02-7		29.2	2	U	2	U	2	U
	2,4-Dinitrotoluene	121-14-2		7.3	0.2	U	0.2	U	0.2	U
	4-Chlorophenyl-phenyl ether	7005-72-3			0.2	U	0.2	U	0.2	U
	Diethyl Phthalate	84-66-2		2920	*0.2*	*U*	*0.2*	*U*	*0.2*	*J*
	4-Nitroaniline	100-01-6			0.97	U	0.99	U	0.96	U
	2-Methyl-4,6-dinitrophenol	534-52-1			2	U	2	U	2	U
	N-Nitrosodiphenylamine	86-30-6	13.721		0.2	U	0.2	U	0.2	U
	4-Bromophenyl-phenyl ether	101-55-3			0.2	U	0.2	U	0.2	U
	Hexachlorobenzene	118-74-1	0.042	2.920	0.2	U	0.2	U	0.2	U
	Carbazole	86-74-8	3.362		0.2	U	0.2	U	0.2	U
	di-n-butyl Phthalate	84-74-2		37	*0.2*	*U*	*0.2*	*U*	*0.2*	*J*
	Butyl Benzyl Phthalate	85-68-7		73	0.2	U	*0.2*	*U*	*0.2*	*J*
	3,3'-Dichlorobenzidine	91-94-1	0.149		2	U	2	U	2	U
	bis (2-Ethylhexyl) phthalate	117-81-7	4.802	73	*0.97*	*U*	0.99	U	*0.96*	*U*
	di-n-octyl Phthalate	117-84-0			0.2	U	0.2	U	0.2	U

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007, and updated from Region 6 Human Health Medium-Specific Screening Levels, March 2008.

U.S. Moorings Feasibility Study
Appendix B Table B-9
Surface Water Sampling Results
Screened to EPA Region 6 PRGs

			SCREENING	CRITERIA	ODOT CACH BASIN		FRENCH DRAIN		SEEP LOCATION	
Sample Number			Region 6		SW-ODOT-01		SW-FD-01		SW-SEEP-01	
Blind ID Number			Tap Water	Tap Water	1051		1052		12000	
Screened Interval (approx. feet/bgs)			PRG	0.1*PRG	N/A		N/A		N/A	
Date Collected			Cancer	Non Cancer	3/13/2008		3/13/2008		4/3/2008	
Matrix					Water		Water		Water	
Basis					N/A		N/A		N/A	
LAB Service Request ID #					K0802291		K0802291		K0802942	
Analyis	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result**	**Qualifie**	**Result**	**Qualifie**	**Result**	**Qualifie**
PCBs										
	Aroclor 1016	12674-11-2	0.960	0.256	0.0049	U	0.005	U	0.005	U
	Aroclor 1221	11104-28-2	0.034		0.0098	U	0.0099	U	0.01	U
	Aroclor 1232	11141-16-5	0.034		0.0049	U	0.005	U	0.005	U
	Aroclor 1242	53469-21-9	0.034		0.0054	U	0.005	U	0.005	U
	Aroclor 1248	12672-29-6	0.034		0.0049	U	0.005	U	0.005	U
	Aroclor 1254	11097-69-1	0.034	0.073	0.0071	U	0.005	U	0.005	U
	Aroclor 1260	11096-82-5	0.034		0.0049	U	0.005	U	0.005	U
	Aroclor 1262	37324-23-5			0.0049	U	0.005	U	0.005	U
	Aroclor 1268	11100-14-4			0.0049	U	0.005	U	0.005	U
	Total PCBs				**ND**		**ND**		**ND**	
Pesticides										
	α - BHC	319-84-6	0.011		0.00049	U	0.0099	U	0.0005	U
	Hexachlorobenzene	118-74-1	0.042	2.920	0.00049	U	0.0099	U	0.0005	U
	β - BHC	319-85-7	0.037		0.0007	U	0.0099	U	0.0005	U
	γ - BHC (Lindane)	58-89-9	0.052	1.095	0.00074	*UJ*	0.0099	*UJ*	0.0005	U
	δ - BHC	319-86-8			0.00049	*UJ*	0.055	*UJ*	0.0005	U
	Heptachlor	76-44-8	0.015	1.825	0.00049	*UJ*	0.0099	*UJ*	0.0005	U
	Aldrin	309-00-2	0.004	0.110	0.00049	U	0.0099	U	0.00015	J
	Heptachlor epoxide	102-45-73	0.007	0.047	0.00049	U	0.0099	U	0.0005	U
	gamma-Chlordane ●	5103-74-2	0.192	1.825	0.00049	U	0.0099	U	0.0005	U
	Endosulfan alpha-	959-98-8		21.9	0.00049	U	0.0099	U	0.0005	U
	alpha-Chlordane●	5103-74-2	0.192	1.825	0.00049	U	0.0099	U	0.0005	U
	Dieldrin	60-57-1	0.004	0.183	0.00049	U	0.0099	U	0.0005	U
	4,4'-DDE	72-55-9	0.198		0.00049	U	0.0099	U	0.00031	J
	Endrin	72-20-8		1.10	0.00049	U	0.0099	U	0.0005	U
	Endosulfan beta-	33213-65-9		21.9	0.00055	U	0.0099	U	0.0005	U
	4,4'-DDD	72-54-8	0.280		0.00049	U	0.0099	U	0.0005	*UJ*
	Endrin aldehyde	7421-93-4		1.10	0.00042	J	0.0099	U	0.0005	U
	Endosulfan sulfate	1031-07-8			0.00098	U	0.0099	U	0.0005	U
	4,4'-DDT	50-29-3	0.198	1.83	0.0013	U	0.0099	U	0.0019	*J*
	Endrin ketone	53494-70-5		1.10	0.00049	U	0.0099	U	0.0005	U
	Methoxychlor	72-43-5		18.3	0.00088	U	0.0099	U	0.0005	U
	Toxaphene	8001-35-2	0.061		0.025	U	0.5	U	0.031	U
	oxy chlordane		0.192	1.8	0.00098	U	0.031	U	0.001	U
	2,4'-DDE	3424-82-6	0.198		0.00049	U	0.0099	U	0.0005	U
	cis - nonachlor	5103-73-1			0.00049	U	0.0099	U	0.0005	U
	2,4'-DDD	53-19-0	0.280		0.00084	U	0.0190	U	0.0005	U
	trans - nonachlor	39765-80-5			0.00049	U	0.0099	U	0.0005	U
	2,4'-DDT	789-02-6	0.198		0.00049	U	0.0099	U	0.0005	U
	Mirex	2385-85-5	0.037	0.730	0.00049	U	0.0099	U	0.0005	U
	Hexachloroethane	67-72-1	4.802	3.65	0.00049	U	0.0099	U	0.0005	U
	Hexachlorobutadiene	87-68-3	0.862	3.65	0.0005	U	0.0099	U	0.0005	U
	DDE (1)	**72-55-9**	0.198		**ND**		**ND**		**0.00031**	**J**
	DDD (1)	**72-54-8**	**0.280**		**ND**		**ND**		**ND**	
	DDT (1)	**50-29-3**	0.198	1.825	**ND**		**ND**		**0.0019**	**J**
	DDx-total (2)	**50-29-3**	0.198	1.825	**ND**		**ND**		**0.00221**	**J**
	Chlordane - total (3)		0.192	1.825	**ND**		**ND**		**ND**	
	Endosulfan - total (4)			21.9	**ND**		**ND**		**ND**	

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007, and updated from Region 6 Human Health Medium-Specific Screening Levels, March 2008.

U.S. Moorings Feasibility Study
Appendix B Table B-9
Surface Water Sampling Results
Screened to EPA Region 6 PRGs

			SCREENING	CRITERIA	ODOT CACH BASIN		FRENCH DRAIN		SEEP LOCATION	
Sample Number			Region 6		SW-ODOT-01		SW-FD-01		SW-SEEP-01	
Blind ID Number			Tap Water	Tap Water	1051		1052		12000	
Screened Interval (approx. feet/bgs)			PRG	0.1*PRG	N/A		N/A		N/A	
Date Collected			Cancer	Non Cancer	3/13/2008		3/13/2008		4/3/2008	
Matrix					Water		Water		Water	
Basis					N/A		N/A		N/A	
LAB Service Request ID #					K0802291		K0802291		K0802942	
Analyis	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result**	**Qualifie**	**Result**	**Qualifie**	**Result**	**Qualifie**
Cyanide (Not Analyzed)										
Metals										
	Aluminum (pH 6.5 - 9.0)[13]	7429-90-5		3650	832	=	132	=	679	=
	Antimony	7440-36-0		1.460	0.19	=	0.26	=	0.11	=
	Arsenic	7440-38-2	0.045	1.095	0.16	=	0.58	=	0.22	=
	Cadmium[15]	7440-43-9		1.825	0.038	=	0.017	B	0.02	U
	Chromium, total	7440-47-3			1.27	*U*	0.72	*U*	2.1	=
	Copper[15]	7440-50-8		135.571	2.66	=	10.6	=	3.12	=
	Lead[15]	7439-92-1			2.03	=	1.09	=	4.05	=
	Manganese	7439-96-5		170.309	27	=	2.23	=	17.5	=
	Mercury	7439-97-6		0.063	0.2	U	0.2	U	0.2	U
	Nickel[15]	7440-02-0		73	1	=	0.7	=	0.84	=
	Selenium	7782-49-2		18.3	0.2	B	0.6	B	1	U
	Silver [15]	7440-22-4		18.3	*0.02*	*U*	0.024	*U*	0.023	*U*
	Zinc[15]	7440-66-6		1095	13.8	=	2.42	=	4.62	=
	Aluminum, Dissolved			3650	374	=	30.8	=	34.8	=
	Antimony, Dissolved			1.460	0.2	=	0.24	=	0.38	=
	Arsenic, Dissolved		0.045	1.095	0.14	=	0.6	=	0.08	=
	Cadmium, Dissolved			1.825	0.056	=	0.02	U	0.02	U
	Chromium, Dissolved				0.63	*U*	0.71	*U*	0.39	=
	Copper, Dissolved			135.571	1.59	=	9.85	=	1.36	=
	Lead, Dissolved				0.486	=	0.3	=	0.113	=
	Manganese, Dissolved			170.309	37.6	=	1.58	=	0.95	=
	Mercury, Dissolved			0.063	0.2	U	0.2	U	0.2	U
	Nickel, Dissolved			73.0	0.91	=	0.8	=	0.42	=
	Selenium, Dissolved			18.3	1	U	0.6	B	1	U
	Silver, Dissolved			18.3	0.022	*U*	*0.02*	*U*	0.02	U
	Zinc, Dissolved			1095	9.11	=	1.74	*U*	6.18	=
TPH-DX										
	TPH-Diesel				41	J	260	U	250	U
	TPH Motor Oil				170	J	510	U	*500,000*	*U*

**SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007, and updated from Region 6 Human Health Medium-Specific Screening Levels, March 2008.

U.S. Moorings Feasibility Study

Appendix B Table B-10

Surface Water Sampling Results

Screened to Fish Consumption

			SCREENING CRITERIA		FRENCH DRAIN		ODOT CACH BASIN		SEEP	
Sample Number			Fish Consumption **		SW-FD-01		SW-ODOT-01		SW-SEEP-01	
Blind ID Number			EPA 2004	DEQ 2004	1052		1051		12000	
Screened Interval (approx. feet/bgs)			NRWQC	AWQC	N/A		N/A		N/A	
Date Collected					3/13/2008		3/13/2008		4/3/2008	
Matrix					Water		Water		Water	
Basis					N/A		N/A		N/A	
LAB Service Request ID #					K0802291		K0802291		K0802942	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
VOCs (Not Analyzed)										
SVOCs										
	Phenols and Substituted Phenols									
	2,4,6-trichlorophenol	88-06-2	2.4	2.4	0.5	U	0.5	U	0.5	U
	2,4,5-Trichlorophenol	95-95-4	3,600 (24)	3600	1.4	U	1.3	U	1.3	U
	2,3,4,5-Tetrachlorophenol				0.5	U	0.5	U	0.5	U
	2,3,5,6- Tetrachlorophenol				0.5	U	0.5	U	0.5	U
	Pentachlorophenol	87-86-5	3	3	0.5	U	0.5	U	0.5	U
	Polycyclic Aromatic Hydrocarbons (PAHs)									
	Naphthalene	91-20-3			*0.0078*	*U*	0.026	*U*	*0.0078*	*U*
	2-Methylnaphthalene	91-57-6			0.0028	J	0.0041	J	0.0078	U
	1-Methylnaphthalene				0.0078	U	0.0045	J	0.0078	U
	Acenaphthylene	208-96-8			0.0078	U	0.0077	U	0.005	J
	Acenaphthene	83-32-9	990	990	0.0069	J	0.017	=	0.0078	U
	Fluorene	86-73-7	5,300	5,300	0.0078	U	0.0089	=	0.0078	U
	Dibenzofuran				0.0078	U	0.0049	J	0.0078	U
	Phenanthrene	85-01-8			*0.0078*	*U*	0.034	*U*	0.013	*U*
	Anthracene	120-12-7	40,000	40,000	0.0078	U	0.011	=	0.0045	J
	Fluoranthene	206-44-0	140	140	0.0078	U	0.049	=	0.034	=
	Pyrene	129-00-0	4,000	4,000	0.0052	J	0.051	=	0.049	=
	Benzo(a)anthracene	56-55-3	0.018	0.018	0.0078	U	0.017	=	0.021	=
	Chrysene	218-01-9	0.018	0.018	0.0078	U	0.025	=	0.027	=
	Benzo(b)fluoranthene	205-99-2	0.018	0.018	0.0028	J	0.03	=	0.04	=
	Benzo(k)fluoranthene	207-08-9	0.018	0.018	0.0078	U	0.0097	=	0.013	=
	Benzo(a)pyrene	50-32-8	0.018	0.018	0.0078	U	0.023	=	0.031	=
	Indeno(1,2,3-cd)pyrene	193-39-5	0.018	0.018	0.0078	U	0.018	=	0.036	=
	Dibenz(a,h)anthracene	53-70-3	0.018	0.018	0.0078	U	0.0036	J	0.0048	J
	Benzo(g,h)perylene	191-24-2			0.0078	U	0.022	=	0.039	=

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study

Appendix B Table B-10

Surface Water Sampling Results

Screened to Fish Consumption

			SCREENING CRITERIA		FRENCH DRAIN		ODOT CACH BASIN		SEEP	
Sample Number			Fish Consumption **		SW-FD-01		SW-ODOT-01		SW-SEEP-01	
Blind ID Number			EPA 2004	DEQ 2004	1052		1051		12000	
Screened Interval (approx. feet/bgs)			NRWQC	AWQC	N/A		N/A		N/A	
Date Collected					3/13/2008		3/13/2008		4/3/2008	
Matrix					Water		Water		Water	
Basis					N/A		N/A		N/A	
LAB Service Request ID #					K0802291		K0802291		K0802942	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
	Organonitrogen Compounds, Halogenated Compounds, Phenols and Substituted Phenols, Oxygen-Containing Compounds									
	n-Nitrosodimethylamine	62-75-9	3	3	2	U	2	U	2	U
	Aniline	62-53-3			0.99	U	0.97	U	0.96	U
	bis (2-Chloroethyl) ether	111-44-4	0.53	0.53	0.2	U	0.2	U	0.2	U
	Phenol	108-95-2	1,700,000	1,700,000	0.5	U	0.49	U	0.48	U
	2-Chlorophenol	95-57-8	150	150	0.5	U	0.49	U	0.48	U
	1,3-Dichlorobenzene	541-73-1	960	960	0.2	U	0.2	U	0.2	U
	1,4-Dichlorobenzene	106-46-7	190	190	0.2	U	0.2	U	0.2	U
	1,2-Dichlorobenzene	95-50-1	1,300	1300	0.2	U	0.2	U	0.2	U
	Benzyl Alcohol	100-51-6			5	U	0.08	J	0.22	J
	bis (2-Chloroisopropyl) ether		0.53	0.53	0.2	*UJ*	0.2	*UJ*	0.2	U
	2-Methylphenol				0.5	U	0.49	U	0.48	U
	Hexachloroethane	67-72-1	3.3	3.3	0.2	U	0.2	U	0.2	U
	n-Nitroso-di-n-propylamine	621-64-7	0.51	0.51	0.2	U	0.2	U	0.2	U
	4-Methylphenol (p-Cresol)	106-44-5			0.5	U	0.49	U	0.48	U
	Nitrobenzene		690	690	0.2	U	0.2	U	0.2	U
	Isophorone		960	960	0.2	U	0.2	U	0.2	U
	2-Nitrophenol				0.5	U	0.49	U	0.48	U
	2,4-Dimethylphenol	120-83-2	850	850	4	U	3.9	U	3.9	U
	bis (2-Chloroethoxy) methane				0.2	U	0.2	U	0.2	U
	2,4-Dichlorophenol		290	290	0.5	U	0.49	U	0.48	U
	Benzoic Acid				5	U	1.3	J	4.8	U
	1,2,4-Trichlorobenzene		70	70	0.2	U	0.2	U	0.2	U
	4-Chloroaniline				0.2	U	0.2	U	0.2	U
	Hexachlorobutadiene	87-68-3	18	18	0.2	U	0.2	U	0.2	U
	4-Chloro-3-methylphenol				0.5	U	0.49	U	0.48	U
	Hexachlorocyclopentadiene	77-47-4	1,100	1,100	0.99	*R*	0.97	*R*	0.96	U
	2-Chloronaphthalene		1,600	1,600	0.2	U	0.2	U	0.2	U
	2-Nitroaniline				0.2	U	0.2	U	0.2	U
	Dimethyl Phthalate		1,100,000	1,100,000	0.2	U	0.2	U	0.2	U
	2,6-Dinitrotoluene				0.2	U	0.2	U	0.2	U
	3-Nitroaniline				0.99	U	0.97	U	0.96	U
	2,4-Dinitrophenol		5,300	5,300	4	U	3.9	U	3.9	U
	4-Nitrophenol				2	U	2	U	2	U
	2,4-Dinitrotoluene		3.4	3.4	0.2	U	0.2	U	0.2	U
	4-Chlorophenyl-phenyl ether	7005-72-3			0.2	U	0.2	U	0.2	U
	Diethyl Phthalate		44,000	44,000	*0.2*	*U*	*0.2*	*U*	*0.2*	*J*
	4-Nitroaniline				0.99	U	0.97	U	0.96	U
	2-Methyl-4,6-dinitrophenol		280	280	2	U	2	U	2	U
	N-Nitrosodiphenylamine		6	6	0.2	U	0.2	U	0.2	U
	4-Bromophenyl-phenyl ether	101-55-3			0.2	U	0.2	U	0.2	U
	Hexachlorobenzene	118-74-1	0.00029	0.00029	0.2	U	0.2	U	0.2	U
	Carbazole	86-74-8			0.2	U	0.2	U	0.2	U
	di-n-butyl Phthalate				*0.2*	*U*	*0.2*	*U*	*0.2*	*J*
	Butyl Benzyl Phthalate		1,900	1,900	*0.2*	*U*	0.2	U	*0.2*	*J*
	3,3'-Dichlorobenzidine		0.028	0.028	2	U	2	U	2	U
	bis (2-Ethylhexyl) phthalate		2.2	2.2	0.99	U	*0.97*	*U*	*0.96*	*U*
	di-n-octyl Phthalate				0.2	U	0.2	U	0.2	U

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study

Appendix B Table B-10

Surface Water Sampling Results

Screened to Fish Consumption

			SCREENING CRITERIA		FRENCH DRAIN		ODOT CACH BASIN		SEEP	
Sample Number			Fish Consumption **		SW-FD-01		SW-ODOT-01		SW-SEEP-01	
Blind ID Number			EPA 2004	DEQ 2004	1052		1051		12000	
Screened Interval (approx. feet/bgs)			NRWQC	AWQC	N/A		N/A		N/A	
Date Collected					3/13/2008		3/13/2008		4/3/2008	
Matrix					Water		Water		Water	
Basis					N/A		N/A		N/A	
LAB Service Request ID #					K0802291		K0802291		K0802942	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
PCBs										
	Aroclor 1016	12674-11-2			0.005	U	0.0049	U	0.005	U
	Aroclor 1221	11104-28-2			0.0099	U	0.0098	U	0.01	U
	Aroclor 1232	11141-16-5			0.005	U	0.0049	U	0.005	U
	Aroclor 1242				0.005	U	0.0054	U	0.005	U
	Aroclor 1248	12672-29-6			0.005	U	0.0049	U	0.005	U
	Aroclor 1254	11097-69-1			0.005	U	0.0071	U	0.005	U
	Aroclor 1260	11096-82-5			0.005	U	0.0049	U	0.005	U
	Aroclor 1262	37324-23-5			0.005	U	0.0049	U	0.005	U
	Aroclor 1268	11100-14-4			0.005	U	0.0049	U	0.005	U
	Total PCBs		0.000064	0.000064	**ND**		**ND**		**ND**	
Pesticides										
	α - BHC	319-84-6	0.0049	0.0049	0.0099	U	0.00049	U	0.0005	U
	Hexachlorobenzene	118-74-1			0.0099	U	0.00049	U	0.0005	U
	β - BHC	319-85-7	0.017	0.017	0.0099	U	0.0007	U	0.0005	U
	γ - BHC (Lindane)	58-89-9	1.8	1.8	0.0099	*UJ*	0.00074	*UJ*	0.0005	U
	δ - BHC	319-86-8			0.055	*UJ*	0.00049	*UJ*	0.0005	U
	Heptachlor	76-44-8	0.000079	0.000079	0.0099	*UJ*	0.00049	*UJ*	0.0005	U
	Aldrin	309-00-2	0.00005	0.00005	0.0099	U	0.00049	U	0.00015	J
	Heptachlor epoxide	102-45-73	0.000039	0.000039	0.0099	U	0.00049	U	0.0005	U
	gamma-Chlordane				0.0099	U	0.00049	U	0.0005	U
	Endosulfan alpha-	959-98-8	89	89	0.0099	U	0.00049	U	0.0005	U
	alpha-Chlordane				0.0099	U	0.00049	U	0.0005	U
	Dieldrin	60-57-1	0.000054	0.000054	0.0099	U	0.00049	U	0.0005	U
	4,4'-DDE				0.0099	U	0.00049	U	0.00031	J
	Endrin	72-20-8	0.06	0.06	0.0099	U	0.00049	U	0.0005	U
	Endosulfan beta-	33213-65-9	89	89	0.0099	U	0.00055	U	0.0005	U
	4,4'-DDD				0.0099	U	0.00049	U	0.0005	*UJ*
	Endrin aldehyde	7421-93-4	0.3	3	0.0099	U	0.00042	J	0.0005	U
	Endosulfan sulfate	1031-07-8	89	89	0.0099	U	0.00098	U	0.0005	U
	4,4'-DDT				0.0099	U	0.0013	U	0.0019	*J*
	Endrin ketone	53494-70-5			0.0099	U	0.00049	U	0.0005	U
	Methoxychlor	72-43-5			0.0099	U	0.00088	U	0.0005	U
	Toxaphene	8001-35-2	0.00028	0.00028	0.5	U	0.025	U	0.031	U
	oxy chlordane				0.031	U	0.00098	U	0.001	U
	2,4'-DDE				0.0099	U	0.00049	U	0.0005	U
	cis - nonachlor	5103-73-1			0.0099	U	0.00049	U	0.0005	U
	2,4'-DDD				0.0190	U	0.00084	U	0.0005	U
	trans - nonachlor	39765-80-5			0.0099	U	0.00049	U	0.0005	U
	2,4'-DDT				0.0099	U	0.00049	U	0.0005	U
	Mirex				0.0099	U	0.00049	U	0.0005	U
	Hexachloroethane	67-72-1			0.0099	U	0.00049	U	0.0005	U
	Hexachlorobutadiene	87-68-3			0.0099	U	0.0005	U	0.0005	U
	DDE (1)	**72-55-9**	**0.00022**	**0.00022**	**ND**		**ND**		**0.00031**	**J**
	DDD (1)	**72-54-8**	**0.00031**	**0.00031**	**ND**		**ND**		**ND**	
	DDT (1)	**50-29-3**	**0.00022**	**0.00022**	**ND**		**ND**		**0.0019**	**J**
	DDx-total (2)	**50-29-3**	**0.00075**	**0.00075**	**ND**		**ND**		**0.00221**	**J**
	Chlordane - total (3)		**0.00081**	**0.00081**	**ND**		**ND**		**ND**	
	Endosulfan - total (4)		**267**	**267**	**ND**		**ND**		**ND**	

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study

Appendix B Table B-10

Surface Water Sampling Results

Screened to Fish Consumption

			SCREENING CRITERIA		FRENCH DRAIN		ODOT CACH BASIN		SEEP	
Sample Number			Fish Consumption **		SW-FD-01		SW-ODOT-01		SW-SEEP-01	
Blind ID Number			EPA 2004	DEQ 2004	1052		1051		12000	
Screened Interval (approx. feet/bgs)			NRWQC	AWQC	N/A		N/A		N/A	
Date Collected					3/13/2008		3/13/2008		4/3/2008	
Matrix					Water		Water		Water	
Basis					N/A		N/A		N/A	
LAB Service Request ID #					K0802291		K0802291		K0802942	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
Cyanide (Not Analyzed)										
Metals										
	Aluminum (pH 6.5 - 9.0)[13]	7429-90-5			132	=	832	=	679	=
	Antimony	7440-36-0	640	640	0.26	=	0.19	=	0.11	=
	Arsenic	7440-38-2	0.14	0.14	0.58	=	0.16	=	0.22	=
	Cadmium[15]	7440-43-9			0.017	B	0.038	=	0.02	U
	Chromium, total	7440-47-3			0.72	*U*	1.27	*U*	2.1	=
	Copper[15]	7440-50-8			10.6	=	2.66	=	3.12	=
	Lead[15]	7439-92-1			1.09	=	2.03	=	4.05	=
	Manganese		100	100	2.23	=	27	=	17.5	=
	Mercury	7439-97-6		0.146	0.2	U	0.2	U	0.2	U
	Nickel[15]	7440-02-0	4,600	4,600	0.7	=	1	=	0.84	=
	Selenium	7782-49-2	4,200	4,200	0.6	B	0.2	B	1	U
	Silver [15]	7440-22-4			0.024	*U*	*0.02*	*U*	0.023	*U*
	Zinc[15]	7440-66-6	26,000	26,000	2.42	=	13.8	=	4.62	=
	Aluminum, Dissolved				30.8	=	374	=	34.8	=
	Antimony, Dissolved		640	640	0.24	=	0.2	=	0.38	=
	Arsenic, Dissolved		0.14	0.14	0.6	=	0.14	=	0.08	=
	Cadmium, Dissolved				0.02	U	0.056	=	0.02	U
	Chromium, Dissolved				0.71	*U*	0.63	*U*	0.39	=
	Copper, Dissolved				9.85	=	1.59	=	1.36	=
	Lead, Dissolved				0.3	=	0.486	=	0.113	=
	Manganese, Dissolved		100	100	1.58	=	37.6	=	0.95	=
	Mercury, Dissolved			0.146	0.2	U	0.2	U	0.2	U
	Nickel, Dissolved		4,600	4,600	0.8	=	0.91	=	0.42	=
	Selenium, Dissolved		4,200	4,200	0.6	B	1	U	1	U
	Silver, Dissolved				*0.02*	*U*	0.022	*U*	0.02	U
	Zinc, Dissolved		26,000	26,000	1.74	*U*	9.11	=	6.18	=
TPH										
	TPH-Diesel				260	U	41	J	250	U
	TPH Motor Oil				510	U	170	J	*500,000*	*U*

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study

Appendix B Table B-11

Surface Water Sampling Results

Screened to Ecological Receptors

			SCREENING CRITERIA			**FRENCH DRAIN**		**ODOT CACH BASI**		**SEEP**	
Sample Number			Ecological Receptors #			SW-FD-01		SW-ODOT-01		SW-SEEP-01	
Blind ID Number			EPA's 2004	ODEQ's	Oak Ridge	1052		1051		12000	
Screened Interval (approx. feet/bgs)			NRWQC	2004	National	N/A		N/A		N/A	
Date Collected			(chronic)	AWQC	Laboratory's	3/13/08		3/13/08		4/3/08	
Matrix				(chronic)	(Tier II SCV)[i]	Water		Water		Water	
Basis						N/A		N/A		N/A	
LAB Service Request ID #						K0802291		K0802291		K0802942	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
VOCs (Not Analyzed)											
SVOCs											
	Phenols and Substituted Phenols										
	2,4,6-trichlorophenol	88-06-2		970 [16]		0.5	U	0.5	U	0.5	U
	2,4,5-Trichlorophenol	95-95-4				1.4	U	1.3	U	1.3	U
	2,3,4,5-Tetrachlorophenol	4901-51-3				0.5	U	0.5	U	0.5	U
	2,3,5,6- Tetrachlorophenol	935-95-5				0.5	U	0.5	U	0.5	U
	Pentachlorophenol	87-86-5	15 [22]	13 [14,23]		0.5	U	0.5	U	0.5	U
	Polycyclic Aromatic Hydrocarbons (PAHs)										
	Naphthalene	91-20-3		620 [16]	12	*0.0078*	*U*	0.026	*U*	*0.0078*	*U*
	2-Methylnaphthalene	91-57-6			2.1[h]	0.0028	J	0.0041	J	0.0078	U
	1-Methylnaphthalene	90-12-0				0.0078	U	0.0045	J	0.0078	U
	Acenaphthylene	208-96-8				0.0078	U	0.0077	U	0.005	J
	Acenaphthene	83-32-9		520 [16]		0.0069	J	0.017	=	0.0078	U
	Fluorene	86-73-7			3.9	0.0078	U	0.0089	=	0.0078	U
	Dibenzofuran	132-64-9				0.0078	U	0.0049	J	0.0078	U
	Phenanthrene	85-01-8				*0.0078*	*U*	0.034	*U*	0.013	*U*
	Anthracene	120-12-7			0.73	0.0078	U	0.011	=	0.0045	J
	Fluoranthene	206-44-0				0.0078	U	0.049	=	0.034	=
	Pyrene	129-00-0				0.0052	J	0.051	=	0.049	=
	Benzo(a)anthracene	56-55-3			0.027	0.0078	U	0.017	=	0.021	=
	Chrysene	218-01-9				0.0078	U	0.025	=	0.027	=
	Benzo(b)fluoranthene	205-99-2				0.0028	J	0.03	=	0.04	=
	Benzo(k)fluoranthene	207-08-9				0.0078	U	0.0097	=	0.013	=
	Benzo(a)pyrene	50-32-8			0.014	0.0078	U	0.023	=	0.031	=
	Indeno(1,2,3-cd)pyrene	193-39-5				0.0078	U	0.018	=	0.036	=
	Dibenz(a,h)anthracene	53-70-3				0.0078	U	0.0036	J	0.0048	J
	Benzo(g,h,i)perylene	191-24-2				0.0078	U	0.022	=	0.039	=

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study

Appendix B Table B-11

Surface Water Sampling Results

Screened to Ecological Receptors

			SCREENING CRITERIA			**FRENCH DRAIN**		**ODOT CACH BASI**		**SEEP**	
Sample Number			Ecological Receptors #			SW-FD-01		SW-ODOT-01		SW-SEEP-01	
Blind ID Number			EPA's 2004	ODEQ's	Oak Ridge	1052		1051		12000	
Screened Interval (approx. feet/bgs)			NRWQC	2004	National	N/A		N/A		N/A	
Date Collected			(chronic)	AWQC	Laboratory's	3/13/08		3/13/08		4/3/08	
Matrix				(chronic)	(Tier II SCV)[i]	Water		Water		Water	
Basis						N/A		N/A		N/A	
LAB Service Request ID #						K0802291		K0802291		K0802942	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
	Organonitrogen Compounds, Halogenated Compounds, Phenols and Substituted Phenols, Oxygen-Containing Compounds										
	n-Nitrosodimethylamine	62-75-9				2	U	2	U	2	U
	Aniline	62-53-3				0.99	U	0.97	U	0.96	U
	bis (2-Chloroethyl) ether	111-44-4				0.2	U	0.2	U	0.2	U
	Phenol	108-95-2		2,560 [16]		0.5	U	0.49	U	0.48	U
	2-Chlorophenol	95-57-8		2,000 [16]		0.5	U	0.49	U	0.48	U
	1,3-Dichlorobenzene	541-73-1		763 [16]	71	0.2	U	0.2	U	0.2	U
	1,4-Dichlorobenzene	106-46-7		763 [16]	15	0.2	U	0.2	U	0.2	U
	1,2-Dichlorobenzene	95-50-1		763 [16]	14	0.2	U	0.2	U	0.2	U
	Benzyl Alcohol	100-51-6			8.6	5	U	0.08	J	0.22	J
	bis (2-Chloroisopropyl) ether	108-60-1				0.2	*UJ*	0.2	*UJ*	0.2	U
	2-Methylphenol	95-48-7			13	0.5	U	0.49	U	0.48	U
	Hexachloroethane	67-72-1		540 [16]	12	0.2	U	0.2	U	0.2	U
	n-Nitroso-di-n-propylamine	621-64-7				0.2	U	0.2	U	0.2	U
	4-Methylphenol (p-Cresol)	106-44-5				0.5	U	0.49	U	0.48	U
	Nitrobenzene	98-95-3				0.2	U	0.2	U	0.2	U
	Isophorone	78-89-1				0.2	U	0.2	U	0.2	U
	2-Nitrophenol	88-75-5		150 [16]		0.5	U	0.49	U	0.48	U
	2,4-Dimethylphenol	120-83-2				4	U	3.9	U	3.9	U
	bis (2-Chloroethoxy) methane	111-91-1				0.2	U	0.2	U	0.2	U
	2,4-Dichlorophenol	120-83-2		365 [16]		0.5	U	0.49	U	0.48	U
	Benzoic Acid	65-85-0			42	5	U	1.3	J	4.8	U
	1,2,4-Trichlorobenzene	120-82-1			110	0.2	U	0.2	U	0.2	U
	4-Chloroaniline	106-47-8				0.2	U	0.2	U	0.2	U
	Hexachlorobutadiene	87-68-3		9.3 [16]		0.2	U	0.2	U	0.2	U
	4-Chloro-3-methylphenol	59-50-7				0.5	U	0.49	U	0.48	U
	Hexachlorocyclopentadiene	77-47-4		5.2 [16]		0.99	*R*	0.97	*R*	0.96	U
	2-Chloronaphthalene	91-58-7				0.2	U	0.2	U	0.2	U
	2-Nitroaniline	88-74-4				0.2	U	0.2	U	0.2	U
	Dimethyl Phthalate	131-11-3		3 [16]		0.2	U	0.2	U	0.2	U
	2,6-Dinitrotoluene	606-20-2				0.2	U	0.2	U	0.2	U
	3-Nitroaniline	99-09-2				0.99	U	0.97	U	0.96	U
	2,4-Dinitrophenol	51-28-5		150 [16]		4	U	3.9	U	3.9	U
	4-Nitrophenol	100-02-7		150 [16]	300	2	U	2	U	2	U
	2,4-Dinitrotoluene	121-14-2				0.2	U	0.2	U	0.2	U
	4-Chlorophenyl-phenyl ether	7005-72-3				0.2	U	0.2	U	0.2	U
	Diethyl Phthalate	84-66-2			210	*0.2*	*U*	*0.2*	*U*	*0.2*	*J*
	4-Nitroaniline	100-01-6				0.99	U	0.97	U	0.96	U
	2-Methyl-4,6-dinitrophenol	534-52-1		150 [16]		2	U	2	U	2	U
	N-Nitrosodiphenylamine	86-30-6			210	0.2	U	0.2	U	0.2	U
	4-Bromophenyl-phenyl ether	101-55-3				0.2	U	0.2	U	0.2	U
	Hexachlorobenzene	118-74-1		3 [16]		0.2	U	0.2	U	0.2	U
	Carbazole	86-74-8				0.2	U	0.2	U	0.2	U
	di-n-butyl Phthalate	84-74-2		3 [16]		*0.2*	*U*	*0.2*	*U*	*0.2*	*J*
	Butyl Benzyl Phthalate	85-68-7		3 [16]	19	*0.2*	*U*	0.2	U	*0.2*	*J*
	3,3'-Dichlorobenzidine	91-94-1		763 [16]		2	U	2	U	2	U
	bis (2-Ethylhexyl) phthalate	117-81-7		3 [16]		0.99	U	*0.97*	*U*	*0.96*	*U*
	di-n-octyl Phthalate	117-84-0		3 [16]		0.2	U	0.2	U	0.2	U

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study

Appendix B Table B-11

Surface Water Sampling Results

Screened to Ecological Receptors

			SCREENING CRITERIA			**FRENCH DRAIN**		**ODOT CACH BASI**		**SEEP**	
Sample Number			Ecological Receptors #			SW-FD-01		SW-ODOT-01		SW-SEEP-01	
Blind ID Number			EPA's 2004	ODEQ's	Oak Ridge	1052		1051		12000	
Screened Interval (approx. feet/bgs)			NRWQC	2004	National	N/A		N/A		N/A	
Date Collected			(chronic)	AWQC	Laboratory's	3/13/08		3/13/08		4/3/08	
Matrix				(chronic)	(Tier II SCV)[i]	Water		Water		Water	
Basis						N/A		N/A		N/A	
LAB Service Request ID #						K0802291		K0802291		K0802942	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
PCBs											
	Aroclor 1016	12674-11-2				0.005	U	0.0049	U	0.005	U
	Aroclor 1221	11104-28-2			0.28	0.0099	U	0.0098	U	0.01	U
	Aroclor 1232	11141-16-5			0.58	0.005	U	0.0049	U	0.005	U
	Aroclor 1242	53469-21-9			0.053	0.005	U	0.0054	U	0.005	U
	Aroclor 1248	12672-29-6			0.081	0.005	U	0.0049	U	0.005	U
	Aroclor 1254	11097-69-1			0.033	0.005	U	0.0071	U	0.005	U
	Aroclor 1260	11096-82-5			94	0.005	U	0.0049	U	0.005	U
	Aroclor 1262	37324-23-5				0.005	U	0.0049	U	0.005	U
	Aroclor 1268	11100-14-4				0.005	U	0.0049	U	0.005	U
	Total PCBs		0.014	0.014	0.14	**ND**		**ND**		**ND**	
Pesticides											
	α - BHC	319-84-6			2.2[c]	0.0099	U	0.00049	U	0.0005	U
	Hexachlorobenzene	118-74-1				0.0099	U	0.00049	U	0.0005	U
	β - BHC	319-85-7				0.0099	U	0.0007	U	0.0005	U
	γ - BHC (Lindane)	58-89-9		0.08		0.0099	*UJ*	0.00074	*UJ*	0.0005	U
	δ - BHC	319-86-8				0.055	*UJ*	0.00049	*UJ*	0.0005	U
	Heptachlor	76-44-8	0.0038	0.0038	0.0069	0.0099	*UJ*	0.00049	*UJ*	0.0005	U
	Aldrin	309-00-2				0.0099	U	0.00049	U	0.00015	J
	Heptachlor epoxide	102-45-73	0.0038	0.0038		0.0099	U	0.00049	U	0.0005	U
	gamma-Chlordane	5103-74-2				0.0099	U	0.00049	U	0.0005	U
	Endosulfan alpha-	959-98-8	0.056	0.056	0.051	0.0099	U	0.00049	U	0.0005	U
	alpha-Chlordane	5103-74-2				0.0099	U	0.00049	U	0.0005	U
	Dieldrin	60-57-1	0.056	0.0019[14]		0.0099	U	0.00049	U	0.0005	U
	4,4'-DDE	72-55-9				0.0099	U	0.00049	U	0.00031	J
	Endrin	72-20-8	0.036	0.0023 [14]	0.061	0.0099	U	0.00049	U	0.0005	U
	Endosulfan beta-	33213-65-9	0.056	0.056	0.051	0.0099	U	0.00055	U	0.0005	U
	4,4'-DDD	72-54-8				0.0099	U	0.00049	U	0.0005	*UJ*
	Endrin aldehyde	7421-93-4				0.0099	U	0.00042	J	0.0005	U
	Endosulfan sulfate	1031-07-8				0.0099	U	0.00098	U	0.0005	U
	4,4'-DDT	50-29-3				0.0099	U	0.0013	U	0.0019	*J*
	Endrin ketone	53494-70-5				0.0099	U	0.00049	U	0.0005	U
	Methoxychlor	72-43-5	0.03	0.03	0.019	0.0099	U	0.00088	U	0.0005	U
	Toxaphene	8001-35-2	0.0002	0.0002		0.5	U	0.025	U	0.031	U
	oxy chlordane					0.031	U	0.00098	U	0.001	U
	2,4'-DDE	3424-82-6				0.0099	U	0.00049	U	0.0005	U
	cis - nonachlor	5103-73-1				0.0099	U	0.00049	U	0.0005	U
	2,4'-DDD	53-19-0				0.0190	U	0.00084	U	0.0005	U
	trans - nonachlor	39765-80-5				0.0099	U	0.00049	U	0.0005	U
	2,4'-DDT	789-02-6				0.0099	U	0.00049	U	0.0005	U
	Mirex	2385-85-5				0.0099	U	0.00049	U	0.0005	U
	Hexachloroethane	67-72-1				0.0099	U	0.00049	U	0.0005	U
	Hexachlorobutadiene	87-68-3				0.0099	U	0.0005	U	0.0005	U
	DDE [1]	**72-55-9**				**ND**		**ND**		**0.00031**	**J**
	DDD [1]	**72-54-8**			0.011[d]	**ND**		**ND**		**ND**	
	DDT [1]	**50-29-3**	0.001	0.001	0.013[e]	**ND**		**ND**		**0.0019**	**J**
	DDx-total [2]	**50-29-3**	0.001	0.001	0.013[e]	**ND**		**ND**		**0.00221**	**J**
	Chlordane-total [3]		0.0043	0.0043		**ND**		**ND**		**ND**	
	Endosulfan-total [4]		0.112	0.112	0.102	**ND**		**ND**		**ND**	

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study

Appendix B Table B-11

Surface Water Sampling Results

Screened to Ecological Receptors

			SCREENING CRITERIA			FRENCH DRAIN		ODOT CACH BASI		SEEP	
Sample Number			Ecological Receptors #			SW-FD-01		SW-ODOT-01		SW-SEEP-01	
Blind ID Number			EPA's 2004	ODEQ's	Oak Ridge	1052		1051		12000	
Screened Interval (approx. feet/bgs)			NRWQC	2004	National	N/A		N/A		N/A	
Date Collected			(chronic)	AWQC	Laboratory's	3/13/08		3/13/08		4/3/08	
Matrix				(chronic)	(Tier II SCV)[i]	Water		Water		Water	
Basis						N/A		N/A		N/A	
LAB Service Request ID #						K0802291		K0802291		K0802942	
Analyis Group	**Chemical**	**CAS #**	**(µg/L)**	**(µg/L)**	**(µg/L)**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**	**Result (µg/L)**	**Q**
Cyanide (Not Analyzed)											
Metals											
	Aluminum (pH 6.5 - 9.0)[13]	7429-90-5	87			132	=	832	=	679	=
	Antimony	7440-36-0		1600 [16]	30	0.26	=	0.19	=	0.11	=
	Arsenic	7440-38-2	150		3.1[a]	0.58	=	0.16	=	0.22	=
	Cadmium[15]	7440-43-9	0.094	0.38 [14]		0.017	B	0.038	=	0.02	U
	Chromium, total	7440-47-3				0.72	*U*	1.27	*U*	2.1	=
	Copper[15]	7440-50-8	2.7	3.6 [14]		10.6	=	2.66	=	3.12	=
	Lead[15]	7439-92-1	0.54	0.54 [14]		1.09	=	2.03	=	4.05	=
	Manganese	7439-96-5			120	2.23	=	27	=	17.5	=
	Mercury	7439-97-6	0.77	0.012	1.3[b]	0.2	U	0.2	U	0.2	U
	Nickel[15]	7440-02-0	16	49 [14]		0.7	=	1	=	0.84	=
	Selenium	7782-49-2	5 [19]	35 [14]		0.6	B	0.2	B	1	U
	Silver [15]	7440-22-4		0.12 [14]	0.36	0.024	*U*	*0.02*	*U*	0.023	*U*
	Zinc[15]	7440-66-6	36	33		2.42	=	13.8	=	4.62	=
	Aluminum, Dissolved		87			30.8	=	374	=	34.8	=
	Antimony, Dissolved			1600 [16]	30	0.24	=	0.2	=	0.38	=
	Arsenic, Dissolved		150		3.1[a]	0.6	=	0.14	=	0.08	=
	Cadmium, Dissolved		0.094	0.38 [14]		0.02	U	0.056	=	0.02	U
	Chromium, Dissolved					0.71	*U*	0.63	*U*	0.39	=
	Copper, Dissolved		2.7	3.6 [14]		9.85	=	1.59	=	1.36	=
	Lead, Dissolved		0.54	0.54 [14]		0.3	=	0.486	=	0.113	=
	Manganese, Dissolved				120	1.58	=	37.6	=	0.95	=
	Mercury, Dissolved		0.77	0.012	1.3[b]	0.2	U	0.2	U	0.2	U
	Nickel, Dissolved		16	49 [14]		0.8	=	0.91	=	0.42	=
	Selenium, Dissolved		5 [19]	35 [14]		0.6	B	1	U	1	U
	Silver, Dissolved			0.12 [14]	0.36	*0.02*	*U*	0.022	*U*	0.02	U
	Zinc, Dissolved		36	33		1.74	*U*	9.11	=	6.18	=
TPH											
	TPH-Diesel					260	U	41	J	250	U
	TPH Motor Oil					510	U	170	J	*500,000*	*U*

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-12
Upland Sediment Sampling Results
Screened to Toxicity and Bioaccumulation

			SCREENING VALUES **		ODOT Catch Basin		Drywell		Run Off		Fence Line	
Sample Number			Toxicity	Bioaccumulation	SD-ODOT-CB		SD-DW-13		SD-NL-01		SB-FL-01	
Blind ID Number			MacDonald	DEQ 2007	1050		13DW		10000		11000	
Sample Depth (approx. feet/bgs)			PECs and	Bioaccumulative	1-3 "		2-3'		0 - ~1'		0-6"	
Date Collected			other SQVs	Sediment	3/13/08		6-Mar		4-Apr		9-Apr	
Matrix			(1)	SLVs (E)	Sediment		Soil		Sediment		Soil	
Basis					Dry		Dry		Dry		Dry	
LAB Service Request ID #					K0802057		K0801963		K0803345		K0802299A	
Analyis Group	**Chemical**	**CAS #**	**µg/kg**	**µg/kg**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**
VOCs (Not Analyzed)												
SVOCs												
	Phenols and Substituted Phenols											
	2,4,6-trichlorophenol	88-06-2			6.1	U	*Not Analyzed*		6.7	U	5	U
	2,4,5-Trichlorophenol	95-95-4			6.1	U			6.7	U	5	U
	2,3,4,5-Tetrachlorophenol	4901-51-3			6.1	U			6.7	U	5	U
	2,3,5,6-Tetrachlorophenol	935-95-5			6.1	U			0.97	J	0.34	J
	Pentachlorophenol	87-86-5	1,000 (8)	250 (33)	2.3	J			21	=	21	=
	Polycyclic Aromatic Hydrocarbons (PAHs)											
	Naphthalene	91-20-3	561 (2)		1.4	J	290	=	26	=	20	=
	2-Methylnaphthalene	91-57-6	200 (11)		1	J	190	=	15	=	13	=
	1-Methylnaphthalene	90-12-0			0.78	J	91	=	9.6	=	12	=
	Acenaphthylene	208-96-8	200 (6)		1.1	J	67	=	17	=	13	=
	Acenaphthene	83-32-9	300 (6)		3	=	850	=	110	=	160	=
	Fluorene	86-73-7	536 (2)		1.5	J	490	=	55	=	100	=
	Dibenzofuran	132-64-9			0.8	J	330	=	34	=	79	=
	Phenanthrene	85-01-8	1,170 (2)		22	=	6,300	=	930	=	1,200	=
	Anthracene	120-12-7	845 (2)	37,000 (32)	5.5	=	1,000	=	150	=	120	=
	Fluoranthene	206-44-0	2,230 (2)	1,900 (32)	52	=	15,000	=	2,500	=	2,700	=
	Pyrene	129-00-0	1,520 (2)		63	=	15,000	=	2,600	=	2,400	=
	Benzo(b)fluoranthene	56-55-3			80	=	19,000	=	3,400	=	2,000	=
	Benzo(k)fluoranthene	218-01-9	13,000 (6)		21	=	6,600	=	1,200	=	630	=
	Benzo(a)anthracene	205-99-2	1,050 (2)		35	=	10,000	=	1,700	=	1,100	=
	Chrysene	207-08-9	1,290 (2)		36	=	12,000	=	2,100	=	1,400	=
	Benzo(a)pyrene	50-32-8			62	=	15,000	=	2,700	=	1,500	=
	Indeno(1,2,3-cd)pyrene	193-39-5	100 (10)		67	=	11,000	=	2,200	=	1,200	=
	Dibenz(a,h)anthracene	53-70-3	1,300 (9)		13	=	2,800	=	550	=	250	=
	Benzo(g,h,i)perylene	191-24-2	300 (16)		72	=	10,000	=	2,000	=	970	=

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U.S. Moorings Feasibility Study
Appendix B Table B-12
Upland Sediment Sampling Results
Screened to Toxicity and Bioaccumulation

Sample Number			Toxicity	Bioaccumulation	SD-ODOT-CB		SD-DW-13		SD-NL-01		SB-FL-01	
Blind ID Number			MacDonald	DEQ 2007	1050		13DW		10000		11000	
Sample Depth (approx. feet/bgs)			PECs and	Bioaccumulative	1-3 "		2-3'		0 - ~1'		0-6"	
Date Collected			other SQVs	Sediment	3/13/08		6-Mar		4-Apr		9-Apr	
Matrix			(1)	SLVs (E)	Sediment		Soil		Sediment		Soil	
Basis					Dry		Dry		Dry		Dry	
LAB Service Request ID #					K0802057		K0801963		K0803345		K0802299A	
Analyis Group	**Chemical**	**CAS #**	**µg/kg**	**µg/kg**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**
	Organonitrogen Compounds, Halogenated Compounds, Phenols and Substituted Phenols, Oxygen-Containing Compounds											
	n-Nitrosodimethylamine	62-75-9			340	U	49	U	340	U	290	U
	Aniline	62-53-3			140	U	20	U	140	U	120	U
	bis (2-Chloroethyl) ether	111-44-4			67	U	9.8	U	68	U	58	U
	Phenol	108-95-2	50 (5, 6)		200	U	510	J	210	U	180	U
	2-Chlorophenol	95-57-8			67	U	9.8	U	68	U	58	U
	1,3-Dichlorobenzene	541-73-1	300 (7)		67	U	9.8	U	68	U	58	U
	1,4-Dichlorobenzene	106-46-7	300 (7)		67	U	9.8	U	68	U	58	U
	1,2-Dichlorobenzene	95-50-1	1,700 (7)		67	U	9.8	U	68	U	58	U
	Benzyl Alcohol	100-51-6			67	U	2,400	=	68	U	58	U
	bis (2-Chloroisopropyl) ether	108-60-1			67	U	9.8	U	68	U	58	U
	2-Methylphenol	95-48-7			67	U	9.8	U	68	U	58	U
	Hexachloroethane	67-72-1			67	U	9.8	U	68	U	58	U
	n-Nitroso-di-n-propylamine	621-64-7			67	U	9.8	U	68	U	58	U
	4-Methylphenol (p-Cresol)	106-44-5			67	U	9.8	U	68	U	58	U
	Nitrobenzene	98-95-3			67	U	9.8	U	68	U	58	U
	Isophorone	78-89-1			67	U	9.8	U	68	U	58	U
	2-Nitrophenol	88-75-5			67	U	9.8	U	68	U	58	U
	2,4-Dimethylphenol	120-83-2			140	U	20	U	140	U	120	U
	bis (2-Chloroethoxy) methane	111-91-1			67	U	9.8	U	68	U	58	U
	2,4-Dichlorophenol	120-83-2			67	U	9.8	U	68	U	58	U
	Benzoic Acid	65-85-0			1,400	U	2,600	J	1,400	U	1200	U
	1,2,4-Trichlorobenzene	120-82-1	9,200 (7)	19 (33)	67	U	9.8	U	68	U	58	U
	4-Chloroaniline	106-47-8			67	U	9.8	U	68	U	58	U
	Hexachlorobutadiene	87-68-3	600 (8)		67	U	9.8	U	68	U	58	U
	4-Chloro-3-methylphenol	59-50-7			67	U	9.8	U	68	U	58	U
	Hexachlorocyclopentadiene	77-47-4	400 (8)		340	U	49	U	340	U	290	U
	2-Chloronaphthalene	91-58-7			67	U	9.8	U	68	U	58	U
	2-Nitroaniline	88-74-4			140	U	20	U	140	U	120	U
	Dimethyl Phthalate	131-11-3	600 (7)		67	U	120	J	68	U	58	U
	2,6-Dinitrotoluene	606-20-2			67	U	9.8	U	68	U	58	U
	3-Nitroaniline	99-09-2			140	U	20	U	140	U	120	U
	2,4-Dinitrophenol	51-28-5			1,400	U	200	U	1,400	U	1200	U
	4-Nitrophenol	100-02-7			670	U	98	U	680	U	580	U
	2,4-Dinitrotoluene	121-14-2			67	U	9.8	U	68	U	58	U
	4-Chlorophenyl-phenyl ether	7005-72-3			67	U	38	J	68	U	58	U
	Diethyl Phthalate	84-66-2			67	U	60	J	68	U	58	U
	4-Nitroaniline	100-01-6			140	U	20	U	140	U	120	U
	2-Methyl-4,6-dinitrophenol	534-52-1			670	U	98	U	680	U	580	U
	N-Nitrosodiphenylamine	86-30-6			67	U	140	J	41	J	58	U
	4-Bromophenyl-phenyl ether	101-55-3			67	U	9.8	U	68	U	58	U
	Hexachlorobenzene	118-74-1	100 (6)	19 (33)	67	U	9.8	U	68	U	58	U
	Carbazole	86-74-8	1,600 (5)		67	U	580	=	150	=	270	=
	di-n-butyl Phthalate	84-74-2	100 (6)	60	79	U	350	=	79	U	100	=
	Butyl Benzyl Phthalate	85-68-7			67	U	260	=	41	J	38	J
	3,3'-Dichlorobenzidine	91-94-1			670	U	98	U	680	U	580	U
	bis (2-Ethylhexyl) phthalate	117-81-7	800 (5, 6)	330	760	=	9,200	=	210	=	140	=
	di-n-octyl Phthalate	117-84-0			67	U	9.8	U	68	U	58	U

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-12
Upland Sediment Sampling Results
Screened to Toxicity and Bioaccumulation

Sample Number			Toxicity	Bioaccumulation	SD-ODOT-CB		SD-DW-13		SD-NL-01		SB-FL-01	
Blind ID Number			MacDonald	DEQ 2007	1050		13DW		10000		11000	
Sample Depth (approx. feet/bgs)			PECs and	Bioaccumulative	1-3 "		2-3'		0 - ~1'		0-6"	
Date Collected			other SQVs	Sediment	3/13/08		6-Mar		4-Apr		9-Apr	
Matrix			(1)	SLVs (E)	Sediment		Soil		Sediment		Soil	
Basis					Dry		Dry		Dry		Dry	
LAB Service Request ID #					K0802057		K0801963		K0803345		K0802299A	
Analyis Group	**Chemical**	**CAS #**	**µg/kg**	**µg/kg**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**
PCBs												
	Aroclor 1016	12674-11-2	530 (9)		1.7	U	17	U	17	U	1.4	U
	Aroclor 1221	11104-28-2			3.4	U	83	U	34	U	2.8	U
	Aroclor 1232	11141-16-5			1.7	U	20	U	17	U	1.4	U
	Aroclor 1242	53469-21-9			1.2	J	12	U	17	U	1.4	U
	Aroclor 1248	12672-29-6	1,500 (9)		1.7	U	12	U	1,600	=	1.4	U
	Aroclor 1254	11097-69-1	300 (9)		3.8	J	130	=	17	U	11	U
	Aroclor 1260	11096-82-5	200 (9)		4.8	=	150	=	17	U	14	=
	Aroclor 1262	37324-23-5			1.7	U	12	U	17	U	1.4	U
	Aroclor 1268	11100-14-4			1.7	U	12	U	17	U	1.4	U
	Total PCBs		676 (2)	0.39 (33)	**9.8**	**J**	**280**	**=**	**1,600**	**=**	**14**	
Pesticides												
	α -BHC	319-84-6			0.14	U	*Not Analyzed*		0.68	U	0.12	U
	Hexachlorobenzene	118-74-1	100 (6)		0.12	J			1.2	U	0.2	U
	β -BHC	319-85-7			0.14	U			0.68	U	0.12	U
	γ -BHC (Lindane)	58-89-9	4.99 (2)		0.14	U			2.4	=	2.6	U
	δ -BHC	319-86-8			0.14	U			1.2	U	4.9	U
	Heptachlor	76-44-8	10 (6)		0.14	U			0.68	U	0.12	U
	Aldrin	309-00-2	40 (6)		0.14	U			0.68	U	0.12	U
	Heptachlor epoxide	102-45-73	16 (2)		0.12	J			4	U	0.43	U
	gamma-Chlordane	5103-74-2			0.32	J			0.74	U	0.27	U
	Endosulfan alpha-	959-98-8			0.14	U			1.1	U	0.23	U
	alpha-Chlordane	5103-74-2			0.082	J			0.74	U	0.19	U
	Dieldrin	60-57-1	61.8 (2)	0.0081 (33)	0.14	U			0.68	U	0.19	U
	4,4'-DDE	72-55-9			0.14	J			0.99	U	4.2	J
	Endrin	72-20-8	207 (2)		0.14	U			1.9	U	0.12	U
	Endosulfan beta-	33213-65-9			0.14	U			0.68	U	0.12	U
	4,4'-DDD	72-54-8			0.1	J			0.68	U	0.44	J
	Endrin aldehyde	7421-93-4			0.14	U			1.8	U	0.12	U
	Endosulfan sulfate	1031-07-8			0.091	J			1.4	J	0.12	U
	4,4'-DDT	50-29-3			1.1	=			23	=	8.7	J
	Endrin ketone	53494-70-5			0.14	U			1.1	J	0.66	J
	Methoxychlor	72-43-5			0.14	U			0.68	U	0.38	U
	Toxaphene	8001-35-2			6.7	U			250	U	16	U
	oxy chlordane				0.14	U			0.68	U	0.16	U
	2,4'-DDE	3424-82-6			0.14	U			2	U	0.76	U
	cis -nonachlor	5103-73-1			0.14	U			3.4	U	0.34	U
	2,4'-DDD	53-19-0			0.14	U			0.68	U	0.38	U
	trans -nonachlor	39765-80-5			0.14	U			6.9	U	0.21	=
	2,4'-DDT	789-02-6			0.56	J			14	U	3.3	J
	Mirex	2385-85-5			0.14	U			0.68	U	0.12	U
	Hexachloroethane	67-72-1			0.14	U			0.68	U	0.12	U
	Hexachlorobutadiene	87-68-3			0.14	U			0.68	U	0.12	U
	DDE (1)	**72-55-9**	**600 (8)**		**0.14**	**J**			**ND**		**4.2**	**J**
	DDD (1)	**72-54-8**	**31.3(2)**	**0.33**	**0.1**	**J**			**ND**		**0.44**	**J**
	DDT (1)	**50-29-3**	**28(2)**	**0.33**	**1.66**	**=**			**23**	**J**	**12**	**J**
	DDx-total (2)	**50-29-3**	**62.9(2)**	**0.33**	**1.9**	**J**			**23**	**J**	**16.64**	**J**
	Chlordane - total (3)			**0.33 (33)**	**0.4**	**J**			**ND**		**0.21**	**=**
	Endosulfan - total (4)		**17.6 (2)**	**0.37 (33)**	**0.09**	**J**			**1.4**	**J**	**ND**	

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

U.S. Moorings Feasibility Study
Appendix B Table B-12
Upland Sediment Sampling Results
Screened to Toxicity and Bioaccumulation

Sample Number			Toxicity	Bioaccumulation	SD-ODOT-CB		SD-DW-13		SD-NL-01		SB-FL-01	
Blind ID Number			MacDonald	DEQ 2007	1050		13DW		10000		11000	
Sample Depth (approx. feet/bgs)			PECs and	Bioaccumulative	1-3 "		2-3'		0 - ~1'		0-6"	
Date Collected			other SQVs	Sediment	3/13/08		6-Mar		4-Apr		9-Apr	
Matrix			(1)	SLVs (E)	Sediment		Soil		Sediment		Soil	
Basis					Dry		Dry		Dry		Dry	
LAB Service Request ID #					K0802057		K0801963		K0803345		K0802299A	
Analyis Group	**Chemical**	**CAS #**	**µg/kg**	**µg/kg**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**	**Result (µg/kg)**	**Q**
Cyanide												
	Cyanide (Total)	57-12-5			*Not Analyzed*		3,500	=	*Not Analyzed*		*Not Analyzed*	
Metals												
	Aluminum (pH 6.5 - 9.0)[13]	7429-90-5			1.18E+07	=	1.43E+07	=	1.38E+07	=	1.12E+07	=
	Antimony	7440-36-0	64,000 [3]		270	=	3,380	=	1,050	=	6,800	=
	Arsenic	7440-38-2	33,000 [2]	7,000 [31]	2,950	=	6,970	=	5,270	=	62,900	=
	Cadmium[15]	7440-43-9	4,980 [2]	1,000[31]	325	*J*	8,280	=	2,190	=	1,500	=
	Chromium, total	7440-47-3	111,000 [2]		84,600	=	369,000	=	76,600	=	508,000	=
	Copper[15]	7440-50-8	149,000 [2]		23,300	=	3.65E+06	=	377,000	=	226,000	=
	Lead[15]	7439-92-1	128,000 [2]	17,000 [31]	30,300	*J*	761,000	=	340,000	=	585,000	*J*
	Manganese	7439-96-5	1,100,000 [6,9]		1,000,000	=	764,000	=	1.23E+06	=	896,000	=
	Mercury	7439-97-6	1,060 [2]	70 [31]	15	B	157	=	112	=	52	=
	Nickel[15]	7440-02-0	48,600 [2]		13,300	=	162,000	=	50,400	=	213,000	=
	Selenium	7782-49-2	5,000 [4]	2,000 [31]	*0.07*	*U*	*120*	*U*	100	*J*	*100*	*U*
	Silver [15]	7440-22-4	5,000 [5,4]		160	=	1,100	=	249	=	270	=
	Zinc[15]	7440-66-6	459,000 [2]		119,000	=	3.76E+06	=	749,000	=	1.12E+06	=
Organobutyltins												
	Tetrabutyltin	1461-25-2			1.3	U	*Not Analyzed*		*Not Analyzed*		1.2	U
	Tributyltin	56573-85-4			1.3	U					14	=
	Dibutyltin	1002-53-5			1.3	U					32	=
	Monobutyltin	78763-54-9			1.3	U					25	=
TPH												
	TPH-Diesel				37,000	=	790,000	=	49,000	=	22,000	=
	TPH Motor Oil				370,000	=	4.50E+06	=	380,000	=	130,000	=

** SLV from Table 3.1 of the Final Portland Harbor JSCS Document, updated July 2007

APPENDIX C

DRYWELL EXCAVATION SAMPLING RESULTS

1317 South 13th Avenue Kelso, Washington 98626 (360) 577-7222 (360) 636-1068 fax

Columbia Analytical Services INC.
An Employee - Owned Company

August 31, 2009 Analytical Report for Service Request No: K0907692

Joshua Patton
US Army Corps Of Engineers
8010 NW St. Helens Road
Portland, OR 97210

RE: US Government Moorings

Dear Joshua:

Enclosed are the results of the rush sample submitted to our laboratory on August 20, 2009. For your reference, these analyses have been assigned our service request number K0907692.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.caslab.com. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3275. You may also contact me via Email at CLeaf@caslab.com.

Respectfully submitted,

Columbia Analytical Services, Inc.

Chris Leaf
Project Chemist

CL/lb

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
i	The MRL/MDL has been elevated due to a matrix interference.
X	See case narrative.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
B	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL has been elevated due to a matrix interference.
X	See case narrative.
*	The duplicate analysis not within control limits. See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results (25% for CLP Pesticides).
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
i	The MRL/MDL has been elevated due to a chromatographic interference.
X	See case narrative.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

Columbia Analytical Services, Inc.
Kelso, WA
State Certifications, Accreditations, and Licenses

Program	Number
Alaska DEC UST	UST-040
Arizona DHS	AZ0339
Arkansas - DEQ	88-0637
California DHS	2286
Colorado DPHE	-
Florida DOH	E87412
Hawaii DOH	-
Idaho DHW	-
Indiana DOH	C-WA-01
Louisiana DEQ	3016
Louisiana DHH	LA050010
Maine DHS	WA0035
Michigan DEQ	9949
Minnesota DOH	053-999-368
Montana DPHHS	CERT0047
Nevada DEP	WA35
New Jersey DEP	WA005
New Mexico ED	-
North Carolina DWQ	605
Oklahoma DEQ	9801
Oregon - DHS	WA200001
South Carolina DHEC	61002
Utah DOH	COLU
Washington DOE	C1203
Wisconsin DNR	998386840
Wyoming (EPA Region 8)	-

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	US Army Corp of Engineers	**Service Request No.:**	K0907692
Project:	US Government Moorings	**Date Received:**	08/20/2009
Sample Matrix:	Soil		

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for samples designated for Tier I data deliverables. When appropriate to the method, method blank results have been reported with each analytical test.

Sample Receipt

One soil sample was received for analysis at Columbia Analytical Services on 08/20/2009. The sample was received in good condition and consistent with the accompanying chain of custody form. The sample was stored in a refrigerator at 4°C upon receipt at the laboratory.

TCLP Metals by EPA Method 1311/6010/7470

No anomalies associated with the analysis of this sample were observed.

Diesel and Residual Range Organics by Method NWTHP-Dx

No anomalies associated with the analysis of this sample were observed.

TCLP Volatiles by EPA Method 1311/8260B

No anomalies associated with the analysis of this sample were observed

Polynuclear Aromatic Hydrocarbons by EPA Method 8270C

Lab Control Sample Exceptions:
The advisory criterion was exceeded for Benzo(g,h,i)perylene in Laboratory Control Sample (LCS) KWG0907415-3. As per the CAS/Kelso Standard Operating Procedure (SOP) for this method, these compounds are not included in the subset of analytes used to control the analysis. The recovery information reported for these analytes is for advisory purposes only (i.e. to provide additional detail related to the performance of each individual compound). No further corrective action was required.

Approved by _____ **Date** 8/31/09

COLUMBIA ANALYTICAL SERVICES, INC.

- Cover Page -
INORGANIC ANALYSIS DATA PACKAGE

Service Request : K0907692

Client : US Army Corps Of Engineers
Project Name : US Government Moorings
Project No. : NA

Sample Name :	Lab Code :
Dry Well	K0907692-001
Dry Well	K0907692-001S
Method Blank	K0907692-MB

Comments:

Approved By: _____ Date: 8/27/09

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : US Army Corps Of Engineers
Project Name : US Government Moorings
Project Number : NA
Matrix : Soil

Service Request : K0907692
Date Collected : 08/20/09
Date Received : 08/20/09
Date TCLP Performed : 08/24/09
Date Extracted : 08/25/09
Date Analyzed : 08/26/09

Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
Units: mg/L (ppm) in TCLP Extract

Sample Name : Dry Well
Lab Code : K0907692-001

Analyte	EPA Method	MRL	Regulatory Limit *	Sample Result	Result Notes
Arsenic	3010A/6010B	0.1	5	ND	
Barium	3010A/6010B	1.0	100	1.1	
Cadmium	3010A/6010B	0.01	1	ND	
Chromium	3010A/6010B	0.01	5	ND	
Lead	3010A/6010B	0.05	5	ND	
Mercury	7470A	0.001	0.2	ND	
Selenium	3010A/6010B	0.1	1	ND	
Silver	3010A/6010B	0.02	5	ND	

* From 40 CFR Part 261, et al., and Federal Register, March 29, 1990 and June 29, 1990.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : US Army Corps Of Engineers
Project Name : US Government Moorings
Project Number : NA
Matrix : Soil

Service Request : K0907692
Date Collected : NA
Date Received : NA
Date TCLP Performed : 08/24/09
Date Extracted : 08/25/09
Date Analyzed : 08/26/09

Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
Units: mg/L (ppm) in TCLP Extract

Sample Name : Method Blank
Lab Code : K0907692-MB

Analyte	EPA Method	MRL	Regulatory Limit *	Sample Result	Result Notes
Arsenic	3010A/6010B	0.1	5	ND	
Barium	3010A/6010B	1.0	100	ND	
Cadmium	3010A/6010B	0.01	1	ND	
Chromium	3010A/6010B	0.01	5	ND	
Lead	3010A/6010B	0.05	5	ND	
Mercury	7470A	0.001	0.2	ND	
Selenium	3010A/6010B	0.1	1	ND	
Silver	3010A/6010B	0.02	5	ND	

* From 40 CFR Part 261, et al., and Federal Register, March 29, 1990 and June 29, 1990.

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client : US Army Corps Of Engineers
Project Name : US Government Moorings
Project Number : NA
Matrix : Soil

Service Request : K0907692
Date Collected : 08/20/09
Date Received : 08/20/09
Date TCLP Performed : 08/24/09
Date Extracted : 08/25/09
Date Analyzed : 08/26/09

Matrix Spike Summary
Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
Units: mg/L (ppm) in TCLP Extract

Sample Name : Dry Well
Lab Code : K0907692-001S

Analyte	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery*	Result Notes
Arsenic	5.0	ND	4.6	92	
Barium	10	1.1	10.4	93	
Cadmium	1.0	ND	1.00	100	
Chromium	5.0	ND	4.89	98	
Lead	5.0	ND	4.5	90	
Mercury	0.005	ND	0.005	100	
Selenium	1.0	ND	0.9	90	
Silver	1.0	ND	0.91	90	

* From 40 CFR Part 261, et al., and Federal Register, March 29, 1990 and June 29, 1990.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client: US Army Corps Of Engineers
Project: US Government Moorings
Sample Matrix: Soil

Service Request: K0907692
Date Collected: 08/20/2009
Date Received: 08/20/2009

Diesel and Residual Range Organics

Sample Name: Dry Well
Lab Code: K0907692-001

Units: mg/Kg
Basis: Dry

Extraction Method: EPA 3550B
Analysis Method: NWTPH-Dx

Level: Low

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Diesel Range Organics (DRO)	ND	U	28	1	08/21/09	08/26/09	KWG0907459	
Residual Range Organics (RRO)	ND	U	120	1	08/21/09	08/26/09	KWG0907459	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
o-Terphenyl	92	50-150	08/26/09	Acceptable
n-Triacontane	95	50-150	08/26/09	Acceptable

Comments:

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client: US Army Corps Of Engineers
Project: US Government Moorings
Sample Matrix: Soil

Service Request: K0907692
Date Collected: NA
Date Received: NA

Diesel and Residual Range Organics

Sample Name: Method Blank
Lab Code: KWG0907459-3

Units: mg/Kg
Basis: Dry

Extraction Method: EPA 3550B
Analysis Method: NWTPH-Dx

Level: Low

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Diesel Range Organics (DRO)	ND	U	25	1	08/21/09	08/26/09	KWG0907459	
Residual Range Organics (RRO)	ND	U	100	1	08/21/09	08/26/09	KWG0907459	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
o-Terphenyl	91	50-150	08/26/09	Acceptable
n-Triacontane	94	50-150	08/26/09	Acceptable

Comments:

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client: US Army Corps Of Engineers
Project: US Government Moorings
Sample Matrix: Soil

Service Request: K0907692
Date Collected: 08/20/2009
Date Received: 08/20/2009
Date Prepared: 08/23/2009

Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction
Volatile Organic Compounds

Sample Name: Dry Well
Lab Code: K0907692-001

Units: mg/L
Basis: NA

Preparation Method: EPA 1311ZHE
Extraction Method: EPA 5030B
Analysis Method: 8260B

Level: Low

Analyte Name	Result	Q	MRL	Regulatory Limit	Dilution Factor	Date Extracted	Date Analyzed	Note
Vinyl Chloride	ND	U	0.080	0.2	1	08/24/09	08/24/09	
1,1-Dichloroethene	ND	U	0.20	0.7	1	08/24/09	08/24/09	
2-Butanone (MEK)	ND	U	8.0	200	1	08/24/09	08/24/09	
Chloroform	ND	U	0.20	6	1	08/24/09	08/24/09	
Carbon Tetrachloride	ND	U	0.20	0.5	1	08/24/09	08/24/09	
Benzene	ND	U	0.20	0.5	1	08/24/09	08/24/09	
1,2-Dichloroethane (EDC)	ND	U	0.20	0.5	1	08/24/09	08/24/09	
Trichloroethene (TCE)	ND	U	0.20	0.5	1	08/24/09	08/24/09	
Tetrachloroethene (PCE)	ND	U	0.20	0.7	1	08/24/09	08/24/09	
Chlorobenzene	ND	U	0.20	100	1	08/24/09	08/24/09	
1,4-Dichlorobenzene	ND	U	0.20	7.5	1	08/24/09	08/24/09	

Surrogate Name	%Rec	Control Limits	Note
Dibromofluoromethane	92	75-120	Acceptable
Toluene-d8	106	80-128	Acceptable
4-Bromofluorobenzene	88	75-117	Acceptable

Comments:

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client: US Army Corps Of Engineers
Project: US Government Moorings
Sample Matrix: Soil

Service Request: K0907692
Date Collected: NA
Date Received: NA
Date Prepared: 08/23/2009

Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction
Volatile Organic Compounds

Sample Name: Method Blank
Lab Code: KWG0907582-3

Units: mg/L
Basis: NA

Preparation Method: EPA 1311ZHE
Extraction Method: EPA 5030B
Analysis Method: 8260B

Level: Low

Analyte Name	Result	Q	MRL	Regulatory Limit	Dilution Factor	Date Extracted	Date Analyzed	Note
Benzene	ND	U	0.20	0.5	1	08/24/09	08/24/09	
Vinyl Chloride	ND	U	0.080	0.2	1	08/24/09	08/24/09	
1,1-Dichloroethene	ND	U	0.20	0.7	1	08/24/09	08/24/09	
2-Butanone (MEK)	ND	U	8.0	200	1	08/24/09	08/24/09	
Chloroform	ND	U	0.20	6	1	08/24/09	08/24/09	
Carbon Tetrachloride	ND	U	0.20	0.5	1	08/24/09	08/24/09	
1,2-Dichloroethane (EDC)	ND	U	0.20	0.5	1	08/24/09	08/24/09	
Trichloroethene (TCE)	ND	U	0.20	0.5	1	08/24/09	08/24/09	
Tetrachloroethene (PCE)	ND	U	0.20	0.7	1	08/24/09	08/24/09	
Chlorobenzene	ND	U	0.20	100	1	08/24/09	08/24/09	
1,4-Dichlorobenzene	ND	U	0.20	7.5	1	08/24/09	08/24/09	

Surrogate Name	%Rec	Control Limits	Note
Dibromofluoromethane	93	75-120	Acceptable
Toluene-d8	107	80-128	Acceptable
4-Bromofluorobenzene	90	75-117	Acceptable

Comments:

Client: US Army Corps Of Engineers
Project: US Government Moorings
Sample Matrix: Soil

Service Request: K0907692

Surrogate Recovery Summary
Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction
Volatile Organic Compounds

Preparation Method EPA 1311ZHE
Extraction Method: EPA 5030B
Analysis Method: 8260B

Units: PERCENT
Level: Low

Sample Name	Lab Code	Sur1	Sur2	Sur3
Dry Well	K0907692-001	92	106	88
Method Blank	KWG0907582-3	93	107	90
Dry WellMS	KWG0907582-2	97	109	92
Lab Control Sample	KWG0907582-1	97	108	92

Surrogate Recovery Control Limits (%)

Sur1 =	Dibromofluoromethane	75-120
Sur2 =	Toluene-d8	80-128
Sur3 =	4-Bromofluorobenzene	75-117

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.

Client: US Army Corps Of Engineers
Project: US Government Moorings
Sample Matrix: Soil

Service Request: K0907692
Date Prepared: 08/23/2009
Date Extracted: 8/24/2009
Date Analyzed: 08/24/2009

Matrix Spike Summary
Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction
Volatile Organic Compounds

Sample Name: Dry Well
Lab Code: K0907692-001

Units: mg/L
Basis: NA

Preparation Method EPA 1311ZHE
Extraction Method: EPA 5030B
Analysis Method: 8260B

Level: Low
Extraction Lot: KWG0907582

Analyte Name	Sample Result	Dry WellMS KWG0907582-2 Matrix Spike Result	Expected	%Rec	%Rec Limits
Vinyl Chloride	ND	3.34	4.00	83	50-150
1,1-Dichloroethene	ND	3.92	4.00	98	67-147
2-Butanone (MEK)	ND	16.4	20.0	82	50-150
Chloroform	ND	3.98	4.00	99	50-150
Carbon Tetrachloride	ND	3.64	4.00	91	50-150
1,2-Dichloroethane (EDC)	ND	3.88	4.00	97	50-150
Benzene	ND	3.82	4.00	96	69-126
Trichloroethene (TCE)	ND	4.09	4.00	102	56-137
Tetrachloroethene (PCE)	ND	4.07	4.00	102	50-150
Chlorobenzene	ND	3.66	4.00	92	68-120
1,4-Dichlorobenzene	ND	3.50	4.00	87	50-150

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: US Army Corps Of Engineers
Project: US Government Moorings
Sample Matrix: Soil

Service Request: K0907692
Date Prepared: 08/23/2009
Date Extracted: 08/24/2009
Date Analyzed: 08/24/2009

Lab Control Spike Summary
Volatile Organic Compounds

Extraction Method: EPA 1311ZHE/EPA 5030B
Analysis Method: 8260B

Units: mg/L
Basis: NA
Level: Low
Extraction Lot: KWG0907582

	Lab Control Sample KWG0907582-1 Lab Control Spike			
Analyte Name	**Result**	**Expected**	**%Rec**	**%Rec Limits**
Vinyl Chloride	2.94	4.00	74	59-135
1,1-Dichloroethene	3.31	4.00	83	70-136
2-Butanone (MEK)	16.1	20.0	81	56-137
Chloroform	3.72	4.00	93	71-118
Carbon Tetrachloride	3.09	4.00	77	58-133
1,2-Dichloroethane (EDC)	3.60	4.00	90	69-125
Benzene	3.46	4.00	86	74-118
Trichloroethene (TCE)	3.52	4.00	88	71-122
Tetrachloroethene (PCE)	3.51	4.00	88	65-121
Chlorobenzene	3.44	4.00	86	74-115
1,4-Dichlorobenzene	3.36	4.00	84	74-112

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client: US Army Corps Of Engineers
Project: US Government Moorings
Sample Matrix: Soil

Service Request: K0907692
Date Collected: 08/20/2009
Date Received: 08/20/2009

Semi-Volatile Organic Compounds by GC/MS

Sample Name: Dry Well
Lab Code: K0907692-001

Units: mg/Kg
Basis: Dry

Extraction Method: EPA 3541
Analysis Method: 8270C

Level: Low

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Naphthalene	ND	U	0.29	1	08/21/09	08/28/09	KWG0907415	
2-Methylnaphthalene	ND	U	0.29	1	08/21/09	08/28/09	KWG0907415	
Acenaphthylene	ND	U	0.29	1	08/21/09	08/28/09	KWG0907415	
Acenaphthene	ND	U	0.29	1	08/21/09	08/28/09	KWG0907415	
Dibenzofuran	ND	U	0.29	1	08/21/09	08/28/09	KWG0907415	
Fluorene	ND	U	0.29	1	08/21/09	08/28/09	KWG0907415	
Phenanthrene	ND	U	0.29	1	08/21/09	08/28/09	KWG0907415	
Anthracene	ND	U	0.29	1	08/21/09	08/28/09	KWG0907415	
Fluoranthene	ND	U	0.28	1	08/21/09	08/28/09	KWG0907415	
Pyrene	ND	U	0.28	1	08/21/09	08/28/09	KWG0907415	
Benz(a)anthracene	ND	U	0.28	1	08/21/09	08/28/09	KWG0907415	
Chrysene	ND	U	0.29	1	08/21/09	08/28/09	KWG0907415	
Benzo(b)fluoranthene	ND	U	0.28	1	08/21/09	08/28/09	KWG0907415	
Benzo(k)fluoranthene	ND	U	0.28	1	08/21/09	08/28/09	KWG0907415	
Benzo(a)pyrene	ND	U	0.28	1	08/21/09	08/28/09	KWG0907415	
Indeno(1,2,3-cd)pyrene	ND	U	0.28	1	08/21/09	08/28/09	KWG0907415	
Dibenz(a,h)anthracene	ND	U	0.28	1	08/21/09	08/28/09	KWG0907415	
Benzo(g,h,i)perylene	ND	U	0.28	1	08/21/09	08/28/09	KWG0907415	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Nitrobenzene-d5	82	29-100	08/28/09	Acceptable
2-Fluorobiphenyl	80	32-104	08/28/09	Acceptable
Terphenyl-d14	101	37-133	08/28/09	Acceptable

Comments:

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client: US Army Corps Of Engineers
Project: US Government Moorings
Sample Matrix: Soil

Service Request: K0907692
Date Collected: NA
Date Received: NA

Semi-Volatile Organic Compounds by GC/MS

Sample Name: Method Blank
Lab Code: KWG0907415-5

Units: mg/Kg
Basis: Dry

Extraction Method: EPA 3541
Analysis Method: 8270C

Level: Low

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Naphthalene	ND	U	0.34	1	08/21/09	08/28/09	KWG0907415	
2-Methylnaphthalene	ND	U	0.34	1	08/21/09	08/28/09	KWG0907415	
Acenaphthylene	ND	U	0.34	1	08/21/09	08/28/09	KWG0907415	
Acenaphthene	ND	U	0.34	1	08/21/09	08/28/09	KWG0907415	
Dibenzofuran	ND	U	0.34	1	08/21/09	08/28/09	KWG0907415	
Fluorene	ND	U	0.34	1	08/21/09	08/28/09	KWG0907415	
Phenanthrene	ND	U	0.34	1	08/21/09	08/28/09	KWG0907415	
Anthracene	ND	U	0.34	1	08/21/09	08/28/09	KWG0907415	
Fluoranthene	ND	U	0.33	1	08/21/09	08/28/09	KWG0907415	
Pyrene	ND	U	0.33	1	08/21/09	08/28/09	KWG0907415	
Benz(a)anthracene	ND	U	0.33	1	08/21/09	08/28/09	KWG0907415	
Chrysene	ND	U	0.34	1	08/21/09	08/28/09	KWG0907415	
Benzo(b)fluoranthene	ND	U	0.33	1	08/21/09	08/28/09	KWG0907415	
Benzo(k)fluoranthene	ND	U	0.33	1	08/21/09	08/28/09	KWG0907415	
Benzo(a)pyrene	ND	U	0.33	1	08/21/09	08/28/09	KWG0907415	
Indeno(1,2,3-cd)pyrene	ND	U	0.33	1	08/21/09	08/28/09	KWG0907415	
Dibenz(a,h)anthracene	ND	U	0.33	1	08/21/09	08/28/09	KWG0907415	
Benzo(g,h,i)perylene	ND	U	0.33	1	08/21/09	08/28/09	KWG0907415	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Nitrobenzene-d5	57	29-100	08/28/09	Acceptable
2-Fluorobiphenyl	63	32-104	08/28/09	Acceptable
Terphenyl-d14	84	37-133	08/28/09	Acceptable

Comments:

Columbia Analytical Services™

CHAIN OF CUSTODY

1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222x07 • FAX (360) 636-1068

SR#: K090792

PAGE 1 OF 1 COC #

PROJECT NAME: US Government Moorings
PROJECT NUMBER: N/A
PROJECT MANAGER: Josh Patton
COMPANY/ADDRESS: 8010 NW Saint Helens Road
CITY/STATE/ZIP: Portland, OR 97210
E-MAIL ADDRESS: joshua.d.patton@usace.army.mil
PHONE #: 503 808-5406 FAX #: 503 808-5416
SAMPLER'S SIGNATURE: [signature]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625☐ 8270☐ 8270LL☐	Volatile Organics 624☐ 8260☐	Hydrocarbons (*see below) Gas☐ 8021☐ BTEX☐ Diesel☐ Oil☐	☐ Fuel Fingerprint (FIQ) ☐ NW-HCID Screen	Oil & Grease/TRPH 1664 HEM☐ 1664 SGT☐	PCB's Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081A☐ 8141A☐ 8151A☐	Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐	PAHS 8310☐ SIM☐	Metals, Total or Dissolved (See list below)	Cyanide☐ Hex-Chrom☐	pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS (circle)	NH_3-N, COD, Total-P, TKN, TOC, DOC (circle) NO_2+NO_3	TOX 9020☐ AOX 1650☐ 506☐					REMARKS
Dry Well	8/20/09	1120			2																			

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. #
Bill To: Sara Robinson
Same address above
Phone: 503 808-5452

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
X 5 Day
___ Standard (10-15 working days)
___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER:_____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:
Sampling Detail emailed to Chris Leif 8/19/09. Following test shall be run: PAH's, VOC's, TCLP, and TPHDX.

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date/Time: 8/20/09 1259	Signature: [signature] Date/Time: 8/20/09 1259	Signature: Date/Time:	Signature: Date/Time:
Printed Name: Josh Patton Firm: US Army Corps of Eng.	Printed Name: John Jones Firm: CAS	Printed Name: Firm:	Printed Name: Firm:

RCOC #1 07/09

Columbia Analytical Services, Inc.
Cooler Receipt and Preservation Form

PC CL

Client / Project: USACE Service Request K09 07692

Received: 8/20/09 Opened: 8/20/09 By: 77

1. Samples were received via? *US Mail* *Fed Ex* *UPS* *DHL* *GH* *GS* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA Y N If yes, how many and where? NA
   If present, were custody seals intact? ~~Y N NA~~ If present, were they signed and dated? ~~Y N NA~~
4. Is shipper's air-bill filed? If not, record air-bill number: _____ NA Y N
5. **Temperature of cooler(s) upon receipt (°C):** 1.4
   Temperature Blank (°C): 1.5
   Thermometer ID: 258
6. If applicable, list Chain of Custody Numbers:
7. Packing material used. *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Sleeves* *Other* _____
8. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
9. **Did all bottles arrive in good condition (unbroken)?** *Indicate in the table below.* NA Y N
10. Were all sample labels complete (i.e analysis, preservation, etc.)? NA Y N
11. Did all sample labels and tags agree with custody papers? *Indicate in the table below* NA Y N
12. **Were appropriate bottles/containers and volumes received for the tests indicated?** NA Y N
13. Were the pH-preserved bottles tested* received at the appropriate pH? *Indicate in the table below* NA Y N
14. Were VOA vials received without headspace? *Indicate in the table below.* NA Y N
15. **Are CWA Microbiology samples received with >1/2 the 24hr. hold time remaining from collection?** NA Y N
16. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

RUSH

*Does not include all pH preserved sample aliquots received. See sample receiving SOP (SMO-GEN).

Additional Notes, Discrepancies, & Resolutions: _____

APPENDIX D

COST ESTIMATE

D1 – Alternative 2, 3 & 4 Cost Table Summary

US Moorings FS
RACER Cost Estimate Report

		CAPITAL COSTS							PERIODIC COSTS			ANNUAL O&M COSTS					TOTAL		
	Fiscal Year	Alt 2 - Gravel Layer	Groundwater Monitoring Well Install	Limited Metals Treatment Install (Filterra)	LUCs - Low Intensity	Sub Total Capital Cost	Remedial Design (15%)	**Total Capital Costs**	Five Year Review- Low Intensity	Periodic Gravel Replace	**Total Periodic Costs**	Monitoring - Groundwater Limited analysis	Monitoring Metals Treatment System Effluent (Filterra)	Limited Metals Treatment (Filterra)	LUC O&M	**Total Annual O&M Costs**	**Total Annual Costs**	Discount Rate @ 2.7%	**TOTAL PRESENT VALUE**
1	**2010**	$37,000	$78,415	$15,000	$354,487	$484,902	$72,735	**$557,637**				$250,495	$69,154		$23,228	**$342,877**	**$900,514**	1	**$900,514**
2	**2011**											$136,022	$40,536	$216	$23,228	**$200,002**	**$200,002**	0.974	**$194,744**
3	**2012**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.948	**$106,620**
4	**2013**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.923	**$103,817**
5	**2014**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.899	**$101,087**
6	**2015**								$27,110		**$27,110**	$48,475	$40,536	$216	$23,228	**$112,455**	**$139,565**	0.875	**$122,159**
7	**2016**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.852	**$95,842**
8	**2017**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.830	**$93,322**
9	**2018**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.808	**$90,869**
10	**2019**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.787	**$88,480**
11	**2020**								$27,110	$3,899	**$31,009**	$48,475	$40,536	$216	$23,228	**$112,455**	**$143,464**	0.766	**$109,910**
12	**2021**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.746	**$83,889**
13	**2022**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.726	**$81,683**
14	**2023**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.707	**$79,536**
15	**2024**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.689	**$77,445**
16	**2025**								$27,110		**$27,110**	$48,475	$40,536	$216	$23,228	**$112,455**	**$139,565**	0.671	**$93,588**
17	**2026**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.653	**$73,426**
18	**2027**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.636	**$71,496**
19	**2028**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.619	**$69,616**
20	**2029**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.603	**$67,786**
21	**2030**								$27,110	$3,899	**$31,009**	$48,475	$40,536	$216	$23,228	**$112,455**	**$143,464**	0.587	**$84,204**
22	**2031**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.572	**$64,269**
23	**2032**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.556	**$62,579**
24	**2033**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.542	**$60,934**
25	**2034**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.528	**$59,332**
26	**2035**								$27,110		**$27,110**	$48,475	$40,536	$216	$23,228	**$112,455**	**$139,565**	0.514	**$71,699**
27	**2036**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.500	**$56,253**
28	**2037**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.487	**$54,774**
29	**2038**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.474	**$53,334**
30	**2039**											$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.462	**$51,932**
31	**2040**								$27,110		**$27,110**						**$27,110**	0.450	**$12,190**
		$37,000	$78,415	$15,000	$354,487	$484,902	$72,735	**$557,637**	$162,661	**$7,797**	**$170,458**	$1,743,815	$1,244,707	$6,264	$696,826	$3,691,613	$4,419,708		$3,337,326

Table D1 - 1. Alternative 2 Costs

		CAPITAL COSTS							PERIODIC COSTS		ANNUAL O&M COSTS					TOTAL		
	Fiscal Year	Alt 3 - Concrete Cap	Groundwater Monitoring Well Install	Metals Treatment Install (Filterra)	LUCs - Low Intensity	Sub Total Capital Cost	Remedial Design (15%)	**Total Capital Costs**	Five Year Review- Low Intensity	**Total Periodic Costs**	Monitoring Groundwater - Limited analysis	Monitoring Metals Treatment System Effluent (Filterra)	Metals Treatment (Filterra)	LUC O&M	**Total Annual O&M Costs**	**Total Annual Costs**	Discount Rate @ 2.7%	**TOTAL PRESENT VALUE**
1	**2010**	$195,101	$78,415	$55,000	$354,487	$683,003	$102,450	**$785,453**		**0**	$250,495	$106,620		$23,228	**$380,343**	**$1,165,795**	1	**$1,165,795**
2	**2011**									**0**	$136,022	$78,002	$864	$23,228	**$238,116**	**$238,116**	0.974	**$231,856**
3	**2012**									**0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.948	**$142,756**
4	**2013**									**0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.923	**$139,003**
5	**2014**									**0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.899	**$135,348**
6	**2015**								$27,110	**$27,110**	$48,475	$78,002	$864	$23,228	**$150,569**	**$177,679**	0.875	**$155,519**
7	**2016**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.852	**$128,325**
8	**2017**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.830	**$124,951**
9	**2018**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.808	**$121,666**
10	**2019**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.787	**$118,468**
11	**2020**								$27,110	**$27,110**	$48,475	$78,002	$864	$23,228	**$150,569**	**$177,679**	0.766	**$136,123**
12	**2021**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.746	**$112,321**
13	**2022**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.726	**$109,368**
14	**2023**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.707	**$106,492**
15	**2024**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.689	**$103,693**
16	**2025**								$27,110	**$27,110**	$48,475	$78,002	$864	$23,228	**$150,569**	**$177,679**	0.671	**$119,146**
17	**2026**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.653	**$98,312**
18	**2027**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.636	**$95,727**
19	**2028**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.619	**$93,211**
20	**2029**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.603	**$90,760**
21	**2030**								$27,110	**$27,110**	$48,475	$78,002	$864	$23,228	**$150,569**	**$177,679**	0.587	**$104,286**
22	**2031**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.572	**$86,051**
23	**2032**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.556	**$83,789**
24	**2033**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.542	**$81,586**
25	**2034**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.528	**$79,441**
26	**2035**								$27,110	**$27,110**	$48,475	$78,002	$864	$23,228	**$150,569**	**$177,679**	0.514	**$91,280**
27	**2036**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.500	**$75,319**
28	**2037**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.487	**$73,339**
29	**2038**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.474	**$71,410**
30	**2039**									**$0**	$48,475	$78,002	$864	$23,228	**$150,569**	**$150,569**	0.462	**$69,533**
31	**2040**								$27,110	**$27,110**						**$27,110**	0.450	**$12,190**
		$195,101	$78,415	$55,000	$354,487	$683,003	$102,450	**$785,453**	$162,661	**$162,661**	$1,743,815	$2,368,680	$25,056	$696,826	$4,834,377	$5,782,492		**$4,357,063**

Table D1 - 2. Alternative 3 Costs

		CAPITAL COSTS							PERIODIC COSTS		ANNUAL O&M COSTS					TOTAL		
	Fiscal Year	Alt 4 Vegetative Buffer	Groundwater Monitoring Well Install	Metals Treatment Install (Filterra)	LUCs Low Intensity	Sub Total Capital Cost	Remedial Design (15%)	**Total Capital Costs**	Five Year Review -Low Intensity	**Total Periodic Costs**	Monitoring Groundwater Limited analysis	Monitoring Metals Treatment System Effluent (Filterra)	Metals Treatment (Filterra)	LUC O&M	**Total Annual O&M Costs**	**Total Annual Costs**	Discount Rate @ 2.7%	**TOTAL PRESENT VALUE**
1	**2010**	$109,960	$78,415	$15,000	$354,487	$557,862	$83,679	**$641,541**		**0**	$250,495	$69,154		$23,228	**$342,877**	**$984,418**	1	**$984,418**
2	**2011**									**0**	$136,022	$40,536	$216	$23,228	**$200,002**	**$200,002**	0.974	**$194,744**
3	**2012**									**0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.948	**$106,620**
4	**2013**									**0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.923	**$103,817**
5	**2014**									**0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.899	**$101,087**
6	**2015**								$27,110	**$27,110**	$48,475	$40,536	$216	$23,228	**$112,455**	**$139,565**	0.875	**$122,159**
7	**2016**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.852	**$95,842**
8	**2017**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.830	**$93,322**
9	**2018**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.808	**$90,869**
10	**2019**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.787	**$88,480**
11	**2020**								$27,110	**$27,110**	$48,475	$40,536	$216	$23,228	**$112,455**	**$139,565**	0.766	**$106,923**
12	**2021**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.746	**$83,889**
13	**2022**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.726	**$81,683**
14	**2023**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.707	**$79,536**
15	**2024**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.689	**$77,445**
16	**2025**								$27,110	**$27,110**	$48,475	$40,536	$216	$23,228	**$112,455**	**$139,565**	0.671	**$93,588**
17	**2026**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.653	**$73,426**
18	**2027**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.636	**$71,496**
19	**2028**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.619	**$69,616**
20	**2029**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.603	**$67,786**
21	**2030**								$27,110	**$27,110**	$48,475	$40,536	$216	$23,228	**$112,455**	**$139,565**	0.587	**$81,916**
22	**2031**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.572	**$64,269**
23	**2032**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.556	**$62,579**
24	**2033**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.542	**$60,934**
25	**2034**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.528	**$59,332**
26	**2035**								$27,110	**$27,110**	$48,475	$40,536	$216	$23,228	**$112,455**	**$139,565**	0.514	**$71,699**
27	**2036**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.500	**$56,253**
28	**2037**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.487	**$54,774**
29	**2038**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.474	**$53,334**
30	**2039**									**$0**	$48,475	$40,536	$216	$23,228	**$112,455**	**$112,455**	0.462	**$51,932**
31	**2040**								$27,110	**$27,110**						**$27,110**	0.450	**$12,190**
		$109,960	$78,415	$15,000	$354,487	$557,862	$83,679	**$641,541**	$162,661	**$162,661**	$1,743,815	$1,244,707	$6,264	$696,826	$3,691,613	$4,495,815		$3,415,955

Table D1 - 3. Alternative 4 Costs

	CAPITAL COSTS							PERIODIC COSTS			ANNUAL O&M COSTS					TOTAL	
	Alternative Construction Costs	Monitoring Well Install	Metals Treatment System (Filterra)	LUCs	Sub Total Capital Cost	Remedial Design (15%)	**Total Capital Costs**	Five Year Review	Periodic Gravel Replace	**Total Periodic Costs**	Monitoring Groundwater	Monitoring Metals Treatment System Effluent (Filterra)	Metals Treatment System (Filterra)	LUC O&M	**Total Annual O&M Costs**	**Total Annual Costs**	**TOTAL PRESENT VALUE**
Alt 2	$37,000	$78,415	$15,000	$354,487	$484,902	$72,735	**$557,637**	$162,661	$7,797	**$170,458**	$1,743,815	$1,244,707	$6,264	$696,826	**$3,691,613**	**$4,419,708**	**$3,337,326**
Alt 3	$195,101	$78,415	$55,000	$354,487	$683,003	$102,450	**$785,453**	$162,661	-	**$162,661**	$1,743,815	$2,368,680	$25,056	$696,826	**$4,834,377**	**$5,782,492**	**$4,357,063**
Alt 4	$109,960	$78,415	$15,000	$354,487	$557,862	$83,679	**$641,541**	$162,661	-	**$162,661**	$1,743,815	$1,244,707	$6,264	$696,826	**$3,691,613**	**$4,495,815**	**$3,415,955**

Table D1 - 4. Alternative Cost Summary

Alternative Description of Primary Action	**Capital Costs**	**Total Remedial Design Costs**	**Total Periodic Costs**	**Total O&M Costs**	**Total Marked-Up Costs (w/o escalation)**	**Present Value Costs**
Alternative 1	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**0**
Alternative 2	**$484,902**	**$72,735**	**$170,458**	**$3,691,613**	**$4,419,707**	**$3,337,326**
Land Use Controls	$354,487	$53,173	-	$696,826	$1,104,485	**$893,886**
Five Year Review	-	-	$162,661	-	$162,661	**$104,708**
Groundwater Monitoring	$78,415	$11,762	-	$1,743,815	$1,833,993	**$1,392,179**
Metals Treatment System Monitoring (Filterra)	-	-	-	$1,244,707	$1,244,707	**$877,173**
Metals Treatment System Install (Filterra)	$15,000	$2,250	-	$6,264	$23,514	**$21,556**
Alt 2 - Gravel Layer	$37,000	$5,550	$7,797	-	$50,347	**$47,825**
Alternative 3	**$683,003**	**$102,450**	**$162,661**	**$4,834,377**	**$5,782,492**	**$4,357,063**
Land Use Controls	$354,487	$53,173	-	$696,826	$1,104,485	**$893,886**
Five Year Review	-	-	$162,661	-	$162,661	**$104,708**
Groundwater Monitoring	$78,415	$11,762	-	$1,743,815	$1,833,993	**$1,392,179**
Metals Treatment System Monitoring (Filterra)	-	-	-	$2,368,680	$2,368,680	**$1,661,452**
Metals Treatment System Install (Filterra)	$55,000	$8,250	-	$25,056	$88,306	**$80,472**
Alt 3 - Concrete Strip	$195,101	$29,265	-	-	$224,366	**$224,366**
Alternative 4	**$557,862**	**$83,679**	**$162,661**	**$3,691,613**	**$4,495,814**	**$3,415,955**
Land Use Controls	$354,487	$53,173	-	$696,826	$1,104,485	**$893,886**
Five Year Review	-	-	$162,661	-	$162,661	**$104,708**
Groundwater Monitoring	$78,415	$11,762	-	$1,743,815	$1,833,993	**$1,392,179**
Metals Treatment System Monitoring (Filterra)	-	-	-	$1,244,707	$1,244,707	**$877,173**
Metals Treatment System Install (Filterra)	$15,000	$2,250	-	$6,264	$23,514	**$21,556**
Alt 4 - Vegetative Buffer	$109,960	$16,494	-	-	$126,454	**$126,454**

Table D1 - 5. Alternative Cost Summary Breakdown

		CAPITAL COSTS			PERIODIC COSTS		ANNUAL O&M COSTS				
	Fiscal Year	Monitoring Well Installation *	LUCs - Low Intensity*	LUCs - Medium Intensity*	5YR - Low Intensity	5YR - Medium Intensity	Monitoring Groundwater - Only metals & CN	Monitoring Groundwater - Limited Analysis	Monitoring Groundwater - Extensive Analysis	LUC O&M - Annual	LUC O&M - Biannual
1	**2010**	$90,178	$407,660	$572,756			$207,445	$250,495	$300,373	$23,228	$23,228
2	**2011**						$92,973	$136,022	$185,900	$23,228	
3	**2012**						$34,487	$48,475	$63,540	$23,228	$23,228
4	**2013**						$34,487	$48,475	$63,540	$23,228	
5	**2014**						$34,487	$48,475	$63,540	$23,228	$23,228
6	**2015**				$27,110	$43,435	$34,487	$48,475	$63,540	$23,228	
7	**2016**						$34,487	$48,475	$63,540	$23,228	$23,228
8	**2017**						$34,487	$48,475	$63,540	$23,228	
9	**2018**						$34,487	$48,475	$63,540	$23,228	$23,228
10	**2019**						$34,487	$48,475	$63,540	$23,228	
11	**2020**				$27,110	$43,435	$34,487	$48,475	$63,540	$23,228	$23,228
12	**2021**						$34,487	$48,475	$63,540	$23,228	
13	**2022**						$34,487	$48,475	$63,540	$23,228	$23,228
14	**2023**						$34,487	$48,475	$63,540	$23,228	
15	**2024**						$34,487	$48,475	$63,540	$23,228	$23,228
16	**2025**				$27,110	$43,435	$34,487	$48,475	$63,540	$23,228	
17	**2026**						$34,487	$48,475	$63,540	$23,228	$23,228
18	**2027**						$34,487	$48,475	$63,540	$23,228	
19	**2028**						$34,487	$48,475	$63,540	$23,228	$23,228
20	**2029**						$34,487	$48,475	$63,540	$23,228	
21	**2030**				$27,110	$43,435	$34,487	$48,475	$63,540	$23,228	$23,228
22	**2031**						$34,487	$48,475	$63,540	$23,228	
23	**2032**						$34,487	$48,475	$63,540	$23,228	$23,228
24	**2033**						$34,487	$48,475	$63,540	$23,228	
25	**2034**						$34,487	$48,475	$63,540	$23,228	$23,228
26	**2035**				$27,110	$43,435	$34,487	$48,475	$63,540	$23,228	
27	**2036**						$34,487	$48,475	$63,540	$23,228	$23,228
28	**2037**						$34,487	$48,475	$63,540	$23,228	
29	**2038**						$34,487	$48,475	$63,540	$23,228	$23,228
30	**2039**						$34,487	$48,475	$63,540	$23,228	
31	**2040**				$27,110	$43,435					
Total Sum		$90,178	$407,660	$572,756	$162,661	$260,612	$1,266,051	$1,743,815	$2,265,401	$696,826	$348,413
Total Present Value		$90,178	$407,660	$572,756	$104,708	$167,759	$951,828	$1,302,001	$ 1,686,077	$486,227	$246,352

* Includes 15% Cost for Remedial Design

Table D1 - 6. Sensitivity Analysis- LUCs, 5YR, Ground Water Monitoring

Present Value Costs			
	5YR	GW Monitoring	LUCs
Min	$104,708	$1,042,006	$654,011
Max	$167,759	$1,776,255	$1,058,983

Table D1 - 7. Max and Min from Sensitivity Analysis- LUCs, 5YR, Ground Water Monitoring

D2 – Alt 2 – Estimate Documentation Report

US Moorings FS

RACER Cost Estimate Report

Estimate Documentation Report

System:

RACER Version: 10.3.0
Database Location: C:\Documents and Settings\G3ECTRAR\Application Data\AECOM\RACER 10.3\FS 091210_Four Alternatives US Moorings.mdb

Folder:

Folder Name: US Moorings

Project:

Project ID: Moorings FS
Project Name: Erosion Control and Ground Water
Project Category: None

Location
State / Country: OREGON
City: PORTLAND

Location Modifier	Default	User
	1.107	1.107

Options
Database: System Costs
Cost Database Date: 2010
Report Option: Fiscal

Description Project includes uplands remedial work associted with interim groundwater and erodidble soils.

This report for official U.S. Government use only.

Estimate Documentation Report

Site Documentation:

Site ID: Moorings Uplands
Site Name: Alt2 - Gravel Layer (Fence Line & Runoff MU) 660
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: Multi-Contaminant

Phase Names

SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation

Description: This includes costs of Alternative 2 relating to construction of erosion control measures associated with the Runoff and Fence Line MUs (660 ft total). Alternative 2 consists of a gravel cover over any exposed erodible soils, and installation of necessary stormwater drainage systems. Alternative 2 assumes the non-contaminated gravel will pose an acceptable reduction of risk to the Willamette compared to the exposed contaminated erodible soils that are currently within the Runoff MU. Since new gravel has already been placed along the Fenceline MU, the only cost associated with the Fenceline MU will be infrequent placement of additional gravel on an as-needed basis to ensure that contaminated erodible soils are not exposed. costing assumes that 4" of additional gravel will be placed over the 10 ft width by 660 ft length every 10 years. Alt 2 also includes costs associated with monitor effluent of metals treatment system at 1 location, quarterly for metals, PAH and PCBs for 30 years. The Runoff MU area will be raised to equal the grade of the Fenceline MU using gravel and will require installation of a concrete curb along the bank edge to stabilize gravel placement. Alternative 2 assumes the current stormwater drainage systems within the Fenceline MU are sufficient and will only include addition of a limited french drain system within the Runoff MU (if such as system has not already been installed as part of general upkeep). Only drainage systems installed as part of the Remedial Action will include passive treatment systems for metals removal. Effluent from this new drainage system would be released as a single effluent point.

Includes costs of Fence removal within Runoff MU and costs of temporary security measures during construction.

This report for official U.S. Government use only.

Estimate Documentation Report

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Rebecca Rule
Estimator Title: Environmental Engineer
Agency/Org./Office: Seattle District USACE
Business Address: 4735 East Marginal Way South
Seattle, WA 98134
Telephone Number: 206-764-6792
Email Address: rebecca.a.rule@usace.army.mil
Estimate Prepared Date: 01/25/2010

Estimator Signature: **Date:**

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed:

Reviewer Signature: **Date:**

Estimated Costs:

Phase Names	Direct Cost	Marked-up Cost
1 - Runoff MU Fencline Removal/ Reuse / Security	$12,026	$18,021
2 - Option Runoff French Drain Passive Treatment	$8,091	$12,124
3 - Runoff MU to grade using gravel + curb	$4,574	$6,854
4 - Metals treatment monitoring	$577,845	$1,244,708
5 - Gravel O&M	$5,203	$7,797
Total Cost:	$607,739	$1,289,504

This report for official U.S. Government use only.

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 1 - Runoff MU Fencline Removal/ Reuse / Security
Description: 200 ft Fenceline runoff MU rumoval for raise to grade plus reinstall existing fence. Assume $30 / 10 ft section for materials assoicated with new fence pole and concrete for install. Also includes costs of 48 hours worth of Security personnel on site (2 days x 24 hrs = 48 hrs).

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Demolition, Fencing	Yes	100	0
Fencing	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $18,021

Technologies:

Technology Name: **Demolition, Fencing (# 1)**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Type of Fencing		Chain Link	n/a
Fence Length		200	LF
Demolition Factor		0.12	CY/LF
Include Load and Haul Costs		No	n/a
Safety Level		D	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **Fencing (# 1)**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Type of Fence		Security	n/a
Fence Length		200	LF
Safety Level		D	n/a

Comments:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.03.05	n/a
Safety Level		D	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 3 - Runoff MU to grade using gravel + curb
Description: Bring in fill: gravel areas in Runoff MU for 40 ft of bank (200 ft x 40 ft x .5 ft = 4000 ft^3 = 148 cy). Add concrete curb along edge of bank for gravel stablization (120 ft x 6" x 6", 80 ft - 12" x 8").

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $6,854

Technologies:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.20.04	n/a
Safety Level		D	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **User Defined Estimate (# 2)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.03.04	n/a
Safety Level		D	n/a

Comments:

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 2 - Option Runoff French Drain Passive Treatment
Description: FOR 1 FRENCH DRAIN IN RUNOFF AREA - stormwater infiltration control at boundary of soil gravel. Use 12" x 12" excavation hole for 230 ft (200 ft + 2 X 15 feet to incude two 15 ft exit pipes). Excavation cost is most significant. Also includes 230 ft of 6" filter sock to prevent sediment movement into pipe. COST OF PASSIVE TREATMENT NOT INCLUDED.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $12,124

Technologies:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.06.90	n/a
Safety Level		D	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **User Defined Estimate (# 2)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.05.06	n/a
Safety Level		D	n/a

Comments:

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 4 - Metals treatment monitoring
Description: Monitor effluent of metals treatment system - 1 location, quarterly for metals, PAH and PCBs.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0

Total Marked-up Cost: $1,244,708

Technologies:

Estimate Documentation Report

Technology Name: **Monitoring (# 1)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		No	n/a
Surface Soil		No	n/a
Surface Water		Yes	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Surface Water			
Required Parameters			
Average Sample Depth		0	FT
Samples per Event (First Year)		1	n/a
Samples per Event (Out Years)		1	n/a
Number of Events (First Year)		4	n/a
Number of Events (Out Years)		4	n/a
Number of Years (Out Years)		29	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Multi-Contaminant	System Water - PCBs	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Number of Samples/Day	8	1	EA
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	0	0	EA

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **Monitoring (# 1)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: 5 - Gravel O&M
Description: Add 4" gravel to outer 10 ft of river boundary as needed - every 10 yrs (660 ft x 10 ft x .33 in = 2200 ft^3 = 82 cy) in year 2020 and in yr 2030.

Start Date: April, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $7,797

Technologies:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.03.12	n/a
Safety Level		D	n/a

Comments:

Estimate Documentation Report

Technology Name: **User Defined Estimate (# 2)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.03.12	n/a
Safety Level		D	n/a

Comments:

D3 – Alt 3 – Estimate Documentation Report

US Moorings FS

RACER Cost Estimate Report

Estimate Documentation Report

System:

RACER Version: 10.3.0
Database Location: C:\Documents and Settings\G3ECTRAR\Application Data\AECOM\RACER 10.3\FS 091210_Four Alternatives US Moorings.mdb

Folder:

Folder Name: US Moorings

Project:

Project ID: Moorings FS
Project Name: Erosion Control and Ground Water
Project Category: None

Location
State / Country: OREGON
City: PORTLAND

Location Modifier	Default	User
	1.107	1.107

Options
Database: System Costs
Cost Database Date: 2010
Report Option: Fiscal

Description Project includes uplands remedial work associated with interim groundwater and erodible soils.

This report for official U.S. Government use only.

Estimate Documentation Report

Site Documentation:

Site ID: Moorings Uplands
Site Name: Alt3 - Concrete Strip (Fence Line & Runoff MU) 660
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: Multi-Contaminant

Phase Names

SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation

Description: This includes costs of Alternative 3 relating to construction of erosion control measures associated with the Runoff and Fence Line MUs (660 ft total). Alternative 3 will include construction of a twelve foot wide concrete strip along the Fence Line and Runoff MU. Prior to construction of this concrete strip, the Runoff MU will be brought to grade using gravel. Two separate drainage systems will be included in the design. The first drainage system will collect clean runoff from the top of the concrete strip and will directly discharge to the river at three locations. The second drainage system will collect groundwater at the landward edge of the concrete strip. This system will discharge at four locations following passive metals treatment located at each of the four french drain exit points.
The twelve foot wide concrete strip will include: i. five feet of cover on the exterior of the fence so that ALL erodible soils near the bank are protected from erosion, and ii. seven feet of cover on the interior of the fence so that general upkeep will prevent the buildup of erodible soils that could reach the river. Current french drain systems will remain if practical, may be moved if necessary or will be completely removed as needed. Alt 3 also includes costs associated with monitor effluent of metals treatment system at 4 locations, quarterly for metals, PAH and PCBs for 30 years.

Costs associated with fence removal and replacement have been included in addition to temporary security personnel for 7 days (168 hours) during construction activities.

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.

This report for official U.S. Government use only.

Estimate Documentation Report

References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Rebecca Rule
Estimator Title: Environmental Engineer
Agency/Org./Office: Seattle District USACE
Business Address: 4735 East Marginal Way South
Seattle, WA 98134
Telephone Number: 206-764-6792
Email Address: rebecca.a.rule@usace.army.mil
Estimate Prepared Date: 01/25/2010

Estimator Signature: **Date:**

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed:

Reviewer Signature: **Date:**

Estimated Costs:

Phase Names	Direct Cost	Marked-up Cost
1 - Fence line Removal / Reinstall / Security	$22,285	$33,394
2 - French Drain Passive Treatment - 660 ft	$14,543	$21,793
3 - Runoff MU to grade using gravel + curb	$6,066	$9,090
4 - Temp Erosion Control	$2,130	$3,192
6 - Metals treatment monitoring	$1,075,190	$2,368,680
5 - 4" Concrete Strip and drainage	$85,174	$127,633
Total Cost:	$1,205,388	$2,563,782

This report for official U.S. Government use only.

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 1 - Fence line Removal / Reinstall / Security
Description: 660 ft Fence Line Removal (460 ft fence line MU, 200 ft sediment MU), plus reinstall existing fence. Assume $30 / 10 ft section for materials associated with new fence pole and concrete for install. Also includes costs of 660 ft a week worth of Security personnel on site (7 days x 24 hrs = 168 hrs). Costs associated with temporary security personnel have been included for 7 days (168 hours) during construction activities.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Demolition, Fencing	Yes	100	0
Fencing	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $33,394

Technologies:

Technology Name: **Demolition, Fencing (# 1)**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Type of Fencing		Chain Link	n/a
Fence Length		600	LF
Demolition Factor		0.12	CY/LF
Include Load and Haul Costs		No	n/a
Safety Level		D	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **Fencing (# 1)**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Type of Fence		Security	n/a
Fence Length		600	LF
Safety Level		D	n/a

Comments:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.03.05	n/a
Safety Level		D	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 4 - Temp Erosion Control
Description: Using 3' silt fence over 660 ft.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $3,192

Technologies:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.03.91	n/a
Safety Level		D	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 2 - French Drain Passive Treatment - 660 ft
Description: FOR 1 FRENCH DRAIN IN RUNOFF AREA - stormwater infiltration control at boundary of concrete strip. Use french drain installation based on 12" x 12" excavation hole for 320 ft (260 ft + 4 X 40 feet to include four forty ft 6" pvc pipes from french drain systems to catch basin, passive treatment system and exit to river). Excavation cost is most significant. Also includes 260 ft of 6" filter sock to prevent sediment movement into pipe and 10 cy of gravel for backfill over french drain system. COST OF PASSIVE TREATMENT NOT INCLUDED.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $21,793

Technologies:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.06.90	n/a
Safety Level		D	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **User Defined Estimate (# 2)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.05.06	n/a
Safety Level		D	n/a

Comments:

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 3 - Runoff MU to grade using gravel + curb
Description: Bring in fill: gravel areas in Runoff MU for 40 ft of bank (200 ft x 40 ft x .5 ft = 4000 ft^3 = 148 cy).
Add concrete curb along entire edge of bank for gravel stabilization and edge of concrete strip (580 ft x 6" x 6", 80 ft - 12" x 8").

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $9,090

Technologies:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.20.04	n/a
Safety Level		D	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **User Defined Estimate (# 2)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.03.04	n/a
Safety Level		D	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 6 - Metals treatment monitoring
Description: Monitor effluent of metals treatment system - 4 location, quarterly for metals, PAH and PCBs.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0

Total Marked-up Cost: $2,368,680

Technologies:

Estimate Documentation Report

Technology Name: **Monitoring (# 1)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		No	n/a
Surface Soil		No	n/a
Surface Water		Yes	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Surface Water			
Required Parameters			
Average Sample Depth		0	FT
Samples per Event (First Year)		4	n/a
Samples per Event (Out Years)		4	n/a
Number of Events (First Year)		4	n/a
Number of Events (Out Years)		4	n/a
Number of Years (Out Years)		29	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Multi-Contaminant	System Water - PCBs	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Number of Samples/Day	8	1	EA
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	0	0	EA

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **Monitoring (# 1)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 5 - 4" Concrete Strip and drainage
Description: Construct 12 ft strip of concrete along Fence Line and Runoff MU. Based on 4" thick sidewalk with metal mesh element, for 660 ft of bank (660 ft x 12 ft = 7,920 ft^2). Includes 800 ft of 6" concrete storm sewer pipe with 3 collection /drains for clean runoff from concrete area.

Start Date: April, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
Storm Sewer	Yes	100	0

Total Marked-up Cost: $127,633

Technologies:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.03.04	n/a
Safety Level		D	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Estimate Documentation Report

Technology Name: **Storm Sewer (# 1)**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Pipe Material		Concrete	n/a
Pipe Size		15 - 61 cm (6 - 24 IN)	n/a
Length of Run		800	LF
Include Load and Haul Costs		Yes	n/a
Safety Level		D	n/a
Pipe & Options			
Secondary Parameters			
Pipe Size/Type	18" Reinforced Class 3	6" Non-Reinforced	n/a
Soil Type	Silt/Silty-Clay Mixture	Gravel/Gravel Sand Mixture	n/a
Moisture Content	Dry	Dry	n/a
Seal Slab	No	Yes	n/a
Trench Box	No	No	n/a
Inlets	Yes	Yes	n/a
Dewatering Pump	No	No	n/a
Wellpoints	No	No	n/a
Trenching & Backfill			
Secondary Parameters			
Average Pipe Depth	5	1	FT
Trench Depth	2.04	n/a	FT
Vertical Trench Height	2.04	2.041667	FT
Overdig	1	1	FT
Backfill	Normal	Normal	n/a
Load & Haul			
Secondary Parameters			
Truck Type		Highway	n/a
Volume		128.5345	CY
One-way Haul Distance		5	MI
Dump Charge		15	$/CY

Comments:

This report for official U.S. Government use only.

D4 – Alt 4 – Estimate Documentation Report

US Moorings FS

RACER Cost Estimate Report

Estimate Documentation Report

System:

RACER Version: 10.3.0
Database Location: C:\Documents and Settings\G3ECTRAR\Application Data\AECOM\RACER 10.3\FS 091210_Four Alternatives US Moorings.mdb

Folder:

Folder Name: US Moorings

Project:

Project ID: Moorings FS
Project Name: Erosion Control and Ground Water
Project Category: None

Location
State / Country: OREGON
City: PORTLAND

Location Modifier	Default	User
	1.107	1.107

Options
Database: System Costs
Cost Database Date: 2010
Report Option: Fiscal

Description Project includes uplands remedial work associated with interim groundwater and erodible soils.

This report for official U.S. Government use only.

Estimate Documentation Report

Site Documentation:

Site ID: Moorings Uplands
Site Name: Alt4 - Veg Buffer (Fence Line & Runoff MU) 660 ft
Site Type: None

Media/Waste Type
Primary: Soil
Secondary: N/A

Contaminant
Primary: Metals
Secondary: Multi-Contaminant

Phase Names
SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation
Description: This includes costs of Alternative 3 relating to construction of erosion control measures associated with the Runoff and Fence Line MUs (660 ft total). Construction related activities include removal and disposal of top 6" of contaminated soil, optional installation of french drain system and passive metals treatment system only within Runoff MU, replacement of topsoil within 10 ft length along bank and gravel in locations in Runoff MU beyond 10 ft, removal and reinstallation of fence, 1 wk with of Security Watchman for temporary fence (168 hrs), erosion prevention plants (willows), seeding of 10 ft vegetative buffer, and installation of 3 ft temporary silt fence along bank.
This Alternative will include a ten foot wide vegetative buffer along the Fence Line and Runoff MU. Six inches of soil will be removed and transported to an appropriately permitted disposal facility. Six inches of topsoil will be placed and a vegetative cover that consists of Portland Greenway approved non-invasive, native species shorter than 8" for security purposes will be planted. Temporary erosion control measures will be used to prevent soil loss to the river while the vegetative buffer stabilizes. Prior to vegetative buffer installation, the Runoff MU area will be raised to equal the grade of the Fence Line MU using gravel / topsoil and will require installation of a 6" wide concrete curb along the bank edge to stabilize gravel / topsoil placement. Alternative 4 assumes the current stormwater drainage systems within the Fence Line MU are sufficient and will only include addition of a limited french drain system within the Runoff MU (if such as system has not already been installed as part of general upkeep). Only a drainage systems installed as part of the Remedial Action will include passive treatment systems for metals removal. Effluent from this new drainage system would be released as a single effluent point. Alt 4 also includes costs associated with monitor effluent of metals treatment system at 1 location, quarterly for

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Estimate Documentation Report

	with monitor effluent of metals treatment system at 1 location, quarterly for metals, PAH and PCBs for 30 years.
Support Team:	Documentation of personnel used to provide support for estimator and preparation of the estimate.
References:	Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name:	Rebecca Rule
Estimator Title:	Environmental Engineer
Agency/Org./Office:	Seattle District USACE
Business Address:	4735 East Marginal Way South Seattle, WA 98134
Telephone Number:	206-764-6792
Email Address:	rebecca.a.rule@usace.army.mil
Estimate Prepared Date:	01/25/2010

Estimator Signature: **Date:**

Reviewer Information

Reviewer Name:	
Reviewer Title:	
Agency/Org./Office:	
Business Address:	
Telephone Number:	
Email Address:	
Date Reviewed:	

Reviewer Signature: **Date:**

Estimated Costs:

Phase Names	Direct Cost	Marked-up Cost
1 – Fence line Removal / Reinstall / Security	$22,285	$33,394
2 - Contaminated Soil Excavation (6in)	$30,531	$36,957
3 - Option Runoff French Drain Passive Treatment	$8,091	$12,124
4 - Add 6" topsoil/ gravel	$6,684	$10,015
5 - Eco stabilization - trees(30), willows(40)	$4,328	$6,486
6 - Runoff MU curb install	$1,338	$2,005
7 - Temp Erosion Control	$2,130	$3,192
8 - Vegetative Buffer (32 shrubs), seeding	$3,863	$5,789
9 - Metals treatment monitoring	$577,845	$1,244,708
Total Cost:	$657,094	$1,354,668

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Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 1 - Fencline Removal / Reinsall / Security
Description: 660 ft Fenceline Remvoal (460 ft fence line MU, 200 ft sediment MU), plus reinstall existing fence. Assume $30 / 10 ft section for materials assoicated with new fence pole and concrete for install. Also includes costs of 660 ft a week worth of Security personnel on site (7 days x 24 hrs = 168 hrs). (Will likely be able to keep current pole location within Fence Line area, so reinstall cost overestimated).

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Demolition, Fencing	Yes	100	0
Fencing	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $33,394

Technologies:

Technology Name: **Demolition, Fencing (# 1)**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Type of Fencing		Chain Link	n/a
Fence Length		600	LF
Demolition Factor		0.12	CY/LF
Include Load and Haul Costs		No	n/a
Safety Level		D	n/a

Comments:

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Estimate Documentation Report

Technology Name: **Fencing (# 1)**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Type of Fence		Security	n/a
Fence Length		600	LF
Safety Level		D	n/a

Comments:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.03.05	n/a
Safety Level		D	n/a

Comments:

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 2 - Contaminated Soil Excavation (6in)
Description: Removal of 3000 ft3 soil runoff (((200 x 30 ft) x 6 in) and Disposal Removal of 3300 soil for 10 ft buffer (((660 x 10 ft x 6 in) and Disposal This becomes 233 yds3, assumed non-hazardous, solid to be trucked 100 miles (was $30,531), for 15 miles ($28,442), is non-hazardous landfill material cost).

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Off-site Transportation and Waste Disposal	Yes	100	0

Total Marked-up Cost: $36,957

Technologies:

Technology Name: Off-site Transportation and Waste Disposal (# 1)

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Waste Type		Non-Hazardous	n/a
Waste Form		Solid	n/a
Condition of Waste		Bulk to remain as bulk	n/a
Volume of Bulk Solid Waste		233	CY
Stabilization		Not Required	n/a
Transportation Type		Truck	n/a
Truck Distance (One-way)		100	MI
Safety Level		D	n/a

Comments:

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Estimate Documentation Report

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 4 - Add 6" topsoil/ gravel
Description: Bring in fill: topsoil in 10 ft buffer near bank for 660 ft (660 ft x 10 ft x 0.5 ft = 3300 ft^3 = 122 cy), gravel areas in Sediment MU beyond 10 ft from bank (200 ft x 30 ft x .5 ft = 111 ft^3 = 111cy).

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $10,015

Technologies:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.20.04	n/a
Safety Level		D	n/a

Comments:

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Estimate Documentation Report

Technology Name: **User Defined Estimate (# 2)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.20.01	n/a
Safety Level		D	n/a

Comments: 111 yds 3 of topsoil for 10 feet buffer along fence line and runoff MU

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Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 8 - Vegetative Buffer (32 shrubs), seeding
Description: Add vegetative buffer along 10ft Fence Line and Runoff MU. Includes grass and shrubs based on surface area calculation : Includes 32 local shrubs and seeding of area

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $5,789

Technologies:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.20.04	n/a
Safety Level		D	n/a

Comments: Includes 32 local shrubs and seeding of area

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Estimate Documentation Report

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 5 - Eco stabilization - trees(30), willows(40)
Description: Put in trees and willow to stabilize soil along bank: 40 willows and 30 trees at current cost. Security requirements may limit stabilizing plant height to 8".

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $6,486

Technologies:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.05.13	n/a
Safety Level		D	n/a

Comments:

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Estimate Documentation Report

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 7 - Temp Erosion Control
Description: Using 3' silt fence over 660 ft.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $3,192

Technologies:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.03.91	n/a
Safety Level		D	n/a

Comments:

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Estimate Documentation Report

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 3 - Option Runoff French Drain Passive Treatment
Description: FOR 1 FRENCH DRAIN IN RUNOFF AREA - stormwater infiltration control at boundary of soil gravel. Use 12" x 12" excavation hole for 230 ft (200 ft + 2 X 15 feet to include two 15 ft exit pipes). Excavation cost is most significant . Also includes 230 ft of 6" filter sock to prevent sediment movement into pipe. COST OF PASSIVE TREATMENT NOT INCLUDED.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $12,124

Technologies:

Technology Name: **User Defined Estimate (# 1)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.06.90	n/a
Safety Level		D	n/a

Comments:

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Estimate Documentation Report

Technology Name: **User Defined Estimate (# 2)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.05.06	n/a
Safety Level		D	n/a

Comments:

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 6 - Runoff MU curb install
Description: For Runoff MU area - Add concrete curb along edge of bank for gravel stabilization (120 ft x 6" x 6", 80 ft - 12" x 8").

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0

Total Marked-up Cost: $2,005

Technologies:

Technology Name: **User Defined Estimate (# 2)**
User Name: **USER DEFINED ESTIMATE**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		USER DEFINED ESTIMATE	n/a
WBS Type		HTRW	n/a
Selected WBS		331.03.04	n/a
Safety Level		D	n/a

Comments:

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Estimate Documentation Report

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: 9 - Metals treatment monitoring
Description: Monitor effluent of metals treatment system - 1 location, quarterly for metals, PAH and PCBs.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0

Total Marked-up Cost: $1,244,708

Technologies:

Estimate Documentation Report

Technology Name: **Monitoring (# 1)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		No	n/a
Surface Soil		No	n/a
Surface Water		Yes	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Surface Water			
Required Parameters			
Average Sample Depth		0	FT
Samples per Event (First Year)		1	n/a
Samples per Event (Out Years)		1	n/a
Number of Events (First Year)		4	n/a
Number of Events (Out Years)		4	n/a
Number of Years (Out Years)		29	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Multi-Contaminant	System Water - PCBs	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Number of Samples/Day	8	1	EA
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	0	0	EA

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Estimate Documentation Report

Technology Name: **Monitoring (# 1)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

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D5 – GW 5YR LUCs – Estimate Documentation Report

US Moorings FS
RACER Cost Estimate Report

Estimate Documentation Report

System:

RACER Version: 10.3.0
Database Location: C:\Documents and Settings\G3ECTRAR\Application Data\AECOM\RACER 10.3\FS 091210_Four Alternatives US Moorings.mdb

Folder:

Folder Name: US Moorings

Project:

Project ID: Moorings FS
Project Name: Erosion Control and Ground Water
Project Category: None

Location
State / Country: OREGON
City: PORTLAND

Location Modifier	Default	User
	1.107	1.107

Options
Database: System Costs
Cost Database Date: 2010
Report Option: Fiscal

Description Project includes uplands remedial work associated with interim groundwater and erodible soils.

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Estimate Documentation Report

Site Documentation:

Site ID: Moorings Uplands
Site Name: Other Alt 2, 3 and 4 Costs
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: Multi-Contaminant

Phase Names

SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation

Description: This includes all other large costs for Alternative 2, 3 and 4 besides costs of construction for erosion control such as: Groundwater Monitoring of 6 well locations over 30 years, Land Use Control implementation to prevent groundwater exposure on site over 30 years, and Five Year Reviews for the duration of 30 years.
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Rebecca Rule
Estimator Title: Environmental Engineer
Agency/Org./Office: Seattle District USACE
Business Address: 4735 East Marginal Way South
Seattle, WA 98134
Telephone Number: 206-764-6792
Email Address: rebecca.a.rule@usace.army.mil
Estimate Prepared Date: 01/25/2010

Estimator Signature: **Date:**

Reviewer Information

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Estimate Documentation Report

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed:

Reviewer Signature: **Date:**

Estimated Costs:

Phase Names		Direct Cost	Marked-up Cost
I - Monitor Groundwater - 30 yr Extensive analysis		$1,500,326	$2,265,401
I - Monitor Groundwater - 30 yr Limited analysis		$1,065,236	$1,743,815
I - Monitor Groundwater - 30 yr Only metals & CN		$666,700	$1,266,051
II - Monitoring Well Install 8 wells)		$48,336	$78,415
III - LUCs - Low Intensity		$132,838	$354,487
III - LUCs - Medium Intensity - SENSITIVITY		$187,132	$498,049
IV - 5YR - Low Intensity		$58,486	$162,661
IV - 5YR - Medium Intensity - SENSITIVITY		$93,704	$260,612
V - LUC O&M - Annual		$261,804	$696,826
V - LUC O&M - Biannual		$21,051	$56,029
V - LUC O&M -Semiannual		$583,617	$1,558,673
	Total Cost:	$4,619,229	$8,941,019

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Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: II - Monitoring Well Install 8 wells)
Description: Install 8 monitoring wells total: 4 at 30 ft depth, 4 at 90 ft depth.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Groundwater Monitoring Well	Yes	100	0
Groundwater Monitoring Well	Yes	100	0

Total Marked-up Cost: $78,415

Technologies:

Estimate Documentation Report

Technology Name: **Groundwater Monitoring Well (# 1)**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Number of Aquifers		One	n/a
Include Guard Posts		No	n/a
Depth to Groundwater to Aquifer One		15	FT
Number of Wells to Aquifer One		4	EA
Safety Level		D	n/a
Aquifer One			
Required Parameters			
Aquifer One: Average Well Depth		30	LF
Aquifer One: Formation Type		Unconsolidated	n/a
Aquifer One: Drilling Method		Hollow Stem	n/a
Aquifer One: Well Diameter		2 Inch	n/a
Aquifer One: Well Construction Material		PVC Schedule 40	n/a
Aquifer One: Split Spoon Sample Collection		No	n/a
Aquifer One: Average Number of Soil Samples per Well		0	EA
Aquifer One: Soil Analytical Template		None	n/a
Aquifer One: Safety Level		D	n/a

Comments:

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Estimate Documentation Report

Technology Name: **Groundwater Monitoring Well (# 2)**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Number of Aquifers		One	n/a
Include Guard Posts		No	n/a
Depth to Groundwater to Aquifer One		15	FT
Number of Wells to Aquifer One		4	EA
Safety Level		D	n/a
Aquifer One			
Required Parameters			
Aquifer One: Average Well Depth		90	LF
Aquifer One: Formation Type		Unconsolidated	n/a
Aquifer One: Drilling Method		Hollow Stem	n/a
Aquifer One: Well Diameter		2 Inch	n/a
Aquifer One: Well Construction Material		PVC Schedule 40	n/a
Aquifer One: Split Spoon Sample Collection		No	n/a
Aquifer One: Average Number of Soil Samples per Well		0	EA
Aquifer One: Soil Analytical Template		None	n/a
Aquifer One: Safety Level		D	n/a

Comments:

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Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: I - Monitor Groundwater - 30 yr Only metals & CN
Description: Potential required groundwater monitoring associated with interim solution for year 30, based on 8 wells. Doesn't include install costs of well. I ncludes groundwater metals, cyanide analytes only. D irect costs $666,700.
Based on quarterly monitoring for years 1 - 5 (8 wells total - 4 @ 90 ft, 4 @ 30 ft), and B ased on annual m onitoring f or years 6 - 30 (8 wells total - 4 @ 90 ft, 4 @ 30 ft)
1 MONITORING input : 30 ft depth x 4 wells, quarterly, 1 yr (2 total)
2 MONITORING input : 90 ft depth x 4 wells, quarterly, 1 yr (2 total)
3 MONITORING input : 30 ft depth x 4 wells, annually, 27 yr (28 total)
4 MONITORING input : 90 ft depth x 4 wells, annually, 27 yr (28 total)

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0

Total Marked-up Cost: $1,266,051

Technologies:

Estimate Documentation Report

Technology Name: **Monitoring (# 1)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		Yes	n/a
Surface Soil		No	n/a
Surface Water		No	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Groundwater			
Required Parameters			
Average Sample Depth		30	FT
Samples per Event (First Year)		4	n/a
Samples per Event (Out Years)		4	n/a
Number of Events (First Year)		4	n/a
Number of Events (Out Years)		4	n/a
Number of Years (Out Years)		1	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Fuels	System Water - Multi-Contaminant	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Existing Wells - Low Flow Pump	Existing Wells - Low Flow Pump	n/a
Number of Wells/Day	8	4	EA
Contain Purge Water	Yes	Yes	n/a
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA

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Estimate Documentation Report

Technology Name: **Monitoring (# 1)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	1	1	EA
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

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Technology Name: **Monitoring (# 2)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		Yes	n/a
Surface Soil		No	n/a
Surface Water		No	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Groundwater			
Required Parameters			
Average Sample Depth		90	FT
Samples per Event (First Year)		4	n/a
Samples per Event (Out Years)		4	n/a
Number of Events (First Year)		4	n/a
Number of Events (Out Years)		4	n/a
Number of Years (Out Years)		1	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Multi-Contaminant	System Water - Multi-Contaminant	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Existing Wells - Low Flow Pump	Existing Wells - Low Flow Pump	n/a
Number of Wells/Day	6	4	EA
Contain Purge Water	Yes	Yes	n/a
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA

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Estimate Documentation Report

Technology Name: **Monitoring (# 2)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	1	1	EA
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **Monitoring (# 3)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		Yes	n/a
Surface Soil		No	n/a
Surface Water		No	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Groundwater			
Required Parameters			
Average Sample Depth		30	FT
Samples per Event (First Year)		4	n/a
Samples per Event (Out Years)		4	n/a
Number of Events (First Year)		1	n/a
Number of Events (Out Years)		1	n/a
Number of Years (Out Years)		27	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Multi-Contaminant	System Water - Multi-Contaminant	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Existing Wells - Low Flow Pump	Existing Wells - Low Flow Pump	n/a
Number of Wells/Day	8	4	EA
Contain Purge Water	Yes	Yes	n/a
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA

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Estimate Documentation Report

Technology Name: **Monitoring (# 3)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	1	1	EA
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

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Estimate Documentation Report

Technology Name: **Monitoring (# 4)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		Yes	n/a
Surface Soil		No	n/a
Surface Water		No	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Groundwater			
Required Parameters			
Average Sample Depth		90	FT
Samples per Event (First Year)		4	n/a
Samples per Event (Out Years)		4	n/a
Number of Events (First Year)		1	n/a
Number of Events (Out Years)		1	n/a
Number of Years (Out Years)		27	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Multi-Contaminant	System Water - Multi-Contaminant	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Existing Wells - Low Flow Pump	Existing Wells - Low Flow Pump	n/a
Number of Wells/Day	6	4	EA
Contain Purge Water	Yes	Yes	n/a
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA

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Estimate Documentation Report

Technology Name: **Monitoring (# 4)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	1	1	EA
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

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Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: III - LUCs - Medium Intensity - SENSITIVITY
Description: These costs are associated with Land Use Control implementation to prevent future contact with groundwater. Costs include Planning and Implementation activities. Planning activities include: LUC Assurance Plan, LUC Implementation Plan and Installation Master Plan. Implementation activities include: Modification of Master Plan, Access Control Signs, Utility Notification Services, and GIS/Overlay Maps based on a low complexity active government installation.
Direct Cost based on medium intensity is $187,132

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Total Marked-up Cost: $498,049

Technologies:

Estimate Documentation Report

Technology Name: **Administrative Land Use Controls (# 1)**
User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Rename Model		ADMINISTRATIVE LAND USE CONTROLS	n/a
Planning Documents		Yes	n/a
Planning Documents: Start Date		2010	n/a
Implementation		Yes	n/a
Implementation: Start Date		2011	n/a
Monitoring & Enforcement		No	n/a
Modification/Termination		No	n/a
Type of Site		Active Government Installation	n/a
Planning Documents			
Required Parameters			
LUC Assurance Plan (LUCAP)		Yes	n/a
LUC Assurance Plan (LUCAP): Plan Complexity		Medium	n/a
LUC Implementation Plan (LUCIP)		Yes	n/a
LUC Implementation Plan (LUCIP): Number		1	EA
LUC Implementation Plan (LUCIP): Plan Complexity		Medium	n/a
Long-term Stewardship (LTS) Plan		No	n/a
Memorandum of Agreements (MOA)		No	n/a
Installation (or City) Master Plan		Yes	n/a
Installation (or City) Master Plan: Plan Complexity		Medium	n/a
Construction Permitting		No	n/a
Geographic Information Systems (GIS)/Overlay Maps		No	n/a
Planning Meetings			
Required Parameters			
LUCAP: Number of Meetings		2	EA
LUCAP: Number of People		2	EA
LUCAP: Number of Days		1	EA
LUCAP: Airfare Cost		0	$
LUCAP: Mileage to Meeting Site		0	MI
LUCIP: Number of Meetings		2	EA
LUCIP: Number of People		2	EA

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Estimate Documentation Report

Technology Name: **Administrative Land Use Controls (# 1)**
User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	*Default*	*Value*	*UOM*
Planning Meetings			
Required Parameters			
LUCIP: Number of Days		1	EA
LUCIP: Airfare Cost		0	$
LUCIP: Mileage to Meeting Site		0	MI
Master Plan: Number of Meetings		2	EA
Master Plan: Number of People		2	EA
Master Plan: Number of Days		1	EA
Master Plan: Airfare Cost		0	$
Master Plan: Mileage to Meeting Site		0	MI
Implementation			
Required Parameters			
Modify Installation (or City) Master Plan		Yes	n/a
Modify Installation (or City) Master Plan: Task Complexity		Medium	n/a
Deed Notification		No	n/a
Negotiating Easements		No	n/a
Restrictive Covenants		No	n/a
Equitable Servitudes		No	n/a
Access Control Signs		Yes	n/a
Access Control Signs: Number		1	EA
Access Control Signs: Task Complexity		Medium	n/a
Utility Notification Service		Yes	n/a
Access Control Signs: Number		1	EA
Access Control Signs: Task Complexity		Medium	n/a
Geographic Information Systems (GIS)/Overlay Maps		Yes	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		1	EA
Geographic Information Systems (GIS)/Overlay Maps: Task Complexity		Medium	n/a
Develop Finding of Suitability to Transfer (FOST)		No	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: I - Monitor Groundwater - 30 yr Extensive analysis
Description: Potential required groundwater monitoring associated with interim solution for year 30, based on 8 wells. Doesn't include install costs of well. Includes general groundwater analysis, metals, cyanide, and other common environmental analytes. Direct cost is $1,500,326.
Based on quarterly monitoring for years 1 - 5 (8 wells total - 4 @ 90 ft, 4 @ 30 ft), and B ased on annual m onitoring f or years 6 - 30 (8 wells total - 4 @ 90 ft, 4 @ 30 ft)
1 MONITORING input : 30 ft depth x 4 wells, quarterly, 1 yr (2 total)
2 MONITORING input : 90 ft depth x 4 wells, quarterly, 1 yr (2 total)
3 MONITORING input : 30 ft depth x 4 wells, annually, 27 yr (28 total)
4 MONITORING input : 90 ft depth x 4 wells, annually, 27 yr (28 total)

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0

Total Marked-up Cost: $2,265,401

Technologies:

Estimate Documentation Report

Technology Name: **Monitoring (# 1)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		Yes	n/a
Surface Soil		No	n/a
Surface Water		No	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Groundwater			
Required Parameters			
Average Sample Depth		30	FT
Samples per Event (First Year)		4	n/a
Samples per Event (Out Years)		4	n/a
Number of Events (First Year)		4	n/a
Number of Events (Out Years)		4	n/a
Number of Years (Out Years)		1	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Fuels	System Water - Multi-Contaminant	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Existing Wells - Low Flow Pump	Existing Wells - Low Flow Pump	n/a
Number of Wells/Day	8	4	EA
Contain Purge Water	Yes	Yes	n/a
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA

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Estimate Documentation Report

Technology Name: **Monitoring (# 1)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	1	1	EA
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

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Estimate Documentation Report

Technology Name: **Monitoring (# 2)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		Yes	n/a
Surface Soil		No	n/a
Surface Water		No	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Groundwater			
Required Parameters			
Average Sample Depth		90	FT
Samples per Event (First Year)		4	n/a
Samples per Event (Out Years)		4	n/a
Number of Events (First Year)		4	n/a
Number of Events (Out Years)		4	n/a
Number of Years (Out Years)		1	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Multi-Contaminant	System Water - Multi-Contaminant	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Existing Wells - Low Flow Pump	Existing Wells - Low Flow Pump	n/a
Number of Wells/Day	6	4	EA
Contain Purge Water	Yes	Yes	n/a
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA

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Estimate Documentation Report

Technology Name: **Monitoring (# 2)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	1	1	EA
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

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Estimate Documentation Report

Technology Name: **Monitoring (# 3)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		Yes	n/a
Surface Soil		No	n/a
Surface Water		No	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Groundwater			
Required Parameters			
Average Sample Depth		30	FT
Samples per Event (First Year)		4	n/a
Samples per Event (Out Years)		4	n/a
Number of Events (First Year)		1	n/a
Number of Events (Out Years)		1	n/a
Number of Years (Out Years)		27	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Multi-Contaminant	System Water - Multi-Contaminant	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Existing Wells - Low Flow Pump	Existing Wells - Low Flow Pump	n/a
Number of Wells/Day	8	4	EA
Contain Purge Water	Yes	Yes	n/a
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA

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Estimate Documentation Report

Technology Name: **Monitoring (# 3)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	1	1	EA
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

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Estimate Documentation Report

Technology Name: **Monitoring (# 4)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		Yes	n/a
Surface Soil		No	n/a
Surface Water		No	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Groundwater			
Required Parameters			
Average Sample Depth		90	FT
Samples per Event (First Year)		4	n/a
Samples per Event (Out Years)		4	n/a
Number of Events (First Year)		1	n/a
Number of Events (Out Years)		1	n/a
Number of Years (Out Years)		27	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Multi-Contaminant	System Water - Multi-Contaminant	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Existing Wells - Low Flow Pump	Existing Wells - Low Flow Pump	n/a
Number of Wells/Day	6	4	EA
Contain Purge Water	Yes	Yes	n/a
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA

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Estimate Documentation Report

Technology Name: **Monitoring (# 4)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	1	1	EA
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

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Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: III - LUCs - Low Intensity
Description: These costs are associated with Land Use Control implementation to prevent future contact with groundwater. Costs include Planning and Implementation activities. Planning activities include: LUC Assurance Plan, LUC Implementation Plan and Installation Master Plan. Implementation activities include: Modification of Master Plan, Access Control Signs, Utility Notification Services, and GIS/Overlay Maps based on a low complexity active government installation.
Direct Cost based on low intensity is $132.838

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Total Marked-up Cost: $354,487

Technologies:

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Estimate Documentation Report

Technology Name: **Administrative Land Use Controls (# 1)**
User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Rename Model		ADMINISTRATIVE LAND USE CONTROLS	n/a
Planning Documents		Yes	n/a
Planning Documents: Start Date		2010	n/a
Implementation		Yes	n/a
Implementation: Start Date		2011	n/a
Monitoring & Enforcement		No	n/a
Modification/Termination		No	n/a
Type of Site		Active Government Installation	n/a
Planning Documents			
Required Parameters			
LUC Assurance Plan (LUCAP)		Yes	n/a
LUC Assurance Plan (LUCAP): Plan Complexity		Low	n/a
LUC Implementation Plan (LUCIP)		Yes	n/a
LUC Implementation Plan (LUCIP): Number		1	EA
LUC Implementation Plan (LUCIP): Plan Complexity		Low	n/a
Long-term Stewardship (LTS) Plan		No	n/a
Memorandum of Agreements (MOA)		No	n/a
Installation (or City) Master Plan		Yes	n/a
Installation (or City) Master Plan: Plan Complexity		Low	n/a
Construction Permitting		No	n/a
Geographic Information Systems (GIS)/Overlay Maps		No	n/a
Planning Meetings			
Required Parameters			
LUCAP: Number of Meetings		1	EA
LUCAP: Number of People		1	EA
LUCAP: Number of Days		1	EA
LUCAP: Airfare Cost		0	$
LUCAP: Mileage to Meeting Site		0	MI
LUCIP: Number of Meetings		1	EA
LUCIP: Number of People		1	EA

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Estimate Documentation Report

Technology Name: **Administrative Land Use Controls (# 1)**
User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	*Default*	*Value*	*UOM*
Planning Meetings			
Required Parameters			
LUCIP: Number of Days		1	EA
LUCIP: Airfare Cost		0	$
LUCIP: Mileage to Meeting Site		0	MI
Master Plan: Number of Meetings		1	EA
Master Plan: Number of People		1	EA
Master Plan: Number of Days		1	EA
Master Plan: Airfare Cost		0	$
Master Plan: Mileage to Meeting Site		0	MI
Implementation			
Required Parameters			
Modify Installation (or City) Master Plan		Yes	n/a
Modify Installation (or City) Master Plan: Task Complexity		Low	n/a
Deed Notification		No	n/a
Negotiating Easements		No	n/a
Restrictive Covenants		No	n/a
Equitable Servitudes		No	n/a
Access Control Signs		Yes	n/a
Access Control Signs: Number		1	EA
Access Control Signs: Task Complexity		Low	n/a
Utility Notification Service		Yes	n/a
Access Control Signs: Number		1	EA
Access Control Signs: Task Complexity		Low	n/a
Geographic Information Systems (GIS)/Overlay Maps		Yes	n/a
Geographic Information Systems (GIS)/Overlay Maps: Number		1	EA
Geographic Information Systems (GIS)/Overlay Maps: Task Complexity		Low	n/a
Develop Finding of Suitability to Transfer (FOST)		No	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Phase Documentation:

Phase Type: Study
Phase Name: I - Monitor Groundwater - 30 yr Limited analysis
Description: Potential required groundwater monitoring associated with interim solution for year 30, based on 8 wells. Doesn't include install costs of well. I ncludes groundwater metals, cyanide analytes mainly. R eomves some common environmental analytes (pesticides/PCBs, chlorinated phenoxy herbicides, purgeable halocarbons). Direct cost is $1,065,236. Based on quarterly monitoring for years 1 - 5 (8 wells total - 4 @ 90 ft, 4 @ 30 ft), and B ased on annual m onitoring f or years 6 - 30 (8 wells total - 4 @ 90 ft, 4 @ 30 ft)
1 MONITORING input : 30 ft depth x 4 wells, quarterly, 1 yr (2 total)
2 MONITORING input : 90 ft depth x 4 wells, quarterly, 1 yr (2 total)
3 MONITORING input : 30 ft depth x 4 wells, annually, 27 yr (28 total)
4 MONITORING input : 90 ft depth x 4 wells, annually, 27 yr (28 total)

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0

Total Marked-up Cost: $1,743,815

Technologies:

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Estimate Documentation Report

Technology Name: **Monitoring (# 1)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		Yes	n/a
Surface Soil		No	n/a
Surface Water		No	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Groundwater			
Required Parameters			
Average Sample Depth		30	FT
Samples per Event (First Year)		4	n/a
Samples per Event (Out Years)		4	n/a
Number of Events (First Year)		4	n/a
Number of Events (Out Years)		4	n/a
Number of Years (Out Years)		1	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Fuels	System Water - Multi-Contaminant	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Existing Wells - Low Flow Pump	Existing Wells - Low Flow Pump	n/a
Number of Wells/Day	8	4	EA
Contain Purge Water	Yes	Yes	n/a
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **Monitoring (# 1)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	1	1	EA
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **Monitoring (# 2)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		Yes	n/a
Surface Soil		No	n/a
Surface Water		No	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Groundwater			
Required Parameters			
Average Sample Depth		90	FT
Samples per Event (First Year)		4	n/a
Samples per Event (Out Years)		4	n/a
Number of Events (First Year)		4	n/a
Number of Events (Out Years)		4	n/a
Number of Years (Out Years)		1	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Multi-Contaminant	System Water - Multi-Contaminant	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Existing Wells - Low Flow Pump	Existing Wells - Low Flow Pump	n/a
Number of Wells/Day	6	4	EA
Contain Purge Water	Yes	Yes	n/a
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **Monitoring (# 2)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	1	1	EA
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **Monitoring (# 3)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		Yes	n/a
Surface Soil		No	n/a
Surface Water		No	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Groundwater			
Required Parameters			
Average Sample Depth		30	FT
Samples per Event (First Year)		4	n/a
Samples per Event (Out Years)		4	n/a
Number of Events (First Year)		1	n/a
Number of Events (Out Years)		1	n/a
Number of Years (Out Years)		27	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Multi-Contaminant	System Water - Multi-Contaminant	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Existing Wells - Low Flow Pump	Existing Wells - Low Flow Pump	n/a
Number of Wells/Day	8	4	EA
Contain Purge Water	Yes	Yes	n/a
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **Monitoring (# 3)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	1	1	EA
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **Monitoring (# 4)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Model Name		MONITORING	n/a
Groundwater		Yes	n/a
Surface Soil		No	n/a
Surface Water		No	n/a
Subsurface Soil		No	n/a
Sediment		No	n/a
Soil Gas		No	n/a
Air		No	n/a
Site Distance (One-way)		0	MI
Safety Level		D	n/a
Groundwater			
Required Parameters			
Average Sample Depth		90	FT
Samples per Event (First Year)		4	n/a
Samples per Event (Out Years)		4	n/a
Number of Events (First Year)		1	n/a
Number of Events (Out Years)		1	n/a
Number of Years (Out Years)		27	n/a
Secondary Parameters			
Primary Analytical Template	System Water - Metals	System Water - Metals	n/a
Secondary Analytical Template	System Water - Multi-Contaminant	System Water - Multi-Contaminant	n/a
Turnaround Time	Standard (21 Days)	Standard (21 Days)	n/a
Data Package/QC	Stage 1	Stage 1	n/a
Sampling Method	Existing Wells - Low Flow Pump	Existing Wells - Low Flow Pump	n/a
Number of Wells/Day	6	4	EA
Contain Purge Water	Yes	Yes	n/a
QA/QC			
Secondary Parameters			
Split Samples	1: 10	1: 10	EA
Field Duplicate Samples	1: 10	1: 10	EA

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **Monitoring (# 4)**
User Name: **MONITORING**

Description	*Default*	*Value*	*UOM*
QA/QC			
Secondary Parameters			
Rinse Blanks (per Round)	1	1	EA
Trip Blanks (per Day)	1	1	EA
Matrix Spikes/Matrix Spike Duplicates	1: 20	1: 20	EA
Data Management			
Secondary Parameters			
Monitoring Plan	Standard	Standard	n/a
Lab Data Review	Stage 1	Stage 1	n/a
Submit Data Electronically	Yes	Yes	n/a
Monitoring Reports	Abbreviated	Abbreviated	n/a

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: IV - 5YR - Low Intensity
Description: This includes the costs of US Moorings Five Year Reviews. Assumed activities include Document Review, Interviews, Site Inspection, and Reports. Direct costs associated with 30 years (6 reviews) totals $58,486. These numbers assume a low complexity site. BASED ON LOW INTENSITY SITE

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Five-Year Review	Yes	100	0

Total Marked-up Cost: $162,661

Technologies:

Estimate Documentation Report

Technology Name: **Five-Year Review (# 1)**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Site Complexity		Low	n/a
Document Review		Yes	n/a
Interviews		Yes	n/a
Site Inspection		Yes	n/a
Report		Yes	n/a
Travel		No	n/a
Rebound Study		No	n/a
Start Date		January-2015	n/a
No. Reviews		6	EA
Document Review			
Required Parameters			
5-Year Review Check List		Yes	n/a
Record of Decision		Yes	n/a
Remedial Action Design & Construction		Yes	n/a
Close-Out Report		Yes	n/a
Operations & Maintenance Manuals & Reports		Yes	n/a
Consent Decree or Settlement Records		Yes	n/a
Groundwater Monitoring & Reports		Yes	n/a
Remedial Action Required		Yes	n/a
Previous 5-Year Review Reports		Yes	n/a
Interviews			
Required Parameters			
Current and Previous Staff Management		Yes	n/a
Community Groups		Yes	n/a
State Contacts		Yes	n/a
Local Government Contacts		Yes	n/a
Operations & Maintenance Contractors		Yes	n/a
PRPs		Yes	n/a
Remedial Design Consultant		Yes	n/a
Site Inspection			
Required Parameters			

This report for official U.S. Government use only.

Estimate Documentation Report

Technology Name: **Five-Year Review (# 1)**

Description	*Default*	*Value*	*UOM*
Site Inspection			
Required Parameters			
General Site Inspection		Yes	n/a
Containment System Inspection		Yes	n/a
Monitoring Systems Inspection		Yes	n/a
Treatment Systems Inspection		Yes	n/a
Regulatory Compliance		Yes	n/a
Site Visit Documentation (Photos, Diagrams, etc.)		Yes	n/a
Report			
Required Parameters			
Introduction		Yes	n/a
Remedial Objectives		Yes	n/a
ARARs Review		Yes	n/a
Summary of Site Visit		Yes	n/a
Areas of Non Compliance		Yes	n/a
Technology Recommendations		Yes	n/a
Statement of Protectiveness		Yes	n/a
Next Review		Yes	n/a
Implementation Requirements		Yes	n/a

Comments:

Estimate Documentation Report

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: IV - 5YR - Medium Intensity - SENSITIVITY
Description: This includes the costs of US Moorings Five Year Reviews. Assumed activities include Document Review, Interviews, Site Inspection, and Reports. Direct costs associated with 30 years (6 reviews) totals $58,486. These numbers assume a low complexity site. BASED ON MEDIUM COMPLEXITY SITE

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Five-Year Review	Yes	100	0

Total Marked-up Cost: $260,612

Technologies:

Estimate Documentation Report

Technology Name: **Five-Year Review (# 1)**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Site Complexity		Moderate	n/a
Document Review		Yes	n/a
Interviews		Yes	n/a
Site Inspection		Yes	n/a
Report		Yes	n/a
Travel		No	n/a
Rebound Study		No	n/a
Start Date		January-2015	n/a
No. Reviews		6	EA
Document Review			
Required Parameters			
5-Year Review Check List		Yes	n/a
Record of Decision		Yes	n/a
Remedial Action Design & Construction		Yes	n/a
Close-Out Report		Yes	n/a
Operations & Maintenance Manuals & Reports		Yes	n/a
Consent Decree or Settlement Records		Yes	n/a
Groundwater Monitoring & Reports		Yes	n/a
Remedial Action Required		Yes	n/a
Previous 5-Year Review Reports		Yes	n/a
Interviews			
Required Parameters			
Current and Previous Staff Management		Yes	n/a
Community Groups		Yes	n/a
State Contacts		Yes	n/a
Local Government Contacts		Yes	n/a
Operations & Maintenance Contractors		Yes	n/a
PRPs		Yes	n/a
Remedial Design Consultant		Yes	n/a
Site Inspection			
Required Parameters			

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Estimate Documentation Report

Technology Name: **Five-Year Review (# 1)**

Description	*Default*	*Value*	*UOM*
Site Inspection			
Required Parameters			
General Site Inspection		Yes	n/a
Containment System Inspection		Yes	n/a
Monitoring Systems Inspection		Yes	n/a
Treatment Systems Inspection		Yes	n/a
Regulatory Compliance		Yes	n/a
Site Visit Documentation (Photos, Diagrams, etc.)		Yes	n/a
Report			
Required Parameters			
Introduction		Yes	n/a
Remedial Objectives		Yes	n/a
ARARs Review		Yes	n/a
Summary of Site Visit		Yes	n/a
Areas of Non Compliance		Yes	n/a
Technology Recommendations		Yes	n/a
Statement of Protectiveness		Yes	n/a
Next Review		Yes	n/a
Implementation Requirements		Yes	n/a

Comments:

Estimate Documentation Report

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: V - LUC O&M -Semiannual
Description: Costs associated with 30 years of LUC O&M. This includes low intensity monitoring and enforcement activities associated with an active government installation. Activities include production of annual i. notice letters, ii. reports/certificates and site visits/inspections for yearly cost of $8727.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Total Marked-up Cost: $1,558,673

Technologies:

Estimate Documentation Report

Technology Name: **Administrative Land Use Controls (# 1)**
User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Rename Model		ADMINISTRATIVE LAND USE CONTROLS	n/a
Planning Documents		No	n/a
Implementation		No	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2010	n/a
Modification/Termination		No	n/a
Type of Site		Active Government Installation	n/a
Monitoring & Enforcement			
Required Parameters			
Duration of Monitoring/Enforcement		30	Years
Notice Letters		Yes	n/a
Notice Letters: Number		2	EA
Notice Letters: Frequency		Semi-Annually	n/a
Guard Service/Security		No	n/a
Reports & Certifications		Yes	n/a
Reports & Certifications: Frequency		Semi-Annually	n/a
Site Visits/Inspections		Yes	n/a
Site Visits/Inspections: Number		1	EA
Site Visits/Inspections: Safety Level		D	n/a
Site Visits/Inspections: Duration		1	Days
Site Visits/Inspections: Number of People		1	EA
Site Visits/Inspections: Frequency		Semi-Annually	n/a
Site Visits/Inspections: Airfare		0	$ Per Ticket
Site Visits/Inspections: Mileage		0	MI

Comments:

This report for official U.S. Government use only.

Estimate Documentation Report

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: V - LUC O&M - Biannual
Description: Costs associated with 30 years of LUC O&M. This includes low intensity monitoring and enforcement activities associated with an active government installation. Activities include production of Biannual i. notice letters, ii. reports/certificates and site visits/inspections for yearly cost of $8727.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Total Marked-up Cost: $56,029

Technologies:

Estimate Documentation Report

Technology Name: **Administrative Land Use Controls (# 1)**
User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Rename Model		ADMINISTRATIVE LAND USE CONTROLS	n/a
Planning Documents		No	n/a
Implementation		No	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2013	n/a
Modification/Termination		No	n/a
Type of Site		Active Government Installation	n/a
Monitoring & Enforcement			
Required Parameters			
Duration of Monitoring/Enforcement		30	Years
Notice Letters		Yes	n/a
Notice Letters: Number		2	EA
Notice Letters: Frequency		Biennially	n/a
Guard Service/Security		No	n/a
Reports & Certifications		Yes	n/a
Reports & Certifications: Frequency		Biennially	n/a
Site Visits/Inspections		Yes	n/a
Site Visits/Inspections: Number		1	EA
Site Visits/Inspections: Safety Level		D	n/a
Site Visits/Inspections: Duration		1	Days
Site Visits/Inspections: Number of People		1	EA
Site Visits/Inspections: Frequency		Biennially	n/a
Site Visits/Inspections: Airfare		0	$ Per Ticket
Site Visits/Inspections: Mileage		0	MI

Comments:

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Estimate Documentation Report

Phase Documentation:

Phase Type: Operations & Maintenance
Phase Name: V - LUC O&M - Annual
Description: Costs associated with 30 years of LUC O&M. This includes low intensity monitoring and enforcement activities associated with an active government installation. Activities include production of annual i. notice letters, ii. reports/certificates and site visits/inspections for yearly cost of $8727.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Total Marked-up Cost: $696,826

Technologies:

Estimate Documentation Report

Technology Name: **Administrative Land Use Controls (# 1)**
User Name: **ADMINISTRATIVE LAND USE CONTROLS**

Description	*Default*	*Value*	*UOM*
System Definition			
Required Parameters			
Rename Model		ADMINISTRATIVE LAND USE CONTROLS	n/a
Planning Documents		No	n/a
Implementation		No	n/a
Monitoring & Enforcement		Yes	n/a
Monitoring & Enforcement: Start Date		2010	n/a
Modification/Termination		No	n/a
Type of Site		Active Government Installation	n/a
Monitoring & Enforcement			
Required Parameters			
Duration of Monitoring/Enforcement		30	Years
Notice Letters		Yes	n/a
Notice Letters: Number		2	EA
Notice Letters: Frequency		Annually	n/a
Guard Service/Security		No	n/a
Reports & Certifications		Yes	n/a
Reports & Certifications: Frequency		Annually	n/a
Site Visits/Inspections		Yes	n/a
Site Visits/Inspections: Number		1	EA
Site Visits/Inspections: Safety Level		D	n/a
Site Visits/Inspections: Duration		1	Days
Site Visits/Inspections: Number of People		1	EA
Site Visits/Inspections: Frequency		Annually	n/a
Site Visits/Inspections: Airfare		0	$ Per Ticket
Site Visits/Inspections: Mileage		0	MI

Comments:

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D6 – Project Cost Detail Report

US Moorings FS

RACER Cost Estimate Report

Project Cost Detail Report (with Markups)

System:

RACER Version: 10.3.0
Database Location: C:\Documents and Settings\G3ECTRAR\Application Data\AECOM\RACER 10.3\FS 091210_Four Alternatives US Moorings.mdb

Folder:

Folder Name: US Moorings

Project:

Project ID: Moorings FS
Project Name: Erosion Control and Ground Water
Project Category: None

Location
State / Country: OREGON
City: PORTLAND

Location Modifier	Default	User
	1.107	1.107

Options
Database: System Costs
Cost Database Date: 2010
Report Option: Fiscal

Description Project includes uplands remedial work associated with interim groundwater

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Project Cost Detail Report (with Markups)

Description Project includes uplands remedial work associated with interim groundwater and erodible soils.

Project Cost Detail Report (with Markups)

Site:

Site ID: Moorings Uplands
Site Name: Other Alt 2, 3 and 4 Costs
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: Multi-Contaminant

Phase Names

SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation

Description: This includes all other large costs for Alternative 2, 3 and 4 besides costs of construction for erosion control such as: Groundwater Monitoring of 6 well locations over 30 years, Land Use Control implementation to prevent groundwater exposure on site over 30 years, and Five Year Reviews for the duration of 30 years.
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

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Project Cost Detail Report
(with Markups)

Estimator Information

Estimator Name: Rebecca Rule
Estimator Title: Environmental Engineer
Agency/Org./Office: Seattle District USACE
Business Address: 4735 East Marginal Way South
Seattle, WA 98134
Telephone Number: 206-764-6792
Email Address: rebecca.a.rule@usace.army.mil
Estimate Prepared Date: 01/25/2010

Estimator Signature: **Date:**

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed:

Reviewer Signature: **Date:**

Project Cost Detail Report (with Markups)

Phase (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
I - Monitor Groundwater - 30 yr Extensive analysis	$1,500,326							$765,075	$2,265,401
(System Defaults)		$0	$0	$389,398	$151,178	$0	$224,499		
I - Monitor Groundwater - 30 yr Limited analysis	$1,065,236							$678,579	$1,743,815
(System Defaults)		$0	$0	$389,398	$116,371	$0	$172,811		
I - Monitor Groundwater - 30 yr Only metals & CN	$666,700							$599,351	$1,266,051
(System Defaults)		$0	$0	$389,398	$84,488	$0	$125,465		
II - Monitoring Well Install 8 wells)	$48,336							$30,079	$78,415
(System Defaults)		$0	$0	$17,075	$5,233	$0	$7,771		
III - LUCs - Low Intensity	$132,838							$221,649	$354,487
(System Defaults)		$0	$0	$162,945	$23,623	$0	$35,080		
III - LUCs - Medium Intensity - SENSITIVITY	$187,132							$310,917	$498,049
(System Defaults)		$0	$0	$228,653	$33,104	$0	$49,160		
IV - 5YR - Low Intensity	$58,486							$104,175	$162,661
(System Defaults)		$0	$0	$77,201	$10,855	$0	$16,120		
IV - 5YR - Medium Intensity - SENSITIVITY	$93,704							$166,908	$260,612
(System Defaults)		$0	$0	$123,690	$17,392	$0	$25,826		
V - LUC O&M - Annual	$261,804							$435,022	$696,826
(System Defaults)		$0	$0	$321,107	$45,841	$0	$68,074		
V - LUC O&M - Biannual	$21,051							$34,978	$56,029

Project Cost Detail Report (with Markups)

Phase (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
(System Defaults)		$0	$0	$25,819	$3,686	$0	$5,474		
V - LUC O&M -Semiannual	$583,617							$975,056	$1,558,673
(System Defaults)		$0	$0	$719,861	$102,694	$0	$152,501		
Total Site Cost	$4,619,229	$0	$0	$2,844,546	$594,464	$0	$882,780	$4,321,790	$8,941,019

Project Cost Detail Report
(with Markups)

Site:

Site ID: Moorings Uplands
Site Name: Alt2 - Gravel Layer (Fence Line & Runoff MU) 660
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: Multi-Contaminant

Phase Names

SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation

Project Cost Detail Report (with Markups)

Description: This includes costs of Alternative 2 relating to construction of erosion control measures associated with the Runoff and Fence Line MUs (660 ft total). Alternative 2 consists of a gravel cover over any exposed erodible soils, and installation of necessary stormwater drainage systems. Alternative 2 assumes the non-contaminated gravel will pose an acceptable reduction of risk to the Willamette compared to the exposed contaminated erodible soils that are currently within the Runoff MU. Since new gravel has already been placed along the Fence Line MU, the only cost associated with the Fence Line MU will be infrequent placement of additional gravel on an as-needed basis to ensure that contaminated erodible soils are not exposed. Costing assumes that 4" of additional gravel will be placed over the 10 ft width by 660 ft length every 10 years. Alt 2 also includes costs associated with monitor effluent of metals treatment system at 1 location, quarterly for metals, PAH and PCBs for 30 years. The Runoff MU area will be raised to equal the grade of the Fence Line MU using gravel and will require installation of a concrete curb along the bank edge to stabilize gravel placement. Alternative 2 assumes the current stormwater drainage systems within the Fence Line MU are sufficient and will only include addition of a limited french drain system within the Runoff MU (if such as system has not already been installed as part of general upkeep). Only drainage systems installed as part of the Remedial Action will include passive treatment systems for metals removal. Effluent from this new drainage system would be released as a single effluent point.

Includes costs of Fence removal within Runoff MU and costs of temporary security measures during construction.

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.

References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Rebecca Rule
Estimator Title: Environmental Engineer
Agency/Org./Office: Seattle District USACE
Business Address: 4735 East Marginal Way South
Seattle, WA 98134
Telephone Number: 206-764-6792
Email Address: rebecca.a.rule@usace.army.mil
Estimate Prepared Date: 01/25/2010

Project Cost Detail Report
(with Markups)

Estimator Signature: **Date:**

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed:

Reviewer Signature: **Date:**

Project Cost Detail Report (with Markups)

Phase (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
1 - Runoff MU fence line Removal/ Reuse / Security	$12,026							$5,995	$18,021
(System Defaults)		$0	$0	$3,007	$1,203	$0	$1,786		
2 - Option Runoff French Drain Passive Treatment	$8,091							$4,033	$12,124
(System Defaults)		$0	$0	$2,023	$809	$0	$1,201		
3 - Runoff MU to grade using gravel + curb	$4,574							$2,280	$6,854
(System Defaults)		$0	$0	$1,143	$457	$0	$679		
4 - Metals treatment monitoring	$577,845							$666,863	$1,244,708
(System Defaults)		$0	$0	$460,450	$83,064	$0	$123,349		
5 - Gravel O&M	$5,203							$2,594	$7,797
(System Defaults)		$0	$0	$1,301	$520	$0	$773		
Total Site Cost	$607,739	$0	$0	$467,923	$86,053	$0	$127,789	$681,765	$1,289,504

Project Cost Detail Report
(with Markups)

Site:

Site ID: Moorings Uplands
Site Name: Alt4 - Veg Buffer (Fence Line & Runoff MU) 660 ft
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: Multi-Contaminant

Phase Names

SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation

Project Cost Detail Report (with Markups)

Description: This includes costs of Alternative 3 relating to construction of erosion control measures associated with the Runoff and Fence Line MUs (660 ft total). Construction related activities include removal and disposal of top 6" of contaminated soil, optional installation of french drain system and passive metals treatment system only within Runoff MU, replacement of topsoil within 10 ft length along bank and gravel in locations in Runoff MU beyond 10 ft, removal and reinstallation of fence, 1 wk with of Security Watchman for temporary fence (168 hrs), erosion prevention plants (willows), seeding of 10 ft vegetative buffer, and installation of 3 ft temporary silt fence along bank.
This Alternative will include a ten foot wide vegetative buffer along the FenceLine and Runoff MU. Six inches of soil will be removed and transported to an appropriately permitted disposal facility. Six inches of topsoil will be placed and a vegetative cover that consists of Portland Greenway approved non-invasive, native species shorter than 8" for security purposes will be planted. Temporary erosion control measures will be used to prevent soil loss to the river while the vegetative buffer stabilizes. Prior to vegetative buffer installation, the Runoff MU area will be raised to equal the grade of the Fence Line MU using gravel / topsoil and will require installation of a 6" wide concrete curb along the bank edge to stabilize gravel / topsoil placement. Alternative 4 assumes the current stormwater drainage systems within the Fence Line MU are sufficient and will only include addition of a limited french drain system within the Runoff MU (if such as system has not already been installed as part of general upkeep). Only a drainage systems installed as part of the Remedial Action will include passive treatment systems for metals removal. Effluent from this new drainage system would be released as a single effluent point. Alt 4 also includes costs associated with monitor effluent of metals treatment system at 1 location, quarterly for metals, PAH and PCBs for 30 years.

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.

References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Rebecca Rule
Estimator Title: Environmental Engineer
Agency/Org./Office: Seattle District USACE
Business Address: 4735 East Marginal Way South
Seattle, WA 98134
Telephone Number: 206-764-6792

Project Cost Detail Report
(with Markups)

Email Address: rebecca.a.rule@usace.army.mil
Estimate Prepared Date: 01/25/2010

Estimator Signature: **Date:**

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed:

Reviewer Signature: **Date:**

Project Cost Detail Report (with Markups)

Phase (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
1 - Fencline Removal / Reinsall / Security	$22,285							$11,109	$33,394
(System Defaults)		$0	$0	$5,571	$2,228	$0	$3,309		
2 - Contaminated Soil Excavation (6in)	$30,531							$6,426	$36,957
(System Defaults)		$0	$0	$297	$2,466	$0	$3,662		
3 - Option Runoff French Drain Passive Treatment	$8,091							$4,033	$12,124
(System Defaults)		$0	$0	$2,023	$809	$0	$1,201		
4 - Add 6" topsoil/ gravel	$6,684							$3,331	$10,015
(System Defaults)		$0	$0	$1,670	$668	$0	$992		
5 - Eco stabilization - trees(30), willows(40)	$4,328							$2,158	$6,486
(System Defaults)		$0	$0	$1,082	$433	$0	$643		
6 - Runoff MU curb install	$1,338							$667	$2,005
(System Defaults)		$0	$0	$334	$134	$0	$199		
7 - Temp Erosion Control	$2,130							$1,062	$3,192
(System Defaults)		$0	$0	$532	$213	$0	$316		
8 - Vegetative Buffer (32 shrubs), seeding	$3,863							$1,926	$5,789
(System Defaults)		$0	$0	$966	$386	$0	$574		
9 - Metals treatment monitoring	$577,845							$666,863	$1,244,708
(System Defaults)		$0	$0	$460,450	$83,064	$0	$123,349		

Project Cost Detail Report (with Markups)

Phase (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
Total Site Cost	$657,094	$0	$0	$472,925	$90,402	$0	$134,246	$697,574	$1,354,668

Project Cost Detail Report
(with Markups)

Site:

Site ID: Moorings Uplands
Site Name: Alt3 - Concrete Strip (Fence Line & Runoff MU) 660
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: Multi-Contaminant

Phase Names

SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation

Project Cost Detail Report (with Markups)

Description: This includes costs of Alternative 3 relating to construction of erosion control measures associated with the Runoff and Fence Line MUs (660 ft total). Alternative 3 will include construction of a twelve foot wide concrete strip along the Fence Line and Runoff MU. Prior to construction of this concrete strip, the Runoff MU will be brought to grade using gravel. Two separate drainage systems will be included in the design. The first drainage system will collect clean runoff from the top of the concrete strip and will directly discharge to the river at three locations. The second drainage system will collect groundwater at the landward edge of the concrete strip. This system will discharge at four locations following passive metals treatment located at each of the four french drain exit points.
The twelve foot wide concrete strip will include: i. five feet of cover on the exterior of the fence so that ALL erodible soils near the bank are protected from erosion, and ii. seven feet of cover on the interior of the fence so that general upkeep will prevent the buildup of erodible soils that could reach the river. Current french drain systems will remain if practical, may be moved if necessary or will be completely removed as needed. Alt 3 also includes costs associated with monitor effluent of metals treatment system at 4 locations, quarterly for metals, PAH and PCBs for 30 years.

Costs associated with fence removal and replacement have been included in addtion to temporary security personnel for 7 days (168 hours) during construction activities.

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.

References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Rebecca Rule
Estimator Title: Environmental Engineer
Agency/Org./Office: Seattle District USACE
Business Address: 4735 East Marginal Way South
Seattle, WA 98134
Telephone Number: 206-764-6792
Email Address: rebecca.a.rule@usace.army.mil
Estimate Prepared Date: 01/25/2010

Estimator Signature: **Date:**

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Project Cost Detail Report
(with Markups)

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed:

Reviewer Signature: **Date:**

Project Cost Detail Report (with Markups)

Phase (Markup Template)	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit	Contingency	Owner Cost	Markup Total	Total
1 – Fence line Removal / Reinstall / Security	$22,285							$11,109	$33,394
(System Defaults)		$0	$0	$5,571	$2,228	$0	$3,309		
2 - French Drain Passive Treatment - 660 ft	$14,543							$7,250	$21,793
(System Defaults)		$0	$0	$3,636	$1,454	$0	$2,160		
3 - Runoff MU to grade using gravel + curb	$6,066							$3,024	$9,090
(System Defaults)		$0	$0	$1,516	$607	$0	$901		
4 - Temp Erosion Control	$2,130							$1,062	$3,192
(System Defaults)		$0	$0	$532	$213	$0	$316		
5 - 4" Concrete Strip and drainage	$85,174							$42,459	$127,633
(System Defaults)		$0	$0	$21,294	$8,517	$0	$12,648		
6 - Metals treatment monitoring	$1,075,190							$1,293,490	$2,368,680
(System Defaults)		$0	$0	$900,686	$158,070	$0	$234,734		
Total Site Cost	$1,205,388	$0	$0	$933,235	$171,090	$0	$254,068	$1,358,394	$2,563,782

	Direct Cost	Markups	Total
Total Project Cost	$7,089,451	$7,059,521	$14,148,972

D7 – Project WBS – ECES Report

US Moorings FS

RACER Cost Estimate Report

Project WBS - ECES Report (with Markups)

System:

RACER Version: 10.3.0
Database Location: C:\Documents and Settings\G3ECTRAR\Application Data\AECOM\RACER 10.3\FS 091210_Four Alternatives US Moorings.mdb

Folder:

Folder Name: US Moorings

Project:

Project ID: Moorings FS
Project Name: Erosion Control and Ground Water
Project Category: None

Location
State / Country: OREGON
City: PORTLAND

Location Modifier	Default	User
	1.107	1.107

Options
Database: System Costs
Cost Database Date: 2010
Report Option: Fiscal

Description Project includes uplands remedial work associated with interim groundwater and erodible soils.

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Project WBS - ECES Report (with Markups)

Site:

Site ID: Moorings Uplands
Site Name: Alt2 - Gravel Layer (Fence Line & Runoff MU) 660
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: Multi-Contaminant

Phase Names

SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation

Description: This includes costs of Alternative 2 relating to construction of erosion control measures associated with the Runoff and Fence Line MUs (660 ft total). Alternative 2 consists of a gravel cover over any exposed erodible soils, and installation of necessary stormwater drainage systems. Alternative 2 assumes the non-contaminated gravel will pose an acceptable reduction of risk to the Willamette compared to the exposed contaminated erodible soils that are currently within the Runoff MU. Since new gravel has already been placed along the Fence Line MU, the only cost associated with the Fence Line MU will be infrequent placement of additional gravel on an as-needed basis to ensure that contaminated erodible soils are not exposed. costing assumes that 4" of additional gravel will be placed over the 10 ft width by 660 ft length every 10 years. Alt 2 also includes costs associated with monitor effluent of metals treatment system at 1 location, quarterly for metals, PAH and PCBs for 30 years. The Runoff MU area will be raised to equal the grade of the Fence Line MU using gravel and will require installation of a concrete curb along the bank edge to stabilize gravel placement. Alternative 2 assumes the current stormwater drainage systems within the Fence Line MU are sufficient and will only include addition of a limited french drain system within the Runoff MU (if such as system has not already been installed as part of general upkeep). O nly drainage systems installed as part of the Remedial Action will include passive treatment systems for metals removal. Effluent from this new drainage system would be released as a single effluent point.

Includes costs of Fence removal within Runoff MU and costs of temporary security measures during construction.

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Project WBS - ECES Report (with Markups)

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Rebecca Rule
Estimator Title: Environmental Engineer
Agency/Org./Office: Seattle District USACE
Business Address: 4735 East Marginal Way South
Seattle, WA 98134
Telephone Number: 206-764-6792
Email Address: rebecca.a.rule@usace.army.mil
Estimate Prepared Date: 01/25/2010

Estimator Signature: **Date:**

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed:

Reviewer Signature: **Date:**

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Study
Phase Name: 1 - Runoff MU Fence line Removal/ Reuse / Security
Description: 200 ft Fence line runoff MU removal for raise to grade plus reinstall existing fence. Assume $30 / 10 ft section for materials associated with new fence pole and concrete for install. Also includes costs of 48 hours worth of Security personnel on site (2 days x 24 hrs = 48 hrs).

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Demolition, Fencing	Yes	100	0
Fencing	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.05	SITE WORK		
4.05.04	Dismantling and Demolition (Non-Hazardous)	Demolition, Fencing	$796
4.05.14	Fencing	Fencing	$15,189
			$15,985
		Subtotal:	$15,985

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Study
Phase Name: 4 - Metals treatment monitoring
Description: Monitor effluent of metals treatment system - 1 location, quarterly for metals, PAH and PCBs.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.07	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION		
4.07.00	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$1,244,708
			$1,244,708
		Subtotal:	$1,244,708

Project WBS - ECES Report (with Markups)

Site:

Site ID: Moorings Uplands
Site Name: Alt3 - Concrete Strip (Fence Line & Runoff MU) 660
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: Multi-Contaminant

Phase Names

SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation

Description: This includes costs of Alternative 3 relating to construction of erosion control measures associated with the Runoff and Fence Line MUs (660 ft total). Alternative 3 will include construction of a twelve foot wide concrete strip along the Fence line and Runoff MU. Prior to construction of this concrete strip, the Runoff MU will be brought to grade using gravel. Two separate drainage systems will be included in the design. The first drainage system will collect clean runoff from the top of the concrete strip and will directly discharge to the river at three locations. The second drainage system will collect groundwater at the landward edge of the concrete strip. This system will discharge at four locations following passive metals treatment located at each of the four french drain exit points.
The twelve foot wide concrete strip will include: i. five feet of cover on the exterior of the fence so that ALL erodible soils near the bank are protected from erosion, and ii. seven feet of cover on the interior of the fence so that general upkeep will prevent the buildup of erodible soils that could reach the river. Current french drain systems will remain if practical, may be moved if necessary or will be completely removed as needed. Alt 3 also includes costs associated with monitor effluent of metals treatment system at 4 locations, quarterly for metals, PAH and PCBs for 30 years.

Costs associated with fence removal and replacement have been included in addition to temporary security personnel for 7 days (168 hours) during construction activities.

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.

References: Documentation of reference sources used in the preparation of the estimate.

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Project WBS - ECES Report (with Markups)

Estimator Information

Estimator Name: Rebecca Rule
Estimator Title: Environmental Engineer
Agency/Org./Office: Seattle District USACE
Business Address: 4735 East Marginal Way South
Seattle, WA 98134
Telephone Number: 206-764-6792
Email Address: rebecca.a.rule@usace.army.mil
Estimate Prepared Date: 01/25/2010

Estimator Signature: **Date:**

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed:

Reviewer Signature: **Date:**

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Study
Phase Name: 1 – Fence line Removal / Reinstall / Security
Description: 660 ft Fence line Removal (460 ft fence line MU, 200 ft sediment MU), plus reinstall existing fence. Assume $30 / 10 ft section for materials associated with new fence pole and concrete for install. Also includes costs of 660 ft a week worth of Security personnel on site (7 days x 24 hrs = 168 hrs). Costs associated with temporary security personnel have been included for 7 days (168 hours) during construction activities.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Demolition, Fencing	Yes	100	0
Fencing	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.05	SITE WORK		
4.05.04	Dismantling and Demolition (Non-Hazardous)	Demolition, Fencing	$2,388
4.05.14	Fencing	Fencing	$23,880
			$26,268
		Subtotal:	$26,268

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Study
Phase Name: 6 - Metals treatment monitoring
Description: Monitor effluent of metals treatment system - 4 location, quarterly for metals, PAH and PCBs.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.07	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION		
4.07.00	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$2,368,680
			$2,368,680
		Subtotal:	$2,368,680

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Study
Phase Name: 5 - 4" Concrete Strip and drainage
Description: Construct 12 ft strip of concrete along Fence Line and Runoff MU. Based on 4" thick sidewalk with metal mesh element, for 660 ft of bank (660 ft x 12 ft = 7,920 ft^2). Includes 800 ft of 6" concrete storm sewer pipe with 3 collection /drains for clean runoff from concrete area.

Start Date: April, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
Storm Sewer	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.05	SITE WORK		
4.05.28	Storm Sewer Systems	Storm Sewer	$67,975
			$67,975
		Subtotal:	$67,975

Project WBS - ECES Report (with Markups)

Site:

Site ID: Moorings Uplands
Site Name: Alt4 - Veg Buffer (Fence Line & Runoff MU) 660 ft
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: Multi-Contaminant

Phase Names

SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation

Description: This includes costs of Alternative 3 relating to construction of erosion control measures associated with the Runoff and Fence Line MUs (660 ft total). Construction related activities include removal and disposal of top 6" of contaminated soil, optional installation of french drain system and passive metals treatment system only within Runoff MU, replacement of topsoil within 10 ft length along bank and gravel in locations in Runoff MU beyond 10 ft, removal and reinstallation of fence, 1 wk with of Security Watchman for temporary fence (168 hrs), erosion prevention plants (willows), seeding of 10 ft vegetative buffer, and installation of 3 ft temporary silt fence along bank.
This Alternative will include a ten foot wide vegetative buffer along the Fence line and Runoff MU. Six inches of soil will be removed and transported to an appropriately permitted disposal facility. Six inches of topsoil will be placed and a vegetative cover that consists of Portland Greenway approved non-invasive, native species shorter than 8" for security purposes will be planted. Temporary erosion control measures will be used to prevent soil loss to the river while the vegetative buffer stabilizes. Prior to vegetative buffer installation, the Runoff MU area will be raised to equal the grade of the Fence line MU using gravel / topsoil and will require installation of a 6" wide concrete curb along the bank edge to stabilize gravel / topsoil placement. Alternative 4 assumes the current stormwater drainage systems within the Fence line MU are sufficient and will only include addition of a limited french drain system within the Runoff MU (if such as system has not already been installed as part of general upkeep). Only a drainage systems installed as part of the Remedial Action will include passive treatment systems for metals removal. Effluent from this new drainage system would be released as a single effluent point. Alt 4 also includes costs associated with monitor effluent of metals treatment system at 1 location, quarterly for metals, PAH and PCBs for 30 years.

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Project WBS - ECES Report (with Markups)

metals, PAH and PCBs for 30 years.

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.

References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Rebecca Rule
Estimator Title: Environmental Engineer
Agency/Org./Office: Seattle District USACE
Business Address: 4735 East Marginal Way South
Seattle, WA 98134
Telephone Number: 206-764-6792
Email Address: rebecca.a.rule@usace.army.mil
Estimate Prepared Date: 01/25/2010

Estimator Signature: **Date:**

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed:

Reviewer Signature: **Date:**

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Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Study
Phase Name: 1 – Fence line Removal / Reinstall / Security
Description: 660 ft Fence line Removal (460 ft fence line MU, 200 ft sediment MU), plus reinstall existing fence. Assume $30 / 10 ft section for materials associated with new fence pole and concrete for install. Also includes costs of 660 ft a week worth of Security personnel on site (7 days x 24 hrs = 168 hrs). (Will likely be able to keep current pole location within Fence line area, so reinstall cost overestimated).

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Demolition, Fencing	Yes	100	0
Fencing	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.05	SITE WORK		
4.05.04	Dismantling and Demolition (Non-Hazardous)	Demolition, Fencing	$2,388
4.05.14	Fencing	Fencing	$23,880
			$26,268
		Subtotal:	$26,268

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Study
Phase Name: 2 - Contaminated Soil Excavation (6in)
Description: Removal of 3000 ft3 soil runoff (((200 x 30 ft) x 6 in) and Disposal Removal of 3300 soil for 10 ft buffer (((660 x 10 ft x 6 in) and Disposal This becomes 233 yds3, assumed non-hazardous, solid to be trucked 100 miles (was $30,531), for 15 miles ($28,442), is non-hazardous landfill material cost).

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Off-site Transportation and Waste Disposal	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS		Marked Up Costs
4. Construction		
4.33 DISPOSAL		
4.33.03 Other	Off-site Transportation and Waste Disposal	$36,957
		$36,957
	Subtotal:	$36,957

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Study
Phase Name: 9 - Metals treatment monitoring
Description: Monitor effluent of metals treatment system - 1 location, quarterly for metals, PAH and PCBs.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.07	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION		
4.07.00	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$1,244,708
			$1,244,708
		Subtotal:	$1,244,708

Project WBS - ECES Report (with Markups)

Site:

Site ID: Moorings Uplands
Site Name: Other Alt 2, 3 and 4 Costs
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: Multi-Contaminant

Phase Names

SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation

Description: This includes all other large costs for Alternative 2, 3 and 4 besides costs of construction for erosion control such as: Groundwater Monitoring of 6 well locations over 30 years, Land Use Control implementation to prevent groundwater exposure on site over 30 years, and Five Year Reviews for the duration of 30 years.
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Rebecca Rule
Estimator Title: Environmental Engineer
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Estimate Prepared Date: 01/25/2010

Estimator Signature: **Date:**

Reviewer Information

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Project WBS - ECES Report (with Markups)

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed:

Reviewer Signature: **Date:**

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Study
Phase Name: I - Monitor Groundwater - 30 yr Extensive analysis
Description: Potential required groundwater monitoring associated with interim solution for year 30, based on 8 wells. Doesn't include install costs of well. Includes general groundwater analysis, metals, cyanide, and other common environmental analytes. Direct cost is $1,500,326.
Based on quarterly monitoring for years 1 - 5 (8 wells total - 4 @ 90 ft, 4 @ 30 ft), and Based on annual monitoring for years 6 - 30 (8 wells total - 4 @ 90 ft, 4 @ 30 ft)
1 MONITORING input : 30 ft depth x 4 wells, quarterly, 1 yr (2 total)
2 MONITORING input : 90 ft depth x 4 wells, quarterly, 1 yr (2 total)
3 MONITORING input : 30 ft depth x 4 wells, annually, 27 yr (28 total)
4 MONITORING input : 90 ft depth x 4 wells, annually, 27 yr (28 total)

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0

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Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.07	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION		
4.07.00	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$214,311
	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$214,725
4.07.00	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$913,766
	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$922,599
			$2,265,401
		Subtotal:	$2,265,401

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Study
Phase Name: I - Monitor Groundwater - 30 yr Limited analysis
Description: Potential required groundwater monitoring associated with interim solution for year 30, based on 8 wells. Doesn't include install costs of well. Includes groundwater metals, cyanide analytes mainly. Removes some common environmental analytes (pesticides/PCBs, chlorinated phenoxy herbicides, purgeable halocarbons). Direct cost is $1,065,236. Based on quarterly monitoring for years 1 - 5 (8 wells total - 4 @ 90 ft, 4 @ 30 ft), and Based on annual monitoring for years 6 - 30 (8 wells total - 4 @ 90 ft, 4 @ 30 ft)
1 MONITORING input : 30 ft depth x 4 wells, quarterly, 1 yr (2 total)
2 MONITORING input : 90 ft depth x 4 wells, quarterly, 1 yr (2 total)
3 MONITORING input : 30 ft depth x 4 wells, annually, 27 yr (28 total)
4 MONITORING input : 90 ft depth x 4 wells, annually, 27 yr (28 total)

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0

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Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.07	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION		
4.07.00	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$164,433
	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$164,847
4.07.00	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$697,055
	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$717,479
			$1,743,815
		Subtotal:	$1,743,815

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Study
Phase Name: I - Monitor Groundwater - 30 yr Only metals & CN
Description: Potential required groundwater monitoring associated with interim solution for year 30, based on 8 wells. Doesn't include install costs of well. I ncludes groundwater metals, cyanide analytes only. D irect costs $666,700.
Based on quarterly monitoring f or years 1 - 5 (8 wells total - 4 @ 90 ft, 4 @ 30 ft), and B ased on annual m onitoring f or years 6 - 30 (8 wells total - 4 @ 90 ft, 4 @ 30 ft)
1 MONITORING input : 30 ft depth x 4 wells, quarterly, 1 yr (2 total)
2 MONITORING input : 90 ft depth x 4 wells, quarterly, 1 yr (2 total)
3 MONITORING input : 30 ft depth x 4 wells, annually, 27 yr (28 total)
4 MONITORING input : 90 ft depth x 4 wells, annually, 27 yr (28 total)

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0

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Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.07	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION		
4.07.00	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$122,051
	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$121,131
4.07.00	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$504,120
	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION	MONITORING	$518,749
			$1,266,051
		Subtotal:	$1,266,051

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Study
Phase Name: II - Monitoring Well Install 8 wells)
Description: Install 8 monitoring wells total: 4 at 30 ft depth, 4 at 90 ft depth.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Groundwater Monitoring Well	Yes	100	0
Groundwater Monitoring Well	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.07	INVESTIGATIONS AND MONITORING/SAMPLE COLLECTION		
4.07.15	Monitoring Well	Groundwater Monitoring Well	$24,772
	Monitoring Well	Groundwater Monitoring Well	$53,644
			$78,415
		Subtotal:	$78,415

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Study
Phase Name: III - LUCs - Low Intensity
Description: These costs are associated with Land Use Control implementation to prevent future contact with groundwater. Costs include Planning and Implementation activities. Planning activities include: LUC Assurance Plan, LUC Implementation Plan and Installation Master Plan. Implementation activities include: Modification of Master Plan, Access Control Signs, Utility Notification Services, and GIS/Overlay Maps based on a low complexity active government installation.
Direct Cost based on low intensity is $132.838

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.02	PROJECT MANAGEMENT & SUPPORT (Operable Unit/Solid Waste Management Unit)		
4.02.04	Institutional Controls	ADMINISTRATIVE LAND USE CONTROLS	$354,487
			$354,487
		Subtotal:	$354,487

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Study
Phase Name: III - LUCs - Medium Intensity - SENSITIVITY
Description: These costs are associated with Land Use Control implementation to prevent future contact with groundwater. Costs include Planning and Implementation activities. Planning activities include: LUC Assurance Plan, LUC Implementation Plan and Installation Master Plan. Implementation activities include: Modification of Master Plan, Access Control Signs, Utility Notification Services, and GIS/Overlay Maps based on a low complexity active government installation.
Direct Cost based on medium intensity is $187,132

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

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Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.02	PROJECT MANAGEMENT & SUPPORT (Operable Unit/Solid Waste Management Unit)		
4.02.04	Institutional Controls	ADMINISTRATIVE LAND USE CONTROLS	$498,049
			$498,049
		Subtotal:	$498,049

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Operations & Maintenance
Phase Name: IV - 5YR - Low Intensity
Description: This includes the costs of US Moorings Five Year Reviews. Assumed activities include Document Review, Interviews, Site Inspection, and Reports. Direct costs associated with 30 years (6 reviews) totals $58,486. These numbers assume a low complexity site. BA SED ON LOW INTENSITY SITE

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Five-Year Review	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.02	PROJECT MANAGEMENT & SUPPORT (Operable Unit/Solid Waste Management Unit)		
4.02.03	Regulatory Interaction	Five-Year Review	$162,661
			$162,661
		Subtotal:	$162,661

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Operations & Maintenance
Phase Name: IV - 5YR - Medium Intensity - SENSITIVITY
Description: This includes the costs of US Moorings Five Year Reviews. Assumed activities include Document Review, Interviews, Site Inspection, and Reports. Direct costs associated with 30 years (6 reviews) totals $58,486. These numbers assume a low complexity site. BASED ON MEDIUM COMPLEXITY SITE

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Five-Year Review	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.02	PROJECT MANAGEMENT & SUPPORT (Operable Unit/Solid Waste Management Unit)		
4.02.03	Regulatory Interaction	Five-Year Review	$260,612
			$260,612
		Subtotal:	$260,612

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Operations & Maintenance
Phase Name: V - LUC O&M - Annual
Description: Costs associated with 30 years of LUC O&M. This includes low intensity monitoring and enforcement activities associated with an active government installation. Activities include production of annual i. notice letters, ii. reports/certificates and site visits/inspections for yearly cost of $8727.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.02	PROJECT MANAGEMENT & SUPPORT (Operable Unit/Solid Waste Management Unit)		
4.02.04	Institutional Controls	ADMINISTRATIVE LAND USE CONTROLS	$696,826
			$696,826
		Subtotal:	$696,826

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Operations & Maintenance
Phase Name: V - LUC O&M - Biannual
Description: Costs associated with 30 years of LUC O&M. This includes low intensity monitoring and enforcement activities associated with an active government installation. Activities include production of Biannual i. notice letters, ii. reports/certificates and site visits/inspections for yearly cost of $8727.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.02	PROJECT MANAGEMENT & SUPPORT (Operable Unit/Solid Waste Management Unit)		
4.02.04	Institutional Controls	ADMINISTRATIVE LAND USE CONTROLS	$56,029
			$56,029
		Subtotal:	$56,029

Project WBS - ECES Report (with Markups)

Phase:

Phase Type: Operations & Maintenance
Phase Name: V - LUC O&M -Semiannual
Description: Costs associated with 30 years of LUC O&M. This includes low intensity monitoring and enforcement activities associated with an active government installation. Activities include production of annual i. notice letters, ii. reports/certificates and site visits/inspections for yearly cost of $8727.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Project WBS - ECES Report (with Markups)

ECES WBS			Marked Up Costs
4.	Construction		
4.02	PROJECT MANAGEMENT & SUPPORT (Operable Unit/Solid Waste Management Unit)		
4.02.04	Institutional Controls	ADMINISTRATIVE LAND USE CONTROLS	$1,558,673
			$1,558,673
		Subtotal:	$1,558,673
		ECES WBS Total:	**$13,972,568**

D8 – Project WBS Report

US Moorings FS
RACER Cost Estimate Report

Project WBS Report
(with Markups)

System:

RACER Version: 10.3.0
Database Location: C:\Documents and Settings\G3ECTRAR\Application Data\AECOM\RACER 10.3\FS 091210_Four Alternatives US Moorings.mdb

Folder:

Folder Name: US Moorings

Project:

Project ID: Moorings FS
Project Name: Erosion Control and Ground Water
Project Category: None

Location
State / Country: OREGON
City: PORTLAND

Location Modifier	Default	User
	1.107	1.107

Options
Database: System Costs
Cost Database Date: 2010
Report Option: Fiscal

Description Project includes uplands remedial work associated with interim groundwater and erodible soils.

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Project WBS Report
(with Markups)

Site:

Site ID: Moorings Uplands
Site Name: Alt2 - Gravel Layer (Fence Line & Runoff MU) 660
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: Multi-Contaminant

Phase Names

SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation

Description: This includes costs of Alternative 2 relating to construction of erosion control measures associated with the Runoff and Fence Line MUs (660 ft total). Alternative 2 consists of a gravel cover over any exposed erodible soils, and installation of necessary stormwater drainage systems. Alternative 2 assumes the non-contaminated gravel will pose an acceptable reduction of risk to the Willamette compared to the exposed contaminated erodible soils that are currently within the Runoff MU. Since new gravel has already been placed along the Fence Line MU, the only cost associated with the Fence Line MU will be infrequent placement of additional gravel on an as-needed basis to ensure that contaminated erodible soils are not exposed. costing assumes that 4" of additional gravel will be placed over the 10 ft width by 660 ft length every 10 years. Alt 2 also includes costs associated with monitor effluent of metals treatment system at 1 location, quarterly for metals, PAH and PCBs for 30 years. The Runoff MU area will be raised to equal the grade of the Fence Line MU using gravel and will require installation of a concrete curb along the bank edge to stabilize gravel placement. Alternative 2 assumes the current stormwater drainage systems within the Fence Line MU are sufficient and will only include addition of a limited french drain system within the Runoff MU (if such as system has not already been installed as part of general upkeep). O nly drainage systems installed as part of the Remedial Action will include passive treatment systems for metals removal. Effluent from this new drainage system would be released as a single effluent point.

Includes costs of Fence removal within Runoff MU and costs of temporary security measures during construction.

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Project WBS Report
(with Markups)

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Rebecca Rule
Estimator Title: Environmental Engineer
Agency/Org./Office: Seattle District USACE
Business Address: 4735 East Marginal Way South
Seattle, WA 98134
Telephone Number: 206-764-6792
Email Address: rebecca.a.rule@usace.army.mil
Estimate Prepared Date: 01/25/2010

Estimator Signature: **Date:**

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed:

Reviewer Signature: **Date:**

Project WBS Report
(with Markups)

Phase:

Phase Type: Study
Phase Name: 1 - Runoff MU Fence Line Removal/ Reuse / Security
Description: 200 ft Fence Line runoff MU removal for raise to grade plus reinstall existing fence. Assume $30 / 10 ft section for materials associated with new fence pole and concrete for install. Also includes costs of 48 hours worth of Security personnel on site (2 days x 24 hrs = 48 hrs).

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Demolition, Fencing	Yes	100	0
Fencing	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS			Marked Up Costs
331	HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.03	SITEWORK		
331.03.01	Demolition	Demolition, Fencing	$796
331.03.05	Fencing	Fencing	$15,189
	Fencing	USER DEFINED ESTIMATE	$2,036
			$18,021
		Total:	$18,021
		HTRW RA WBS Total:	$18,021

Phase:

Phase Type: Study

Phase Name: 2 - Option Runoff French Drain Passive Treatment

Description: FOR 1 FRENCH DRAIN IN RUNOFF AREA - stormwater infiltration control at boundary of soil gravel. Use 12" x 12" excavation hole for 230 ft (200 ft + 2 X 15 feet to include two 15 ft exit pipes). Excavation cost is most significant. Also includes 230 ft of 6" filter sock to prevent sediment movement into pipe. COST OF PASSIVE TREATMENT NOT INCLUDED.

Start Date: January, 2010

Labor Rate Group: System Labor Rate

Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.05 SURFACE WATER COLLECTION AND CONTROL		
331.05.06 Chutes or Flumes	USER DEFINED ESTIMATE	$1,322
		$1,322
331.06 GROUNDWATER COLLECTION AND CONTROL		
331.06.90 Other	USER DEFINED ESTIMATE	$10,802
		$10,802
	Total:	$12,124
	HTRW RA WBS Total:	$12,124

Phase:

Phase Type: Study

Phase Name: 3 - Runoff MU to grade using gravel + curb

Description: Bring in fill: gravel areas in Runoff MU for 40 ft of bank (200 ft x 40 ft x .5 ft = 4000 ft^3 = 148 cy). Add concrete curb along edge of bank for gravel stabilization (120 ft x 6" x 6", 80 ft - 12" x 8").

Start Date: January, 2010

Labor Rate Group: System Labor Rate

Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.03 SITEWORK		
331.03.04 Roads/Parking/Curbs/Walks	USER DEFINED ESTIMATE	$2,005
		$2,005
331.20 SITE RESTORATION		
331.20.04 Revegetation and Planting	USER DEFINED ESTIMATE	$4,849
		$4,849
	Total:	$6,854
	HTRW RA WBS Total:	$6,854

Phase:

Phase Type: Study
Phase Name: 4 - Metals treatment monitoring
Description: Monitor effluent of metals treatment system - 1 location, quarterly for metals, PAH and PCBs.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS			Marked Up Costs
331	HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.02	MONITORING, SAMPLING, TESTING, AND ANALYSIS		
331.02.91	Other	MONITORING	$1,244,708
			$1,244,708
		Total:	$1,244,708
		HTRW RA WBS Total:	$1,244,708

Phase:

Phase Type: Operations & Maintenance
Phase Name: 5 - Gravel O&M
Description: Add 4" gravel to outer 10 ft of river boundary as needed - every 10 yrs (660 ft x 10 ft x .33 in = 2200 ft^3 = 82 cy) in year 2020 and in yr 2030.

Start Date: April, 2020
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS			Marked Up Costs
331	HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.03	SITEWORK		
331.03.12	Permanent Cover Structure Over Containment Area	USER DEFINED ESTIMATE	$3,899
	Permanent Cover Structure Over Containment Area	USER DEFINED ESTIMATE	$3,899
			$7,797
		Total:	$7,797
		HTRW RA WBS Total:	$7,797

Project WBS Report
(with Markups)

Site:

Site ID: Moorings Uplands
Site Name: Alt3 - Concrete Strip (Fence Line & Runoff MU) 660
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: Multi-Contaminant

Phase Names

SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation

Description: This includes costs of Alternative 3 relating to construction of erosion control measures associated with the Runoff and Fence Line MUs (660 ft total). Alternative 3 will include construction of a twelve foot wide concrete strip along the Fence Line and Runoff MU. Prior to construction of this concrete strip, the Runoff MU will be brought to grade using gravel. Two separate drainage systems will be included in the design. The first drainage system will collect clean runoff from the top of the concrete strip and will directly discharge to the river at three locations. The second drainage system will collect groundwater at the landward edge of the concrete strip. This system will discharge at four locations following passive metals treatment located at each of the four french drain exit points.
The twelve foot wide concrete strip will include: i. five feet of cover on the exterior of the fence so that ALL erodible soils near the bank are protected from erosion, and ii. seven feet of cover on the interior of the fence so that general upkeep will prevent the buildup of erodible soils that could reach the river. Current french drain systems will remain if practical, may be moved if necessary or will be completely removed as needed. Alt 3 also includes costs associated with monitor effluent of metals treatment system at 4 locations, quarterly for metals, PAH and PCBs for 30 years.

Costs associated with fence removal and replacement have been included in addition to temporary security personnel for 7 days (168 hours) during construction activities.

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.

References: Documentation of reference sources used in the preparation of the estimate.

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Project WBS Report
(with Markups)

Estimator Information

Estimator Name:	Rebecca Rule
Estimator Title:	Environmental Engineer
Agency/Org./Office:	Seattle District USACE
Business Address:	4735 East Marginal Way South Seattle, WA 98134
Telephone Number:	206-764-6792
Email Address:	rebecca.a.rule@usace.army.mil
Estimate Prepared Date:	01/25/2010

Estimator Signature: **Date:**

Reviewer Information

Reviewer Name:	
Reviewer Title:	
Agency/Org./Office:	
Business Address:	
Telephone Number:	
Email Address:	
Date Reviewed:	

Reviewer Signature: **Date:**

Project WBS Report (with Markups)

Phase:

Phase Type: Study
Phase Name: 1 – Fence line Removal / Reinstall / Security
Description: 660 ft Fence line Removal (460 ft fence line MU, 200 ft sediment MU), plus reinstall existing fence. Assume $30 / 10 ft section for materials associated with new fence pole and concrete for install. Also includes costs of 660 ft a week worth of Security personnel on site (7 days x 24 hrs = 168 hrs). Costs associated with temporary security personnel have been included for 7 days (168 hours) during construction activities.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Demolition, Fencing	Yes	100	0
Fencing	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS			Marked Up Costs
331	HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.03	SITEWORK		
331.03.01	Demolition	Demolition, Fencing	$2,388
331.03.05	Fencing	Fencing	$23,880
	Fencing	USER DEFINED ESTIMATE	$7,126
			$33,394
		Total:	$33,394
		HTRW RA WBS Total:	$33,394

Phase:

Phase Type: Study

Phase Name: 2 - French Drain Passive Treatment - 660 ft

Description: FOR 1 FRENCH DRAIN IN RUNOFF AREA - stormwater infiltration control at boundary of concrete strip. Use french drain installation based on 12" x 12" excavation hole for 320 ft (260 ft + 4 X 40 feet to include four forty ft 6" pvc pipes from french drain systems to catch basin, passive treatment system and exit to river). Excavation cost is most significant. Also includes 260 ft of 6" filter sock to prevent sediment movement into pipe and 10 cy of gravel for backfill over french drain system. COST OF PASSIVE TREATMENT NOT INCLUDED.

Start Date: January, 2010

Labor Rate Group: System Labor Rate

Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.05 SURFACE WATER COLLECTION AND CONTROL		
331.05.06 Chutes or Flumes	USER DEFINED ESTIMATE	$1,724
		$1,724
331.06 GROUNDWATER COLLECTION AND CONTROL		
331.06.90 Other	USER DEFINED ESTIMATE	$20,069
		$20,069
	Total:	$21,793
	HTRW RA WBS Total:	$21,793

Phase:

Phase Type: Study
Phase Name: 3 - Runoff MU to grade using gravel + curb
Description: Bring in fill: gravel areas in Runoff MU for 40 ft of bank (200 ft x 40 ft x .5 ft = 4000 ft^3 = 148 cy).
Add concrete curb along entire edge of bank for gravel stabilization and edge of concrete strip (580 ft x 6" x 6", 80 ft - 12" x 8").

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.03 SITEWORK		
331.03.04 Roads/Parking/Curbs/Walks	USER DEFINED ESTIMATE	$4,241
		$4,241
331.20 SITE RESTORATION		
331.20.04 Revegetation and Planting	USER DEFINED ESTIMATE	$4,849
		$4,849
	Total:	$9,090
	HTRW RA WBS Total:	$9,090

Phase:

Phase Type: Study
Phase Name: 4 - Temp Erosion Control
Description: Using 3' silt fence over 660 ft.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.03 SITEWORK		
331.03.91 Other	USER DEFINED ESTIMATE	$3,192
		$3,192
	Total:	$3,192
	HTRW RA WBS Total:	$3,192

Phase:

Phase Type: Study
Phase Name: 6 - Metals treatment monitoring
Description: Monitor effluent of metals treatment system - 4 location, quarterly for metals, PAH and PCBs.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.02 MONITORING, SAMPLING, TESTING, AND ANALYSIS		
331.02.91 Other	MONITORING	$2,368,680
		$2,368,680
	Total:	$2,368,680
	HTRW RA WBS Total:	$2,368,680

Phase:

Phase Type: Study
Phase Name: 5 - 4" Concrete Strip and drainage
Description: Construct 12 ft strip of concrete along Fence Line and Runoff MU. Based on 4" thick sidewalk with metal mesh element, for 660 ft of bank (660 ft x 12 ft = 7,920 ft^2). Includes 800 ft of 6" concrete storm sewer pipe with 3 collection /drains for clean runoff from concrete area.

Start Date: April, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
Storm Sewer	Yes	100	0

Project WBS Report
(with Markups)

HTRW RA WBS			Marked Up Costs
331	HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.03	SITEWORK		
331.03.11	Storm Drainage/Subdrainage	Storm Sewer	$67,975
331.03.04	Roads/Parking/Curbs/Walks	USER DEFINED ESTIMATE	$59,659
			$127,633
		Total:	$127,633
		HTRW RA WBS Total:	$127,633

Project WBS Report
(with Markups)

Site:

Site ID: Moorings Uplands
Site Name: Alt4 - Veg Buffer (Fence Line & Runoff MU) 660 ft
Site Type: None

Media/Waste Type
Primary: Soil
Secondary: N/A

Contaminant
Primary: Metals
Secondary: Multi-Contaminant

Phase Names
SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation
Description: This includes costs of Alternative 3 relating to construction of erosion control measures associated with the Runoff and Fence Line MUs (660 ft total). Construction related activities include removal and disposal of top 6" of contaminated soil, optional installation of french drain system and passive metals treatment system only within Runoff MU, replacement of topsoil within 10 ft length along bank and gravel in locations in Runoff MU beyond 10 ft, removal and reinstallation of fence, 1 wk with of Security Watchman for temporary fence (168 hrs), erosion prevention plants (willows), seeding of 10 ft vegetative buffer, and installation of 3 ft temporary silt fence along bank.
This Alternative will include a ten foot wide vegetative buffer along the Fence Line and Runoff MU. Six inches of soil will be removed and transported to an appropriately permitted disposal facility. Six inches of topsoil will be placed and a vegetative cover that consists of Portland Greenway approved non-invasive, native species shorter than 8" for security purposes will be planted. Temporary erosion control measures will be used to prevent soil loss to the river while the vegetative buffer stabilizes. Prior to vegetative buffer installation, the Runoff MU area will be raised to equal the grade of the Fence Line MU using gravel / topsoil and will require installation of a 6" wide concrete curb along the bank edge to stabilize gravel / topsoil placement. Alternative 4 assumes the current stormwater drainage systems within the Fence Line MU are sufficient and will only include addition of a limited french drain system within the Runoff MU (if such as system has not already been installed as part of general upkeep). Only a drainage systems installed as part of the Remedial Action will include passive treatment systems for metals removal. Effluent from this new drainage system would be released as a single effluent point. Alt 4 also includes costs associated with monitor effluent of metals treatment system at 1 location, quarterly for

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Project WBS Report
(with Markups)

with monitor effluent of metals treatment system at 1 location, quarterly for metals, PAH and PCBs for 30 years.

Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.

References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Rebecca Rule
Estimator Title: Environmental Engineer
Agency/Org./Office: Seattle District USACE
Business Address: 4735 East Marginal Way South
Seattle, WA 98134
Telephone Number: 206-764-6792
Email Address: rebecca.a.rule@usace.army.mil
Estimate Prepared Date: 01/25/2010

Estimator Signature: **Date:**

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed:

Reviewer Signature: **Date:**

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Project WBS Report (with Markups)

Phase:

Phase Type: Study
Phase Name: 1 – Fence line Removal / Reinstall / Security
Description: 660 ft Fence line Removal (460 ft fence line MU, 200 ft sediment MU), plus reinstall existing fence. Assume $30 / 10 ft section for materials associated with new fence pole and concrete for install. Also includes costs of 660 ft a week worth of Security personnel on site (7 days x 24 hrs = 168 hrs). (Will likely be able to keep current pole location within Fence line area, so reinstall cost overestimated).

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Demolition, Fencing	Yes	100	0
Fencing	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS			Marked Up Costs
331	HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.03	SITEWORK		
331.03.01	Demolition	Demolition, Fencing	$2,388
331.03.05	Fencing	Fencing	$23,880
	Fencing	USER DEFINED ESTIMATE	$7,126
			$33,394
		Total:	$33,394
		HTRW RA WBS Total:	$33,394

Phase:

Phase Type: Study
Phase Name: 2 - Contaminated Soil Excavation (6in)
Description: Removal of 3000 ft3 soil runoff (((200 x 30 ft) x 6 in) and Disposal Removal of 3300 soil for 10 ft buffer (((660 x 10 ft x 6 in) and Disposal This becomes 233 yds3, assumed non-hazardous, solid to be trucked 100 miles (was $30,531), for 15 miles ($28,442), is non-hazardous landfill material cost).

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Off-site Transportation and Waste Disposal	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.19 DISPOSAL (COMMERCIAL)		
331.19.22 Disposal Fees and Taxes	Off-site Transportation and Waste Disposal	$36,957
		$36,957
	Total:	$36,957
	HTRW RA WBS Total:	$36,957

Phase:

Phase Type: Study

Phase Name: 3 - Option Runoff French Drain Passive Treatment

Description: FOR 1 FRENCH DRAIN IN RUNOFF AREA - stormwater infiltration control at boundary of soil gravel. Use 12" x 12" excavation hole for 230 ft (200 ft + 2 X 15 feet to include two 15 ft exit pipes). Excavation cost is most significant . Also includes 230 ft of 6" filter sock to prevent sediment movement into pipe. COST OF PASSIVE TREATMENT NOT INCLUDED.

Start Date: January, 2010

Labor Rate Group: System Labor Rate

Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.05 SURFACE WATER COLLECTION AND CONTROL		
331.05.06 Chutes or Flumes	USER DEFINED ESTIMATE	$1,322
		$1,322
331.06 GROUNDWATER COLLECTION AND CONTROL		
331.06.90 Other	USER DEFINED ESTIMATE	$10,802
		$10,802
	Total:	$12,124
	HTRW RA WBS Total:	$12,124

Phase:

Phase Type: Study
Phase Name: 4 - Add 6" topsoil/ gravel
Description: Bring in fill: topsoil in 10 ft buffer near bank for 660 ft (660 ft x 10 ft x 0.5 ft = 3300 ft^3 = 122 cy), gravel areas in Sediment MU beyond 10 ft from bank (200 ft x 30 ft x .5 ft = 111 ft^3 = 111cy).

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS			Marked Up Costs
331	HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.20	SITE RESTORATION		
331.20.04	Revegetation and Planting	USER DEFINED ESTIMATE	$3,637
331.20.01	Earthwork	USER DEFINED ESTIMATE	$6,378
			$10,015
		Total:	$10,015
		HTRW RA WBS Total:	$10,015

Phase:

Phase Type: Study
Phase Name: 5 - Eco stabilization - trees(30), willows(40)
Description: Put in trees and willow to stabilize soil along bank: 40 willows and 30 trees at current cost. Security requirements may limit stabilizing plant height to 8".

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.05 SURFACE WATER COLLECTION AND CONTROL		
331.05.13 Erosion Control	USER DEFINED ESTIMATE	$6,486
		$6,486
	Total:	$6,486
	HTRW RA WBS Total:	$6,486

Phase:

Phase Type: Study
Phase Name: 6 - Runoff MU curb install
Description: For Runoff MU area - Add concrete curb along edge of bank for gravel stabilization (120 ft x 6" x 6", 80 ft - 12" x 8").

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.03 SITEWORK		
331.03.04 Roads/Parking/Curbs/Walks	USER DEFINED ESTIMATE	$2,005
		$2,005
	Total:	$2,005
	HTRW RA WBS Total:	$2,005

Phase:

Phase Type: Study
Phase Name: 7 - Temp Erosion Control
Description: Using 3' silt fence over 660 ft.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.03 SITEWORK		
331.03.91 Other	USER DEFINED ESTIMATE	$3,192
		$3,192
	Total:	$3,192
	HTRW RA WBS Total:	$3,192

Phase:

Phase Type: Study
Phase Name: 8 - Vegetative Buffer (32 shrubs), seeding
Description: Add vegetative buffer along 10ft Fence Line and Runoff MU. Includes grass and shrubs based on surface area calculation : Includes 32 local shrubs and seeding of area

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
USER DEFINED ESTIMATE	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.20 SITE RESTORATION		
331.20.04 Revegetation and Planting	USER DEFINED ESTIMATE	$5,789
		$5,789
	Total:	$5,789
	HTRW RA WBS Total:	$5,789

Phase:

Phase Type: Study
Phase Name: 9 - Metals treatment monitoring
Description: Monitor effluent of metals treatment system - 1 location, quarterly for metals, PAH and PCBs.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0

Project WBS Report
(with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.02 MONITORING, SAMPLING, TESTING, AND ANALYSIS		
331.02.91 Other	MONITORING	$1,244,708
		$1,244,708
	Total:	$1,244,708
	HTRW RA WBS Total:	$1,244,708

Project WBS Report
(with Markups)

Site:

Site ID: Moorings Uplands
Site Name: Other Alt 2, 3 and 4 Costs
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Metals
Secondary: Multi-Contaminant

Phase Names

SI:
RI/FS, EE/CA:
RD:
IRA, RmA-C:
RA-C:
RA-O:
LTM:
PCO:

Documentation

Description: This includes all other large costs for Alternative 2, 3 and 4 besides costs of construction for erosion control such as: Groundwater Monitoring of 6 well locations over 30 years, Land Use Control implementation to prevent groundwater exposure on site over 30 years, and Five Year Reviews for the duration of 30 years.
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Rebecca Rule
Estimator Title: Environmental Engineer
Agency/Org./Office: Seattle District USACE
Business Address: 4735 East Marginal Way South
Seattle, WA 98134
Telephone Number: 206-764-6792
Email Address: rebecca.a.rule@usace.army.mil
Estimate Prepared Date: 01/25/2010

Estimator Signature: **Date:**

Reviewer Information

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Project WBS Report
(with Markups)

Reviewer Name:
Reviewer Title:
Agency/Org./Office:
Business Address:
Telephone Number:
Email Address:
Date Reviewed:

Reviewer Signature: **Date:**

Project WBS Report
(with Markups)

Phase:

Phase Type: Study
Phase Name: I - Monitor Groundwater - 30 yr Extensive analysis
Description: Potential required groundwater monitoring associated with interim solution for year 30, based on 8 wells. Doesn't include install costs of well. Includes general groundwater analysis, metals, cyanide, and other common environmental analytes. Direct cost is $1,500,326.
Based on quarterly monitoring for years 1 - 5 (8 wells total - 4 @ 90 ft, 4 @ 30 ft), and Based on annual monitoring for years 6 - 30 (8 wells total - 4 @ 90 ft, 4 @ 30 ft)
1 MONITORING input : 30 ft depth x 4 wells, quarterly, 1 yr (2 total)
2 MONITORING input : 90 ft depth x 4 wells, quarterly, 1 yr (2 total)
3 MONITORING input : 30 ft depth x 4 wells, annually, 27 yr (28 total)
4 MONITORING input : 90 ft depth x 4 wells, annually, 27 yr (28 total)

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0

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Project WBS Report
(with Markups)

HTRW RA WBS			Marked Up Costs
331	HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.02	MONITORING, SAMPLING, TESTING, AND ANALYSIS		
331.02.91	Other	MONITORING	$214,311
	Other	MONITORING	$214,725
331.02.91	Other	MONITORING	$913,766
	Other	MONITORING	$922,599
			$2,265,401
		Total:	$2,265,401
		HTRW RA WBS Total:	$2,265,401

Phase:

Phase Type: Study
Phase Name: I - Monitor Groundwater - 30 yr Limited analysis
Description: Potential required groundwater monitoring associated with interim solution for year 30, based on 8 wells. Doesn't include install costs of well. I ncludes groundwater metals, cyanide analytes mainly. Removes some common environmental analytes (pesticides/PCBs, chlorinated phenoxy herbicides, purgeable halocarbons). Direct cost is $1,065,236. Based on quarterly monitoring for years 1 - 5 (8 wells total - 4 @ 90 ft, 4 @ 30 ft), and B ased on annual m onitoring f or years 6 - 30 (8 wells total - 4 @ 90 ft, 4 @ 30 ft)
1 MONITORING input : 30 ft depth x 4 wells, quarterly, 1 yr (2 total)
2 MONITORING input : 90 ft depth x 4 wells, quarterly, 1 yr (2 total)
3 MONITORING input : 30 ft depth x 4 wells, annually, 27 yr (28 total)
4 MONITORING input : 90 ft depth x 4 wells, annually, 27 yr (28 total)

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0

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Project WBS Report
(with Markups)

HTRW RA WBS			Marked Up Costs
331	HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.02	MONITORING, SAMPLING, TESTING, AND ANALYSIS		
331.02.91	Other	MONITORING	$164,433
	Other	MONITORING	$164,847
331.02.91	Other	MONITORING	$697,055
	Other	MONITORING	$717,479
			$1,743,815
		Total:	$1,743,815
		HTRW RA WBS Total:	$1,743,815

Phase:

Phase Type: Study
Phase Name: I - Monitor Groundwater - 30 yr Only metals & CN
Description: Potential required groundwater monitoring associated with interim solution for year 30, based on 8 wells. Doesn't include install costs of well. I ncludes groundwater metals, cyanide analytes only. D irect costs $666,700.
Based on quarterly monitoring f or years 1 - 5 (8 wells total - 4 @ 90 ft, 4 @ 30 ft), and B ased on annual m onitoring f or years 6 - 30 (8 wells total - 4 @ 90 ft, 4 @ 30 ft)
1 MONITORING input : 30 ft depth x 4 wells, quarterly, 1 yr (2 total)
2 MONITORING input : 90 ft depth x 4 wells, quarterly, 1 yr (2 total)
3 MONITORING input : 30 ft depth x 4 wells, annually, 27 yr (28 total)
4 MONITORING input : 90 ft depth x 4 wells, annually, 27 yr (28 total)

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0
MONITORING	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS			Marked Up Costs
331	HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.02	MONITORING, SAMPLING, TESTING, AND ANALYSIS		
331.02.91	Other	MONITORING	$122,051
	Other	MONITORING	$121,131
331.02.91	Other	MONITORING	$504,120
	Other	MONITORING	$518,749
			$1,266,051
		Total:	$1,266,051
		HTRW RA WBS Total:	$1,266,051

Phase:

Phase Type: Study
Phase Name: II - Monitoring Well Install 8 wells)
Description: Install 8 monitoring wells total: 4 at 30 ft depth, 4 at 90 ft depth.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Groundwater Monitoring Well	Yes	100	0
Groundwater Monitoring Well	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS			Marked Up Costs
331	HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.02	MONITORING, SAMPLING, TESTING, AND ANALYSIS		
331.02.04	Monitoring Wells	Groundwater Monitoring Well	$24,772
	Monitoring Wells	Groundwater Monitoring Well	$53,644
			$78,415
		Total:	$78,415
		HTRW RA WBS Total:	$78,415

Phase:

Phase Type: Study

Phase Name: III - LUCs - Low Intensity

Description: These costs are associated with Land Use Control implementation to prevent future contact with groundwater. Costs include Planning and Implementation activities. Planning activities include: LUC Assurance Plan, LUC Implementation Plan and Installation Master Plan. Implementation activities include: Modification of Master Plan, Access Control Signs, Utility Notification Services, and GIS/Overlay Maps based on a low complexity active government installation.
Direct Cost based on low intensity is $132.838

Start Date: January, 2010

Labor Rate Group: System Labor Rate

Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.01 MOBILIZATION AND PREPARATORY WORK		
331.01.03 Submittals/Implementation Plans	ADMINISTRATIVE LAND USE CONTROLS	$354,487
		$354,487
	Total:	$354,487
	HTRW RA WBS Total:	$354,487

Phase:

Phase Type: Study

Phase Name: III - LUCs - Medium Intensity - SENSITIVITY

Description: These costs are associated with Land Use Control implementation to prevent future contact with groundwater. Costs include Planning and Implementation activities. Planning activities include: LUC Assurance Plan, LUC Implementation Plan and Installation Master Plan. Implementation activities include: Modification of Master Plan, Access Control Signs, Utility Notification Services, and GIS/Overlay Maps based on a low complexity active government installation.
Direct Cost based on medium intensity is $187,132

Start Date: January, 2010

Labor Rate Group: System Labor Rate

Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.01 MOBILIZATION AND PREPARATORY WORK		
331.01.03 Submittals/Implementation Plans	ADMINISTRATIVE LAND USE CONTROLS	$498,049
		$498,049
	Total:	$498,049
	HTRW RA WBS Total:	$498,049

Phase:

Phase Type: Operations & Maintenance
Phase Name: IV - 5YR - Low Intensity
Description: This includes the costs of US Moorings Five Year Reviews. Assumed activities include Document Review, Interviews, Site Inspection, and Reports. Direct costs associated with 30 years (6 reviews) totals $58,486. These numbers assume a low complexity site. BASED ON LOW INTENSITY SITE

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Five-Year Review	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.20 SITE RESTORATION		
331.20.90 Other	Five-Year Review	$162,661
		$162,661
	Total:	$162,661
	HTRW RA WBS Total:	$162,661

Phase:

Phase Type: Operations & Maintenance
Phase Name: IV - 5YR - Medium Intensity - SENSITIVITY
Description: This includes the costs of US Moorings Five Year Reviews. Assumed activities include Document Review, Interviews, Site Inspection, and Reports. Direct costs associated with 30 years (6 reviews) totals $58,486. These numbers assume a low complexity site. BA SED ON MEDIUM COMPLEXITY SITE

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
Five-Year Review	Yes	100	0

Project WBS Report
(with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.20 SITE RESTORATION		
331.20.90 Other	Five-Year Review	$260,612
		$260,612
	Total:	$260,612
	HTRW RA WBS Total:	$260,612

Phase:

Phase Type: Operations & Maintenance
Phase Name: V - LUC O&M - Annual
Description: Costs associated with 30 years of LUC O&M. This includes low intensity monitoring and enforcement activities associated with an active government installation. Activities include production of annual i. notice letters, ii. reports/certificates and site visits/inspections for yearly cost of $8727.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.01 MOBILIZATION AND PREPARATORY WORK		
331.01.03 Submittals/Implementation Plans	ADMINISTRATIVE LAND USE CONTROLS	$696,826
		$696,826
	Total:	$696,826
	HTRW RA WBS Total:	$696,826

Phase:

Phase Type: Operations & Maintenance
Phase Name: V - LUC O&M - Biannual
Description: Costs associated with 30 years of LUC O&M. This includes low intensity monitoring and enforcement activities associated with an active government installation. Activities include production of Biannual i. notice letters, ii. reports/certificates and site visits/inspections for yearly cost of $8727.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.01 MOBILIZATION AND PREPARATORY WORK		
331.01.03 Submittals/Implementation Plans	ADMINISTRATIVE LAND USE CONTROLS	$56,029
		$56,029
	Total:	$56,029
	HTRW RA WBS Total:	$56,029

Phase:

Phase Type: Operations & Maintenance
Phase Name: V - LUC O&M -Semiannual
Description: Costs associated with 30 years of LUC O&M. This includes low intensity monitoring and enforcement activities associated with an active government installation. Activities include production of annual i. notice letters, ii. reports/certificates and site visits/inspections for yearly cost of $8727.

Start Date: January, 2010
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups	Markup	% Prime	% Sub.
ADMINISTRATIVE LAND USE CONTROLS	Yes	100	0

Project WBS Report (with Markups)

HTRW RA WBS		Marked Up Costs
331 HTRW REMEDIAL ACTION (CONSTRUCTION)		
331.01 MOBILIZATION AND PREPARATORY WORK		
331.01.03 Submittals/Implementation Plans	ADMINISTRATIVE LAND USE CONTROLS	$1,558,673
		$1,558,673
	Total:	$1,558,673
	HTRW RA WBS Total:	$1,558,673
	Total:	**$14,148,975**

D9 – Assembly Level Report

US Moorings FS

RACER Cost Estimate Report

Phase Name	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	Cost Override	Duplications
IV - 5YR - Low Intensity	Five-Year Review	33220102	Project Manager	6	HR	0.00	70.35	0.00	0.00	422.13	FALSE	TRUE
IV - 5YR - Low Intensity	Five-Year Review	33220102	Project Manager	9	HR	0.00	70.35	0.00	0.00	633.19	FALSE	TRUE
IV - 5YR - Low Intensity	Five-Year Review	33220102	Project Manager	12	HR	0.00	70.35	0.00	0.00	844.26	FALSE	TRUE
IV - 5YR - Low Intensity	Five-Year Review	33220102	Project Manager	8	HR	0.00	70.35	0.00	0.00	562.84	FALSE	TRUE
IV - 5YR - Low Intensity	Five-Year Review	33220105	Project Engineer	16	HR	0.00	62.63	0.00	0.00	1,002.15	FALSE	TRUE
IV - 5YR - Low Intensity	Five-Year Review	33220105	Project Engineer	11	HR	0.00	62.63	0.00	0.00	688.98	FALSE	TRUE
IV - 5YR - Low Intensity	Five-Year Review	33220105	Project Engineer	16	HR	0.00	62.63	0.00	0.00	1,002.15	FALSE	TRUE
IV - 5YR - Low Intensity	Five-Year Review	33220108	Project Scientist	12	HR	0.00	71.27	0.00	0.00	855.26	FALSE	TRUE
IV - 5YR - Low Intensity	Five-Year Review	33220108	Project Scientist	8	HR	0.00	71.27	0.00	0.00	570.17	FALSE	TRUE
IV - 5YR - Low Intensity	Five-Year Review	33220108	Project Scientist	13	HR	0.00	71.27	0.00	0.00	926.53	FALSE	TRUE
IV - 5YR - Low Intensity	Five-Year Review	33220109	Staff Scientist	13	HR	0.00	40.73	0.00	0.00	529.45	FALSE	TRUE
IV - 5YR - Low Intensity	Five-Year Review	33220109	Staff Scientist	16	HR	0.00	40.73	0.00	0.00	651.63	FALSE	TRUE
IV - 5YR - Low Intensity	Five-Year Review	33220109	Staff Scientist	26	HR	0.00	40.73	0.00	0.00	1,058.89	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33010101	Mobilize/DeMobilize Drilling Rig & Crew	1	LS	0.00	1,346.33	787.90	0.00	2,134.23	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33020303	Organic Vapor Analyzer Rental, per Day	2	DAY	0.00	0.00	0.00	38.22	76.44	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33170808	Decontaminate Rig, Augers, Screen (Rental Equipment)	2	DAY	22.96	538.44	0.00	0.00	1,122.81	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33220112	Field Technician	32	HR	0.00	42.21	0.00	0.00	1,350.61	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33230101	2" PVC, Schedule 40, Well Casing	80	LF	1.14	4.49	4.79	0.00	833.65	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33230201	2" PVC, Schedule 40, Well Screen	40	LF	3.79	4.49	4.79	0.00	522.66	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33230301	2" PVC, Well Plug	4	EA	12.29	13.46	14.38	0.00	160.52	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33231101	Hollow Stem Auger, 8" Dia Borehole, Depth <= 100 ft	124	LF	0.00	15.16	25.27	0.00	5,013.43	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33231178	Move Rig/Equipment Around Site	3	EA	84.02	193.53	113.26	0.00	1,172.45	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33231182	DOT steel drums, 55 gal., open, 17C	6	EA	105.38	0.00	0.00	0.00	632.27	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33231401	2" Screen, Filter Pack	48	LF	8.38	3.46	3.70	0.00	745.90	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33231504	Surface Pad, Concrete, 2' x 2' x 4"	4	EA	52.31	15.05	0.18	0.00	270.13	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33231811	2" Well, Portland Cement Grout	68	LF	1.09	0.00	0.00	0.00	74.35	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33232101	2" Well, Bentonite Seal	4	EA	135.05	89.52	95.60	0.00	1,280.67	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33010101	Mobilize/DeMobilize Drilling Rig & Crew	1	LS	0.00	1,346.33	787.90	0.00	2,134.23	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33020303	Organic Vapor Analyzer Rental, per Day	5	DAY	0.00	0.00	0.00	38.22	191.09	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33170808	Decontaminate Rig, Augers, Screen (Rental Equipment)	5	DAY	22.96	538.44	0.00	0.00	2,807.02	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33220112	Field Technician	80	HR	0.00	42.21	0.00	0.00	3,376.52	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33230101	2" PVC, Schedule 40, Well Casing	320	LF	1.14	4.49	4.79	0.00	3,334.61	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33230201	2" PVC, Schedule 40, Well Screen	40	LF	3.79	4.49	4.79	0.00	522.66	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33230301	2" PVC, Well Plug	4	EA	12.29	13.46	14.38	0.00	160.52	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33231101	Hollow Stem Auger, 8" Dia Borehole, Depth <= 100 ft	364	LF	0.00	15.16	25.27	0.00	14,716.83	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33231178	Move Rig/Equipment Around Site	3	EA	84.02	193.53	113.26	0.00	1,172.45	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33231182	DOT steel drums, 55 gal., open, 17C	18	EA	105.38	0.00	0.00	0.00	1,896.81	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33231401	2" Screen, Filter Pack	48	LF	8.38	3.46	3.70	0.00	745.90	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33231504	Surface Pad, Concrete, 2' x 2' x 4"	4	EA	52.31	15.05	0.18	0.00	270.13	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33231811	2" Well, Portland Cement Grout	308	LF	1.09	0.00	0.00	0.00	336.76	FALSE	TRUE
II - Monitoring Well Install 8 wells)	Groundwater Monitoring Well	33232101	2" Well, Bentonite Seal	4	EA	135.05	89.52	95.60	0.00	1,280.67	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33020401	Disposable Materials per Sample	29	EA	9.50	0.00	0.00	0.00	275.58	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33020402	Decontamination Materials per Sample	29	EA	12.40	0.00	0.00	0.00	359.66	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33020561	Lysimeter accessories, nylon tubing, 1/4" OD	505	LF	0.14	0.00	0.00	0.00	72.67	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	4	WK	0.00	0.00	0.00	332.10	1,328.40	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33021620	Testing, TAL metals (6010/7000s)	29	EA	0.00	0.00	0.00	260.88	7,565.52	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	1320	LB	0.00	0.00	0.00	4.25	5,611.16	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33022130	Testing, cyanide (SW9010) with prep	29	EA	0.00	0.00	0.00	59.47	1,724.57	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220102	Project Manager	10	HR	0.00	70.35	0.00	0.00	703.55	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220102	Project Manager	7	HR	0.00	70.35	0.00	0.00	492.48	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220108	Project Scientist	64	HR	0.00	71.27	0.00	0.00	4,561.39	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220110	QA/QC Officer	18	HR	0.00	70.60	0.00	0.00	1,270.73	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220112	Field Technician	32	HR	0.00	42.21	0.00	0.00	1,350.61	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220112	Field Technician	116	HR	0.00	42.21	0.00	0.00	4,895.95	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220112	Field Technician	2	HR	0.00	42.21	0.00	0.00	84.41	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220114	Word Processing/Clerical	14	HR	0.00	36.29	0.00	0.00	508.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220115	Draftsman/CADD	10	HR	0.00	39.83	0.00	0.00	398.26	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33230614	Peristaltic Pump, Weekly Rental	4	WK	0.00	0.00	0.00	79.34	317.35	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33240101	Other Direct Costs	1	LS	316.59	0.00	0.00	0.00	316.59	TRUE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33020401	Disposable Materials per Sample	29	EA	9.50	0.00	0.00	0.00	275.58	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33020402	Decontamination Materials per Sample	29	EA	12.40	0.00	0.00	0.00	359.66	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33020561	Lysimeter accessories, nylon tubing, 1/4" OD	1465	LF	0.14	0.00	0.00	0.00	210.83	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	4	WK	0.00	0.00	0.00	332.10	1,328.40	FALSE	TRUE

Phase Name	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	Cost Override	Duplications
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33021610	Testing, cyanide	29	EA	0.00	0.00	0.00	40.28	1,168.23	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33021620	Testing, TAL metals (6010/7000s)	29	EA	0.00	0.00	0.00	260.88	7,565.52	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	1320	LB	0.00	0.00	0.00	4.25	5,611.16	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220102	Project Manager	7	HR	0.00	70.35	0.00	0.00	492.48	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220102	Project Manager	10	HR	0.00	70.35	0.00	0.00	703.55	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220108	Project Scientist	64	HR	0.00	71.27	0.00	0.00	4,561.39	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220110	QA/QC Officer	18	HR	0.00	70.60	0.00	0.00	1,270.73	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220112	Field Technician	116	HR	0.00	42.21	0.00	0.00	4,895.95	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220112	Field Technician	2	HR	0.00	42.21	0.00	0.00	84.41	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220112	Field Technician	32	HR	0.00	42.21	0.00	0.00	1,350.61	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220114	Word Processing/Clerical	14	HR	0.00	36.29	0.00	0.00	508.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220115	Draftsman/CADD	10	HR	0.00	39.83	0.00	0.00	398.26	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33230614	Peristaltic Pump, Weekly Rental	4	WK	0.00	0.00	0.00	79.34	317.35	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33240101	Other Direct Costs	1	LS	316.59	0.00	0.00	0.00	316.59	TRUE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33020401	Disposable Materials per Sample	9	EA	9.50	0.00	0.00	0.00	85.52	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33020402	Decontamination Materials per Sample	9	EA	12.40	0.00	0.00	0.00	111.62	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33020561	Lysimeter accessories, nylon tubing, 1/4" OD	145	LF	0.14	0.00	0.00	0.00	20.87	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	1	WK	0.00	0.00	0.00	332.10	332.10	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33021610	Testing, cyanide	9	EA	0.00	0.00	0.00	40.28	362.55	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33021620	Testing, TAL metals (6010/7000s)	9	EA	0.00	0.00	0.00	260.88	2,347.92	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	420	LB	0.00	0.00	0.00	4.25	1,785.37	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33190403	DOT steel drums, 55 gal., closed only, 17H	3	EA	62.82	0.00	0.00	0.00	188.47	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220102	Project Manager	3	HR	0.00	70.35	0.00	0.00	211.06	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220102	Project Manager	9	HR	0.00	70.35	0.00	0.00	633.19	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220108	Project Scientist	56	HR	0.00	71.27	0.00	0.00	3,991.21	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220110	QA/QC Officer	17	HR	0.00	70.60	0.00	0.00	1,200.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220112	Field Technician	1	HR	0.00	42.21	0.00	0.00	42.21	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220112	Field Technician	36	HR	0.00	42.21	0.00	0.00	1,519.43	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220112	Field Technician	8	HR	0.00	42.21	0.00	0.00	337.65	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220114	Word Processing/Clerical	13	HR	0.00	36.29	0.00	0.00	471.73	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220115	Draftsman/CADD	9	HR	0.00	39.83	0.00	0.00	358.43	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33230614	Peristaltic Pump, Weekly Rental	1	WK	0.00	0.00	0.00	79.34	79.34	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33240101	Other Direct Costs	1	LS	295.85	0.00	0.00	0.00	295.85	TRUE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33020401	Disposable Materials per Sample	9	EA	9.50	0.00	0.00	0.00	85.52	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33020402	Decontamination Materials per Sample	9	EA	12.40	0.00	0.00	0.00	111.62	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33020561	Lysimeter accessories, nylon tubing, 1/4" OD	385	LF	0.14	0.00	0.00	0.00	55.41	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	1	WK	0.00	0.00	0.00	332.10	332.10	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33021610	Testing, cyanide	9	EA	0.00	0.00	0.00	40.28	362.55	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33021620	Testing, TAL metals (6010/7000s)	9	EA	0.00	0.00	0.00	260.88	2,347.92	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	420	LB	0.00	0.00	0.00	4.25	1,785.37	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33190403	DOT steel drums, 55 gal., closed only, 17H	8	EA	62.82	0.00	0.00	0.00	502.58	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220102	Project Manager	3	HR	0.00	70.35	0.00	0.00	211.06	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220102	Project Manager	9	HR	0.00	70.35	0.00	0.00	633.19	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220108	Project Scientist	56	HR	0.00	71.27	0.00	0.00	3,991.21	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220110	QA/QC Officer	17	HR	0.00	70.60	0.00	0.00	1,200.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220112	Field Technician	36	HR	0.00	42.21	0.00	0.00	1,519.43	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220112	Field Technician	1	HR	0.00	42.21	0.00	0.00	42.21	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220112	Field Technician	8	HR	0.00	42.21	0.00	0.00	337.65	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220114	Word Processing/Clerical	13	HR	0.00	36.29	0.00	0.00	471.73	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33220115	Draftsman/CADD	9	HR	0.00	39.83	0.00	0.00	358.43	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33230614	Peristaltic Pump, Weekly Rental	1	WK	0.00	0.00	0.00	79.34	79.34	FALSE	TRUE
I - Monitor Groundwater - 30 yr Only metals & CN	Monitoring	33240101	Other Direct Costs	1	LS	295.85	0.00	0.00	0.00	295.85	TRUE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	18010412	Construction Signs	24	SF	19.82	0.00	0.00	0.00	475.57	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33010202	Per Diem (per person)	12	DAY	0.00	0.00	0.00	165.00	1,980.00	TRUE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33022037	Overnight Delivery, 8 oz Letter	10	EA	0.00	0.00	0.00	13.00	129.96	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33040671	Portable GPS Set with Mapping, 5 cm Accuracy	1	MO	773.35	0.00	0.00	0.00	773.35	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220102	Project Manager	80	HR	0.00	57.69	0.00	0.00	4,615.28	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220102	Project Manager	110	HR	0.00	57.69	0.00	0.00	6,346.00	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220102	Project Manager	120	HR	0.00	57.69	0.00	0.00	6,922.91	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220105	Project Engineer	180	HR	0.00	51.36	0.00	0.00	9,244.80	FALSE	TRUE

Phase Name	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	Cost Override	Duplications
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220105	Project Engineer	280	HR	0.00	51.36	0.00	0.00	14,380.79	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220105	Project Engineer	96	HR	0.00	51.36	0.00	0.00	4,930.56	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220106	Staff Engineer	220	HR	0.00	68.06	0.00	0.00	14,972.74	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220106	Staff Engineer	660	HR	0.00	68.06	0.00	0.00	44,918.22	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220110	QA/QC Officer	51	HR	0.00	57.89	0.00	0.00	2,952.33	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220110	QA/QC Officer	99	HR	0.00	57.89	0.00	0.00	5,730.99	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220114	Word Processing/Clerical	160	HR	0.00	29.76	0.00	0.00	4,760.89	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220114	Word Processing/Clerical	400	HR	0.00	29.76	0.00	0.00	11,902.22	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220114	Word Processing/Clerical	96	HR	0.00	29.76	0.00	0.00	2,856.53	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220115	Draftsman/CADD	48	HR	0.00	32.66	0.00	0.00	1,567.55	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220115	Draftsman/CADD	370	HR	0.00	32.66	0.00	0.00	12,083.18	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220115	Draftsman/CADD	500	HR	0.00	32.66	0.00	0.00	16,328.62	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220120	Computer Data Entry	200	HR	0.00	29.76	0.00	0.00	5,951.11	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220213	Surveying - 3-man Crew	4	DAY	0.00	766.04	15.32	0.00	3,125.46	FALSE	FALSE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33220503	Attorney, Partner, Real Estate	30	HR	0.00	197.37	0.00	0.00	5,921.04	FALSE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33240101	Other Direct Costs	1	LS	406.94	0.00	0.00	0.00	406.94	TRUE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33240101	Other Direct Costs	1	LS	1,364.51	0.00	0.00	0.00	1,364.51	TRUE	TRUE
III - LUCs - Medium Intensity - SENSITIVITY	Administrative Land Use Controls	33240101	Other Direct Costs	1	LS	2,490.17	0.00	0.00	0.00	2,490.17	TRUE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33020401	Disposable Materials per Sample	29	EA	9.50	0.00	0.00	0.00	275.58	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33020402	Decontamination Materials per Sample	29	EA	12.40	0.00	0.00	0.00	359.66	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33020561	Lysimeter accessories, nylon tubing, 1/4" OD	505	LF	0.14	0.00	0.00	0.00	72.67	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	4	WK	0.00	0.00	0.00	332.10	1,328.40	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021603	Testing, dissolved solids	29	EA	0.00	0.00	0.00	21.18	614.10	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021604	Testing, suspended solids	29	EA	0.00	0.00	0.00	16.57	480.61	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021620	Testing, TAL metals (6010/7000s)	29	EA	0.00	0.00	0.00	260.88	7,565.52	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021803	Testing, non-rad lab tests, tentative id of compounds GC/MS 30/5040/8240	29	EA	0.00	0.00	0.00	69.01	2,001.20	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	1320	LB	0.00	0.00	0.00	4.25	5,611.16	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022124	Testing, RCRA evaluations, EP toxicity analysis, metals (6010,7470)	1	EA	0.00	0.00	0.00	129.35	129.35	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022130	Testing, cyanide (SW9010) with prep	29	EA	0.00	0.00	0.00	59.47	1,724.57	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022131	Testing, purgeable halocarbons (SW5030/8010)	29	EA	0.00	0.00	0.00	156.51	4,538.82	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022133	Testing, pesticides/PCBs (SW3510/SW8080)	29	EA	0.00	0.00	0.00	237.23	6,879.74	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022135	Testing, base neutral & acid extractable organics (SW3510/SW8270)	29	EA	0.00	0.00	0.00	517.52	15,008.15	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022149	Testing, chlorinated phenoxy herbicides (SW3510/SW8150)	29	EA	0.00	0.00	0.00	304.43	8,828.33	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220102	Project Manager	10	HR	0.00	70.35	0.00	0.00	703.55	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220102	Project Manager	7	HR	0.00	70.35	0.00	0.00	492.48	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220108	Project Scientist	64	HR	0.00	71.27	0.00	0.00	4,561.39	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220110	QA/QC Officer	18	HR	0.00	70.60	0.00	0.00	1,270.73	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220112	Field Technician	32	HR	0.00	42.21	0.00	0.00	1,350.61	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220112	Field Technician	116	HR	0.00	42.21	0.00	0.00	4,895.95	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220112	Field Technician	2	HR	0.00	42.21	0.00	0.00	84.41	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220114	Word Processing/Clerical	14	HR	0.00	36.29	0.00	0.00	508.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220115	Draftsman/CADD	10	HR	0.00	39.83	0.00	0.00	398.26	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33230614	Peristaltic Pump, Weekly Rental	4	WK	0.00	0.00	0.00	79.34	317.35	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33240101	Other Direct Costs	1	LS	316.59	0.00	0.00	0.00	316.59	TRUE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33020401	Disposable Materials per Sample	29	EA	9.50	0.00	0.00	0.00	275.58	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33020402	Decontamination Materials per Sample	29	EA	12.40	0.00	0.00	0.00	359.66	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33020561	Lysimeter accessories, nylon tubing, 1/4" OD	1465	LF	0.14	0.00	0.00	0.00	210.83	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	4	WK	0.00	0.00	0.00	332.10	1,328.40	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021603	Testing, dissolved solids	29	EA	0.00	0.00	0.00	21.18	614.10	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021604	Testing, suspended solids	29	EA	0.00	0.00	0.00	16.57	480.61	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021620	Testing, TAL metals (6010/7000s)	29	EA	0.00	0.00	0.00	260.88	7,565.52	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021803	Testing, non-rad lab tests, tentative id of compounds GC/MS 30/5040/8240	29	EA	0.00	0.00	0.00	69.01	2,001.20	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	1320	LB	0.00	0.00	0.00	4.25	5,611.16	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022124	Testing, RCRA evaluations, EP toxicity analysis, metals (6010,7470)	1	EA	0.00	0.00	0.00	129.35	129.35	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022130	Testing, cyanide (SW9010) with prep	29	EA	0.00	0.00	0.00	59.47	1,724.57	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022131	Testing, purgeable halocarbons (SW5030/8010)	29	EA	0.00	0.00	0.00	156.51	4,538.82	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022133	Testing, pesticides/PCBs (SW3510/SW8080)	29	EA	0.00	0.00	0.00	237.23	6,879.74	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022135	Testing, base neutral & acid extractable organics (SW3510/SW8270)	29	EA	0.00	0.00	0.00	517.52	15,008.15	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022149	Testing, chlorinated phenoxy herbicides (SW3510/SW8150)	29	EA	0.00	0.00	0.00	304.43	8,828.33	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220102	Project Manager	10	HR	0.00	70.35	0.00	0.00	703.55	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220102	Project Manager	7	HR	0.00	70.35	0.00	0.00	492.48	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220108	Project Scientist	64	HR	0.00	71.27	0.00	0.00	4,561.39	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE

Phase Name	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	Cost Override	Duplications
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220110	QA/QC Officer	18	HR	0.00	70.60	0.00	0.00	1,270.73	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220112	Field Technician	2	HR	0.00	42.21	0.00	0.00	84.41	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220112	Field Technician	32	HR	0.00	42.21	0.00	0.00	1,350.61	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220112	Field Technician	116	HR	0.00	42.21	0.00	0.00	4,895.95	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220114	Word Processing/Clerical	14	HR	0.00	36.29	0.00	0.00	508.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220115	Draftsman/CADD	10	HR	0.00	39.83	0.00	0.00	398.26	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33230614	Peristaltic Pump, Weekly Rental	4	WK	0.00	0.00	0.00	79.34	317.35	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33240101	Other Direct Costs	1	LS	316.59	0.00	0.00	0.00	316.59	TRUE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33020401	Disposable Materials per Sample	9	EA	9.50	0.00	0.00	0.00	85.52	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33020402	Decontamination Materials per Sample	9	EA	12.40	0.00	0.00	0.00	111.62	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33020561	Lysimeter accessories, nylon tubing, 1/4" OD	145	LF	0.14	0.00	0.00	0.00	20.87	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	1	WK	0.00	0.00	0.00	332.10	332.10	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021603	Testing, dissolved solids	9	EA	0.00	0.00	0.00	21.18	190.58	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021604	Testing, suspended solids	9	EA	0.00	0.00	0.00	16.57	149.16	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021620	Testing, TAL metals (6010/7000s)	9	EA	0.00	0.00	0.00	260.88	2,347.92	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021803	Testing, non-rad lab tests, tentative id of compounds GC/MS 30/5040/8240	9	EA	0.00	0.00	0.00	69.01	621.06	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	420	LB	0.00	0.00	0.00	4.25	1,785.37	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022124	Testing, RCRA evaluations, EP toxicity analysis, metals (6010,7470)	1	EA	0.00	0.00	0.00	129.35	129.35	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022130	Testing, cyanide (SW9010) with prep	9	EA	0.00	0.00	0.00	59.47	535.21	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022131	Testing, purgeable halocarbons (SW5030/8010)	9	EA	0.00	0.00	0.00	156.51	1,408.60	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022133	Testing, pesticides/PCBs (SW3510/SW8080)	9	EA	0.00	0.00	0.00	237.23	2,135.09	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022135	Testing, base neutral & acid extractable organics (SW3510/SW8270)	9	EA	0.00	0.00	0.00	517.52	4,657.70	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022149	Testing, chlorinated phenoxy herbicides (SW3510/SW8150)	9	EA	0.00	0.00	0.00	304.43	2,739.82	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33190403	DOT steel drums, 55 gal., closed only, 17H	3	EA	62.82	0.00	0.00	0.00	188.47	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220102	Project Manager	9	HR	0.00	70.35	0.00	0.00	633.19	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220102	Project Manager	3	HR	0.00	70.35	0.00	0.00	211.06	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220108	Project Scientist	56	HR	0.00	71.27	0.00	0.00	3,991.21	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220110	QA/QC Officer	17	HR	0.00	70.60	0.00	0.00	1,200.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220112	Field Technician	1	HR	0.00	42.21	0.00	0.00	42.21	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220112	Field Technician	8	HR	0.00	42.21	0.00	0.00	337.65	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220112	Field Technician	36	HR	0.00	42.21	0.00	0.00	1,519.43	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220114	Word Processing/Clerical	13	HR	0.00	36.29	0.00	0.00	471.73	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220115	Draftsman/CADD	9	HR	0.00	39.83	0.00	0.00	358.43	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33230614	Peristaltic Pump, Weekly Rental	1	WK	0.00	0.00	0.00	79.34	79.34	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33240101	Other Direct Costs	1	LS	295.85	0.00	0.00	0.00	295.85	TRUE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33020401	Disposable Materials per Sample	9	EA	9.50	0.00	0.00	0.00	85.52	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33020402	Decontamination Materials per Sample	9	EA	12.40	0.00	0.00	0.00	111.62	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33020561	Lysimeter accessories, nylon tubing, 1/4" OD	385	LF	0.14	0.00	0.00	0.00	55.41	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	1	WK	0.00	0.00	0.00	332.10	332.10	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021603	Testing, dissolved solids	9	EA	0.00	0.00	0.00	21.18	190.58	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021604	Testing, suspended solids	9	EA	0.00	0.00	0.00	16.57	149.16	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021610	Testing, cyanide	9	EA	0.00	0.00	0.00	40.28	362.55	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021620	Testing, TAL metals (6010/7000s)	9	EA	0.00	0.00	0.00	260.88	2,347.92	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33021803	Testing, non-rad lab tests, tentative id of compounds GC/MS 30/5040/8240	9	EA	0.00	0.00	0.00	69.01	621.06	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	420	LB	0.00	0.00	0.00	4.25	1,785.37	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022124	Testing, RCRA evaluations, EP toxicity analysis, metals (6010,7470)	1	EA	0.00	0.00	0.00	129.35	129.35	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022131	Testing, purgeable halocarbons (SW5030/8010)	9	EA	0.00	0.00	0.00	156.51	1,408.60	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022133	Testing, pesticides/PCBs (SW3510/SW8080)	9	EA	0.00	0.00	0.00	237.23	2,135.09	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022135	Testing, base neutral & acid extractable organics (SW3510/SW8270)	9	EA	0.00	0.00	0.00	517.52	4,657.70	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33022149	Testing, chlorinated phenoxy herbicides (SW3510/SW8150)	9	EA	0.00	0.00	0.00	304.43	2,739.82	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33190403	DOT steel drums, 55 gal., closed only, 17H	8	EA	62.82	0.00	0.00	0.00	502.58	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220102	Project Manager	9	HR	0.00	70.35	0.00	0.00	633.19	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220102	Project Manager	3	HR	0.00	70.35	0.00	0.00	211.06	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220108	Project Scientist	56	HR	0.00	71.27	0.00	0.00	3,991.21	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220110	QA/QC Officer	17	HR	0.00	70.60	0.00	0.00	1,200.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220112	Field Technician	36	HR	0.00	42.21	0.00	0.00	1,519.43	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220112	Field Technician	8	HR	0.00	42.21	0.00	0.00	337.65	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220112	Field Technician	1	HR	0.00	42.21	0.00	0.00	42.21	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220114	Word Processing/Clerical	13	HR	0.00	36.29	0.00	0.00	471.73	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33220115	Draftsman/CADD	9	HR	0.00	39.83	0.00	0.00	358.43	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33230614	Peristaltic Pump, Weekly Rental	1	WK	0.00	0.00	0.00	79.34	79.34	FALSE	TRUE
I - Monitor Groundwater - 30 yr Extensive analysis	Monitoring	33240101	Other Direct Costs	1	LS	295.85	0.00	0.00	0.00	295.85	TRUE	TRUE

Phase Name	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	Cost Override	Duplications
IV - 5YR - Medium Intensity - SENSITIVITY	Five-Year Review	33220102	Project Manager	12	HR	0.00	70.35	0.00	0.00	844.26	FALSE	TRUE
IV - 5YR - Medium Intensity - SENSITIVITY	Five-Year Review	33220102	Project Manager	12	HR	0.00	70.35	0.00	0.00	844.26	FALSE	TRUE
IV - 5YR - Medium Intensity - SENSITIVITY	Five-Year Review	33220102	Project Manager	15	HR	0.00	70.35	0.00	0.00	1,055.32	FALSE	TRUE
IV - 5YR - Medium Intensity - SENSITIVITY	Five-Year Review	33220102	Project Manager	12	HR	0.00	70.35	0.00	0.00	844.26	FALSE	TRUE
IV - 5YR - Medium Intensity - SENSITIVITY	Five-Year Review	33220105	Project Engineer	31	HR	0.00	62.63	0.00	0.00	1,941.66	FALSE	TRUE
IV - 5YR - Medium Intensity - SENSITIVITY	Five-Year Review	33220105	Project Engineer	23	HR	0.00	62.63	0.00	0.00	1,440.58	FALSE	TRUE
IV - 5YR - Medium Intensity - SENSITIVITY	Five-Year Review	33220105	Project Engineer	15	HR	0.00	62.63	0.00	0.00	939.51	FALSE	TRUE
IV - 5YR - Medium Intensity - SENSITIVITY	Five-Year Review	33220108	Project Scientist	25	HR	0.00	71.27	0.00	0.00	1,781.79	FALSE	TRUE
IV - 5YR - Medium Intensity - SENSITIVITY	Five-Year Review	33220108	Project Scientist	19	HR	0.00	71.27	0.00	0.00	1,354.16	FALSE	TRUE
IV - 5YR - Medium Intensity - SENSITIVITY	Five-Year Review	33220108	Project Scientist	11	HR	0.00	71.27	0.00	0.00	783.99	FALSE	TRUE
IV - 5YR - Medium Intensity - SENSITIVITY	Five-Year Review	33220109	Staff Scientist	23	HR	0.00	40.73	0.00	0.00	936.71	FALSE	TRUE
IV - 5YR - Medium Intensity - SENSITIVITY	Five-Year Review	33220109	Staff Scientist	50	HR	0.00	40.73	0.00	0.00	2,036.33	FALSE	TRUE
IV - 5YR - Medium Intensity - SENSITIVITY	Five-Year Review	33220109	Staff Scientist	20	HR	0.00	40.73	0.00	0.00	814.53	FALSE	TRUE
V - LUC O&M -Semiannual	Administrative Land Use Controls	33010202	Per Diem (per person)	4	DAY	0.00	0.00	0.00	165.00	660.00	TRUE	TRUE
V - LUC O&M -Semiannual	Administrative Land Use Controls	33022038	Overnight delivery service, 1 lb package	6	LB	0.00	0.00	0.00	41.49	248.94	FALSE	TRUE
V - LUC O&M -Semiannual	Administrative Land Use Controls	33220102	Project Manager	58	HR	0.00	70.35	0.00	0.00	4,080.58	FALSE	TRUE
V - LUC O&M -Semiannual	Administrative Land Use Controls	33220106	Staff Engineer	146	HR	0.00	68.06	0.00	0.00	9,936.46	FALSE	TRUE
V - LUC O&M -Semiannual	Administrative Land Use Controls	33220110	QA/QC Officer	24	HR	0.00	57.89	0.00	0.00	1,389.33	FALSE	TRUE
V - LUC O&M -Semiannual	Administrative Land Use Controls	33220112	Field Technician	1	HR	0.00	42.21	0.00	0.00	42.21	FALSE	TRUE
V - LUC O&M -Semiannual	Administrative Land Use Controls	33220114	Word Processing/Clerical	52	HR	0.00	29.76	0.00	0.00	1,547.29	FALSE	TRUE
V - LUC O&M -Semiannual	Administrative Land Use Controls	33220115	Draftsman/CADD	32	HR	0.00	32.66	0.00	0.00	1,045.03	FALSE	TRUE
V - LUC O&M -Semiannual	Administrative Land Use Controls	33220119	Health and Safety Officer	1	HR	0.00	51.74	0.00	0.00	51.74	FALSE	TRUE
V - LUC O&M -Semiannual	Administrative Land Use Controls	33240101	Other Direct Costs	1	LS	452.32	0.00	0.00	0.00	452.32	TRUE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	18010412	Construction Signs	18	SF	19.82	0.00	0.00	0.00	356.68	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33010202	Per Diem (per person)	3	DAY	0.00	0.00	0.00	165.00	495.00	TRUE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33022037	Overnight Delivery, 8 oz Letter	8	EA	0.00	0.00	0.00	13.00	103.97	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33040671	Portable GPS Set with Mapping, 5 cm Accuracy	1	MO	773.35	0.00	0.00	0.00	773.35	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220102	Project Manager	60	HR	0.00	57.69	0.00	0.00	3,461.46	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220102	Project Manager	60	HR	0.00	57.69	0.00	0.00	3,461.46	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220102	Project Manager	82	HR	0.00	57.69	0.00	0.00	4,730.66	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220105	Project Engineer	210	HR	0.00	51.36	0.00	0.00	10,785.60	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220105	Project Engineer	135	HR	0.00	51.36	0.00	0.00	6,933.60	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220106	Staff Engineer	165	HR	0.00	68.06	0.00	0.00	11,229.55	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220106	Staff Engineer	495	HR	0.00	68.06	0.00	0.00	33,688.66	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220110	QA/QC Officer	75	HR	0.00	57.89	0.00	0.00	4,341.66	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220110	QA/QC Officer	39	HR	0.00	57.89	0.00	0.00	2,257.66	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220114	Word Processing/Clerical	300	HR	0.00	29.76	0.00	0.00	8,926.67	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220114	Word Processing/Clerical	48	HR	0.00	29.76	0.00	0.00	1,428.27	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220114	Word Processing/Clerical	120	HR	0.00	29.76	0.00	0.00	3,570.67	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220115	Draftsman/CADD	375	HR	0.00	32.66	0.00	0.00	12,246.47	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220115	Draftsman/CADD	278	HR	0.00	32.66	0.00	0.00	9,078.71	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220115	Draftsman/CADD	24	HR	0.00	32.66	0.00	0.00	783.77	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220120	Computer Data Entry	150	HR	0.00	29.76	0.00	0.00	4,463.33	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220212	Surveying - 2-man Crew	3	DAY	0.00	766.04	15.32	0.00	2,344.09	FALSE	FALSE
III - LUCs - Low Intensity	Administrative Land Use Controls	33220503	Attorney, Partner, Real Estate	22	HR	0.00	197.37	0.00	0.00	4,342.09	FALSE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33240101	Other Direct Costs	1	LS	1,024.87	0.00	0.00	0.00	1,024.87	TRUE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33240101	Other Direct Costs	1	LS	141.84	0.00	0.00	0.00	141.84	TRUE	TRUE
III - LUCs - Low Intensity	Administrative Land Use Controls	33240101	Other Direct Costs	1	LS	1,867.99	0.00	0.00	0.00	1,867.99	TRUE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33020401	Disposable Materials per Sample	29	EA	9.50	0.00	0.00	0.00	275.58	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33020402	Decontamination Materials per Sample	29	EA	12.40	0.00	0.00	0.00	359.66	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33020561	Lysimeter accessories, nylon tubing, 1/4" OD	505	LF	0.14	0.00	0.00	0.00	72.67	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	4	WK	0.00	0.00	0.00	332.10	1,328.40	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021603	Testing, dissolved solids	29	EA	0.00	0.00	0.00	21.18	614.10	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021604	Testing, suspended solids	29	EA	0.00	0.00	0.00	16.57	480.61	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021610	Testing, cyanide	29	EA	0.00	0.00	0.00	40.28	1,168.23	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021620	Testing, TAL metals (6010/7000s)	29	EA	0.00	0.00	0.00	260.88	7,565.52	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021803	Testing, non-rad lab tests, tentative id of compounds GC/MS 30/5040/8240	29	EA	0.00	0.00	0.00	69.01	2,001.20	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	1320	LB	0.00	0.00	0.00	4.25	5,611.16	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33022124	Testing, RCRA evaluations, EP toxicity analysis, metals (6010,7470)	1	EA	0.00	0.00	0.00	129.35	129.35	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33022135	Testing, base neutral & acid extractable organics (SW3510/SW8270)	29	EA	0.00	0.00	0.00	517.52	15,008.15	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220102	Project Manager	7	HR	0.00	70.35	0.00	0.00	492.48	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220102	Project Manager	10	HR	0.00	70.35	0.00	0.00	703.55	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220108	Project Scientist	64	HR	0.00	71.27	0.00	0.00	4,561.39	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220110	QA/QC Officer	18	HR	0.00	70.60	0.00	0.00	1,270.73	FALSE	TRUE

Phase Name	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	Cost Override	Duplications
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220112	Field Technician	116	HR	0.00	42.21	0.00	0.00	4,895.95	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220112	Field Technician	32	HR	0.00	42.21	0.00	0.00	1,350.61	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220112	Field Technician	2	HR	0.00	42.21	0.00	0.00	84.41	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220114	Word Processing/Clerical	14	HR	0.00	36.29	0.00	0.00	508.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220115	Draftsman/CADD	10	HR	0.00	39.83	0.00	0.00	398.26	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33230614	Peristaltic Pump, Weekly Rental	4	WK	0.00	0.00	0.00	79.34	317.35	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33240101	Other Direct Costs	1	LS	316.59	0.00	0.00	0.00	316.59	TRUE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33020401	Disposable Materials per Sample	29	EA	9.50	0.00	0.00	0.00	275.58	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33020402	Decontamination Materials per Sample	29	EA	12.40	0.00	0.00	0.00	359.66	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33020561	Lysimeter accessories, nylon tubing, 1/4" OD	1465	LF	0.14	0.00	0.00	0.00	210.83	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	4	WK	0.00	0.00	0.00	332.10	1,328.40	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021603	Testing, dissolved solids	29	EA	0.00	0.00	0.00	21.18	614.10	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021604	Testing, suspended solids	29	EA	0.00	0.00	0.00	16.57	480.61	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021610	Testing, cyanide	29	EA	0.00	0.00	0.00	40.28	1,168.23	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021620	Testing, TAL metals (6010/7000s)	29	EA	0.00	0.00	0.00	260.88	7,565.52	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021803	Testing, non-rad lab tests, tentative id of compounds GC/MS 30/5040/8240	29	EA	0.00	0.00	0.00	69.01	2,001.20	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	1320	LB	0.00	0.00	0.00	4.25	5,611.16	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33022124	Testing, RCRA evaluations, EP toxicity analysis, metals (6010,7470)	1	EA	0.00	0.00	0.00	129.35	129.35	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33022135	Testing, base neutral & acid extractable organics (SW3510/SW8270)	29	EA	0.00	0.00	0.00	517.52	15,008.15	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220102	Project Manager	7	HR	0.00	70.35	0.00	0.00	492.48	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220102	Project Manager	10	HR	0.00	70.35	0.00	0.00	703.55	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220108	Project Scientist	64	HR	0.00	71.27	0.00	0.00	4,561.39	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220110	QA/QC Officer	18	HR	0.00	70.60	0.00	0.00	1,270.73	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220112	Field Technician	2	HR	0.00	42.21	0.00	0.00	84.41	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220112	Field Technician	32	HR	0.00	42.21	0.00	0.00	1,350.61	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220112	Field Technician	116	HR	0.00	42.21	0.00	0.00	4,895.95	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220114	Word Processing/Clerical	14	HR	0.00	36.29	0.00	0.00	508.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220115	Draftsman/CADD	10	HR	0.00	39.83	0.00	0.00	398.26	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33230614	Peristaltic Pump, Weekly Rental	4	WK	0.00	0.00	0.00	79.34	317.35	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33240101	Other Direct Costs	1	LS	316.59	0.00	0.00	0.00	316.59	TRUE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33020401	Disposable Materials per Sample	9	EA	9.50	0.00	0.00	0.00	85.52	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33020402	Decontamination Materials per Sample	9	EA	12.40	0.00	0.00	0.00	111.62	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33020561	Lysimeter accessories, nylon tubing, 1/4" OD	145	LF	0.14	0.00	0.00	0.00	20.87	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	1	WK	0.00	0.00	0.00	332.10	332.10	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021603	Testing, dissolved solids	9	EA	0.00	0.00	0.00	21.18	190.58	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021604	Testing, suspended solids	9	EA	0.00	0.00	0.00	16.57	149.16	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021610	Testing, cyanide	9	EA	0.00	0.00	0.00	40.28	362.55	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021620	Testing, TAL metals (6010/7000s)	9	EA	0.00	0.00	0.00	260.88	2,347.92	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021803	Testing, non-rad lab tests, tentative id of compounds GC/MS 30/5040/8240	9	EA	0.00	0.00	0.00	69.01	621.06	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	420	LB	0.00	0.00	0.00	4.25	1,785.37	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33022124	Testing, RCRA evaluations, EP toxicity analysis, metals (6010,7470)	1	EA	0.00	0.00	0.00	129.35	129.35	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33022135	Testing, base neutral & acid extractable organics (SW3510/SW8270)	9	EA	0.00	0.00	0.00	517.52	4,657.70	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33190403	DOT steel drums, 55 gal., closed only, 17H	3	EA	62.82	0.00	0.00	0.00	188.47	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220102	Project Manager	9	HR	0.00	70.35	0.00	0.00	633.19	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220102	Project Manager	3	HR	0.00	70.35	0.00	0.00	211.06	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220108	Project Scientist	56	HR	0.00	71.27	0.00	0.00	3,991.21	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220110	QA/QC Officer	17	HR	0.00	70.60	0.00	0.00	1,200.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220112	Field Technician	8	HR	0.00	42.21	0.00	0.00	337.65	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220112	Field Technician	1	HR	0.00	42.21	0.00	0.00	42.21	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220112	Field Technician	36	HR	0.00	42.21	0.00	0.00	1,519.43	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220114	Word Processing/Clerical	13	HR	0.00	36.29	0.00	0.00	471.73	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220115	Draftsman/CADD	9	HR	0.00	39.83	0.00	0.00	358.43	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33230614	Peristaltic Pump, Weekly Rental	1	WK	0.00	0.00	0.00	79.34	79.34	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33240101	Other Direct Costs	1	LS	295.85	0.00	0.00	0.00	295.85	TRUE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33020401	Disposable Materials per Sample	9	EA	9.50	0.00	0.00	0.00	85.52	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33020402	Decontamination Materials per Sample	9	EA	12.40	0.00	0.00	0.00	111.62	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33020561	Lysimeter accessories, nylon tubing, 1/4" OD	385	LF	0.14	0.00	0.00	0.00	55.41	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	1	WK	0.00	0.00	0.00	332.10	332.10	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021603	Testing, dissolved solids	9	EA	0.00	0.00	0.00	21.18	190.58	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021604	Testing, suspended solids	9	EA	0.00	0.00	0.00	16.57	149.16	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021620	Testing, TAL metals (6010/7000s)	9	EA	0.00	0.00	0.00	260.88	2,347.92	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33021803	Testing, non-rad lab tests, tentative id of compounds GC/MS 30/5040/8240	9	EA	0.00	0.00	0.00	69.01	621.06	FALSE	TRUE

Phase Name	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	Cost Override	Duplications
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	420	LB	0.00	0.00	0.00	4.25	1,785.37	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33022124	Testing, RCRA evaluations, EP toxicity analysis, metals (6010,7470)	1	EA	0.00	0.00	0.00	129.35	129.35	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33022130	Testing, cyanide (SW9010) with prep	9	EA	0.00	0.00	0.00	59.47	535.21	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33022135	Testing, base neutral & acid extractable organics (SW3510/SW8270)	9	EA	0.00	0.00	0.00	517.52	4,657.70	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33190403	DOT steel drums, 55 gal., closed only, 17H	8	EA	62.82	0.00	0.00	0.00	502.58	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220102	Project Manager	9	HR	0.00	70.35	0.00	0.00	633.19	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220102	Project Manager	3	HR	0.00	70.35	0.00	0.00	211.06	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220108	Project Scientist	56	HR	0.00	71.27	0.00	0.00	3,991.21	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220110	QA/QC Officer	17	HR	0.00	70.60	0.00	0.00	1,200.13	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220112	Field Technician	1	HR	0.00	42.21	0.00	0.00	42.21	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220112	Field Technician	8	HR	0.00	42.21	0.00	0.00	337.65	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220112	Field Technician	36	HR	0.00	42.21	0.00	0.00	1,519.43	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220114	Word Processing/Clerical	13	HR	0.00	36.29	0.00	0.00	471.73	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33220115	Draftsman/CADD	9	HR	0.00	39.83	0.00	0.00	358.43	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33230614	Peristaltic Pump, Weekly Rental	1	WK	0.00	0.00	0.00	79.34	79.34	FALSE	TRUE
I - Monitor Groundwater - 30 yr Limited analysis	Monitoring	33240101	Other Direct Costs	1	LS	295.85	0.00	0.00	0.00	295.85	TRUE	TRUE
V - LUC O&M - Biannual	Administrative Land Use Controls	33010202	Per Diem (per person)	2	DAY	0.00	0.00	0.00	165.00	330.00	TRUE	TRUE
V - LUC O&M - Biannual	Administrative Land Use Controls	33022038	Overnight delivery service, 1 lb package	3	LB	0.00	0.00	0.00	41.49	124.47	FALSE	TRUE
V - LUC O&M - Biannual	Administrative Land Use Controls	33220102	Project Manager	20	HR	0.00	70.35	0.00	0.00	1,407.10	FALSE	TRUE
V - LUC O&M - Biannual	Administrative Land Use Controls	33220106	Staff Engineer	73	HR	0.00	68.06	0.00	0.00	4,968.23	FALSE	TRUE
V - LUC O&M - Biannual	Administrative Land Use Controls	33220110	QA/QC Officer	6	HR	0.00	57.89	0.00	0.00	347.33	FALSE	TRUE
V - LUC O&M - Biannual	Administrative Land Use Controls	33220114	Word Processing/Clerical	26	HR	0.00	29.76	0.00	0.00	773.64	FALSE	TRUE
V - LUC O&M - Biannual	Administrative Land Use Controls	33220115	Draftsman/CADD	16	HR	0.00	32.66	0.00	0.00	522.52	FALSE	TRUE
V - LUC O&M - Biannual	Administrative Land Use Controls	33220119	Health and Safety Officer	1	HR	0.00	51.74	0.00	0.00	51.74	FALSE	TRUE
V - LUC O&M - Biannual	Administrative Land Use Controls	33240101	Other Direct Costs	1	LS	201.76	0.00	0.00	0.00	201.76	TRUE	TRUE
V - LUC O&M - Annual	Administrative Land Use Controls	33010202	Per Diem (per person)	2	DAY	0.00	0.00	0.00	165.00	330.00	TRUE	TRUE
V - LUC O&M - Annual	Administrative Land Use Controls	33022038	Overnight delivery service, 1 lb package	3	LB	0.00	0.00	0.00	41.49	124.47	FALSE	TRUE
V - LUC O&M - Annual	Administrative Land Use Controls	33220102	Project Manager	20	HR	0.00	70.35	0.00	0.00	1,407.10	FALSE	TRUE
V - LUC O&M - Annual	Administrative Land Use Controls	33220106	Staff Engineer	73	HR	0.00	68.06	0.00	0.00	4,968.23	FALSE	TRUE
V - LUC O&M - Annual	Administrative Land Use Controls	33220110	QA/QC Officer	6	HR	0.00	57.89	0.00	0.00	347.33	FALSE	TRUE
V - LUC O&M - Annual	Administrative Land Use Controls	33220114	Word Processing/Clerical	26	HR	0.00	29.76	0.00	0.00	773.64	FALSE	TRUE
V - LUC O&M - Annual	Administrative Land Use Controls	33220115	Draftsman/CADD	16	HR	0.00	32.66	0.00	0.00	522.52	FALSE	TRUE
V - LUC O&M - Annual	Administrative Land Use Controls	33220119	Health and Safety Officer	1	HR	0.00	51.74	0.00	0.00	51.74	FALSE	TRUE
V - LUC O&M - Annual	Administrative Land Use Controls	33240101	Other Direct Costs	1	LS	201.76	0.00	0.00	0.00	201.76	TRUE	TRUE
1 - Runoff MU Fencline Removal/ Reuse / Security	Demolition, Fencing	17020225	Remove and Reuse Chain Link Fence, Excludes Hauling	200	LF	0.00	2.66	0.00	0.00	531.22	FALSE	TRUE
1 - Runoff MU Fencline Removal/ Reuse / Security	Fencing	18040101	Security Fence, 10' Galvanized with 3 Strands Barbed Wire	200	LF	27.12	18.15	5.41	0.00	10,136.27	FALSE	TRUE
1 - Runoff MU Fencline Removal/ Reuse / Security	User Defined Estimate	33222008	Security Escort	48	HR	0.00	28.30	0.00	0.00	1,358.60	FALSE	TRUE
3 - Runoff MU to grade using gravel + curb	User Defined Estimate	17030430	Gravel, 6" Lifts	148	CY	13.16	7.86	0.83	0.02	3,236.43	FALSE	TRUE
3 - Runoff MU to grade using gravel + curb	User Defined Estimate	18010201	Concrete Curb, 6" x 6"	120	LF	1.63	1.61	0.00	0.00	389.21	FALSE	TRUE
3 - Runoff MU to grade using gravel + curb	User Defined Estimate	18010207	Concrete Curb, 12" High x 8" Deep	80	LF	5.65	6.20	0.01	0.00	948.73	FALSE	TRUE
2 - Option Runoff French Drain Passive Treatment	User Defined Estimate	19020601	12" x 12" Underground French Drain	230	LF	2.88	16.64	2.01	0.00	4,950.91	FALSE	TRUE
2 - Option Runoff French Drain Passive Treatment	User Defined Estimate	33260901	Plastic, perforated PVC, pipe, 4" diameter, excludes excavation and backfill	230	LF	1.10	8.21	0.51	0.00	2,257.38	FALSE	TRUE
2 - Option Runoff French Drain Passive Treatment	User Defined Estimate	33230403	6" Filter Sock	230	LF	1.05	1.35	1.44	0.00	882.23	FALSE	TRUE
5 - Gravel O&M	User Defined Estimate	18010102	Gravel, Delivered & Dumped	82	CY	23.25	4.13	4.35	0.00	2,601.71	FALSE	TRUE
5 - Gravel O&M	User Defined Estimate	18010102	Gravel, Delivered & Dumped	82	CY	23.25	4.13	4.35	0.00	2,601.71	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33020401	Disposable Materials per Sample	11	EA	9.50	0.00	0.00	0.00	104.53	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33020402	Decontamination Materials per Sample	11	EA	12.40	0.00	0.00	0.00	136.42	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	1	WK	0.00	0.00	0.00	332.10	332.10	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33021603	Testing, dissolved solids	11	EA	0.00	0.00	0.00	21.18	232.93	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33021604	Testing, suspended solids	11	EA	0.00	0.00	0.00	16.57	182.30	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33021620	Testing, TAL metals (6010/7000s)	11	EA	0.00	0.00	0.00	260.88	2,869.68	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	180	LB	0.00	0.00	0.00	4.25	765.16	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33022134	Testing, PAH (SW3510/SW8310)	11	EA	0.00	0.00	0.00	193.47	2,128.17	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33022155	PCBs in Water (Method SW8082)	11	EA	0.00	0.00	0.00	80.67	887.40	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33220102	Project Manager	11	HR	0.00	70.35	0.00	0.00	773.90	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33220102	Project Manager	9	HR	0.00	70.35	0.00	0.00	633.19	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33220108	Project Scientist	56	HR	0.00	71.27	0.00	0.00	3,991.21	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33220110	QA/QC Officer	17	HR	0.00	70.60	0.00	0.00	1,200.13	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33220112	Field Technician	176	HR	0.00	42.21	0.00	0.00	7,428.34	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33220112	Field Technician	32	HR	0.00	42.21	0.00	0.00	1,350.61	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33220112	Field Technician	1	HR	0.00	42.21	0.00	0.00	42.21	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33220114	Word Processing/Clerical	13	HR	0.00	36.29	0.00	0.00	471.73	FALSE	TRUE

Phase Name	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	Cost Override	Duplications
4 - Metals treatment monitoring	Monitoring	33220115	Draftsman/CADD	9	HR	0.00	39.83	0.00	0.00	358.43	FALSE	TRUE
4 - Metals treatment monitoring	Monitoring	33240101	Other Direct Costs	1	LS	295.85	0.00	0.00	0.00	295.85	TRUE	TRUE
1 - Fencline Removal / Reinsall / Security	Demolition, Fencing	17020225	Remove and Reuse Chain Link Fence, Excludes Hauling	600	LF	0.00	2.66	0.00	0.00	1,593.68	FALSE	TRUE
1 - Fencline Removal / Reinsall / Security	Fencing	18040101	Security Fence, 10' Galvanized with 3 Strands Barbed Wire	600	LF	3.00	18.15	5.41	0.00	15,935.91	TRUE	TRUE
1 - Fencline Removal / Reinsall / Security	User Defined Estimate	33222008	Security Escort	168	HR	0.00	28.30	0.00	0.00	4,755.12	FALSE	TRUE
2 - Contaminated Soil Excavation (6in)	Off-site Transportation and Waste Disposal	33190102	Bulk Solid Waste Loading Into Disposal Vehicle or Bulk Disposal Container	233	BCY	1.13	1.12	0.36	0.00	610.12	FALSE	FALSE
2 - Contaminated Soil Excavation (6in)	Off-site Transportation and Waste Disposal	33190205	Transport Bulk Solid Hazardous Waste, Maximum 20 CY (per Mile)	1200	MI	0.00	0.00	0.00	2.05	2,457.54	FALSE	FALSE
2 - Contaminated Soil Excavation (6in)	Off-site Transportation and Waste Disposal	33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1	EA	0.00	0.00	0.00	530.93	530.93	FALSE	FALSE
2 - Contaminated Soil Excavation (6in)	Off-site Transportation and Waste Disposal	33190807	32 Ft. Dump Truck, 6 Mil Liner, disposable	12	EA	48.10	0.00	0.00	0.00	577.19	FALSE	FALSE
2 - Contaminated Soil Excavation (6in)	Off-site Transportation and Waste Disposal	33197270	Landfill Nonhazardous Solid Bulk Waste by CY	233	CY	0.00	0.00	0.00	113.11	26,355.39	FALSE	FALSE
4 - Add 6" topsoil/ gravel	User Defined Estimate	17030430	Gravel, 6" Lifts	111	CY	13.16	7.86	0.83	0.02	2,427.32	FALSE	TRUE
4 - Add 6" topsoil/ gravel	User Defined Estimate	18050301	Loam or topsoil, imported topsoil, 6" deep, furnish and place	122	LCY	27.90	5.28	1.71	0.00	4,256.35	FALSE	FALSE
8 - Vegetative Buffer (32 shrubs), seeding	User Defined Estimate	18050407	Landscaping, Shrubs	1	ACR	1,153.27	1,304.99	342.15	0.00	2,800.41	FALSE	FALSE
8 - Vegetative Buffer (32 shrubs), seeding	User Defined Estimate	18050416	Seeding, Vegetative Cover, Per Square Yard (SY)	667	SY	0.66	0.93	0.00	0.00	1,062.76	FALSE	FALSE
5 - Eco stabilization - trees(30), willows(40)	User Defined Estimate	33111023	Salix bebbiana (Bebb's Willow)	30	EA	20.20	0.00	0.00	0.00	606.08	FALSE	FALSE
5 - Eco stabilization - trees(30), willows(40)	User Defined Estimate	33111028	Plant Trees, includes cover soil (3' Whip)	20	EA	0.00	67.91	8.20	0.00	1,522.24	FALSE	FALSE
5 - Eco stabilization - trees(30), willows(40)	User Defined Estimate	33111029	Plant Trees, includes cover soil (5' Tree)	10	EA	0.00	110.92	13.40	0.00	1,243.17	FALSE	FALSE
5 - Eco stabilization - trees(30), willows(40)	User Defined Estimate	33111032	Weeping Willow 8 - 12"	10	EA	94.10	1.58	0.00	0.00	956.78	FALSE	FALSE
7 - Temp Erosion Control	User Defined Estimate	18050206	Erosion control, silt fence, polypropylene, 3' high, includes 7.5' posts	660	LF	0.87	2.35	0.00	0.00	2,129.85	FALSE	TRUE
3 - Option Runoff French Drain Passive Treatment	User Defined Estimate	19020601	12" x 12" Underground French Drain	230	LF	2.88	16.64	2.01	0.00	4,950.91	FALSE	TRUE
3 - Option Runoff French Drain Passive Treatment	User Defined Estimate	33260901	Plastic, perforated PVC, pipe, 4" diameter, excludes excavation and backfill	230	LF	1.10	8.21	0.51	0.00	2,257.38	FALSE	TRUE
3 - Option Runoff French Drain Passive Treatment	User Defined Estimate	33230403	6" Filter Sock	230	LF	1.05	1.35	1.44	0.00	882.23	FALSE	TRUE
6 - Runoff MU curb install	User Defined Estimate	18010201	Concrete Curb, 6" x 6"	120	LF	1.63	1.61	0.00	0.00	389.21	FALSE	TRUE
6 - Runoff MU curb install	User Defined Estimate	18010207	Concrete Curb, 12" High x 8" Deep	80	LF	5.65	6.20	0.01	0.00	948.73	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33020401	Disposable Materials per Sample	11	EA	9.50	0.00	0.00	0.00	104.53	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33020402	Decontamination Materials per Sample	11	EA	12.40	0.00	0.00	0.00	136.42	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	1	WK	0.00	0.00	0.00	332.10	332.10	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33021603	Testing, dissolved solids	11	EA	0.00	0.00	0.00	21.18	232.93	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33021604	Testing, suspended solids	11	EA	0.00	0.00	0.00	16.57	182.30	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33021620	Testing, TAL metals (6010/7000s)	11	EA	0.00	0.00	0.00	260.88	2,869.68	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	180	LB	0.00	0.00	0.00	4.25	765.16	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33022134	Testing, PAH (SW3510/SW8310)	11	EA	0.00	0.00	0.00	193.47	2,128.17	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33022155	PCBs in Water (Method SW8082)	11	EA	0.00	0.00	0.00	80.67	887.40	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33220102	Project Manager	11	HR	0.00	70.35	0.00	0.00	773.90	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33220102	Project Manager	9	HR	0.00	70.35	0.00	0.00	633.19	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33220108	Project Scientist	56	HR	0.00	71.27	0.00	0.00	3,991.21	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33220110	QA/QC Officer	17	HR	0.00	70.60	0.00	0.00	1,200.13	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33220112	Field Technician	1	HR	0.00	42.21	0.00	0.00	42.21	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33220112	Field Technician	176	HR	0.00	42.21	0.00	0.00	7,428.34	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33220112	Field Technician	32	HR	0.00	42.21	0.00	0.00	1,350.61	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33220114	Word Processing/Clerical	13	HR	0.00	36.29	0.00	0.00	471.73	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33220115	Draftsman/CADD	9	HR	0.00	39.83	0.00	0.00	358.43	FALSE	TRUE
9 - Metals treatment monitoring	Monitoring	33240101	Other Direct Costs	1	LS	295.85	0.00	0.00	0.00	295.85	TRUE	TRUE
1 - Fencline Removal / Reinsall / Security	Demolition, Fencing	17020225	Remove and Reuse Chain Link Fence, Excludes Hauling	600	LF	0.00	2.66	0.00	0.00	1,593.68	FALSE	TRUE
1 - Fencline Removal / Reinsall / Security	Fencing	18040101	Security Fence, 10' Galvanized with 3 Strands Barbed Wire	600	LF	3.00	18.15	5.41	0.00	15,935.91	TRUE	TRUE
1 - Fencline Removal / Reinsall / Security	User Defined Estimate	33222008	Security Escort	168	HR	0.00	28.30	0.00	0.00	4,755.12	FALSE	TRUE
4 - Temp Erosion Control	User Defined Estimate	18050206	Erosion control, silt fence, polypropylene, 3' high, includes 7.5' posts	660	LF	0.87	2.35	0.00	0.00	2,129.85	FALSE	TRUE
2 - French Drain Passive Treatment - 660 ft	User Defined Estimate	18010102	Gravel, Delivered & Dumped	10	CY	23.25	4.13	4.35	0.00	317.28	FALSE	TRUE
2 - French Drain Passive Treatment - 660 ft	User Defined Estimate	19020601	12" x 12" Underground French Drain	320	LF	2.88	16.64	2.01	0.00	6,888.22	FALSE	TRUE
2 - French Drain Passive Treatment - 660 ft	User Defined Estimate	33260416	6" PVC, Schedule 40, Connection Piping	160	LF	8.08	12.47	0.00	0.00	3,287.78	FALSE	FALSE
2 - French Drain Passive Treatment - 660 ft	User Defined Estimate	33260902	Plastic, perforated PVC, pipe, 6" diameter, excludes excavation and backfill	260	LF	2.03	8.59	0.54	0.00	2,899.38	FALSE	FALSE
2 - French Drain Passive Treatment - 660 ft	User Defined Estimate	33230403	6" Filter Sock	300	LF	1.05	1.35	1.44	0.00	1,150.73	FALSE	TRUE
3 - Runoff MU to grade using gravel + curb	User Defined Estimate	17030430	Gravel, 6" Lifts	148	CY	13.16	7.86	0.83	0.02	3,236.43	FALSE	TRUE
3 - Runoff MU to grade using gravel + curb	User Defined Estimate	18010201	Concrete Curb, 6" x 6"	580	LF	1.63	1.61	0.00	0.00	1,881.17	FALSE	TRUE
3 - Runoff MU to grade using gravel + curb	User Defined Estimate	18010207	Concrete Curb, 12" High x 8" Deep	80	LF	5.65	6.20	0.01	0.00	948.73	FALSE	TRUE
5 - 4" Concrete Strip and drainage	User Defined Estimate	18030301	Standard 4" Sidewalk with Mesh, Formed	7920	SF	1.86	3.17	0.00	0.00	39,812.18	FALSE	FALSE
5 - 4" Concrete Strip and drainage	Storm Sewer	17020401	Dump Charges	128.5299988	EA	15.00	0.00	0.00	0.00	1,927.95	TRUE	FALSE
5 - 4" Concrete Strip and drainage	Storm Sewer	17030220	910, 1.25 CY, Wheel Loader	3	HR	0.00	74.84	32.11	0.00	320.86	FALSE	FALSE
5 - 4" Concrete Strip and drainage	Storm Sewer	17030264	Cat 235, 2.5 CY, Soil/Sand with Boulders, Trenching	145.1900024	CY	0.00	1.23	1.14	0.00	344.75	FALSE	FALSE
5 - 4" Concrete Strip and drainage	Storm Sewer	17030284	8 CY, Dump Truck	10	HR	0.00	69.84	47.06	0.00	1,169.00	FALSE	FALSE
5 - 4" Concrete Strip and drainage	Storm Sewer	17030401	950, 3.25 CY, Backfill with Excavated Material	3884.439941	CY	0.00	1.27	1.08	0.00	9,102.84	FALSE	FALSE
5 - 4" Concrete Strip and drainage	Storm Sewer	17030405	950, 3.00 CY, Delivered & Dumped, Backfill with Sand	34.06999969	CY	93.18	6.70	4.33	0.00	3,550.38	FALSE	FALSE
5 - 4" Concrete Strip and drainage	Storm Sewer	17030511	Compact Soil with Vibrating Plate, 2 Passes	109.6299973	ECY	0.00	2.06	0.14	0.00	241.33	FALSE	FALSE
5 - 4" Concrete Strip and drainage	Storm Sewer	17030515	Backfill and compact, by hand, 6" layers, air rammer/tamper	34.06999969	ECY	0.00	10.89	1.11	0.00	408.84	FALSE	FALSE

Phase Name	Technology Name	Assembly No.	Assembly Description	Qty	UOM	Materials	Labor	Equipment	SubBid	Extended Cost	Cost Override	Duplications
5 - 4" Concrete Strip and drainage	Storm Sewer	18020204	27" x 20", 5' Deep Area Drain with Grate	3	EA	1,345.70	1,955.94	39.11	0.00	10,022.24	FALSE	FALSE
5 - 4" Concrete Strip and drainage	Storm Sewer	18040203	Pour & Cure Concrete, Continuous Footing	29.62999916	CY	114.88	56.06	15.96	0.00	5,537.98	FALSE	FALSE
5 - 4" Concrete Strip and drainage	Storm Sewer	19030157	6" Extra Strength, Nonreinforced Concrete Pipe	800	LF	5.59	9.72	0.61	0.00	12,735.73	FALSE	FALSE
6 - Metals treatment monitoring	Monitoring	33020401	Disposable Materials per Sample	25	EA	9.50	0.00	0.00	0.00	237.57	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33020402	Decontamination Materials per Sample	25	EA	12.40	0.00	0.00	0.00	310.05	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33021509	Monitor well sampling equipment, rental, water quality testing parameter device rental	4	WK	0.00	0.00	0.00	332.10	1,328.40	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33021603	Testing, dissolved solids	25	EA	0.00	0.00	0.00	21.18	529.40	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33021604	Testing, suspended solids	25	EA	0.00	0.00	0.00	16.57	414.32	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33021620	Testing, TAL metals (6010/7000s)	25	EA	0.00	0.00	0.00	260.88	6,522.00	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33022043	Overnight delivery service, 51 to 70 lb packages	420	LB	0.00	0.00	0.00	4.25	1,785.37	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33022155	PCBs in Water (Method SW8082)	25	EA	0.00	0.00	0.00	80.67	2,016.82	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33220102	Project Manager	24	HR	0.00	70.35	0.00	0.00	1,688.52	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33220102	Project Manager	10	HR	0.00	70.35	0.00	0.00	703.55	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33220105	Project Engineer	30	HR	0.00	62.63	0.00	0.00	1,879.02	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33220108	Project Scientist	62	HR	0.00	71.27	0.00	0.00	4,418.84	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33220109	Staff Scientist	80	HR	0.00	40.73	0.00	0.00	3,258.13	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33220110	QA/QC Officer	18	HR	0.00	70.60	0.00	0.00	1,270.73	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33220112	Field Technician	2	HR	0.00	42.21	0.00	0.00	84.41	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33220112	Field Technician	400	HR	0.00	42.21	0.00	0.00	16,882.58	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33220112	Field Technician	32	HR	0.00	42.21	0.00	0.00	1,350.61	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33220114	Word Processing/Clerical	14	HR	0.00	36.29	0.00	0.00	508.02	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33220115	Draftsman/CADD	10	HR	0.00	39.83	0.00	0.00	398.26	FALSE	TRUE
6 - Metals treatment monitoring	Monitoring	33240101	Other Direct Costs	1	LS	313.02	0.00	0.00	0.00	313.02	TRUE	TRUE

Filterra™ Cost Worksheet for Alt 2 (Gravel Layer) & 4 (Vegetative Buffer) - French Drain metals treatment system

Filterra™ Capital Cost and Installation

Data

# Filterras (6X6)	1	unit
Treatment Area	0.5	Acre

Capital Costs

Filterra	$10,000.00	delivered
Installation (20% of Capital Costs)	$2,000.00	
Total	**$12,000.00**	

Filterra™ Annual Mantenance Costs

Data

# Filterras	1	units

Maint. Item

Labor Rate ($/hr)	$195.00
Annual man-hours / FT	1
Total Labor ($/yr)	$195.00
Mulch ($/yr))	$20.00
Disposal ($/yr)	$1.00
Total Annual T&M ($/yr)	**$216.00**

Maint.Costs	Maint. Costs	Maint.Costs
Year 1 (Included wth purchase)	Year 2	Year 3
$0.00	$216.00	$216.00

Filterra™ Cost Worksheet for Alt 3 (Concrete Strip) - French Drain metals treatment system

Filterra™ Capital Cost and Installation

Data

# Filterras (6X6)	4	unit
Treatment Area	2	Acre

Capital Costs

Filterra	$40,000.00	delivered
Installation (20% of Capital Costs)	$8,000.00	
Total	**$48,000.00**	

Filterra™ Annual Mantenance Costs

Data

# Filterras	4	units

Maint. Item

Labor Rate ($/hr)	$195.00
Annual man-hours / FT	1
Total Labor ($/yr)	$780.00
Mulch ($/yr))	$80.00
Disposal ($/yr)	$4.00
Total Annual T&M ($/yr)	**$864.00**

Maint.Costs	Maint. Costs	Maint.Costs
Year 1 (Included wth purchase)	Year 2	Year 3
$0.00	$864.00	$864.00

Rule, Rebecca A NWS

From: Peter Evans [pevans@filterra.com]
Sent: Wednesday, April 07, 2010 7:32 AM
To: Rule, Rebecca A NWS
Subject: USACE - Portland Enhanced Application

Hi Rebecca:
Thank you for the email. I am the PNW Sales Engineer for Filterra and will be your contact for your feasibility study in Portland.
Regarding the enhanced treatment regiment, the Filterra Bioretention System can achieve 58% Dissolved Zinc (68% total) and 48% dissolved copper removal (58% total). Exactly what pollutant are you looking to target for removal?
We size and cost out the filterra in Oregon based on the BES Portland SW Manual. As such, we can treat 1/2 acre with our 6'X6' unit. I've attached a sizing table for your use. In terms of cost, I generally use $20,000 Capital Cost per impervious acre treated. I then add about 15% to this for installation or $3000 for a total installed cost of $23,000/acre installed. Our price includes delivery, activation or start up services, the specified tree or shrub, and one free year of maintainance (trash and 3" mulch removal is al we do). The cost of maintenance is about $225/year/unit. Our systems do not need vactor trucks, decanting, dewatering or confined space permits. We access our systems through the tree grate, remove the trash and mulch layer, replace the mulch (medium or coarse fir, hemlock, cedar) and close the tree grate.
Please give me a call later today and we can discuss other needs you may have.

Warm Regards,
Peter Evans
PNW Sales Manager
Filterra Bioretention Systems
(503) 267-3604

APPENDIX E

EPA and DEQ Correspondence on US Moorings FS

E1 - EPA Correspondence

US Moorings FS

From:	Mark Ader
To:	Budai, Christine M NWP
Cc:	Lori Cora; Rene Fuentes; Deb Yamamoto
Subject:	Re: Moorings Update (UNCLASSIFIED)
Date:	Friday, July 22, 2011 10:01:17 AM

Chris, Lori and I have reviewed the revised FS and it is ok to proceed with finalizing the document. Please send me one hard copy and 10 dvds, thanks

Mark Ader
Remedial Project Manager
Environmental Cleanup Office (ECL-115)
U.S. EPA Region 10
1200 6th Ave.
Seattle, WA 98101
Phone 206-553-1849
Fax 206-553-0124
e-mail Ader.Mark@epa.gov

From: "Budai, Christine M NWP" <Christine.M.Budai@usace.army.mil>
To: Mark Ader/R10/USEPA/US@EPA
Date: 07/20/2011 04:00 PM
Subject: Moorings Update (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Hi Mark,
I left voice messages for you to call so I can update you. Attached is the revised FS showing the changes we made to address DEQ comments. In summary, DEQ wanted hot spots identified. We had a discussion with Jim Anderson and Dana and we all agreed that there were no soil hot spots, so we didn't need to add anything to the FS about that. We did all acknowledge that there is a groundwater hot spot, but that it is not going to be addressed by our FS. We added language to the FS explaining the GW hot spot, as defined by DEQ, was to be addressed by others. I've also attached the final RTC spreadsheet for EPA's comments. Please let me know if EPA concurs with the Moorings Upland FS and then we'll finalize, print, and send you some copies. Let me know how many hard copies and discs you need.

Also, I plan to send the Proposed Plan to EPA for review next week, if possible. That means the 30-day review would be from July 25 - Aug 25. It's only 13 pages, so hopefully it won't take you that long to review.
Thanks,
Chris

Classification: UNCLASSIFIED
Caveats: NONE

E2 - DEQ Correspondence

US Moorings FS

From:	ANDERSON Jim M
To:	Budai, Christine M NWP; BAYUK Dana
Cc:	"Ader.Mark@epamail.epa.gov"
Subject:	RE: Letter to DEQ-Corps RTC on Moorings Upland FS (UNCLASSIFIED)
Date:	Friday, August 12, 2011 12:19:24 PM

Chris,
I'd like to discuss 2 thing's in this e-mail: 1) DEQ's limited role in the US Moorings project & 2) DEQ's review of certain portions of the draft final FS.

1) DEQ's role in the US Moorings project
In most upland sites in Portland Harbor, DEQ provides oversight to the upland responsible party in their source control work. At US Moorings, EPA..., not DEQ..., is the lead agency providing oversight to the Corps in this project. DEQ doesn't have a cost recovery agreement with either the Corps or EPA that specifically involves DEQ in the US Moorings project. Most of our previous involvement in the US Moorings project has been related to our work on the neighboring Gasco site. Recently, you & Mark asked DEQ to review state ARARs for the US Moorings FS.

I bring this up because I want to avoid any failed expectations you may have regarding DEQ's involvement in the US Moorings project, especially with regard to State Acceptance (Section 7.1.8 of the FS). As I understand that referenced section of the FS, the Corps & EPA are looking for DEQ acceptance of EPA's selected remedy thru the public comment process reviewing the Proposed Plan. DEQ has a copy of the draft Proposed Plan & we will provide comments on that draft document by the due date you requested, 8/26/11.

That said, our involvement in the upland project efforts is limited. It appears the site is well characterized & the conclusions you came to in the RI, risk assessments, & FS are sound..., but since EPA is the lead agency for the project & we don't have an cost agreement with the Corps..., we haven't reviewed the RI, risk assessment, or FS to any great extent. Rather we're relying on EPA to ensure the adequacy of the work.

Just to be clear, we're fine with EPA in that lead agency role, & we comfortably assume both EPA's work & the Corps' work is sound. However, it should be stated DEQ's involvement in reviewing site-related documents is really focused on the Proposed Plan.
2) DEQ's review of portions of the draft final FS
In my 7/8/11 e-mail to you, I advised you that DEQ was OK with the state ARARs you presented in draft versions of Table 4.1. In my 7/8/11 e-mail, I said the only possible disconnect DEQ & the Corps may have was over the issue of possible hot spots in soil.

In your 7/28/11 letter, you again stated that the risk associated with upland soil does not meet the definition of a hot spot. As I said in my 7/8/11 e-mail, if soil contamination is below hot spot criteria, then soil contamination at the US Moorings site wouldn't be considered a hot spot. Furthermore, if there is no soil on the site that could be considered hot spot material, then specific state OARs describing soil hot spots shouldn't be included in Table 4.1. I see Table 4.1 in the FS doesn't include soil hot spot OAR references..., & assuming EPA ensured an adequate site RI and risk assessment (which DEQ does comfortably assume)..., DEQ concurs with Table 4.1.

Please call or reply with any questions or concerns.

-----Original Message-----
From: Budai, Christine M NWP [mailto:Christine.M.Budai@usace.army.mil]
Sent: Wednesday, August 10, 2011 3:05 PM
To: ANDERSON Jim M; BAYUK Dana
Subject: RE: Letter to DEQ-Corps RTC on Moorings Upland FS (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Jim,
Yes, Friday the 12th will be fine.
Thanks,
Chris

-----Original Message-----
From: ANDERSON Jim M [mailto:ANDERSON.Jim@deq.state.or.us]
Sent: Wednesday, August 10, 2011 2:52 PM
To: Budai, Christine M NWP; BAYUK Dana
Subject: RE: Letter to DEQ-Corps RTC on Moorings Upland FS (UNCLASSIFIED)

Chris,
Yes we received your response letter, but I haven't made time to look at it yet. Can I get something to you by Friday 8/12?
Jim

-----Original Message-----
From: Budai, Christine M NWP [mailto:Christine.M.Budai@usace.army.mil]
Sent: Wednesday, August 10, 2011 2:44 PM
To: ANDERSON Jim M; BAYUK Dana
Subject: RE: Letter to DEQ-Corps RTC on Moorings Upland FS (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Hi Jim/Dana,
This is a follow-up message to the email below. Did you receive our official response to comment letter in the mail? Can you provide an email and/or letter concurring with our revised FS so we can finalize and send out for distribution? Call if you need to discuss.
Thanks,
Chris Budai
Project Manager
503-808-4725

-----Original Message-----
From: Budai, Christine M NWP
Sent: Thursday, July 28, 2011 4:56 PM
To: ANDERSON Jim M; BAYUK Dana
Cc: Mark Ader; Shaw, Travis C NWS; Gross, Michael J NWP; Craner, Douglas C NWP
Subject: Letter to DEQ-Corps RTC on Moorings Upland FS (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Hi Jim/Dana,
Attached is an advanced copy of the U.S. Army Corps of Engineers response to DEQ's review comments on the US Moorings Uplands Feasibility Study (FS). A hard copy has been mailed to Jim. Also attached is a redlined version of the FS so you can back check revisions made to address your comments. Please reply to this email with your concurrence on the revised FS so that we can finalize for distribution.
Thank you,
Chris Budai
Project Manager
503-808-4725