Former International Paper Facility
Port of Longview Maintenance Facility Area
Longview, Washington

Draft Cleanup Action Plan

Issued by

Washington State Department of Ecology
Hazardous Waste and Toxics Reduction Program
Southwest Regional office
Olympia, Washington

May 1, 2020

Table of Contents

List of Tables

List of Figures

List of Appendices

List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
AAFS	Additional Action Feasibility Study
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
CAP	Cleanup Action Plan
COC	Chemical of Concern
cPAH	carcinogenic Polycyclic Aromatic Hydrocarbon
CPOC	Conditional Point of Compliance
CUL	Cleanup Level
DCA	Disproportionate Cost Analysis
DNAPL	Dense Non-Aqueous Phase Liquid
DRO	Diesel Range Organics
DW	Dangerous Waste
ERH	Electrical Resistance Heating
FS	Feasibility Study
GW	Groundwater
HDPE	High-Density Polyethylene
IC	Institutional Control
IP	International Paper
LNAPL	Light Non-Aqueous Phase Liquid
MFA	Maintenance Facility Area
MNA	Monitored Natural Attenuation
msl	mean sea level

MTCA	Model Toxics Control Act
PAH	Polycyclic Aromatic Hydrocarbon
PCMP	Performance and Compliance Monitoring Plan
PCP	Pentachlorophenol
POC	Point of Compliance
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SVOC	Semivolatile Organic Compound
TSDF	Treatment, Storage, and Disposal Facility
TWP	Treated Wood Products
USEPA	United States Environmental Protection Agency
WAC	Washington Administrative Code

Executive Summary

This document presents the Cleanup Action Plan (CAP) for the Port of Longview Maintenance Facility Area (MFA) at the Former International Paper Facility near Longview, Washington. This CAP was prepared by the Washington State Department of Ecology in collaboration with International Paper Company. This CAP has been prepared to meet the requirements of the Model Toxics Control Cleanup Act (MTCA) administered by Ecology under Chapter 173-340 of the Washington Administrative Code (WAC). This CAP describes Ecology's proposed cleanup action for the MAF (Site) and sets forth the requirements that the cleanup must meet.

The Site is located at the Port of Longview in Longview, Washington on the north side of the Columbia River approximately 66 miles upstream (east) from the Pacific Ocean and less than 2 miles downstream (west) of the confluence of the Columbia River and Cowlitz River.

The area of the MFA is approximately 5 acres. The area north of the MFA is paved and currently is used to store steel products. The area east of the MFA is currently unpaved and vacant. Additional Port of Longview facilities are located south and west of the MFA, including terminals along the shore of the Columbia River. The Columbia River is located approximately 700 feet south of the southern boundary of the MFA.

Between 1937 and 1982, wood treatment operations were conducted in the Treated Wood Products (TWP) Area adjacent to the MFA. Between 1947 and 1953 these operations discharged liquid wastes through a trench that was formerly located northwest of the TWP Area in the area now identified as the MFA. During construction of a subsurface barrier wall at the TWP Area in 1997, potentially impacted soil was observed in three areas outside the barrier wall alignment. Additional investigations were conducted in these areas to delineate the extent of contamination outside the barrier wall. Those investigations and the associated evaluation of possible cleanup action alternatives for the MFA are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report for the Site. This CAP applies to the portions of the MFA where concentrations of contaminants of concern in soil and groundwater exceed applicable cleanup levels.

Based on a detailed review of remedial alternatives, including a Disproportionate Cost Analysis (DCA), Ecology selected soil cleanup Alternative S9 and groundwater cleanup Alternative GW2 as the preferred remedial action. These combined remedial alternatives will minimize the quantity of soil that needs to be removed, allow for solidification of contaminated soil remaining on site, retain the approximate original surface elevations and grades, allow for a reasonable remediation time frame, and maximize the benefit/cost ratio. The selected remedial action complies with MTCA requirements and addresses concerns expressed by International Paper Company, the Port of Longview, and the public.

The selected cleanup action includes limited excavation, removal, and disposal of contaminated soil to allow for the expansion of subsurface soils that will be treated by *in situ* soil solidification. This alternative also allows for deeper excavation and removal of contaminated soil within a utility corridor to allow for future utility work. Following soil excavation and removal, *in situ* soil solidification will be used to treat areas containing Dense Non-Aqueous Phase Liquid (DNAPL) and areas with chemicals of concern (COCs) at concentrations exceeding cleanup levels. This alternative will result in surface elevations and grades at the Site that are approximately the same as the existing elevations and grades.

After soil removal, disposal, solidification, and regrading, groundwater treatment will be implemented. The selected groundwater treatment alternative uses *in situ* chemical oxidation followed by monitored natural attenuation. Chemical oxidation and monitored natural attenuation are treatment technologies that detoxify contaminants through chemical processes that alter the contaminants to less toxic or non-toxic chemicals. Groundwater monitoring will continue until groundwater cleanup levels are achieved.

Because the selected cleanup action would result in hazardous substances remaining on Site, MTCA requires Ecology to consider the likelihood of future site maintenance activities, utility and drainage work, or building construction re-exposing residual hazardous substances, and whether site conditions are likely to change in the foreseeable future. That consideration was factored into Ecology's selection of Alternative S9/GW2.

1.0 Introduction

1.1 Purpose

This document is the Cleanup Action Plan (CAP) for the Maintenance Facility Area (MFA) at the Former International Paper Facility (Site) located in Longview, Washington. The general location of the Site is shown in Figure 1. This CAP has been prepared to meet the requirements of the Model Toxics Control Act (MTCA) administered by the Washington Department of Ecology (Ecology) under Chapter 173-340 of the Washington Administrative Code (WAC). This CAP describes Ecology's proposed cleanup action for this Site and sets forth the requirements that the cleanup must meet.

The purpose of the CAP is to identify the proposed cleanup action for the Site and to provide an explanatory document for public review. More specifically, this plan:

- Describes the Site
- Summarizes current site conditions
- Summarizes the cleanup action alternatives considered in the remedy selection process
- Describes the selected cleanup action for the Site and the rationale for selecting this alternative
- Identifies site-specific cleanup levels and points of compliance for each hazardous substance and medium of concern for the proposed cleanup action
- Identifies applicable state and federal laws for the proposed cleanup action
- Identifies residual contamination remaining on the Site after cleanup
- Describes restrictions on future uses and activities at the Site to ensure continued protection of human health and the environment
- Discusses compliance monitoring requirements
- Presents the schedule for implementing the CAP

Ecology has made a preliminary determination that a cleanup conducted in conformance with this CAP will comply with the requirements for selection of a remedy under WAC 173-340-360.

1.2 Previous Studies

Between 1937 and 1982, wood treatment operations were conducted in the Treated Wood Products (TWP) Area of the Site, adjacent to the MFA. Between 1947 and 1953 these operations discharged liquid wastes through a trench that was formerly located northwest of the TWP Area in the area now called the MFA. Operational changes were made in 1953 that included discontinuing the discharge of liquid wastes outside of the TWP Area. These liquid wastes were subsequently discharged into ponds within the TWP Area. Operations at the TWP Area were discontinued in 1982.

In 1985, the most impacted surface soils at the TWP Area were excavated and removed. In 1989, the remaining impacted soils were capped with a low permeability cover system. Additional cleanup actions were conducted in the TWP Area in 1997 and 1998. These actions included constructing a subsurface barrier wall around the area formerly occupied by treatment operations, capping the area with an additional low permeability cover system, and treating contaminants *in situ* within the area bounded by the subsurface barrier wall.

During installation of the subsurface barrier wall, impacted soils were observed outside the wall alignment within the MFA. Investigations within the area of contamination (AOC) outside the barrier wall were conducted between 1998 and 2000. The activities, findings, and results of these investigations were reported in the following five documents:

- *Investigation of Areas of Soil Impact Outside the Containment Area* (URS 1998)
- *Soil and Groundwater Investigation of Western Area* (URS 2000a)
- *Soil and Groundwater Investigation of Eastern Area* (URS 2000b)
- *Additional Perimeter Boring Investigation Report and Maintenance Facility Work Plan* (URS 2000c)
- *Offsite Investigation Report and Additional Action Feasibility Study* (AAFS) (URS 2000d)

The offsite investigation report and AAFS identified impacted soil and groundwater in an area described as the MFA and evaluated possible remedial alternatives for the area. In 2002, additional cleanup actions were implemented in the MFA with the installation of a biosparging/bioventing treatment system, which operated until June 2008. Monitoring of the MFA is ongoing.

URS Corporation (URS) submitted a draft Remedial Investigation and Feasibility Study (RI/FS) report to Ecology that summarized the above investigation activities, evaluated potential cleanup action alternatives, and recommended preferred cleanup action alternatives on January 19, 2007. Ecology provided comments on this draft RI/FS report on March 19, 2007 and requested additional investigation to further delineate the nature and extent of contamination at specific locations within the MFA. An investigation work plan was subsequently prepared and approved by Ecology. This additional investigation was conducted in September 2008, and the results of this investigation were initially reported in the draft revised RI/FS report dated May 2011. URS performed treatability studies and an additional investigation and evaluation of cleanup action alternatives in response to Ecology comments on the May 2011 draft revised RI/FS report.

Supplemental soil sampling was conducted near the Mechanics Shop, and the results were presented in the Mechanics Shop investigation report. Treatability studies were conducted to evaluate the effectiveness of *in situ* soil solidification and thermal remediation technologies. Draft final revised RI sections of this report were submitted to Ecology in August of 2013, and draft final revised FS sections of this report were submitted to Ecology in February of 2014. Comments on the FS sections were received from Ecology in September of 2014. URS was subsequently acquired by AECOM Technical Services Incorporated (AECOM) in October 2014.

Based upon comments received from Ecology in September 2014 and subsequent communications with the Port of Longview, specific details of the preferred cleanup action alternative were revised and resubmitted to Ecology in May 2015. Additional clarifications regarding revisions to sections of the FS report were submitted to Ecology in June of 2015, and a complete draft final revised RI/FS report was submitted to Ecology on October 8, 2015. The final revised RI/FS report addressed comments received from Ecology on previous submittals.

1.3 Regulatory Framework

The investigation and evaluation of the MFA Site was conducted in accordance with the corrective action requirements of the Washington State Dangerous Waste (DW) Regulations [Chapter 173-303 Washington Administrative Code (WAC)] and the specific cleanup action requirements of the MTCA Cleanup Regulation (Chapter 173-340 WAC). Historic site investigation and cleanup activities summarized in the RI/FS Report were conducted under both Agreed Order DEHS-S437 (1997) and Consent Decree 97-2-01088-9 (1997) between International Paper and the Washington State Department of Ecology (Ecology). The primary objective of the RI/FS was to present results of investigations conducted in the MFA and the subsequent evaluations performed to identify cleanup action alternatives for that area. Based on the analysis provided in the RI/FS and additional analysis described below, this CAP identifies the cleanup action selected by Ecology for the Site.

2.0 Site Description

2.1 Site Location

The Site is located in Longview, Washington on the north side of the Columbia River, approximately 66 miles upstream (east) from the Pacific Ocean and less than 2 miles downstream (west) of the confluence of the Columbia River and Cowlitz River (Figure 2). The Site area is relatively level and ranges in elevation from 10 to 15 feet above mean sea level (msl).

International Paper once owned approximately 900 acres near the Site. Current owners of the property include the Port of Longview, Pacific Fibre, and Longview Fibre. In 1999 the Port of Longview purchased a property parcel measuring approximately 20 acres that included the former Treated Wood Products (TWP) Area. Additional Port of Longview property borders the TWP Area on all sides. Port of Longview vehicle maintenance currently takes place in the Mechanics Shop located northwest of the former TWP Area in the MFA (Figure 3).

The area of the MFA (Figure 3) is approximately 5 acres. The area north of the MFA is paved and currently is used to store steel products. The area east of the MFA (and immediately north of the TWP Area) is currently unpaved and vacant. Additional Port of Longview facilities are located south and west of the MFA, including terminals along the shore of the Columbia River. The Columbia River is located approximately 700 feet south of the southern boundary of the MFA.

2.1 Site History

The Site and the surrounding area were undeveloped in 1919. Long Bell operated a saw mill at the Site from the early 1920s until International Paper purchased Long Bell in 1956. The former TWP operation was active from 1937 to 1982. The TWP operation included a treatment building; wastewater plant; boiler house; a pentachlorophenol (PCP) mix tank; two PCP work tanks; four creosote and carrier oil tanks; and two unlined surface impoundments.

Two 8-foot diameter retorts were housed inside the treatment building, which included a basement that extended to approximately 10 feet below ground surface (bgs). PCP in carrier oil, creosote, and a 50/50 creosote solution (50 percent coal-tar-derived creosote and 50 percent low-grade petroleum) were used in both retorts, but tank storage areas were distinct. The creosote tank farm was in the southernmost part of the wood treatment plant near Pond 2. Product was delivered to these tanks through piping from an unloading area adjacent to the Columbia River.

Between 1947 and 1953, wastewater from the wood-treating process that used a creosote/diesel mixture was reportedly routed to a nearby municipal impoundment. Historical aerial photographs indicate a northwest-trending trench extending from the TWP Area through the MFA to the impoundment.

The TWP Area became inactive in 1982. International Paper dismantled the TWP operation, except for the boiler house and the treatment building foundation, and then submitted a closure plan to the U.S. Environmental Protection Agency (USEPA) and Ecology in 1985. As part of the Resource Conservation and Recovery Act (RCRA) corrective action and closure activities, affected soil was removed from several locations within the former TWP Area in 1985 (Ponds 1 and 2, the PCP storage tank area, and the treatment building area). The excavated soil was disposed of at a permitted treatment, storage, and disposal facility (TSDF). In 1989, the former ponds and process areas were capped with an engineered cover including a high-density polyethylene (HDPE) geomembrane. Nearly all TWP Area structures (buildings, tanks, and related hardware) were removed or capped as part of closure activities. The treatment building foundation remains beneath an engineered cover installed in 1998.

Following closure activities in 1989, the former TWP Area was surrounded by a 6-foot high metal chain-link fence, and access was controlled by a locking gate. In 1997, Ecology requested additional corrective action at the TWP Area to further ensure long-term protection of human health and the environment. These cleanup actions were implemented during 1997 and 1998 and are described in the engineering design report (Woodward-Clyde 1997a) and cleanup action plan (CAP) prepared for the former TWP Area (Woodward-Clyde 1997b). Specific cleanup actions included the physical containment of chemicals of concern (COCs) by construction of a subsurface barrier wall and an additional engineered cover system; removal of light non-aqueous phase liquid (LNAPL) within the contained area; and *in situ* treatment of contaminants within the contained area using a combined system of active biosparging wells and passive bioventing wells.

URS conducted active LNAPL recovery at well AV-06 from March to August 1999. The LNAPL recovery system was removed on March 4, 2003 after a period of more than 2 years with no observed recoverable product within the TWP Area. The TWP biosparging/bioventing treatment system operated from October 1998 to October 2001. In October 2001, active biosparging was discontinued within the TWP Area (with Ecology approval) when concentrations of COCs had decreased to an asymptotic minimum.

Performance and compliance groundwater monitoring has been ongoing in the TWP Area since cleanup actions were implemented in 1998, in accordance with the Performance and Compliance Monitoring Plan (PCMP). Performance monitoring includes monitoring wells both inside and outside the subsurface barrier wall to ensure its effectiveness. Compliance monitoring includes monitoring groundwater quality at the point of compliance (POC), which is defined in Consent Decree 97-2-01088-9 to be the deed restriction boundary for the TWP Area. URS observed damage to PCMP well 97-6A during a groundwater sampling event in March 2004. Well 97-6A was closed in place and replaced with adjacent well 04-6A on May 11, 2004. The remaining six PCMP wells are 04-6A, 97-6B, 97-1A, 97-3A, 97-5A, and LL-01.15.

During construction of a subsurface barrier wall at the TWP Area in 1997, potentially impacted soil was observed in three areas outside the wall alignment. Subsequently, additional investigations were conducted in these areas to delineate the extent of contamination outside the barrier wall. Those investigations and the associated evaluation of possible cleanup action alternatives for the MFA are presented in the RI/FS Report for the Site.

2.2 Hydrogeologic Setting

Site geological and hydrogeological conditions have been determined based upon multiple investigations conducted at the Site and surrounding areas. The Site is situated on a reclaimed floodplain of the Columbia River, and surficial soils consist of gravelly sandy fill and hydraulic/dredged sand fill. The thickness of the fill layer varies in the site area and ranges from 1 foot to approximately 10 feet. Native alluvium underlies the fill and consists of interbedded sands and silts, which vary laterally because of the constantly changing nature of the depositional environment associated with the Columbia River.

The fill layer at the Site contains a seasonally saturated perched water zone that is not present across the entire Site. Groundwater occurs within the alluvial deposits below the fill layer and is a major aquifer in the county that yields up to 3,000 gallons per minute. Groundwater elevations in the alluvium generally range between zero and 12 feet above msl in the site area. Groundwater elevations vary in response to the stage of the adjacent Columbia River, which fluctuates in response to tidal effects as well as flow quantity variations. Four general stratigraphic units are evident at the Site: Upper Sand (Gravelly Sand/Sand Fill), Upper Silt, Lower Sand, and Lower Silt. The top of the Upper Silt unit is generally encountered in the MFA at depths ranging from approximately 5 to 12 feet below ground surface (bgs).

Groundwater is present within the Upper Sand and the Lower Sand units. Within the Upper Sand, groundwater occurs as a shallow perched zone located immediately above the Upper Silt. The perched groundwater zone appears to be intermittent and is evident in the southeastern portion of the MFA.

The saturated thickness of the perched groundwater zone appears to be limited where this zone is present. The Lower Sand is divided into two units (Aquifer A and Aquifer B) that are separated by the Intermediate Silt. The base of Aquifer B is bounded by the Lower Silt. The Upper Silt and Intermediate Silt units underlie the MFA and are considered confining layers, due to the fine-grained nature of these units. Groundwater within Aquifer A is semi-confined to confined, and Aquifer B is under confined conditions. The depths to groundwater in the Upper Sand range from approximately 10 to 15 feet bgs. The Intermediate Silt appears to act as a confining layer, and as a result, Aquifers A and B behave as distinct aquifers at the Site.

2.3 Extent of Contamination

The occurrence of Dense Non-Aqueous Phase Liquid (DNAPL) at the Site is concentrated along the alignment of an historic ditch used to transport of liquid wastes from the adjacent TWP Area in an area between the TWP barrier wall and approximately 280 feet to the north-northwest. DNAPL within this area was generally found within the lower portion of the Upper Sand near the contact with the Upper Silt. The Upper Silt unit is generally of lower permeability and appears to be a confining layer that minimizes the vertical migration of DNAPL into the Lower Sand.

The volume of soil containing concentrations of diesel-range organics (DRO) and polycyclic aromatic hydrocarbons (PAHs) exceeding MTCA Method C soil cleanup levels for protection of groundwater is estimated at approximately 6,470 cubic yards. Impacted groundwater has been delineated at depths of approximately 10 to 45 feet bgs over an area that approximates the footprint of delineated impacted soil.

2.4 Human Health and Environmental Concerns

Human and environmental exposure pathways involve four necessary elements: (1) a source and mechanism of chemical release to the environment, (2) an environmental transport medium, (3) a point of potential receptor contact with the medium containing the site-related chemical, and (4) a receptor intake route at the contact point. Whenever one or more of these elements are missing in an exposure pathway, the pathway is considered incomplete, and there is no exposure and therefore no risk.

2.4.1 Human Exposure Pathways

The following potential human receptors and pathways were considered in the RI/FS Report:

- Future construction and remediation workers, from potential exposure to dust or volatile emissions (inhalation) and direct contact (incidental ingestion and dermal absorption) with contaminated subsurface soil, including treated soils, during construction or remediation.
- Future construction and remediation workers, from potential exposure via dermal contact or inhalation of volatile compounds in affected shallow groundwater in Aquifer A during construction or remediation.

- Future industrial workers, from potential exposure to vapors emitted to the outdoor air from affected subsurface soil during daily work activities.
- Future industrial workers, from potential exposure to groundwater in Aquifer A if affected groundwater is used in the future for water supply.
- Future industrial workers, from potential inhalation exposures to volatile chemicals in vapors migrating into indoor air.

Construction worker and industrial worker exposures to contaminants of concern (COCs) in soil and groundwater through direct contact (ingestion, dermal, and inhalation of fugitive dust emissions) are currently incomplete due to:

- The existing asphalt paved area limits ingestion, dermal contact, and particulate inhalation exposure routes to impacted subsurface soil.
- The lack of groundwater supply wells near the former trench alignment.

Because the remedy will result in contamination remaining at the Site above unrestricted cleanup levels, institutional controls will be required to prohibit activities that might interfere with the integrity of the remedy. As part of the cleanup requirements for the MFA, a soil management plan will be developed that describes the required institutional controls at the Site, as well as the procedures to be used when excavating, handling, and disposing of contaminated soil. Site industrial workers will be expected to follow all applicable worker health regulations.

The currently complete pathway of exposure at the MFA is through the inhalation of vapors migrating to indoor and outdoor air through the vapor migration pathway. While volatile chemicals can migrate through the subsurface into both indoor and outdoor air, exposures to vapors in outdoor air are generally considered insignificant relative to inhalation of vapors in indoor air. Therefore, inhalation of vapors in outdoor air, while complete, is considered insignificant for construction workers and industrial workers and this pathway is not considered further.

International Paper conducted air sampling in the Mechanics Shop building located in the MFA to evaluate whether industrial workers could be exposed to vapors moving through underlying soil into the indoor air of the building. Naphthalene was detected below cleanup levels at one location in the building. No other chemicals of concern were detected in the indoor air samples. International Paper concluded the vapor intrusion pathway was complete but insignificant, since the single detection was below industrial air cleanup levels.

2.4.2 Ecological Exposure Pathways

Pathways to ecological receptors are considered incomplete because groundwater impacts are localized beneath the paved area, and those impacts do not migrate to surface water bodies. Under WAC 173-340-7491(1)(b), no further terrestrial ecological evaluation is required because all soil contaminated with hazardous substances is covered by buildings, paved roads, pavement, or other physical barriers that will prevent plants or wildlife from being exposed to the soil contamination.

2.5 Cleanup Standards

2.5.1 Contaminants of Concern

Contaminants of concern (COCs) identified for the MFA Site in soils and groundwater include:

- Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)
  - benzo[a]pyrene
  - benzo[a]anthracene
  - benzo[b]fluoranthene
  - benzo[k]fluoranthene
  - chrysene
  - dibenzo[a,h]anthracene
  - indeno[1,2,3-cd]pyrene
- 2-Methylnaphthalene
- Naphthalene
- Diesel Range Organics (DRO)
- Pentachlorophenol (PCP)
- Dibenzofuran

2.5.2 Cleanup Levels

2.5.2.1 Soil Cleanup Levels

The MFA is part of an existing industrial facility, and based on the characteristic site uses, Ecology has determined that Method C soil cleanup levels for industrial properties are applicable to MFA site cleanup actions. Method C soil cleanup levels are based on an adult worker exposure scenario. In addition to being protective of direct contact human exposures, Method C soil cleanup levels must also be established at concentrations that do not directly or indirectly cause violations of ground water, surface water, sediment, or air cleanup standards. Where Method C soil cleanup levels are used, institutional controls will be required to assure the continued protection of human health and the environment and the integrity of the cleanup action.

2.5.2.2 Groundwater Cleanup Levels

Ground water cleanup levels are established based on estimates of the highest beneficial use and the reasonable maximum exposure expected to occur under both current and potential future site use conditions. Ecology has determined that at most sites use of groundwater as a source of drinking water is the beneficial use requiring the highest quality of ground water, and exposure to hazardous substances through ingestion of drinking water and other domestic uses represents the reasonable maximum exposure.

For groundwater, Method C cleanup levels may be established if the person conducting the cleanup action can demonstrate that such levels comply with applicable state and federal laws, that all practicable methods of treatment are used, that institutional controls are implemented in accordance with WAC 173-340-440, and that one or more of the following conditions exist:

> (i) Where Method A or B cleanup levels are below area background concentrations, Method C cleanup levels may be established at concentrations that are equal to area background concentrations, but in no case greater than concentrations specified in WAC 173-340-706(2);
>
> (ii) Where attainment of Method A or B clean-up levels has the potential for creating a significantly greater overall threat to human health or the environment than attainment of Method C cleanup levels established under WAC 173-340-706; or,
>
> (iii) Where Method A or B cleanup levels are below technically possible concentrations, Method C cleanup levels may be established at the technically possible concentrations

Ecology has determined that none of these conditions exist at the MFA Site; therefore, Method B groundwater cleanup levels were determined to be applicable to MFA site cleanup actions.

3.0 Cleanup Action Alternatives and Analysis

This section describes the cleanup alternatives that were developed and evaluated in the RI/FS Report. As presented in the RI/FS Report, the soil and groundwater cleanup alternatives are described separately in Sections 3.1 and 3.2. For a more detailed discussion of the cleanup alternatives and selection process refer to the RI/FS Report.

3.1 Soil Cleanup Action Alternatives

The RI/FS Report presented 10 alternatives to remediate Site soils:

- Alternative S1: Comprehensive Excavation (Baseline Alternative)
- Alternative S2: Comprehensive Excavation Outside the Building Footprint
- Alternative S3: DNAPL Excavation Outside the Building Footprint
- Alternative S4: DNAPL Excavation Outside the Building Footprint, Limited Excavation Inside
- Alternative S5: Solidification Outside the Building Footprint
- Alternative S5A: Solidification Outside the Building Footprint, DNAPL Recovery Underneath the Mechanics Shop

- Alternative S5B: Solidification Outside and Inside the Building Footprint with Relocation of Soil Near the Railroad Tracks
- Alternative S5C: Solidification Outside the Building Footprint, ERH Treatment Underneath the Mechanics Shop
- Alternative S6: DNAPL Treatment by Electrical Resistance Heating
- Alternative S7: DNAPL Excavation and Electrical Resistance Heating

In addition to the alternatives presented in the RI/FS Report, two additional alternatives were developed after completion of the RI/FS. A soil cleanup alternative developed by the Port of Longview (Alternative S8) was not included in the RI/FS; however, this alternative was included with the RI/FS Report for public review during the RI/FS public comment period in September 2017. Alternative S8 included a combination of soil excavation, removal, off-site disposal, and solidification.

Another soil cleanup alternative (Alternative S9) was developed by Ecology to reduce the quantity of soil requiring off-site disposal under Alternative S8. An objective of Alternative S9 was to retain existing site elevations and grades. Because Alternative S9 did not include consideration of a proposed future unloading pit in the northern portion of the Site, Alternatives S5B and S8 were both modified with respect to the alternatives that were presented during the public comment period by eliminating the elements of Alternatives S5B and S8 that accommodated the proposed future unloading pit. This was done to provide a fair comparison among Alternatives S5B, S8, and S9 during the Disproportionate Cost Analysis.

3.2 Groundwater Cleanup Action Alternatives

The RI/FS Report presented four alternatives to remediate Site groundwater:

- Alternative GW1 – Electrical Resistance Heating and Enhanced Biodegradation (Baseline Alternative)
- Alternative GW2 – Chemical Oxidation and Monitored Natural Attenuation
- Alternative GW3 – Active Biosparging
- Alternative GW4 – Monitored Natural Attenuation

3.3 Initial Screening of Alternatives

The cleanup action alternatives developed in the RI/FS Report were evaluated using the criteria established by MTCA. WAC 173-340-360 requires first that all cleanup action alternatives meet the following four threshold requirements:

1. Protect human health and the environment
2. Comply with cleanup standards (WAC 173-340-700 through 760)
3. Comply with applicable state and federal laws (WAC 173-340-710)
4. Provide for compliance monitoring (WAC 173-340-410 and 720 through 760)

MTCA then requires that cleanup action alternatives that fulfill these threshold requirements be evaluated against the following “other requirements” [WAC 173-340-360(2)(b)]:

5. Use permanent solutions to the maximum extent practicable by evaluating specific elements described in WAC 173-340-360(3)
6. Provide for a reasonable restoration time frame (WAC 173-340-360[4])
7. Consider public concerns (WAC 173-340-600)

3.3.1 Initial Screening of Soil Cleanup Alternatives

Based on the analysis presented in the RI/FS Report, Ecology eliminated the following soil cleanup alternatives from additional detailed analysis:

- Alternative S2 – Comprehensive Excavation Outside the Building Footprint
- Alternative S3 – DNAPL Excavation Outside the Building Footprint
- Alternative S4 – DNAPL Excavation Outside the Building Footprint, Limited Excavation Inside
- Alternative S5 – Solidification Outside the Building Footprint
- Alternative S5A – Solidification Outside the Building Footprint, DNAPL Recovery Underneath the Mechanics Shop
- Alternative S5C – Solidification Outside the Building Footprint, ERH Treatment Underneath the Mechanics Shop
- Alternative S7 – DNAPL Excavation and Electrical Resistance Heating

3.3.2 Initial Screening of Groundwater Cleanup Alternatives

Based on the analysis presented in the RI/FS Report, Ecology eliminated the following groundwater cleanup alternatives from additional detailed analysis:

- Alternative GW3 – Active Biosparging
- Alternative GW4 – Monitored Natural Attenuation

Alternative GW4 was eliminated due to the proposed use of a conditional point of compliance for groundwater.

Ecology selected Alternative GW2 – Chemical Oxidation and Monitored Natural Attenuation as the groundwater cleanup alternative.

Alternative S6 and Alternative GW1 - Electrical Resistance Heating (ERH) – were combined as a single alternative.

3.4 Detailed Evaluation of Alternatives

To further evaluate the selected alternatives to support the remedy selection, Ecology evaluated five combined alternatives for the remediation of contaminated soil and groundwater at the MFA Site. Each of these combined soil/groundwater cleanup alternatives are described below:

- Alternative S1/GW2: Complete Excavation, Removal, Off-site Disposal, and Chemical Oxidation
- Alternative S5B (modified)/GW2: *In situ* Solidification and Chemical Oxidation
- Alternative S6/GW1: Electrical Resistance Heating (ERH)
- Alternative S8 (modified)/GW2: Excavation, Removal, Off-site Disposal, *In situ* Solidification, and Chemical Oxidation
- Alternative S9/GW2: Limited Soil Excavation, Removal, Off-site Disposal, *In situ* Solidification, and Chemical Oxidation

These alternatives were developed based on the alternatives provided in the *Public Review Draft Remedial Investigation/Feasibility Study Report (RI/FS)* dated July 12, 2016 and prepared by AECOM for the International Paper Company (AECOM, 2016) and subsequent work that was conducted on behalf of International Paper, the Port of Longview, and Ecology. A more detailed description of each alternative is provided below.

When selecting a cleanup action, MTCA requires that Ecology give preference to actions that use permanent solutions to the maximum extent practicable. To select the most practicable permanent solution from among those cleanup action alternatives that are protective of human health and the environment, Ecology conducts a disproportionate cost analysis (DCA). The DCA allows for a comparison of the costs and benefits of the alternatives and evaluation of alternatives according to criteria identified in Section 360(f) of MTCA [WAC 173-340-360(f)]. These criteria include:

- Protectiveness
- Permanence
- Cost
- Effectiveness over the long term
- Management of short-term risks
- Technical and administrative implementability
- Consideration of public concerns

A detailed DCA evaluation is included as Appendix A to this Draft Cleanup Action Plan. As described in MTCA, the comparison of benefits and costs may be quantitative, but will often be qualitative and require the use of best professional judgment. It’s important to recognize that Ecology has the discretion to favor or disfavor qualitative benefits and use that information in selecting a cleanup action. [WAC 173-340-360(3)(e)(ii)(C)].

The MFA is now owned and operated by the Port of Longview; therefore, Ecology considered the current and potential future needs of the Port of Longview to reduce the risk that cleanup actions would disrupt or adversely affect Port operations and operations on adjacent properties. In evaluating alternatives where hazardous substances would remain at a site after a remedial action, MTCA requires Ecology to consider the likelihood of future site maintenance activities, utility and drainage work, or building construction re-exposing residual hazardous substances, and whether site conditions are likely to change in the foreseeable future [WAC 173-340-745(1(a)(iii)].

The five soil alternatives selected by Ecology are based on the following rationale:

1. Alternative S1 was selected because it is the baseline soil treatment alternative presented in the draft RI/FS.

2. Alternative S5B was selected because it is the preferred alternative presented in the draft RI/FS Report. This alternative was modified from the version presented in the RI/FS report by eliminating the elements of the alternative that were designed to accommodate a proposed future unloading pit.

3. Alternative S6 was selected because it involves technology that's different from the technology involved in the other alternatives and has the capability of treating both contaminated soils and groundwater at the same time.

4. Alternative S8 was selected because it is the Port of Longview's preferred alternative. This alternative was modified from the version presented during the RI/FS public comment period by eliminating the elements of the alternative that were designed to accommodate a proposed future unloading pit.

5. Alternative S9 was developed to minimize the quantity of soil that would need to be disposed of off-site while retaining the current site surface elevations and grades.

Under all five soil alternatives, the upper 3 feet of soil, including a permeable geotextile fabric layer that overlies contaminated soils, are assumed to be clean with COC concentrations below cleanup levels; therefore, the top 3 feet of soil will be excavated, stockpiled on-site, and re-used after treatment of contaminated subsurface soils. Each alternative will include reconstructing the clean 3-foot soil horizon at the surface and installing a permeable geotextile fabric layer above the treated soil.

Under Alternative S1 the contaminated soils from 3 to 8 feet bgs will be excavated, transported, and disposed of at an approved landfill. Once the excavation is complete, new and stockpiled fill material will be used to return the Site to approximate original surface elevations and grades. Groundwater treatment Alternative GW2 will be used to address groundwater contamination after soil removal.

Alternative S5B involves *in situ* mechanical mixing of solidifying agents into the subsurface soils within the treatment areas. Under this alternative, all contaminated soil remains on-site and is treated from 3 to 9 feet bgs using the solidification technique. Due to volumetric expansion due to solidification, this alternative would result in increases in the post-treatment surface elevations and grades of the Site. Groundwater treatment Alternative GW2, will be used to address groundwater contamination after soil solidification.

Under Alternative S6 electrical resistance heating (ERH) will be used to treat both contaminated soil and groundwater within the treatment areas. Removal and disposal of soils from drilling (drill cuttings) would be necessary.

Alternative S8 involves soil excavation from 3 to 5 feet bgs throughout the treatment areas. Contaminated soil will be transported and disposed of at an approved landfill. Once the excavation is complete, *in situ* mechanical mixing of solidifying agents into the subsurface soils will be conducted within the treatment areas from 5 to 9 feet bgs. New and stockpiled clean fill material will be used to return the Site to approximate original surface elevations and grades. The post-treatment site conditions after implementation of this alternative will include approximately 3.5 feet of clean surface soils above a permeable geotextile fabric layer in Zones 1 and 2. Groundwater treatment Alternative GW2 will be used to address groundwater contamination after soil removal and solidification.

Ecology developed Alternative S9 that calls for soil excavation from 3 to 4.5 feet bgs throughout the treatment areas except within a predetermined utility corridor within which soils will be excavated from 3 to 5 feet bgs. This will allow for future installation of underground utilities. The contaminated soils will be removed, transported, and disposed of at an approved landfill. Once the excavation and removal are complete, *in situ* mechanical mixing of solidifying agents into the subsurface soils of the treatment areas will be conducted. New and stockpiled clean fill material will be used to return the Site to approximate original surface elevations and grades. The post-treatment site conditions after implementation of this alternative will include approximately 3 feet of clean surface soils above a permeable geotextile fabric layer in Zone 1 and 3.5 feet of clean surface soils above a permeable geotextile fabric layer in Zone 2. Groundwater treatment Alternative GW2 will be used to address groundwater contamination after soil removal and treatment.

After an evaluation of costs and benefits of these alternatives using the DCA, Alternatives S5B/GW2; S8/GW2; and S9/GW2 were determined to be most similar in costs and benefits relative to the other alternatives considered. These three alternatives were further evaluated, and this evaluation is summarized below.

3.4.1 Protection of Human Health and the Environment

This criterion calls for evaluation of the overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, the time required to reduce risk at the facility and attain cleanup standards, on-site and off-site risks resulting from implementing the alternative, and improvement of the overall environmental quality.

Since Alternatives S5B/GW2, S8/GW2, and S9/GW2 use the same remedial technologies of solidification and excavation, evaluation of these alternatives results in similar levels of protectiveness, and each alternative would be implemented in a similar time frame.

3.4.2 Compliance and Cleanup Standards

Since Alternatives S5B/GW2, S8/GW2, and S9/GW2 use the same remedial technologies of solidification and excavation, compliance with site cleanup standards are expected to be achieved in soil and groundwater in similar time frames.

3.4.3 Compliance with ARARs

In addition to establishing minimum requirements for cleanup, applicable state and federal regulations impose certain technical and procedural requirements for cleanup actions. Alternatives S5B, S8, and S9 are all compliant with state and federal regulations, and cleanup actions under these alternatives meet the requirements of MTCA.

3.4.4 Compliance Monitoring

Under MTCA, compliance monitoring is required for all cleanup actions (WAC 173-340-410). The three categories of compliance monitoring are defined under MTCA:

- Protection monitoring to confirm that human health and the environment are protected during construction and operation of the cleanup action.
- Performance monitoring to confirm that the cleanup action has attained cleanup standards or remedial objectives.
- Confirmation monitoring to confirm the long-term effectiveness of the cleanup action after remedial objectives have been attained. Cleanup actions consisting of on-site disposal, isolation, or containment will require long-term monitoring until the residual hazardous substance no longer exceeds cleanup levels (CULs).

Alternatives S5B, S8, and S9 rely on similar technologies and therefore call for similar monitoring requirements.

Protection monitoring would be conducted during remediation for protection of on-site personnel. Performance monitoring would take place during remediation to confirm that solidification standards have been met. Confirmation monitoring would include a groundwater sampling program to monitor and evaluate groundwater treatment and attenuation. This program would monitor for trends in contaminant concentrations, confirm that attenuation is taking place, determine the anticipated time frame for meeting CULs, determine whether cleanup standards are met, and determine whether additional remedial actions are warranted.

3.4.5 Permanence

This criterion calls for the evaluation of the degree to which the alternative permanently reduces the toxicity, mobility, or volume of hazardous substances including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of the waste treatment process, and the characteristics and quantity of treatment residuals generated.

Alternatives S5B, S8, and S9 rely on similar technologies and are therefore similar in permanence. Because Alternative S5B would increase the site elevations over the treatment areas, including the upper elevation of solidified soils, it poses a higher risk that subsurface treatment areas would be disturbed during future site activities such as site maintenance activities, utility and drainage work, or building construction. Therefore, Alternative S5B was determined to be slightly less permanent than the other two solidification alternatives, which would not result in significant changes to existing site surface elevations. Alternative S5B would also result in a greater volume of hazardous substances remaining on-site.

3.4.6 Restoration Time Frame

The proposed cleanup action can be completed within a reasonable time frame. The proposed cleanup action will be implemented upon Ecology approval of the Engineering Design Report. The selected alternative offers an effective remedy that meets the criteria for selection of a cleanup action under MTCA. A Construction Completion Report documenting the soil excavation and solidification, institutional controls, and groundwater monitoring will be prepared for Ecology review and approval.

The proposed cleanup action will greatly reduce the risk posed by COCs to human health and the environment by:

- Excavation and off-site disposal of contaminated soil
- Solidification of on-site soils
- Chemical oxidation of contaminants in groundwater

- Institutional controls to protect personnel on site from accidental exposure to contaminated soils and groundwater long-term monitoring to evaluate and confirm the effectiveness of the remedy

Groundwater monitoring will be required following completion of the cleanup action. When groundwater monitoring results indicate that cleanup objectives have been met, a Groundwater Completion Report will be prepared and submitted to Ecology to demonstrate compliance. Once Ecology approves the Groundwater Completion Report, the monitoring wells will be removed and closed in accordance with the Minimum Standards for Construction and Maintenance of Wells, WAC 173-160-151 and Water Well Construction, Chapter 18.104.040 of the Revised Code of Washington.

3.4.7 Consideration of Public Concerns

This criterion calls for recognition and evaluation of community concerns with respect to the selected alternative. The evaluation considers the extent to which the alternative addresses community concerns. The community may include individuals, community groups, local governments, tribes, federal and state agencies, or any other organizations that have an interest in or knowledge of the Site.

Alternatives S5B, S8, and S9 are very similar with respect to concerns expressed by the public. Alternative S5B would result in an increase in surface elevations throughout the Site, and this is an issue that was communicated to Ecology during public meetings. Consequently, this alternative scored lower than the other two alternatives for this criterion.

3.4.8 Selection of the Preferred Cleanup Action

Based on a disproportionate cost analysis (Attachment A), Alternative S9, combined with groundwater treatment alternative GW2, was determined to be the most practicable permanent solution. The selected remedy is described in Section 4.0.

<u>4.0 Description of the Selected Remedy</u>

4.1 Site Description.

This CAP applies to the portions of the MFA where soil and groundwater concentrations exceed applicable cleanup levels. The lateral and vertical extent of COCs (including DNAPL) exceeding the preliminary cleanup levels in Site soil and groundwater were estimated in 2011. Estimated extents for soil were updated in 2013 with new DNAPL/sheen observations from two test pits completed for the *in situ* solidification treatability study in August 2011 and soil borings advanced during an investigation at the Mechanics Shop in December 2011. The final lateral extent boundaries for soil and groundwater are shown on Figure 4 and Figure 5, respectively.

4.2 Description of the Cleanup Action

Based on a detailed review of remedial alternatives, including the DCA, Ecology selected Alternative S9 (Limited Soil Excavation, Removal, Off-Site Disposal, and *In Situ* Solidification) and Alternative GW2 (Chemical Oxidation and Monitored Natural Attenuation). These combined remedial alternatives will minimize the quantity of soil that needs to be removed, allow for solidification of contaminated soil remaining on site, retain the approximate original surface elevations and grades, retain a minimum of 3 feet of clean soil at the surface including a geotextile separation layer, and allow for a reasonable remediation time frame. The selected remedial action complies with MTCA requirements and addresses concerns expressed by International Paper Company, the Port of Longview, and the public, and maximize the benefit/cost ratio.

Alternative S9 complies with MTCA requirements and addresses concerns expressed by International Paper Company, the Port of Longview, and the public. The highlights and benefits of Alternative S9 are summarized below:

- Reduces the volume of contaminated soil on site by removing and disposing of contaminated soils in areas where the probable threat to groundwater from excavation is minimal, such as areas that do not contain DNAPL.
- Reduces the thickness of solidified soil remaining on site by limiting *in situ* solidification to soil layers in which contamination exists at concentrations that would otherwise call for off-site disposal and treatment at higher costs.
- Reduces the risk of exposure by Port of Longview workers to solidified soil during projects requiring shallow earthwork (e.g., trenching, post-hole digging, and boring).
- Reduces the risk of adverse effects of soil swelling due to solidification and substantial changes between original and post-treatment surface elevations and grades.
- Reduces the risk of unwarranted costs associated with soil excavation and handling during future construction projects.
- Reduces cleanup costs relative to Alternative S8 by using *in situ* solidification for a substantial volume of soils containing the highest contaminant levels and demanding the highest disposal costs.
- Reduces the vertical extent of the Site that would be encumbered by post-cleanup deed restrictions.

Alternative S9 calls for excavation, removal, and disposal of the minimum amount of contaminated soil to allow for the expected expansion of soils that would be treated by *in situ* solidification and still maintain existing site surface elevations and grades. This alternative also allows for deeper excavation and removal of contaminated soil within a utility corridor to allow for future utility work. The Site is separated into two zones, Zone 1 and Zone 2. (See Figure 6).

Based on the results of a bench scale study that were provided in the RI/FS report, the solidification process is expected to result in volumetric expansion of the treated soil of approximately 35 percent. This is based on application of a preferred "Mix 28" containing 8 percent NewCem® slag cement, 2 percent bentonite, and 0.5 percent caustic soda. To compensate for the expansion caused by the solidification process, the top 1.5 feet of existing soil would need to be removed in the treatment area.

Alternative S9 includes performing a solidification pilot test on a 1,600-square-foot area of the Site prior to full-scale implementation. The pilot-test would provide field data and experience to refine the mix design, determine the preferred mixing tools and techniques, and verify the expansion estimate prior to full-scale remediation. Mechanical mixing will be used to affect the solidification. The pilot test will include strength and leachability testing, similar to bench-scale testing, and would provide data about the cure time for solidified soil. During the pilot test, soil sampling would be conducted to determine whether soil located below 3 feet of the site surface contains concentrations of COCs that exceed preliminary cleanup levels and, if not, whether segregating soils below this level would benefit the project by reducing the volume of soil requiring solidification. Also, if the solidification expansion factor is determined to be substantially different from the bench-scale test results, excavation depths could be modified to account for expected soil expansion.

Based on the currently available information, the following soil remediation depths have been developed:

Zone 1:

- Non-impacted surface soil: Excavation from existing grade to 3 feet bgs. Stockpile soil for re-use after solidification.
- Impacted soil excavation: Excavation from 3 to 4.5 feet bgs. Dispose of impacted soil.
- Impacted soil solidification: *In situ* solidification from 4.5 to 9 feet bgs.

Zone 2:

- Non-impacted surface soil: Excavation from existing grade to 3 feet bgs. Stockpile soil for re-use after solidification.
- Impacted soil excavation: Excavation from 3 to 5 feet bgs. Dispose of impacted soil.
- Impacted soil solidification: *In situ* solidification from 5 to 9 feet bgs. Import soil as necessary to restore existing grade.

Groundwater Treatment and Monitoring

After soil removal, disposal, solidification, and regrading, Alternative GW2 will be implemented. This groundwater treatment alternative uses *in situ* chemical oxidation followed by monitored natural attenuation (MNA). Chemical oxidation and MNA are treatment technologies that detoxify COCs through chemical processes that alter the COCs to less toxic or non-toxic chemicals. Groundwater monitoring will continue until groundwater cleanup levels are achieved.

Chemical oxidation, using an oxidant such as persulfate or Fenton's reagent, would be performed during sequential injection events using temporary push-probe injection points or short-term injection wells throughout the area in which DRO concentrations in groundwater exceed MTCA Method A cleanup levels. Oxidants would be injected during multiple events, as necessary to meet groundwater cleanup goals based upon periodic reviews. MNA will be implemented during and after chemical oxidation and continue until cleanup levels are achieved.

Alternative GW2 for groundwater cleanup includes the following elements:

1. Identifying ARARs and substantive requirements
2. Designing the cleanup action injection system
3. Planning for temporary revisions to Port of Longview MFA operations
4. Injecting a chemical oxidant
5. Groundwater monitoring to determine performance and compliance after each injection event
6. Groundwater monitoring to track natural attenuation and verify achievement of cleanup levels
7. Closure reporting

Under Alternative GW2, no COCs would ultimately remain in groundwater beneath the MFA at concentrations exceeding cleanup levels (MTCA Method A [DRO] and Method B). However, the treatment processes of Alternative GW2 operate relatively slowly, and achieving cleanup levels is expected to take several years.

4.3 Cleanup Standards and Point of Compliance

4.3.1 Soil Cleanup Standards and Point of Compliance

As discussed in Section 2.4.2.1, because the MFA Site is zoned for industrial use and is likely to remain an industrial site in the future, Method C soil cleanup levels are applicable. The Method C soil cleanup levels for the protection of human health are based on direct soil exposure to an adult worker.

Additionally, Method C soil cleanup levels must also be established at concentrations that do not directly or indirectly cause violations of ground water, surface water, sediment, or air cleanup standards. At this Site soil cleanup levels must be at least as stringent as those required to protect Site groundwater. Note that Method A (for DRO) and Method B cleanup levels are applicable to Site groundwater.

The soil cleanup levels in Table 1 shall apply at the standard point of compliance, which is in soils throughout the Site.

Table 1. Soil Cleanup Levels

Chemicals of Concern	MTCA Method C Soil Direct Contact (mg/kg)	MTCA Method C Soil Protection of Groundwater (mg/kg)
Carcinogenic PAHs[1]	18	2.3
2-Methylnaphthalene	14,000	3.8
Naphthalene	70,000	9.7
Diesel Range Organics	2,000	2,000
Dibenzofuran	3,500	6.6
Pentachlorophenol	330	0.035

[1] When establishing and determining compliance with cleanup levels for mixtures of carcinogenic polycyclic aromatic hydrocarbons, a total toxicity equivalence approach is used following procedures in MTCA [WAC 173-340-708(8)(e)]

mg/kg = milligrams per kilogram

4.3.2 Groundwater Cleanup Level and Point of Compliance

Groundwater cleanup levels are established based on estimates of the highest beneficial use and the reasonable maximum exposure expected to occur under both current and potential future site use conditions. Ecology has determined that at most sites use of groundwater as a source of drinking water is the beneficial use requiring the highest quality of groundwater and that exposure to hazardous substances through ingestion of drinking water and other domestic uses represents the reasonable maximum exposure.

For groundwater, Method C cleanup levels may be established where the person conducting the cleanup action can demonstrate that such levels comply with applicable state and federal laws, that all practicable methods of treatment are used, that institutional controls are implemented in accordance with WAC 173-340-440, and that one or more of the following conditions exist:

(i) Where Method A or B cleanup levels are below area background concentrations, Method C cleanup levels may be established at concentrations that are equal to area background concentrations, but in no case greater than concentrations specified in WAC 173-340-706(2);

(ii) Where attainment of Method A or B clean-up levels has the potential for creating a significantly greater overall threat to human health or the environment than attainment of Method C cleanup levels established under WAC 173-340-706; or,

(iii) Where Method A or B cleanup levels are below technically possible concentrations, Method C cleanup levels may be established at the technically possible concentrations

Ecology has determined that none of these conditions exist at the MFA Site; therefore, Method B groundwater cleanup levels were determined to be applicable to MFA site cleanup actions.

Where it can be demonstrated under WAC 173-340-350 through 173-340-390 that it is not practicable to meet the cleanup level throughout the Site within a reasonable restoration time frame, Ecology may approve a conditional point of compliance that shall be as close as practicable to the source of hazardous substances, not to exceed the property boundary. Based on the evaluation included in the RI/FS Report, it was determined that it is not practicable to meet Method B groundwater cleanup levels throughout the Site within a reasonable restoration time frame.

Where a conditional point of compliance is proposed, the person responsible for undertaking the cleanup action shall demonstrate that all practicable methods of treatment are to be used in the site cleanup. MTCA defines "all practicable methods of treatment" as "all technologies and/or methods currently available and demonstrated to work under similar site circumstances or through pilot studies, and applicable to the Site at reasonable cost" (WAC 173-340-200). Based on implementation of the selected remedy, which includes implementation of soil cleanup Alternative S9 and groundwater cleanup Alternative GW2, Ecology has determined that a conditional point of compliance (CPOC) as described in Figure 7 is appropriate. The groundwater cleanup levels shown in Table 2 shall apply at the conditional point of compliance for groundwater.

Table 2. Groundwater Cleanup Levels

Chemicals of Concern	MTCA Method B Groundwater (µg/L)
Carcinogenic PAHs[1]	0.012
2-Methylnaphthalene	32
Naphthalene	160
Diesel Range Organics (DRO)[2]	500
Dibenzofuran	16
Pentachlorophenol	0.22

[1] When establishing and determining compliance with cleanup levels for mixtures of carcinogenic polycyclic aromatic hydrocarbons, a total toxicity equivalence approach is used following procedures in MTCA [WAC 173-340-708(8)(e)]

[2] Cleanup level for DRO based on MTCA Method A

µg/L = micrograms per liter

4.4 Applicable, Relevant, and Appropriate Requirements

A detailed list of applicable, relevant, and appropriate requirements (ARARs) applicable to the selected cleanup actions is included as Appendix B to the Draft Cleanup Action Plan. The list of ARARs is from Section 6 in the amended 2016 RI/FS Report.

4.5 Restoration Time Frame

The soil component of the cleanup action provides a reasonable restoration time frame by excavating and removing shallow soil with COC concentrations exceeding cleanup levels or solidifying soil containing DNAPL or COC concentrations exceeding cleanup levels within approximately 2 years of approval of the CAP.

The groundwater component of the cleanup action is designed to treat groundwater COC concentrations exceeding cleanup levels within approximately 10 years of approval of the CAP, including an anticipated 2 years of chemical oxidation treatment following implementation of soil cleanup action (excavation/solidification), followed by an anticipated 6 years of groundwater monitoring (MNA).

This restoration time frame is based on best engineering judgment by comparing the proposed action to similar actions and considering the likely lead times for design, permitting, coordination with Port of Longview operations, demolition, solidification, site restoration, expected biodegradation treatment time, and expected time for MNA.

4.6 Compliance Monitoring

A Compliance Monitoring Plan (CMP) will be developed for the soil cleanup action that will meet the requirements of WAC 173-340-410. Compliance monitoring for the soil cleanup action includes protection monitoring (during construction), performance monitoring (physical performance testing of solidified soil following implementation of solidification) and confirmation monitoring (long-term groundwater monitoring) for 10 years. Protection and performance groundwater monitoring will also be conducted during the 2-year period of groundwater treatment, followed by MNA and confirmation monitoring for 6 years after completion of groundwater cleanup action implementation.

Protection monitoring requirements will be identified in a site-specific health and safety plan (HASP) that will govern site safety during implementation of the remedy.

Confirmation monitoring of the soil remedy will include monitoring of groundwater both below and downgradient of the solidified soil for 10 years following implementation of solidification. Ten monitoring wells (5 wells screened below the solidified soil and 5 wells located downgradient of the solidified soil) will be sampled twice per year for semivolatile organic compounds (SVOCs) and DRO.

Groundwater confirmation monitoring will be conducted once per year for a total of 6 years at CPOC wells. Groundwater samples will be collected from 13 groundwater monitoring wells located at the CPOC once per year and they will be analyzed for DRO, SVOCs, PAHs, and MNA parameters.

4.7 Schedule for Implementation

The cleanup action implementation schedule outlined here identifies major cleanup action tasks to be implemented over a period of approximately 4 years, assuming the completion of Alternative S9 soil cleanup action tasks prior to the initiation of Alternative GW2 groundwater cleanup action tasks:

Soil Alternative S9 – approximately 2 years

- Soil Cleanup Action Design / Bid / Award / Planning
- Contractor Mobilization / Site Work / Demobilization
- Construction Completion Report

Groundwater Alternative GW2 – approximately 2 years (treatment and performance monitoring)

- Groundwater Cleanup Action Design / Bid / Award / Planning
- Contractor Mobilization / First Injection Site Work / Demobilization
- Groundwater Performance Monitoring
- Performance Evaluation and Reporting
- Repeat Additional Injection Mobilization / Site Work / Demobilization (As Necessary)
- Groundwater Completion Report and Project Closeout

4.8 Institutional and Engineering Controls

The cleanup action includes engineering and institutional controls to protect human health and the environment from residual contamination in soil and groundwater in accordance with WAC 173-340-440.

During implementation of the soil cleanup action, interim engineering controls including construction fencing/securing the work area would be used to minimize exposure to contaminated soil. Following excavation and solidification activities, engineering controls will include replacement of asphalt pavement over the excavation, solidification, and transition areas, minimizing exposure to the solidified soil following implementation.

Institutional controls would be required in the form of a restrictive environmental covenant on the property to protect human health and the environment from exposure to soil remaining on site exceeding MTCA Method B cleanup levels, including soil treated by solidification and groundwater exceeding MTCA Method B cleanup levels. . The restrictive covenant would, at a minimum, prohibit intrusive activities at the Site within the solidified soil that may interfere with the performance or integrity of the cleanup action. The use of Site groundwater as a drinking water source would also be prohibited. The restrictive covenant would be recorded prior to completion of the soil and groundwater cleanup actions. An Institutional Controls (IC) Plan will be developed prior to completion of the soil cleanup action. The IC Plan would prescribe periodic inspections of the Site, including the integrity of asphalt pavement. The IC Plan would be reviewed and updated every 5 years as part of the periodic review process. Appendix C to the draft Cleanup Action Plan includes a template for an environmental covenant.

4.9 Public Participation

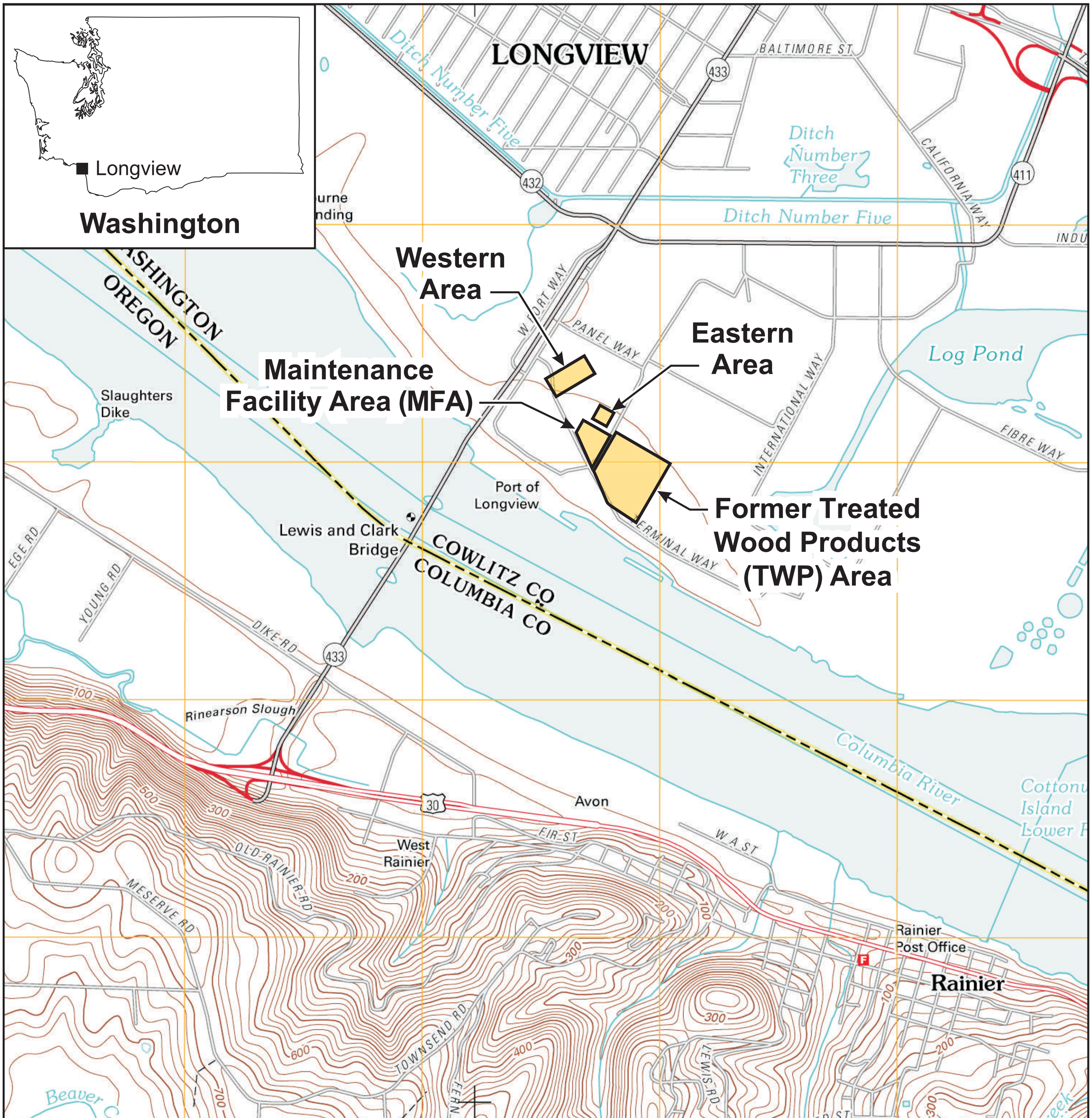
Members of the public will be invited to review and comment on the draft cleanup action plan before it is finalized during a formal public comment period. Comments received during this period will be entered into the site's formal record, considered by cleanup staff, and responded to in a responsiveness summary before the cleanup action plan is final.

Notice for this comment period will include mailings to nearby businesses and residents, email notification distributed to an email listserv, posting in Ecology's Site Register, website updates, and a newspaper legal ad. Contingent on public interest, Ecology will hold a public meeting where detailed information about the site and the draft cleanup action plan will be available. Ecology's commitment to public participation for the International Paper site is detailed in our Public Participation Plan for the site.[1]

[1] Washington State Department of Ecology, 2018. *Public Participation Plan: International Paper and Port of Longview*. Publication No. 16-04-004. https://apps.ecology.wa.gov/gsp/DocViewer.ashx?did=76349.

FIGURES

J:\DCS\Resources\GRFX\Projects\60544916 IP Longview\60544916_01.ai



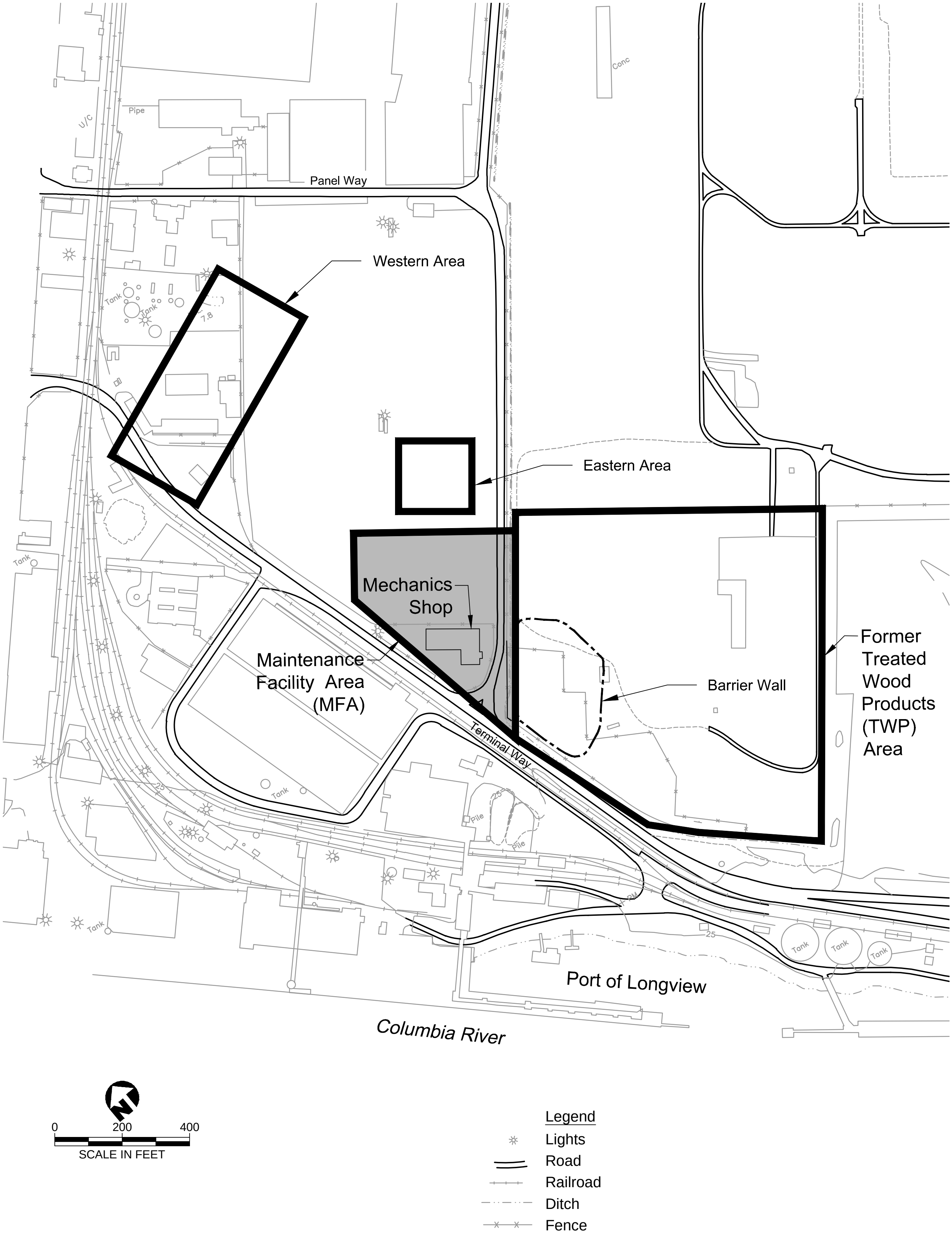
Source: USGS 7.5-minute topographic quadrangle, Rainier, Washington, 2011

N

0 0.5 1

Scale in Miles

International Paper Longview, WA	Project No. 60544916	Former International Paper Longview Facility General Location Map	Figure 1
AECOM			



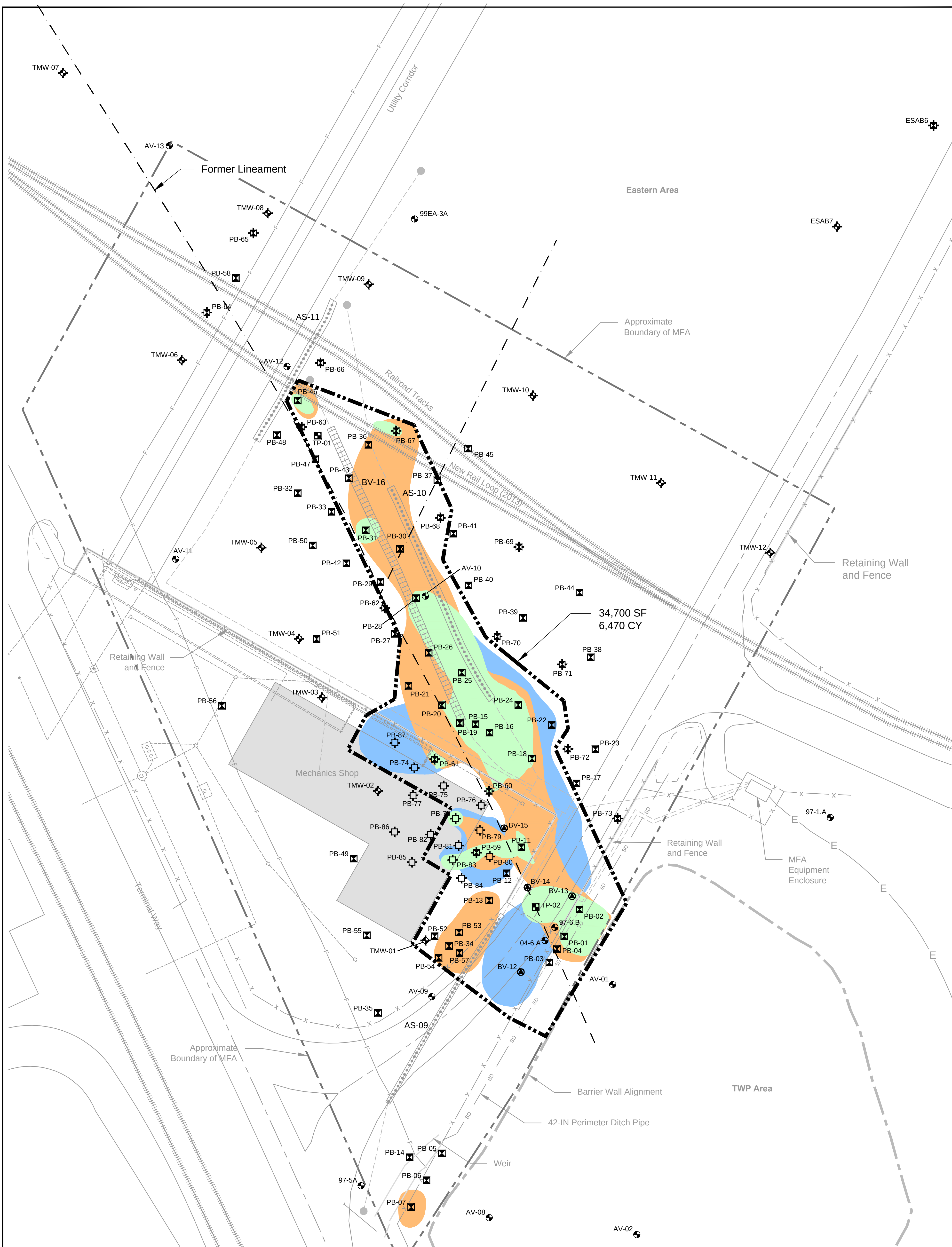
J:\DCS\Projects\GIS\International Paper\Longview\2019\190513\CAD\Fig 2-2 (Site Location).dwg
Mod: 05/13/2019, 11:50 | Plotted: 05/13/2019, 15:11 | mark.gagnon

International Paper Longview, WA	Project No. 60544916	Former International Paper Longview Facility Site Location	Figure 2
AECOM			

J:\DCS\Projects\GIS\International Paper\Longview\2019\190513\CAD\Fig 3 (Current MFA Site Map).dwg
Mod: 05/13/2019, 11:49 | Plotted: 05/13/2019, 14:38 | mark.gagnon

Aerial Source: 2010 Bing (Microsoft Corp)

International Paper Longview, WA	Project No. 60544916	Former International Paper Longview Facility Current MFA Site Map	Figure 3
AECOM			



Legend

- Horizontal Bioventing Well
- Horizontal Biosparging Well
- Horizontal Well Termination Vault
- Groundwater Monitoring Well
- Vertical Bioventing Well
- Pre-2008 Geoprobe Soil Boring Location
- 2008 Groundwater Monitoring Well
- 2008 Geoprobe Soil Boring Location
- August 2011 Test Pit Location
- December 2011 Geoprobe Soil Boring Location
- Extent of DNAPL
- Extent of DRO in Soil > MTCA Method A
- Extent of Naphthalene in Soil > MTCA Method C Protection of Groundwater Soil Cleanup Level
- Estimated Limits of Soil Treatment

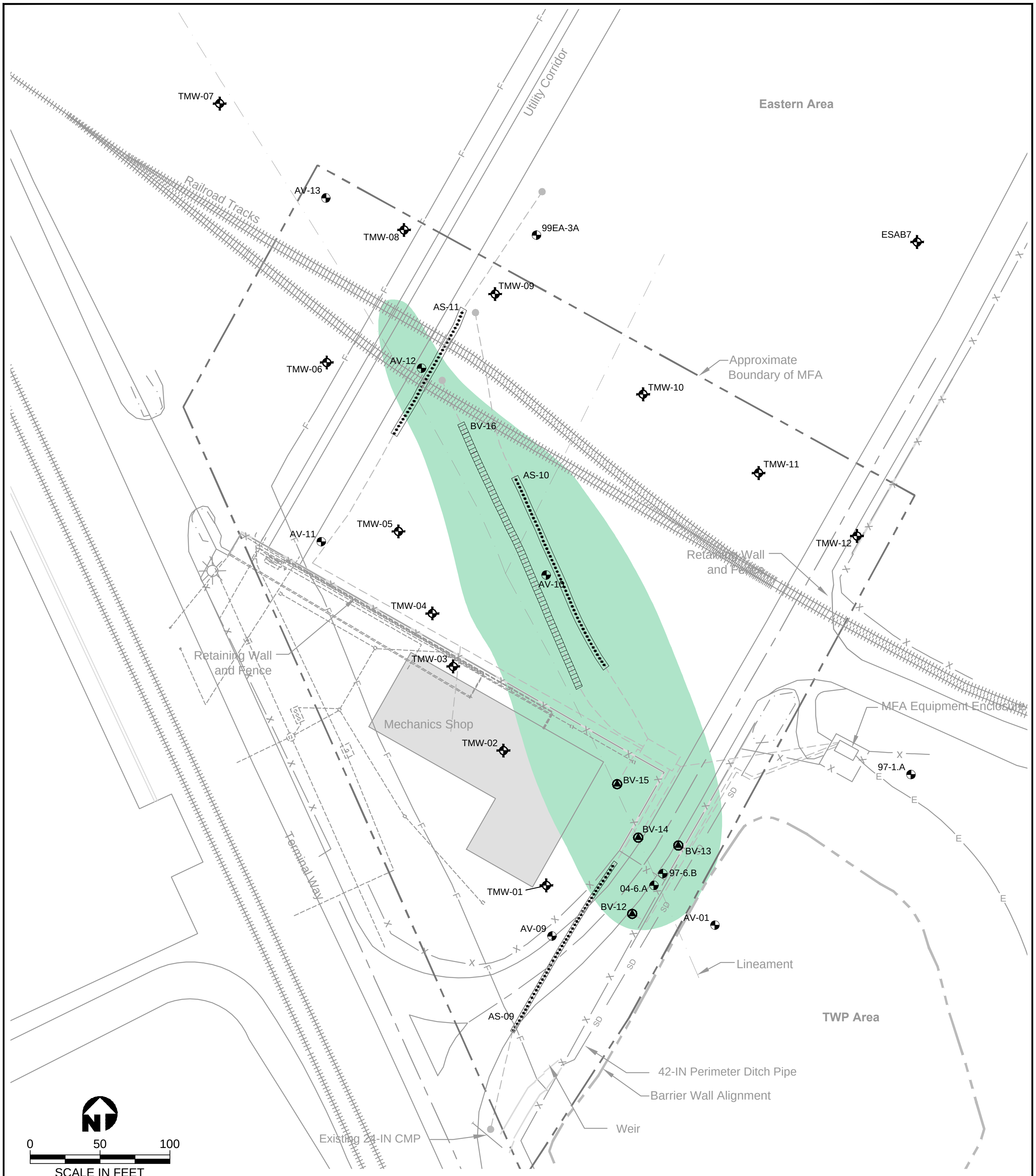
Note:
Solidification will be completed 1 foot into the Upper Silt layer. Because the depth of the Upper Silt layer varies across the site, the solidification depth will vary across the site. On average, the solidification depth will be 9 ft bgs.

N

0 30 60
SCALE IN FEET

J:\DCS\Projects\GIS\International Paper\Longview\2019\190513\CAD\Fig 4 (Contaminated Soil).dwg
Mod: 05/14/2019, 11:24 | Plotted: 05/14/2019, 11:33 | mark.gagnon

International Paper Longview, WA	Project No. 60544916	Former International Paper Longview Facility Contaminated Soil	Figure 4
AECOM			

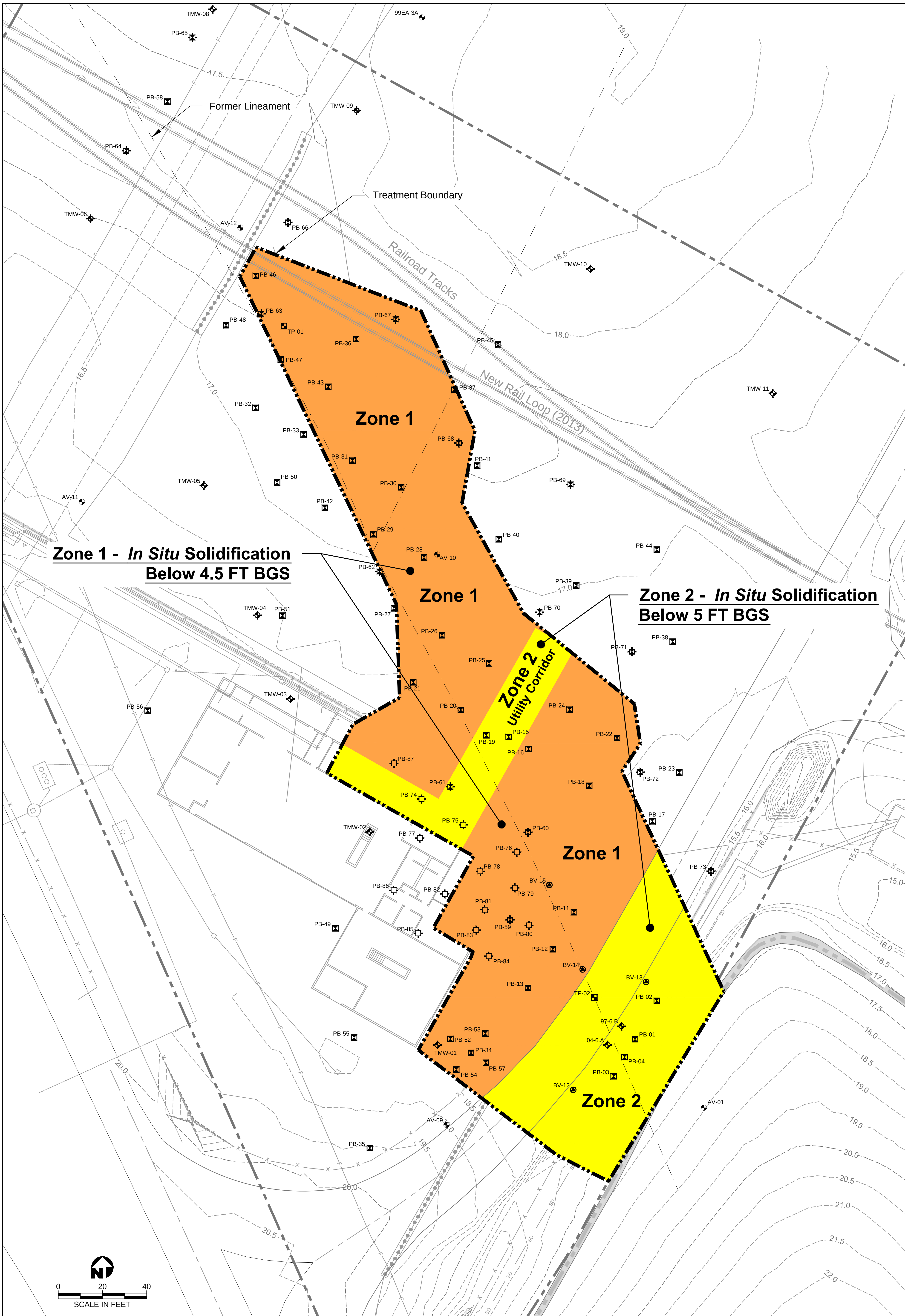


Legend

- Horizontal Bioventing Well
- Horizontal Biosparging Well
- Horizontal Well Termination Vault
- Groundwater Monitoring Well
- 2008 Groundwater Monitoring Well
- Vertical Bioventing Well
- Extent of DRO in Groundwater > MTCA Method A

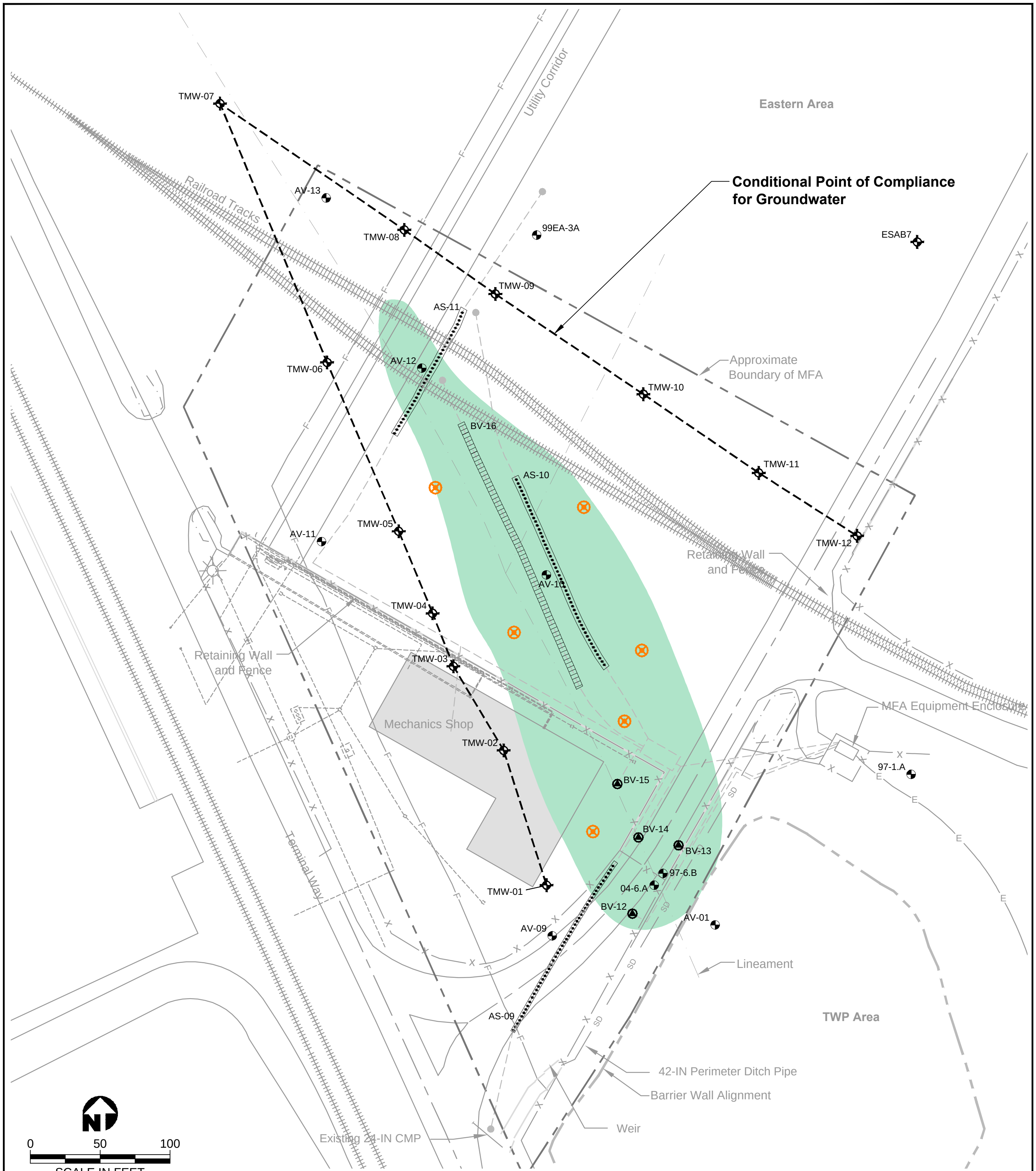
J:\DCS\Projects\GIS\International Paper\Longview\2019\190513\CAD\Fig 5 (Contaminated Groundwater).dwg
Mod: 05/14/2019, 11:02 | Plotted: 05/14/2019, 11:02 | mark.gagnon

International Paper Longview, WA	Project No. 60544916	Former International Paper Longview Facility Contaminated Groundwater	Figure 5
AECOM			



J:\DCS\Projects\GIS\International Paper\Longview\2019\190513\CAD\Fig 6 (Contaminated Soil Zones).dwg
Mod: 05/14/2019, 11:27 | Plotted: 05/14/2019, 13:17 | mark.gagnon

International Paper Longview, WA	Project No. 60544916	Former International Paper Longview Facility Contaminated Soil Zones	Figure 6
AECOM			



Legend

- Horizontal Bioventing Well
- Horizontal Biosparging Well
- Horizontal Well Termination Vault
- Groundwater Monitoring Well
- 2008 Groundwater Monitoring Well
- Vertical Bioventing Well
- Additional Monitored Natural Attenuation Monitoring Points
- Extent of DRO in Groundwater > MTCA Method A

J:\DCS\Projects\GIS\International Paper\Longview\2019\190513\CAD\Fig 7 (Longitudinal Point of Compliance).dwg
Mod: 05/14/2019, 11:12 | Plotted: 05/14/2019, 11:12 | mark.gagnon

International Paper Longview, WA	Project No. 60544916	Former International Paper Longview Facility Conditional Point of Compliance	Figure 7
AECOM			

APPENDIX A

Comparison of Remediation Alternatives

M E M O R A N D U M

DATE: September 18, 2018

TO: Kerry Graber and Kaia Petersen, Washington Department of Ecology
Hazardous Waste and Toxics Reduction Program

FROM: Bill Beckley, Paul Bianco, and Bruno Ridolfi, RIDOLFI Inc.

SUBJECT: **Port of Longview Maintenance Facility Area Cleanup Site**
Comparison of Remediation Alternatives

1.0 Introduction

RIDOLFI Inc. (Ridolfi) has been retained by the Washington Department of Ecology's Hazardous Waste and Toxics Reduction Program to provide technical consulting services in support of the program's oversight of cleanup activities at hazardous waste sites in Washington.

Under Work Assignment R100F, effective March 1, 2018, Ridolfi is providing technical consulting services to support Ecology's oversight of cleanup activities at the Port of Longview Maintenance Facility Area (MFA) cleanup site in Longview, Washington. The purpose of this Work Assignment is to complete an independent review of environmental work completed previously, including the *Public Review Draft Remedial Investigation/Feasibility Study Report Port of Longview Maintenance Facility Area, Longview, Washington* (AECOM, 2016), and develop responses to public comments on the Remedial Investigation/Feasibility Study (RI/FS) specifically relating to project costs and the remedy selection process. Ridolfi is also supporting Ecology in selecting the preferred remedy based on a revised disproportionate cost analysis (DCA), developing the cleanup action plan, supporting Ecology's public involvement process, and informing the current legal framework as needed.

1.1. Objective

At the request of the Ecology project team, Ridolfi has completed an evaluation of the comparative costs and benefits of a selected set of cleanup action alternatives to support Ecology's selection of a preferred remedy for the Port of Longview MFA cleanup site and to support the development of a draft Cleanup Action Plan for the Site.

The following subsections describe the selected alternatives, provide estimates of probable costs of implementing each alternative, and summarize a comparison of the alternatives based on the evaluation criteria included in section 360 of the Model Toxics Control Act (MTCA) [WAC 173-340-360(3)(f)].

1.2. Rationale for Selecting Alternatives

A total of 10 soil cleanup alternatives and four groundwater cleanup alternatives were evaluated in the public review draft of the RI/FS for the Port of Longview MFA Site (AECOM, 2016). To assist in selecting a preferred remedy for the Site, Ecology is conducting further evaluation of a more focused set of cleanup alternatives. The soil cleanup alternatives considered in this evaluation include:

- The "baseline" soil cleanup alternative evaluated in the draft RI/FS (Alternative S1).
- The preferred soil cleanup alternative evaluated in the draft RI/FS (Alternative S5B).
- A soil cleanup alternative using electrical resistance heating evaluated in the draft RI/FS (Alternative S6).
- A soil cleanup alternative developed on behalf of the Port of Longview and identified as the Port's preferred soil cleanup alternative. This alternative was not evaluated in the draft RI/FS and is identified here as soil cleanup alternative S8.
- A soil cleanup alternative developed by Ecology as a potential preferred soil cleanup remedy. This alternative was not evaluated in the draft RI/FS and is identified here as soil cleanup alternative S9.

To develop and evaluate a comprehensive site remedy, each of these soil cleanup alternatives was paired with a complementary groundwater cleanup alternative. While final cleanup levels and points of compliance have not yet been determined for the Site, this evaluation assumes that Method C groundwater cleanup levels may be used at this site, and that a conditional point of compliance for groundwater may be appropriate. Section 706 of MTCA states that Ecology may only approve the use of Method C groundwater cleanup levels if it can be demonstrated that, in addition to other requirements, all practicable methods of treatment are used [WAC 173-340-706(1)(a)]. For this reason, each of the soil alternatives was combined with an active groundwater cleanup alternative.

1.3. Overall Approach

To determine the relative costs and benefits of the selected set of alternatives, cost estimates were developed for each alternative, and a comparison of the benefits of each of the alternatives relative to their costs was made following the procedures for a Disproportionate Cost Analysis (DCA) included in Section 360 of MTCA [WAC 173-340-360(3)(e)]. Descriptions of the procedures and results of the evaluation of probable costs and benefits are provided in Section 3 and Section 4 of this memorandum. A summary of the estimated costs relative to the benefits of each alternative is presented in Section 5.

Additionally, to support a fair comparison of the relative costs and benefits of the selected alternatives, the scope of two of the soil cleanup alternatives (S5B and S8) have been modified based on changes that have occurred in plans for potential future site development since these original alternatives (S5B and S8) were developed. An objective of both Alternative S5B and Alternative S8 was to accommodate an "unloading pit" adjacent to the existing rail lines in the northern portion of the Site. This unloading pit area was identified in the draft RI/FS as "Zone 1." Both alternatives proposed excavation and removal of contaminated soils from 3 feet to approximately 8 feet below ground surface (bgs) and backfilling with clean soil to accommodate the proposed unloading pit development. Since an unloading pit in this location is no longer proposed, the proposed soil cleanup actions within Zone 1 for both alternatives (S5B and S8) were modified as described in Section 2 of this memorandum. No modifications were required for Alternative S1 and Alternative S6 based on this change.

2.0 <u>Description of Alternatives Evaluated</u>

The Washington Department of Ecology has developed five alternatives for the remediation of contaminated soil and groundwater at the Port of Longview Maintenance Facility Area Cleanup Site. Each of these combined soil/groundwater cleanup alternatives are identified below:

- Alternative S1/GW2: Complete Excavation, Removal, Off-site Disposal, and Chemical Oxidation
- Alternative S5B (modified)/GW2: *In situ* Solidification and Chemical Oxidation
- Alternative S6/GW1: Electrical Resistance Heating (ERH)
- Alternative S8 (modified)/GW2: Excavation, Removal, Off-site Disposal, *In situ* Solidification, and Chemical Oxidation
- Alternative S9/GW2: Limited Soil Excavation, Removal, Off-site Disposal, *In situ* Solidification, and Chemical Oxidation

These alternatives were developed based on the alternatives provided in the *Public Review Draft Remedial Investigation/Feasibility Study Report (RI/FS)* dated July 12, 2016, prepared by AECOM for the International Paper Company for the Port of Longview Maintenance Facility Area (AECOM, 2016), as well as subsequent work that was conducted on behalf of International Paper Company, the Port of Longview, and Ecology. A more detailed description of each alternative is provided below.

2.1. Alternative S1/GW2: Complete Excavation, Removal, Off-Site Disposal, and Chemical Oxidation

This alternative combines Alternative S1 for soil cleanup and Alternative GW2 for treatment of contaminated groundwater. Alternative S1 calls for complete removal of contaminated soil and is therefore considered a permanent soil cleanup alternative. This alternative was used as the baseline alternative in the draft RI/FS to compare soil cleanup alternatives to one another and assess whether each alternative is permanent to the maximum extent practicable pursuant to MTCA [WAC 173-340-360(3)(e)].

Soil Removal and Off-site Disposal

Alternative S1 calls for excavation, removal, and off-site landfill disposal or treatment of soil overlying the Upper Silt stratigraphic layer and containing dense non-aqueous-phase liquid (DNAPL) or chemicals of concern (COCs) at concentrations exceeding cleanup levels. The depth of the Upper Silt layer varies within the MFA. Based on the average depth bgs to the top of the Upper Silt layer, an average excavation depth of 8 feet bgs was assumed for cost estimating.

Soils within the Upper Silt layer that contain COCs at concentrations greater than the preliminary cleanup levels will not be excavated and removed due to the risk of breaking through this aquitard and allowing contamination of the underlying aquifer.

Groundwater monitoring will determine the impact of residual contamination in the Upper Silt layer on groundwater within the underlying aquifer. The cleanup plan also calls for asphalt pavement to be reinstalled and maintained over the excavation areas to reduce stormwater infiltration into and through the Upper Silt layer.

A remediation level would be used to segregate soil for either landfill disposal or treatment as necessary to immobilize or destroy COCs. Soils containing COCs at concentrations exceeding the cleanup level, but not containing DNAPL, would be eligible for off-site disposal at a hazardous waste landfill facility permitted to receive Corrective Action Management Unit (CAMU) eligible waste. Soils in which DNAPL is indicated during field testing would not be eligible for off-site landfill disposal without additional treatment. Soils containing DNAPL would be treated off-site as necessary to destroy or immobilize the COCs.

Alternative S1 calls for shoring during excavation to support the foundation of the Mechanics Shop building and protect the Treated Wood Products (TWP) barrier wall. For purposes of cost estimating, it was assumed that a freeze-wall shoring system keyed into the Upper Silt layer would be used.

Soil would be excavated and segregated based on three categories: (1) uncontaminated overburden, (2) soil that likely contains COCs but does not exhibit DNAPL, and (3) soil containing DNAPL. The last two categories of soil would be placed in shipping containers equipped with drainage nets and staged on site within an area equipped with temporary secondary containment. Water and DNAPL would be decanted and phase-separated by pumping or vacuum extraction from the shipping containers until the soil is dry enough to transport for disposal.

Groundwater Treatment and Monitoring

After soil removal and disposal, Alternative GW2 would be implemented. This alternative uses *in situ* chemical oxidation followed by monitored natural attenuation (MNA). Groundwater monitoring will continue until groundwater cleanup levels are achieved.

Chemical oxidation will probably use persulfate or Fenton's reagent. For the cost estimates provided in the Feasibility Study, the use of persulfate was assumed. The persulfate would be injected during multiple injection events using either temporary push-probe injection points or short-term injection wells installed throughout the area in which DRO concentrations in groundwater exceed MTCA Method A cleanup levels.

In the draft FS it was assumed that oxidants would be injected during four events over a 2-year period. After chemical oxidation treatment, MNA would be implemented and would continue until cleanup levels are achieved. Chemical oxidation and MNA are treatment technologies that detoxify COCs through chemical processes that alter the COCs to less toxic or non-toxic chemicals.

Alternative GW2, as described in the draft FS, includes the following elements:

- Identifying applicable or relevant and appropriate requirements (ARARs) and substantive requirements
- Designing the cleanup action
- Planning for temporary revisions to Port of Longview maintenance yard operations

- Injecting a chemical oxidant (persulfate) into the ground four times over 2 years
- Groundwater monitoring for 6 years following the last injection event to monitor treatment performance, natural attenuation, and groundwater quality for compliance with cleanup levels
- Demonstration that cleanup levels have been achieved and site closure reporting

Under Alternative GW2, no COCs would ultimately remain in groundwater beneath the MFA at concentrations exceeding MTCA Method C cleanup levels; however, the Alternative GW2 treatment process is relatively slow and achieving groundwater cleanup levels is expected to take several years.

2.2. Alternative S5B/GW2: *In Situ* Solidification and Chemical Oxidation

This alternative combines Alternative S5B for soil cleanup and Alternative GW2 for treatment of contaminated groundwater. Alternative S5B was identified as the preferred soil cleanup alternative in the draft RI/FS. Alternative S5B as presented in the RI/FS has been modified here to account for the fact that there is no longer a need to accommodate a future unloading pit in the northern portion of the Site, which was identified in the draft FS as "Zone 1". Note that this alternative was first proposed as Alternative 5B in a draft FS submitted to Ecology in 2014 (URS, 2014).

Soil Solidification

Alternative S5B consists of in-place mechanical mixing of solidifying agents with soils at the MFA located outside and inside the footprint of the Port's Mechanics Shop building that contain DNAPL or COCs at concentrations exceeding cleanup levels. The mixing agent would be selected based on the bench-scale treatability testing already performed and future pilot testing. The mixing agent would be designed to bind the COCs within a modified matrix so that the resulting matrix would exhibit permeability orders of magnitude lower than the surrounding soil. This treatment reduces the likelihood of COC migration by diverting groundwater around the treated matrix and binding the impacted media within the matrix. The mixing agents used inside the building footprint would be identical to the mix design selected for outside the building footprint; however, the mechanical mixing method used may differ. Solidification outside the building would be performed using mechanical mixing techniques such as mixing with large-diameter augers, excavator buckets, or specialized *in situ* blenders manufactured by Lang Tool Company. Large diameter augers could not be used inside the building due to space limitations; therefore, solidification inside the building footprint would be performed using medium-diameter telescoping augers, excavator buckets, or specialized *in situ* blenders.

Alternative S5B includes conducting a pilot test on a 1,600-square-foot area (approximately 5 percent of the total treatment area) prior to full-scale implementation. The pilot test would be performed to further refine the mix design and determine the preferred mixing tools and techniques for full-scale remediation. The pilot test would include testing for permeability, leachability, strength, cure time, and volumetric expansion. During the pilot test, additional soil sampling would be performed to determine whether soils 3 feet bgs exceed preliminary cleanup levels and, if not, whether segregating additional soils below this level would benefit the project by reducing the volume of soil requiring solidification.

Full-scale solidification is conservatively assumed to include soils exceeding preliminary cleanup levels from 3 to 10 feet bgs within the designated treatment area. Outside the building footprint, the existing clean fill materials (0 to 3 feet bgs) would be removed and temporarily stockpiled for reuse after solidification. Solidification would extend horizontally to immediately adjacent to the Mechanics Shop building and the TWP Area slurry wall and would be completed in an alternating pattern to protect the building and slurry wall from damage. Impediments to solidification operations, such as two existing retaining walls located near the Mechanics Shop building and along the east side of the road and a large storm water culvert would be removed and reconstructed following solidification activities. The solidified soil would be overlaid with new geotextile fabric and covered with reused clean fill (previously excavated from the site and stockpiled prior to solidification). The surface of the clean fill would be graded, and new asphalt paving would be placed over the entire area. The new asphalt surface would not be impermeable; however, it is anticipated that most of the storm water would drain across the asphalt surface. Storm water that penetrates the asphalt surface would most likely remain within the clean fill above the solidified soil. It should not be necessary to prevent infiltration through the new asphalt surface because the hydraulic conductivity of the solidified soil would be orders of magnitude lower than other subsurface materials.

Because the solidification process results in volumetric expansion of the treated soils, an average increase of surface elevation of approximately 2.5 feet has been conservatively estimated. The increased volume of material in the treatment area would result in higher elevations in the area south of the new railroad spur. Site elevations can be increased in a manner that maintains current grades and drainage patterns and provides the Port with a relatively smooth level working surface, because portions of the road and the storage yard surface are low compared to surrounding areas. Clean structural fill, similar to the crushed rock below the existing paved area, would be imported to transition between the new higher elevations where solidification would be completed and the elevations of the surrounding existing areas. Solidified soil would only be moved within the treatment limits under Ecology's Area of Contamination (AOC) policy and would be covered with approximately 3 feet of clean structural fill to permit the Port of

Longview to perform shallow excavation work in the future without encountering COC-containing materials.

Groundwater Treatment and Monitoring

After soil removal and treatment, Alternative GW2 would be implemented. This groundwater treatment alternative uses *in situ* chemical oxidation followed by monitored natural attenuation (MNA). Groundwater monitoring will continue until groundwater cleanup levels are achieved.

2.3. Alternative S6/GW1: Electrical Resistance Heating (ERH)

Alternative S6 calls for soil treatment by electrical resistance heating (ERH) throughout the area of DNAPL occurrence (including beneath mechanics shop) and preservation of the existing asphalt pavement over soils containing COCs at concentrations exceeding the cleanup level. Because there is reduced risk of breaching the Upper Silt layer during ERH treatment, soils within the Upper Silt layer would also be treated. To assess whether contaminants left in place in the northern part of the maintenance yard are impacting groundwater within the underlying aquifer, groundwater monitoring would be performed for a period of 2 years following completion of ERH treatment. The asphalt pavement over the ERH treatment area and in the northern part of the maintenance yard would be maintained long-term to limit direct contact with soil exceeding the cleanup levels. Asphalt over the treatment area would be maintained, because, based on the results of the treatability study, ERH may not achieve cleanup levels.

Alternative S6 calls for installation of an array of electrodes throughout the treatment area and subsequently passing electricity through the array into the surrounding soils. The treatment would be performed in phases. The first phase would focus on treatment of the smaller area under the Mechanics Shop building, and the second phase would treat the area outside the building. Information gleaned from the first phase would be applied to the second phase to improve the efficiency and effectiveness of ERH treatment within the larger second-phase area.

The resistance of the soils to the electric current between the electrodes generates heat within the soils and perched groundwater. This heating of the soils causes contaminants with boiling points lower than the soil temperature to change from liquid phase to vapor phase. The heating of the soils also causes the perched groundwater to boil and change phases from liquid to vapor.

A vacuum extraction system (a network of extraction wells connected to a vacuum pump) would be used to remove the vaporized contaminants. The vapors, steam, and liquids from the extraction process would be condensed and treated prior to release. Treatment of the vapors and liquids would be accomplished using thermal processes that destroy the contaminants.

Under Alternative S6, residual soil containing COCs would remain beneath the existing asphalt paved area in the northern part of the maintenance yard area. Although not impermeable, the asphalt pavement would significantly reduce water infiltration and thus mobilization of the residual COCs from beneath the existing asphalt paved area.

Groundwater Treatment and Monitoring

Since Alternative S6 involves ERH to treat both contaminated soils and groundwater, this alternative is the only one of the five Ecology alternatives that treats both soil and groundwater simultaneously. Consequently, rather than pairing Alternative S6 with a groundwater treatment alternative like GW2 (chemical oxidation), Alternative S6 has been paired with GW1 (electrical resistance heating and enhanced biodegradation). Therefore, at the appropriate time following the ERH process, an oxygen releasing compound would be injected into the soils during the post-ERH cooling phase. This compound should enhance the natural biodegradation process and expedite the cleanup of residual contamination in groundwater.

Alternative GW1 is the baseline alternative for groundwater remediation in the Feasibility Study. This alternative consists of ERH followed by enhanced biodegradation. The ERH system calls for the installation of electrodes within the underlying aquifer throughout the area in which groundwater contains DRO at concentrations exceeding the Method A groundwater cleanup level. The resistance of the saturated soils to the electrical current between the electrodes results in heating of the soils and boiling of the groundwater. The increased temperatures change liquid contaminants with boiling points lower than the boiling point of water into vapors.

A vacuum extraction system (a network of extraction wells connected to a vacuum pump) would be used to remove the vaporized contaminants. The vapors, steam, and liquids from the extraction process would be condensed and treated prior to release. Treatment of the vapors and liquids would be accomplished using thermal processes that destroy the contaminants.

This ERH treatment process would be conducted for approximately 1 year.

Since residual contamination is expected to remain following ERH treatment, Alternative GW1 assumes enhancement of the natural biodegradation process as a polishing treatment to achieve groundwater cleanup levels. Enhanced biodegradation would be accomplished during the post-ERH treatment rebound of microbial populations by injecting an oxygen-releasing compound during the cooling phase. The oxygen releasing compound would be injected during a series of four events over 1 year. Both ERH (with treatment of the extracted vapor stream) and enhanced biodegradation are treatment technologies that destroy or detoxify COCs. Following the active treatment phase, groundwater monitoring would continue for 4 years.

Under Alternative GW1, which is the baseline alternative for groundwater remediation, no COCs would remain in groundwater beneath the MFA at concentrations exceeding MTCA Method C cleanup levels.

2.4. Alternative S8/GW2: Soil Excavation, Removal, Off-Site Disposal, *In Situ* Solidification, and Chemical Oxidation

To address probable adverse impacts to Port of Longview operations associated with International Paper Company's preferred Alternative S5B, the Port retained GeoEngineers to develop a revised version of Alternative S5B that would be expected to significantly reduce future impacts to Port operations and reduce future costs associated with construction projects within the MFA (GeoEngineers, 2016). This revised alternative combines the *in situ* solidification treatment process with limited removal and off-site disposal of soils with lower concentrations of contaminants. Note that this alternative has been modified, since it was originally developed to accommodate an unloading pit within the northern portion of the Site, and this unloading pit is no longer planned.

Soil Excavation, Removal, Off-site Disposal, and Treatment

For Alternative S8 contaminated soils would be removed to allow for the expansion of soils treated with *in situ* solidification and return the surface elevations within the treated areas to approximate original elevations. The approach for Alternative S8 is summarized below:

- Reduce the volume of contaminated soil on site by removing and disposing of contaminated soils from areas where the probable threat to groundwater from excavation is minimal, such as areas that do not contain DNAPL. The anticipated depth of soil removal would be from 3.0 to 5.0 feet bgs over the entire treatment area.
- Reduce the thickness of solidified soil remaining on site by limiting *in situ* solidification treatment to the soil layers in which contamination exists at concentrations that would call for off-site disposal and treatment methods at higher costs. The anticipated depth of *in situ* solidification treatment would be from 5.0 to 9.0 feet bgs throughout the treatment area.
- Eliminate exposure by Port of Longview workers to solidified soil during projects requiring shallow earthwork (e.g., trenching, post-hole digging, and boring).

- Eliminate the adverse effects of soil solidification on post-treatment elevations and slopes within the MFA.
- Reduce the risk of unwarranted costs associated with soil excavation and handling during future construction projects.
- Reduce cleanup costs by using *in situ* solidification for a substantial volume of soils containing the highest contaminant levels and demanding the highest disposal costs.
- Reduce the vertical extent of the site that would be encumbered by deed restrictions that would be necessary after the site cleanup.

For comparison purposes, Alternative S8 is based on the assumptions and unit costs provided in the draft FS and other supporting cost information. Alternative S8 is a combination of Alternative S1 (comprehensive excavation) and S5B (solidification under and outside of the Mechanic Shop building). This modified version of Alternative S5B relies heavily on *in situ* solidification treatment; however, it uses limited excavation and off-site disposal to minimize changes in site surface elevations and grades caused by expansion of soils during the solidification process.

The basic principle of this combined alternative is to use *in situ* solidification for DNAPL-impacted soils within the footprint of observed DNAPL but only within the expected vertical profile of the DNAPL to reduce the post-treatment volume of solidified soil. Contaminated soil that doesn't contain DNAPL and has lower associated disposal costs would be excavated and disposed of off-site.

Groundwater Treatment and Monitoring

After soil removal and disposal, Alternative GW2 would be implemented. This groundwater treatment alternative uses *in situ* chemical oxidation followed by monitored natural attenuation (MNA). Groundwater monitoring will continue until groundwater cleanup levels are achieved.

2.5. Alternative S9/GW2: Limited Soil Excavation, Removal, Off-Site Disposal, *In Situ* Solidification, and Chemical Oxidation

Alternative S9 calls for excavation, removal, and disposal of enough contaminated soil to allow for the expected expansion of soils that would be treated by *in situ* solidification. This approach should result in surface elevations and grades that are approximately the same as the original elevations and grades; therefore, this alternative would significantly reduce the risk of future adverse impacts to Port of Longview operations within the MFA. This alternative is very similar to Alternative S8/GW2, which is described in the preceding section. The primary difference is that this alternative involves less excavation and off-site disposal of soils in Zone 1 and Zone 3 and removal of just enough soil to bring the site back to original elevations and grades following treatment.

Soil Excavation, Removal, Off-site Disposal, and Treatment

Alternative S9/GW2 was developed by Ecology to provide a site cleanup that complies with MTCA requirements and addresses concerns expressed by International Paper Company, the Port of Longview, and the public. The approach and attributes of Alternative S9 are summarized below:

- Reduce the volume of contaminated soil on site by removing and disposing of contaminated soils in areas where the probable threat to groundwater from excavation is minimal, such as areas that do not contain DNAPL.
- The anticipated depth of soil removal would be from 3.0 to 4.5 feet below ground surface for Zone 1 and Zone 3.
- In Zone 2 (utility corridor) the depth of soil removal would be from 3.0 to 5.0 feet bgs over the treatment area.
- Reduce the thickness of solidified soil remaining on site by limiting *in situ* solidification treatment to the soil layers in which contamination exists at concentrations that would call for off-site disposal and treatment methods at higher costs.
- The anticipated depth of *in situ* solidification treatment would be from 4.5 to 9.0 feet bgs in Zone 1 and Zone 3.
- The anticipated depth of *in situ* solidification treatment would be from 5.0 to 9.0 feet bgs in Zone 2.
- Eliminate exposure by Port of Longview workers to solidified soil during projects requiring shallow earthwork (e.g., trenching, post-hole digging, and boring).
- Eliminate the adverse effects of soil solidification on post-treatment elevations and slopes within the MFA.
- Reduce the risk of unwarranted costs associated with soil excavation and handling during future construction projects.
- Reduce cleanup costs by using *in situ* solidification for a substantial volume of soils containing the highest contaminant levels and demanding the highest disposal costs.
- Reduce the vertical extent of the site that would be encumbered by deed restrictions that would be necessary after the site cleanup.

Alternative S9 was developed using the assumptions and unit costs that were used in the Feasibility Study and other supporting cost information. Alternative S9 is essentially a combination of two alternatives from the Feasibility Study. Alternative S9 includes elements of Alternative S1 (comprehensive excavation) and Alternative S5B (solidification outside and under the Mechanic Shop). Combining these two alternatives allows the responsible party to rely heavily on *in situ* solidification treatment, while addressing the problem related to soil expansion, surface elevation changes, and abrupt grade changes by removing and disposing of an appropriate volume of contaminated soil off-site.

Another important feature of Alternative S9 is that it uses *in situ* solidification for DNAPL-impacted soils within the area of observed DNAPL; however, solidification would only be done within the expected vertical profile of the DNAPL, and this would reduce the post-treatment volume of solidified soils.

Relatively shallow (from 3.0 to 4.5 feet bgs) contaminated soils that don't contain DNAPL and could be disposed of at lower costs, would be excavated, removed, and disposed of off-site.

Groundwater Treatment and Monitoring

After soil removal, disposal, and treatment, Alternative GW2 would be implemented. This groundwater treatment alternative uses *in situ* chemical oxidation followed by monitored natural attenuation (MNA). Groundwater monitoring will continue until groundwater cleanup levels are achieved.

3.0 Alternative Cost Estimates

The process and rationale used to develop cost estimates for the five alternatives are described in the subsections below.

3.1. General Approach

The five alternatives were selected based on the following rationale:

1. Alternative S1 was selected since it is the baseline soil treatment alternative presented in the draft RI/FS.

2. Alternative S5B was selected since it is the preferred alternative presented in the draft RI/FS.

3. Alternative S6 was selected since it uses different technology than the other four selected alternatives and has the capability of treating both contaminated soils and groundwater at the same time.

4. Alternative S8 was selected since it is the Port of Longview's preferred alternative.

5. Alternative S9 was developed to minimize the quantity of soil that would need to be disposed of off-site while retaining the current site surface elevations and grades.

To evaluate and compare these alternatives, we reviewed cost estimates, supporting information, and contractor quotes provided by AECOM (on behalf of International Paper) and by GeoEngineers (on behalf on the Port of Longview). We then developed revised versions of each cost estimate and created an additional alternative (Alternative S9) that calls for removing a limited quantify of contaminated soil as necessary to reclaim original site surface elevations and grades. The objective of the revised cost estimates was to eliminate disparities between various assumptions and provide a fair and reasonable comparison of probable costs.

Under all five alternatives the upper 3 feet of soil is assumed to be clean with COC concentrations below cleanup levels; therefore, the top 3 feet of soil will be excavated, stockpiled on-site, and re-used after treatment of contaminated subsurface soils.

Under Alternative S1 the contaminated soils from 3 to 8 feet bgs will be excavated, transported, and disposed of at an approved landfill. Once the excavation is complete, new and stockpiled fill material will be used to return the site to original surface elevations and grades. Groundwater treatment Alternative GW2, which is presented in the RI/FS, will be used to address groundwater contamination after soil removal.

Alternative S5B consists of *in situ* mechanical mixing of solidifying agents into the subsurface soils within the treatment areas. Under this alternative, all contaminated soil remains on-site and is treated from 3 to 9 feet bgs using the solidification technique. Due to the volumetric expansion due to solidification, this alternative would result in increases in the post-treatment surface elevations and grades of the site. Groundwater treatment Alternative GW2, presented in the RI/FS, will be used to address groundwater contamination after soil solidification.

Under Alternative S6 ERH will be used to treat both contaminated soil and groundwater within the treatment area. Removal and disposal of soils from drilling (drill cuttings) would be necessary.

Alternative S8 consists of soil excavation from 3 to 5 feet bgs over the treatment area. Contaminated soil will be transported and disposed of at an approved landfill. Once the excavation is complete, *in situ* mechanical mixing of solidifying agents into the subsurface soils will be conducted within the treatment area from 5 to 9 feet bgs. New and stockpiled clean fill material will be used to return the site to original surface elevations and grades. Groundwater treatment Alternative GW2, presented in the RI/FS, will be used to address groundwater contamination after soil removal and solidification.

The new Ecology alternative (Alternative S9) consists of soil excavation from 3 to 4.5 feet bgs over the treatment areas except for the utility corridors in which soils will be excavated from 3 to 5 feet bgs to allow for installation of future underground utilities. The contaminated soils removed will be transported and disposed of at an approved landfill. Once the excavation and removal are complete, *in situ* mechanical mixing of solidifying agents into the subsurface soils of the treatment area will be performed. New and stockpiled clean fill material will be used to return the site to original surface elevations and grades. Groundwater treatment Alternative GW2, presented in the RI/FS, will be used to address groundwater contamination after soil removal.

To compare the cost estimates associated with each of the five alternatives, we created a side-by-side comparison spreadsheet (Attachment A) on which the cost estimate for each alternative is shown.

1. International Paper Alternative S1 (Complete Excavation): This cost estimate is based on the most recent information provided by AECOM and the AECOM estimate dated July 2016.
2. International Paper Alternative S5B (modified): This cost estimate is based on our analysis of the scope and probable costs to complete Alternative S5B. The most recent information from GeoEngineers is dated July 2018. This alternative no longer includes the excavation and removal soils to accommodate an unloading pit, which was included in the RI/FS.
3. Alternative S6: This cost estimate reflects our analysis of the necessary scope and probable costs to complete Alternative S6 and is dated July 2018.
4. Port of Longview Preferred Alternative (modified): This cost estimate is based on our analysis of the scope and probable costs to complete Alternative S8 and is dated July 2018. This alternative no longer includes the excavation, removal, and disposal of soils to 8 feet bgs to accommodate an unloading pit, which was previously included in the Port of Longview's preferred alternative.
5. Ecology Alternative S9: This cost estimate dated July 2018 is based on the approach Ecology developed to excavate and remove a limited quantity of subsurface soil as necessary to offset the expansion of solidified soils. This alternative also does not include excavation and disposal of subsurface soils to 8 feet bgs to accommodate an unloading pit.

3.2. Sources

The line-item cost estimates for several tasks are equal among alternatives, since each alternative proposes the same or similar construction and treatment methods. The one exception is Alternative S6 (ERH), which is markedly different from the other four alternatives. To produce revised cost estimates that could be appropriately compared, cost estimates for excavation and solidification were obtained from written quotes dated August 15, 2015 provided by AECOM's subcontractor for solidification. Since excavation for the three solidification alternatives (S5B, S8, and S9) no longer needs to accommodate an unloading pit, the excavation and solidification volumes are based on the treatment areas provided in the draft RI/FS.

In certain instances, the original unit costs were different than the unit costs provided in the contractor's quote. In those instances, the unit costs in the contractor's quote were used.

For Alternative S6, the costs were obtained from written quotes provided by AECOM's contractor and revised based on the engineer's experience to incorporate Alternatives S6 and Alternative GW1 into one treatment system.

3.3. Assumptions

The following assumptions and decisions were made during our evaluation to support an objective analysis and comparison of alternatives:

- Shoring: Alternatives S5B, S8, and S9 use two methods of shoring consisting of sheet pile retaining walls adjacent to the Mechanics Shop building and existing TWP slurry wall and cut slopes at a 45-degree angle elsewhere to secure the excavation side walls. Alternative S1 uses freeze wall shoring as presented in the draft RI/FS.

- Contaminated Soil Disposal: The Port of Longview assumption that 85 percent of the excavated material will be disposed of as hazardous waste was used in our analysis.

- Solidification Expansion: An expansion factor of 35 percent was used to determine the increase in volume caused by the solidification process. This expansion factor was derived from bench scale test results that were provided in the draft RI/FS.

- Long-Term Monitoring: Monitoring of institutional controls was assumed to be conducted over a 30-year period for each alternative. The monitoring of leachate releases was assumed to be conducted over a 10-year period for each alternative.

- Bioventing Wells: Since either Alternative GW1 or Alternative GW2 was selected to treat and monitor groundwater, the line item for re-installing the bioventing wells was removed.

- Unloading Pit (Zone 1): The original Alternative S5B and Alternative S8 included excavation to 8 feet bgs to accommodate an unloading pit in the area shown as Zone 1 in the draft RI/FS. The revised cost estimates provided with this memorandum treat Zone 1 the same as Zone 2 and do not include excavation to 8 feet bgs in Zone 1.

3.4. Results

Based on our evaluation of the alternatives provided in the draft RI/FS, supplemental information provided by AECOM and GeoEngineers, and the development of revised alternatives, the estimated costs of the five remediation alternatives are summarized in Table 1.

Table 1. Summary of Estimated Costs for Selected Alternatives

Alternative	Alternative S1/GW2	Alternative S5B/GW2	Alternative S6/GW1	Alternative S8/GW2	Alternative S9/GW2
Estimator	*Ridolfi*	*Ridolfi*	*Ridolfi*	*Ridolfi*	*Ridolfi*
Remedial Action Construction	$2,107,758	$1,927,307	$7,410,800	$1,770,671	$1,760,443
Contaminated Waste Transportation and Disposal	$1,870,318	$24,368	$148,960	$613,219	$510,113
Contractor Contingency (20 percent)	$795,615	$390,335	$2,267,928	$476,778	$454,111
Total Engineering Costs	$692,677	$640,554	$1,094,271	$731,838	$707,902
O&M and Long-Term Monitoring Costs	$649,126	$649,126	$694,676	$649,126	$649,126
Sales Tax and Agency Oversight	$545,886	$276,838	$1,113,874	$336,629	$320,950
GW Treatment Cost	***$4,559,355***	***$4,559,355***	***$0***	***$4,559,355***	***$4,559,355***
Total Project Cost	**$11,220,735**	**$8,467,883**	**$12,730,509**	**$9,137,616**	**$8,962,000**

A detailed comparison of the estimates of probable cost for these five alternatives is provided in Attachment A.

The following observations and conclusions are based on the cost comparison analysis:

- The cost of International Paper Alternative S5B/GW2 is approximately $670,000 lower than the cost of Port of Longview Preferred Alternative S8/GW2.

- The cost of International Paper Alternative S5B/GW2 is approximately $495,000 lower than the cost of Ecology Alternative S9/GW2.

- The cost difference between International Paper Alternative S5B/GW2 and Alternatives S8/GW2 and S9/GW2 is due in large part to the costs associated with transport and disposal of contaminated soil.

- Since most of the cost difference is due to the transport and disposal of contaminated soil, a significant savings could result if soil characterization determined that less than the assumed 85 percent of the soil is considered CAMU-eligible waste.

- The cost estimates presented in this memorandum do not include costs for dioxin sampling and analysis that would be required to adequately characterize site soils and groundwater. These costs would probably be the same for each alternative; however, the costs could be slightly higher for the alternatives that include off-site disposal of contaminated soil, depending on soil characterization requirements imposed by the disposal facility.

- Engineering Costs for the Port of Longview's Preferred Alternative S8/GW2 are probably biased high, since the costs associated with certain tasks are based on a percentage of the costs for "Remedial Action Construction" and "Contaminated Waste Disposal and Transportation."

4.0 Comparative Benefits of the Proposed Alternatives

Based on the focused set of five cleanup alternatives described above, we performed an evaluation and comparison of the alternatives using the criteria included in MTCA for determining whether proposed cleanup alternatives use permanent solutions to the maximum extent practicable.

4.1. Approach

This evaluation was conducted following the procedures included in section 360(e) of MTCA for performing a disproportionate cost analysis [WAC 173-340-360(e)], and the comparison of the relative costs and benefits of each alternative was based on the evaluation criteria included in section 360(f) of MTCA [WAC 173-340-360(f)]. The evaluation criteria include:

- Protectiveness
- Permanence
- Cost
- Effectiveness over the long term
- Management of short-term risks
- Technical and administrative implementability
- Consideration of public concerns

As explained in MTCA, the comparison of benefits and costs may be quantitative, but will often be qualitative and require the use of best professional judgment. In particular, Ecology has the discretion to favor or disfavor qualitative benefits and use that information in selecting a cleanup action. This evaluation included a combination of quantitative and qualitative comparisons, which are described in the following subsections.

For each of the evaluation criteria, each alternative was given a numerical score (from 1 to 10) based on a qualitative assessment of how well the alternative addressed each criterion. The individual scores for each alternative were then summed to calculate a total benefit score for the alternatives.

A comparison of the estimated costs of implementing each alternative relative to their total benefit score is summarized in Section 5 and is intended to provide a basis for selecting a preferred cleanup action alternative.

4.2. Evaluation Criteria

The following subsections compare each of the five selected alternatives based on the degree to which they satisfy the evaluation criteria. Note that the cost criterion is addressed in Section 3 of this memorandum, and the relative cost per benefit is summarized below in Section 5.

4.2.1. Protectiveness

This criterion evaluates the overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and off-site risks resulting from implementing the alternative, and improvement of the overall environmental quality.

Because Alternative S1/GW2 calls for the excavation and removal of all contaminated soils from the site, it achieves soil cleanup levels throughout the site and results in the greatest reduction of on-site risks. However, this alternative also results in greater off-site risks because it would transport and dispose of the greatest amount of soils off-site.

Alternatives S5B/GW2, S8/GW2, and S9/GW2 would result in a similar level of protectiveness and would be implemented in a similar timeframe.

Alternative S6/GW1 would require additional time to implement compared to the other four alternatives.

4.2.2. Permanence

This criterion evaluates the degree to which the alternative permanently reduces the toxicity, mobility, or volume of hazardous substances including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated.

In the draft RI/FS, Alternative S1 was identified as the only permanent alternative, and Alternative S1 would rely less on institutional controls to restrict exposure to site soils.

Alternative S6/GW1 is considered the least reversible alternative because it relies on ERH, which removes and destroys contaminants and does not rely on on-site containment of soils containing DNAPL or COCs exceeding the cleanup levels.

Alternatives S5B/GW2, S8/GW2, and S9/GW2 rely on similar technologies and are therefore similar in permanence. Because Alternative S5B/GW2 would increase the site elevation over the treatment area, it is the most likely of these three alternatives to be disturbed during future site development activities; therefore, this alternative was determined to be slightly less permanent than the other two solidification alternatives, which would not result in significant changes to current site elevations. Alternative S5B/GW2 would also result in a greater volume of hazardous substances remaining on-site.

4.2.3. Effectiveness Over the Long Term

Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the time that hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes. The following types of cleanup action components may be used as a guide, in descending order, when assessing the relative degree of long-term effectiveness: Reuse or recycling; destruction or detoxification; immobilization or solidification; on-site or off-site disposal in an engineered, lined, and monitored facility; on-site isolation or containment with attendant engineering controls; and institutional controls and monitoring.

Because Alternative S6/GW1 would result in the destruction of site contaminants to the greatest degree, it was determined to be most effective over the long-term.

Although solidification may be considered to have greater long-term effectiveness than off-site disposal in general, since solidified soils would remain on-site directly beneath an actively operating facility, Alternative S1/GW2 was scored the same as the solidification alternatives.

Alternatives S5B/GW2, S8/GW2, and S9/GW2 rely on similar technologies and therefore would be similarly effective over the long-term. Because Alternative S5B/GW2 would increase the elevation over the treatment area, it is the most likely of these three alternatives to be disturbed during future site development activities, and was therefore determined to be slightly less effective over the long-term than the other two solidification alternatives, which would not result in significant changes to current site elevations.

4.2.4. Management of short-term risks

This criterion evaluates the risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks.

Alternative S6/GW1 is considered to have the lowest short-term risks because it does not require soil removal and transport and does not require shoring.

Alternatives S5B/GW2, S8/GW2, and S9/GW2 are considered to have the next lowest short-term risks.

Because of the extensive excavation, extensive shoring, and the potential for breaching the Upper Silt unit during excavation, Alternative S1/GW2 is considered to have the most short-term risk.

4.2.5. Technical and Administrative Implementability

This criterion evaluates the alternative's ability to be implemented including consideration of whether the alternative is technically possible; availability of necessary off-site facilities, services, and materials; administrative and regulatory requirements; scheduling; size; complexity; monitoring requirements; access for construction operations and monitoring; and integration with existing facility operations and other current or potential remedial actions.

All soil alternatives could be implemented at the site with respect to technically practicability; availability of necessary off-site facilities; availability of necessary off-site services and materials; administrative and regulatory requirements; scheduling; size; complexity; monitoring requirements; access for construction operations and monitoring; and integration with existing facility operations and other current or potential cleanup actions. However, some soil alternatives would be more easily implemented than others, based on the relative complexity of implementation, the degree of disruption to Port of Longview operations, and the technical certainty associated with each technology's effectiveness given site conditions and contaminant characteristics.

Alternatives S5B/GW2, S8/GW2, and S9/GW2 are very similar and were scored highest for technical and administrative implementability. Because Alternative S5B/GW2 would result in an increase in surface elevations throughout the Site, it was assumed to have a greater potential for affecting existing operations at the facility; therefore, this alternative was scored slightly lower than Alternatives S8/GW2 and S9/GW2 for this criterion.

While Alternative S1/GW2 relies on common and proven remedial technologies, the extent of excavation and shoring, and the potential for breaching the Upper Silt unit during excavation results in this alternative scoring lower for technical and administrative implementability.

Alternative S6/GW1 is considered the least favorable with regard to technical and administrative implementability because it relies on ERH technology. Use of this technology would likely require upgrading the power supply to the property. Additionally, the installation and operation of the ERH system is complex, potentially lengthy, and disruptive to Port operations (because the aboveground infrastructure would remain in place for a substantial time). Effective ERH treatment requires installation of heating electrodes to approximately 12 feet bgs (through and below the Upper Silt layer) to provide a sufficient soil thickness for heat retention. Penetration of the Upper Silt layer could result in migration pathways for untreated DNAPL or COCs.

4.2.6. Consideration of Public Concerns

This criterion evaluates whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site.

Because Alternative S1/GW2 removes the most contaminated material from the site, it best addresses concerns expressed by the public.

Alternatives S5B/GW2, S8/GW2, and S9/GW2 are very similar and similarly addressed concerns expressed by the public. However, because Alternative S5B/GW2 would result in an increase in surface elevations throughout the Site, which was an issue specifically identified as a public concern, it scored lower than the other two alternatives for this criterion.

4.3. Comparison of Overall Benefits

To assess overall benefits for each alternative, the numeric scores for each of the above criteria were summed, and the results were used to calculate the overall “total benefit score”. The scoring for each alternative is presented in Table 2.

Table 2. Comparison of Alternative Benefit Scores

Criterion	Alternative S1/GW2	Alternative S5B/GW2	Alternative S6/GW1	Alternative S8/GW2	Alternative S9/GW2
Protectiveness	8	7	5	7	7
Permanence	9	7	8.5	7.5	7.5
Effectiveness Over the Long-Term	6	6	9	6	6
Management of Short-Term Risk	4	6	5	6	6
Technical and Administrative Implementability	5	6	4	7	7
Consideration of Public Concerns	9	6	6	7	7
Total Benefit Score	**41**	**38**	**37.5**	**40.5**	**40.5**

Alternative S1/GW2 was scored the highest for protectiveness, permanence, and consideration of public concerns, since it would remove all soils exceeding cleanup levels and dispose of them off-site. Alternative S1 was identified in the draft RI/FS as the only permanent soil cleanup alternative, and it best addresses public concerns.

Alternative S6/GW1 was scored the highest for effectiveness over the long term, since it relies primarily on the destruction of contaminants.

Alternatives S5B/GW2, S8/GW2, and S9/GW2 rely on similar cleanup technologies and were scored the same for many of the evaluation criteria. Because Alternative S5B/GW2 would result in an increase in the overall site grade and would result in a greater volume of waste treatment residuals remaining on-site, it was scored slightly lower for permanence, technical and administrative implementability, and consideration of public concerns relative to Alternatives

S8/GW2 and S9/GW2. This was primarily due to the potential for conflict with current and future site development activities that may be affected by the increase in site elevations. Alternatives S8/GW2 and S9/GW2 would not significantly affect the current site elevations and would result in lower volumes of on-site waste treatment residuals. The potential to affect current and future Port operations was a primary issue raised by the public during the draft RI/FS comment period.

5.0 Disproportionate Cost Analysis

When selecting a cleanup action, MTCA requires that Ecology give preference to actions that use permanent solutions to the maximum extent practicable. To select the most practicable permanent solution from among those cleanup action alternatives that are protective of human health and the environment, Ecology conducts a disproportionate cost analysis (DCA). To conduct a DCA, the costs and benefits to be compared are the evaluation criteria identified in section 360(f) of MTCA [WAC 173-340-360(f)], and include:

- Protectiveness
- Permanence
- Cost
- Effectiveness over the long term
- Management of short-term risks
- Technical and administrative implementability
- Consideration of public concerns

Costs are considered to be disproportionate to benefits if the incremental costs of an alternative over that of a lower cost alternative exceed the incremental degree of benefits achieved by that alternative over that of a lower cost alternative.

For our analysis, we compared the five alternatives by dividing the estimated total cost of implementing each alternative by the total benefit score for that alternative to arrive at a “cost per benefit” value. The results of this cost/benefit analysis are presented in Table 3.

Table 3. Disproportionate Cost Analysis

Alternative	S1/GW2	S5B/GW2	S6/GW1	S8/GW2	S9/GW2
Total Project Cost	$11,220,735	$8,467,883	$12,730,509	$9,137,616	$8,962,000
Total Benefit Score	41	38	37.5	40.5	40.5
Cost/Benefit	$ 273,676	$ 222,839	$ 339,480	$ 225,620	$ 221,283

6.0 Conclusions and Recommendations

Based on our analysis of the selected set of five alternatives described in Section 2, Alternative S9/GW2 ("the Ecology Alternative") was determined to be the most practicable permanent cleanup action for the Port of Longview MFA Site.

Of the alternatives considered, Alternative S5B/GW2 was the lowest cost alternative; however, the cost per benefit for this alternative was slightly higher than the cost per benefit of Alternative S9/GW2.

Alternatives S5B/GW2, S8/GW2, and S9/GW2 rely on similar cleanup actions, and were similar in both their costs and benefits. As discussed in Section 2, Alternatives S5B/GW2 and S8/GW2 were modified slightly from the alternatives originally proposed based on changes in future development plans for the Site.

Based on this analysis, we recommend that Ecology consider the actions proposed in Alternative S9/GW2 when selecting a preferred remedy for this Site.

Prepared and reviewed by:

Bill Beckley
Principal Environmental Scientist

Bruno Ridolfi, P.E.
Principal Engineer

Paul Bianco, P.E.
Senior Environmental Engineer

References:

AECOM. 2016. *Public Review Draft Remedial Investigation/Feasibility Study Report Port of Longview Maintenance Facility Area, Longview, Washington*. July 12.

GeoEngineers. 2016. *Development of Additional Alternative for MFA Cleanup Action*. Memorandum from Chris Bailey to Lisa Hendriksen. March 10.

URS Corporation (URS). 2014. *Draft Final Revised Remedial Investigation/Feasibility Study (FS Sections Only), Port of Longview, Maintenance Facility Area, International Paper, Longview, Washington*. February 28.

APPENDIX B

Applicable or Relevant and Appropriate Requirements

6.4 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

MTCA requires that cleanup actions comply with legally applicable state and federal laws and regulations, as well as other applicable or relevant and appropriate requirements (ARARs). This section discusses the ARARs that potentially apply to the cleanup alternatives.

"Legally applicable" requirements under MTCA are *"those cleanup standards, standards of control, and other environmental protection requirements, criteria, or limitations adopted under state or federal law that specifically address a hazardous substance, cleanup action, location or other circumstances at the site"* (WAC 173-340-710[3]).

"Relevant and appropriate" requirements are *"those cleanup standards, standards of control, and other environmental requirements, criteria, or limitations established under state or federal law that, while not legally applicable to the hazardous substance, cleanup action, location, or other circumstance at a site, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site"* (WAC 173-340-710[4]). WAC 173-340-710(4) identifies the criteria to be used in determining whether a requirement is relevant and appropriate, which include whether:

- The purpose for which the statute or regulations under which the requirement was created is similar to the purpose of the cleanup action
- The media regulated or affected by the requirement is similar to the media contaminated or affected at the site
- The hazardous substance regulated by the requirement is similar to the hazardous substance found at the site
- The entities or interests affected or protected by the requirement are similar to the entities or interests affected by the site
- The actions or activities regulated by the requirement are similar to the cleanup action contemplated at the site
- Any variance, waiver, or exemption to the requirements are available for the circumstances of the site
- The type of place regulated is similar to the site
- The type and size of structure or site regulated is similar to the type and size of structure or site affected by the release or contemplated by the cleanup action
- Any consideration of use or potential use of affected resources in the requirement is similar to the use or potential use of the resources affected by the site or contemplated cleanup action

In accordance with WAC 173-340-710(9)(b), cleanup actions conducted under a consent decree or agreed order are exempt from the procedural requirements of certain state and local laws, including[2]:

- Washington State Clean Air Act (Chapter 70.94 RCW)
- Washington State Solid Waste Management Act (Chapter 70.95 RCW)
- Washington State Hazardous Waste Management Act (Chapter 70.105 RCW)
- Washington State Construction Projects in Water Act (Chapter 75.20 RCW, recodified as Chapter 77.55 RCW)
- Washington State Water Pollution Control (Chapter 90.48 RCW)
- Washington State Shoreline Management Act (Chapter 90.58 RCW)
- Any laws requiring or authorizing local government permits or approvals for the action

The cleanup action still must comply with the substantive requirements of the laws in accordance with WAC 173-340-710(9)(c). It is part of Ecology's role under a consent decree or other order to ensure compliance with the substantive requirements, and to provide an opportunity for comment by the public, state agencies, and local governments (WAC 173-340-710[9][d]).

6.4.1 Potential Chemical-Specific ARARs

Chemical-specific ARARs are health-based or risk-based numerical values or methodologies, which when applied to site-specific conditions, establish numerical cleanup levels. The cleanup levels quantify the amount or concentration of a hazardous substance allowed to be present in or discharged to the environment. Table 6-1 presents the preliminary cleanup levels for groundwater and soil at the MFA, as derived from the potential chemical-specific ARARs which are presented in Table 6-2. The chemical-specific ARARs are based on values obtained from Ecology's CLARC database (August 2015). Changes in the chemical-specific ARARs compared to the draft final revised FS dated February 2014 resulted in the following:

- Rounding to two significant figures instead of three (according to Ecology, cleanup levels should only include two significant figures)
- Changing the basis for the MTCA Method C air cleanup levels from non-cancer to cancer (2-methylnaphthalene, naphthalene, and dibenzofuran)

[2] This exemption does not apply if Ecology determines that the exemption would result in loss of necessary approval from a federal agency to administer any federal law.

- Using EPA chemical-specific properties in the migration to groundwater calculations (2-methylnaphthalene and dibenzofuran).

Preliminary cleanup and remediation levels and preliminary POCs are discussed in detail in Sections 6.1, 6.2, and 6.3.

6.4.1.1 Soil

MTCA Regulations, WAC 173-340-745(3) and (5), 173-340-708(8), and 173-340-355. MTCA Method C and A industrial cleanup levels are potentially applicable to evaluating soil cleanup standards at the site. Because the MFA portion of the site meets the criteria for industrial land use (WAC 173-340-745), the proposed preliminary cleanup levels for the rarely detected semivolatile compounds dibenzofuran and PCP, the PAH compounds 2-methylnaphthalene and naphthalene, and for cPAHs in soil are based on the standard MTCA Method C industrial soil cleanup levels (WAC 173-340-745[5][b]). The total concentration of the cPAH compounds (benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenzo[a,h]anthracene, chrysene, benzo[k]fluoranthene, benzo[b]fluoranthene, and benzo[a]anthracene) is compared to the cleanup level using the Toxicity Equivalency Factor methodology of WAC 173-340-708(8). Concentration limits for TPH as diesel or heavy oil are based on MTCA Method A industrial soil cleanup levels (WAC 173-340-900, Table 745-1). International Paper has elected to not perform fractionation analysis of the petroleum compounds found at the site, and therefore has elected not to calculate MTCA Method B or C cleanup levels. Table 6-1 presents the preliminary cleanup levels that will be met at the conditional POC (Section 6.3).

Pathways to ecological receptors are considered to be incomplete because groundwater impacts are localized beneath the paved area, and those impacts do not migrate to surface water bodies (Section 5.0). Under WAC 173-340-7491(1)(b), no further terrestrial ecological evaluation is required because all soil contaminated with hazardous substances is covered by buildings, paved roads, pavement, or other physical barriers that will prevent plants or wildlife from exposure to the soil contamination. Therefore, no potential chemical-specific ARARs have been identified as no significant adverse terrestrial risk is anticipated at the site (WAC 173-340-745(5)(b)(ii).

When developing soil cleanup levels, MTCA also requires consideration of the soil to vapor pathway, as discussed in detail in Section 5.3, and protection of groundwater. Preliminary air cleanup levels were developed for volatile COCs and are summarized in Table 6-2.

Table 6-2 also summarizes the preliminary soil cleanup levels for protection of groundwater for DRO, the PAH compounds that have been detected in soil at the MFA, and the two semivolatile organic compounds dibenzofuran and PCP, which also have been rarely detected at the MFA site (see also Section 3.3 for a discussion of the nature and extent of COCs). Both MTCA Method B and Method C soil cleanup levels protective of groundwater are included in Table 6-2 for completeness. MTCA Method C cleanup levels for soil protective of groundwater are applicable rather than MTCA Method B cleanup levels, since MTCA Method C groundwater cleanup levels would apply in the area within the conditional POC for groundwater.

The cleanup action alternatives evaluated in this RI/FS also include remediation levels evaluated in accordance with WAC 173-340-355. The remediation level is established to distinguish when various potential cleanup action components would be implemented (see Section 6.2).

6.4.1.2 Groundwater

MTCA Regulations, WAC 173-340-720. Groundwater at the site has no present or reasonably foreseeable use for drinking water purposes. However, MTCA requires groundwater to be protected based on its highest potential beneficial use as potable groundwater (WAC 173-340-720[1][a]). Both MTCA Standard Method B and C cleanup levels for potable water have been proposed for the site based on the existing and anticipated use of the property. The cleanup levels for 2-methylnaphthalene, naphthalene, and cPAHs in groundwater are based on the MTCA Standard Method C potable water cleanup levels for groundwater beneath the MFA (WAC 173-340-720[5][b]). Concentration limits for individual PAH compounds and cPAHS in groundwater beyond the existing COC plume boundaries are based on MTCA Standard Method B Cleanup Levels for potable water (WAC 173-340-720[4][b]). Finally, concentration limits for TPH as diesel or heavy oil are based on MTCA Method A groundwater cleanup levels (WAC 173-340-720, Table 720-1) both within the current COC plume and beyond the existing COC plume boundaries. Table 6-1 presents the preliminary cleanup levels. These cleanup levels will be met at the conditional POC as described in Section 6.3.

Safe Drinking Water Act Primary Drinking Water Regulations, 40 Code of Federal Regulations (CFR) 141.61(a), and Washington State Department of Health Drinking Water Standards (WAC 246-290-310[7]). The federal and state primary drinking water regulations establish health-based maximum contaminant levels for public water systems. Although site groundwater does not supply a public water system, the federal and state maximum contaminant levels are potentially relevant and appropriate requirements for these waters where groundwater is a potential source of drinking water. The federal maximum contaminant level (MCL) for benzo(a)pyrene is 0.2 mg/L and is potentially relevant and appropriate to groundwater at the site. No other site COCs are regulated by the Safe Drinking Water Act. Table 6-1 presents the preliminary cleanup levels, which will be met at the conditional POC as described in Section 6.3. Since MTCA groundwater cleanup levels are more stringent for benzo(a)pyrene (reported as cPAHs), the federal MCL for benzo(a)pyrene is not included in this table.

6.4.2 Potential Action-Specific ARARs

Action-specific ARARs are usually technology- or activity-based requirements or restrictions on actions taken with respect to hazardous substance(s). These requirements set performance, design or other standards that would be used to implement the proposed cleanup action and are triggered by the particular cleanup action alternative. The action-specific requirements do not in themselves determine the selected cleanup or interim action alternative; rather, they indicate how, or to what level, a cleanup action alternative must achieve a standard. The potential applicability of the action-specific ARARs to the soil and groundwater alternatives is summarized in Tables 6-3 and 6-4, respectively.

Model Toxics Control Act Cleanup Action Requirements

The MTCA implementing regulations specify requirements that potentially affect implementation of a remedial design/cleanup action at the site. These regulations are potentially applicable requirements to implement the selected cleanup action alternative at the site.

Monitored Natural Attenuation, Expectations for Cleanup Action Alternatives, WAC 173-340-370. WAC 173-340-370(7) states that MNA may be appropriate at sites where: 1) source control has been conducted to the maximum extent practicable, 2) leaving contaminants on site during the restoration time frame does not pose an unacceptable threat to human health or the environment, 3) there is evidence that natural biodegradation or chemical degradation is occurring and will continue to occur at a reasonable rate at the site, and 4) cleanup actions conducted will not result in a significantly greater overall threat to human health or the environment than other alternatives.

Applicability to Soil and Groundwater Alternatives: WAC 173-340-370(7) is applicable to cleanup action alternatives that include MNA as part of the cleanup action. This includes all groundwater alternatives (GW1 through GW4) being considered for the MFA in this FS.

Institutional Controls, WAC 173-340-440. In accordance with this regulation, appropriate institutional controls shall be described in a restrictive covenant on the property when cleanup levels are established using MTCA Method C (WAC 173-340-440(4)(b)). The covenant shall be executed by the property owner and recorded with the register of deeds for the county in which the site is located, shall run with the land, and shall be binding on the owner's successors and assigns. In addition, the covenant shall prohibit activities on the site that may interfere with a cleanup action, O&M, monitoring, or other measures necessary to assure the integrity of the cleanup action and continued protection of human health and the environment or that may result in the release of a hazardous substance that was contained as a part of the cleanup action.

Applicability to Soil and Groundwater Alternatives: WAC 173-340-440 is applicable to cleanup action alternatives that use MTCA Method C cleanup levels. This includes all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and groundwater alternatives (GW1 through GW4) being considered for the MFA in this FS.

Compliance Monitoring Requirements, WAC 173-340-410. This regulation requires the performance of compliance monitoring for all cleanup actions. A compliance monitoring plan must be submitted to Ecology for review and approval. Compliance monitoring plans may include monitoring for chemical constituents, biological testing, and physical parameters, as appropriate. Where the cleanup action includes engineered or institutional controls, documented observations on the performance of these controls may be required. Long-term monitoring shall be required if on-site disposal, isolation, or containment is the selected cleanup action for a site or a portion of a site. Such measures shall be required until residual hazardous substance concentrations no longer exceed site cleanup levels established under WAC 173-340-700 through 173-340-760. Compliance monitoring plans shall be specific to the media being tested and shall contain a sampling and analysis plan meeting the requirements of WAC 173-340-820. In addition, all analytical procedures shall be consistent with the requirements specified in WAC 173-340-830.

Applicability to Soil and Groundwater Alternatives: WAC 173-340-410 is applicable to all cleanup action alternatives conducted under MTCA. This includes all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and groundwater alternatives (GW1 through GW4) being considered for the MFA in this FS.

6.4.2.1 Stormwater Management

Stormwater Permit Program, 40 CFR 122.26, Chapter 173-226 WAC. The Federal Clean Water Act, as delegated to Ecology under RCW 90.48.260, requires that coverage under the general stormwater permit must be obtained for stormwater discharges associated with construction activities disturbing more than 1 acre. The disturbed area for this project is expected to be greater than 1 acre. Since Ecology has determined that this permit is not exempt under WAC 173-340-710(9), the site would obtain coverage under the Washington State General Stormwater Permit for Construction Activities to meet both the procedural and substantive provisions this requirement. In addition, a stormwater pollution prevention plan would be prepared before beginning land-disturbing activities. The plan would describe the best management practices that would be implemented to protect surface water quality. Once construction begins, the site would be monitored weekly to ensure stormwater runoff does not cause the receiving surface water body to exceed water quality standards. These requirements would be coordinated with any applicable local grading and erosion control requirements by the Longview Municipal Code (LMC) or Cowlitz County Code (CCC) as provided in Section 6.4.3.2.

Applicability to Soil and Groundwater Alternatives: 40 CFR 122.26 and WAC 173-226 are applicable to cleanup action alternatives where the disturbed area is greater than 1 acre. This includes all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and three groundwater alternatives (GW1, GW2, and GW3) being considered for the MFA in this FS.

6.4.2.2 Hazardous Waste and Environmental Media Management

RCRA and Washington Hazardous Waste Management Act (RCW 70.105) and Dangerous Waste Regulations; 40 CFR 260, 261, 262, 263, and 268; Chapter 173-303 WAC. The Federal RCRA regulations and the Washington State Dangerous Waste regulations apply to the cleanup action alternatives for the MFA because hazardous constituents from the TWP Area, a RCRA corrective action site, migrated to the MFA and contaminated media potentially contains a listed waste (listed waste designation code F034). These regulations identify the requirements for characterization, management, and disposal of waste including contaminated media (i.e., soil and groundwater). The requirements of the Federal RCRA regulations and Washington State Dangerous Waste Regulations must be complied with fully for off-site activities. For on-site activities, only the substantive requirements of the Federal RCRA regulations and the Washington Dangerous Waste regulations must be met. Off-site disposition of waste would occur at facilities that are licensed and permitted to accept the specific hazardous waste or contaminated media.

Applicability to Soil and Groundwater Alternatives: These regulations are potentially applicable to cleanup action alternatives that include characterization and on-site management of groundwater, soil, de-watering water and water treatment residuals, and the off-site transportation and disposal of soil, water, and water treatment residuals. This includes all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and groundwater alternatives (GW1 through GW4) being considered for the MFA in this FS.

Federal EPA and Washington State "Contained-In" Policy (USEPA 1986, WDOE 1993); Federal Register preambles; EPA memos and correspondences; Hazardous Waste. According to EPA and Ecology "contained-in" policies, contaminated environmental media is not a "solid waste" and therefore, is not a hazardous waste. However, contaminated media that contains a hazardous waste becomes subject to RCRA 1) when it exhibits a characteristic of hazardous waste (i.e., ignitable, corrosive, reactive or toxic), or 2) when it is contaminated with listed hazardous waste. If contaminated environmental media contain hazardous waste, they are subject to all applicable RCRA requirements until they no longer contain hazardous waste. EPA considers contaminated environmental media to no longer contain hazardous waste 1) when it no longer exhibits a characteristic of hazardous waste, and 2) when concentrations of hazardous constituents from listed hazardous wastes are below health-based levels. The approval of Ecology is required for "contained-in" determinations and may require implementation of "contingent management," which would be addressed during development of the CAP. As discussed below, land disposal restrictions (LDRs) are not applicable to environmental media (contaminated soil and groundwater) that receives a "contained-in" determination prior to removal from the Area of Contamination (AOC).

Based on discussions with Ecology, a "contained-in" determination for disposition of soil off site would be issued for soil with COC concentrations as follows:

- Soil with concentrations less than MTCA Method B cleanup levels for F034 hazardous constituents would be disposed of at a RCRA Subtitle D facility as solid waste

- Soil with contamination above MTCA Method B cleanup levels and below MTCA Method C cleanup levels or 10 times the Universal Treatment Standards (UTS) value for F034 hazardous constituents, whichever is higher, would be disposed of as non-hazardous waste in a hazardous waste facility permitted under RCRA Subtitle C

- Soil with alternative concentrations may be approved by Ecology based upon waste properties (solubility, mobility, toxicity, and interactive effects of the contaminants present that can impact these properties) and exposure potential and the effect of any management controls that could less this exposure potential

Applicability to Soil and Groundwater Alternatives: This policy is potentially applicable to cleanup action alternatives that include soil excavation and off-site disposal, on-site water treatment with off-site disposal of water treatment residuals, and off-site disposal of groundwater. This includes all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and groundwater alternatives (GW1 through GW4) being considered for the MFA in this FS.

LDRs, 40 CFR 268, WAC 173-303-140. Wood treating facility operations at this site ceased in 1985, prior to the LDR for waste designation F034 being established. Ecology has indicated that LDRs would not apply to any contaminated media containing F034, because the F034 listing became applicable to waste after August 12, 1997, so long as the contaminated media is not actively managed. Furthermore, environmental media that has received a "contained-in" determination before the media is removed from the AOC does not have to comply with LDRs. However, soil and groundwater, including construction dewatering effluent, which is actively managed must comply with LDRs. Active management includes removal, excavation, mixing with other wastes, and on-site treatment, but does not include consolidation within the AOC or *in situ* treatment in accordance with the AOC policy discussed below. Water treatment residuals that are contaminated with listed waste constituents (i.e., those constituents resulting in an F034 waste designation code) must also comply with the LDRs.

LDRs for contaminated soil would include 1) meeting the land disposal treatment requirements in 40 CFR 268.40 and the UTS in 40 CFR 268.48 for nonwastewaters, or 2) meeting alternative soil LDRs under 40 CFR 268.49. Alternative LDR treatment standards for contaminated soil are applied for all constituents listed in the UTS (40 CFR 268.48) that are detected at concentrations greater than 10 times the UTS at the site. Alternative LDR treatment standards for contaminated soil require a 90 percent reduction in the applicable hazardous constituents or treatment to ten times the UTS, whichever is greater. LDRs for contaminated groundwater and construction dewatering effluent would include meeting the land disposal treatment requirements in 40 CFR 268.40 and the UTS in 40 CFR 268.48 for wastewaters. LDRs for contaminated water treatment residuals would include meeting the land disposal treatment requirements in 40 CFR 268.40 and the UTS in 40 CFR 268.48 for nonwastewaters.

Applicability to Soil and Groundwater Alternatives: LDRs are applicable to cleanup action alternatives where soil contaminated with listed waste constituents (i.e., those constituents resulting in an F034 waste designation code) is excavated, and where the cleanup action alternative does not include disposal at a facility authorized to accept "corrective action management unit (CAMU)-eligible waste." LDRs are also applicable to cleanup action alternatives where groundwater, construction dewatering effluent, and water treatment residuals contaminated with listed waste constituents are generated, and where the cleanup action alternative does not include disposal at the Cowlitz publicly-owned treatment works (POTW) and/or a facility authorized to accept "CAMU-eligible waste." This includes all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and groundwater alternatives (GW1 through GW4) being considered for the MFA in this FS.

AOC Policy, National Contingency Plan (55 FR 8758-8760, March 8, 1990), EPA guidance memorandum (USEPA 1996), Ecology AOC Policy (WDOE 1993). The AOC policy was established by EPA and Ecology to allow for the movement of hazardous waste within a defined AOC. An AOC is delineated by the areal extent of contiguous contamination, but may contain varying types and concentrations of hazardous substances. Movement of wastes within those areas is not considered to be land disposal and does not trigger the RCRA LDRs or minimum technology requirements. Consolidation or *in situ* treatment of hazardous waste within an AOC does not constitute disposal, and does not trigger LDRs. *Ex situ* treatment in tanks or containers or through incineration or transfer to another AOC is considered "active management" and triggers RCRA management and LDR requirements.

Applicability to Soil and Groundwater Alternatives: The AOC policy is potentially applicable to cleanup action alternatives that include management of soil that is contaminated with listed waste constituents (i.e., those constituents resulting in an F034 waste designation code). This includes some of the soil alternatives (S1 through S5, S5A, S5B, S5C, and S7) being considered for the MFA in this FS.

CAMUs, 40 CFR 264.555, WAC 173-303-646920. Soil and water treatment residuals that are contaminated with listed waste constituents (i.e., those constituents resulting in an F034 waste designation code) and for which Ecology does not provide a "contained-in" determination may be eligible for disposal in an off-site CAMU-eligible waste permitted hazardous waste landfill. CAMU-eligible waste includes solid and hazardous waste, contaminated media, and debris from cleanup activities. The off-site disposal of CAMU-eligible waste also is allowed if the following conditions are met:

- Principle hazardous constituents must be treated to meet the treatment standards in WAC 173-303-64660(3)(d)(iv); the adjusted treatment levels or methods that are protective of human health and the environment specified in WAC 173-303-64660(3)(d)(v)(A), (C), (D), or (E)(I); or the adjusted treatment standards that are protective of human health and the environment specified in WAC 173-303-64660(3)(d)(v)(E)(II) where the treatment significantly reduces the toxicity or mobility of the principal hazardous constituents, minimizing the short-term and long-term threats posed by the waste, including the threat at the remediation site. The treatment requirements specified in WAC 173-303-64660(3)(d)(iv) are: 1) for nonmetals, treatment must achieve 90 percent reduction in concentrations or 10 times the UTS, whichever is higher, 2) for metals, treatment must achieve 90 percent reduction in principle hazardous constituents as measured in leachate from the treated waste or media or 90 percent reduction in total constituent concentrations, but not less than 10 times the UTS. Principle hazardous constituents are constituents that the regulatory agency determines pose a risk to human health and the environment and that are substantially higher than the cleanup levels or goals of the site. These include carcinogens that pose a potential direct risk from ingestion or inhalation at site at or above 10^{-3} and noncarcinogens that pose a potential direct risk from ingestion or inhalation at the site an order of magnitude or greater above their RfD. Soils that exceed the adjusted treatment levels, even soil containing DNAPL, can be disposed offsite as CAMU-eligible waste if the off-site landfill treats the soil to approved treatment levels or uses an approved method, such as macro-encapsulation, to treat the soils that is protective of human health and the environment. The treatment can occur at the off-site landfill.

- The landfill must be a RCRA hazardous waste facility whose permit authorizes receipt of CAMU-eligible waste. The landfill will have met the minimum design requirements for management of CAMU-eligible waste under the regulations.

- The landfill must notify the regulatory agency of its intent to receive CAMU-eligible waste and receive notification of no objections; the landfill must notify people on the facility mailing list. These requirements are specifically defined in the RCRA hazardous waste facility CAMU-eligible waste provisions of the off-site permit. The provisions of this permit may modify, reduce or eliminate such notification requirements.

- The landfill must obtain a permit modification specifically authorizing receipt of the waste. These requirements are specifically defined by the RCRA hazardous waste facility "CAMU-eligible waste" provisions of the off-site permit which may modify, reduce or eliminate such requirements.

Disposal of the waste would not need to meet LDRs. However, the permitted hazardous waste landfill must treat the wastes to approved treatment levels or methods outlined in the first bullet above.

Applicability to Soil and Groundwater Alternatives: These regulations are applicable to cleanup action alternatives that include off-site disposal at a permitted hazardous waste landfill of excavated soil, including soil containing DNAPL, and water and water treatment residuals that are contaminated with listed waste constituents. This includes all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and groundwater alternatives (GW1 through GW4) being considered for the MFA in this FS.

Treatment by Generator, 40 CFR 262.34, WAC 173-303-200 and -201. These regulations apply to cleanup action alternatives that include on-site treatment of hazardous or dangerous wastes. Dangerous or hazardous wastes may be treated on site without a dangerous waste treatment permit, provided the waste is managed *in situ* in accordance with 40 CFR 262.34 and WAC 173-303-200 and -201.

Applicability to Soil and Groundwater Alternatives: These regulations are potentially applicable to cleanup action alternatives that include on-site treatment of construction dewatering effluent and condensed liquids from electrical resistance heating (ERH) prior to discharge to a POTW or to the land surface. This includes some soil alternatives (S1 through S4, S5B, S5C, S6, and S7) and one groundwater alternative (GW1) being considered for the MFA in this FS.

Washington Solid Waste Management Handling Standards Regulations, Chapter 173-350 WAC. These regulations potentially apply to off-site disposal of solid nonhazardous wastes and contaminated media, and are potentially relevant and appropriate to on-site cleanup actions governing contaminated media management. Environmental media and residuals would be transported and disposed of at a permitted solid waste landfill in accordance with the waste acceptance criteria for the landfill.

Applicability to Soil and Groundwater Alternatives: WAC 173-350 is applicable to cleanup action alternatives that include off-site disposal of solid nonhazardous wastes and contaminated media. This includes all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and groundwater alternatives (GW1 through GW4) being considered for the MFA in this FS.

6.4.2.3 Dewatering Effluent Management

Clean Water Act Pretreatment Regulations, 40 CFR 503.5. These regulations are potentially applicable if water is discharged to the Cowlitz Sewer Operating Board POTW. The discharge would need to meet the discharge requirements in CCC 15.14.160 and any other requirements established pursuant to a permit or discharge authorization under CCC 15.14.180. In addition, the discharge would need to meet any federally-required limitations for discharge of pollutants in the POTW under 40 CFR 503.5.

Applicability to Soil and Groundwater Alternatives: WAC 173-226 is applicable to cleanup action alternatives that include discharge of construction dewatering effluent and condensed liquids from ERH to the Cowlitz County POTW. This includes some soil alternatives (S1 through S4, S5B, S5C, S6, and S7) and one groundwater alternative (GW1) being considered for the MFA in this FS.

State Waste Discharge Permit Program, Chapter 173-216 WAC. These regulations would be potentially applicable if treated water is discharged directly to the ground. This regulation requires the use of all known, available and reasonable methods to prevent and control the discharge of wastes into the waters of the state. In addition, disposal of wastes that present a risk to human health, including the potential chronic effects of lifetime exposure to waste materials, are not allowed.

Applicability to Soil and Groundwater Alternatives: WAC 173-216 is potentially applicable to cleanup action alternatives that include discharge of treated construction dewatering effluent or condensed liquids from ERH directly to the ground. However, discharge of treated water to the ground is not planned for any of the cleanup action alternatives evaluated.

Submission of Plans and Reports for Construction of Wastewater Facilities, Chapter 173-240 WAC. These regulations are potentially applicable if treated water is discharged directly to the ground. They require the submittal and approval of engineering reports and plans and specifications prior to constructing or modifying industrial wastewater facilities.

Applicability to Soil and Groundwater Alternatives: WAC 173-240 is potentially applicable to cleanup action alternatives that include discharge of treated construction dewatering effluent or condensed liquids from ERH directly to the ground. However, discharge of treated water to the ground is not planned for any of the cleanup action alternatives evaluated.

6.4.2.4 Air Quality

Washington Clean Air Act and Implementing Regulations, Chapter 173-400 and 173-460 WAC, Southwest Clean Air Agency (SWCAA) Regulation 400. These regulations establish general emission standards for all stationary sources and more specific emission standards for specific types of sources. In addition, all emission sources are required to use reasonably available control technology to control air emissions.

The regulations provide exemptions from registration (SWCAA 400-101). For instance, sources are exempt if they emit less than the following: 1.0 tons per year combined criteria and VOCs, 0.005 tons per year lead, 1.0 tons per year ozone depleting substances, and 1.0 tons per year toxic air pollutions or less than the applicable small quantity emission rate under Chapter 173-460 WAC, whichever is less. An air discharge permit application shall be submitted for all new installations, modifications, changes, and alterations to process and emission control equipment consistent with the definition of "new source" (SWCAA 400-109). If a source is exempt under SWCAA 400-101, a written authorization to confirmation exemption must be requested and received from SWCAA. If source is not exempt, then compliance with a new source review permit requirements must be met through substantive review by SWCAA.

Toxics best available control technology must be installed and operated on sources of toxic air pollutants, which include naphthalene and cPAHs, to control toxic air emissions. Furthermore, the toxic emission rate must be quantified and the impacts of these emissions must be demonstrated to be less than the acceptable source impact limit at the site boundary (Chapter 173-460 WAC, SWCAA 400-076). Compliance with acceptable source impact limits can be demonstrated by comparing emissions to the small quantity emission reduction table or through dispersion modeling. Sources subject to MTCA cleanup actions are not exempt from these regulations. Compliance with the new source review requirements would be met through substantive review by SWCAA and/or Ecology. Chapter 173-400 and SWCAA 400-040(3) also require control of fugitive dust emissions during construction activities.

Applicability to Soil and Groundwater Alternatives: These regulations are potentially applicable to cleanup action alternatives where air emissions are anticipated, including *in situ* solidification, *in situ* ERH, and biosparging. This includes some of the soil alternatives (S5, S5A, S5B, S5C, S6, and S7) and groundwater alternatives (GW1 and GW3) being considered for the MFA in this FS.

6.4.2.5 Underground Injection and Well Installation and Abandonment

Washington Underground Injection Control Program, Chapter 173-218 WAC. The underground injection control regulations potentially apply to cleanup action alternatives that include enhanced bioremediation and chemical oxidation. Injection wells used for remediation are considered to be Class V injection wells and must be registered with Ecology and are either rule authorized or must receive a state waste discharge permit. If rule-authorized under WAC 173-200-100, the well would need to not cause a violation of water quality standards for groundwater of the state per Chapter 173-200 WAC. If not rule-authorized, the underground injection control well would need to demonstrate compliance with WAC 173-218-090 and -110, by 1) not directly discharging into an aquifer, 2) having a separation between the bottom of the well and the top of the aquifer, 3) meeting additional groundwater protection requirements if the well is located in a groundwater protection area as defined in WAC 173-218-030, and obtaining a state waste discharge permit authorization under Chapter 173-216. Pursuant to WAC 173-340-710(9)(b), Class V injection wells are exempt if authorized in accordance with a MTCA consent decree. Substantive compliance with the requirements of Chapter 173-218 and 173-216 WAC would be met through review by Ecology.

Applicability to Soil and Groundwater Alternatives: WAC 173-218 is potentially applicable to cleanup action alternatives that include injection of materials into the subsurface, which is expected to occur during chemical oxidation and bioremediation. This includes three of the groundwater alternatives (GW1 through GW3) being considered for the MFA in this FS.

Washington Water Well Construction Act Regulations, Chapter 173-160 WAC. These regulations are potentially applicable to the installation, operation, or closure of monitoring and treatment wells.

Applicability to Soil and Groundwater Alternatives: WAC 173-160 is applicable to cleanup alternatives that include the construction of monitoring or treatment wells. This includes all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and groundwater alternatives (GW1 through GW4) being considered for the MFA in this FS.

Regulation and Licensing of Well Contractors and Operators, Chapter 173-162 WAC. These regulations apply to all water well contractors and operators who are providing well installation, maintenance, or abandonment services in Washington. These regulations are potentially applicable to any well contractor or operator who installs wells at the site.

Applicability to Soil and Groundwater Alternatives: WAC 173-162 is applicable to cleanup action alternatives that include the construction of monitoring or treatment wells. This includes all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and groundwater alternatives (GW1 through GW4) being considered for the MFA in this FS.

6.4.2.6 State Environmental Policy Act

State Environmental Policy Act, RCW 43.21.036, WAC 197-11-250 through 268. For MTCA cleanup actions, the MTCA and State Environmental Policy Act processes are to be combined to reduce duplication and improve public participation (WAC 97-11-250). It is anticipated that Ecology would be the lead agency as stipulated by WAC 197-11-253. State Environmental Policy Act requirements would be incorporated into the MTCA public notification process. More specifically, the State Environmental Policy Act checklist would be attached to the draft MFA CAP, with the intent of having public review of these occur concurrently.

Applicability to Soil and Groundwater Alternatives: These regulations are applicable to all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and groundwater alternatives (GW1 through GW4).

6.4.3 Local Requirements

The MFA is located within the city limits of Longview, and the TWP Area is located within unincorporated Cowlitz County. Since construction or development activities may occur in the MFA and disposal of excavated soil may occur at the TWP Area, both City and County ordinances potentially apply to the cleanup actions. As described in Section 6.4 regarding WAC 173-340-710(9)(b), cleanup actions conducted under a consent decree or other order are exempt from the procedural requirements of laws requiring or authorizing local government permits or approvals for the action. Rather than obtain a permit under the local codes and ordinances described below, the selected cleanup action would need to comply with the substantive requirements of the laws in accordance with WAC 173-340-710(9)(c).

6.4.3.1 City of Longview Requirements Associated with Maintenance Facility Area Activities

City of Longview requirements may be applicable to cleanup action activities conducted within the MFA. Construction and development within these areas may require substantive compliance with the local requirements discussed in this section. The potential applicability of the location-specific ARARs to the soil and groundwater alternatives is summarized on Tables 6-3 and 6-4, respectively.

Special Flood Hazard Area Development Permit (Chapter 17.24 LMC). Construction or development within any area of special flood hazard requires a permit per LMC 17.24.110. Special flood hazard areas are mapped by the City of Longview pursuant to the Federal Insurance Administration in a scientific and engineering report entitled "The Flood Study for the City of Longview," (City of Longview 2001) (LMC 17.24.060). Development" means any manmade change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations located within the area of special flood hazard (LMC 17.24.040). Cleanup action activities that meet the definition of "development" would require substantive compliance with Chapter 17.24 of the LMC.

Applicability to Soil and Groundwater Alternatives: This regulation is applicable to all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and groundwater alternatives (GW1 through GW4).

Shoreline Development Permit (Chapter 17.60 LMC, Ordinance 2786, passed 2000). Development within 200 feet of the shoreline would need to meet the requirements of the Cowlitz County Shoreline Management Master Program. If within 200 feet of the high water mark, substantive compliance with this requirement would be met through review and coordination with Cowlitz County, including any work associated with the TWP Area.

Applicability to Soil and Groundwater Alternatives: This regulation is potentially applicable to cleanup action alternatives that include development within 200 feet of the shoreline. However, construction activities are not anticipated within 200 feet of the shoreline for any of the cleanup action alternatives evaluated.

Critical Areas Permit (Chapter 17.10 LMC, Ordinance 2821, passed January 8, 2009). Development within critical areas or their buffers may require a permit. Specifically, under the LMC, all persons proposing development or alteration, whether on public or private property, within 100 feet of critical areas or their buffers, shall obtain a Critical Area permit pursuant to this chapter, except as exempted pursuant to LMC 17.10.070.

"Critical area" includes wetlands, fish and wildlife habitat conservation areas, frequently flooded areas, geologically hazardous areas, and areas with a critical recharging effect on aquifers used for potable water. "Development" includes any manmade changes to improved or unimproved land, including buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, and activities of a similar nature.

Exemptions from critical areas permit are identified in LMC 17.10.070 and include in part:

- Development occurring within a volcanic hazard area as described in Section 17.10.140 and containing no other critical area(s) as defined by this chapter
- Development occurring within frequently flooded areas provided the development meets the requirements of LMC 17.24, Flood Damage Prevention Ordinance
- Maintenance, operation, and reconstruction of existing public and private roads, streets, driveways, and the installation, construction, or replacement of utility lines in improved city rights-of-way, not including electric substations, provided that reconstruction of any such facilities are not expanded within, or do not extend outside of, the previously disturbed areas within a critical area or designated buffer
- Maintenance, operation, and reconstruction of existing structures and equipment operating areas, provided that reconstruction of any such structures and facilities are not expanded within, or do not extend outside of, the previously disturbed areas within a critical area or designated buffer
- Minimal site investigative work (as required by a city, state, or federal agency, or any other applicant) such as surveys, soil logs, percolation tests, and other related activities so long as impacts on environmentally critical areas are minimized and disturbed areas are restored to the pre-existing level of function and value within 1 year after such tests are concluded
- Applicants who are required to obtain Shoreline Permits, Section 404 Permits from the US Army Corps of Engineers, and/or an Ecology 401 Water Quality Certification

Applications for projects within designated Geologic Hazard Areas as described in LMC 17.10.140 shall not be exempt. If the activity is not exempt, compliance with a critical areas permit requirement would be met through substantive review by the City of Longview.

Applicability to Soil and Groundwater Alternatives: This regulation is applicable to all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and groundwater alternatives (GW1 through GW4).

Stormwater Runoff and Erosion Controls (Chapter 17.80 LMC, Ordinance 3079, passed January 8, 2009). This local requirement applies to 1) water or pollutants directly or indirectly entering waters of the state or the storm drainage system generated on any developed and undeveloped lands, and 2) new development, redevelopment, and construction site activities, unless exempt.

The local ordinance provides qualified exemptions for the following: 1) projects disturbing less than 5 acres that meet the requirements delineated in the City of Longview Stormwater Manual that have obtained an "Erosivity Waiver" to be exempt from the requirements of 17.80.050(G)(2) to submit a Stormwater Pollution Prevention Plan, 2) underground utility projects that replace the ground surface with in-kind material or materials with similar runoff characteristics that are exempt and must only meet the Minimum Requirement #2, Construction Stormwater Pollution Prevention, identified in the City of Longview Stormwater Manual, and 3) normal landscape activities and gardening.

If the activities associated with the selected cleanup action alternative are not exempt, compliance with the stormwater runoff and erosion control requirements would be met through substantive review by the City of Longview.

Applicability to Soil and Groundwater Alternatives: This regulation is potentially applicable to cleanup action alternatives that include construction activities, unless an exemption is obtained as discussed above. This includes all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and three of the groundwater alternatives (GW1 through GW3) being considered for the MFA in this FS.

Building Permits (Chapter 16 LMC). The City of Longview has adopted the International Building Codes Chapter 51-11 WAC (2006 Energy Code), Chapter 51-13 WAC (2006 Ventilation and Indoor Air Quality Code), Chapter 51-50 WAC (2006 International Building Code including the Appendix Chapters E, as further amended by Chapter 51-50 WAC, I and J), Chapter 51-51 WAC (2006 International Residential Code including the Appendix Chapters G and H), Chapter 51-52 WAC (2006 International Mechanical Code), and Chapters 51–56 and 51–57 WAC (2006 Uniform Plumbing Code and Uniform Plumbing Code Standards with amendments and additions). Under the Building Code (LMC 16.02), building permits are required for all new construction of buildings, and all alterations, additions, improvements and repairs of existing buildings as well as moved, converted, or demolished buildings. Demolition and/or construction of buildings or portion of buildings would need to meet the substantive requirements of the following permits:

- Plumbing permit: for all new plumbing, relocated fixtures, and new or replaced sewer lines
- Electrical permit: for all new electrical installations, alterations, additions, or repairs of existing electrical installations
- Mechanical permit: for all new or altered heating, air conditioning, ventilation, ducting, and gas appliance installations
- Life safety permit: for fire extinguishing systems, hood and duct systems, flammable and combustible materials, and tank removals (Chapter 18.10 LMC) administered by the fire department

Applicability to Soil and Groundwater Alternatives: This regulation is potentially applicable to cleanup action alternatives that include demolition and/or construction of buildings or portion of buildings, including replacing sewer lines and upgrading the electrical power supply. This includes all soil alternatives (S1 through S5, S5A, S5B, S5C, S6, and S7) and one of the groundwater alternatives (GW1) being considered for the MFA in this FS.

Longview Historic Preservation Ordinance (Chapter 16.12 LMC). Review is required for construction of a new building or structure or reconstruction, alteration, restoration, remodeling, repairing, moving, or demolishing any existing property on the Longview register of historic places or within an historic district on the Longview register of historic places. If any structures at the site are listed on the register, compliance with this requirement would be met through substantive review by the City of Longview.

Applicability to Soil and Groundwater Alternatives: This regulation is potentially applicable to cleanup action alternatives that impact buildings or structures listed on the Longview register of historic places. However, the Mechanics Shop is not anticipated to be a listed historic place.

Standard Plans and Specifications for Sanitary Sewers, Storm Sewers, and Water (Chapter 14.06 LMC). Standard plans and specifications for modifications to public works connecting to City of Longview infrastructure would need to meet the requirements of the City's Standard Plans and Specifications and be reviewed and approved.

Applicability to Soil and Groundwater Alternatives: This regulation is potentially applicable to cleanup action alternatives that include discharge of construction dewatering effluent and condensed liquids from ERH to the Cowlitz County POTW. This includes some soil alternatives (S1 through S4, S5B, S5C, S6, and S7) and one groundwater alternative (GW1) being considered for the MFA in this FS.

6.4.3.2 Cowlitz County Requirements Associated with Treated Wood Products Area Activities

Cowlitz County requirements may be applicable to cleanup action activities conducted within the TWP Area. Construction and development within these areas may require substantive compliance with the local requirements discussed in this section. The potential applicability of the location-specific ARARs to the soil and groundwater alternatives is summarized on Tables 6-3 and 6-4, respectively.

No buildings are planned for construction or demolition within the TWP Area portion of the site, therefore, the Cowlitz County Building Code is not applicable. Substantive compliance with the following Cowlitz County requirements may be required if construction or development is planned for the TWP Area:

Floodplain Management Permit (Chapter16.25 CCC). Construction or development within any areas of special flood hazard requires a permit. "Development" means any human-made change to improved or unimproved real estate, including but not limited to buildings or other structures, and all works. "Works" are any dam, wall, wharf, embankment, levee, dike, pile, bridge, road, abutments, excavation, structure, subdivision, channel alteration, culvert, fill, earth movement or removal, mining, building, aboveground or underground hazardous material storage, or other similar development attached to or occurring upon real property (CCC 16.25.030). Cleanup action activities that meet the definition of "development" would require substantive compliance with Chapter 16.25 CCC.

Applicability to Soil and Groundwater Alternatives: No construction or development is currently planned for the TWP area. Therefore, this regulation is not applicable to any of the cleanup action alternatives.

Shoreline Development Permit (Chapter 19.20 CCC). Development within 200 feet of the shoreline would need to meet the requirements of the Cowlitz County Shoreline Management Master Program. If within 200 feet of the high water mark, substantive compliance with this requirement would be met through review and coordination with Cowlitz County, including any work associated with the TWP Area.

Applicability to Soil and Groundwater Alternatives: No construction or development is currently planned for the TWP area. Therefore, this regulation is not applicable to any of the cleanup action alternatives.

Critical Areas Permit (Chapter 19.15 CCC). Development within critical areas or their buffers may require a permit. Exemptions are similar to those under the LMC and are identified in CCC 19.15.070. If the activity associated with the cleanup action is not exempt, compliance with a critical areas permit requirement would be met through substantive review by Cowlitz County.

Applicability to Soil and Groundwater Alternatives: No construction or development is currently planned for the TWP area. Therefore, this regulation is not applicable to any of the cleanup action alternatives.

Grading Ordinance (Chapter 16.35 CCC). This ordinance requires grading or engineered grading plans for excavation and grading projects, unless exempt under CCC 16.35.050 (i.e., projects under 500 cubic yards that are outside of a critical area). Generally, grading plans are required for projects in excess of 100 cubic yards and within a critical area, projects with a natural slope in excess of 50 percent, projects requiring grading of 5,000 cubic yards, or projects that are located within a critical area as defined in Chapter 19.15 CCC. Specific requirements for exemptions and grading plan requirements can be found in Chapter 16.25 CCC. If the activities associated with the selected cleanup action are not exempt, compliance with the grading plan and permit requirement would be met through substantive review by Cowlitz County.

Applicability to Soil and Groundwater Alternatives: No construction or development is currently planned for the TWP area. Therefore, this regulation is not applicable to any of the cleanup action alternatives.

APPENDIX C

Environmental Covenants for MTCA Sites

Environmental Covenant for MTCA Sites: Instructions for Use and Covenant Template

Established: August 20, 2015

Revised: December 22, 2016

To: Interested Persons

From: James. J. Pendowski, Program Manager
Toxics Cleanup Program

JJP

Contact: Policy & Technical Support Unit, Headquarters

Note: This is Attachment C in Procedure 440A. For additional instructions on using this Covenant, please see Toxics Cleanup Program's **Procedure 440A: Establishing Environmental Covenants under the Model Toxics Control Act,** publication no. 15-09-054.

Instructions for Use

The following steps provide guidance on how to develop an environmental covenant using the enclosed template. While the exact sequence of steps, as well as who conducts the work (Ecology, potentially liable person (PLP) or Voluntary Cleanup Program (VCP) customer), may vary from site to site, all of the elements identified here must be addressed. When requesting a Covenant, Ecology should identify which steps are the responsibilities of the PLP or VCP customer at the site. Questions about specific provisions in the Covenant template should be directed to the Ecology Cleanup Project Manager assigned to the site. If no Cleanup Project Manager has been assigned, contact Ecology's Toxics Cleanup Program at (360) 407-7170 and ask for advice from the Toxics Cleanup Program (TCP) Policy Unit.

Step 1: Identify the Parcels Subject to the Covenant

Using the County Assessors Tax records, identify the parcels subject to the Covenant. Even though the site (or part of the site subject to the Covenant) may be owned by one entity, it may actually encompass more than one parcel of real property as shown on the County's property (and tax) records.

Step 2: Identify the Specific Activity and Use Restrictions for the Property

Create a conceptual list of specific prohibited activities (e.g., don't drill wells on the property) and prohibited uses (e.g., property can't be used for residential uses).

Work with the PLP/VCP customer, the property owner, and owners of other property interests (if different) to refine the language implementing these restrictions.

Step 3: Consult with the Local Government Land Use Planning Authority

The Uniform Environmental Covenants Act (UECA) and Model Toxics Control Act (MTCA) require Ecology to "consult" with the local government land use planning authority on the terms of the Covenant. While technically the Mayor/Executive is this authority, this guidance recommends contacting the staff that who work with land use issues. However, if the jurisdiction prefers the contact be through the local elected executive, work through the Mayor/Executive instead.

Ideally, before drafting the Covenant, Ecology staff should discuss the proposed restrictions with the local government staff by phone or email. **Once the Covenant has been drafted, the full covenant should be sent to the local government for review.** This consultation should be done by Ecology, but may be delegated to the PLP or VCP customer, upon agreement by Ecology.

The purpose of this consultation is to identify provisions in the Covenant that might conflict with current or future land use plans and development regulations for the property. For example, a provision requiring the land to remain in industrial use won't hold up in the long term if the comprehensive plans for the area call for future mixed residential and commercial use development. Similarly, a provision prohibiting infiltration of stormwater anywhere on the property may conflict with local development regulations requiring all stormwater to be retained and infiltrated on the property. If there is a conflict, see if it's possible to apply the restriction to only part of the property where the exposure pathway is of concern.

Use the following table as a guide for whom to contact:

Jurisdiction	Department
City or Town	City or Town Planning Department
Unincorporated Areas	County Planning Department
Urban Growth Areas not Annexed to City or Town[1]	Both City or Town Planning Department and County Planning Department

Note: In larger communities, planning staff who work on zoning and comprehensive plan issues are typically different than those who review development proposals. *Make sure you are talking to the right staff.*

[1] City limits and urban growth area should be identified in the City's and County's comprehensive plans. They can typically be found on the local jurisdiction's website. If not, call the jurisdiction's staff to obtain a copy.

Step 4: Confirm the Recorded Interests in the Property

To determine who owns the property and any relevant property interests that may need to be superseded by the Covenant, a title search must be conducted to identify all recorded interests in the Property. The title search should be the responsibility of the PLP (or VCP customer) and conducted by a title company. **The results of this search, typically called a title report or plat certificate, must be included with any request asking Ecology to sign a Covenant.** An uninsured title report is sufficient for this purpose.

In general, the title search should be no more than six months old to ensure it reflects the current status of the property. However, under some circumstances, Ecology may accept an older title search, such as that completed during the PLP identification process. Accepting older title searches should be done only if Ecology has been closely involved with the site during the intervening time period since the last title search, and there is no reason to suspect the owner has changed or an easement or other interest in the property has been granted. Examples of changes that would trigger the need for a new title search are:

- Establishment of a new business on the property;
- Change in the name of the business currently on the property;
- Subdivision of the property;
- Construction of new utilities or roads across the property;
- Foreclosure on the property;
- Change in the status of the persons owning the property (death, divorce or marriage); and
- Bankruptcy of the site owner or operator.

Step 5: Determine Who Needs to Sign the Covenant

Real property interests are prioritized according to the date on which they were recorded with the land record authority. Such interests include not only ownership of the property, but may also include mortgages; tax or mechanics' liens; utility easements; surface land rights; and judgments. If a senior mortgage holder forecloses on the property, for instance, it may be able to dispose of all other interests, including Ecology's Covenant. For this reason, to ensure the restrictions in a Covenant are enforceable, the Covenant must supersede these pre-existing property interests.

Grantors or signatories to a Covenant not only are granting access to Ecology and agreeing to adhere to the restrictions on future activities or uses of the property, they are also agreeing to be responsible for any "affirmative obligations" described in the Covenant, such as maintaining the remedy and monitoring.

Signing a subordination agreement means the person holding a senior property interest is agreeing that the Covenant takes precedent over their interest, including providing Ecology with access, and consenting to the restrictions on future uses and activities on the property. However, they are not necessarily agreeing to the affirmative obligations in the Covenant.

Use the following as a guide to determine who must sign the Covenant as a grantor or subordinate their interests:

a) **Persons holding fee simple title to the property (i.e., landowners).**

   The landowner must always sign the Covenant as a Grantor.

b) Persons holding other property interests (such as easements, right-of-ways, water & mineral rights).

In general, if a person holds a title to:

a) An easement or right-of-way,

b) Water rights (if groundwater use is restricted); or

c) Mineral rights,

…that is located within the area of activity or use restrictions, and compliance with those restrictions could be overridden by the person exercising their rights, then the person holding the title should either:

a) Sign the covenant as a Grantor, or

b) Subordinate their interests by signing a subordination agreement.

However, if a current contact cannot be located, or if the holder's interest is not critical to the success of the Covenant, it is probably not necessary to expend a lot of effort to track them down and obtain a signature. For example, many properties, especially in eastern Washington State, have underlying mineral rights that are controlled by someone different than the owner. In most urban areas it is unlikely those rights would be exercised to the detriment of the remedy, and so there would be no reason to pursue a signature.

Similarly, the holder of an easement or right-of-way for overhead power lines that is unlikely to affect the performance of the remedy does not need to be pursued.

However, if a cap is part of the remedy, and the easement or right-of-way grants the holder the right to conduct activities that could compromise the integrity of the cap (such as installation and maintenance of road or an underground utility), these holders should be required to sign the Covenant as a Grantor or subordinate their interests.

c) Persons holding encumbrances on the property (such as lien and mortgage holders).

In general, persons holding a lien have merely a monetary interest (lien imposed because of lack of payment of a bill) and do not need to sign the Covenant or subordinate their interests. However, if the lien holder is claiming a right that could affect the performance of the remedy, such as control over future sale and development of the property, then they should be required to subordinate their interest.

Mortgage holders such as banks usually hold the title to the property until the property owner pays off the loan for purchase of the property. Should they foreclose on a property, they may be able to extinguish all subsequent interests, including Ecology's Covenant. As such, they should be required to sign a subordination agreement.

A Covenant or subordination agreement must be voluntarily granted. There may be circumstances where the holder of an interest or encumbrance on the property (other than the property owner) refuses to grant a Covenant or subordinate their interests, can't be located, or are not responsive. In these cases, the Ecology Cleanup Project Manager should, in consultation with the Assistant Attorney General assigned to the site, consider the success of the remedy without their signature. If it is deemed necessary to secure their signature and they refuse to sign, then a more complete cleanup will be required.

In cases where there is minimal risk to the success of the remedy and it is decided to proceed without their signature, a letter should be sent to the holder of this interest or encumbrance notifying them that, should they do anything on the property that affects the integrity of the remedial action or results in a release of a hazardous substance, they could trigger liability under MTCA. If the holder of this interest is unresponsive or cannot be located, work with the Assistant Attorney General assigned to the site on an appropriate notification procedure.

Step 6: Prepare the Covenant

Use the attached Ecology template to prepare the Covenant.

A precise legal description of the Property and any interests in the Property (such as an easement) is essential to know where the Covenant applies. A map must also be developed to provide a visual representation of where the restrictions apply on the Property.

- If the restrictions apply to the entire Property, the legal description in the Property deed and a map of the Property should be sufficient.
- If the restrictions apply to only part of the Property, a new legal description and map will need to be developed, and boundary markers or reference monuments will need to be established on the Property by a licensed surveyor.

If the Property includes more than one parcel of real property, the legal description and map should cover all of the parcels. This will enable recording of the same covenant on each parcel instead of creating and recording a different covenant for each parcel.

There are specific formatting requirements that apply to recorded Covenants. For example, there must be a three inch margin on the top of the first page and a one inch margin on the bottom and sides. See Chapter 65.04.045 RCW for additional format requirements.

Step 7: Public Involvement

In general, there is no requirement for a public notice and comment period on a Covenant, other than the requirement for local government consultation discussed above. However, because a Covenant can affect future uses of a property and potentially impact future development in the area, any public notice issued for the cleanup action plan or order or decree governing the cleanup should highlight the fact that there will be restrictions on future activities or uses of the property.

For sites with a high level of public interest or controversy, it may be appropriate to provide a separate opportunity for public comment. The Ecology Cleanup Project Manager should consult with the public involvement specialist assigned to the site regarding the appropriate level of public involvement.

Step 8: Sign the Covenant

The Ecology Cleanup Project Manager must ensure all appropriate persons sign the Covenant and that each of those signatures is notarized. This responsibility can be delegated to the PLP (or VCP applicant) but Ecology staff must verify this step has been completed.

Ecology’s representative should sign the Covenant only after all other parties to the Covenant have signed.

Step 9: Record the Covenant

The Covenant must be recorded on the title of each parcel of real property subject to the Covenant. Recording is done by the County Auditor. If the area covered by the Covenant extends across a County boundary, the Covenant will have to be recorded in both Counties.

Step 10: Send the Recorded Covenant to Ecology and Others per RCW 64.70.070

a. Send the original recorded Covenant to Ecology's contact for the site. [2]

b. Send a legible copy of the recorded Covenant, with the recording number evident, to the following persons (per RCW 64.70.070):

- Each person who signed the Covenant.
- Each person holding a recorded interest in the real property subject to the Covenant (including each person who subordinated their interests to Ecology's Covenant).
- Each person in possession of the real property subject to the Covenant at the time the Covenant is executed (such as renters).
- The local government planning authority in which the real property subject to the Covenant is located.
- Any other person to whom the Covenant expressly grants the power to enforce the Covenant.
- Any other persons required by Ecology.

Note: These instructions and attached template are intended solely for the guidance of Ecology staff. They are not intended, and cannot be relied on, to create rights, substantive or procedural, enforceable by any party in litigation with the state of Washington. Ecology may act at variance with these instructions and the attached template depending on site-specific circumstances, or modify or withdraw these documents at any time.

[2] Some Counties retain the original. If that is the case, make sure Ecology receives a legible copy of the recorded Covenant with all the signatures and with recorded notation.

Environmental Covenant for MTCA Sites: Covenant Template

*See Toxics Cleanup Program's **Procedure 440A** for additional instructions on the use of this Covenant.*

Text highlighted by yellow are instructions/comments and options.
Those instructions and related footnotes should be removed from the Covenant.

After Recording Return
Original Signed Covenant to: [1]
[ECOLOGY SITE MANAGER]
Toxics Cleanup Program
Department of Ecology
[ECOLOGY OFFICE ADDRESS]

NOTE: This Covenant is not valid without Ecology's approval and signature.

Environmental Covenant

(For MTCA Sites – August 20, 2015 Version)

Grantor: [NAME OF THE LANDOWNER OR OTHER GRANTOR] [2]
Grantee: State of Washington, Department of Ecology (hereafter "Ecology")
Brief Legal Description: [BRIEF LEGAL DESCRIPTION]
Tax Parcel Nos.: [INSERT TAX PARCEL NUMBERS]
Cross Reference: [SEE BOX]

- **If superseding or amending an existing Covenant, insert one of the following:** "Original Covenant #____(superseding)" OR "Original Covenant #____(amending)"
- **Insert a reference to any subordination agreements, if separately recorded**
- **Insert a list of other related documents such as consent decree, order, or NFA opinion**
- **Otherwise, delete**

RECITALS [3]

a. This document is an environmental (restrictive) covenant (hereafter "Covenant") executed pursuant to the Model Toxics Control Act ("MTCA"), chapter 70.105D RCW, and Uniform Environmental Covenants Act ("UECA"), chapter 64.70 RCW.

b. The Property that is the subject of this Covenant is part or all of a site commonly known as [ECOLOGY SITE NAME AND FACILITY ID]. The Property is legally described in Exhibit A, and illustrated in Exhibit B, both of which are attached (hereafter "Property"). If there are differences between these two Exhibits, the legal description in Exhibit A shall prevail.

c. The Property is the subject of remedial action conducted under MTCA. This Covenant is required because residual contamination remains on the Property after completion of remedial actions. Specifically, the following principal contaminants remain on the Property: [4]

---

[1] Some counties keep the original Covenant, others don't. If the signed original is available, it must be sent to Ecology. If the signed original is not available, send a legible copy to Ecology.
[2] The Grantor of a Covenant typically is the fee simple land owner of the property. The Grantor may also include holders of other property interests such as a holder of an easement, right-of-way, mineral right, lien, or mortgage.
[3] This section is primarily used to describe this document and its purpose. It should not be used for substantive binding provisions.
[4] List the contaminants for the associated media. If more than a few are present, list the top three to five for each medium.

Medium	Principal Contaminants Present
Soil	
Groundwater	
Surface Water/Sediment	

d. It is the purpose of this Covenant to restrict certain activities and uses of the Property to protect human health and the environment and the integrity of remedial actions conducted at the site. Records describing the extent of residual contamination and remedial actions conducted are available through Ecology. **[*Optional--This includes the following documents: (list key documents such as RI/FS, Cleanup Action Plan, Voluntary Cleanup Report(s), As-built report)*].**

e. This Covenant grants Ecology certain rights under UECA and as specified in this Covenant. As a Holder of this Covenant under UECA, Ecology has an interest in real property, however, this is not an ownership interest which equates to liability under MTCA or the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9601 *et seq*. The rights of Ecology as an "agency" under UECA, other than its' right as a holder, are not an interest in real property.

f. **[*Include the following statement if this Covenant is superseding another environmental covenant.*]** This Covenant supersedes and replaces the existing Environmental (Restrictive) Covenant, which is recorded with [______] County as [# OF ORIGINAL COVENANT].

COVENANT

[NAME OF LANDOWNER OR OTHER GRANTOR], as Grantor [5] and [FEE SIMPLE, EASEMENT OR OTHER] owner of the Property hereby grants to the Washington State Department of Ecology, and its successors and assignees, the following covenants. Furthermore, it is the intent of the Grantor that such covenants shall supersede any prior interests the GRANTOR has in the property and run with the land and be binding on all current and future owners of any portion of, or interest in, the Property.

Section 1. General Restrictions and Requirements.

The following general restrictions and requirements shall apply to the Property:

a. **Interference with Remedial Action**. The Grantor shall not engage in any activity on the Property that may impact or interfere with the remedial action and any operation, maintenance, inspection or monitoring of that remedial action without prior written approval from Ecology.

b. **Protection of Human Health and the Environment**. The Grantor shall not engage in any activity on the Property that may threaten continued protection of human health or the environment without prior written approval from Ecology. This includes, but is not limited to, any activity that results in the release of residual contamination that was contained as a part of the remedial action or that exacerbates or creates a new exposure to residual contamination remaining on the Property.

[5] If there is more than one Grantor, use the term "Grantors" here and throughout this document.

c. Continued Compliance Required. Grantor shall not convey any interest in any portion of the Property without providing for the continued adequate and complete operation, maintenance and monitoring of remedial actions and continued compliance with this Covenant.

d. Leases. Grantor shall restrict any lease for any portion of the Property to uses and activities consistent with this Covenant and notify all lessees of the restrictions on the use of the Property.

e. Preservation of Reference Monuments. Grantor shall make a good faith effort to preserve any reference monuments and boundary markers used to define the areal extent of coverage of this Covenant. Should a monument or marker be damaged or destroyed, Grantor shall have it replaced by a licensed professional surveyor within 30 days of discovery of the damage or destruction.

Section 2. Specific Prohibitions and Requirements.

In addition to the general restrictions in Section 1 of this Covenant, the following additional specific restrictions and requirements shall apply to the Property.

[*See Appendix 1 for example restrictions.*]

Select from the restrictions in Appendix 1 as appropriate, based on site-specific circumstances. Most sites will have only some of these restrictions. Options are provided to illustrate the range of potential restrictions. In some cases, the options are mutually exclusive (pick one or the other, but not both). In other cases, several options may need to be combined to cover the range of conditions at the site. This is not intended to be an all-inclusive list. In circumstances where none of the categories or suggested options fit the site conditions, adjust the language as appropriate to fit the situation.

a. Land use.
b. Containment of soil/waste materials.
c. Stormwater facilities.
d. Vapor/gas controls.
e. Groundwater use.
f. Sediments.
g. Monitoring.
h. Other.

Section 3. Access.

a. The Grantor shall maintain clear access to all remedial action components necessary to construct, operate, inspect, monitor and maintain the remedial action.

b. The Grantor freely and voluntarily grants Ecology and its authorized representatives, upon reasonable notice, the right to enter the Property at reasonable times to evaluate the effectiveness of this Covenant and associated remedial actions, and enforce compliance with this Covenant and those actions, including the right to take samples, inspect any remedial actions conducted on the Property, and to inspect related records.

c. No right of access or use by a third party to any portion of the Property is conveyed by this instrument.

Section 4. Notice Requirements.

a. Conveyance of Any Interest. The Grantor, when conveying any interest [IN ANY PART OF THE PROPERTY] ***OR*** [WITHIN THE AREA OF THE PROPERTY DESCRIBED AND ILLUSTRATED IN EXHIBITS B AND C], including but not limited to title, easement, leases, and security or other interests, must:

i. Provide written notice to Ecology of the intended conveyance at least thirty (30) days in advance of the conveyance.[6]

ii. Include in the conveying document a notice in substantially the following form, as well as a complete copy of this Covenant:

NOTICE: THIS PROPERTY IS SUBJECT TO AN ENVIRONMENTAL COVENANT GRANTED TO THE WASHINGTON STATE DEPARTMENT OF ECOLOGY ON [DATE] AND RECORDED WITH THE [COUNTY] COUNTY AUDITOR UNDER RECORDING NUMBER [RECORDING NUMBER]. USES AND ACTIVITIES ON THIS PROPERTY MUST COMPLY WITH THAT COVENANT, A COMPLETE COPY OF WHICH IS ATTACHED TO THIS DOCUMENT.

iii. Unless otherwise agreed to in writing by Ecology, provide Ecology with a complete copy of the executed document within thirty (30) days of the date of execution of such document.

b. Reporting Violations. Should the Grantor become aware of any violation of this Covenant, Grantor shall promptly report such violation in writing to Ecology.

c. Emergencies. For any emergency or significant change in site conditions due to Acts of Nature (for example, flood or fire) resulting in a violation of this Covenant, the Grantor is authorized to respond to such an event in accordance with state and federal law. The Grantor must notify Ecology in writing of the event and response actions planned or taken as soon as practical but no later than within 24 hours of the discovery of the event.

d. Notification procedure. Any required written notice, approval, reporting or other communication shall be personally delivered or sent by first class mail to the following persons. Any change in this contact information shall be submitted in writing to all parties to this Covenant. Upon mutual agreement of the parties to this Covenant, an alternative to personal delivery or first class mail, such as e-mail or other electronic means, may be used for these communications.

---

[6] Ecology may waive this notice provision for some units at a Property where the anticipated use is a multi-tenant/owner building where some owners or tenants are unlikely to be exposed to residual contamination. For example: upper story apartments or condominiums, or commercial tenants in a strip mall, with limited rights to use the grounds under and around the building (such as for parking).

If Ecology agrees to such a waiver, the circumstances of the waiver must be detailed in paragraph 4.a.i. In addition to the specific circumstances, this provision must include the following statement: "Waiver of this advance notice to Ecology for these transactions does not constitute waiver of this notice for the entire Property nor a waiver of the requirement in Section 4.a.ii. to include this notice in any document conveying interest in the Property."

[insert contact name, address, phone number and e-mail for Grantor]	Environmental Covenants Coordinator Washington State Department of Ecology Toxics Cleanup Program P.O. Box 47600 Olympia, WA 98504 – 7600 (360) 407-6000 ToxicsCleanupProgramHQ@ecy.wa.gov

Section 5. Modification or Termination.

a. Grantor must provide written notice and obtain approval from Ecology at least sixty (60) days in advance of any proposed activity or use of the Property in a manner that is inconsistent with this Covenant. [7] For any proposal that is inconsistent with this Covenant and permanently modifies an activity or use restriction at the site: [8]

i. Ecology must issue a public notice and provide an opportunity for the public to comment on the proposal; and

ii. If Ecology approves of the proposal, the Covenant must be amended to reflect the change before the activity or use can proceed.

b. If the conditions at the site requiring a Covenant have changed or no longer exist, then the Grantor may submit a request to Ecology that this Covenant be amended or terminated. Any amendment or termination of this Covenant must follow the procedures in MTCA and UECA and any rules promulgated under these chapters.

c. ***[Optional]*** By signing this agreement, per RCW 64.70.100, the original signatories to this agreement, other than Ecology, agree to waive all rights to sign amendments to and termination of this Covenant. [9]

Section 6. Enforcement and Construction.

a. This Covenant is being freely and voluntarily granted by the Grantor.

b. Within ten (10) days of execution of this Covenant, Grantor shall provide Ecology with an original signed Covenant and proof of recording and a copy of the Covenant and proof of recording to others required by RCW 64.70.070.

c. Ecology shall be entitled to enforce the terms of this Covenant by resort to specific performance or legal process. All remedies available in this Covenant shall be in addition to any

[7] Example of inconsistent uses are using the Property for a use not allowed under the covenant (i.e. mixed residential and commercial use on a property restricted to industrial uses), OR drilling a water supply well when use of the groundwater for water supply is prohibited by the covenant.
[8] An example of an activity that is unlikely to be considered a permanent modification is a proposal to disturb a cap to repair an existing underground utility that passes through the site. However, installing a new underground utility within a capped area would be a permanent change.
[9] As time passes, the original grantor and other signers of the Covenant may no longer exist as viable entities. This provision is intended to allow future amendments or termination of the Covenant without Ecology having to seek court authorization, as provided by RCW 64.70.100.

and all remedies at law or in equity, including MTCA and UECA. Enforcement of the terms of this Covenant shall be at the discretion of Ecology, and any forbearance, delay or omission to exercise its rights under this Covenant in the event of a breach of any term of this Covenant is not a waiver by Ecology of that term or of any subsequent breach of that term, or any other term in this Covenant, or of any rights of Ecology under this Covenant.

d. The Grantor shall be responsible for all costs associated with implementation of this Covenant. Furthermore, the Grantor, upon request by Ecology, shall be obligated to pay for Ecology's costs to process a request for any modification or termination of this Covenant and any approval required by this Covenant.

e. This Covenant shall be liberally construed to meet the intent of MTCA and UECA.

f. The provisions of this Covenant shall be severable. If any provision in this Covenant or its application to any person or circumstance is held invalid, the remainder of this Covenant or its application to any person or circumstance is not affected and shall continue in full force and effect as though such void provision had not been contained herein.

g. A heading used at the beginning of any section or paragraph or exhibit of this Covenant may be used to aid in the interpretation of that section or paragraph or exhibit but does not override the specific requirements in that section or paragraph.

[GRANTOR'S SIGNATURE BLOCK FOR ORIGINAL COVENANTS]

Each person who signs must have a separate signature block and applicable notary acknowledgment. Repeat as many times as necessary.

Holders of other property interests must either sign the amended Covenant as a GRANTOR or sign the subordination agreement in Exhibit D.

The undersigned Grantor warrants he/she holds the title **[to the Property] OR [to an (Easement/Right of Way/etc.) on the Property]** and has authority to execute this Covenant.

EXECUTED this ______ day of __________________, 20___.

____________ [SIGNATURE] ___________

by: ________ [PRINTED NAME] _________

Title: ______________________________

Insert one of the following, as applicable after each signature. See example format on page after next:

INDIVIDUAL ACKNOWLEDGMENT
CORPORATE ACKNOWLEDGMENT
REPRESENTATIVE ACKNOWLEDGEMENT

[GRANTOR'S SIGNATURE BLOCK FOR AMENDED COVENANTS]

Each person who signs must have a separate signature block and applicable notary acknowledgment. Repeat as many times as necessary.

When amending a Covenant, each GRANTOR of the existing Covenant must sign the amended Covenant unless the GRANTOR waived its rights under Section 5(b) of the Covenant.

Holders of other property interests must either sign the amended Covenant as a GRANTOR or sign the subordination agreement in Exhibit D.

The undersigned Grantor warrants he/she holds the title **[to the Property] OR [to an (Easement/Right of Way/etc.) on the Property]** and has authority to execute this Covenant.

EXECUTED this ______ day of __________________, 20___.

The undersigned further acknowledges [Environmental or Restrictive] Covenant [# OF THE ORIGINAL COVENANT] filed in **[_______]** County, is hereby terminated and replaced with the above Environmental Covenant.

____________ [SIGNATURE] ___________

by: ________ [PRINTED NAME] _________

Title: ______________________________

Insert one of the following, as applicable. See example format on next page:

INDIVIDUAL ACKNOWLEDGMENT
CORPORATE ACKNOWLEDGMENT
REPRESENTATIVE ACKNOWLEDGEMENT

INDIVIDUAL ACKNOWLEDGMENT

STATE OF ____________________
COUNTY OF __________________

On this ______ day of _____________, 20__, I certify that ____________________________ personally appeared before me, acknowledged that **he/she** is the individual described herein and who executed the within and foregoing instrument and signed the same at **his/her** free and voluntary act and deed for the uses and purposes therein mentioned.

____
Notary Public in and for the State of Washington [10]
Residing at ______________________________
My appointment expires _____________________

CORPORATE ACKNOWLEDGMENT

STATE OF ____________________
COUNTY OF __________________

On this ______ day of __________________, 20__, I certify that ___________________ personally appeared before me, acknowledged that **he/she** is the ___________________________ of the corporation that executed the within and foregoing instrument, and signed said instrument by free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that **he/she** was authorized to execute said instrument for said corporation.

____
Notary Public in and for the State of Washington [15]
Residing at ______________________________
My appointment expires _____________________

REPRESENTATIVE ACKNOWLEDGEMENT

STATE OF ____________________
COUNTY OF __________________

On this ______ day of __________________, 20__, I certify that ___________________ personally appeared before me, acknowledged that **he/she** signed this instrument, on oath stated that **he/she** was authorized to execute this instrument, and acknowledged it as the _________________________ [TYPE OF AUTHORITY] of ______________________ [NAME OF PARTY BEING REPRESENTED] to be the free and voluntary act and deed of such party for the uses and purposes mentioned in the instrument.

____
Notary Public in and for the State of Washington [15]
Residing at ______________________________
My appointment expires _____________________

---

10 Where landowner is located out of state, replace with appropriate out-of-state title and location.

[ECOLOGY'S SIGNATURE BLOCK]

The Department of Ecology**,** hereby accepts the status as GRANTEE and HOLDER of the above Environmental Covenant.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

____________ [SIGNATURE] ___________

by: ________ [PRINTED NAME] _________

Title: ______________________________

Dated: _____________________________

STATE ACKNOWLEDGMENT

STATE OF ___________________________

COUNTY OF _________________________

On this ______ day of _____________, 20__, I certify that ___________________________ personally appeared before me, acknowledged that **he/she** is the _____________________________ of the state agency that executed the within and foregoing instrument, and signed said instrument by free and voluntary act and deed, for the uses and purposes therein mentioned, and on oath stated that **he/she** was authorized to execute said instrument for said state agency.

____
Notary Public in and for the State of Washington

Residing at _______________________________

My appointment expires ______________________

Exhibit A

LEGAL DESCRIPTION

(Required)

Exhibit B

PROPERTY MAP

(Required)

Exhibit C

MAP ILLUSTRATING LOCATION OF RESTRICTIONS

While a map illustrating the location of the restrictions is required, the grantor has the option of creating a separate map or including this information in Exhibit B.

More than one map may be necessary to illustrate the area subject to restrictions. For example, the area encompassing a soil cap may be different than the area where vapor or groundwater contamination is a concern.

The area subject to the restrictions, if less than the entire property, should be a contiguous area with even boundaries that follow physical features on the site so the boundary can be easily discerned in the field.

Exhibit D

SUBORDINATION AGREEMENT

KNOW ALL PERSONS, That __ [HOLDER'S NAME] __, the owner and holder of that certain __[INSTRUMENT – E.G. EASEMENT/ROW/MORTGAGE/ETC.]__ bearing the date the _______ day of __[MONTH]__, __ [YEAR] __, executed by __[NAME OF PERSON THAT GRANTED THE INTEREST BEING SUBORDINATED] __, __[LEGAL STATUS OF ORIGINAL GRANTOR – E.G. LANDOWNER, CORPORATE OFFICER, ETC.]__, and recorded in the office of the County Auditor of __[COUNTY]__ County, State of Washington, on __[DATE]__, under Auditor's File Number ____________, does hereby agree that said Instrument shall be subordinate to the interest of the State of Washington, Department of Ecology, under the environmental (restrictive) covenant dated __[DATE]__, executed by __[NAME OF PERSON SIGNING THIS SUBORDINATION AGREEMENT]__, and recorded in __[COUNTY]__ County, Washington under Auditor's File Number _________________.

____________ [SIGNATURE] ___________

by: ________ [PRINTED NAME] _________

Title: ______________________________

Dated: ______________________________

Insert one of the following, as applicable. See example format on next page:

INDIVIDUAL ACKNOWLEDGMENT
CORPORATE ACKNOWLEDGMENT
REPRESENTATIVE ACKNOWLEDGEMENT

INDIVIDUAL ACKNOWLEDGMENT

STATE OF ____________________
COUNTY OF __________________

On this ______ day of ____________, 20__, I certify that ____________________________ personally appeared before me, acknowledged that **he/she** is the individual described herein and who executed the within and foregoing instrument and signed the same at **his/her** free and voluntary act and deed for the uses and purposes therein mentioned.

____
Notary Public in and for the State of Washington [11]
Residing at ______________________________
My appointment expires ____________________

CORPORATE ACKNOWLEDGMENT

STATE OF ____________________
COUNTY OF __________________

On this ______ day of __________________, 20__, I certify that ____________________ personally appeared before me, acknowledged that **he/she** is the ___________________________ of the corporation that executed the within and foregoing instrument, and signed said instrument by free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that **he/she** was authorized to execute said instrument for said corporation.

____
Notary Public in and for the State of Washington [16]
Residing at ______________________________
My appointment expires ____________________

REPRESENTATIVE ACKNOWLEDGEMENT

STATE OF ____________________
COUNTY OF __________________

On this ______ day of __________________, 20__, I certify that ____________________ personally appeared before me, acknowledged that **he/she** signed this instrument, on oath stated that **he/she** was authorized to execute this instrument, and acknowledged it as the ________________________ [TYPE OF AUTHORITY] of _______________________ [NAME OF PARTY BEING REPRESENTED] to be the free and voluntary act and deed of such party for the uses and purposes mentioned in the instrument.

____
Notary Public in and for the State of Washington [16]
Residing at ______________________________
My appointment expires ____________________

[11] Where landowner is located out of state, replace with appropriate out-of-state title and location.

APPENDIX 1

EXAMPLE SITE-SPECIFIC COVENANT PROVISIONS

a. Land Use. [12]

Option 1 Industrial Land Use: The remedial action for the Property is based on a cleanup designed for industrial property. As such, the Property shall be used in perpetuity only for industrial uses, as that term is defined in the rules promulgated under Chapter 70.105D RCW. Prohibited uses on the Property include but are not limited to residential uses, childcare facilities, K-12 public or private schools, parks, grazing of animals, growing of food crops, and non-industrial commercial uses.

Option 2 Commercial Land Use: The remedial action for the Property is based on a cleanup designed for commercial property. As such, the Property shall be used in perpetuity only for commercial land uses as that term is defined in the rules promulgated under Chapter 70.105D RCW. Prohibited uses on the Property include but are not limited to residential uses, childcare facilities, K-12 public or private schools, parks, grazing of animals, and growing of food crops.

Option 3 Park: The remedial action for the Property is based on a cleanup designed for a public park. As such, the Property shall be used in perpetuity only for a public park. Prohibited uses on the Property include but are not limited to residential uses, childcare facilities, K-12 public or private schools, grazing of animals, and growing of food crops.

Option 4 [Specify other land use limitations as appropriate.]

b. Containment of Soil/Waste Materials. [13]

[Use where contaminated soil or solid or hazardous waste remains on the property.]

The remedial action for the Property is based on containing contaminated soil **[and waste materials]** under a cap consisting of **[Insert a description of the cap]** [14] and located as illustrated in **[Exhibit B/C]** [15]. The primary purpose of this cap is to **[Insert purpose of cap]**. [16] As such, the following restrictions shall apply within the area illustrated in **[Exhibit B/C]** [17]:

Option 1 [Use where a cap is required.] Any activity on the Property that will compromise the integrity of the cap including: drilling; digging; piercing the cap with sampling device, post, stake or similar device; grading; excavation; installation of underground utilities; removal of the cap; or, application of loads in excess of the cap load bearing capacity, is prohibited without prior written approval by Ecology. The Grantor shall report to Ecology within forty-eight (48) hours of the discovery of any damage to the cap. Unless an alternative plan has been approved by Ecology in writing, the Grantor shall promptly repair the damage and submit a report documenting this work to Ecology within thirty (30) days of completing the repairs.

---

[12] Use one of these restrictions only if the underlying zoning allows the use.

[13] Waste materials means solid wastes as defined in Chapter 70.95 RCW or hazardous wastes as defined in Chapter 70.105 RCW and the rules promulgated under these statutes.

[14] Such as: an X foot thick layer of clean soil; an engineered cap consisting of X inches of clean soil overlying a X mil thick geomembrane and/or clay layer; asphalt pavement; an X square foot building, etc.]

[15] Be very clear in describing or diagramming where the contamination is located relative to a legally defined benchmark such as a property line or survey monument; or use a legal description.

[16] Such as: minimize the potential for contact with contaminated soil; minimize leaching of contaminants to groundwater and surface water; prevent runoff from contacting contaminated soil; minimize airborne contaminants. A cap may have multiple purposes.

[17] NOTE: More than one exhibit may be necessary to illustrate the area restricted by this and other limitations.

Option 2 [Use when contamination is left behind under a building.]

The Grantor shall not alter or remove the existing structures on the Property in any manner that would expose contaminated soil **[and waste materials]**, result in a release to the environment of contaminants, or create a new exposure pathway, without prior written approval of Ecology. Should the Grantor propose to remove all or a portion of the existing structures illustrated in **[Exhibit B/C]** so that access to the underlying contamination is feasible, Ecology may require treatment or removal of the underlying contaminated soil **[and waste materials]**.

Option 3: [Use when periodic inspections of a cap/building are included.]

The Grantor covenants and agrees that it shall annually, or at another time as approved in writing by Ecology, inspect the **[cap/building]** and report within thirty (30) days of the inspection the condition of the **[cap/building]** and any changes to the **[cap/building]** that would impair its performance.

c. Stormwater facilities. [Use when infiltration needs to be controlled to minimize leaching from soil or waste materials, or spreading of groundwater contamination.]

To minimize the potential for mobilization of contaminants remaining in the **[soil/waste materials/groundwater]** on the Property, no stormwater infiltration facilities or ponds shall be constructed **[on the Property] OR [within the area of the Property illustrated in Exhibit B/C]**. All stormwater catch basins, conveyance systems, and other appurtenances located within this area shall be of water-tight construction.[18]

d. Vapor/gas controls. [Use when vapors and/or methane gas are a concern. An example of when this provision would be appropriate is if a soil cap or a groundwater conditional point of compliance are being used to address volatile contaminants remaining on the property.]

The residual contamination on the Property includes **[volatile chemicals that may generate harmful vapors] and/or [biodegradable wastes/chemicals that may generate methane, a combustible gas]**. As such, the following restrictions shall apply **[on the Property]** or **[within the area of the Property illustrated in Exhibit B/C]** to minimize the potential for exposure to these vapors:

1. No building or other enclosed structure shall be constructed **[on the Property/within this area]** unless approved by Ecology.
2. If a building or other enclosed structure is approved, it shall be constructed with a sealed foundation and a **[vapor/gas]** control system that is operated and maintained to prevent the migration of **[vapors/gas]** into the building or structure, unless an alternative approach is approved by Ecology.

e. Groundwater Use. [Use when groundwater use restrictions are required.]

The groundwater beneath **[the Property] OR [within the area of the Property illustrated in Exhibit B/C]** remains contaminated and shall not be extracted for any purpose other than temporary construction dewatering, investigation, monitoring or remediation. Drilling of a well for any water supply purpose is strictly prohibited. Groundwater extracted **[from the**

[18] NOTE: Most local ordinances require on-site infiltration of runoff. If redevelopment of the Property is anticipated, the cleanup plan should reserve an area for this infiltration to occur without exacerbating leaching of residual soil contamination or enhancing movement of contaminants within the groundwater.

Property/within this area] for any purpose shall be considered potentially contaminated and any discharge of this water shall be done in accordance with state and federal law.

f. Sediments. [Use for sediment cleanup sites.] [19]

The residual contamination on the Property includes contaminated sediments. As such, the following restrictions shall apply to minimize potential disturbance of these sediments **[on the Property] OR [within the area of the Property illustrated in Exhibit B/C]**:

Option 1 **[Use where a cap is required.]** Any activity **[on the Property/within this area]** that will compromise the integrity of the cap including: drilling; digging; piercing the cap with sampling device, post, stake or similar device; excavation; installation of buried utilities; removal of the cap; or, application of loads in excess of the cap load bearing capacity, is prohibited without prior written approval by Ecology. The Grantor shall report to Ecology within forty-eight (48) hours of the discovery of any damage to the cap. Unless an alternative plan has been approved by Ecology in writing, the Grantor shall promptly repair the damage and submit a report documenting this work to Ecology within thirty (30) days of completing the repairs.

Option 2 No docks or other structures shall be constructed **[on the Property/within this area]** without prior written approval of Ecology.

Option 3 No dredging shall be allowed **[on the Property/within this area]** without prior written approval of Ecology.

Option 4 No ships or boats shall be allowed to anchor or use side thrusters **[on the Property/within this area]**. A no wake zone shall be enforced and ships and boats shall be limited to a draft depth of **[XX]** feet **[on the Property/within this area]**.

Option 5 No digging for clams, setting of crab pots or fishing nets, anchoring of mooring buoys or channel markers, or similar activities that could disturb the surface of the sediment shall be allowed **[on the Property/within this area]** without prior written approval of Ecology.

g. Monitoring. [Use for long-term protection of monitoring devices.]

Several **[groundwater monitoring wells, vapor probes, etc.]** are located on the Property to monitor the performance of the remedial action. The Grantor shall maintain clear access to these devices and protect them from damage. The Grantor shall report to Ecology within forty-eight (48) hours of the discovery of any damage to any monitoring device. Unless Ecology approves of an alternative plan in writing, the Grantor shall promptly repair the damage and submit a report documenting this work to Ecology within thirty (30) days of completing the repairs.

h. Other.

[Add other property-specific use or activity restrictions and affirmative obligations that are necessary but not identified above. Examples include special remedy-specific requirements such as restrictions on structures over leachate/groundwater collection systems, or protection requirements for cut-off walls or sheet piling.]

---

[19] NOTE: Sediment restrictions are currently evolving. Additional guidance can be found in Ecology's Sediment Cleanup Users Manual II (SCUM II), Publication No. 12-09-057, located at: https://fortress.wa.gov/ecy/publications/SummaryPages/1209057.html

This page left intentionally blank.