DEPARTMENT OF ECOLOGY
State of Washington

International Paper Facility, Longview

Maintenance Facility Area Remedial Investigation and Feasibility Study

Responsiveness Summary

Department of Ecology's response to comments received from stakeholders and the public

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Publication and Contact Information

This report is available on the Department of Ecology's International Paper Longview cleanup website.[1]

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[1] https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=3685

International Paper Facility, Longview

Maintenance Facility Area Remedial Investigation
and Feasibility Study Report

Responsiveness Summary

Department of Ecology's response to comments received from stakeholders and the public

Prepared by Bridgette Valdez-Kogle

Hazardous Waste and Toxics Reduction Program
Washington State Department of Ecology
Lacey, Washington

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Introduction

Ecology held a public comment period from August 17 - October 2, 2017 on draft environmental cleanup documents for the International Paper Company's former facility at 10 International Way in Longview, WA. These documents included a remedial investigation and feasibility report (RI/FS) for the Maintenance Facility Area. The draft RI/FS describes:

- Where potentially harmful chemicals are located.
- How the chemicals may affect people and the environment.
- Different cleanup options.

In addition to draft cleanup documents, we made administrative documents available for public comment. These letters between Ecology, International Paper Company, and the Port of Longview help form how we view this cleanup site.

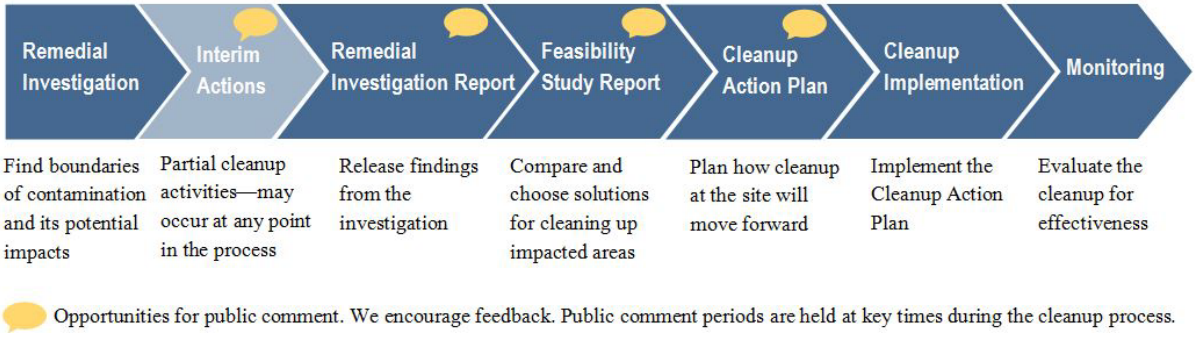
You can view the final documents and learn more about this site on our International Paper, Longview cleanup website.[2]

Cleanup process

We use our state's cleanup law, the Model Toxics Control Act (MTCA), to clean up hazardous waste sites. There are many steps in the cleanup process. The first is the remedial investigation (RI) that describes where potentially harmful chemicals are located. It also describes how the chemicals may affect people and the environment. The next step is the feasibility study (FS) that describes cleanup levels, points of compliance, and describes and compares different cleanup options.

The next step is the draft cleanup plan (CAP). This plan will describe which proposed cleanup option Ecology has chosen to clean up the site.

Figure 1. Ecology's basic cleanup process



[2] https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=3685

Public outreach and involvement

Informing the public about the comment period

We followed our public participation plan for this site, ensuring the public and stakeholders were informed about the public comment period for the draft Remedial Investigation and Feasibility Study (RI/FS).

We posted a public notice of the draft document availability on Ecology's International Paper website,[3] public event listing,[4] and Site Register.[5] We sent initial public notice to 310 interested parties and 183 email listserv addresses.[6] Ecology published a legal ad in The Daily News on Aug. 17, 2017.

Public meetings

On Sept. 28, 2017, we hosted an open house and public hearing about this site at the Cowlitz Event Center. Handouts, display boards, and Ecology staff provided more information about the draft documents. We gave a brief presentation followed by a question and answer session. We accepted oral public comments formally during the public hearing.

In addition to our public open house and hearing, we met with several interested parties including environmental staff from United States Environmental Protection Agency Region X, The Cowlitz Indian Tribe, and the Confederated Tribes and Bands of the Yakama Tribe.

These meetings allowed us to engage with others about the challenges we face in solving the problems stemming from historical contamination. We appreciate the thoughtful contributions of the individuals and organizations who commented.

We will continue to keep our website up to date. You can stay informed during formal comment periods by signing up for our mailing list by contacting Bridgette Valdez-Kogle.[7]

Responses to comments

We received 24 comments through email, letter, and oral testimony. This Responsiveness Summary combines comments that either ask the same question or express the same or similar concerns. We believe our responses address the major concerns from the public. We sought to provide a complete and comprehensive response to each concern. However, we realize this approach may not answer detailed individual questions.

[3] https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=3685
[4] https://ecology.wa.gov/Events/Search/Listing
[5] https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Site-Register-lists-and-data
[6] https://ecology.wa.gov/Events/Search/Listing
[7] bridgette.valdez-kogle@ecy.wa.gov

Support for specific remedy

Many people commented in support of the Port of Longview's preferred alternative; we thank you for your comments. We are not making a decision at this time on how to clean up this site. However, your comments about how to clean up this site will help us make a decision in the next phase – the draft Cleanup Action Plan (CAP). We will make our proposed decision on the cleanup available for public comment during the draft CAP phase of the cleanup.

Community and economic development

Many comments focused on ensuring productive current and future use of this property. We determine whether a cleanup option restores the in a reasonable amount of time. As part of this determination, we consider whether the time required to restore the site will affect current use of the site, potential future use of the site, surrounding areas, and resources.

Recently, the Port of Longview released information on their plans for this site and Berth 4. We are taking their plans and the public comments into consideration for the next phase of the cleanup – the revised disproportionate cost analysis (DCA) and the draft CAP.

Protectiveness and permanence

We heard from the public that they want a cleanup that is as permanent as possible and is protective of human health and the environment. We evaluate and compare the permanence of each cleanup alternative when we select cleanup actions. We give preference to permanent solutions to the maximum extent practicable. This includes how much the cleanup option reduces the toxicity, mobility, or volume of hazardous substances. We consider the following issues when analyzing potential cleanup options:

- How well they destroy the hazardous substance.
- How well they reduce or eliminate releases of hazardous substances.
- How reversible waste treatment process is.
- The amount and type of treatment wastes created.

We also evaluate and compare how well each cleanup option protects human health and the environment. This includes:

- How much existing risks are reduced.
- How much time is required to reduce risk and meet cleanup standards.
- The on-site and off-site risks from implementing the cleanup alternative.
- Overall improvements to environmental quality.

We will analyze protectiveness and permanence under a revised DCA, available for public comment during the next phase, the draft CAP.

Financial responsibility and cost

Many comments focused on who is responsible for paying the cleanup costs. There were also comments about the cost difference between International Paper's preferred cleanup option and the Port of Longview's preferred cleanup option.

Federal and Washington state regulations require the responsible parties performing the cleanup to have the financial ability to clean up the site. The responsible parties are also required to have the financial ability to pay for long-term maintenance and monitoring of contamination left in place. Our financial assurance specialist and the site manager review and approve the amount of money set aside and the financial mechanism (trust funds, insurance, bonds, or other) used to set money aside. This financial responsibility will continue as long as contamination remains above cleanup levels in the Maintenance Facility Area.

We evaluate and compare the cost of each cleanup action alternative presented during the public comment period. This includes the costs of construction, long-term costs, and Ecology's oversight costs. Long-term costs include costs for operating and maintaining a constructed remedy, monitoring, equipment replacement, and maintaining institutional controls. Cost estimates for treatment technologies should include discussions of pretreatment, sample analysis, labor, and waste management.

Ecology has hired a third-party consultant to review cost estimates for all the alternatives presented during the public comment period. The review memo is included as an attachment to this Responsiveness Summary.[8] This review of cost estimates and Ecology's evaluation will be available in a revised DCA in the draft CAP.

Long-term monitoring and responsibility

Because contaminated soil and groundwater will remain on site after cleanup, International Paper is required to monitor this site for many years. We will conduct periodic reviews of site conditions and monitoring data to ensure human health and the environment continue to be protected. During those reviews, we will consider:

- The effectiveness of the cleanup action.
- New scientific information.
- New regulations for hazardous substances present at the site.
- The availability and practicability of more permanent remedies.
- New analytical methods.

[8] Memorandum, Review of Public Review Draft Remedial Investigation/Feasibility Study Report for the Port of Longview Maintenance Facility Area in Longview, Washington, from Ridolfi Environmental to Department of Ecology, dated April 13, 2018

Groundwater and soil monitoring reports will be available to the public. Periodic review reports will be available for public review and comment at least every 5 years.

Our decisions

Conditional approval of the draft RI/FS Report

We are conditionally approving the draft Remedial Investigation and Feasibility Report for the Maintenance Facility Area, without the disproportionate cost analysis (DCA). The DCA in the draft RI/FS does not completely describe and evaluate the remedy proposed by the Port of Longview. We have provided an addendum to the report that includes the Port of Longview's proposed alternative and related documents. Ecology will draft a revised DCA with assistance of a contractor. We will present the revised DCA in the draft cleanup action plan (CAP), which outlines Ecology's proposed cleanup plan to address contamination at this site. Other documents for review with the CAP will include documents concerning State Environmental Policy Act (SEPA) review. While we have not made a decision on our preferred cleanup option, your comments during public comment period for the draft RI/FS will help us make our proposed decision. We expect Ecology's draft CAP to go out for public comment in 2019.

Setting cleanup levels for this site

Ecology sets cleanup levels for soil and groundwater to protect people and the environment. For this site, soil must meet Method C industrial cleanup levels to protect groundwater, surface water, and protect current and future workers from dangerous vapors from contamination. This site, like many cleanup sites, will likely have some contamination left on the property. However, the soil cannot be disturbed without consulting with and receiving permission from Ecology.

The draft RI/FS proposed the use of Method C industrial cleanup levels for groundwater within the Maintenance Facility Area. This cleanup level may be used when:

- All practicable methods of treatment are used.
- Method A or B cleanup levels are below area background.
- Meeting Method A or B cleanup levels has the potential to create a significantly greater threat to human health or the environment than attainment of Method C.
- Meeting Method A or B cleanup levels is technically impossible.

The public review draft of the RI/FS does not clearly demonstrate that the responsible parties will use all practicable methods of treatment to clean up the site. This demonstration is necessary for us to allow using Method C cleanup levels for groundwater within the deed-restricted portion of the Maintenance Facility Area. The fact that the site qualifies for Method C cleanup levels for soil does not mean that it also qualifies for Method C cleanup levels for groundwater. We evaluate each medium (soil, groundwater, air) separately using the criteria applicable to that medium.

The draft Cleanup Action Plan for the Maintenance Facility Area will include a revised demonstration for setting cleanup levels.

Setting points of compliance for this site

"Point of compliance" means the point or points on a site where cleanup levels must be met. MTCA allows us to establish less stringent "conditional" points of compliance for groundwater - if certain criteria are met. Responsible parties must demonstrate that it is not possible (due to technological limitations, environmental conditions, or other factors) to meet the cleanup level throughout the site within a reasonable time. Ecology may approve a conditional point of compliance if the point is located as close to the source of contamination as possible. Any contamination left on the site must be contained within a specified area that protects people and animals from exposure to the contaminants.

Ecology has determined that the draft review RI/FS does not adequately demonstrate the support of a conditional point of compliance for groundwater. Where a conditional point of compliance is proposed, the person responsible for the cleanup must 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.”

The draft Cleanup Action Plan will include a revised demonstration for establishing a conditional point of compliance for groundwater. This will contain information showing that all practicable methods of treatment will be used to clean up this site.

Table 1. Conditional approval of Public Review Draft *Remedial Investigation/Feasibility Study Report, Port of Longview Maintenance Facility Area, Longview, Washington, dated July 12, 2016*

Section	Topic	Ecology Decision
Section 1	Introduction	Approved
Section 2	Hydrogeologic Setting	Approved
Section 3	Remedial Investigation Activities	Approved
Section 4	Additional Action Feasibility Study	Approved

Section	Topic	Ecology Decision
Section 5	Exposure Pathways	Approved
Section 6	Cleanup Standards and Remediation Levels	See notes below.
Section 6.1	Preliminary Cleanup Levels	Revised discussion of Method C cleanup levels for groundwater will be in the draft CAP for the MFA.
Section 6.2	Preliminary Remediation Levels	Revised discussion of remediation levels will be in the draft CAP for the MFA.
Section 6.3	Preliminary Points of Compliance	Revised discussion of conditional point of compliance will be in the draft CAP for the MFA.
Section 6.4	Applicable or Relevant and Appropriate Requirements	Approved
Section 7	Development of Cleanup Action Alternatives	See notes below.
Section 7.1	Quantities and Location of Environmental Media Requiring Cleanup	Approved
Section 7.2	Screening of Cleanup Action Alternative Components	Revised screening of cleanup action alternative components will be in the revised DCA and the draft CAP for the MFA.

Section	Topic	Ecology Decision
Section 7.3	*In Situ* Soil Remediation Treatability Studies	Approved
Section 7.4	Soil Alternatives	Revised discussion of soil remedial alternatives will be in the revised DCA and the draft CAP for the MFA.
Section 7.5	Groundwater Alternatives	Revised discussion of groundwater remedial alternatives will be in the revised DCA and the draft CAP for the MFA.
Section 8	Analysis of Cleanup Action Alternatives	See notes below.
Section 8.1	Evaluation of Soil Alternatives	Revised evaluation of soil remedial alternatives will be in the revised DCA and the draft CAP for the MFA.
Section 8.2	Evaluation of Groundwater Alternatives	Revised evaluation of groundwater remedial alternatives will be in the revised DCA and the draft CAP for the MFA.
Section 9	Selection of Preferred Cleanup Action Alternatives	Revised selection of preferred cleanup action alternatives will be in the revised DCA and in draft CAP for the MFA.
Section 10	References	Approved

Table 2. Appendices for Conditional approval of Public Review Draft

Section	Topic	Ecology Decision
Appendix A	General Facility Information	Approved
Appendix B	MFA Boring Logs and Monitoring Wells Construction Diagrams/Summary of Soil DRO, cPAH, and Naphthalene Results Figure (1997-2011)	Approved
Appendix C	Previous Investigation Figures	Approved
Appendix D	Biosparging/Bioventing System Design	Approved
Appendix E	MFA Biosparging/Bioventing Performance Monitoring Data	Approved
Appendix F	Groundwater Sampling Logs – 2008/2009	Approved
Appendix G	Laboratory Analytical Reports	Approved
Appendix H	Environmental Visualization System Model Outputs – 2009	Approved
Appendix I	Feasibility Study Cleanup Action Alternative Calculations	Approved
Appendix J	Feasibility Study Cost Estimates	Revised cost estimates for remedial alternatives will be in revised DCA and draft CAP for MFA.

Section	Topic	Ecology Decision
Appendix K	Revised Alternative S5B Cleanup Action Alternative Technical Memorandum	Revised cost estimate for remedial alternative S5B will be in revised DCA and draft CAP for MFA.
Appendix L	Draft Interim Feasibility Study Clarification Deliverables	Revisions to calculations of long-term effectiveness and ranking of groundwater remedial alternatives will in the revised DCA and draft CAP for the MFA.
Appendix M	Alternative S5B Site Grade Cross Sections	Additional cross section for remedial alternative S5B will be in the draft CAP for MFA.

Public comments

You can view the public comments on our International Paper, Longview cleanup website.[9]

Table 3. List of public comments submitted.

Commenter	Representing	Topic
Doug Averett	Self	• Community and economic development. • Support for specific remedy • Protectiveness • Other
Commissioner Dale Boon	Port of Woodland	• Support for specific remedy
Cowlitz County		• Support for specific remedy

[9] https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=3685

Commenter	Representing	Topic
Cowlitz County Board of Commissioners		• Community and economic development • Financial responsibility • Support for specific remedy
Cowlitz Wahkiakum Council of Governments		• Support for specific remedy
Sandra Davis	Self	• Financial responsibility • Long-term monitoring and responsibility • Support for specific remedy • Protectiveness • Permanence
David Futcher	Self	• Community and economic development • Support for specific remedy
Commissioner Joe Gardener	Cowlitz County Board of Commissioners	• Support for specific remedy
Mayor Paul Helenberg,	City of Castle Rock	• Community and economic development • Financial responsibility • Support for specific remedy • Public outreach and communications
Mayor Don Jensen	City of Longview	• Support for specific remedy
Marvin Kallwick	Self	• Support for specific remedy • Other

Commenter	Representing	Topic
Norm Krehbiel	Port of Longview	• Community and economic development • Support for specific remedy • Current use of site • Long-term monitoring and responsibility • Cost • Permanence • Protectiveness • Public outreach and communications
Phillip Miller	Self	• Financial responsibility
Gerry O'Keefe	Self	• Support for specific remedy
Philip Slowiak	International Paper Company	• Community and economic development • Support of specific remedy • Financial responsibility • Current use of site • Long-term monitoring and responsibility • Protectiveness • Cost
Ted Sprague	Cowlitz Economic Development Council	• Community and economic development • Support for specific remedy
Sen. Dean Tako	Self	• Support for specific remedy
Three Rivers Regional Wastewater Authority	Self	• Other

Commenter	Representing	Topic
Rep. Jim Walsh	Self	• Community and economic development • Support for specific remedy
Dennis Weber	Self	• Community and economic development
Jeff Wilson	Self	• Community and economic development • Support for specific remedy

Memorandum: Review of Draft Remedial Investigation/Feasibility Study Report for the Port of Longview Maintenance Facility Area

RIDOLFI Environmental

M E M O R A N D U M

DATE: April 13, 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: **Review of Public Review Draft Remedial Investigation/Feasibility Study Report for the Port of Longview Maintenance Facility Area in Longview, Washington**

At the request of Ecology's project manager, the Ridolfi project team has reviewed the public review draft of the *Remedial Investigation/Feasibility Study Report for the Port of Longview Maintenance Facility Area in Longview, Washington* dated July 12, 2016 and prepared for International Paper Company by AECOM.

Based on our review, we have prepared comments for Ecology's review and consideration, including general comments by topic area, and specific comments by section and page. Note that these comments are primarily focused on the Feasibility Study (FS) portion of the subject document.

The FS presented 10 alternatives to remediate the site soils:

- Alternative S1: Comprehensive Excavation (Baseline Alternative)
- Alternative S2: Comprehensive Excavation Outside Building Footprint
- Alternative S3: DNAPL Excavation Outside Building Footprint
- Alternative S4: DNAPL Excavation Outside Building Footprint, Limited Excavation Inside
- Alternative S5: Solidification Outside Building Footprint
- Alternative S5A: Solidification Outside Building Footprint, DNAPL Recovery Underneath Mechanics Shop
- Alternative S5B: Solidification Outside and Inside Building Footprint with Relocation of Soil Near Railroad Tracks

- Alternative S5C: Solidification Outside Building Footprint, ERH Treatment Under Mechanics Shop
- Alternative S6: DNAPL Treatment by Electrical Resistance Heating
- Alternative S7: DNAPL Excavation and Electrical Resistance Heating

The FS also 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

Through the FS, International Paper selected Alternative S5B as their preferred alternative for the remediation of soils at the site. However, one result of Alternative S5B will be substantial soil expansion caused by the solidification process that will impact the existing site grades and elevations. In an attempt to eliminate the grading and elevation impacts to the site, the Port of Longview retained GeoEngineers to develop an alternative using technologies presented in the FS that would eliminate the grade and elevation changes caused by Alternative S5B. In addition, GeoEngineers estimated the cost of the Port of Longview's preferred alternative to compare to the estimated cost of Alternative S5B.

At Ecology's request, we have conducted a review and comparison of cost estimates developed for International Paper's preferred soil alternative (Alternative S5B) and the alternative proposed by the Port of Longview, which was not evaluated in the Remedial Investigation and Feasibility Study (RI/FS). Our evaluation of cost estimates included review of background project correspondence provided by the Ecology project manager, including updated cost estimates provided to Ecology by AECOM in a technical memorandum dated July 21, 2017. We also evaluated a revised cost estimate for the Port of Longview alternative provided by GeoEngineers to Ridolfi on March 6, 2018.

We prepared a set of spreadsheets to facilitate our evaluation of the cost estimates of all the alternatives evaluated in the FS, and these spreadsheets are provided as Attachments A1 and A2.

Specific comments on the FS cost estimates are included in the attached spreadsheets and in Specific Comments 13 and14 of this memorandum.

Additionally, a separate comparison of cost estimates for International Paper's preferred soil cleanup alternative (Alternative S5B) and the Port of Longview's preferred alternative (not included in the FS) is provided following the specific comments on the FS. A separate spreadsheet supporting this cost comparison is provided as Attachment B.

GENERAL COMMENTS

Cleanup Levels

The RI/FS does not provide a clear demonstration, as required by Section 706 of the Model Toxics Control Act (MTCA) to support the use of Method C groundwater cleanup levels [WAC 173-340-706(1)(a)]. The rationale provided in the document for applying Method C groundwater cleanup levels includes the following: the site qualifies for Method C soil cleanup levels; there is a proposed deed restriction; and Method C levels for groundwater were approved at the adjacent treated wood products (TWP) site. However, none of these conditions meet the requirements for establishing Method C groundwater cleanup levels at this site, including the requirement that all practicable methods of treatment are used, and that: 1) Method A or B cleanup levels are below area background; 2) attainment of Method A or B cleanup levels has the potential for creating a significantly greater overall threat to human health or the environment than attainment of Method C; or 3) Method A or B cleanup levels are below technically possible concentrations.

The fact that the site qualifies for Method C soil cleanup levels does not by itself mean that the site also qualifies for Method C groundwater cleanup levels. Section 745 of MTCA notes that "[a] property that qualifies for an industrial soil cleanup level under this section does not necessarily qualify for a Method C cleanup level in other media. Each medium must be evaluated separately using the criteria applicable to that medium" [WAC 173-340-745(2)(c)].

If conditions at the Maintenance Facility Area (MFA) site meet the conditions for establishing Method C groundwater cleanup levels, that demonstration should be provided.

Point of Compliance

The document does not appear to include a demonstration to support the approval of a conditional point of compliance for ground water, as required in section 720 of MTCA [WAC 173-340-720(8)(c)]. Ecology may approve a conditional point of compliance "where it can be demonstrated…that it is not practicable to meet the cleanup level throughout the site within a reasonable restoration time frame". A demonstration to support the approval of a conditional point of compliance for groundwater should be provided, including the requirement that "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).

International Paper's preferred groundwater alternative (GW-4, Monitored Natural Attenuation) is unlikely to meet the requirement that all practicable methods of treatment have been used prior to being granted a conditional point of compliance for groundwater.

Chemicals of Concern (CoCs)

Dioxins are often found in association with wood-treating chemicals. It is not clear from the document why dioxins were not included as a COC. If they have been eliminated based on sampling and analysis or site history, then this information should be provided. If dioxins have not been evaluated, any future efforts to determine whether dioxins are present at the site above cleanup levels should be identified.

Evaluation of Soil Alternatives

The evaluation of soil alternatives based on MTCA criteria that is provided in Sections 8 and 9 of the subject document appears to be detailed, comprehensive, and generally consistent with Ecology regulations and guidance. However, it may be warranted to consider the likelihood of future disturbance of site soils related to Port of Longview operations when evaluating and ranking the permanence and long-term effectiveness criteria. Although MTCA guidance ranks immobilization or solidification (the preferred soil alternative) as being more effective over the long-term in comparison to off-site disposal, site-specific circumstances (i.e. being located beneath an active operating facility) should be thoroughly considered.

RIDOLFI Environmental

SPECIFIC COMMENTS

Section 7 – Development of Cleanup Action Alternatives

1. Section 7.4.3, Alternative S3 - DNAPL Excavation Outside Building Footprint, Page 7-13: The first paragraph includes the statement: ". . . long-term groundwater monitoring would be performed for a period of 2 years following completion of excavation." Since 2 years does not constitute long-term groundwater monitoring, this statement should be corrected here and in any other place it occurs within the RI/FS Report. Long-term groundwater monitoring is usually scheduled for 20 to 30 years.

   [Per Section 410 of MTCA "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" (WAC 173-340-410(3)).]

2. Section 7.4.6, Alternative S5A – Solidification Outside Building Footprint, DNAPL Recovery under Mechanics Shop, Page 7-20: Alternative S5A includes a DNAPL recovery system inside the mechanics' shop building footprint to remove DNAPL beneath the building. It is anticipated that the passive DNAPL collection system proposed would require long-term operations, and the probability is low that enough of the DNAPL will be removed to sufficiently reduce the concentrations of hazardous substances below site cleanup levels. The addition of heating elements to the DNAPL collection system would only increase DNAPL collection close to the recovery well due to the low power and limited heating capacity of these heating elements.

3. Section 7.4.7, Alternative S5B – Solidification Outside and Inside Building Footprint with Relocation of Soil near Railroad Tracks, Page 7-23: The third paragraph that begins on Page 7-22 includes the statement: "Any soil identified as containing concentrations of COCs below cleanup levels could be placed above solidified soil within Zones 2 and 3 to provide additional depth in which the Port could work during potential future development or could be used as backfill in Zone 1." This additional soil in Zones 2 and 3 in combination with the increase in volume due to the solidification process in these zones could pose an adverse impact on Port of Longview operations. Information should be included in this section to address these potential impacts. Such information should

include a summary of the expected material balance in each zone that accounts for material moved into and out of each zone and volume increases due to material swell. The post-soil-handling volumes expected and anticipated surface grades in each zone should be shown in plan and cross-sectional views. Based on this information, mitigation measures should be identified and included as necessary to address potential adverse impacts from this soil placement.

4. Section 7.4.8, Alternative S5C – Solidification Outside Building Footprint, ERH Treatment under Mechanics Shop, Page 7-27: Alternative S5C includes *in situ* treatment by electrical resistance heating (ERH) inside the shop building footprint. One of the proposed ERH designs incorporates a subsurface system that begins heating at 2 feet below ground surface (bgs) and incorporates multi-phase extraction from the electrodes. Although a subsurface electrode could be designed to begin heating at 2 feet below ground surface, it's highly unlikely that such a system could be operated without exposing personnel working above the system to serious safety hazards such as stray electrical current, high temperatures, contaminated steam, and contaminated vapor migration within an enclosed space. Based on this concern, the design of a system that begins heating at 2 feet bgs is not technically feasible and should not be included in this RI/FS. In addition to these serious safety concerns, there are operational limitations. A multi-phase extraction could only be performed manually on an intermittent basis if the electrodes are installed below grade.

Section 9 – Selection of Preferred Cleanup Action Alternatives

5. Table 9-6, MTCA Criteria Rankings Summary for Soil Alternatives: The sum of individual risks for Alternative S1, which is listed as 77 in the table, should actually be 38; and the combined rank, which is listed as 10 in the table, should be 5.

6. Table 9.7, MTCA Criteria Rankings Summary for Groundwater Alternatives: Public Concerns for Alternative GW4 are ranked as 3 out of 4; however, Protectiveness is ranked as 4, which is the lowest of all alternatives presented. It seems inconsistent that the alternative ranked least protective would not be of the most concern to the public.

Appendix J – Cost Estimates

7. Alternative S5C, Page 8 of 9: The cost estimates for ERH installation, startup, and operation are based on the proposed subsurface ERH system. Since designing, constructing, and operating this ERH system in a safe manner is not technically feasible (see Comment 4 above), the cost estimate should be based on an above-ground ERH system.

8. General Comment: The cost estimates for several alternatives use the same amounts for work plans, mobilization, and design even though the work needed to complete these tasks would be substantially different. For example, the costs of completing work plans and designs for Alternatives S1 and S2 are the same, even though Alternative S1 would require additional planning, design work, and equipment selection for demolition of the existing facility.

9. General Comment: The cost estimates for ERH alternatives seem high for design, review, and long-term O&M. For example, for Alternative S6 Contractor Design and Work Plans are valued at $86,000, and Engineering Design cost is estimated at $193,000. The allocation of these costs should be revisited, and justification should be provided for the higher engineering design cost, since most of the design work for an ERH system would be completed by the ERH contractor.

10. General Comment: The FS should clarify and confirm the 30-year O&M period on which each cost estimate is based. For example, the text in Section 7.4.3 states, ". . . long-term groundwater monitoring would be performed for a period of 2 years following completion of excavation." This reference to 2 years with respect to long-term monitoring should be removed from the RI/FS Report. For removal actions, such as in Alternative S1, long-term O&M should be reduced with respect to other alternatives (such as Alternative S5) in which removal actions do not occur.

11. Engineering Costs (Capital Indirect) and Alternative Cost Summary: Line item 2 under Engineering Costs applies a 1-percent Direct Capital Costs (DCC) factor to estimate the cost of Regulatory Review, Coordination, and Meetings. Then, under Alternative Cost Summary, 3 percent of Capital Costs is added to the budget for Agency Oversight. The difference between these budget line items should be explained. If the Agency Oversight

tasks are associated with O&M, should the budget for Agency Oversight be based on a percentage of the O&M costs?

12. Groundwater (GW) Remediation Alternatives: The same contingency factor was applied to each groundwater remediation alternative (GW1, GW2, GW3, and GW4); however, the RI/FS Report recognizes that monitored natural attenuation (MNA) carries a greater risk. The following statement is taken from the RI/FS Report: ". . . if progress towards achieving the cleanup levels cannot be demonstrated during the 5-year reviews, the need for implementing the contingent cleanup action, chemical oxidation (Alternative GW2), would be assessed." In addition to this contingent GW cleanup alternative, the RI/FS proposes the future use of chemical oxidation if MNA is not successful. These contingent actions are included in the analysis of cleanup action alternatives to reduce the hazard rankings of MNA, and this assumes that chemical oxidation will be used in the event that MNA is unsuccessful. Since MNA carries a greater risk of not being successful, the contingency factor should be much greater than the 25 percent applied in the cost estimate. This contingency factor should recognize and account for the higher uncertainty, greater risk, and higher probability of increased costs of chemical oxidation that would probably be required in the future. If a substantially higher contingency factor is not applied to Alternative GW4, the hazard rankings should be revised based on MNA without the application and benefit of chemical oxidation.

13. Total Costs for Soil Remediation Alternatives: The line item and total costs for each alternative were copied to a spreadsheet (Attachment A1) for review and comparison. The costs in Attachment A1 are from the public review draft of the *Remedial Investigation/ Feasibility Study Report for the Port of Longview Maintenance Facility Area in Longview, Washington* dated July 12, 2016. Our review comments from this spreadsheet are summarized below:

    - **Contractor Costs, Alternatives S5C, S6, and S7, Tasks 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, and 20:** The cost estimates for DNAPL treatment and electrical resistance heating (ERH) are reasonable if only soil is being treated; however, combining soil treatment with groundwater treatment would eliminate redundant tasks and activities and reduce associated costs. Consider combining Alternative GW1 with a soil remediation alternative to eliminate separate mobilization, demobilization, equipment installation, and operations for soil and groundwater treatment.

- **Contractor Cost, Alternatives S5C, S6, and S7:** Each of these alternatives involves electrical resistance heating (ERH) treatment technology. In addition to combining ERH soil treatment with ERH groundwater treatment, conductive heating should be considered in lieu of ERH, especially as a thermal treatment technology to remove heavier polyaromatic hydrocarbons (PAHs).

- **Contractor Costs, Alternative S5B:** The purpose and need for additional backfill material for this alternative are unclear. This indicates that there will be a net decrease in volume. A table summarizing the material balance within each area should be provided to substantiate the quantities and costs associated with excavation, material swell, and backfilling.

- **Contractor Costs, Alternatives S1 through S7, Contingency Factors:** The contingency factors applied to Contractor Costs range from 20 percent to 30 percent. These factors seem low with respect to the relatively high levels of uncertainty associated with the more complex remediation systems. A contingency factor of 20 percent is applied to contractor costs for Alternative S5B. This factor should probably be substantially higher. These contingency factors should be revisited, rationale for each factor should be provided, and each factor should be adjusted as necessary.

- **Non-Routine Operations and Maintenance (O&M) Cost, Alternative S5A:** An allowance of $2,500 is provided for Alternative S5A only. This allowance for "non-routine O&M cost" is 2 percent of construction cost. Should this factor be applied to all 10 alternatives, or should it be eliminated and included as a contingency applied to the estimates of annual O&M and long-term monitoring (LTM) costs? This allowance should be revisited and addressed as necessary.

- **Present Worth of O&M and LTM Costs:** Allowances for the annual costs of long-term operating and maintenance (O&M) and long-term monitoring (LTM) are provided for all 10 alternatives. These allowances range from $51,708 to $123,058. A time frame of 30 years is assumed for long-term O&M and LTM; therefore, it's probably appropriate to project the total annual costs for O&M and LTM out over 30 years. This results in a substantially higher present worth and a higher total present worth alternative cost. Consider this proposed change in final evaluation of the alternatives for remedy selection.

14. Total Costs for Groundwater Remediation Alternatives: The line item and total costs for each alternative were copied to an attached spreadsheet (Attachment A2) for review and comparison. The costs in Attachment A2 are from the public review draft of the *Remedial Investigation/ Feasibility Study Report for the Port of Longview Maintenance Facility Area in Longview, Washington* dated July 12, 2016. Our review comments from this spreadsheet are summarized below:

    - **Contractor Costs, Alternative GW4, Task 3:** Allowances for "Contractor Coordination with Port's maintenance operations" should also be provided for Alternatives GW1, GW2, and GW3; and the allowance for GW4 should be substantially greater.

    - **Contractor Costs, Alternative GW3, Task 3:** Allowances for "Inconvenience Fee for Disruption of Port's maintenance operations" should be provided for Alternatives GW1 and GW2.

    - **Contractor Costs, Alternatives GW3 and GW4, Task 4:** The allowances for "Specialty Subcontractors (surveyor, utility locates)" for Alternatives GW3 and GW4 seem low. Provide the basis for these cost estimates and revise the estimates as needed.

    - **Contractor Costs, Alternative GW2, Task 8:** Allowances for "Environmental Protection" should be provided for Alternatives GW1 and GW3.

    - **Contractor Costs, Alternative GW1, Task 8:** Allowances should be provided for "Storm Water Handling and Environmental Protection" for Alternatives GW2 and GW3.

    - **Contractor Costs, Alternatives GW2 and GW3, Tasks 15 and 11:** An allowance should be provided for "General Site Restoration Work" for Alternative GW1.

    - **Contractor Costs, Alternative GW1, Task 10:** Allowances should be provided for "General Trenching and Site Restoration Work" for Alternatives GW2 and GW3.

    - **Contractor Costs, Alternative GW1, Task 11:** Provide a breakdown of the cost estimate for "Drilling & Analytical Services for subsurface ERH installations" to verify

the total amount. Clarify the scope of this task. Does it include just drilling or does it also include trenching?

- **Contractor Costs, Alternative GW1, Tasks 18 and 19:** Why is the use of an oxygen release compound (ORC) included for this alternative only and not for GW2, GW3, and GW4?

- **Contractor Costs, Alternative GW2, Task 17:** Regarding "Monitoring Well Installation for Oxidation and MNA," can the same wells can be used for chemical oxidation and long-term monitoring?

- **Contractor Costs, Alternative GW4, Task 6:** The $4,000 allowance for demobilization on Alternative GW4 seems low.

- **Annual O&M and LTM Costs, Alternative GW2 and GW4, Task 1:** Cost allowances for annual monitoring of institutional controls for Alternatives GW2 and GW4 seem low at $1,000 and $2,000 per year, respectively.

- **Annual O&M and LTM Costs, Alternative GW2 and GW4, O&M Contingency:** Based on the risk and high probability that monitored natural attenuation (MNA) will not provide an adequate remedy, and groundwater treatment might be necessary, this contingency factor and contingency allowances are low.

COST COMPARISON OF INTERNATIONAL PAPER ALTERNATIVE S5B AND THE PORT OF LONGVIEW PREFERRED ALTERNATIVE FOR SOIL REMEDIATION

At the request of Ecology's project manager, the Ridolfi project team has prepared the following comparison of estimated costs for two soil cleanup action alternatives; Alternative S5B, identified as the preferred soil cleanup alternative in the draft Remedial Investigation/Feasibility Study Report for the Port of Longview Maintenance Facility Area in Longview, Washington (RI/FS), and the Port of Longview's preferred soil cleanup alternative, which was not evaluated in the RI/FS.

To compare the alternatives, Ridolfi reviewed cost estimates and supporting information provided by AECOM (on behalf of International Paper) and by GeoEngineers (on behalf on the Port of Longview). Additionally, Ridolfi developed revised versions of each of the cost estimates

that were intended to eliminate disparities between cost assumptions and present a fair comparison of costs.

Alternative Remediation Plans

Under both alternatives the upper three feet of soil is assumed to be clean (below cleanup standards). Therefore, the top three feet of soil will be excavated, stockpiled on-site, and re-used after completion of the remedy. In addition, both alternatives assume a maximum treatment depth of nine feet below ground surface.

Alternative S5B consists of soil excavation within the limits of a proposed "dump pit" area, consolidation of excavated dump pit soils within the remaining extent of the treatment area, and in-situ mechanical mixing of solidifying agents into the treatment area. Under this alternative, all contaminated soil remains on-site and is treated using the solidification technique. Due to the consolidation of excavated dump pit soil and volumetric expansion due to solidification, this alternative would increase the final surface elevation of the site.

The Port of Longview's preferred alternative consists of soil excavation within the limits of the dump pit area, and soil excavation from three to five feet below grade over the remaining treatment area. Contaminated soil will be transported and disposed of at an agency approved landfill. Once the excavation is complete, in-situ mechanical mixing of solidifying agents into the treatment area from five to nine feet below ground surface will be performed. New and stockpiled fill material will be used to return the site to its original grade.

To compare the cost estimates associated with each alternative, Ridolfi created a side-by-side comparison spreadsheet using the cost data provided by AECOM and GeoEngineers (Attachment B). Four discrete cost estimates are presented on Attachment B as follows:

1. International Paper Alternative S5B: This cost estimate presents the latest estimate provided by AECOM dated July 21, 2017. No changes were made to this estimate.

2. Port of Longview Preferred Alternative: This cost estimate presents the latest estimate provided by GeoEngineers dated March 6, 2018. No changes were made to this estimate.

3. Ridolfi Alternative S5B: This cost estimate presents Ridolfi's analysis of the necessary costs to complete Alternative S5B. To complete this analysis all estimates were based on unit costs or quantities provided by AECOM or GeoEngineers.

4. Ridolfi Port of Longview Preferred Alternative: This cost estimate presents Ridolfi's analysis of the necessary costs to complete the Port of Longview's preferred alternative. To complete this analysis all estimates were based on unit costs or quantities provided by AECOM or GeoEngineers.

For most tasks and cost elements, the costs associated with each alternative are equal since each alternative proposes similar treatment methods. However, to produce revised estimates that could be compared fairly and equally, wherever the cost estimates differed Ridolfi selected the unit cost or methodology from one of the base alternatives and assigned it to both alternatives. The following decisions were made during the Ridolfi analysis to present an objective analysis.

- Mobilization/Demobilization Task: Alternative S5B presented a solidification mobilization/demobilization cost of $225,000 and the Port of Longview presented a cost of $152,000. This was due to the Port of Longview receiving a lower cost estimate from a solidification contractor. Since each contractor will perform solidification, the lower mobilization/demobilization cost was used in the Ridolfi analysis.

- Shoring Tasks: Alternative S5B proposed freeze wall shoring for securing the perimeter of the excavation. The Port of Longview's preferred alternative proposed two methods, consisting of sheet pile near the building and existing slurry wall, and cut slopes at a 45-degree angle elsewhere to secure the excavation. Since either method is acceptable, the lower cost option of sheet pile and cut slopes was used for both alternatives in Ridolfi's analysis.

- Solidification Labor: Alternative S5B presented a solidification labor cost of $60 per cubic yard and the Port of Longview presented a labor cost of $30 per cubic yard. This was due to the Port of Longview receiving a lower cost estimate from a solidification contractor. Since each contractor will perform solidification, the lower solidification labor cost was used in the Ridolfi analysis.

- Contaminated Soil Disposal: Under the Port of Longview's preferred alternative, contaminated soil disposal of excavated soil is necessary. The Port of Longview assumption that 85 percent of the excavated material will be disposed of as hazardous waste was used in the Ridolfi analysis.

- Engineering Costs (Capital Direct): Alternative S5B used a 7 percent estimate for engineering design and the Port of Longview's preferred alternative used a 5 percent estimate. The Ridolfi analysis uses the more conservative 7 percent estimate for both alternatives.

- Cost per Cubic Yard: Ridolfi used the treatment area and depths given in both the Alternative S5B and the Port of Longview's preferred alternative cost estimates to calculate a total treatment volume of 7,404 cubic yards (CY).

In the attached spreadsheet, the cost difference between the original cost estimates provided by AECOM and GeoEngineers is presented in the column labeled "Cost Difference – (POL-S5B)". The cost difference between Alternative S5B and the Port of Longview's Preferred Alternative based on Ridolfi's revised analysis is presented in the column labeled "Cost Difference – (RPOL-RS5B)".

Based on information provided by AECOM and GeoEngineers, and Ridolfi's revised analysis of each alternative, the summary of estimated costs of the remediation alternatives are presented in Table 1. A detailed cost comparison is provided in Attachment B.

Table 1. Summary of Estimated Costs for Selected Alternatives

Alternative	International Paper Alternative S5B	Port of Longview's Preferred Alternative	International Paper Alternative S5B	Port of Longview's Preferred Alternative
Estimator	*AECOM*	*GeoEngineers*	*Ridolfi*	*Ridolfi*
Remedial Action Construction	$2,258,300	$1,751,500	$1,883,800	$1,751,000
Contaminated Waste Disposal and Transportation	$24,400	$850,100	$24,400	$850,100
Contractor Contingency (20%)	$456,500	$520,300	$381,600	$520,200
Total Engineering Costs	$710,400	$709,200	$710,400	$777,700
O&M and Long-Term Monitoring Costs	$649,100	$649,100	$649,100	$649,100
Sales Tax and Agency Oversight	$322,600	$364,700	$273,200	$366,700
Total Project Cost	**$4,421,300**	**$4,844,900**	**$3,922,500**	**$4,914,800**
Project Unit Cost ($/CY)	**$597**	**$654**	**$530**	**$664**

Conclusions and Observations

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

- Based on the comparison of Ridolfi revised cost estimates, the cost of International Paper Alternative S5B is approximately $1,000,000 lower than the cost of Port of Longview Preferred Alternative.

- The majority (83 percent) of the cost disparity between International Paper Alternative S5B and the Port of Longview's Preferred Alternative is due to the costs associated with transportation and disposal of contaminated soil, which is only required in the Port of Longview's Preferred Alternative.

- Since most of the cost disparity is due to the transportation 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 likely be equal for both alternatives, but may be slightly higher for the Port of Longview's Preferred Alternative depending on soil characterization requirements of the disposal facility.

- Engineering Costs for the Port of Longview's Preferred Alternative are likely biased high, since certain tasks are based on a percentage of the costs for "Remedial Action Construction" and "Contaminated Waste Disposal and Transportation." Costs associated with these two activities are approximately $850,000 higher for the Port of Longview's Preferred Alternative due to soil disposal; however, the higher disposal and transportation costs would not necessarily result in proportionally higher costs for engineering and other support activities.

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Attachment A1. Total Costs for Soil Remediation Alternatives from the Public Review Draft of the *Remedial Investigation/Fesbility Study Report for the Port of Longview Maintenance Facility Area in Longview, Washington* Dated July 12, 2016

Task Numbers by Alternative										Task Description	Line-Item and Total Costs by Alternative									Review Notes, Questions, and Comments
S1	S2	S3	S4	S5	S5A	S5B	S5C	S6	S7	Alternatives for Soil Remediation	S1	S2	S3	S4	S5	S5A	S5B	S5C	S6	S7	
Contractor Costs (Capital Direct)																					
Remedial Action Construction																					
1	1	1	1	1	1	1	1	1	1	Mobilization / Demobilization	$ 67,000	$ 67,000	$ 67,000	$ 67,000	$ 225,000	$ 225,000	$ 225,000	$ 240,000	$ 489,000	$ 150,000	
2	2	2	2	2	2	2	2	3	2	Contractor Design and Work Plans	$ 21,600	$ 21,600	$ 21,600	$ 21,600	$ 21,600	$ 21,600	$ 21,600	$ 21,600	$ 86,000	$ 70,000	
				3	3	3	3			Solidification Pilot Testing					$ 120,000	$ 120,000	$ 105,000	$ 120,000			
3	3	3	3	4	4	4	4	4	3	Temporary Relocation of Port Maintenance Operations	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	
4										Demo Port's Maintenance Building (east corner)	$ 75,000										
			4							Demo Port's Maintenance Buildling Interior Floor Slab				$ 19,500							
5	4	4	5	5	5	5	5	5	4	Demo Horizontal Bioventing Wells & Connection Piping	$ 29,600	$ 29,600	$ 29,600	$ 29,600	$ 29,600	$ 29,600	$ 29,600	$ 29,600	$ 29,600	$ 29,600	
6	5	5	6	6	6	6	6	6	5	Decommission Groundwater Monitoring & Biovent Wells	$ 32,200	$ 32,200	$ 23,000	$ 23,000	$ 36,800	$ 36,800	$ 36,800	$ 36,800	$ 32,200	$ 23,000	
7	6	6	7	7	7	7	7	7	6	Specialty Subcontractors (surveyor, utility locate)	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000	
8	7	7	8	8	8	8	8	8	7	Demo Underground Utilities and Fencing	$ 28,000	$ 28,000	$ 28,000	$ 28,000	$ 28,000	$ 28,000	$ 28,000	$ 28,000	$ 28,000	$ 28,000	
9	8	8	9	9	9	9	9		8	Demo Retaining Wall	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 12,000	$ 16,500	$ 12,000		$ 12,000	
						10				Demo Portion of Building with Lower Roof Height							$ 62,500				
10	9	9	10						9	Install Freeze Wall Shoring for Building (200 LF)	$ 142,800	$ 142,800	$ 142,800	$ 142,800						$ 225,000	
11	10									Install Freeze Wall Shoring for Excavation Perimeter (720 LF)	$ 468,720	$ 468,720									
		10	11						10	Install Freeze Wall Shoring for Excavation Perimeter (550 LF)				$ 358,050	$ 358,050					$ 358,050	
12	11	11	12						11	Install Sheet Pile Wall Shoring along Slurry Wall (100 LF)	$ 112,500	$ 112,500	$ 112,500	$ 112,500						$ 112,500	*Verify that shoring will not be needed for Alternative S5B as well as Alternatives S5, S5A, S5C, and S6.*
13	12	12	13	10	10	11	10		20	Remove Surface Asphalt in Storage Yard and Road	$ 28,688	$ 28,688	$ 21,912	$ 21,912	$ 28,688	$ 28,688	$ 28,688	$ 24,112		$ 21,912	
14	13	13	14	11	12	12	11		21	Remove 42-IN HDPE Culvert and Replace after Excavation	$ 18,750	$ 18,750	$ 18,750	$ 18,750	$ 18,750	$ 18,750	$ 18,750	$ 18,750		$ 18,750	
15	14	14	15	12	11	13	12		22	Excavation and Stockpiling of Overburden (0 to 3 FT bgs)	$ 105,300	$ 97,200	$ 75,600	$ 78,300	$ 97,200	$ 97,200	$ 105,300	$ 81,000		$ 75,600	
				13	13	14	13	9	12	Storm Water Handling and Environmental Protection					$ 11,000	$ 11,000	$ 11,000	$ 11,000	$ 17,500	$ 15,000	*Cost allowances for storm water handling and environmental protection should be included for Alternatives S1, S2, S3, and S4.*
							14	10	13	Subsurface Installations by ERH Contractor								$ 42,000	$ 133,000	$ 18,000	
								11		General Trenching and Site Restoration Work									$ 50,000		
							15	12	14	Drilling & Analytical Services for subsurface ERH installations								$ 70,500	$ 234,000	$ 41,310	*Review these nine tasks with Paul Bianco regarding DNAPL treatment and Electrical Resistance Heating (ERH)*
								13		Upgrade Electrical Service to Treatment Pad									$ 40,000		
							16	14	15	ERH Surface installations and startup								$ 180,750	$ 461,000	$ 181,000	*These cost estimates seem high, but are reasonable if only soil is being treated. Assuming that only the soil, and not the groundwater, will be treated poses a problem.*
							17	15	16	ERH Operations								$ 348,000	$ 726,000	$ 314,000	*If the approach provided here is used, it is recommended that Alternative GW1 be combined with the corresponding soil remediation alternative to reduce the total combined cost of soil and groundwater treatment. This combined treatment alternative would eliminate redundant costs for mobilization, installation, and operation.*
							18	16	17	Electrical Connection and Usage charges								$ 102,750	$ 289,000	$ 79,000	
							19	17	18	Activated Carbon Usage								$ 7,000	$ 7,000	$ 10,000	
							20	19	19	Other Misc. ERH operational costs								$ 14,250	$ 15,000	$ 16,000	
						15				Excavate Soil from 3 to 8 feet bgs within 80 feet of Railroad Tracks							$ 23,100				
						16				Relocate and Backfill Soil from Near the Railroad Tracks							$ 14,850				
				14	14	17	21			Solidification Materials (8% NewCem Slag Cement)					$ 113,880	$ 113,880	$ 116,220	$ 95,160			
				15	15	18	22			Solidification Materials (2% Bentonite Grout - Hydrogel 90)					$ 50,370	$ 50,370	$ 51,405	$ 42,090			
				16	16	19	23			Solidification Materials (0.5% Caustic Soda)					$ 69,806	$ 69,806	$ 71,241	$ 58,331			
				17	17		24			Solidification Labor and Equipment					$ 438,000	$ 438,000		$ 366,000			
						20				Solidification Labor and Equipment Outside Building Footprint							$ 417,000				
						21				Solidification Labor and Equipment Under Mechanics Shop							$ 30,000				
				18	18	22	25			Geotextile Fabric Market Layer over Solidified Soil					$ 6,650	$ 6,650	$ 5,017	$ 6,650			
				19	19	23	26			Import of Clean Backfill for Transition Grades					$ 34,000	$ 34,000	$ 34,000	$ 34,000			
			16							Specialty excavation of Contaminated Soil inside building				$ 12,750							
						24				Additional Import of Backfill Material to Replace Relocated Soil							$ 32,000				*Why is additional backfill material needed for Alternative S5B? This indicates that there will be a net decrease in soil volume.*
16	15	15	17						23	Excavation and Stockpiling of Contaminated Soil	$ 182,000	$ 170,800	$ 131,600	$ 137,200						$ 128,800	*Won't excavation and stockpiling of soil be required for Alternative S5B?*
17	17	16	18						24	Loading of Contaminated Soil	$ 58,500	$ 54,900	$ 42,300	$ 45,630						$ 41,400	*Request a summary table of the material balance include volumes of soil removed, added, and swell in each area.*
18	18	18	20						26	Import of Clean Fill to the Site	$ 130,000	$ 122,000	$ 94,000	$ 101,400						$ 92,000	
19	16	17	19					18	25	Contaminated Water Handling and Environmental Protection	$ 32,500	$ 30,000	$ 25,000	$ 27,500					$ 50,000	$ 27,500	*Allowances for water handling and environmental protection should be included for Alternatives S5, S5A, S5B, and S5C.*
20	19	19	21	19	20		27		27	Backfill and Compaction of Excavation	$ 93,600	$ 87,300	$ 67,500	$ 71,730	$ 32,400	$ 32,400		$ 27,000		$ 66,600	
						25				Backfill and Compaction of Overburden Soil Stockiles on Site							$ 42,900				
						26				Backfill and Compaction of Transitional Backfill Material							$ 29,700				
21	20	20	22						28	Asphalt Paving of Site Excavation Areas	$ 130,400	$ 130,400	$ 99,600	$ 99,600						$ 99,600	
				20	21	27	28			Asphalt Paving of Excavation, Solidification, and Transition Areas					$ 130,400	$ 130,400	$ 130,400	$ 109,600			
22	21	21	23	21	22	28	29	20	29	Rebuild Access Road (150 LF)	$ 22,500	$ 18,750	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	
								21		Replace Utilities to Building									$ 75,000		
						29				Reconstruct Lower Roof Height Portion of Maintenance Building							$ 125,000				
23	23	22	24	22	23		30		30	Rebuild Retaining Wall	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000		$ 24,000		$ 24,000	*Why is the cost of rebuilding the retaining wall not included in Alternative S5B?*
24	22	23	25	23	24	30	31	22	31	Replace Connection Piping for Bioventing System	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	
25										Reconstruct Maintenance Building (east corner)	$ 150,000										
			26							Reconstruct Maintenence Building Interior Floor Slab				$ 27,000							
26	24	24	27	24	25	31	32	24	32	Monitoring Well Installation	$ 54,000	$ 54,000	$ 37,800	$ 37,800	$ 54,000	$ 54,000	$ 54,000	$ 54,000	$ 54,000	$ 54,000	

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Attachment A1. Total Costs for Soil Remediation Alternatives from the Public Review Draft of the *Remedial Investigation/Fesbility Study Report for the Port of Longview Maintenance Facility Area in Longview, Washington* Dated July 12, 2016

Task Numbers by Alternative										Task Description	Line-Item and Total Costs by Alternative										Review Notes, Questions, and Comments
S1	S2	S3	S4	S5	S5A	S5B	S5C	S6	S7	Alternatives for Soil Remediation	S1	S2	S3	S4	S5	S5A	S5B	S5C	S6	S7	
					26					Product Recovery Well Installation						$ 30,000					
					27					DNAPL Recovery Equipment and Supplies						$ 23,600					
					28					Heaters for Recovery Wells						$ 875					
					29					Product Recovery System Installation and Startup						$ 17,500					
27	25	25	28	25	30	32	33	25	33	Contractor Reporting and Closeout Submittals	$ 26,100	$ 18,000	$ 14,400	$ 14,400	$ 14,400	$ 21,600	$ 18,000	$ 34,200	$ 18,000	$ 34,200	*Verify the relatively low cost allowances for all 10 alternatives. The level of effort (200 hours) for Alternative S5B seems low.*
										Subtotal	**$ 2,107,758**	**$ 1,831,208**	**$ 1,531,512**	**$ 1,616,522**	**$ 1,681,044**	**$ 1,760,219**	**$ 1,968,071**	**$ 2,323,643**	**$ 2,918,800**	**$ 2,451,322**	
Contaminated Waste Disposal and Transportation																					
1	1	1	1	1	1	1	1	1	1	NAPL Soil (CAMU RCRA Stabilization) Costs	$ 195,075	$ 183,600	$ 183,600	$ 195,075	$ -	$ -	$ -	$ -	$ 1,275	$ 183,600	
2	2	2	2	2	2	2	2	2	2	Transportation Costs to RCRA Stabilization Facility	$ 42,075	$ 39,600	$ 39,600	$ 42,075	$ -	$ -	$ -	$ -	$ 1,650	$ 39,600	
3	3	3	3	3	3	3	3	3	3	Liquid NAPL Material Disposal Costs (Incinerator)	$ 31,000	$ 29,000	$ 29,000	$ 31,000	$ -	$ 500	$ -	$ 10,000	$ 23,000	$ 31,000	
4	4	4	4	4	4	4	4	4	4	Liquid NAPL Transportation Costs to Incinerator	$ 15,500	$ 14,500	$ 14,500	$ 15,500	$ -	$ 250	$ -	$ 5,000	$ 11,500	$ 15,500	
5	5	5	5	5	5	5	5	5	5	CAMU-Eligible Material Disposal Costs (Subtitle C Landfill)	$ 1,035,000	$ 920,000	$ 810,750	$ 845,250	$ -	$ -	$ -	$ -	$ 3,450	$ 793,500	
6	6	6	6	6	6	6	6	6	6	Transportation Costs to Subtitle C Landfill	$ 495,000	$ 440,000	$ 387,750	$ 404,250	$ -	$ -	$ -	$ -	$ 1,650	$ 379,500	
7	7	7	7	7	7	7	7	7	7	Non-Hazardous Material Disposal Costs (Subtitle D)	$ 1,800	$ 1,800	$ 1,350	$ 1,350	$ -	$ -	$ -	$ -	$ 300	$ 1,350	
8	8	8	8	8	8	8	8	8	8	Transportation Costs to Subtitle D Landfill	$ 1,500	$ 1,500	$ 1,125	$ 1,125	$ -	$ -	$ -	$ -	$ 750	$ 1,125	
9	9	9	9	9	9	9	9	9	9	Contaminated Water Treatment and Disposal	$ 39,000	$ 36,600	$ 28,000	$ 29,600	$ -	$ -	$ -	$ -	$ 6,000	$ 28,600	
10	10	10	10	10	10	10	10	10	10	Non-Hazardous Material Disposal Costs (Asphalt Recycling)	$ 6,761	$ 6,761	$ 5,200	$ 5,200	$ 6,761	$ 6,948	$ 6,761	$ 7,197	$ 240	$ 2,640	
11	11	11	11	11	11	11	11	11	11	Transportation Costs to Asphalt Recycler	$ 7,607	$ 7,607	$ 5,850	$ 5,850	$ 7,607	$ 7,817	$ 7,607	$ 8,097	$ 270	$ 2,970	
										Subtotal	**$ 1,870,318**	**$ 1,680,968**	**$ 1,506,725**	**$ 1,576,275**	**$ 14,368**	**$ 15,515**	**$ 14,368**	**$ 30,294**	**$ 50,085**	**$ 1,479,385**	
										Subtotal Contractor Costs	**$ 3,978,076**	**$ 3,512,176**	**$ 3,038,237**	**$ 3,192,797**	**$ 1,695,412**	**$ 1,775,734**	**$ 1,982,439**	**$ 2,353,937**	**$ 2,968,885**	**$ 3,930,707**	
										Contingency Factors (% Contractor Costs)	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*30%*	*25%*	*Contractor contingency for Alternative S5B should probably be higher. Provide criteria on which contingency factors are based. Adjust factors as necessary.*
										Contractor Contingency (20% for S1 to S5C, 30% for S6, 25% for S7)	$ 795,615	$ 702,435	$ 607,647	$ 638,559	$ 339,082	$ 355,147	$ 396,488	$ 470,787	$ 890,666	$ 982,677	
										Total Contractor Costs	**$ 4,773,691**	**$ 4,214,611**	**$ 3,645,884**	**$ 3,831,356**	**$ 2,034,494**	**$ 2,130,881**	**$ 2,378,927**	**$ 2,824,724**	**$ 3,859,551**	**$ 4,913,384**	
Engineering Costs (Capital Indirect)																					
1	1	1	1	1	1	1	1	1	1	General Coordination, Meetings, and Planning (% DCC)	$ 95,400	$ 84,200	$ 73,000	$ 76,600	$ 40,600	$ 42,600	$ 47,580	$ 56,400	$ 77,200	$ 73,650	
2	2	2	2	2	2	2	2	2	2	Regulatory Review, Coordination, and Meetings (% DCC)	$ 47,700	$ 42,100	$ 36,500	$ 38,300	$ 40,600	$ 42,600	$ 47,580	$ 56,400	$ 38,600	$ 49,100	
				3	3	3	3			Pilot Test Sampling, CBR, and Reporting					$ 75,000	$ 75,000	$ 75,000	$ 75,000			
3	3	3	3	4	4	4	4	3	3	Engineering Design (% DCC)	$ 143,100	$ 126,300	$ 146,000	$ 153,200	$ 142,100	$ 149,100	$ 166,530	$ 197,400	$ 193,000	$ 147,300	
4	4	4	4	5	5	5	5	4	4	Planning for temporary relocation of Port Maintenance Ops	$ 13,500	$ 13,500	$ 13,500	$ 13,500	$ 13,500	$ 13,500	$ 13,500	$ 13,500	$ 13,500	$ 13,500	
5	5	5	5	6	6	6	6	5	5	Bid & RFI Support	$ 8,100	$ 8,100	$ 8,100	$ 8,100	$ 8,100	$ 8,100	$ 8,100	$ 8,100	$ 10,800	$ 13,500	
6	6	6	6	7	7	7	7	6	6	Construction Oversight and QA (% DCC)	$ 238,500	$ 210,500	$ 182,500	$ 191,500	$ 101,500	$ 106,500	$ 118,950	$ 141,000	$ 193,000	$ 245,500	
					8		8			System Startup (if applicable)						$ 5,000		$ -			
7	7	7	7	8	9	8	9	7	7	Confirmational Sample Collection and Reporting	$ 30,000	$ 30,000	$ 20,000	$ 20,000	$ 33,000	$ 33,000	$ 33,000	$ 33,000	$ 33,000	$ 33,000	
8	8	8	8	9	10	9	10	8	8	Closure Documentation & Reporting	$ 53,000	$ 53,000	$ 53,000	$ 53,000	$ 53,000	$ 53,000	$ 53,000	$ 53,000	$ 53,000	$ 53,000	
										Subtotal Engineering Costs	**$ 629,300**	**$ 567,700**	**$ 532,600**	**$ 554,200**	**$ 507,400**	**$ 528,400**	**$ 563,240**	**$ 633,800**	**$ 612,100**	**$ 628,550**	
										Engineering Contingency (10 percent)	$ 62,930	$ 56,770	$ 53,260	$ 55,420	$ 50,740	$ 52,840	$ 56,324	$ 63,380	$ 61,210	$ 62,855	
										Total Engineering Costs	**$ 692,230**	**$ 624,470**	**$ 585,860**	**$ 609,620**	**$ 558,140**	**$ 581,240**	**$ 619,564**	**$ 697,180**	**$ 673,310**	**$ 691,405**	
Annual O&M Cost (DNAPL Recovery)																					
					1					Project Management & Coordination						$ 6,480					
					2					Mob/Demob for O&M (monthly)						$ 21,600					
					3					Monthly O&M Labor						$ 18,000					
					4					Equipment Repair and Supplies						$ 7,500					
					5					Annual Product Recovery Reporting						$ 3,500					
										Subtotal Annual O&M Cost (DNAPL Recovery)						**$ 57,080**					
										O&M Contingency (DNAPL Recovery, 25 percent)						$ 14,270					
										Total Annual O&M Cost (DNAPL Recovery)						**$ 71,350**					
Annual O&M Cost (Weekly Temp Monitoring for 6 months)																					
								1	1	Project Management and Communication									$ 14,040	$ 7,020	
								2	2	Weekly Temperature Readings									$ 10,400	$ 5,200	
								3	3	Monthly Reports									$ 12,000	$ 6,000	
										Subtotal Annual O&M Cost (Weekly Temp Monitoring)									**$ 36,440**	**$ 18,220**	
										O&M Contingency (Weekly Temp Monitoring, 25 percent)									$ 9,110	$ 4,555	
										Total Annual O&M Cost (Weekly Temp Monitoring)									**$ 45,550**	**$ 22,775**	
Annual O&M Cost (Institutional controls maintenance, asphalt inspection and repair)																					
1	1	1	1	1	1	1	1	1	1	Project Management & Coordination	$ 2,160	$ 2,160	$ 2,160	$ 2,160	$ 2,160	$ 2,160	$ 2,160	$ 2,160	$ 2,160	$ 2,160	
2	2	2	2	2	2	2	2	2	2	Annual Inspection and Reporting	$ 3,520	$ 3,520	$ 3,520	$ 3,520	$ 3,520	$ 3,520	$ 3,520	$ 3,520	$ 3,520	$ 3,520	
3	3	3	3	3	3	3	3	3	3	Update ICs Plan (once every 5 years)	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	
4	4	4	4	4	4	4	4	4	4	Prorated Cost for Asphalt Repairs	$ 8,606	$ 8,606	$ 8,606	$ 8,606	$ 8,606	$ 8,606	$ 8,606	$ 8,606	$ 8,606	$ 8,606	
										Subtotal Annual O&M Cost	**$ 15,036**	**$ 15,036**	**$ 15,036**	**$ 15,036**	**$ 15,036**	**$ 15,036**	**$ 15,036**	**$ 15,036**	**$ 15,036**	**$ 15,036**	
										O&M Contingency (25 percent)	$ 3,759	$ 3,759	$ 3,759	$ 3,759	$ 3,759	$ 3,759	$ 3,759	$ 3,759	$ 3,759	$ 3,759	
										Total Annual O&M Cost (ICS Maintenance and Asphalt Inspection/Repair as Needed)	**$ 18,795**	**$ 18,795**	**$ 18,795**	**$ 18,795**	**$ 18,795**	**$ 18,795**	**$ 18,795**	**$ 18,795**	**$ 18,795**	**$ 18,795**	
										Total Annual O&M Cost	**$ 18,795**	**$ 18,795**	**$ 18,795**	**$ 18,795**	**$ 18,795**	**$ 90,145**	**$ 18,795**	**$ 18,795**	**$ 64,345**	**$ 41,570**	
Annual LTM Cost (Monitoring and Sampling)																					
1	1	1	1	1	1	1	1	1	1	Project Management & Coordination	$ 3,240	$ 3,240	$ 3,240	$ 3,240	$ 3,240	$ 3,240	$ 3,240	$ 3,240	$ 3,240	$ 3,240	
2	2	2	2	2	2	2	2	2	2	Mobilization/Demobilization for Sampling (semi-annual)	$ 3,600	$ 3,600	$ 3,600	$ 3,600	$ 3,600	$ 3,600	$ 3,600	$ 3,600	$ 3,600	$ 3,600	
3	3	3	3	3	3	3	3	3	3	Pickup Truck Rental	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	$ 390	
4	4	4	4	4	4	4	4	4	4	Sampling Labor and Supplies	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000	
5	5	5	5	5	5	5	5	5	5	Analytical Testing (DRO and SVOCs)	$ 7,600	$ 7,600	$ 7,600	$ 7,600	$ 7,600	$ 7,600	$ 7,600	$ 7,600	$ 7,600	$ 7,600	
6	6	6	6	6	6	6	6	6	6	Annual Reporting	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	
										Subtotal Annual LTM Cost	**$ 26,330**	**$ 26,330**	**$ 26,330**	**$ 26,330**	**$ 26,330**	**$ 26,330**	**$ 26,330**	**$ 26,330**	**$ 26,330**	**$ 26,330**	

Attachment A1. Total Costs for Soil Remediation Alternatives from the Public Review Draft of the *Remedial Investigation/Fesbility Study Report for the Port of Longview Maintenance Facility Area in Longview, Washington* Dated July 12, 2016

Task Numbers by Alternative										Task Description	Line-Item and Total Costs by Alternative										Review Notes, Questions, and Comments
S1	S2	S3	S4	S5	S5A	S5B	S5C	S6	S7	**Alternatives for Soil Remediation**	**S1**	**S2**	**S3**	**S4**	**S5**	**S5A**	**S5B**	**S5C**	**S6**	**S7**	
										LTM Contingency (25 percent)	$ 6,583	$ 6,583	$ 6,583	$ 6,583	$ 6,583	$ 6,583	$ 6,583	$ 6,583	$ 6,583	$ 6,583	
										Total Annual LTM Cost	**$ 32,913**	**$ 32,913**	**$ 32,913**	**$ 32,913**	**$ 32,913**	**$ 32,913**	**$ 32,913**	**$ 32,913**	**$ 32,913**	**$ 32,913**	
										Total Annual O&M and LTM Cost	**$ 51,708**	**$ 51,708**	**$ 51,708**	**$ 51,708**	**$ 51,708**	**$ 123,058**	**$ 51,708**	**$ 51,708**	**$ 97,258**	**$ 74,483**	
										Total Non-Routine O&M Cost (estimated to be 2% of construction costs						**$ 2,500**					*Should this allowance for non-routine O&M be included in all alternatives?*
										Total O&M and LTM Cost (30 years until completion)	**$ 629,800**	**$ 629,800**	**$ 629,800**	**$ 629,800**	**$ 893,000**	**$ 1,208,000**	**$ 893,000**	**$ 893,000**	**$ 675,000**	**$ 653,000**	
										Present-Worth O&M Cost (with presumed interest rate of 3%)	**$ 431,000**	**$ 431,000**	**$ 431,000**	**$ 431,000**	**$ 649,000**	**$ 920,000**	**$ 649,000**	**$ 649,000**	**$ 476,000**	**$ 454,000**	
										Alternative Cost Summary	**S1**	**S2**	**S3**	**S4**	**S5**	**S5A**	**S5B**	**S5C**	**S6**	**S7**	
										Total Capital Costs (Direct & Indirect)	$ 5,465,921	$ 4,839,081	$ 4,231,744	$ 4,440,976	$ 2,592,634	$ 2,712,121	$ 2,998,491	$ 3,521,904	$ 4,532,861	$ 5,604,789	
										Total O&M Costs (Present Worth)	$ 431,000	$ 431,000	$ 431,000	$ 431,000	$ 649,000	$ 920,000	$ 649,000	$ 649,000	$ 476,000	$ 454,000	
										Sales Tax (WA State, 8% of direct capital costs)	$ 381,895	$ 337,169	$ 291,671	$ 306,509	$ 162,760	$ 170,470	$ 190,314	$ 225,978	$ 308,764	$ 393,071	
										Agency Oversight (Ecology, 3% of capital costs)	$ 163,978	$ 145,172	$ 126,952	$ 133,229	$ 77,779	$ 81,364	$ 89,955	$ 105,657	$ 135,986	$ 168,144	
										Total Present-Worth Cost	**$ 6,442,794**	**$ 5,752,423**	**$ 5,081,367**	**$ 5,311,714**	**$ 3,482,173**	**$ 3,883,955**	**$ 3,927,760**	**$ 4,502,539**	**$ 5,453,610**	**$ 6,620,003**	
										Recommended Calculation (Using 30 years for all O&M and LTM)	**S1**	**S2**	**S3**	**S4**	**S5**	**S5A**	**S5B**	**S5C**	**S6**	**S7**	
										Subtotal Annual O&M and LTM Cost	*$ 51,708*	*$ 51,708*	*$ 51,708*	*$ 51,708*	*$ 51,708*	*$ 123,058*	*$ 51,708*	*$ 51,708*	*$ 97,258*	*$ 74,483*	
										Total Non-Routine O&M Cost (estimated to be 2% of construction costs	*$ 1,034*	*$ 1,034*	*$ 1,034*	*$ 1,034*	*$ 1,034*	*$ 2,461*	*$ 1,034*	*$ 1,034*	*$ 1,945*	*$ 1,490*	
										Total Annual O&M and LTM Cost	*$ 52,742*	*$ 52,742*	*$ 52,742*	*$ 52,742*	*$ 52,742*	*$ 125,519*	*$ 52,742*	*$ 52,742*	*$ 99,203*	*$ 75,972*	
										Present-Worth Factor (I = 3%, n = 30 years)	*19.600*	19.600	19.600	19.600	19.600	19.600	19.600	19.600	19.600	19.600	
										Total Present-Worth O&M and LTM Cost	*$ 1,033,736*	*$ 1,033,736*	*$ 1,033,736*	*$ 1,033,736*	*$ 1,033,736*	*$ 2,460,166*	*$ 1,033,736*	*$ 1,033,736*	*$ 1,944,372*	*$ 1,489,054*	*Consider projecting the annual cost of O&M and LTM out for 30 years.*
										Sales Tax (WA State, 8% of direct capital costs)	*$ 381,895*	*$ 337,169*	*$ 291,671*	*$ 306,509*	*$ 162,760*	*$ 170,470*	*$ 190,314*	*$ 225,978*	*$ 308,764*	*$ 393,071*	
										Agency Oversight (Ecology, 3% of capital costs)	*$ 163,978*	*$ 145,172*	*$ 126,952*	*$ 133,229*	*$ 77,779*	*$ 81,364*	*$ 89,955*	*$ 105,657*	*$ 135,986*	*$ 168,144*	
										Total Present-Worth Cost	***$ 7,045,530***	***$ 6,355,159***	***$ 5,684,104***	***$ 5,914,451***	***$ 3,866,909***	***$ 5,424,120***	***$ 4,312,496***	***$ 4,887,276***	***$ 6,921,982***	***$ 7,655,057***	
										Rank (Lowest to Highest Cost)	9	7	5	6	1	4	2	3	8	10	

Notes:

bgs = below ground surface
CAMU = Corrective Action Management Unit
DCC = direct capital costs
DNAPL = dense non-aqueous phase liquid
DRO = diesel range organics
ERH = electrical resistance heating
FT = feet
HDPE = high density polyethylene
IC = institutional control
IN = inch
LF = linear feet
LTM = long-term monitoring
NAPL = non-aqueous phase liquid
O&M = operation and maintenance
QA = quality assurance
RCRA = Resource Conservation and Recovery Act
SVOCs = semi volatile organic compounds
S1 = Comprehensive Excavation (Baseline Alternative)
S2 = Comprehensive Excavation Outside Building Footprint
S3 = DNAPL Excavation Outside Building Footprint
S4 = DNAPL Excavation Outside Building Footprint, Limited Excavation Inside
S5 = Solidification Outside Building Footprint
S5A = Solidification Outside Building Footprint, DNAPL Recovery under Mechanics Shop
S5B = Solidification Outside and Inside Building Footprint with Relocation of Soil near Railroad Tracks (Preferred Alternative in RI/FS)
S5C = Solidification Outside Building Footprint, ERH Treatment under Mechanics Shop
S6 = DNAPL Treatment by Electrical Resistance Heating (ERH)
S7 = DNAPL Excavation and Electrical Resistance Heating (ERH)

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Attachment A2. Total Costs for Groundwater Remediation Alternatives from the Public Review Draft of the Remedial Investigation/Fesbility Study Report for the Port of Longview Maintenance Facility Area in Longview, Washington Dated July 12, 2016

Task Numbers				Task Description	Line-Item and Total Costs by Alternative				Review Notes, Questions, and Comments
GW1	GW2	GW3	GW4	Groundwater Alternatives	GW1	GW2	GW3	GW4	
Contractor Costs (Capital Direct)									
Remedial Action Construction									
1	1	1	1	Mobilization	$ 1,377,000	$ 60,000	$ 15,000	$ 6,000	*Mobilization cost for Alternative GW1 is very high relative to mobilization costs for Alternatives GW2, GW3, and GW4. Provide a breakdown of this cost. (Overall the cost for GW-1 seems high.)*
2	2	2	2	Contractor Design and Work Plans	$ 146,300	$ 14,400	$ 8,000	$ 2,700	
			3	Contractor Coordination with Port's maintenance operations				$ 900	*Allowances should be provided for Alternatives GW1, GW2, and GW3; and the allowance for GW4 should be substantially greater.*
		3		Inconvenience Fee for Disruption of Port's maintenance operations			$ 10,000		*Allowances should be provided for Alternatives GW1 and GW2.*
3	3			Temporary Relocation of Port Maintenance Operations	$ 30,000	$ 30,000			
4	4			Demo Horizontal Bioventing Wells	$ 7,400	$ 7,400			
5	5			Decommission Groundwater Monitoring & Biovent Wells	$ 41,400	$ 41,400			
6	6	4	4	Specialty Subcontractors (surveyor, utility locates)	$ 20,000	$ 20,000	$ 6,000	$ 2,000	*The allowances for Alternatives GW3 and GW4 seem too low.*
		5	5	Monitoring Well Installation			$ 50,400	$ 86,400	
		6		BioVenting Well Installation			$ 60,000		
		7		BioVenting Connection Piping Installation			$ 21,000		
		8		BioVenting System Upgrade and Connections			$ 30,000		
		9		BioVenting System Startup Testing and Monitoring			$ 9,000		
		10		BioVenting Well and System Upgrade Reporting			$ 10,000		
	7			Demo Fencing		$ 5,000			
7				Demo Underground Utilities and Fencing	$ 28,000				
	8			Environmental Protection		$ 5,000			*Allowances should be provided for Alternative GW1 and GW3.*
8				Storm Water Handling and Environmental Protection	$ 10,000				*Allowances should be provided for Alternatives GW2 and GW3.*
	9			Pre and Post Injection Groundwater Monitoring (8 locations)		$ 104,000			
	10			1st Injection of Modified Fenton's Reagent (100%)		$ 720,000			
	11			2nd Injection of Modified Fenton's Reagent (100%)		$ 720,000			
	12			3rd Injection of Modified Fenton's Reagent (50%) Hot Spot		$ 360,000			
	13			4th Injection of Modified Fenton's Reagent (50%) Hot Spot		$ 360,000			
	14			Chemical Injection Reporting (4 events)		$ 30,000			
	15	11		General Site Restoration Work		$ 10,000	$ 20,000		*An allowance should be provided for Alternative GW1.*
9				Subsurface Installations by ERH Contactor(214 electrodes, 23 TMPs)	$ 251,200				
10				General Trenching and Site Restoration Work	$ 13,000				*Allowances should be provided for Alternative GW2 and GW3.*
11				Drilling & Analytical Services for subsurface ERH installations	$ 857,400				*Provide a breakdown of this cost estimate to verify the total amount. Clarify if this is just drilling or trenching too.*
12				Upgrade Electrical Service to Treatment Pad (4,500 kW)	$ 55,000				
13				ERH Surface installations and startup	$ 798,600				
14				ERH Operations	$ 1,641,300				*Provide a breakdown of this cost estimate to verify the total amount.*
15				Electrical Connection and Usage charges	$ 1,359,800				*Provide a breakdown of this cost estimate to verify the total amount.*
16				Activated Carbon Usage	$ 7,000				
17				Other Misc. ERH Operational Costs	$ 26,700				*What does this allowance cover? Why is it separate from the contingency allowance?*
18				Chemical Injection of ORC using Push Probe (4 events)	$ 136,000				*Explain why the use of ORC technology is included.*
19				ORC Advanced Chemical or Equal	$ 88,000				
20	16			Rebuild Access Road (150 LF)	$ 18,750	$ 18,750			
		12		Resurface Access Road (150 LF)			$ 18,750		

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Attachment A2. Total Costs for Groundwater Remediation Alternatives from the Public Review Draft of the Remedial Investigation/Fesbility Study Report for the Port of Longview Maintenance Facility Area in Longview, Washington Dated July 12, 2016

Task Numbers				Task Description	Line-Item and Total Costs by Alternative				Review Notes, Questions, and Comments
GW1	GW2	GW3	GW4	Groundwater Alternatives	GW1	GW2	GW3	GW4	
	17			Monitoring Well Installation for Oxidation and MNA		$ 151,200			*Can the same wells be used for chemical oxidation and long-term monitoring?*
21				Monitoring Well Installation (12 wells to 50 feet)	$ 86,400				
22	18	13	6	Demobilization	$ 50,000	$ 40,000	$ 10,000	$ 4,000	*The allowance for demobilization on Alternative GW4 seems too low.*
23	19	14	7	Contractor Reporting and Closeout Submittals	$ 32,400	$ 14,400	$ 10,800	$ 2,700	*The allowance for Contractor Report and Closeout on Alternative GW4 seems too low.*
				Subtotal	**$ 7,081,650**	**$ 2,711,550**	**$ 278,950**	**$ 104,700**	
Contaminated Waste Disposal and Transportation									
1	1	1	1	NAPL Soil (CAMU RCRA Stabilization) Costs	$ 2,550	$ 510	$ 255	$ 255	
2	2	2	2	Transportation Costs to RCRA Stabilization Facility	$ 550	$ 110	$ 55	$ 55	
3	3	3	3	Liquid NAPL Material Disposal Costs (Incinerator)	$ 50,000	$ 2,000	$ 500	$ 500	
4	4	4	4	Liquid NAPL Transportation Costs to Incinerator	$ 25,000	$ 1,000	$ 250	$ 250	
	5	5	5	Transportation Charge for Small Loads to Aragonite, Utah		$ 4,000	$ 4,000	$ 4,000	
5	6	6	6	CAMU-Eligible Material Disposal Costs (Subtitle C Landfill)	$ 4,600	$ 690	$ 260	$ 130	
6	7	7	7	Transportation Costs to Subtitle C Landfill	$ 2,200	$ 330	$ 110	$ 55	
	8	8		Transportation Charge for Small Loads to Arlington, Oregon		$ 1,000	$ 1,000		
7	9	9	8	Non-Hazardous Material Disposal Costs (Subtitle D)	$ 600	$ 390	$ 612	$ 30	
8	10	10	9	Transportation Costs to Subtitle D Landfill	$ 500	$ 325	$ 492	$ 22	
			10	Transportation Charge for Small Loads to Oregon				$ 1,000	
9	11	11	11	Contaminated Water Treatment and Disposal	$ 100,000	$ 5,000	$ 200	$ 300	
10	12	12	12	Non-Hazardous Material Disposal Costs (Asphalt Recycling)	$ 240	$ 240	$ 240	$ -	
11	13	13	13	Transportation Costs to Asphalt Recycler	$ 270	$ 270	$ 270	$ -	
				Subtotal	**$ 186,510**	**$ 15,865**	**$ 8,244**	**$ 6,597**	
				Subtotal Contractor Costs	**$ 7,268,160**	**$ 2,727,415**	**$ 287,194**	**$ 111,297**	
				Contractor Contingency (25%)	$ 1,817,040	$ 545,483	$ 57,439	$ 22,259	
				Total Contractor Costs	**$ 9,085,200**	**$ 3,272,898**	**$ 344,633**	**$ 133,556**	
Engineering Costs (Capital Indirect)									
1	1	1	1	General Coordination, Meetings, and Planning (% DCC)	$ 90,900	$ 65,400	$ 34,500	$ 26,800	
2	2	2	2	Regulatory Review, Coordination, and Meetings (% DCC)	$ 90,900	$ 65,400	$ 20,700	$ 33,500	
	3			Pre-Design Investigation Testing (% DCC)		$ 98,100			
3	4	3	3	Engineering Design (% DCC)	$ 363,600	$ 163,500	$ 75,900	$ 33,500	
		4	4	Coordinate with Port Maintenance Ops			$ 2,700	$ 2,160	
4	5			Planning for temporary relocation of Port Maintenance Ops	$ 13,500	$ 13,500			
5	6	5	5	Bid & RFI Support	$ 10,800	$ 10,800	$ 8,100	$ 1,350	
6	7	6	6	Construction Oversight and QA (% DCC)	$ 181,800	$ 98,100	$ 27,600	$ 13,400	
7	8	7	7	Institutional Controls	$ 5,000	$ 5,000	$ 5,000	$ 5,000	
8	9	8	8	Closure Documentation & Reporting	$ 53,000	$ 35,000	$ 20,000	$ 12,000	
				Subtotal Engineering Costs	**$ 809,500**	**$ 554,800**	**$ 194,500**	**$ 127,710**	
				Engineering Contingency (10 percent)	$ 80,950	$ 55,480	$ 19,450	$ 12,771	
				Total Engineering Costs	**$ 890,450**	**$ 610,280**	**$ 213,950**	**$ 140,481**	
Annual O&M and LTM Costs									
Annual O&M Cost (Weekly Temp Monitoring for 6 months)									*Cost allowances should be provided for annual O&M beyond 6 months.*
1				Project Management and Communication	$ 14,040				
2				Weekly Temperature Readings	$ 18,720				
3				Monthly Reports	$ 18,000				
				Subtotal Annual O&M Cost	**$ 50,760**				
				O&M Contingency (25 percent)	$ 12,690				

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Attachment A2. Total Costs for Groundwater Remediation Alternatives from the Public Review Draft of the Remedial Investigation/Fesbility Study Report for the Port of Longview Maintenance Facility Area in Longview, Washington Dated July 12, 2016

Task Numbers				Task Description	Line-Item and Total Costs by Alternative				Review Notes, Questions, and Comments
GW1	GW2	GW3	GW4	Groundwater Alternatives	GW1	GW2	GW3	GW4	
				Total Annual O&M Cost	**$ 63,450**				*Cost allowances should be provided for annual O&M beyond 6 months.*
Annual O&M Cost (Institutional Controls) - 30 years of annual O&M									
	1		1	ICs Monitoring		$ 1,000		$ 2,000	*Cost allowance for annual monitoring of institutional controls seems low.*
				Subtotal Annual O&M Cost		**$ 1,000**		**$ 2,000**	
				O&M Contingency (25 percent)		$ 250		$ 500	*Based on the risk that natural attenuation will not provide and adequate remedy, and groundwater treatment might be necessary, this contingency factor and allowance are much too low.*
				Total Annual O&M Cost		**$ 1,250**		**$ 2,500**	
Annual O&M Cost (Bioventing system O&M, IC Monitoring)									
		1		ICs Monitoring			$ 2,000		
		2		Monthly O&M Visits			$ 16,800		
		3		Annual Electricity Consumption (Combined 20 hp motors)			$ 15,000		
		4		Miscellaneous Supplies & Replacement Part			$ 1,000		
		5		Bioventing System O&M Reporting			$ 6,000		
				Subtotal Annual O&M Cost			**$ 40,800**		
				O&M Contingency (25 percent)			$ 10,200		
				Total Annual O&M Cost			**$ 51,000**		
Annual LTM Cost (Annual MNA monitoring and IC)									
1				Project Management & Coordination	$ 8,100				
2				Institutional Controls Monitoring	$ 1,000				
3				Mobilization/Demobilization for Sampling (two person crew)	$ 1,800				
4				Pickup Truck Rental	$ 260				
5				Lodging and Meals (2 people 3 days each)	$ 780				
6				Sampling Labor and Supplies	$ 4,800				
7				Analytical Testing (DRO)	$ 910				
8				Analytical Testing (SVOCs)	$ 4,030				
9				Analytical Testing (PAHs)	$ 2,600				
10				IDW Disposal	$ 300				
11				Annual Reporting	$ 7,500				
				Subtotal Annual LTM Cost	**$ 32,080**				
				LTM Contingency (25 percent)	$ 8,020				
				Total Annual LTM Cost (Annual MNA monitoring and IC)	**$ 40,100**				
Annual LTM Cost (Annual GW Monitoring, GW2: 2 years during treatment & 6 years after)									*The timelines for long-term maintenance (LTM) for Alternatives GW2, GW3, and GW4 should be more than 6 years.*
	1	1	1	Project Management & Coordination		$ 8,100	$ 8,100	$ 6,750	
	2	2	2	Mobilization/Demobilization for Sampling (two person crew)		$ 1,800	$ 1,800	$ 1,800	
	3	3	3	Pickup Truck Rental		$ 340	$ 325	$ 510	
	4	4	4	Lodging and Meals (2 people 3 days each)		$ 1,014	$ 1,690	$ 1,690	
	5	5	5	Sampling Labor and Supplies		$ 4,800	$ 7,200	$ 8,000	
	6	6	6	Analytical Testing (DRO)		$ 910	$ 1,610	$ 1,540	
	7	7	7	Analytical Testing (SVOCs)		$ 4,030	$ 7,130	$ 6,820	
	8	8	8	Analytical Testing (PAHs)		$ 2,600	$ 4,600	$ 4,400	
	9		9	Analytical Testing (MNA Specific)		$ 1,950		$ 3,300	
	10	9	10	IDW Disposal		$ 300	$ 600	$ 900	
	11	10	11	Annual Reporting		$ 7,500	$ 8,000	$ 8,000	

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Attachment A2. Total Costs for Groundwater Remediation Alternatives from the Public Review Draft of the Remedial Investigation/Fesbility Study Report for the Port of Longview Maintenance Facility Area in Longview, Washington Dated July 12, 2016

Task Numbers				Task Description	Line-Item and Total Costs by Alternative				Review Notes, Questions, and Comments
GW1	GW2	GW3	GW4	Groundwater Alternatives	GW1	GW2	GW3	GW4	
				Subtotal Annual LTM Cost		**$ 33,344**	**$ 41,055**	**$ 43,710**	
				LTM Contingency (25 percent)		$ 8,336	$ 10,264	$ 10,928	
				Total Annual LTM Cost (Annual GW Monitoring)		**$ 41,680**	**$ 51,319**	**$ 54,638**	
				Total Annual O&M and LTM Cost	**$ 103,550**	**$ 42,930**	**$ 102,319**	**$ 57,138**	*Verify the Total O&M and LTM Cost for Alternative GW1.*
				Total O&M and LTM Cost (30 years until completion)	**$ 223,850**	**$ 343,440**	**$ 1,840,000**	**$ 1,710,000**	*Verify the calcuations that yielded these total amounts.*
				Present-Worth O&M Cost (with presumed interest rate of 3%)	**$ 210,658**	**$ 301,355**	**$ 1,404,110**	**$ 1,119,920**	*Verify the calcuations that yielded these total amounts.*
				Alternative Cost Summary	**GW1**	**GW2**	**GW3**	**GW4**	
				Total Capital Costs (Direct & Indirect)	$ 9,975,650	$ 3,883,178	$ 558,583	$ 274,037	
				Total O&M Costs (Present Worth)	$ 211,000	$ 301,000	$ 1,404,000	$ 1,120,000	
				Sales Tax (Washington State, 8% of direct capital costs)	$ 726,816	$ 261,832	$ 27,571	$ 10,685	
				Agency Oversight (Ecology, 3% of capital costs)	$ 299,270	$ 116,495	$ 16,757	$ 8,221	
				Total Present-Worth Cost	**$ 11,212,736**	**$ 4,562,505**	**$ 2,006,911**	**$ 1,412,943**	
				Recommended Calculation (Using 30 years for all O&M and LTM)	**GW1**	**GW2**	**GW3**	**GW4**	
				Total Capital Costs (Direct & Indirect)	*$ 9,975,650*	*$ 3,883,178*	*$ 558,583*	*$ 274,037*	
				Total Annual O&M and LTM Cost (30 years until completion)	*$ 103,550*	*$ 42,930*	*$ 102,319*	*$ 57,138*	
				Present-Worth Factor (discount rate = 3%, n = 30 years)	*19.600*	*19.600*	*19.600*	*19.600*	
				Total Present-Worth O&M and LTM Cost	*$ 210,658*	*$ 841,428*	*$ 2,005,448*	*$ 1,119,895*	*Long-term costs for Alternatives GW2, GW3, and GW4 have been projected out for 30 years.Cost for Alternative GW1 are for 2 years.*
				Sales Tax (Washington State, 8% of direct capital costs)	*$ 726,816*	*$ 261,832*	*$ 27,571*	*$ 10,685*	
				Agency Oversight (Ecology, 3% of capital costs)	*$ 299,270*	*$ 116,495*	*$ 16,757*	*$ 8,221*	
				Total Present-Worth Cost	**$ 11,212,394**	**$ 5,102,933**	**$ 2,608,358**	**$ 1,412,838**	

Notes:

CAMU = Corrective Action Management Unit
DCC = direct capital costs
DRO = diesel range organics
ERH = electrical resistance heating
GW = groundwater
IDW = investigation-derived waste
kW = kilowatts
LF = linear feet
LTM = long-term monitoring
MNA = monitored natural attenuation
NAPL = non-aqueous phase liquid
O&M = operation and maintenance
ORC = oxygen releasing compound
PAH = polycyclic aromatic hydrocarbon
QA = quality assurance
RFI = request for information
RCRA = Resource Conservation and Recovery Act
SVOCs = semi volatile organic compounds
GW1 = Electrical Resistance Heating and Enhanced Biodegradation (Baseline Alternative)
GW2 = Chemical Oxidation and Monitored Natural Attenuation
GW3 = Active Biosparging
GW4 = Monitored Natural Attenuation (International Paper preferred alternative)

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Attachment B. Comparison of Remedial Cost Estimates between Alternative S5B and the Port of Longview's Preferred Alternative

Internation Paper Site, Maintenance Facility Area (MFA) Remediation		International Paper - Alternative S5B (Excavation with On-Site Disposal and Solidification)				Port of Longview Alternative (Excavation with Off-Site Disposal and Solidification)				Cost Difference (GEO - S5B)	International Paper - Alternative S5B (Excavation with On-Site Disposal and Solidification)				Port of Longview Alternative (Excavation with Off-Site Disposal and Solidification)				Cost Difference (RGEO - RS5B)	Notes, Questions, and Comments
Estimator (Date):		AECOM (July 21, 2017)				Geoengineers (March 6, 2018)					Ridolfi				Ridolfi					
Task No.	Task Descripton	Quantity	Unit	Unit Cost	Total Cost	Quantity	Unit	Unit Cost	Total Cost		Quantity	Unit	Unit Cost	Total Cost	Quantity	Unit	Unit Cost	Total Cost		
	Contractor Costs (Capital Direct)																			
	Remedial Action Construction					*"85% Disposal as CAMU"*									*"85% Disposal as CAMU"*					*Offsite disposal of Corrective Action Management Unit (CAMU) waste (WAC 173-303-646920)*
1	Mobilization / Demobilization	1	LS	$ 225,000	$ 225,000	1	LS	$ 152,000	$ 152,000	$ *(73,000)*	1	LS	$ 152,000	$ 152,000	1	LS	$ 152,000	$ 152,000	$ -	*Based on Geoengineers Quote since cheaper vender.*
2	Contractor Work Plans	240	HR	$ 90	$ 21,600	240	HR	$ 90	$ 21,600	$ -	240	HR	$ 90	$ 21,600	240	HR	$ 90	$ 21,600	$ -	*Both estimates seem low. For the Port of Longview (POL) alternative, more than one contractor work plan would be required, since more than one remediation technology would be used.*
3	Solidification Pilot Testing	350	CY	$ 300	$ 105,000	350	CY	$ 300	$ 105,000	$ -	350	CY	$ 300	$ 105,000	350	CY	$ 300	$ 105,000	$ -	
4	Temporary relocation of Port Maintenance Operations	1	LS	$ 30,000	$ 30,000	1	LS	$ 30,000	$ 30,000	$ -	1	LS	$ 30,000	$ 30,000	1	LS	$ 30,000	$ 30,000	$ -	
5	Demo Horizontal Bioventing Wells and Connection Piping	800	LF	$ 37	$ 29,600	800	LF	$ 37	$ 29,600	$ -	800	LF	$ 37	$ 29,600	800	LF	$ 37	$ 29,600	$ -	
6	Decommission Groundwater Monitoring & Bioventing Wells	40	EA	$ 920	$ 36,800	40	EA	$ 920	$ 36,800	$ -	40	EA	$ 920	$ 36,800	40	EA	$ 920	$ 36,800	$ -	
7	Specialty Subcontractors (surveyor, utility locates)	1	LS	$ 8,000	$ 8,000	1	LS	$ 8,000	$ 8,000	$ -	1	LS	$ 8,000	$ 8,000	1	LS	$ 8,000	$ 8,000	$ -	
8	Demo Underground Utilities and Fencing	1	LS	$ 28,000	$ 28,000	1	LS	$ 28,000	$ 28,000	$ -	1	LS	$ 28,000	$ 28,000	1	LS	$ 28,000	$ 28,000	$ -	
9	Demo Retaining Wall	220	LF	$ 75	$ 16,500	220	LF	$ 75	$ 16,500	$ -	220	LF	$ 75	$ 16,500	220	LF	$ 75	$ 16,500	$ -	
10	Demo Port's Maintenance Building (east corner) with Lower Roof Height	2,500	SF	$ 25	$ 62,500	2,500	SF	$ 25	$ 62,500	$ -	2,500	SF	$ 25	$ 62,500	2,500	SF	$ 25	$ 62,500	$ -	
	Install Freeze Wall Shoring for Building (200 LF)																			*Removed all cost associated with freeze wall. Assume both IP and POL use cut slopes for shoring.*
	Install Sheet Pile Wall Shoring along building (200 LF)					2,400	SF	$ 45	$ 108,000	$ *108,000*	2,400	SF	$ 45	$ 108,000	2,400	SF	$ 45	$ 108,000	$ -	*Use Sheet pile shoring against building and not freeze wall.*
	Install Freeze Wall Shoring for Excavation Perimeter (720 LF)																		$ -	*Removed all cost associated with freeze wall. Assume both IP and POL use cut slopes for shoring.*
	Install Sheet Pile Wall Shoring along slurry wall - 100 LF, 16 ft deep					1,200	SF	$ 45	$ 54,000	$ *54,000*	1,200	SF	$ 45	$ 54,000	1,200	SF	$ 45	$ 54,000	$ -	*Use Sheet pile shoring against slurry wall and not freeze wall.*
11	Remove Surface Asphalt in Storage Yard and Road	32,600	SF	$ 0.88	$ 28,688	37,188	SF	$ 0.88	$ 32,725	$ *4,037*	37,188	SF	$ 0.88	$ 32,725	37,188	SF	$ 0.88	$ 32,725	$ -	*Incresed asphalt removal for cut slope.*
12	Remove 42-inch HDPE Culvert and Replace	125	LF	$ 150	$ 18,750	125	LF	$ 150	$ 18,750	$ -	125	LF	$ 150	$ 18,750	125	LF	$ 150	$ 18,750	$ -	
13	Freeze Wall Shoring for Excavation Perimeter	9,450	SF	$ 31	$ 292,950					$ *(292,950)*									$ -	*Removed all cost associated with freeze wall. Assume both IP and POL use cut slopes for shoring.*
14	Excavation and Stockpiling of Overburden (0 to 3 FT bgs)	3,900	CY	$ 27	$ 105,300	3,900	CY	$ 27	$ 105,300	$ -	3,900	CY	$ 27	$ 105,300	3,900	CY	$ 27	$ 105,300	$ -	
	Excavate Cut Slope at 45 Degrees for Shoring					596	CY	$ 27	$ 16,092		596	CY	$ 27	$ 16,092	596	CY	$ 27	$ 16,092	$ -	
	Excavation and Stockpiling of Contaminated Soil					3,604	CY	$ 27	$ 97,300	$ *97,300*					3,604	CY	$ 27	$ 97,308	$ *97,308*	
	Loading of Contaminated Soil					5,406	TN	$ 6	$ 32,433	$ *32,433*					5,406	TN	$ 6	$ 32,436	$ *32,436*	
	Import of clean fill to the site					2,039	CY	$ 20	$ 40,785	$ *40,785*					2,039	CY	$ 20	$ 40,780	$ *40,780*	
15	Stormwater Handling and Environmental Protection	1	LS	$ 11,000	$ 11,000	1	LS	$ 11,000	$ 11,000	$ -	1	LS	$ 11,000	$ 11,000	1	LS	$ 11,000	$ 11,000	$ -	
16	Excavate Soil from 3 to 8 feet bgs within 80 feet of Railroad Tracks	1,650	CY	$ 14	$ 23,100					$ *(23,100)*	1,650	CY	$ 14	$ 23,100					$ *(23,100)*	
17	Relocate and Backfill Soil from Near the Railroad Tracks	1,650	CY	$ 9	$ 14,850					$ *(14,850)*	1,650	CY	$ 9	$ 14,850					$ *(14,850)*	
18	Solidification Materials (8% NewCem Slag Cement)	890	TN	$ 130	$ 115,752	469	TN	$ 130	$ 61,013	$ *(54,739)*	890	TN	$ 130	$ 115,752	469	TN	$ 130	$ 60,970	$ *(54,782)*	
19	Solidification Materials (2% Bentonite Grout - Hydrogel 90)	223	TN	$ 230	$ 51,198	117	TN	$ 230	$ 26,987	$ *(24,211)*	223	TN	$ 230	$ 51,198	117	TN	$ 230	$ 26,910	$ *(24,288)*	
20	Solidification Materials (0.5% Caustic Soda)	56	TN	$ 1,275	$ 70,954	29	TN	$ 1,275	$ 37,400	$ *(33,554)*	56	TN	$ 1,275	$ 70,954	29	TN	$ 1,275	$ 36,975	$ *(33,979)*	
21	Solidification Labor and Equipment Outside Building Footrprint	6,950	CY	$ 60	$ 417,000	3,689	CY	$ 30	$ 110,666	$ *(306,334)*	6,950	CY	$ 30	$ 208,500	3,689	CY	$ 30	$ 110,670	$ *(97,830)*	
22	Solidification Labor and Equipment Under Mechanics Shop	470	CY	$ 60	$ 28,200	222	CY	$ 30	$ 6,667	$ *(21,533)*	470	CY	$ 30	$ 14,100	222	CY	$ 30	$ 6,660	$ *(7,440)*	
23	Geotextile Fabric Marker Layer Over Solidified Soil	2,867	SY	$ 1.75	$ 5,017	2,933	SY	$ 1.75	$ 5,133	$ *116*	2,933	SY	$ 1.75	$ 5,133	2,933	SY	$ 1.75	$ 5,133	$ -	
24	Import of Clean Backfill for Transition Grades	1,700	CY	$ 20	$ 34,000					$ *(34,000)*	1,700	CY	$ 20	$ 34,000					$ *(34,000)*	
25	Additional Import of Backfill Material to Replace Relocated Soil	1,600	CY	$ 20	$ 32,000					$ *(32,000)*	1,600	CY	$ 20	$ 32,000					$ *(32,000)*	
26	Backfill and Compaction of Overburden Soil Stockpiles on Site	3,900	CY	$ 11	$ 42,900					$ *(42,900)*	3,900	CY	$ 11	$ 42,900					$ *(42,900)*	
27	Backfill and Compaction of Excavation	3,300	CY	$ 9	$ 29,700	8,100	CY	$ 9	$ 72,900	$ *43,200*	3,896	CY	$ 9	$ 35,064	8,100	CY	$ 9	$ 72,900	$ *37,836*	*Includes cut slope.*
28	Asphalt Paving	32,600	SF	$ 4	$ 130,400	37,188	SF	$ 4	$ 148,752	$ *18,352*	37,188	SF	$ 4	$ 148,752	37,188	SF	$ 4	$ 148,752	$ -	*Increased asphalt for cut slope.*
29	Rebuild Access Road (150 LF)	3,750	SF	$ 6	$ 22,500	3,750	SF	$ 6	$ 22,500	$ -	3,750	SF	$ 6	$ 22,500	3,750	SF	$ 6	$ 22,500	$ -	
	Rebuild Retaining Wall					160	LF	$ 150	$ 24,000	$ *24,000*					160	LF	$ 150	$ 24,000	$ *24,000*	
30	Reconstruct Portion of Maintenance Building	2,500	SF	$ 50	$ 125,000	2,500	SF	$ 50	$ 125,000	$ -	2,500	SF	$ 50	$ 125,000	2,500	SF	$ 50	$ 125,000	$ -	
31	Replace Connection Piping for Bioventing System	600	LF	$ 40	$ 24,000	600	LF	$ 40	$ 24,000	$ -	600	LF	$ 40	$ 24,000	600	LF	$ 40	$ 24,000	$ -	
32	Monitoring Well Installation	10	EA	$ 5,400	$ 54,000	10	EA	$ 5,400	$ 54,000	$ -	10	EA	$ 5,400	$ 54,000	10	EA	$ 5,400	$ 54,000	$ -	
33	Contractor Reporting and Closeout Submittals	200	HR	$ 90	$ 18,000	290	HR	$ 90	$ 26,100	$ *8,100*	290	HR	$ 90	$ 26,100	290	HR	$ 90	$ 26,100	$ -	*Used POL level of effort.*
	Subtotal - Remedial Action Construction				**$ 2,258,300**				**$ 1,751,500**	***$ (506,800)***				**$ 1,883,800**				**$ 1,751,000**	***$ (132,800)***	
	Contaminated Waste Disposal and Transportation																			
1	NAPL Soil (CAMU RCRA Stabilization) Costs	0	TN	$ 255	$ -	0	TN	$ 255	$ -	$ -	0	TN	$ 255	$ -	0	TN	$ 255	$ -	$ -	
2	Transportation Costs to RCRA Stabilization Facility	0	TN	$ 55	$ -	0	TN	$ 55	$ -	$ -	0	TN	$ 55	$ -	0	TN	$ 55	$ -	$ -	
3	Liquid NAPL Material Disposal Costs (Incinerator)	0	GAL	$ 10	$ -	0	GAL	$ 10	$ -	$ -	0	GAL	$ 10	$ -	0	GAL	$ 10	$ -	$ -	
4	Liquid NAPL Transportation Costs to Incinerator	0	DRUM	$ 250	$ -	0	DRUM	$ 250	$ -	$ -	0	DRUM	$ 250	$ -	0	DRUM	$ 250	$ -	$ -	
5	CAMU-Eligible Material Disposal Costs (Subtitle C Landfill)	0	TN	$ 115	$ -	4,595	TN	$ 115	$ 528,393	$ *528,393*	0	TN	$ 115	$ -	4,595	TN	$ 115	$ 528,393	$ *528,393*	*Assume 85% of excavated soil disposed of as CAMU-eligible waste*
6	Transportation Costs to Subtitle C Landfill	0	TN	$ 55	$ -	4,595	TN	$ 55	$ 252,710	$ *252,710*	0	TN	$ 55	$ -	4,595	TN	$ 55	$ 252,710	$ *252,710*	
7	Non-Hazardous Material Disposal Costs (Subtitle D)	0	TN	$ 30	$ -	811	TN	$ 30	$ 24,325	$ *24,325*	0	TN	$ 30	$ -	811	TN	$ 30	$ 24,325	$ *24,325*	*Assume 15% of excavated soil disposed of using contained-in determination*
8	Transportation Costs to Subtitle D Landfill	0	TN	$ 25	$ -	811	TN	$ 25	$ 20,271	$ *20,271*	0	TN	$ 25	$ -	811	TN	$ 25	$ 20,271	$ *20,271*	
9	Contaminated water treatment and disposal	50,000	GAL	$ 0.20	$ 10,000	50,000	GAL	$ 0.20	$ 10,000	$ -	50,000	GAL	$ 0.20	$ 10,000	50,000	GAL	$ 0.20	$ 10,000	$ -	
10	Non-Hazardous Material Disposal Costs (Asphalt Recycling)	845	TN	$ 8	$ 6,761	845	TN	$ 8	$ 6,760	$ *(1)*	845	TN	$ 8	$ 6,761	845	TN	$ 8	$ 6,761	$ -	
11	Transportation Costs to Asphalt Recycler	845	TN	$ 9	$ 7,607	845	TN	$ 9	$ 7,605	$ *(2)*	845	TN	$ 9	$ 7,607	845	TN	$ 9	$ 7,607	$ -	
	Subtotal - Contaminated Waste Disposal and Transportation				**$ 24,400**				**$ 850,100**	***$ 825,700***				**$ 24,400**				**$ 850,100**	***$ 825,700***	
	Subtotal - Contractor Costs				**$ 2,282,700**				**$ 2,601,600**	***$ 318,900***				**$ 1,908,200**				**$ 2,601,100**	$ *692,900*	
	Contractor Contingency (percent)	20	%	$ 2,282,700	**$ 456,500**	20	%	$ 2,601,600	**$ 520,300**	***$ 63,800***	20	%	$ 1,908,200	**$ 381,600**	20	%	$ 2,601,100	**$ 520,200**	$ *138,600*	
	TOTAL CONTRACTOR COSTS				**$ 2,739,200**				**$ 3,121,900**	***$ 382,700***				**$ 2,289,800**				**$ 3,121,300**	***$ 831,500***	

RIDOLFI
Environmental

Internation Paper Site, Maintenance Facility Area (MFA) Remediation		International Paper - Alternative S5B (Excavation with On-Site Disposal and Solidification)				Port of Longview Alternative (Excavation with Off-Site Disposal and Solidification)				Cost Difference (GEO - S5B)	International Paper - Alternative S5B (Excavation with On-Site Disposal and Solidification)				Port of Longview Alternative (Excavation with Off-Site Disposal and Solidification)				Cost Difference (RGEO - RS5B)	Notes, Questions, and Comments
Estimator (Date):		AECOM (July 21, 2017)				Geoengineers (March 6, 2018)					Ridolfi				Ridolfi					
Task No.	Task Descripton	Quantity	Unit	Unit Cost	Total Cost	Quantity	Unit	Unit Cost	Total Cost		Quantity	Unit	Unit Cost	Total Cost	Quantity	Unit	Unit Cost	Total Cost		
ENGINEERING COSTS (CAPITAL INDIRECT)																				
1	General Coordination, Meetings, and Planning (% DCC)	2	%	$ 2,739,000	$ 54,780	2	%	$ 3,121,900	$ 62,438	$ 7,658	2	%	$ 2,739,000	$ 54,780	2	%	$ 3,121,300	$ 62,426	$ 7,646	
2	Regulatory Review, Coordination, and Meetings (% DCC)	2	%	$ 2,739,000	$ 54,780	2	%	$ 3,121,900	$ 62,438	$ 7,658	2	%	$ 2,739,000	$ 54,780	2	%	$ 3,121,300	$ 62,426	$ 7,646	
3	Pilot Test Sampling, CBR, and Reporting	1	LS	$ 75,000	$ 75,000	1	LS	$ 75,000	$ 75,000	$ -	1	LS	$ 75,000	$ 75,000	1	LS	$ 75,000	$ 75,000	$ -	
4	Engineering Design (% DCC)	7	%	$ 2,739,000	$ 191,730	5	%	$ 3,121,900	$ 156,095	$ (35,635)	7	%	$ 2,739,000	$ 191,730	7	%	$ 3,121,300	$ 218,491	$ 26,761	*Used IP estimate of 7%.*
5	Planning for temporary relocation of Port maintenance ops	100	HR	$ 135	$ 13,500	100	HR	$ 135	$ 13,500	$ -	100	HR	$ 135	$ 13,500	100	HR	$ 135	$ 13,500	$ -	
6	Bid and RFI Support	60	HR	$ 135	$ 8,100	60	HR	$ 135	$ 8,100	$ -	60	HR	$ 135	$ 8,100	60	HR	$ 135	$ 8,100	$ -	
7	Construction Oversight and QA (% DCC)	5	%	$ 2,739,000	$ 136,950	5	%	$ 3,121,900	$ 156,095	$ 19,145	5	%	$ 2,739,000	$ 136,950	5	%	$ 3,121,300	$ 156,065	$ 19,115	
8	Confirmational Sample Collection and Reporting	1	LS	$ 33,000	$ 33,000	1	LS	$ 33,000	$ 33,000	$ -	1	LS	$ 33,000	$ 33,000	1	LS	$ 33,000	$ 33,000	$ -	
9	Zone 1 Soil Characterization	1	LS	$ 25,000	$ 25,000	1	LS	$ 25,000	$ 25,000		1	LS	$ 25,000	$ 25,000	1	LS	$ 25,000	$ 25,000	$ -	
10	Closure Documentation & Reporting	1	LS	$ 53,000	$ 53,000	1	LS	$ 53,000	$ 53,000	$ -	1	LS	$ 53,000	$ 53,000	1	LS	$ 53,000	$ 53,000	$ -	
	Subtotal - Engineering Costs				**$ 645,800**				**$ 644,700**	$ (1,100)				**$ 645,800**				**$ 707,000**	$ 61,200	
	Engineering Contingency (percent)	10	%	$ 645,800	**$ 64,600**	10	%	$ 644,700	**$ 64,500**	$ (100)	10	%	$ 645,800	**$ 64,600**	10	%	$ 707,000	**$ 70,700**	$ 6,100	
	TOTAL ENGINEERING COSTS				**$ 710,400**				**$ 709,200**	**$ (1,200)**				**$ 710,400**				**$ 777,700**	**$ 67,300**	***Difference between IP and POL alternatives.*** *Engineering Costs for the POL Alternative are probably biased high, since the same percentages were used for both alternatives. The engineering costs associated with soil removal and disposal for the POL Alternative should be less than the engineering costs associated with soil solidification for the International Paper Alternative.*
ANNUAL O&M AND LONG TERM MONITORING COSTS																				
Annual O&M Cost (Institutional Controls Maintenance; Asphalt Inspection and Repair) - 30 years of annual O&M																				
1	Project Management and Coordination	16	HR	$ 135	$ 2,160	16	HR	$ 135	$ 2,160	$ -	16	HR	$ 135	$ 2,160	16	HR	$ 135	$ 2,160	$ -	
2	Annual Inspection and Reporting	32	HR	$ 110	$ 3,520	32	HR	$ 110	$ 3,520	$ -	32	HR	$ 110	$ 3,520	32	HR	$ 110	$ 3,520	$ -	
3	Update Institutional Controls (ICs) Plan (once every 5 years)	1	LS	$ 750	$ 750	1	LS	$ 750	$ 750	$ -	1	LS	$ 750	$ 750	1	LS	$ 750	$ 750	$ -	
4	Prorated Cost for Asphalt Repairs	1	LS	$ 8,606	$ 8,606	1	LS	$ 8,606	$ 8,606	$ -	1	LS	$ 8,606	$ 8,606	1	LS	$ 8,606	$ 8,606	$ -	
	Subtotal - Annual O&M Cost				**$ 15,040**				**$ 15,040**	$ -				**$ 15,040**				**$ 15,040**	$ -	
	O&M Contingency	25	%	$ 15,040	**$ 3,760**	25	%	$ 15,040	**$ 3,760**	$ -	25	%	$ 15,040	**$ 3,760**	25	%	$ 15,040	**$ 3,760**	$ -	
	Total Annual O&M Cost				**$ 18,800**				**$ 18,800**	$ -				**$ 18,800**				**$ 18,800**	$ -	
Annual LTM Cost (Monitoring of leachate and physical performance of solidified soil) - 10 years of annual LTM																				*Is 10 years sufficient for long-term monitoring of solidified soil?*
1	Project Management and Coordination	24	HR	$ 135	$ 3,240	24	HR	$ 135	$ 3,240	$ -	24	HR	$ 135	$ 3,240	24	HR	$ 135	$ 3,240	$ -	
2	Mob/Demob for Sampling (semi-annual)	2	EA	$ 1,800	$ 3,600	2	EA	$ 1,800	$ 3,600	$ -	2	EA	$ 1,800	$ 3,600	2	EA	$ 1,800	$ 3,600	$ -	
3	Pickup Truck Rental	6	DAY	$ 65	$ 390	6	DAY	$ 65	$ 390	$ -	6	DAY	$ 65	$ 390	6	DAY	$ 65	$ 390	$ -	
4	Sampling Labor and Supplies	20	EA	$ 400	$ 8,000	20	EA	$ 400	$ 8,000	$ -	20	EA	$ 400	$ 8,000	20	EA	$ 400	$ 8,000	$ -	
5	Analytical Testing (DRO and SVOCs)	20	EA	$ 380	$ 7,600	20	EA	$ 380	$ 7,600	$ -	20	EA	$ 380	$ 7,600	20	EA	$ 380	$ 7,600	$ -	
6	Annual Reporting	1	LS	$ 3,500	$ 3,500	1	LS	$ 3,500	$ 3,500	$ -	1	LS	$ 3,500	$ 3,500	1	LS	$ 3,500	$ 3,500	$ -	
	Subtotal - Annual LTM Cost				**$ 26,330**				**$ 26,330**	$ -				**$ 26,330**				**$ 26,330**	$ -	
	LTM Contingency (percent)	25	%	$ 26,330	**$ 6,580**	25	%	$ 26,330	**$ 6,580**	$ -	25	%	$ 26,330	**$ 6,580**	25	%	$ 26,330	**$ 6,580**	$ -	
	Total Annual LTM Cost				**$ 32,900**				**$ 32,900**	$ -				**$ 32,900**				**$ 32,900**	$ -	*The estimate for annual LTM costs for both alternatives is $32,913 per year. Consider projecting this annual cost out for 30 years, along with the operating and maintenance (O&M) cost, so that the allowance for all long-term costs is based on a 30-year timeline.*
	Total Annual O&M and LTM Cost				**$ 51,700**				**$ 51,700**	$ -				**$ 51,700**				**$ 51,700**	$ -	
	Total Non-Routine O&M Cost	2	%	$ 2,258,300	**$ -**	2	%	$ 1,751,500	**$ -**	$ -	2	%	$ 1,883,800	**$ -**	2	%	$ 1,751,000	**$ -**	$ -	*Why is the allowance for non-routine O&M zero?*
	Total O&M and LTM Cost (over 30 years)				**$ 893,000**				**$ 893,000**	$ -				**$ 893,000**				**$ 893,000**	$ -	
																			$ -	
	O&M Present Value (PV) = $18,795 (P/A 3%, 30 yr) =	19.6000	*PWF*	$ 18,800	$ 368,500	19.6000	*PWF*	$ 18,800	$ 368,500	$ -	19.6000	*PWF*	$ 18,800	$ 368,500	19.6000	*PWF*	$ 18,800	$ 368,500	$ -	*PWF = Present Worth Factor*
	LTM Present Value (PV) = $32,913 (P/A 3%, 10 yr) =	8.5300	*PWF*	$ 32,900	$ 280,600	8.5300	*PWF*	$ 32,900	$ 280,600	$ -	8.5300	*PWF*	$ 32,900	$ 280,600	8.5300	*PWF*	$ 32,900	$ 280,600	$ -	
	NET PRESENT VALUE OF O&M and LTM COSTS				**$ 649,100**				**$ 649,100**	**$ -**				**$ 649,100**				**$ 649,100**	**$ -**	
ALTERNATIVE COST SUMMARY																				
	TOTAL CAPITAL COSTS (DIRECT & INDIRECT)				**$ 3,449,600**				**$ 3,831,100**	$ 381,500				**$ 3,000,200**				**$ 3,899,000**	$ 898,800	
	TOTAL O&M and LTM COSTS (PRESENT WORTH)				**$ 649,100**				**$ 649,100**	$ -				**$ 649,100**				**$ 649,100**	$ -	
	SALES TAX (Washington State)	8	%	$ 2,739,200	**$ 219,100**	8	%	$ 3,121,900	**$ 249,800**	$ 30,700	8	%	$ 2,289,800	**$ 183,200**	8	%	$ 3,121,300	**$ 249,700**	$ 66,500	
	AGENCY OVERSIGHT (Ecology)	3	%	$ 3,449,600	**$ 103,500**	3	%	$ 3,831,100	**$ 114,900**	$ 11,400	3	%	$ 3,000,200	**$ 90,000**	3	%	$ 3,899,000	**$ 117,000**	$ 27,000	*Is this allowance different than Task 2 (Regulatory Review, Coordination, and Meetings) of Engineering Costs?*
	TOTAL PRESENT-WORTH ALTERNATIVE COST				**$ 4,421,300**				**$ 4,844,900**	**$ 423,600**				**$ 3,922,500**				**$ 4,914,800**	**$ 992,300**	***Total Difference between IP and POL alternatives***
	UNIT COST ($/CY)				**$ 597**				**$ 654**	**$ 57**				**$ 530**				**$ 664**	**$ 134**	***Based on a total treatment volume of 7,404 cubic yards***

Notes:

%DCC = percent Direct Capital Costs
CAMU = Corrective Action Management Unit
CY = cubic yard
DRO = diesel-range organics
DRUM = 55-gallon drum
EA = each
FT = feet
GAL = gallon
HR = hour
IP = International Paper
LF = linear feet
LTM = long term monitoring
LS = lump sum
MFA = Maintenance Facility Area
O&M = operation and maintenance
P/A = uniform series present worth factor
POL = Port of Longview
PV = present value
PWF = present worth factor
SF = square feet
SVOCs = semi-volatile organic compounds
SY = square yard
TN = ton