ECOLOGY DRAFT DATA GAP REPORT COMMENT LETTER

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
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April 21, 2014

Mr. Stephen Wilson
Director
Health, Safety, Security, Environmental and Quality
CPD Alaska, LLC
201 Arctic Slope Avenue
Anchorage, AK 99518

Re: Agreed Order No. DE 6721
Draft Data Gaps Report, First Phase of Remedial Investigation,
8th Avenue Terminals Site, Seattle, WA, February 14, 2014

Dear Mr. Wilson:

This letter contains the Department of Ecology's (Ecology) comments on the Draft Data Gaps Report submitted on February 14, 2104, and summarizes our evaluation of the remaining data gaps. These data gaps are required to be addressed in a draft Sampling and Analysis Plan Addendum (Addendum) to the Remedial Investigation and Feasibility Work Plan, October 2012 for the Phase 2 Remedial Investigation as required by the Agreed Order No. DE 6721 and Ecology's letter of May 23, 2013, Resolution of Dispute. The draft Addendum is due on June 13, 2014, for Ecology review.

This letter also provides an extension of the schedule requirement in Agreed Order No. DE 6721 to complete field work for the remedial investigation (RI) from May 23, 2014, to November 21, 2014. This will allow for the Phase 2 investigation activities in the Addendum to be conducted.

To facilitate evaluation of the site data, Ecology prepared the enclosed draft maps for soil, groundwater and intertidal sediment contaminants arsenic, lead, carcinogenic PAHs, naphthalene, total petroleum hydrocarbons (TPH), and summaries of other contaminants. Maps for polychlorinated biphenyls (PCBs) and dioxins/furans were prepared for soil.

Based on our review, the primary site areas that require additional investigation and characterization include:

- The western margin of the property, including the parking area and right-of-way west of the existing borings and wells; primarily for, but not limited to, metals, PAHs, and TPH.

- The northern margin and northeastern corner of the property; primarily for, but not limited to, metals, TPH, volatile organic carbons (VOCs) and PCBs.

- The southwestern corner of the property; primarily for, but not limited to, metals, PAHs, TPH, and PCBs.

- The area beneath and down-gradient from the former wood treatment facility; primarily for, but not limited to, PAHs. PCBs, TPH, VOCs; pentachlorophenol and metals are also not fully delineated at some locations in this area.

The following section includes our responses for each of the data gaps identified by SLR in the Draft Data Gaps Report and summarized in Section 8. Ecology's responses are below each item in italic text.

1. The source and the lateral and vertical extents of the oily substance with a creosote-like odor in deep boring EMW-l0D (at the former wood treating operations area) have not been determined.

   Additional characterization of the lateral and vertical extent of soil affected by possible creosote-related contaminants is needed.

2. The lateral extents of the PAH-impacted soil have not been delineated to the north, northeast, northwest, and west and the vertical extents of the impacted soil have not been determined at several locations throughout the property.

   Ecology considers that these areas of PAH impacts require delineation, and the areas requiring the most additional investigation appear to be the western margin of the site in both shallow and deep soil, the area around and downgradient of the former wood treatment facility.

3. The lateral extents of the main area of arsenic- and lead-impacted soil have not delineated to the west of the property, and the lateral extents of two localized areas of arsenic-impacted soil at the western part of Parcel F are not defined. The western and northeastern extents of the long area of lead-impacted soil on Parcel F and the northern extent of the northern area of lead-impacted soil (north of the property) have not been delineated. Also, the lateral extents of a localized area of lead-impacted soil at the western part of Parcel F are not defined.

   Metals contamination in these areas, including off-site to the west of the property, are not defined. The full-suite of metals analyses as listed in the current RI and FS Work Plan should be considered at these locations.

4. The vertical extents of the arsenic- and lead-impacted soil have not been delineated at several locations throughout the property.

These locations need to be specified in the Addendum and include locations where the deepest analyzed sample had arsenic and/or lead concentration above the screening level. The full-suite of metals analyses as listed in the current RI and FS Work Plan should be considered at these locations.

5. The vertical extents of the PCB-impacted soil at boring DB-12, the 2- methylphenol-impacted soil at boring HC-13, and the di-n-octyl phthalate- impacted soil at boring CMW-4 have not been defined.

   Add borings as required to characterize nature and extent of contamination near the listed locations.

6. The source of 1,1-dichloroethene in soil at FMW-2 has not been determined, and may be associated with activities at the neighboring Markey Machinery Company facility.

   Perform additional sampling to verify and characterize extent as necessary.

7. The preliminary soil cleanup levels for petroleum hydrocarbons are very conservative (MTCA Method A levels) because the data necessary to calculate site-specific, risk-based Method B cleanup level for TPH have not been collected. After collecting the data and calculating the Method B cleanup level, the existing data can be evaluated to determine if the lateral and vertical extents of the petroleum hydrocarbon-impacted soil have been delineated.

   The lateral and vertical extent should also be characterized based on the MTCA Method A levels for areas where TPH impacts are not currently delineated. Note that the TPH concentrations identified in proximity to the former wood treatment area could be related to creosote rather than petroleum-based hydrocarbon, or to both, so PAHs should also be included in the risk-based cleanup level calculations.

8. The source of petroleum hydrocarbons in the soil at EMW-7S has not been identified and may be associated with off-property activities.

   Additional evaluation is warranted in this area, particularly to the west of EMW-7S.

9. The lateral extents of each area of dioxin-impacted soil have not been delineated, and the vertical extent of the impacted soil is not defined at boring EMW-9S.

   Additional assessment of dioxins/furans is needed to delineate the lateral and vertical extent. Assessment should also include areas where dioxin/furan sampling has not been previously performed to determine if the detected concentrations represent a site-wide "background" or localized hot spots.

10. We have assumed that the observed westernmost arm of the sheet pile seawall extends to the same depth as the rest of the wall; however, there are no records to verify that assumption. Since the seawall serves as a barrier to shallow groundwater flow, the depth of that section of the seawall is needed to determine if the shallow groundwater flows around the western end of the observed seawall or the western end of the pier.

    Additional wells in the shallow-zone and deep-zone may also be needed to characterize hydrogeologic conditions in the southwestern portion of the site and to evaluate the extent to which the seawall affects groundwater flow and discharge to surface water.

11. Additional groundwater sampling should be conducted at the groundwater compliance wells to further evaluate the groundwater COPCs for the site.

    Additional groundwater sampling should include all wells necessary to evaluate the extent of impacts and to address data gaps, including any new wells that are installed for Phase 2 of the RI. Analyses should include the "full suite" for each type of contaminant that requires additional assessment (i.e. all PAHs, all metals, etc. as listed in the RI and FS Work Plan).

12. The lateral extent of PAH-impacted groundwater has not been delineated to the west of the property (west of HC-20 and EMW-7S), and the vertical extents of the PAH-impacted groundwater have not been defined at wells EMW-4D and EMW-14D.

    The shallow and deep PAH impacts to groundwater are not fully characterized laterally along the western property margin including the southwest corner, and vertically at the indicated wells. PAH characterization should include both cPAHs and naphthalene, both of which are typical of creosote. Ecology's assessment of cPAHs was based on total cPAHs. SLR's maps are based on benzo(a)anthracene and chrysene. The overall area of cPAH impacts is similar in both cases.

13. The preliminary cleanup level for arsenic is based on a regional background concentration; however, groundwater samples from the upgradient wells (EMW-1S EMW-6S, and EMW-7S) on the property contained arsenic concentrations much greater than the preliminary cleanup level. Additional groundwater sampling is needed at the upgradient wells and possibly upgradient of the property to evaluate the arsenic concentrations flowing onto the property (background conditions). After the background arsenic concentration for the property has been established, it may be possible to delineate the lateral and vertical extents of the arsenic- impacted groundwater.

    Additional evaluation of background concentrations for arsenic may be warranted, but the preliminary screening level of 0.87 ug/l is fairly low. The MTCA Method A and LDW surface water proposed cleanup level of 5 ug/l may be more appropriate for delineation of the extent of groundwater impacts. Additional shallow-zone and deep-zone wells may be needed to evaluate the extent of arsenic impacts to groundwater.

Analytical testing should include the full-suite of metals as described in the RI and FS Work Plan, including any proposed "background" locations.

14. The lateral extents of the barium- and copper-impacted groundwater have not been delineated to the west of the property (west of EMW-11S), and the lateral extent of cadmium-impacted groundwater has not been delineated to the north of well EMW-3 (and northeast of well EMW-2S).

    In general, additional delineation of the lateral extent of metals in shallow groundwater should be considered for the western property margin, the southwestern corner, the northern property margin, and the northeastern corner north of the seawall. Analysis of the full-suite of metals based on the RI and FS Work Plan should be considered for existing wells and any new wells installed during Phase 2 of the RI.

15. The vertical extents of the barium-impacted groundwater have not been delineated near the seawall (at EMW-4D, EMW-14D, and EMW-16D), and the vertical extents of the cadmium-impacted groundwater are not delineated near the seawall (at EMW-4D) or below the former wood treating operations area (at EMW-10D).

    Additional delineation of the lateral and vertical extent of metals in deep groundwater should be performed. New deep-zone monitoring wells should be positioned to provide for evaluation of potential contaminant transport from upland areas to the LDW. Additional shoreline and upland deep wells should both be considered and ideally paired with shallow-zone wells. Analysis of the full-suite of metals based on the RI and FS Work Plan should be considered for existing deep wells and any new deep wells installed during Phase 2 of the RI.

16. Nickel analysis by ICP-DRC-MS is needed to evaluate if matrix interferences have been affecting the concentrations that were analyzed by EPA Method 200.8. After establishing if the ICP-DRC-MS or 200.8 method is appropriate for nickel, then the lateral and vertical extents can be properly evaluated.

    Perform additional groundwater analyses for nickel as needed to address data gaps, including all site wells that were analyzed for metals in 2013 plus any new wells installed for Phase 2 of the RI.

Additional data gaps identified during our review, some of which are similar to those discussed above, include the following:

- Currently, there are some large areas where soil sampling has not been previously performed. Some of these areas will likely be "filled in" based on the previously discussed data gaps and planned Phase 2 borings. However, based on the extensive fill history of the site, additional soil borings for general assessment and CSM revision should be considered for gaps greater than approximately 100 feet between existing soil borings.

- Metals impacts in soil are mostly located within the footprint of the arsenic- and lead-affected areas, and provide a good reference for overall metals impacts at the site. However, there are some areas, primarily in the northern and northeastern portions of the site, where other metals have been detected at concentrations above the screening levels. These include selenium, copper, cadmium, and barium. Many of the older soil borings did not include a full-suite of metals analyses, so the previous data set should be reviewed and soil borings proposed where needed to delineate the extent of these other metals impacts.

- To further assess potability of site groundwater and groundwater flow, along with the chloride and total dissolved solids data, a tidal study to measure groundwater flow should be included for Phase 2. Data from deep well EMW-10D indicates the potential presence of a marine or brackish water "wedge" beneath the site, however, no other deep wells are currently located in upland areas.

- In the northeastern corner of the site, PCE (at SLR-6) and vinyl chloride (at EMW-2S) were detected in groundwater samples at concentrations above screening levels. Vinyl chloride was also detected in groundwater at CMW-5 at a concentration above the screening level. Delineation of the extent of possible impacts should be considered at these locations, including additional groundwater sampling and possibly soil sampling to identify potential sources.

- The extent of PCB impacts in soil does appear to be generally delineated; however, much of the previous analytical data is based on reporting limits that are above the screening level making a full assessment difficult. Some level of additional soil sampling using lower reporting limits should be considered to verify the previous findings. PCBs were detected in shallow groundwater during 2013 at three locations (DMW-2, CMW-4, EMW-13S) suggesting that PCBs could be present in soil at some of the previous "non-detect" locations where reporting limits were elevated.

Phase 2 RI Sampling and Analysis Plan Addendum

In addition to including the Data Gap needs, the Addendum must also contain the following tasks planned for Phase 2 during the Dispute Resolution, and any tasks remaining to be completed, as described in the Remedial Investigation and Feasibility Study Work Plan, Crowley Marine Services 8th Avenue South Site, October 2012:

- Section 4.2.2 Soil Borings, modified by letter of May 23, 2013 - All soil borings planned for Phase 2 and shown in Figure 3 of the May 23, 2013 Resolution of Dispute Letter unless justification is provided for moving or eliminating the boring.

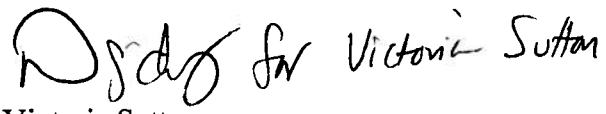
- Section 4.2.6, modified by letter of May 23, 2013 - Three remaining stormwater sampling events.

- Section 4.2.4 Conduct Groundwater Monitoring, modified by letter of May 23, 2013 - Two additional groundwater monitoring events. Analytes for these events may be modified by request to Ecology at least 30 days prior to the third quarterly monitoring event.

- Section 4.2.8 Sediment Sampling

Ecology appreciates your work on the Phase 1 Remedial Investigation and look forward to working with you on Phase 2. Please contact me at vsut461@ecy.wa.gov or (425) 649-7219 if you have any questions or would like to discuss this review.

Sincerely,



Victoria Sutton
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Enclosures

By Certified Mail [7011 0470 0003 3682 5056]

DRAFT SAMPLING AND ANALYSIS PLAN ADDENDUM

DRAFT SAMPLING AND ANALYSIS PLAN ADDENDUM

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November 2014

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LIST OF ACRONYMS AND ABBREVIATIONS

The TOC Title style can also be used for an acronym list or any other front matter required for the document.

Abbreviation	Definition
µg/kg	micrograms per kilogram
8th Avenue Terminals	8th Avenue Terminals, Inc.
AO	Agreed Order
ARAR	applicable or relevant and appropriate requirement
ARI	Analytical Resources, Inc.
bgs	below ground surface
CAP	cleanup action plan
cm	centimeter
COC	chain-of-custody
COPC	constituent of potential concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
Crowley	Crowley Marine Services, Inc.
DAHP	Washington State Department of Archaeology and Historical Preservation
DCE	1,1-dichloroethene
DeNovo	DeNovo Seattle, LLC
DGPS	differential global positioning system
DNS	Determination of Non-significance
DRO	diesel range organics
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
EPH	extractable petroleum hydrocarbon
FS	Feasibility Study
FSP	Field Sampling Plan
GRO	gasoline range organics
LDW	Lower Duwamish Waterway
LOD	limit of detection

mg/kg	milligrams per kilogram
MS/MSD	matrix spike/matrix spike duplicate
MTCA	Model Toxics Control Act
NAD 83	North American Datum 1983
NAVD 88	North American Vertical Datum 1988
ng/kg	nanograms per kilogram
NPDES	National Pollutant Discharge Elimination System
ORP	redox potential
PCB	polychlorinated biphenyl Aroclor
PCE	tetrachloroethylene
PID	photoionization detector
PQL	practical quantitation limit
Property	8th Avenue Terminals Property
PSL	preliminary screening level
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
RRO	residual oil-range organics
SAP	Sampling and Analysis Plan
SAP Addendum	Sampling and Analysis Plan Addendum
Site	8th Avenue Terminals Site
SLR	SLR International
SMS	Sediment Management Standards
SVOC	semi-volatile organic compound
TDS	total dissolved solids
TEE	Terrestrial Ecological Evaluation
TEQ	Toxic Equivalency
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TSS	total suspended solids
vibracore	vibration core sampler
UCT	Universal Cell Technology

VOC	volatile organic compound
VPH	volatile petroleum hydrocarbon
WAC	Washington Administrative Code
Work Plan	Washington State Department of Ecology's 2012 Remedial Investigation/Feasibility Study Work Plan

1 INTRODUCTION

On October 12, 2009, 8th Avenue Terminals, Inc. (8th Avenue Terminals), entered into an Agreed Order (AO; No. DE 6721) with the Washington Department of Ecology (Ecology) to complete a remedial investigation (RI) and feasibility study (FS), and prepare a cleanup action plan (CAP) for the 8th Avenue Terminals, Inc., site (Site). On April 18, 2014, the 8th Avenue Terminals, Inc. property (Property) was purchased by DeNovo Seattle, LLC (DeNovo), and the responsibility for completing the required activities under the AO was transferred to DeNovo. The Site is defined by the extent of contamination caused by the release of hazardous substances at the Property at 7400 8th Avenue South in Seattle, Washington. The Property is located along the northeast bank of the Duwamish Waterway and the west bank of Slip 4, and includes the southwestern part of Slip 4 (see Figure 1-1).

This RI/FS process is part of Ecology's effort to investigate properties adjacent to the federal Lower Duwamish Waterway (LDW) Superfund Site for potential ongoing sources of contamination to the Superfund Site. In early 2008, Ecology issued a Site Hazard Ranking of "2" for the site, due in large part to the perceived potential of contaminants on the Property to migrate to the LDW sediments (primarily Slip 4). In response, Crowley Marine Services, Inc. (Crowley), the former property owner, conducted an independent investigation at the Property to assess the potential contaminant migration pathways to the waterway. A report that presented the results of that investigation was submitted to Ecology on August 1, 2008 (SLR 2008).

Under the AO, 8th Avenue Terminals was required to provide additional data and analysis to determine the potential risks to the LDW posed by the Property, to determine if active cleanup of the Site is necessary and, if so, to facilitate the selection of a cleanup alternative. More specifically, the RI will determine the nature and extent of contamination and assess the potential risks to human health and the environment. The FS will identify, screen, and evaluate potential remedial measures. Based on the results of the RI/FS, the CAP will present a proposed remedial action to address the remediation of contamination present at the Site, as necessary.

After the negotiation of an RI scope of work, 8th Avenue Terminals agreed to conduct the scope of work developed by Ecology and presented in Ecology's RI/FS Work Plan (Work Plan) dated October 2012 (Ecology 2012) after modifications to the scope were accepted by both parties (Ecology 2013; see Appendix A-1). In accordance with Washington Administrative Code (WAC) 173-340-350(6) and (7)(a), the RI is being conducted in two phases to adequately characterize the Site, address critical questions, focus sampling efforts on data gaps, prevent the collection of unnecessary data, and increase the efficiency of the investigation. The first phase of the RI (Phase 1) was conducted from May 2013 through February 2014 by SLR International (SLR) and consisted of collecting the data necessary to assess the potential contaminant source areas that currently have limited data, to better understand contaminant fate and transport and associated potential receptors, and to further review the applicable or relevant and appropriate requirements (ARARs) for the Site. After identifying the appropriate ARARs for the Site, the preliminary conceptual site model was revised, contaminants of potential concern (COPCs) were identified, and preliminary soil and groundwater screening levels were developed for the COPCs in accordance with WAC 173-340-350(9)(a).

A Draft Data Gaps Report dated February 2014 (SLR 2014a) was prepared and described the field activities performed during Phase 1 of the RI, presented the results of the work, including the revised preliminary conceptual site model and the proposed preliminary soil and groundwater screening levels, and identified the remaining investigation data gaps that would be addressed during the Phase 2 investigation. The Data Gaps Report was finalized by SRL in October 2014 (see Appendix A-2). Ecology provided comments to the Data Gaps Report and summarized an evaluation of the remaining data gaps (Ecology 2014; see Appendix A-3). In addition, during a meeting between Ecology and DeNovo on October 1, 2014, Ecology presented a series of maps (prepared by Kennedy/Jenks Consultants) with a revised conceptual site model and focus on further data collection needs for Phase 2 of the RI (see Appendix A-4)[1].

[1] During its review, Ecology did not consider the preliminary cleanup levels, conditional points of compliance wells, and non-potability determination identified in the 2014 SLR's Draft Data Gaps Report. Ecology comments considered these elements to be 'preliminary' in this phase of the investigation and identified that these items will be revisited during completion of the RI/FS process.

In coordination with Ecology and DeNovo, SLR and Anchor QEA conducted soil sampling and chemical testing in July 2014 to support implementation of planned development activities (i.e., rail construction) that were determined by Ecology to be completed under an interim action process. As part of that interim action planning effort, soil samples were collected at 42 locations throughout the Site and groundwater samples were collected from three existing site monitoring wells that were subsequently decommissioned (Figure 2-1) in anticipation of construction of the interim action. Appendices B and C present final laboratory and data validation reports for the July 2014 soil and groundwater sampling efforts.

As part of the interim action, the purpose of the July 2014 sampling effort was to evaluate soil conditions throughout the proposed interim action project area, and to develop the extents of planned soil removal activities associated with the interim action. As part of the July 2014 investigation, continuous soil samples were obtained from the anticipated bottom depth(s) of excavation, as well as from deeper (2-foot) intervals, including one from the top of the saturated zone, and one each from approximately 15 and 20 feet below ground surface (bgs). Soil samples from the uppermost sample at each location and groundwater samples (collected from site monitoring wells EMW-5S, DMW6, and MW-2) were analyzed for COPCs identified for the Site.

In August 2014, Ecology withdrew their Determination of Non-Significance (DNS) as part of the Model Toxics Control Act (MTCA) State Environmental Policy Act process, and the planned interim action (including site development activities for construction of new rail access) was not implemented. DeNovo then began coordination efforts with Ecology for completion of required supplemental Site investigation activities, development of RI and FS reports, and a CAP, in accordance with the AO for the Site.

This draft Sampling and Analysis Plan (SAP) Addendum (Addendum) document addresses the second phase (Phase 2) of the RI and identifies the RI data gaps for the Site (described in Section 2), thereby completing the investigation of the nature and extent of the contamination at the Site and the assessment of any potential risks to human health and the environment presented by the contamination. Completion of the Phase 2 investigations

described in this SAP Addendum will also allow for development of the RI and FS reports, as required by the AO.

1.1 Purpose

The purposes of this draft SAP Addendum are to describe the proposed scope of work for Phase 2 of the RI, and to specify procedures for implementation of the proposed field activities and sample analyses that will serve as the basis for development of the RI and FS reports, as required by the AO.

1.2 Sampling and Analysis Plan Organization

The draft SAP Addendum is organized in five sections. A brief description of each section is presented below:

- Section 1—Introduction. Section 1 contains an overview of the draft SAP Addendum.
- Section 2—Remaining Investigation Data Gaps. Section 2 contains an overview of the data gaps presented in the Data Gaps Report (SLR 2014a) and updates to RI data gaps based on the July 2014 interim action soil sampling effort.
- Section 3—Remedial Investigation Scope of Work (Phase 2). Section 3 presents the proposed scope of work that will be performed during Phase 2.
- Section 4—Field Sampling Plan (FSP) Section 4 identifies the proposed sampling locations and depths, and presents the procedures to be used in field sampling and characterization studies. Included are procedures for drilling and soil sampling; soil, groundwater, storm water, and sediment sample collection; sample labeling, shipping, and custody; groundwater monitoring well installation and development; decontamination; and residuals management.
- Section 5—Analytical Methods. Section 5 identifies the analyses and analytical methods that will be used during Phase 2 of the RI.

A Quality Assurance Program Plan (QAPP, Ecology 2012) that describes the quality assurance/quality control procedures for the proposed Phase 2 field activities and laboratory analyses is presented in Appendix D of the Work Plan. Phase 2 of the RI will be conducted in accordance with the QAPP. Current analytical methods and laboratory practical

quantitation limits (PQLs) for each medium supersede those included in Ecology's 2012 QAPP and are presented in Section 5.

2 REMAINING INVESTIGATION DATA GAPS

Based on the results of the first phase of the RI, SLR identified several remaining investigation data gaps (Appendix A-2; SLR 2014a and 2014b) to address during implementation of Phase 2 of the RI. On April 21, 2014, Ecology commented on the data gaps identified in the Data Gaps Report, and provided additional recommendations (Appendix A-3; Ecology 2014). In July 2014, additional soil and groundwater data were collected and analyzed as part of the interim action and planned redevelopment activities for the Site. Historical and Phase 1 RI data, along with the recent July 2014 data (all existing locations shown in Figure 2-1), were evaluated against Site-specific soil and groundwater screening levels (described below), and are used herein to identify remaining data gaps as part of Phase 2 of the RI. Additional discussion of data gaps occurred at a meeting with DeNovo and Ecology on October 1, 2014, where Ecology consultants (Kennedy/Jenks) provided technical information to support Ecology's comments that were issued in September 2014 (Appendix A-4) regarding the draft SAP Addendum submitted in June 2014.

2.1 Preliminary Screening Levels

Preliminary screening levels (PSLs) were developed for soil and groundwater contaminants by evaluating potential pathways and exposure scenarios applicable to the Site. The basis for development of the PSLs is the protection of the highest beneficial use of each Site medium, including protection of human health and the environment (with respect to protection of surface water and sediment quality in the LDW), and ensuring that all the requirements of federal, state and local regulations are satisfied. The pathway and exposure scenarios evaluation for potential soil and groundwater contamination included conservative pathway assumptions and accounted for Site-specific conditions. A summary of the potential pathways for the ARAR evaluation is included in Table 2-1. Based on pathways applicable to the Site, an ARAR evaluation for Site soil and groundwater is presented in Tables 2-2 and 2-3. These tables present each potential ARAR and the rationale for their identification, and provide justification as to whether the potential ARAR is retained as a Site-specific PSL. A description of the pathway and ARAR evaluation process for each medium is provided below.

2.1.1 Pathway Evaluation

A summary of the applicable pathways for the ARAR evaluation is presented in Table 2-1. Site soil and groundwater have potential exposure pathways to human health and/or ecological receptors. For upland soils, the primary exposure pathway is direct contact, so direct contact ARARs are applied. Soil-to-groundwater leaching of contaminants is an applicable pathway for upland soils, and therefore, relevant soil ARARs under MTCA include those derived for protection of groundwater. Groundwater at the Site is assumed to be non-potable, and final determination of this assumption will be made in the RI report in coordination with Ecology. The soil ARARs evaluation for protection of groundwater at the Site was conducted based on this assumption.

The groundwater exposure pathways are defined by protection of the highest beneficial use of Site groundwater. Both groundwater and surface water at the Site are non-potable based on MTCA criteria (WAC 173-340-720[2]), and this will be verified as part of the final RI report. Groundwater at the Site discharges to the LDW and therefore, must be protective of LDW human health and aquatic life exposure pathways for both surface water and sediment.

2.1.2 ARAR Evaluation

A summary of the soil, groundwater, and surface water ARARs that were evaluated are included in Tables 2-2 and 2-3. The ARAR evaluation includes a review of the applicability of each potential ARAR to the Site and whether a potential ARAR is retained or not retained in the determination of Site-specific PSLs. In additional to identifying ARARs, the Site-specific soil and groundwater PSLs were determined based on the following assumptions:

- **Promulgated ARARs.** Promulgated ARARs established under state or federal law are retained as site-specific PSLs.
- **Unrestricted Land Use.** The property is zoned as industrial; however, for purposes of determining soil PSLs, unrestricted land use is assumed.
- **Terrestrial Ecological Evaluation (TEE).** A TEE for Site soils is assumed not to be applicable, given the industrial setting of the Site; however, analysis of the proximity to the Slip 4 habitat restoration area will be evaluated as part of the RI to determine if completion of a TEE is required.
- **Natural Background.** The Site-specific soil PSLs take into account natural background

concentrations for select metals published by Ecology. Groundwater natural background concentrations were not used for determination of groundwater Site-specific PSLs.

- **Soil to Groundwater.** Potential ARARs for soil protective of groundwater are based on the most stringent potential groundwater and surface water ARARs that apply to the Site, and were calculated using MTCA Equation 747-1 (WAC 173-340-747(4)(b)) with a calculated average Site-specific organic carbon content of 0.4 percent.
- **Conservative Pathway Assumptions.** The potential soil ARARs protective of groundwater do not take into account Site-specific conditions (e.g., fate and transport processes).
- **Potable Water.** Based on groundwater salinity data collected from site monitoring wells, groundwater beneath the Site is assumed to be non-potable, and this assumption will be verified during development of the RI report. The LDW surface water is also determined to be non-potable; and therefore, potential soil ARARs are protective of non-potable groundwater and surface water for the purposes of Phase 2 investigation planning.

2.1.3 Determination of Site-Specific Preliminary Screening Levels

The evaluation of potential pathways and ARARs resulted in the determination of Site-specific PSLs for soil and groundwater. PSLs were the lowest value of those ARARs retained in Section 2.1.2. After determining the PSLs, the PQLs that were established for each analytical method were compared to PSLs. If the lowest possible PQL exceeded the PSL, then the PQL was identified as the PSL. Site-specific PSLs for soil and groundwater are presented in Tables 2-4 and 2-5.

2.2 Soil Data Gaps

Soil data gaps were determined based on a review of historical data, Phase 1 RI data, and recent (July 2014) interim action Site data (see the summary of soil results in Tables 2-6 through 2-10) by comparing these data to Site-specific preliminary soil PSLs, as described in the previous section. The remaining RI data gaps for soils, to be fulfilled as part of Phase 2 investigations, are outlined below. A summary of RI data gaps was identified by SLR in the Data Gaps Report, by Ecology in their comments to the document, and in meeting materials

and maps provided by Kennedy/Jenks on October 1, 2014, as well as DeNovo's responses and comments addressing each data gap as part of Phase 2 data collection efforts. This summary is also included in Table 3-1. In addition, six cross-sections (Figures 2-2a through 2-8f) and two plan views (Figures 2-9a through 2-10b) have been developed to aid in determining the vertical and lateral extent of soil contamination for the COPCs.

The following describes a summary of the remaining soil data gaps that require further evaluation in the RI/FS process to determine nature and extent of contamination at the Site:

- The lateral extents of arsenic-impacted soil were evaluated using a PSL of 7 milligrams per kilogram (mg/kg), which is currently considered the natural background level for arsenic. Based on that evaluation, the lateral extents of arsenic-impacted soil have not been delineated to the west of the Property, and the lateral extents of two localized areas of arsenic-impacted soil at the western part of Parcel F (Figure 2-1) are not defined. The vertical extents of the arsenic-impacted soil have not been delineated at several locations throughout the Site.
- The lateral extents of lead-impacted soil at the Site were evaluated using a PSL of 17 mg/kg, which is the natural background level. Based on that evaluation, the lateral extents of lead-impacted soil have been delineated at most locations, except along the western part of Parcels D and F (Figure 2-1). The vertical extents of lead-impacted soil (i.e., above the PSL) have not been delineated at several shoreline borings.
- The lateral extents of copper-impacted soil at the Site were evaluated using a PSL of 36 mg/kg, which is the natural background level. Based on that evaluation, the lateral extents of copper-impacted soil have been delineated at most locations, except along the western part of Parcel D. The vertical extents of copper-impacted soil (i.e., above the PSL) have been mostly delineated, except at shoreline location CMW-3 (Figure 2-1).
- The lateral and vertical extents of naphthalene-impacted soil at the site were evaluated using a PSL of 2,262 micrograms per kilogram (µg/kg), which is based on the MTCA Method B Direct Contact/Ingestion cleanup level soil, and was calculated using site-specific assumptions. Based on the evaluation of site soil data to the PSL, the lateral extents of the naphthalene-impacted soil have not been delineated to the east of the former aluminum window manufacturing plant (near the Property line) and in the area east and south of the former wood treatment facility. The vertical

extents of the naphthalene-impacted soil have not been determined at several locations throughout the Site.

- The lateral and vertical extents of total carcinogenic polycyclic aromatic hydrocarbon (cPAH)-impacted soil at the site were evaluated using a PSL of 100 µg/kg, which corresponds to the MTCA Method A Unrestricted Land Use soil cleanup level. The lateral extents of the total cPAH-impacted soil have not been delineated east and south of the former wood treatment facility, along the western property boundary, and in the area surrounding the former pipe manufacturing building (Figure 2-1). The vertical extents of the total cPAH-impacted soil have not been determined at several locations throughout the Site.
- The extents of polychlorinated biphenyl (PCB)-impacted soil at the property were evaluated using a PSL of 47 µg/kg, which is the MTCA Method B Direct Contact/Ingestion cleanup level that was calculated using site-specific data (WAC 173-340-747). Based on that evaluation, the lateral extents of PCB-impacted are mostly delineated, except along the southern Site shoreline, and in the upland areas between the former wood treatment and storage areas and shoreline of Slip 4. The vertical extents of PCB-impacted soil have not been delineated in the vicinity of the former creosote tanks (e.g., boring DB-12) (Figure 2-1).
- The source of 1,1-dichloroethene (DCE) in soil at FMW-2 (Figure 2-1) has not been determined, and may be associated with activities at the neighboring Markey Machinery Company facility.
- The extents of Diesel Range Organics (DRO)- and Residual Oil-Range Organics (RRO)- impacted soils were evaluated using a PSL of 2,000 mg/kg, which corresponds to the MTCA Method A unrestricted land use level for both total petroleum hydrocarbon (TPH) constituents. The data necessary to calculate a Site-specific, risk-based Method B cleanup level for TPH have not yet been collected. Therefore, Phase 2 of the RI will include the collection of, extractable petroleum hydrocarbons (EPH) and volatile petroleum hydrocarbons (VPH) to calculate Method B cleanup levels that are appropriate for the Site. Based on the evaluation of soil DRO and RRO data to the PSL, the lateral extent of DRO and RRO-impacted soil has not been delineated to the west of EMW-7S and EB-40 (Figure 2-1).
- The source and the lateral and vertical extents of the oily substance with a creosote-like odor in deep boring EMW-10D (at the former wood treating operations area)

have not been determined. The location of EMW-10D is shown on Figure 2-1.

- Total dioxins/furan concentrations were compared to the PSL of 5.2 nanograms per kilogram (ng/kg), which is the natural soil background level for total dioxins/furans Toxic Equivalency (TEQ; Ecology 2010). The lateral extents of each area of dioxin/furan-impacted soil have not been delineated, and the vertical extent of the impacted soil is not defined at boring EMW-9S (Figure 2-1).

2.3 Groundwater Data Gaps

Data gaps were determined based on a review of recent site groundwater data, including 2013 Phase 1 RI data and July 2014 interim action data (see the summary of groundwater results in Tables 2-11 through 2-14) by comparing these data to Site-specific groundwater PSLs, as described in Section 2.1. Historical groundwater data collected from 1988 to 2012 were not included in the data gaps evaluation, as these data are not representative of current Site groundwater conditions; historical site groundwater data, screened to Site-specific PSLs, are included in Appendix D for informational purposes only. The remaining RI data gaps for groundwater, to be fulfilled as part of Phase 2 investigations, are outlined below. A summary of RI data gaps identified by SLR and Ecology, as well as DeNovo's data gap comments are also included in Table 3-1. In addition, eight plan view maps (Figures 2-11 through 2-18) have been developed to aid determining the lateral extent of groundwater contamination for the COPCs.

The following describes a summary of the remaining groundwater data gaps that require further evaluation in the RI/FS process to determine the nature and extent of contamination at the Site:

- The lateral extent of total cPAH-impacted groundwater has not been delineated to the west of the Property (e.g., west of EMW-7S), and downgradient from the former wood treatment facility. The vertical extents of total cPAH-impacted groundwater have not been defined at wells EMW-4D and EMW-15D (Figure 2-1).
- The lateral and vertical extents of metals impacts to groundwater have not been fully delineated at the Site, specifically along the western property margin, the southwest shoreline, and along the western shoreline adjacent to the seawall.
- Though volatile organic compounds (VOCs) are not typically above groundwater

PSLs, the extent of potential tetrachloroethylene (PCE) and vinyl chloride impacts to Site groundwater should be verified at all wells.

- Potential matrix interferences in total and dissolved metals results, including those caused by groundwater salinity (i.e., polyatomic interferences), will be evaluated as part of Phase 2 groundwater analyses by using EPA Method 200.8 with Universal Cell Technology (UCT).

2.4 Sediment Data Gaps

Based on the previous sediment dredging adjacent to the Property, the extensive sediment sampling that has been conducted in the LDW and Slip 4, and EPA's planned remedial action for the LDW Superfund Site, few sediment data gaps remain for this Site (see the summary of sediment results in Table 2-15). In accordance with the Work Plan, additional surface sediment sampling will performed to provide baseline surface conditions in the barge berth areas.

During the October 1, 2014 meeting between Ecology and DeNovo, Ecology identified additional surface and subsurface sediment data gaps adjacent to the 8th Avenue right of way along the shoreline of the Duwamish River. The Ecology-identified data gaps include an evaluation of the nature and extent of contamination related to a historical sand dump and sand blast area near the southwestern corner of the Property, as depicted in a 1952 Georgetown Steam Plant Map (see Appendix E).

2.5 Catch Basin Solids and Storm Water Data Gaps

Catch basin solids sampling was completed in accordance with the Work Plan during Phase 1. No RI data gaps remain for catch basin solids and stormwater (see the summary of catch basin solids and storm water results in Tables 2-16 and 2-17). In accordance with the Work Plan, there will be one additional stormwater sampling event completed as part of Phase 2 investigations at the Site.

2.6 Cultural Resources Investigation

DeNovo is in the process of coordinating with the Washington State Department of Archaeology and Historical Preservation (DAHP) and Ecology to prepare and implement a

Cultural Resources investigation effort that will address planned remediation and redevelopment activities at the Site. The Site is identified as a location that may contain cultural resources (archaeological and/or historical resources), and a review of available historical information indicates that a set of pipes once crossed through the Property that were used to support operations associated with the former Seattle Electric Company Georgetown Steam Plant, which is included on the National Register of Historic Places. As such, it has been determined that a Cultural Resources investigation must be completed prior to implementation of remediation or redevelopment activities, in order to meet permitting requirements for the planned work. The scope of the Cultural Resources investigation is currently being coordinated with DAHP and Ecology and will be implemented (following agency review and approval) independent of the Phase 2 data collection efforts described in this draft SAP Addendum.

3 REMEDIAL INVESTIGATION SCOPE OF WORK (SECOND PHASE)

The proposed scope of work for Phase 2 of the RI was developed to address the data gaps described in Section 2. A summary of all RI data gaps, including data gaps identified by SLR in the Data Gaps Report, and by Ecology in their comments to the document and in meeting materials provided by Kennedy/Jenks on October 1, 2014, as well as DeNovo's responses and comments to each data gap as part of Phase 2 data collection efforts, is included in Table 3-1. The Phase 2 RI scope of work is described in the following sections.

3.1 Pre-fieldwork Activities

Prior to conducting any field work, the following activities will be completed:

- Permissions will be obtained from the City of Seattle to drill soil borings and/or install groundwater monitoring wells within the 8th Avenue South and Othello Street rights-of-way, located to the west and northwest of the Property, respectively.
- A public utility locate will be requested, and it will be arranged for a private utility locator to identify and mark the locations of underground utilities within 50 feet of the proposed drilling locations.
- All required permits to conduct sediment sampling will be obtained.

3.2 Soil Boring Drilling and Sampling

To meet the objectives described above, a total of 29 soil borings will be drilled and sampled. In addition, soil borings will be drilled to install replacement wells for four monitoring wells that were decommissioned in July 2014. Three of the 31 borings are additional drilling locations that were added to address data gaps discussed in Section 2.1. The locations of proposed soil borings, including soil-only borings and borings for monitoring well installations (see Section 3.3), are shown on Figure 3-1. The proposed soil borings address the data gaps discussed in Section 2.1. The rationale for moving several of the boring locations originally proposed in the Work Plan are described in Table 3-2. Table 3-2 also provides a summary of the depths to be sampled and analyses to be performed, which are further discussed in Section 5. The Work Plan proposed drilling and sampling of 39 soil borings for the second phase of the RI; however, there was limited to no technical

justification for 13 of the proposed borings; therefore, Table 3-2 discusses the rationale for eliminating each of those borings.

If any of the proposed boring locations need to be moved by more than 25 feet for any reason (e.g., underground utilities, Site features, access restrictions, etc.), the revised location will be coordinated with Ecology.

3.3 Monitoring Well Installation and Development

A total of six groundwater monitoring wells will be installed at the locations indicated on Figure 3-1. Prior to well installation, soil borings will be advanced at each location, as described in Table 3-2. Two of the wells (EMW-17S and EMW-18S) will be shallow-zone wells screened across the water table between approximately 5 and 20 feet bgs (similar to the existing shallow monitoring wells installed during Phase 1 of the RI), and four of the wells (EMW-19D through EMW-22D) will be installed at greater depth (below the depths of the existing deep monitoring wells) and screened from approximately 75 to 80 feet bgs.

The shallow and deeper wells will be installed using hollow-stem auger or sonic drilling techniques. The borings for the shallow wells will be drilled to approximately 20 feet bgs. The borings for the deep wells will be drilled to approximately 80 feet bgs, or to the bottom of the water bearing unit, whichever is shallower (as determined in the field). Approximate well construction details and development are described in the FSP (Section 4). Groundwater sampling of the new wells will be performed no sooner than 24 hours following the completion of well development.

In addition to the new wells, two of the recently decommissioned groundwater monitoring wells (DMW6 and EMW 5S) will be replaced during Phase 2 of the RI. Monitoring wells DMW6 and EMW-5S were decommissioned in accordance with the requirements of WAC 173-160 in July 2014. The replacement wells will be constructed at similar depths (approximately 20 feet bgs), and with similar screen intervals (approximately 5 to 20 feet bgs) as the original wells. Installation of the replacement wells will be located as close to the original well locations as feasible (see Figure 3-1). Based on the evaluation of soil data gaps, soil samples will not be collected or analyzed for replacement well EMW 5Sa.

During June 2014, well HC-19 was found underneath an area where soil and compost materials were previously stored by a past Property tenant. Monitoring well HC-19 was observed to be damaged and was decommissioned in accordance with the requirements of WAC 173-160 in July 2014. In addition, intact well MW-2 was discovered during investigation activities at the Site, and was subsequently sampled for Site COPCs and decommissioned. Wells HC-19 and MW-2 are not proposed for replacement during Phase 2 of the RI due to their proximity to other monitoring wells that provide shallow groundwater data for those areas of the Site.

3.4 Groundwater Sampling

After installing all Phase 2 monitoring wells, two quarterly groundwater sampling events will be conducted to obtain additional required data for completion of the RI dataset. The two sampling events will be conducted during low tide conditions in the LDW to minimize any surface water effects on the groundwater samples.

The first quarterly groundwater sampling event will occur no sooner than 24 hours following the development of the newly installed wells. Wells included in the sampling events are listed in Table 3-3 and shown on Figure 3-1 (all intact wells will be sampled during each sampling event). Groundwater samples collected during each event will be submitted for laboratory analysis, as indicated in Table 3-3. Analytical methods are further discussed in Section 5. During each groundwater sampling event, groundwater elevation monitoring will be performed as described in the FSP (Section 4).

3.5 Sediment Sampling

During Phase 2 of the RI, sediment sampling will be conducted in the LDW areas adjacent to the Site to address sediment data gaps. Sediment data gaps are summarized in Section 2.1 and Table 3-1. Surface and subsurface sediment sampling locations proposed for Phase 2 work are shown on Figure 3-2, and the methodology for sample collection is described below. DeNovo will coordinate with the U.S. Army Corps of Engineers, EPA and the Washington Department of Fish and Wildlife (and other agencies as necessary) to determine if permits are required to complete the sediment sampling scope of work. Sediment sampling will be

performed in accordance with EPA and Ecology standards for management and disposal of investigation derived waste.

3.5.1 Surface Sediment Sampling

Eighteen surface sediment samples will be collected within the berth areas adjacent to the Site at the approximate locations shown on Figure 3-2. These samples will be collected to evaluate current sediment conditions in proximity to the Site and provide a baseline of sediment conditions prior to the start of tenant operations at the Property. Seven of 18 sediment locations (SSED-12 through SSED-18) will investigate the extent of a historical sand dump adjacent to the Site.

Surface sediment samples will be collected using a hydraulic Van Veen grab sampling device (or similar device). Sediment sampling methodologies are described in the FSP (Section 4). Approximate surface sediment sampling depths and analytical tests to be performed are summarized in Table 3-4.

3.5.2 Subsurface Sediment Sampling

Four subsurface sediment locations will be co-located with surface sediment locations in the vicinity of the historical sand dump area adjacent to the Site at the approximate locations shown on Figure 3-2. The four subsurface sediment locations, SSED-SB-12, SSED-SB -13, SSED-SB-14, and SSED-SB-16) will investigate the nature and extent of potential sediment contamination associated with the historical sand dump.

Subsurface sediment sampling will be collected by vibratory core sampler (vibracore) on a vessel. Subsurface sediment sampling methodologies are described in the FSP (Section 4). Approximate subsurface sediment sampling depths and analytical tests to be performed are summarized in Table 3-4.

3.6 Stormwater Sampling

To further assess the potential impacts to the LDW from stormwater discharge, stormwater samples will be collected from the outfalls of the six site stormwater conveyance lines during one precipitation event with at least 0.1 inch of rainfall over a 24-hour period. Outfalls

included in the sampling event are listed in Table 3-5 and are shown on Figure 3-3. Table 3-6 provides coordinates for proposal sampling locations. Stormwater sampling methods are described in the FSP (Section 4). Stormwater sampling activities will be coordinated with the Property tenant and will not interfere with (or replace) the sampling required under their National Pollutant Discharge Elimination System (NPDES) permit(s).

3.7 Tidal Study

To further assess groundwater flow beneath the Site and interactions between the LDW and shallow and deep groundwater beneath the Site, a tidal study will be performed during Phase 2 of the RI. The study will consist of tidally filtered groundwater monitoring that includes pressure transducers/data loggers installed in ten shallow wells (CMW-1, CMW-4, CMW-7, DMW-3, EMW-1S, EMW-3S, EMW-5Sa, EMW-7S, EMW-12S, and SLR-6) completed at depths of approximately 20 feet bgs, four intermediate wells (EMW-4D, EMW-10D, EMW-15D, and EMW-16D) completed at depths of approximately 50 feet bgs, and the four proposed deeper wells (EMW-19D, EMW-20D, EMW-21D, EMW-22D) completed at depths of approximately 80 feet bgs, plus a stilling well in the LDW. Four of the locations are situated with shallow/intermediate/deep well groupings spread across the Site. The locations of the wells are shown on Figure 2-1. The transducers will be installed for a period of 72 hours, and will be set to record water level measurements at 10-minute intervals. Periodic manual water level measurements will also be recorded to correlate transducer measurements to groundwater elevations. The shallow, intermediate, and deep nested well groupings will be used to compare the amplitudes of tidal signals between shallow and deep groundwater and to allow for calculation of vertical gradients.

To further assess the potability of site groundwater, chloride and total dissolved solids data will be collected from Site monitoring wells during the groundwater monitoring events to evaluate for the presence of marine or brackish water in groundwater beneath the Site.

3.8 Waste Disposal

The soil generated by the drilling activities and the wastewater that is generated by the cleaning of the drilling and sampling equipment and the development and purging of the wells will be temporarily stored at the Site in properly labeled 55-gallon drums. After

obtaining the sample analytical results, the soil and water will be characterized in accordance with WAC 173-303 and transported off-site for disposal at licensed facilities.

3.9 Surveying

A licensed surveyor will survey the horizontal positions and vertical elevations of the new soil borings and groundwater monitoring wells from Phase 2 of the RI. The horizontal positions will be surveyed to the nearest 0.1 foot, relative to the Washington State Plane Coordinate System, North Zone, 83/91. The vertical elevations of the ground surface and well casings will be surveyed to the nearest 0.01 foot, relative to the North American Vertical Datum of 1988 (NAVD 88).

4 FIELD SAMPLING PLAN

The FSP presented below is based on the site data gaps discussed in Section 2 and summarized in Table 3-1. The FSP describes the field procedures, methodologies, and analytical methods for each work task based on the scope of work presented in Section 3.

The sampling activities for Phase 2 of the RI at the Site will be performed to provide data of sufficient quality and quantity to satisfy the investigation objectives for the entire Site and will address known data gaps.

Sample locations are shown on the following figures:

- Figure 3-1 shows the proposed soil and groundwater investigation locations that will be used to further delineate the lateral and vertical extents of impacted soil and groundwater
- Figure 3-2 shows the proposed locations surface and subsurface sediment investigation locations
- Figure 3-3 shows the outfalls that will be used for storm water investigation

Sampling locations, depths, analytical testing requirements, and coordinates are listed on the following tables:

- Table 3-2—Soil Sampling Locations, Analyses, and Sample Depths
- Table 3-3—Groundwater Sampling Locations and Analyses
- Table 3-4—Sediment Sampling Locations and Analyses
- Table 3-5—Stormwater Outfall Sampling Locations and Analyses
- Table 3-6—Proposed Sampling Location Coordinates

4.1 Sample Locations

During Phase 2 of the RI, a total of 29 soil borings will be drilled and sampled, and six of the borings will be completed as new groundwater monitoring wells to address the remaining investigation data gaps. In addition, two borings will be drilled and completed as replacement monitoring wells for decommissioned wells DMW6 and EMW-5S (see Section

3.3). The proposed depths of soil samples that will be collected from each of the borings for chemical analysis are provided in Table 3-2.

During Phase 2 of the RI, a total of two low-tide groundwater sampling events will be conducted. The locations of the proposed and existing groundwater monitoring wells are shown on Figure 3-1.

A total of 18 surface sediment samples with four co-located subsurface sediment locations will be collected within the berth areas adjacent to the piers. The locations of the proposed sediment samples are shown on Figure 3-2.

During Phase 2 of the RI, one stormwater sampling event will be conducted, and a stormwater sample will be collected from each of the six outfalls (OF1 through OF6). The locations of the stormwater system components, including the outfalls, are shown on Figure 3-3.

4.2 Soil Borings

A total of 31 soil borings are proposed for Phase 2 of the RI, including six to be completed as new monitoring wells, and two monitoring wells to replace wells decommissioned in July 2014. The proposed soil boring and monitoring well locations are shown on Figure 3-1.

Soil borings will be drilled by a driller licensed in the State of Washington by using direct-push or sonic drilling methods, and soil samples will be collected on a continuous basis. After the completion of drilling and sampling activities, each temporary boring will be abandoned with hydrated bentonite. Drilling activities will be performed under the direction of an Anchor QEA geologist.

Anchor QEA field personnel will continuously log the soils encountered during drilling and will perform field screening for the potential presence of contamination based on visual appearance (staining or sheen), odor, and photoionization detector (PID) readings. Most of the soil borings will be advanced to a depth of 20 feet bgs. Some soil borings (see Table 3-2) will be advanced to greater depths (up to 80 feet bgs) to provide for evaluation of COPCs, site

stratigraphy, and for deep monitoring well installation. If field observations indicate the potential presence of contaminants at the proposed bottom depth at a soil boring location, the boring may be advanced to greater depth as needed to evaluate the vertical extent of potential contaminant impacts.

A minimum of two soil samples from each boring and up to five soil samples from select borings, based on previous analytical results and data gaps, will be submitted for laboratory analysis. The samples will be analyzed for the parameters specified in Table 3-2. Soil analytical methods, limits of determination (LODs), and PQLs are defined in Table 5-1. Additional soil samples will be collected and archived at the laboratory for possible follow-up analyses. Soil samples will be collected for analysis or archive at the 2-foot depth intervals specified in Table 3-2 for depths less than 20 feet bgs, and at approximate 10-foot intervals for depths more than 20 feet bgs.

The approximate sample depths for analysis and archive for each soil boring are listed in Table 3-2. The specified depths are the "default" depths, and samples should be collected as close as possible to the indicated depths; however, the depths may be adjusted slightly if warranted by field observations (i.e., preference will be given for sample collection where field observations indicate contaminant impacts are more likely).

Additional samples will be submitted for initial laboratory analysis if field observations indicate the potential presence of contaminants. Field observations warranting additional sample analyses include, but are not necessarily limited to, the following:

- Staining, odor, non-aqueous phase liquid, sheen, and PID readings greater than background readings. Additional samples will be submitted for the full suite of analyses listed for that specific boring in Table 3-2.
- The presence of materials such as metals shavings or slag-like materials that may suggest anthropogenic activities. Additional samples will be submitted for the full suite of analyses listed for that specific boring in Table 3-2.
- The presence of burned or partially burned materials and ash that indicate past filling activities. These samples will be submitted for analysis of dioxins and furans. If burned or ash materials are observed in a sample already being submitted for laboratory analysis, analysis for dioxins and furans will be added.

The soil sampling procedures generally include the following:

- All sampling equipment and reusable materials that will contact the sample will be decontaminated on Site in accordance with procedures identified in Section 4.10. The field geologist will use clean nitrile gloves for handling each sample.
- The sample container labels will be filled out and attached to the appropriate containers as described in Section 4.9. Sample handling requirements are outlined in Table 5-2.
- A clean, stainless-steel spoon will be used to transfer the soil samples to the sample jars.
- The laboratory-provided volatile organic analysis vials (EPA Method 5035 kit) will be filled at each sample interval to be analyzed for VOCs and/or gasoline range organics (GRO). Soil will be transferred directly from the sampler to the sample containers. Care will be taken to minimize disturbance of soil placed in the containers. Sample container requirements are specified in Table 5-2.
- After filling the sample jars, the sample interval will be logged on a dedicated field boring log form using the United Soil Classification System.
- Quality assurance and field duplicate samples will be collected at a frequency of 1 in 20 samples, and is further described in Section 4.13.
- Sample container and sample handling requirements for each Site media are provided in Table 5-2.

After filling, the sample containers will be placed on ice in a cooler and handled as described in Section 4.9.

4.3 Monitoring Well Installation

As discussed in Section 3.3, six new monitoring wells will be installed following completion of soil boring sampling activities, and two replacement wells will be installed. The new wells include two shallow wells (EMW-17S and EMW-18S) and four deep wells (EMW-19D through EMW-22D), and the replacement wells (DMW6a and EMW-5Sa) are both shallow wells. The proposed locations of the wells are shown on Figure 3-1.

All monitoring wells will be installed using appropriate techniques that are suitable for meeting the RI/FS work plan objectives and to comply with applicable regulations. It is anticipated that both the shallow and the deeper wells will be installed using a hollow-stem auger or sonic drill rig methods at the same location as the original soil boring.

Each of the wells will be constructed of 2-inch-diameter Schedule 40 polyvinyl chloride (PVC) with a 15-foot-long (shallow wells) or 5-foot-long (deep wells) screen (0.010-inch-wide slots). The screen interval for the shallow wells will intercept the groundwater table with at least 1 foot of screen installed above the seasonal/temporal high water level. A blank PVC casing will be attached to the screen and will extend to approximately 6 inches bgs.

A filter pack consisting of 2/12 Lapis Lustre silica sand or equivalent will extend from the bottom of each well to approximately 2 feet above the uppermost screen slot. A hydrated bentonite chip seal will be installed above the filter pack to approximately 1 foot bgs. A traffic-rated steel monument will be installed (in concrete) flush with the ground surface to protect the well.

After installation, the driller will thoroughly develop the newly installed wells by using surging and pumping methods. The development will be conducted at 1- to 2-foot intervals beginning at the bottom of the well and extending up to the top of the water table (shallow wells) or top or the screened interval (deep wells). The development process will be repeated until the turbidity of the groundwater becomes visually clear, three annular volumes of groundwater have been removed, or the well purges dry, whichever occurs first.

4.4 Groundwater Elevation Monitoring

As discussed in Section 3.4, quarterly groundwater elevation monitoring will be performed at low tide during two separate monitoring events. The first elevation monitoring event will be performed at least 1 week after the installation of new monitoring wells and replacement of the exiting site wells that will be decommissioned due to site redevelopment activities.

Water level measurements will include all Site monitoring wells (shallow and deep) and the Slip 4 stilling well for each monitoring event. Measurements will be completed within a

2-hour time span for each event and will coincide with published times for low tide conditions in the LDW, adjacent to the Property. Measurements will begin no earlier than one-half hour before the maximum low tide condition during that tidal cycle. Well caps will be loosened at least 30 minutes prior to measurement to allow for equilibration of water levels.

Water levels will be measured by using an electric water level probe at each well location. The probe will be cleaned between measurements, as described in Section 4.10. The water level in each well will be measured to the nearest 0.01 foot from a surveyed notch in the well casing by using an electric water level probe.

4.5 Groundwater Sampling

As discussed in Section 3.4, two quarterly groundwater sampling events during low tide conditions will be included in Phase 2 of the RI. During each sampling event, a groundwater sample will be collected from each monitoring well at the Property (see Figure 3-1). The sample analyses to be performed for each sampling event are presented in Table 3-3. Groundwater analytical methods, LODs, and PQLs are defined in Table 5-3. Table 5-2 presents the sample handling requirements.

The groundwater sampling procedures include the following:

- The depths to groundwater will be measured in the monitoring wells before sampling. The water level in each well will be measured to the nearest 0.01 foot from a surveyed notch in the well casing by using an electric water level probe. Water depths will be recorded on a dedicated purge and sample field form, and will include date, time, and sampler's initials.
- The monitoring wells will be purged by using low-flow procedures. Groundwater samples will be collected using a peristaltic pump fitted with silicon tubing and either Tygon® or polyethylene tubing. Pump tubing will be lowered to a depth of approximately 1 to 2 feet below the water table in the shallow wells, and at a depth of approximately 1 to 2 feet below the top of the well screen in the deep wells, for purging and sampling. Monitoring wells will be purged at a rate of less than 0.3 liter per minute. The flow rate will be adjusted as necessary to prevent the groundwater

level from dropping more than 10 percent.

- Field parameters will be measured in purged groundwater as it is discharging through a flow-through cell. Groundwater will be passed through the cell and discharged into a temporary storage container. Field parameters will be periodically measured (every 3 to 5 minutes) and recorded during well purging and upon stabilization. Field parameters will be measured by using a multi-parameter meter. The multi-parameter meter will be calibrated before measurements are taken. Field parameter measurements will include the following:
  - Temperature
  - Turbidity
  - pH
  - Dissolved oxygen
  - Redox potential (ORP)
  - Specific conductance.
- Groundwater samples will be collected after the field parameters have stabilized to within 10 percent of the previous reading. If the groundwater parameters do not stabilize, a maximum of three casing volumes will be purged prior to sampling. The purge water will be stored and disposed of as described in Section 4.11.
- Groundwater samples will be collected by using low-flow sampling techniques. Pump tubing will be maintained at a depth of 1 to 2 feet below the water table in the shallow wells, and at a depth of approximately 1 to 2 feet below the top of the well screen in the deep wells. Groundwater samples will be collected after recording final field parameter readings.
- Groundwater samples will be collected from the discharge line of the peristaltic pump. All samples will be transferred in the field from the sampling equipment into the laboratory-prepared containers and stored in a cooler on ice pending transport to the laboratory. Sample container requirements will be verified for the selected analytical laboratory prior to the start of field sampling activities.
- Samples will be labeled, handled, and shipped using the procedures described in Section 4.9. Sample custody will be maintained until delivery to the analytical laboratory. All sampling field activity and data will be recorded on a dedicated purge and sample field form.

- The sampler(s) will wear new nitrile gloves at each sampling location. New dedicated Tygon® or polyethylene tubing will be used at each sampling location.
- Quality assurance samples and duplicate samples will be collected at a frequency of 1 for every 20 samples, as described in Section 4.13. Duplicate samples will be collected by alternately filling similar containers until both containers are filled.

All reusable purging and sampling equipment will be decontaminated by using the procedures described in Section 4.10.

4.6 Duwamish River Sediment Sampling

Surface and subsurface sediment samples will be collected in the LDW at the locations indicated on Figure 3-2. Sample collection and testing will be conducted to establish baseline conditions adjacent to the Property prior to initiation of facility offloading operations and to address the data gaps outlined in Section 2. A detailed review of sediment quality, and historical dredging, and previous sediment investigations completed on and adjacent to the Site, are provided in the Data Gaps Report (SLR 2014a; Appendix A-2).

Sediment sample collection and processing procedures are described below. Analyses to be performed for sediment samples are listed in Table 3-4.

Horizontal positioning will be determined in the field by differential global positioning system (DGPS) based on target coordinates. The horizontal datum will be North American Datum of 1983 (NAD 83), Washington State Plane North. Measured geographical coordinates for station positions will be recorded and reported to the nearest 0.01 second. In addition, state plane coordinates will be reported to the nearest foot. The DGPS accuracy is less than 1 meter and generally less than 30 centimeter (cm), depending on the satellite coverage and the number of data points collected.

Surface sediment samples will be collected from the 0 to 10 cm biologically active zone at 18 locations in the LDW, as presented on Figure 3-2.

A hydraulic Van Veen (or similar) grab sampling device (or similar device) will be used to collect surface sediment samples. Final sampling methodology in the LDW will depend on access and water level. Van Veen sampling locations will be approached at slow boat speeds with minimal wake to minimize disturbance of bottom sediments prior to sampling. Sediment samples will be handled carefully to minimize disturbance during collection and transportation to the laboratory.

The grab sampler will be lowered over the side of the boat from a cable wire at an approximate speed of 0.3 foot per second. When the sampler reaches the mudline, the cable will be drawn taut, and DGPS measurements will be recorded. Each surface grab sample will be retrieved aboard the vessel and evaluated for the following acceptance criteria:

- Overlying water is present and has low turbidity
- Adequate penetration depth is achieved
- Sampler is not overfilled
- Sediment surface is undisturbed
- No signs of winnowing or leaking from sampling device

Grab samples not meeting these criteria will be rejected near the location of sample collection. The process will be repeated until criteria have been met. Deployments will be repeated within a 20-foot radius of the proposed sample location. If adequate penetration is not achieved after multiple attempts, less volume will be accepted and noted in the field notebook. Once accepted, overlying water will be siphoned off and a decontaminated stainless steel trowel, spoon, or equivalent will be used to collect only the upper 10 cm of sediment from inside the sampler without touching the sidewalls. The sampler will be decontaminated between stations and rinsed with site water between grabs.

After sample collection, the following information will be recorded on the Field Log Sheet, on the Sediment Sampling Form, and/or in the field notebook:

- Date, time and name of the person logging the sample
- Weather conditions
- Sample location number and coordinates
- Project designation

- Depth of water at the location and surface elevation
- Sediment penetration and depth
- Sediment sample interval
- Sample recovery

Homogenized surface sediment will be spooned immediately into appropriate pre-cleaned, pre-labeled sample containers, placed in coolers filled with ice or equivalent, and maintained at 4 degrees Celsius. Debris and materials more than 0.5 inch in diameter will be omitted from sample containers.

Sample concentrations will be reported down to the lowest laboratory limit available in order to evaluate for potential exceedences of the Sediment Management Standards (SMS) or other LDW preliminary screening levels/cleanup levels. Analytical methods for completion of sediment chemical testing are presented in Table 3-4.

In addition to the location information collected in the field, sample logging of bulk sediment not sampled in containers will involve physical characterization in general accordance with the visual-manual description procedure (ASTM D-2488 modified). The information will be recorded on the Sediment Sampling Forms (see Appendix F). Physical characterization includes the following:

- Grain size distribution
- Density/consistency
- Plasticity
- Color and moisture content
- Biological structures (e.g., shells, tubes, macrophytes, and bioturbation)
- Presence of debris and quantitative estimate (e.g., wood chips or fibers, paint chips, concrete, sand blast grit, and metal debris)
- Presence of oily sheen
- Odor (e.g., hydrogen sulfide)

Surface sediment samples collected for chemical and physical analysis will be securely packed and hand delivered to the analytical testing laboratory. The sediment sample analyses are listed in Table 3-4.

4.7 Subsurface Sediment Collection and Sampling

Subsurface sediment sampling will be carried out by vibracore to collect chemical and physical data. Four subsurface sediment sampling locations are proposed as part of Phase 2 activities. All four locations are co-located with surface sediment sampling locations in the LDW adjacent to the Property. Figure 3-2 shows the proposed subsurface sampling locations.

The subsequent sections provide details regarding vibracore collection and sediment processing methods.

4.7.1 Subsurface Sediment Collection Methods

Subsurface sediment stations will be collected by a vibracore. A vibracore collects a continuous profile of subsurface sediments by utilizing a high frequency vibrating coring device that penetrates into the underlying sediments with minimal distortion. A vibracore is ideal for collecting long, relatively undisturbed cores from a variety of sediment types. Subsurface sediment sampling by vibracore will be advanced approximately 15 feet below mudline, or until refusal is met.

Prior to deployment, the following procedure will be used to decontaminate sample tubes:

- Rinse and pre-clean with potable water
- Wash and scrub the tubes in a solution of laboratory grade, non-phosphate-based soap and potable water
- Rinse with potable water
- Rinse three times with distilled water
- Seal both ends of each core tube with aluminum foil

The aluminum foil will be removed immediately prior to placement into the coring device. Care will be taken during sampling to avoid contact of the sample tube with potentially contaminated surfaces.

Vibracore sediment samples will be collected in the following manner:

1. The vessel will maneuver to the proposed sample location.

2. A decontaminated core tube the length of the desired penetration depth will be secured to the vibratory assembly and deployed from the vessel.
3. The cable umbilical to the vibrator assembly will be drawn taut and perpendicular as the core rests on the bottom sediment.
4. The location of the umbilical hoist will be measured and recorded by the location control personnel, and depth to sediment will be measured using a lead line.
5. A 4-inch-diameter, thin-walled, aluminum tube will be vibratory-driven into the sediment using two counter-rotating vibrating heads.
6. A continuous core sample will be collected to the designated coring depth (15 feet below mudline) or until refusal.
7. The depth of core penetration will be measured and recorded.
8. The vibrator will be turned off, and the core barrel will be extracted from the sediment using the winch.
9. While suspended from the A-frame, the assembly and core barrel will be sprayed off and then placed on the vessel deck.
10. The core sample will be evaluated at the visible ends of the core tube and the length of recovered sediment will be recorded. If accepted, the core tube will be sectioned into 4- to 6.5-foot lengths.

Acceptance criteria for sediment core samples are as follows:

- Overlying water is present and the surface is intact
- The core tube appears intact without obstruction or blocking
- Recovery is greater than 75 percent of drive length

If sample acceptance criteria are not achieved, the sample will be rejected, unless modified acceptance criteria are approved by the Anchor QEA field geologist.

Anchor QEA personnel will record field conditions and drive notes on a standard core log (Appendix F). Logs will include the following information:

- Water depth at each station sampling using lead-line at point of sampling station
- Location of each station as determined by DGPS
- Date and time of collection of each sediment core sample

- Names of field personnel collecting and handling the samples
- Observations made during sample collection, including weather conditions, complications, and other details associated with the sampling effort
- The sample station identification
- Length and depth intervals of each core section and estimated recovery for each sediment sample as measured from mean lower low water
- Qualitative notation of apparent resistance of sediment column to coring (how the core drove)
- Any deviation from the approved SAP Addendum

Once the core samples are deemed acceptable, the cutterhead will be removed, and a cap will be placed over the end of the tube and secured firmly in place with duct tape. The core tube will then be removed from the sampler, and the other end of the core will be capped and taped. The core tube will be labeled with permanent black pen and inscribed with the location ID and an arrow pointing to the top of core. The cores will then be cut into appropriate lengths for transport and processing. Cores will be cut to a maximum length of 6.5 feet. The cores will be sealed tightly enough to prevent leakage or disturbance during transport to the processing station. Cores will be transported daily to the on-site processing area. A Chain-of-custody (COC) form (Appendix F) will be logged by Anchor QEA field staff and maintained by staff at the processing area.

4.7.2 Subsurface Sediment Processing Methods

The vibracore processing station will be located at the analytical laboratory. Transported cores will be handled consistent with ASTM procedures (ASTM D 4220) and stored upright and cool until processed. When processed, the core caps will be removed, and the core will be cut longitudinally using a circular saw. The core will be split with decontaminated stainless steel wire core splitters or spatulas into two halves for sampling.

Prior to sampling, Anchor QEA field staff will collect color photographs. Field staff also will record a sediment description of each core on a standard core processing log (Appendix F). The following parameters will be noted:

- Sample recovery

- Physical sediment description in accordance with ASTM procedures (ASTM D 2488 and ASTM D 2487 – Unified Soil Classification System) including sediment type, density/consistency of sediment, and color
- Odor (e.g., hydrogen sulfide and petroleum)
- Visual stratification, structure, and texture
- Vegetation and debris (e.g., wood chips or fibers, paint chips, concrete, sand blast grit, and metal debris)
- Biological activity (e.g., detritus, shells, tubes, bioturbation, and live or dead organisms)
- Presence of oil sheen

All cores will be fully logged, photographed, and sampled from discrete 2-foot depth intervals based on the sampling scheme outlined in Table 3-4. Field observations, such as color, odor, sheen, and anthropogenic material (e.g., blasting grit), may also be used to identify/adjust sample intervals.

Discrete samples will be taken directly from the selected depth interval and spooned into a stainless steel bowl for homogenization and then into laboratory-supplied jars. Table 3-4 presents the subsurface sediment sampling details, including sample nomenclature, depth interval, and planned analyses. Table 3-6 provides coordinates for proposal sampling locations.

Samples will be placed in a decontaminated stainless steel bowl and mixed using a decontaminated stainless steel mixing spoon. The sediment will be mixed until homogenous in color and texture and then spooned into laboratory-supplied jars for analyses. A COC form will be logged by the processing staff and relinquished to the laboratory staff (Appendix F). Subsurface sediment testing will include the parameters listed in Table 3-4. Sample concentrations will be reported down to the lowest laboratory limits available to evaluate for potential exceedences of the SMS and the Draft LDW preliminary screening levels. Analytical methods, LODs, and PQLs are defined in Table 5-1. Table 5-2 presents the sample handling requirements.

Quality assurance samples and duplicate samples will be collected at the frequency of one for every 20 samples, as described in Section 4.13.

4.8 Stormwater Outfall Sampling

As discussed in Section 3.5, stormwater samples will be collected from each of the six outfalls from the Site (see Figure 3-3). Since there will likely be minimal differences in sample analytical results between stormwater sampling events, completion of one stormwater sampling event is proposed for Phase 2 of the RI.

Stormwater samples will each be collected during precipitation events with at least 0.1 inch of rainfall over a 24-hour period. The sampling event will be preceded by at least 24 hours of no greater than a trace of precipitation. To minimize any surface water influence on the samples, the samples will be collected during a period when the drainage outfalls are above the water level of the waterway (at low tide). The stormwater samples will be grab samples collected directly from the outfall pipes. Each sample jar may be attached to an extension pole in order to reach the outfall.

The field geologist will use clean nitrile gloves for handling each sample. After filling, the sample containers will be placed on ice in a cooler and handled as described in Section 4.9. The stormwater sample analyses are listed in Table 3-5.

4.9 Sample Designation

Soil samples will be identified by the boring from which they are collected and the sample depth range. For example, the sample collected from boring EB-22, at a depth of 4 to 6 feet, would be designated "EB-22-4-6." The groundwater samples will be identified by the monitoring well from which they are collected and the date collected, using a six-digit date alphanumeric. For example, the groundwater sample collected from monitoring well EMW-17S on November 22, 2014 would be designated "EMW-17S-112214". Stormwater samples will be identified by the outfall that they are collected from and the date collected, using a six-digit alphanumeric. For example, the stormwater sample collected from outfall #5 on November 22, 2014 would be identified as "OF5-112214".

Quality assurance (QA) samples (field duplicates) will be collected at a frequency of one for every 20 samples for each medium. Field duplicate samples will be identified by the addition of 50 to the sample number when submitted to the laboratory. The following are examples of sample numbering:

- EB-72-4-6 represents a field duplicate soil sample for the 4- to 6-foot sample interval at soil location EB-22
- EMW-67S-112214 represents a field duplicate groundwater sample collected at well EMW-07S on November 22, 2014
- OF55-112214 represents a field duplicate stormwater outfall sample collected at Outfall 5 on November 22, 2014

The sediment sample nomenclature is described as follows. Each sample will be assigned a unique alphanumeric identifier according to the following method:

- Each station ID will be identified by a Surface Sediment Sample (SSED)-Sample Number described as follows:
  - The sample number will be in the order of sampling locations, beginning with -01
- Example sample identification nomenclature includes the following:
  - SSED-01: Surface sediment sample collected from the first location
- Subsurface sediment locations will be identified by Subsurface Boring (SB) after the SSED
  - SSED-SB-12: Subsurface sediment sample collected from the first location
- A field duplicate collected from a sample will be identified by the addition of 50 to the sample number
  - SSED-51: Duplicate surface sediment sample collected from the first location
  - SSED-SB-12-52: Duplicate subsurface sediment sample collected from station SSED-SB-12.

For rinsate blank samples, the letters "RB" will be used instead of the sample number, and the rinsate blank date in MMDDYY format will be added to the end. The resulting

nomenclature of a rinsate blank of the decontaminated sediment sample processing equipment on November 22, 2014, would be SSED-RB-112214.

Trip blanks will be identified with sequential sample number and a date suffix (e.g., TB-1-0614) on the container. Extra samples collected for laboratory duplicates and matrix spike and matrix spike duplicate (MS/MSD) analyses will be identified with the same designation as the sample.

4.10 Sample Labeling, Shipping, and Chain-of-Custody

Sample Labeling. Sample container labels will be completed immediately before or immediately after sample collection. Container labels will include the following information:

- Project name
- Sample number
- Name of collector
- Date and time of collection
- Analyses requested

Sample Transport. Samples will be transported in a sealed, iced cooler to the analytical laboratory at the end of each day of sample collection. Ice will be placed into each cooler with the samples. All delivered samples will be accompanied by a chain-of-custody form. Sample coolers will be transported to the laboratory by the field sampler.

Chain-of-Custody. Once a sample is collected, it will remain in the custody of the sampler or other Anchor QEA personnel until delivered to the laboratory. Upon transfer of sample containers to subsequent custodians, a chain-of-custody will be signed by each person transferring custody of the sample container. Upon receipt of samples at the laboratory, the condition of the samples will be recorded by the receiver. Chain-of-custody records will be included in the analytical report prepared by the laboratory.

4.11 Decontamination Procedures

All down-hole drilling equipment will be steam-cleaned or pressure-washed prior to beginning drilling and between drilling each boring. Spoons and other sampling equipment that will contact the soil samples will be decontaminated prior to initial use, between sampling locations, and between different sampling depths at the same location. Soil and sediment sampling equipment will be decontaminated by steam cleaning, pressure washing, or by the following procedure:

- Tap water rinse
- Non-phosphatic detergent (Liquinox) and tap water wash
- Tap water rinse
- Distilled water rinse (three times)
- Store in clean, closed container for next use

Polyethylene tubing will be dedicated to each well. The water level probe will be rinsed with distilled water between uses in different monitoring wells.

4.12 Residuals Management

The soil generated by the drilling activities, and the wastewater generated by the cleaning of the drilling and sampling equipment and the development and purging of the wells will be temporarily stored at the Site in properly labeled 55-gallon drums. After obtaining the sample analytical results, the soil and water will characterized and will be transported off-site for disposal at licensed facilities in accordance with WAC 173-303.

4.13 Field Quality Assurance

As described in the QAPP of the Work Plan (Ecology 2012), field QA will be maintained through compliance with the sampling plan, collection of field QA samples, and documentation of sampling plan alterations.

Duplicate soil, groundwater, stormwater, and sediment samples will be collected at a minimum frequency of one duplicate sample per 20 samples or one duplicate sample per batch of samples if less than 20 samples are collected. Duplicate samples will be collected to check the precision of the field sampling and analytical procedures. During each sampling

event, at least one duplicate sample will be taken from one sampling point at the same time as the regular sample. For soil and sediment, a split sample will be collected from the same homogenized sample interval. For groundwater and stormwater, duplicate samples will be obtained by alternately filling like sample bottles for the two sample sets (original and duplicate). Duplicate samples will be labeled similarly to the other samples and will be identified by the addition of 50 to the sample location ID. The locations for duplicate sample collection will be determined in the field.

Equipment rinsate blanks will be obtained after non-dedicated sampling equipment is decontaminated and will involve passing deionized organic-free water through the sampling equipment and transferring the water into an appropriate sampling container. Rinsate blanks will not be collected if single-use or dedicated equipment (e.g., tubing) is used for sampling. Rinsate blanks will be analyzed to determine whether decontamination of sampling equipment is adequate. One equipment rinsate blank will be collected with non-dedicated equipment or, at a minimum, one equipment rinsate blank will be collected for each sampling event for soil, groundwater, stormwater, and sediment programs. For the above media, one field rinsate sample will be collected for every 20 samples collected.

4.14 Standard Field Forms

Standard field forms used to record sampling data and field observations include the following:

- Daily Log
- Boring Log Form
- Soil Description Checklist – Field Log
- Generalized Well Installation Details – Flush Mount
- Well Development Log
- Groundwater Field Sampling Data Sheet
- Surface Sediment Field Log
- Sediment Core Collection Form
- Sediment Core Processing Log
- Chain of Custody Form

A blank copy of each form is presented in the Appendix F.

5 ANALYTICAL METHODS

All of the soil, groundwater, storm water, and sediment samples will be submitted to Analytical Resources, Inc. (ARI) in Tukwila, Washington, an Ecology-certified laboratory for the suite of analyses required. Groundwater samples for metals analysis will be analyzed by EPA Method 200.8 with UCT to reduce potential interferences associated with salinity.

A PQL for each of the sample analyses will be applied to ensure that the lowest practical detection limit is used. However, if interference in an analysis prevents the use of the PQL, then the laboratory will use the lowest possible reporting limit that is technically feasible for the sample matrix. The target PQLs for all soil, sediment, and water samples are presented in Tables 5-1 and 5-3.

5.1 Soil Samples

Select laboratory analyses and analytical methods anticipated for soil samples will be performed based on evaluation of Phase 1 data (Tables 2-6 through 2-10), and include the following:

- DRO and RRO by Northwest Method NWTPH-Dx (after silica gel cleanup)
- GRO by Northwest Method NWTPH-Gx
- Priority Pollutant Metals (antimony, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium, and zinc) and barium by EPA Method 200.8 or 6020
- Mercury by EPA Method 7471
- Semi-volatile organic compounds (SVOCs) by EPA Method 8270D
- PAHs by EPA Method 8270D SIM
- PCBs by EPA Method 8082A
- VOCs (including n-hexane, 1,2-dibromoethane, 1,2-dichloroethane, and methyl tertiary butyl ether) by EPA Method 8260C
- VPH by Ecology Method WA-VPH
- EPH by Ecology Method WA-EPH
- Dioxins and furans by EPA Method 1613

5.2 Groundwater Samples

Select laboratory analyses and analytical methods anticipated for groundwater samples will be performed based on evaluation of Phase 1 data (Tables 2-11 through 2-14), and will include the following:

- Total and dissolved metals (antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium, and zinc) by EPA Method 200.8 with UCT
- Dissolved mercury by EPA Method 1631E
- SVOCs by EPA Method 8270D
- PAHs by 8270D SIM
- PCBs by EPA Method 8082A
- DRO and RRO by Northwest Method NWTPH-Dx (after silica gel cleanup)
- VOCs by EPA Method 8260C
- Total Dissolved Solids (TDS) by Standard Method 2540C
- Chloride by Method SM4500.

All dissolved metals analyses will be conducted after field filtering of the samples.

5.3 Sediment Samples

Select laboratory analyses and analytical methods anticipated for sediment samples will be performed based on evaluation of historical data (Table 2-15), and will include the following:

- Arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver, and zinc by EPA Method 200.8 or 6020
- Mercury by EPA Method 7471
- SVOCs by EPA Method 8270D
- PAHs by EPA Method 8270D SIM
- PCBs by EPA Method 8082A
- Dioxins and Furans by EPA Method 1613
- Total organic carbon (TOC) by EPA Method 9060
- Grain size by ASTM D-422.

Dioxins/furans will be tested for sediment samples if visual field observations indicate potential impacts in the historical Sand Dump Area.

5.4 Storm Water Samples

Select laboratory analyses and analytical methods anticipated for storm water samples will be performed based on evaluation of Phase 1 data (Table 2-16), and include the following:

- Total metals (antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium, and zinc) by EPA Method 200.8 or 6020
- Total mercury by EPA Method 1631E
- SVOCs by EPA Method 8270D
- PAHs by 8270D SIM
- PCBs by EPA Method 8082A
- DRO and RRO by Northwest Method NWTPH-Dx (after silica gel cleanup)
- GRO by Northwest Method NWTPH-Gx
- VOCs by EPA Method 8260C
- Total Suspended Solids (TSS) by Standard Method 2540D
- TOC by EPA Method 9060M
- Chloride by Method SM4500.

6 REFERENCES

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Ecology (Washington State Department of Ecology), 2010. Natural Background for Dioxins/Furans in WA Soils, Technical Memorandum #8, Publication No. 10-09-053. August 2010.

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Ecology, 2013. Letter to Stephen Wilson of Crowley Maritime Corporation Regarding Resolution of Dispute of November 16, 2012, Approval of RI/FS Work Plan with Revisions, Crowley Marine Services 8th Avenue S. Site, Agreed Order No. DE 6721. May 23, 2013.

Ecology, 2014. Letter to Stephen Wilson of Crowley Marine Corporation Regarding Comments on SLR's Draft Data Gap Report, 8th Avenue Terminals Site, Agreed Order No. DE 6721. April 21, 2014.

ECOLOGY DRAFT SAMPLING AND ANALYSIS PLAN ADDENDUM COMMENT LETTER

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March 25, 2015

Mr. Matthew Woltman
Anchor QEA, LLC
720 Olive Way, Suite 1900
Seattle, WA 98101

Re: Agreed Order No. DE 6721
Review of Draft Sampling and Analysis Plan Addendum, November 7, 2014
Crowley Marine Services 8th Ave S Site – DeNovo Seattle LLC
7400 8th Ave S, Seattle, WA

Dear Mr. Woltman:

This letter contains the Department of Ecology's (Ecology) review of the Draft SAP Addendum (Addendum), submitted on November 7, 2104, documenting remaining information and data gaps for completion of the remedial investigation (RI) at the Site. The Addendum was incomplete upon submission. Therefore Ecology requested supplemental information during the review period. At this time, some requested information remains outstanding. However, Ecology is providing comments on the Addendum to facilitate progress on the RI.

DeNovo implemented the proposed data collection in November and December 2014 prior to approval of the scope of work proposed in the Addendum. Ecology has not reviewed the Phase 2 data set.

The sampling program, as proposed in the Addendum, is insufficient to meet the requirements of the Phase 2 RI to provide sufficient data to prepare the Draft Remedial Investigation Report.

The comments below and in the enclosed table and figure show additional sampling proposed to fill remaining data gaps. Significant data gaps remain. However, since the field activities proposed in the Addendum have been completed, these comments are directed toward preparation of an updated and Revised Addendum. The Revised Addendum must contain the Phase 2 data and a plan to fill data gaps identified in this letter and additional data gaps which may be indicated by the Phase 2 data.

On October 22, Ecology approved the early submittal of the Addendum in advance of validated Phase 1 data entry into the EIM system. Ecology stated it would begin review of the Addendum. However, the validated data would be required before comments on the Addendum would be provided. The data became available in EIM on February 26. At this writing, Ecology has not had sufficient time to perform a complete review of the validated data, and is therefore providing comments in advance of the validated data set review.

Please address the comments below in a Revised Addendum and submit an agency review draft upon completion. At this time, Ecology does not approve any further data collection at the site prior to approval of the Revised Addendum to assure that the data gaps will be addressed and the appropriate field procedures are followed.

1. Information about the future development proposed for the site was not included in the Addendum.

   Ecology has provided the comments below in the absence of information on the future site development plans. This incomplete information may result in conflicting, unresolved, or unidentified data gaps. For example, the Site data collected to date indicates that the top five to six feet of soil across the Site has not been adequately characterized for a variety of Site contaminants. If future development plans include complete removal of the top six feet of soil, then contaminants need to be characterized for disposal and health and safety purposes to mitigate risks associated with the soil removal. Alternatively, if future development plans intend to leave this soil in place, additional characterization of contaminants, particularly metals and PAHs, is needed to understand and mitigate risks to Site workers and the environment. Revisions to the Addendum to include this information would be helpful to move the RI forward and determine the scope of applicable data gaps.

2. The Addendum did not describe how the data collected would inform the Feasibility Study (FS) so that a cleanup option can be selected.

   Further data collection to address the remaining data gaps should be coordinated with the plans for the future development, descriptions of potential cleanup options, and information on how data collected will inform the FS. Assure that the development and cleanup option information is considered in the Revised Addendum.

3. The Addendum sampling program does not appear to be connected to the conceptual site model presented by SLR or to a conceptual site model that considers exposure pathways as site development occurs or planned future use.

   Prepare and include a revised graphic conceptual site model that addresses potential exposure pathways for the RI and during development of the site and future use. Then, propose additional environmental sampling that will inform interim actions and cleanup actions that will preclude or mitigate risks to potential receptors.

4. Contaminants of potential concern appear to be identified too early in the RI process and are based on limited Site data.

   RI investigation activities should be focused on collecting data and developing information that will be needed to evaluate remedial alternatives for the Site. Based on the detection frequencies calculated during a limited review of the Site data posted to EIM, additional contaminants in soil and groundwater must also be considered as contaminants of potential concern.

5. The statements in Sections 2.1.1-2.1.2 and Table 2-1 eliminating the soil to surface water pathway and soil to sediment pathway are not supported by site data.

   Add further support for not retaining the soil to surface water pathway and the soil to sediment pathway. Please indicate how impacted soil throughout the entire Site is not capable of affecting the adjacent surface water and sediment. Without further substantiating information, these pathways and criteria will need to be added to the tables for use in developing screening levels.

6. Table 2-1, Summary of Applicable Pathways and ARAR Evaluation, includes soil and groundwater pathways only.

   Air, storm and surface water, and sediment also need to be included in this and other tables.

7. The Addendum assumes site groundwater is non-potable until further data is collected.

   Until the possible non-potability of site groundwater is determined and approved by Ecology, the Addendum and other RI documents will need to assume that site groundwater is potable. Based on existing TDS results from groundwater samples in site wells, a significant portion of the shallow aquifer does not exceed the MTCA criterion of 10,000 mg/L TDS to potentially qualify for non-potability.

8. Tables 2-2 and 2-3 show an incomplete ARAR Evaluation.

   This Site is undergoing Method B cleanup, and thus Method C is not necessary to consider; remove from the Yes column any Method C criteria. However, Method A should be retained only for TPH ranges. As mentioned above, the soil to sediment protection and soil to surface water protection (marine only, not fresh water) may need to be considered as Yes in this table.

   It is not stated how the surface water criteria will be applied. Are these surface water criteria to be applied as screening levels to all Site groundwater sample results? Are they also to be applied to surface water (outfall) sample results? This Site is undergoing Method B cleanup, and thus Method C is not necessary to consider; remove from the Yes column any Method C criteria. However, Method A should be retained only for TPH ranges. Whether the State Board of Health and MCLs/MCLGs are considered under groundwater Method A (rows 4-7) or groundwater Method B (rows 1-4), these criteria are required to be addressed per MTCA.

   For surface water, Slip 4 and the LDW in this area have been shown to qualify as marine water, and thus the fresh water criteria do not need to be considered as screening levels. Background levels for groundwater and surface water hazardous substances may be considered, as listed in the Ecology 2012 ARAR/PSL table. Although the groundwater to sediment pathway is included in Table 2-1, these two sets of criteria (based on CSL and SQS) are listed as not being retained under the groundwater pathway evaluation; they should be listed in the Yes column.

9. Screening levels were revised for this Phase of the RI. Tables 2-4 and 2-5, Preliminary Screening Levels do not show the criterion on which the screening level is based.

   The discussion in Section 2 concerning modifying screening levels, eliminating pathways, potentially applicable ARARs and exposure pathways, including the decision to use a non-potable groundwater determination, is based on an incomplete RI data set and includes assumptions that are not justified at this stage of the RI. Screening levels applied in this report are different from the screening levels presented in the SLR Data Gaps Report. This creates inconsistencies in the data screening process. Although the method seems to be somewhat similar in developing screening levels, numeric screening values in this SAP Addendum are up to several orders of magnitude different than in the SLR report. If there are errors or inconsistencies in the current screening levels, the SLR report screening levels would be more appropriate and would retain consistency during the RI process.

   Add to these tables the name of the criterion that corresponds to each of the Preliminary Screening Levels values (one per analyte). Develop similar tables for surface water and sediment. Incorporate the 2013 revision of the Sediment Management Standards criteria and information in the 2013 Sediment Cleanup Users Manual II (SCUM II).Additional information is needed to explain the process used in developing screening levels, or instead the SLR screening levels should be adopted to retain consistency.

   To provide one example of a screening level that is inconsistent with the SLR value, the soil screening level for lead is presented in the SAP Addendum as 17 mg/kg, which is the background level in the 2012 Ecology ARAR/PSL table. However, all criteria in the 2012 table are above this level (25 mg/kg is the lowest). Thus, the value of 25 mg/kg should be the proper screening level, which was the level used in the SLR report.

10. The soil borings, sampling, and analyses proposed in the 2012 Work Plan were meant to fill data gaps with regard to the nature and extent of soil contamination across the Site and were tied to a CSM for the Site use, as it was understood in 2012. Borings were located in areas where insufficient data are available to complete the RI and prepare FS and cleanup plans; including areas with no soil data, such as the area north of the former Treated Pole Storage area, and in areas where definition of the vertical and lateral extents of contaminants were not understood. Ecology disagrees with and objects to the assertions in the Section 3.2 that the 13 eliminated soil borings were proposed with "limited to no technical justification" and in Table 3-2 that indicates the eliminated borings were not needed because "objectives of the RI have been met..., [the boring] is not needed to further delineate the lateral or vertical extent of COPCs..., and there is sufficient information about contaminant conditions in the area to design a remedial action, if necessary."

    Remove all language from the Revised Addendum which indicates that environmental samples were proposed with "limited to no technical justification". Remove the statements from Table 3-2 that RI objectives have been met in the areas where Phase 2 soil borings were eliminated.

11. Interim action soil boring logs were not included in the Addendum.

    Include the boring logs for the interim action soil borings IAB-1 through IAB-42 in an Appendix. In the text of the Revised Addendum, explain the reason for multiple logs for some of the borings. Present all boring locations (i.e., "A", "B", "C", etc.) on the sample location map.

12. Soil contaminant maps were prepared with unvalidated Phase 1 data.

    The maps were reviewed as drafts. Revised figures and cross-sections using the validated data should be included in the Revised Addendum. Show proposed borings on these figures.

13. Contaminant maps for carcinogenic PAHs (cPAH) were prepared using data that did not contain the complete set of seven cPAHs. No contaminant maps were provided for individual cPAHs.

    Data for samples without the complete set of cPAHs should be mapped as individual cPAHs and compared to individual preliminary screening levels rather than cPAH TEQ. Some individual PAHs may warrant additional and separate maps.

14. Cross-sections and contaminant maps for diesel-range and residual-range organics were prepared as separate figures in the Addendum.

    Revise cross-sections and contaminant maps to present the sum of diesel-range and residual-range organics in soil and groundwater.

15. The nature and extent of dioxins/furans has not been adequately characterized across the Site.

    Collect samples for dioxins/furans analysis in areas and depths where PCB concentrations in soil and storm drain solids exceed preliminary screening levels. Collect additional samples in soil across the Site to define the lateral and vertical extent of dioxins/furans impacts. Address comments in this letter regarding dioxins at the site.

16. Some Site figures may be revised to be more easily read and interpreted.

    On figures which show soil concentrations and proposed boring and/or monitoring well locations, use unique symbols to show existing borings, existing wells, proposed borings, and proposed wells, rather than symbols that describe the date of installation. This will facilitate interpretation of information contained on the figures, such as Figure 3-1.

17. The Addendum provided for collection of additional samples, but not additional analyses, where field indications of impacts are observed.

    Sampling plans should include analysis for contaminants not planned for the particular boring location. For example, if field indications of hydrocarbon impacts are observed in a boring, samples should be submitted for TPH, PAHs, and PCBs regardless of whether those analyses are initially planned at that location.

18. Section 7.1.1 of the 2012 RI Work Plan called for additional analyses or borings when field evidence indicates the presence of contamination. This appears not to have been followed during the 2014 field investigation.

    Additional borings should be advanced lateral to borings in which field indications of impacts (e.g., sheen, odor, staining, elevated PID readings) are observed. Although this may not be practicable for metals at all locations, potential impacts from TPH, PAHs, VOCs, and possible PCBs can be readily identified based on field observations and "step-out" borings should be completed during the sampling event.

19. Ecology reviewed the draft borings logs from November and December 2014 and the laboratory chains-of-custody for soil samples. The following comments address questions and concerns resulting from this review.

    a. Descriptions of odor/sheen are not provided for all borings and sample intervals. Odor and/or sheen observations are typically only described if odor and/or sheen were present, but not in cases where no odor and/or no sheen were observed. The absence of odor and/or sheen should be noted in the logs as part of each description, particularly for borings in which odor and/or sheen were noted in one or more depth intervals, or where odor and/or sheen were observed in nearby borings.

    b. Reporting of odor/sheen is specified in the 2012 Work Plan and in the Addendum for all field screening activities, and as a basis for selection of additional sample intervals and analyses. Where provided, descriptions of odor and sheen are informative, but an absence of odor and/or sheen should not be left to assumption.

    Ensure that field observations are consistently reported, including the presence or absence of odors, sheens, and staining. Collect soil samples for laboratory analysis when odors, sheens, and/or staining are observed. Use appropriate sample containers when TPH-gasoline and/or VOC contamination is suspected to allow proper laboratory analysis within hold times. Samples collected for other contaminants may be archived for later analysis.

20. All of the PID readings for the Phase 2 borings are "0.0", even for intervals in which other indications of impacts (such as odor and/or sheen) were reported. This is unusual and is inconsistent with previous investigation findings.

    Please provide field calibration logs for PID units. Provide the field log book for each phase of data collection.

21. PID readings are not provided for all sample intervals, and the vertical spacing of readings is inconsistent.

    PID readings should be provided consistently for the entire vertical sequence in each boring, and for each sampled interval. The 2012 Work Plan and the Addendum specify PID readings for all field screening activities, and as a basis for selection of additional sample intervals and/or analyses. The PID screening results provided in the draft boring logs provide limited

information for evaluation of whether or not additional sampling and/or analyses should have been performed.

22. Some of the planned sample intervals shown in Table 3-2 of the Addendum were skipped. The rationale for skipping these intervals is not evident from the information provided in the logs, and soil does appear to have recovered in these skipped intervals.

    Provide the rationale for the skipped intervals which were not sampled as required under the Addendum.

23. Some boring/well locations include multiple logs, typically labeled "A", "B", etc. (typically locations where "refusal" was reported or borings were advanced with multiple drilling techniques; i.e. direct-push boring followed by well installation with an auger rig). Logs for the following "multiple boring" locations appear to be missing based on the boring designations.

    a. A log for EB-12-C is provided, but not for borings "A" or "B"

    b. A log for EB-30-D is provided, but not for "A", "B", or "C"

    c. Logs for EB-31-B and -C are provided, but not for "A"

    d. A log for EB-36-H is provided, but not for "A" through "G"

    e. A log for EB-53-C is provided, but not for "A" or "B"

    Provide logs for each boring attempted at each location. Without information regarding the field observations from the above-listed borings, it is uncertain if analytical results will be representative of and characterize site conditions at this location. Present all boring locations (i.e., "A", "B", "C", etc.) on the sample location map.

24. For some of the boring/well locations that include multiple logs, a note is included that samples from multiple borings were homogenized to meet soil volume requirements. In most of these instances, it is also noted that samples to be analyzed for TPH-gasoline and VOC were collected from a single boring sample, without clearly indicating if it was collected prior to sample homogenization. Additional comments on the boring logs are as follows:

    a. Soil boring EB-12: The notes on the log for EB-12-C do not indicate if sample intervals from the "A" and "B" borings were homogenized with the sample intervals from the "C" boring.

    b. Soil boring EB-30: The notes on the log for EB-30-D do not indicate if sample intervals from the "A", "B", and "C" borings were homogenized with the sample intervals from the "D" boring.

    c. Soil borings EB-31-A, EB-31-B, and EB-31C (note the log for EB-31-A was not provided, as stated above):

d. The notes on the log for EB-31-C indicate that the sample intervals from the "B" and "C" borings were homogenized. With no information about the samples from the "A" boring, it is uncertain if analytical results will be representative of and characterize site conditions at this location.

e. Samples to be analyzed for VOC were collected from EB-31-B. A "sulfur-like" odor was noted between 12.9 and 15.0 feet bgs in EB-31-C, a separate sample should have been collected from this location for VOC analysis. The logs do not indicate from which boring the samples to be analyzed for TPH-gasoline were collected. A "petroleum-like odor" was noted at 12.4 feet bgs in EB-31-B. It is not clear if this sample interval was collected for TPH-gasoline analysis.

f. Soil boring EB-36-H: It is noted on the log that samples collected for VOC analysis were taken prior to homogenization. No description of odor or sheen is provided on the EB-36-H log. In the absence of the remaining logs for this boring (i.e., EB-36-A through EB-36-G) it is uncertain that the VOC results from the "H" boring will be representative of and will properly characterize the site conditions at this location.

g. Soil boring EB-44: The logs for EB-44-1 and EB-44-2 do not indicate from which boring the samples to be analyzed for TPH-gasoline were collected.

h. Soil boring EB-53: The notes on the log for EB-53-C do not indicate if sample intervals from the "A" and "B" borings were homogenized with the sample intervals from the "C" boring.

i. Soil boring EB-55: The notes on the log for EB-55 indicate that samples were collected for VOC analysis prior to homogenization. However, there are no other indications that multiple boring attempts may have been made at this location.

j. Well EMW-17S: The notes on the log for EMW-17S-A indicate that the analytical samples were discarded after successful completion of EMW-17S-B.

k. Well EMW-21D: Sampled intervals from EMW-21D-A and EMW-21D-B were not homogenized. Samples were collected for analysis only from the "A" boring. However, red staining was noted in the "B" boring between 7.0 and 7.3 feet bgs.

In the Revised Addendum please include a discussion describing the rationale for determining when to discard or homogenize samples from multiple boring attempts at a single boring/well location, as well as the rationale and procedures for selecting samples to be analyzed for TPH-gasoline and VOCs when multiple boring attempts are made for a single boring/well location.

25. The boring logs all include notes and calculations for a "correction factor", apparently to correct for an assumption of linear compaction of the soil material within the sampler tube. The "correction factor" appears to be to have been used to normalize the recovery in each sampler to five feet (the length of the sampler tube). Recovery in direct-push borings ranged from approximately 2.3 to five feet, and was generally between 3.5 and 4.5 feet. The

"correction factor" was apparently used to correlate actual depths bgs with the interval collected from the sampler tube.

For example, if sample recovery was 80% (i.e., four feet recovered in a five foot sampler), and a sample was planned for two to four feet bgs, both the top and bottom depths were multiplied by the percent recovery, and the sample was collected from the sampler at the calculated intervals. For this example, the sample would be collected between 1.6 feet (2 x 80%) and 3.2 feet (4 x 80%) as measured from the top of the soil interval, but would be labeled as two to four feet. The calculations for sample intervals are shown at the bottom of each of the draft boring logs.

This approach leads to a degree of uncertainty with respect to actual sample depths. The methodology appears to assume that soil from the entire vertical sequence is represented in the sampler tube (i.e., no portions of the vertical sequence were missed) and that compaction is linear for all soil types. However, there are many factors that can result in a missed interval with direct-push sampling (for example, material being too coarse to enter the sampler tube or material being too soft or pushed aside so that the sampler advances through the interval without collecting soil). The information provided in the draft boring logs typically does not address the possibility of incomplete recovery or nonlinear compaction.

The depth intervals reported for each sample submitted to the laboratory for analysis or archive should be viewed with a "margin of error" in mind. It is difficult to assign a numerical value for a global "margin of error" (based on the variability of percent recovery), but ±0.5 foot would be a reasonable default value.

Provide a summary of the soil-depth correction factor problem and state the typical errors in the reported sample depths compared to the measured interval collected from the sampler tube.

26. Ecology has reviewed the boring logs and chains-of-custody for the soil samples collected in November/December 2014. In addition, Ecology reviewed the January 2015 draft contaminant concentration maps. The following list provides recommendations for potential additional analyses for soil samples collected for analysis of other parameters or as archive samples. This list is based on the information and descriptions provided in the draft boring logs, the chains-of-custody, and the draft contaminant concentration maps.

    a. *DMW-6A-2-3 and DMW-6A-3-3.5: Add analysis for dioxins/furans. "Organic debris" and "Ash debris" were noted on the log in these intervals.*

    b. *DMW-6A, all samples: Add analysis for SVOCs to characterize pentachlorophenol impacts in this area.*

    c. *EB-03-3-5: Add analysis for PCBs to characterize extent of PCB impacts near SS-4 and SS-5.*

    d. *EB-06, all samples: Add analysis for PCBs to characterize extent of PCB impacts in this area.*

e. *EB-07-2-4: Add analysis for dioxins/furans. "White fire brick" was noted on the log in this interval.*

f. *EB-07, all samples: Add analysis for PCBs to characterize extent of PCB impacts in this area.*

g. *EB-12-5-7: Add TPH-Dx analysis. A "diesel-like odor" was noted on the log in this interval.*

h. *EB-12, all samples: Add analysis for SVOCs to characterize extent of pentachlorophenol in this area.*

i. *EB-12-8-10: Add dioxins/furans analysis. The log describes "fused, glassy, sand material, coal-like fragments" in this interval.*

j. *EB-13, all samples: Add analysis for SVOCs and dioxins/furans to characterize the extents of pentachlorophenol and dioxins/furans in this area.*

k. *EB-19-1.5-4: Analyze this interval for all analyses identified in Table 3-2 of the Addendum.*

l. *EB-20, all samples: Add analyses for PAHs and PCBs to characterize impacts in this area.*

m. *EB-22, all samples: Add analysis for dioxins/furans to evaluate the extent of dioxins/furans detected in EMW-6S.*

n. *EB-25-2-4; EB-25-5.5-7.5; and EB-25-10.5-12.5: Add analysis for dioxins/furans. Anthropogenic materials were noted on the log for these intervals.*

o. *EB-27-2.5-4.5: Add analyses for metals, PAHs, SVOCs, and PCBs. Pentachlorophenol was detected above preliminary screening levels in well EMW-9S. Additional analyses will address data gaps in shallow soil in this area.*

p. *EB-30-2-4; EB-30-6-8; and EB-30-16.5-18.5 (well EMW-31D): Add analysis for dioxins/furans to evaluate the lateral extent of impacts in this area.*

q. *EB-31-12.5-14.5 (well EMW-32D): Run archived sample for all analyses. Logs note "petroleum odor" and "sulfur-like odor".*

r. *EB-31-18-20 (well EMW-32D): Run archived sample for all analyses to assess soil conditions in an area with limited data.*

s. *EB-34-3.5-5: Add dioxins/furans analysis. Log describes "coal debris" in this interval.*

t. *EB-34-8-10; EB-34-11-13; and EB-34-15-17: Add TPH and VOC analyses. Log describes "strong petroleum-like odor, rainbow sheen" in these intervals.*

u. *EB-35, all samples: Add analysis for metals, PAHs and PCBs to define lateral and vertical extent of contaminants in this area.*

v. *EB-42-3-5: Add dioxins/furans and metals analysis. Log notes "potential coal debris" and "paint chip flakes" in this interval.*

w. *EB-49, all samples: Add analysis for PCBs to define lateral and vertical extent of PCB impacts in this area.*

x. *EB-53-2-4; EB-53-5-7; and EB-53-8-10 (well EMW-30D): Add analyses for SVOCs, PCBs, and dioxins/furans to define extent of impacts in this area.*

y. *EB-55, all samples: The log notes "fire-brick-like debris" in the 0.5-3 foot depth interval, but a sample was not collected for dioxins/furans analysis. Analysis of dioxins/furans was omitted from all samples collected at EB-55 although it was listed for initial analysis in Table 3-2 of the Addendum. All samples from EB-55 (2-4', 5-7', 8-10') should be analyzed for dioxins/furans as specified in the Addendum.*

z. *EB-56, all samples: Add analysis for PCBs to define lateral and vertical extent of PCB impacts in this area.*

aa. *EMW-20D-2-4 and EMW-20D-4-7: Add dioxins/furans analysis. Log describes "burnt wood fragments" from 4.1-4.5 feet bgs (log "A").*

bb. *EMW-20D-10-11: Run archived sampled for dioxins/furans analysis. Log notes "black wood-like material". In addition, data may be used to evaluate the lateral extent of dioxins/furans concentrations detected in EB-45.*

cc. *EMW-21D-15-15.4 and EMW-21D-17-17.7: Run archived samples for metals and PCBs analyses to characterize impacts in this area.*

dd. *EMW-22D-2-4: Add dioxins/furan analysis. Log describes "wood fragments, burnt" at 0.2-1.2 feet bgs, but a sample was not collected. However, the two to four foot bgs interval sample was collected.*

ee. *EMW-22D-12.5-14.5: Add full suite of analyses performed for other EMW-22D samples (TPH, SVOCs, and PAHs). Log noted "petroleum-like odor, rainbow sheen" for 12.5-14.6 foot interval. Sample was initially submitted for archive.*

Review soil boring logs and draft contaminant concentration maps to identify additional samples collected during November/December 2014 that may be available for additional analyses that will define the lateral and vertical extents of Preliminary Contaminants of Concern (PCOCs).

Direct the laboratory to perform the above-listed analyses, in addition to any analyses identified by DeNovo's review of the soil boring logs and draft contaminant concentration maps. Data from these analyses must be validated to EPA Stage 2b and incorporated into the RI data set. If samples are outside holding times or no longer available in sufficient volume to perform these analyses, include plans to collect representative samples in the Revised Addendum.

27. The EB-34 boring log notes a "strong petroleum-like odor, rainbow sheen" from 10.2-20 feet bgs in description on first page, but on second page notes "no odor/sheen" at 18.1 feet bgs. The boring log is inconclusive regarding the presence of odor and sheen at the bottom of the boring (20 feet bgs). If odor and/or sheen were observed at the bottom of the boring, the boring should have been advanced to greater depth, and an additional deeper boring should be advanced at this location.

    Add at least one deep boring adjacent to EB-34 to sample shallow intervals (if needed to characterize TPH and VOCs, see comments above regarding additional analyses), the 18 to 20 feet bgs interval, and deeper intervals if field observations indicate the presence of PCOCs.

28. EMW-19D: The boring log describes a "silvery sheen on surface of standing water" for the 13.4-14.2 foot interval, but a sample was not collected. Samples were collected from 11-13 feet bgs and 15-17 feet bgs, but the "silvery sheen" was not noted in these intervals. In addition, the log notes a "petroleum-like odor and rainbow sheen" in the 21.5-31.8 foot interval, but no additional samples were collected for analysis (samples were collected at planned intervals of 18-20 feet, 26-28 feet and 38-40 feet).

    Add at least one boring adjacent to EMW-19D to sample the intervals described above, (13.4-14.2 feet bgs and 21.5-31.8 feet bgs) and others, if field observations indicate the presence of PCOCs. All samples should be analyzed for the full suite specified for EMW-19D samples (PAHs, PCBs, TPH).

29. EMW-22D: As indicated in the previous section, "wood fragments, burnt" were described in the log at 0.2-1.2 feet, but a sample was not collected.

    Add at least one boring adjacent to EMW-22D to sample the 0 to 1.5 foot interval for dioxins/furans analysis. Note that this boring may need to be extended to sample the 12.5-14.6 feet bgs interval for TPH, SVOCs, PAHs if the archived sample is not available for these analyses.

30. A moderate creosote odor and sheen was noted in boring IAB-37 from three to 24 feet bgs. Contamination was present in the samples from this boring. Well DMW-6 was replaced near this area. The well was drilled to a depth of 20 feet bgs and the sample from 18-20 was archived and not analyzed. Well DMW-6 was not drilled to a sufficient depth to collect samples to attempt to define the lateral and vertical extent of contamination at this location.

    Advance additional borings and a well in this area to characterize contamination in this area. Information on the extent of the contamination is required for completion of the

remedial investigation and selection of a cleanup action. If PCOCs are identified through field screening or analytical results in the new borings, additional "step-out" borings may be needed to characterize the vertical and lateral extent of impacts.

31. Locations for additional soil borings were selected to fill data gaps, including defining the nature and extent of contaminants at identified soil "hot spots" and in areas of the Site where limited or no analytical soil data are currently available. Other contaminants that are not depicted on the Addendum soil concentration maps and the January 2015 draft soil contaminant maps need to be considered for laboratory analysis. Recommended locations are shown on the enclosed figure.

    In addition to the borings identified in the following comments, DeNovo should review soil boring logs, all Site soil data, and draft contaminant concentration maps to identify the locations of additional soil borings needed to fully define the nature and extent of PCOCs. Particular attention is needed in areas with low sample density and in areas near and downgradient from areas where PCOCs are known or suspected to greatly exceed preliminary screening levels (i.e., "hot spots").

    Areas where potential "hot spots" were identified based on non-detects with elevated detection limits, such as for PCBs in the central portion of Parcel F, additional sampling and analysis is required to verify the presence of the PCOCs. Ensure that the analytical laboratory's PQLs are at or below the preliminary screening levels for each analyte.

32. The upper five to six feet of soil at the Site has not been characterized for PCOCs.

    In the Revised Addendum, develop a sampling plan to characterize the lateral and vertical extent of PCOCs within the upper 5 to 6 feet of soil across the Site. Information on the extent of contamination is required for completion of the remedial investigation, feasibility study, and selection of a cleanup action.

33. The lateral and vertical extent of PCBs is not defined along the western property line of Parcel F.

    Advance additional soil borings to characterize the extent of PCBs to the west of SS-5, FB-4 and EB-16. If PCOCs are identified through field screening or analytical results in the new borings, additional "step-out" borings may be needed to characterize the vertical and lateral extent of impacts.

34. The lateral and vertical extent of arsenic, PCBs, and PAHs is not defined in the central portion of Parcel F.

    Advance additional soil borings to characterize the extent of arsenic in the central portion of Parcel F, between previous borings SLR-3 and SLR-7, EB-17 and EB-14, and SB-3 and EMW-5SA. If PCOCs are identified through field screening or analytical results in the new borings, additional "step-out" borings may be needed to characterize the vertical and lateral extent of impacts.

35. The lateral extent of TPH and PAHs has not been characterized near EMW-7S.

    Advance additional soil borings near EMW-7S to characterize the lateral extent of TPH and PAHs at EMW-7S. If indications of TPH and/or PAHs are identified through field screening or analytical results in these borings (or in EB-20), additional "step-out" borings may be needed to characterize the vertical and lateral extent of impacts.

36. Site data are limited within the former Treated Pole Storage Area, the area to the north, and the area around boring EB-35 and EB-38. Additional data are needed to define the lateral and vertical extent of PCOC impacts in these areas.

    Advance additional soil borings within and to the north of these areas where previous data are limited and/or additional data are needed to define "hot spots." Soil samples should be analyzed for the full suite of PCOCs. If indications of PCOCs are identified through field screening or analytical results in the new borings, additional "step-out" borings may be needed to characterize the vertical and lateral extent of impacts.

37. The vertical extent of metals, PAHs, PCBs, and TPH has not been characterized in the former Creosote Tanks and Pole Dipping Tank areas and to the north of these areas (see Addendum figures associated with Cross-section I-I').

    Advance additional soil borings in this area to define the vertical extent of PCOC impacts in these areas. If PCOCs are identified through field screening or analytical results in the new borings, additional "step-out" borings may be needed to characterize the vertical extent of impacts.

38. The vertical and lateral extent of the "oily substance" previously identified in soil in the vicinity of the former Wood Treatment Facility has not been defined.

    Advance additional deep soil borings in addition to EB-36 and EB-42. Soil samples should be analyzed for the full suite of PCOCs. If PCOCs are identified through field screening or analytical results in the new borings, additional "step-out" borings may be needed to characterize the vertical and lateral extent of impacts.

39. The lateral and vertical extents of metals, PCBs, PAHs, and dioxins/furans have not been defined in the Interim Action area (see Addendum figures associated with cross-section D-D').

    Advance additional soil borings to characterize the extent of metals, PCBs, PAHs, and dioxins/furans detected in the central portion of the Interim Action area (northern portion of Parcel D). Additional analyses were also added to borings already located in the area. If PCOCs are identified through field screening or analytical results in the new borings, additional "step-out" borings may be needed to characterize the vertical and lateral extent of impacts.

40. The lateral and vertical extent of metals, PCBs, and PAHs is not defined in the former Pipe Manufacturing area, Sandblast area and near well EMW-11S.

Advance additional soil borings to characterize the extent of the PCOCs, including dioxins/furans, detected in this area to better define "hot spots" near well DMW-6 and borings EB-32 and EB-41. Additional borings are needed in the area between the former Pipe Manufacturing area and Sandblast area where soil samples have not been collected. If PCOCs are identified through field screening or analytical results in the new borings, additional "step-out" borings may be needed to characterize the vertical and lateral extent of impacts.

41. The lateral and vertical extent of metals, PCBs, and PAHs is not defined to the north and south of the former sawmill area.

    Advance additional soil borings to characterize the extent of PCOCs in this area, to the north of EB-11, near boring EB-28, and near boring EB-45. If PCOCs are identified through field screening or analytical results in the new borings, additional "step-out" borings may be needed to characterize the vertical and lateral extent of impacts.

42. The extent of PCOCs has not been defined along the Slip 4 shoreline near wells CMW-3, CMW-4, and CMW-5 and boring DB-7.

    Advance additional soil borings to characterize the extent of PCOCs in these areas. If PCOCs are identified through field screening or analytical results in the new borings, additional "step-out" borings may be needed to characterize the vertical and lateral extent of impacts.

43. The total metals concentrations in the soil samples submitted during the interim action for TCLP analysis (composite samples) were typically much lower than the total metals concentrations detected in discrete soil samples collected from interim action borings. For example, total arsenic was detected at a maximum concentration of 6,000 mg/kg in the interim action samples (as listed on Addendum Table 2-6), but the samples submitted for TCLP analysis had a maximum total arsenic concentration of 960 mg/kg (listed in the lab reports in Appendix G, but not tabulated). Total lead was detected at up to 3,700 mg/kg in interim action boring samples, but only at a maximum of 800 mg/kg in samples submitted for TCLP analysis. Although none of the samples submitted for TCLP metals analysis exceeded the respective dangerous waste criteria (for those analytes with such criteria), the samples submitted for TCLP do not appear to represent areas of greatest metals impacts.

    Additional TCLP metals analyses may be needed to characterize any waste soils generated at the site, and also to characterize the leaching potential of metals from highly contaminated soil at the Site.

44. The nature and extent of contaminants in groundwater have not been defined throughout the Site.

    Additional groundwater monitoring wells screened in the shallow (~20 feet bgs) and intermediate (~50 feet bgs) zones are required at the upgradient to cross-gradient perimeters of the Site to evaluate the nature of contaminants potentially migrating from offsite sources.

Shallow and intermediate groundwater monitoring wells are also required in the interior of the Site to define groundwater contaminant plumes within the Site boundaries.

The net groundwater flow direction in this tidally influenced aquifer has not been well defined. Therefore, the downgradient transport direction of groundwater plumes is considered approximate. Some recommended wells illustrated on the enclosed figure are located in the approximately downgradient direction from undefined or poorly defined groundwater contaminant plumes. Information on the proximity of the contaminant plume to the surface water is required for completion of the remedial investigation and selection of a cleanup action.

To evaluate the nature of contaminants potentially migrating onto the property, the following wells are required:

a. *Two additional shallow zone wells and one intermediate zone well are required near the property boundary with 8th Avenue S;*

b. *One additional shallow groundwater monitoring well is required adjacent to the western property boundary with Markey Machinery Company; and*

c. *Three additional shallow groundwater monitoring wells are required near the property boundary with S. Garden Street.*

To define groundwater contaminant plumes in the interior area of the Site, the following wells are required:

d. *One intermediate well near well EMW-5SA to evaluate PCOC concentrations in the intermediate groundwater zone;*

e. *One shallow zone well in the area north of the former Treated Pole Storage area (where groundwater data have not been collected previously);*

f. *One intermediate zone well near existing well EMW-9S to evaluate PCOC concentrations in this zone;*

g. *Two wells (shallow- and intermediate-zone pair) downgradient of borings IAB-19 and IAB-20 to evaluate metals in groundwater;*

h. *Two wells (shallow- and intermediate-zone pair) to replace abandoned well HC-19 to evaluate all PCOCs;*

i.

j. *One shallow zone well downgradient of wells DMW3/EMW-10D/EMW-19D to evaluate metals, PAHs, and TPH concentrations.*

To define PCOC contaminant plumes within 100 to 150 feet of the shoreline of the Site, five paired shallow and intermediate zone wells (10 wells total) are required upgradient or inland of the following wells:

- *CMW-7/EMW-16D and EMW-13S/EMW-21D;*
- *CMW-6/EMW-14D;*
- *CMW-5/EMW-30D;*
- *CMW-4/EMW-20D; and*
- *CMW-3/EMW-31D.*

Soil samples must be collected from all well borings to further delineate the lateral and vertical extent of contaminants in soil. Well locations shown on the enclosed figure were placed to address data gaps in the soil and groundwater data sets.

In the Revised Addendum, show proposed groundwater monitoring wells on the maps that present the contaminant groundwater plumes. Identify all existing and proposed shallow, intermediate, and deep wells with symbols unique to the zones in which the wells are screened, rather than using a symbol that identifies the date the well was installed.

All wells must be added to the quarterly groundwater monitoring program and analyzed for the full suite of PCOCs as part of the RI. The full-suite of analytes should be maintained for any additional wells that are installed and sampled during the required quarters of groundwater monitoring. Upon approval from Ecology, some chemical classes may be eliminated from the analyses performed from individual wells based on detection frequencies established during the first two quarterly monitoring events. This will be considered on a well-by-well basis.

In addition and not shown on the enclosed draft figure, wells in the wood treating area near 10D may be required and screened in the contaminated soil zone(s).

45. The arsenic and selenium analyses of groundwater in the shoreline wells were rejected by data validators in some samples. Data from the October 2014 sampling event were rejected. Because only the dissolved data are available, two complete full-suite data sets are not available.

    Include a discussion of this issue in the text about the technical quality of the data set, and in the groundwater section. Include a plan to address this issue including collection of additional groundwater samples, additional wells in alternate locations, or other methods to assure the collection of appropriate data for these chemicals in the shoreline area.

46. Groundwater data for arsenic indicate exceedances of screening levels in the 50-foot deep wells and the shallow zone wells in the shoreline area. This indicates that contaminated groundwater may be entering the surface water below the sheet pile wall.

    Include a discussion of the shallow and deep well data and the indications for all potential ongoing contaminant releases to the LDW. Propose additional wells where needed to further assess the movement of contaminated groundwater into the surface water.

47. The groundwater maps provided show diesel range organics on Figure 2-16 and residual range organics on Figure 2-17.

    Unless the specific nature of the petroleum material is known, revise the groundwater maps to show the combined diesel and residual range organics information. Show the proposed well locations on the maps so that the proposed locations can be evaluated in relation to the estimated contaminant plume(s).

48. The deeper wells (screened to ~80 feet bgs) proposed in the Addendum need a unique designation to distinguish them from the deep (now intermediate) wells screened at ~40-50 feet bgs (e.g., "DD" instead of "D"). DeNovo indicates that deeper wells will be set at 80 feet bgs, or at the bottom of the saturated unit, but they do not identify how the "bottom of the saturated unit" would be defined or identified in the field.

    In the Revised Addendum, include the criteria for determining the depth to set wells for installation of the deeper groundwater monitoring wells. Add rationale for why these wells are necessary and their selected screen depths. Is there a known aquitard at this approximate depth? If the aquitard depth is unknown, it could be stated, for example, that the deeper wells will be set above the first significant aquitard layer below the intermediate zone, or at a maximum depth of 80 feet, whichever is encountered first.

49. The proposed tidal study includes a limited number of wells along the shoreline, a few wells near the western boundary of the Site, two wells in the northern portion of the Site, and only one well (EMW-5Sa) in the interior of the Site.

    If one of the goals of the tidal survey is to identify groundwater flow at different tidal stages, and to identify net groundwater flow, then additional wells will need to be included in the interior of the Site. The previous tidal study (by SLR) produced questionable groundwater flow directions near the seawall, due to a lack of data points. The text of Section 3.7 states that the wells to be used in the tidal study are shown in Figure 2-1. However, the proposed wells are not so indicated on this figure.

    The well network should include additional shallow wells along the shoreline and the sheet pile seawall (such as EMW-13S, CMW-6, CMW-5, CMW-3, CMW-2, EMW-3S, and proposed new wells along 8th Avenue S) and additional intermediate wells (EMW-14D, EMW-30D, EMW-31D, and EMW-32D), plus any new intermediate/deep wells that are installed down-gradient from the former wood treatment facility and along 8th Avenue S.

    Results of the tidal study should be used to evaluate groundwater flow gradients, tidal amplitudes, and lag times between various wells. In addition to water levels, field measurements of salinity (or specific conductance) should be made in the wells during at least all low and high tidal levels. This will aid in interpretation of how far seawater intrusion affects the site during tidal cycles, and will distinguish between simply a pressure wave transmitted through the aquifer versus actual LDW/Slip 4 water entering the aquifer at high tidal periods.

50. The Addendum did not include a discussion of Site salinity nor provide maps showing where the groundwater may be affected by marine surface water interaction.

    Include a discussion of the salinity data and provide maps showing the salinity in the groundwater at the site with the available data. If additional data and/or wells are indicated to characterize the interaction between the groundwater and surface water, propose additional well locations to address data gaps.

51. The draft SAP Addendum proposes to collect surface sediment samples in Slip 4. No subsurface core samples are proposed. The recent sediment cleanup on the Boeing Plant 2 property in Slip 4 identified subsurface PCB contamination which may also be present on the DeNovo Slip 4 property.

    Subsurface sediment samples should be collected near the mouth of Slip 4 and adjacent to the recent Boeing Plant 2 cleanup area; a minimum of five sediment cores should be collected and analyzed for sediment SQS including PCBs to determine if contamination is present below the surface sampling interval. Sufficient samples should be collected to characterize the extent of the subsurface sediment contamination in this area.

52. Stormwater discharges from the six outfalls on the property are a potential source of contaminants to Slip 4. Phase 2 sediment sample locations should characterize sediments near the six outfalls; in general, surface sediment samples should be located within approximately 50 feet of outfalls less than 24 inches in diameter, and within approximately 100 feet of outfalls that are 24 inches or greater.

    Based on previous sampling conducted in Slip 4, and the proposed Phase 2 sediment sampling locations provided in the draft SAP, additional sampling will be required near Outfalls OF1, OF2, and OF4 to evaluate potential sediment contamination associated with current and historical discharges from these outfalls.

53. The draft SAP proposes to collect surface and subsurface sediment samples near the southwestern corner of the site to characterize the extent of a historical sandblast grit dumping site. These samples were collected in December 2014. Preliminary results indicate the presence of PCBs, HPAHs, and LPAHs in subsurface sediments at concentrations above the benthic lowest apparent effects threshold (LAET) and second lowest apparent effects threshold (2LAET) in this area, both downstream and upstream of the approximate dumping location. In addition, total dioxins/furans TEQ above the 25 ng/kg Remedial Action Level (RAL) was found in two locations on the downstream side of the former sandblast grit area.

    Additional characterization of the area potentially affected by sandblast material is needed. The dioxins/furans and PAHs detected in the Phase 2 sediment samples may be associated with this material, which may have migrated downstream from its original location. A minimum of three additional surface and subsurface sediment samples should be collected downstream of the December 2014 sample locations to delineate the downstream extent of contamination. In addition, subsurface sediment samples should be collected at locations SSED-09 and SSED-17A, since the Phase 2 subsurface sample collected between these two locations contained PAHs, PCBs, and phthalates at concentrations above the LAET.

Samples should be analyzed for PCBs, dioxins/furans, SVOCs, metals, TOC, and grain size. Additional samples should be collected as needed to fully delineate the extent of contamination in this area including the intertidal and/or bank area.

54. The October 2012 Work Plan called for two rounds of storm drain (catch basin) solids sampling. The first round of samples was collected in June 2013. Each of the active catch basins on Parcel D was subsequently cleaned. During the second round of storm drain solids sampling in February 2014, only two structures contained enough solid material to sample. The draft SAP Addendum does not propose any additional catch basin solids sampling.

    Since the collection of storm drain solids samples in June 2013 and February 2014, land use at the facility has changed; the Phase 1 storm drain solids data no longer represent current activities at the site. All catch basins on the site (including both Parcels D and F) should be resampled to assess the likelihood that contaminants are being transported to the LDW via the stormwater pathway.

    In addition, the samples collected previously had excessively high reporting limits; analytical methods should be selected to ensure that reporting limits are below the relevant screening levels, per the preliminary screening levels presented in Section 2.1.

    NOTE: Section 2.1 should include screening levels for storm drain solids and stormwater, based on sediment and surface water criteria.

    In addition to the suite of analytes selected for Phase 1, at least one sample from each storm drain line should be analyzed for dioxins/furans as part of the Phase 2 storm drain solids sampling. Where possible, structures selected for dioxins/furans sampling should be near locations where dioxins/furans are elevated in soil.

55. The October 2012 Work Plan called for five stormwater monitoring events. Two events were completed as part the Phase 1 investigation, prior to the land use change. The Addendum proposed only one stormwater outfall sampling event.

    Phase 2 stormwater sampling should include additional stormwater monitoring events per the October 2012 Work Plan. As stated above, land use at the facility has changed. Therefore, the Phase 1 stormwater samples are not representative of current activities at the site. A minimum of three rounds of stormwater monitoring is needed to adequately characterize the potential for transport of Site contaminants to the LDW.

56. A summary of data quality has not been provided for the Site data set. A plan for establishing a Site data set to be used for the RI has not been determined to assure that the appropriate data quality is achieved.

    The Site data set consists of older data collected for property transfer purposes with missing information such as detection limits, and more current data with variable technical quality, such as practical quantitation limits (PQLs). Include in the Revised Addendum a discussion of the technical quality status of the site data set and summary of data quality and validation

information, including issues with the data set and discussion of sampling and/or laboratory issues which could bias data. Discuss a rationale for how site data will be used in the RI.

57. The Addendum was prepared using unvalidated Phase 1 data. The entire data set, including data collected in November and December 2014, requires evaluation using the appropriate process to adequately determine site potential contaminants of concern (PCOCs). Because this evaluation is not complete, all appropriate maps of PCOCs may not have been included for consideration in the Addendum to assure that all Site contaminants were being addressed.

    Once an appropriate process to assess usability of Site data and applicability of historical data is established, the process for determining site PCOCs should be conducted. Contaminant maps to be included in the Revised Addendum can then be determined through coordination with Ecology.

58. Data validation was performed under Stage 2A guidelines by Laboratory Data Consultants (LDC) for the samples collected during the Phase 1 RI activities and under Stage 2B guidelines for the samples collected during the Interim Action activities.

    Summary-level (EPA Stage 2b) data validation should be performed for all standard chemistry. A full-level (EPA Stage 4) data validation should be performed for dioxins/furans. Compliance-level (EPA Stage 2a) screening, including a comparison of detected results to associated sample concentrations, should be performed for all rinse blank, trip blank, and waste characterization samples. As part of the validation process, 100 percent of field sample results and 10 percent of QC results in the EDD should be verified against the data package.

59. Data tables in the Addendum were prepared with preliminary data.

    Text, tables and figures in the Revised Addendum should show only the accepted and validated sample results, including data qualifiers as assigned by LDC or other third-party validators.

60. Several data validation reports for the interim action data set indicate that sample hold times were missed by several days to several weeks. As shown in Appendix C on pages 105 and 121, polynuclear aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) were extracted more than three weeks after the end of the 14-day holding time window. Due to soil reactivity outside the holding time "window", soil analytical results may be impacted by this deviation. The data validation reports address this issue by qualifying associated data points as estimated (including non-detect results), but these qualifiers have not been updated in the data tables, and do not address overall data usability.

    Update the data tables and add a discussion in the Addendum of the number of sample results qualified due to exceeding the holding time criteria identified in the method(s), and the implications for project data use.

61. The data validation reports from LDC for the interim action data do not appear to be using Spike Recovery Criteria (%R) acceptance criteria established by the laboratory for

LCS/LCSD and/or MS/MSD samples. The results were evaluated against a 50-150 %R window, and LDC qualifies and rejects data based on this alternate acceptance criteria. For example, in SDG 250-20167-1 the data were "J" qualified as estimated by LDC for MS/MSD recoveries outside the acceptance criteria (e.g. lead, barium, silver), shown on Appendix C, PDF page 48. These J-qualifiers are not presented on the data tables. See PDF page 15; e.g., the metals results for lead and barium are not J-qualified for IAB-02-3-5 and IAB-02-5-7).

Explain the reasons for the recovery criteria issues noted here. Explain if it was due to more stringent site-specific acceptance criteria that are identified in a previous work plan or QAPP/SAP, approved by Ecology. Update the data tables with any qualifiers added by the data validation process.

62. Low-level blank contamination was noted as an issue in some samples in the interim action data set. In SDG 250-20167-1 and 250-20212-1, data were qualified as non-detect by LDC due to low-level metals, such as antimony and selenium concentrations in method blank(s) shown on Appendix C page 47-48 and 133-134. These non-detect qualifiers, such as antimony and selenium in IAB-02-3-5 and IAB-02-5-7 shown on page 15, are not presented on the data tables. The metals results for these samples are still shown as detected concentrations.

    Revise the data tables and figures to show the qualifiers, and include in the discussion of the technical quality of the data the effect of the low level blank contamination on the site data set.

63. Discrepancies were noted between the data validation reports and laboratory reports for the interim action data. The data tables and data validation reports appear to be created from preliminary results are not consistent with the final laboratory reports. Examples are:

    a. In SDG 250-20167-2 and 250-2012-2, the data were qualified for individual volatiles in this data validation report, beginning on Appendix C, page 65 and page 160, including volatile compounds that do not appear to be reported in the corresponding final laboratory analytical report. For example, acrolein and vinyl acetate are mentioned in the data validation report, but are not reported in the final laboratory report. The data validation report has filename "_RV1", report dated November 3, 2014, and the TestAmerica report is dated August 5, 2014, on the cover page. This indicates that a change in analyte lists possibly occurred between the preliminary laboratory report and the final laboratory report, indicating that the preliminary laboratory report may have been used for the data validation, rather than the final report. Acrolein and vinyl acetate are reported in the data tables with the other volatile organic compounds (VOCs).

    b. Similar discrepancies were noted when comparing the semivolatile organic compounds (SVOCs) data validation report containing results for benzoic acid (see Appendix C PDF page 83) to the final laboratory analytical report where benzoic acid does not appear in the list of reported analytes for SVOCs. Also noted in this report: the range of acceptable %R for LCS/CLSD and MS/MSD analyses was based on an "advisory" (likely the QAPP/SAP or work plan approved by Ecology) and not based

on the acceptable ranges published in the QA/QC section of the laboratory analytical report for the individual analytes.

Explain the reason for the discrepancy, such as if LDC did not receive the final laboratory reports, or did not look for changes in the analyte lists before submitting their revised data validation report.

64. The rejected data in the interim action data set were assessed with some discrepancies noted. On Appendix C, page 178, the R-qualifier was applied by LDC to benzoic acid results associated with laboratory results that are not reported in the final laboratory report for SDG 250-2012-2. The 2,4-dinitrophenol data are rejected due to no recovery in MS/MSD samples. "R" data is not accurately shown in the associated data table (though in this case the result is non-detect, and to apply the "R" qualifier in the table is essentially inconsequential). Additional issues in the remaining rejected data are as follows:

    a. In SDG 250-20213-2, as explained in the case narrative of the laboratory analytical report, the sample was run at a dilution and both results were reported in the laboratory report from TestAmerica. R-qualifiers from LDC on Appendix C, page 255, appear to be data points rejected because more than one result is reported for the sample IAB-19-5-7, original results and dilution results. The data tables report both results for IAB-19-5-7 in the table, see PDF page 187.

    b. In SDG 250-20238-1, the "R" qualifier was applied by LDC to benzoic acid results due to low MS recoveries. Also, benzoic acid may not be reported in the final laboratory report, similar to SDG 250-2012-2.

    c. In SDG 250-20238-1, Appendix C, page 398, the R-qualifier was assigned to samples with two reported results, the original analysis plus dilution analysis.

    d. In SDG 250-20267-2, Appendix C, page 511, the R-qualifier was assigned to samples with two reported results, the original analysis plus dilution analysis.

    Revise the data tables and figures to show only accepted and validated results. Include in the discussion of the technical quality of the data that results rejected through data validation are eliminated from the site data set. Explain if the MS/MSD and/or LCS/LCSD results may have been reported outside the laboratory acceptance criteria or outside the site-specific acceptance criteria (more stringent acceptance criteria) and thereby given an R-qualifier by LDC.

65. The PQLs for the dioxins OCDF and OCDD in the Addendum are 10 ng/kg, but were 5 ng/kg in the 2012 work plan. PQLs for other dioxins/furans are the same or lower than the 2012 work plan.

    OCDF and OCDD should be reported to the lower PQL, as presented in the 2012 work plan.

66. A PQL for selenium is listed for soil analysis, but not for groundwater analysis.

    Provide a PQL for selenium for groundwater analysis.

Ecology appreciates your work toward completion of the Phase 2 RI and looks forward to working with you to complete the RI through the Revised Addendum and prepare a Draft RI Report. Please contact me at vsut461@ecy.wa.gov or (425) 649-7219 if you have any questions or would like to discuss this review.

Sincerely,

Victoria Sutton

Victoria Sutton
Hydrogeologist
Toxics Cleanup Program

Enclosures

By Certified Mail [7011 0470 0003 3682 6527]

cc: Stephen Wilson, Crowley Maritime Corp.