100% Remedial Design Basis of Design Report

Appendix C
Clean Water Act Sections 401/404 and Rivers and Harbors Act Section 10 Substantive Compliance Report

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Attachment C.1 Lower Duwamish Waterway Upper Reach RAA 27 (SMA 5 and 6) Wetland Evaluation

ABBREVIATIONS

ARAR	Applicable and Relevant or Appropriate Requirement
BA	*Biological Assessment*
BMP	best management practice
BODR	*Basis of Design Report*
CFR	Code of Federal Regulations
cm	centimeter
COC	contaminant of concern
contractor	Remedial Action Contractor
CWA	Clean Water Act
DER	Data Evaluation Report
DO	dissolved oxygen
DPS	distinct population segment
DSAY	discounted-service-acre-year
ENR	enhanced natural recovery
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESD	*Explanation of Significant Differences*
FNC	federal navigation channel
HEA	Habitat Equivalency Analysis
Habitat Evaluation Addendum	*Lower Duwamish Waterway Upper Reach Biological Assessment – Habitat Evaluation Update Addendum*
LDW	Lower Duwamish Waterway
MHHW	mean higher high water
MLLW	mean lower low water
MNR	monitored natural recovery
NMFS	National Marine Fisheries Service
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
RAA	remedial action area
RAL	remedial action level
RAWP	Remedial Action Work Plan
RD	remedial design
RHA	Rivers and Harbors Act
RM	river mile
RMC	residuals management cover
ROD	*Record of Decision*

SCO	sediment cleanup objective
SMA	sediment management area
U&A	Usual and Accustomed
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WQMP	*Water Quality Monitoring Plan*

1 Introduction and Background

This document presents a Clean Water Act (CWA) Sections 401/404 and Rivers and Harbors Act (RHA) Section 10 substantive compliance analysis for the proposed cleanup remedy for the upper reach of the Lower Duwamish Waterway (LDW) Superfund Site in King County, Washington. The LDW Superfund Site has been divided into three reaches (lower, middle, and upper) that are each undergoing remedial design (RD) on different timelines, with the upper reach being the first reach for which RD is being performed. The upper reach encompasses river miles (RMs) 3.0 to 5.0 of the LDW (Figures C1-1 and C1-2). This document represents an "equivalency analysis" that can be used by the U.S. Environmental Protection Agency (EPA) to document its substantive compliance with the CWA Sections 401/404 and RHA Section 10 Applicable and Relevant or Appropriate Requirements (ARARs). This document is prepared as a supplement to the 100% RD *Basis of Design Report* (BODR) for the LDW upper reach, which includes a detailed description of the proposed cleanup remedy.

The proposed cleanup remedy has been designed consistent with the EPA-approved *Remedial Design Work Plan for the Lower Duwamish Waterway Upper Reach* (Anchor QEA and Windward 2019) and the EPA's November 2014 *Record of Decision* (ROD; EPA 2014) as modified by an *Explanation of Significant Differences* (ESD; EPA 2021). The selected remedy for cleanup of the LDW is described in Section 13 of the ROD and as modified in the ESD. The selected cleanup remedy addresses unacceptable human health risks associated with consumption of resident fish and shellfish and with direct contact (skin contact and incidental ingestion of sediment) from net fishing, clamming, and beach play. It also addresses ecological risks to bottom-dwelling organisms (benthic invertebrates), fish, and wildlife.

Compliance with CWA Section 401 is demonstrated in the *Water Quality Monitoring Plan* (WQMP) prepared as Appendix A of the *Construction Quality Assurance Plan* (100% RD Volume II, Part I) as well as the *Water Quality Effects Evaluation* (BODR Appendix M). Implementation of water quality monitoring during construction to track compliance with Washington State water quality standards will provide information to inform actions needed to avoid or minimize water quality impacts and will satisfy substantive compliance requirements with the CWA, as amended, and applicable state laws.

The CWA Section 404(b)(1) requires an evaluation of alternatives to determine if the proposed project is water-dependent and the least environmentally damaging and practicable alternative. The project includes an RD intended to clean up contaminated sediment within a commercial waterway. The project requires access and proximity to the LDW to implement the RD and is thereby "water-dependent" per the Title 40 of Code of Federal Regulations (CFR), Section 230.10. Alternatives must consider measures to avoid, minimize, or mitigate for adverse impacts to the aquatic environment. Best management practices (BMPs) and conservation measures incorporated into the project to avoid and minimize potential adverse impacts to the aquatic environment are described in relevant sections of this document. Measures incorporated into the project to avoid and minimize

potential impacts to Endangered Species Act (ESA)-listed species and critical habitat are described in more detail in the *Biological Assessment* (BA) prepared for the project (BODR Appendix E).

1.1 Purpose and Need

The proposed cleanup remedy (i.e., the remedial action for upper reach) is needed to address contamination at the LDW Superfund Site as required by and consistent with the remedial action defined in the ROD (EPA 2014) and ESD (EPA 2021). The primary contaminants exceeding remedial action levels (RALs) in the upper reach are polychlorinated biphenyls (PCBs). Other contaminants that determine the RAL cleanup areas include metals, polycyclic aromatic hydrocarbons (PAHs), phthalates, other semivolatile organic compounds (e.g. benzoic acid and phenol), and dioxins/furans, depending on the area (Anchor QEA and Windward 2022; BODR Appendix A). The remedy will address unacceptable human health risks associated with consumption of resident fish and shellfish and with direct contact (skin contact and incidental ingestion) from net fishing, clamming, and recreational beach uses. The project also addresses ecological risks to bottom-dwelling organisms (benthic invertebrates), fish, and wildlife. The selected remedy includes active remediation and natural recovery to achieve remedial action objectives. There will be long-term monitoring to assess the success of the remedy in achieving cleanup levels.

2 Proposed Alternatives

2.1 Alternative 1: No Action Alternative

The No Action Alternative is intended to provide one or more alternatives that would not involve a discharge within waters of the United States. The No Action Alternative provides a baseline against which project effects from the build alternatives can be compared. It can also be used to determine if there is a more reasonable alternative that does not impact waters of the United States.

The No Action Alternative would leave the upper reach of the LDW in its current state with contaminated sediment exposed and biologically available. Under the No Action Alternative, this contamination would continue to impact habitats, species, and human health.

The No Action Alternative does not meet the project purpose and need criteria as follows:

- No Action would not remediate impacted sediments to reduce ecological and human health risks to acceptable levels.
- Although the No Action Alternative would remain consistent with the current maritime and industrial uses of the LDW and cause no temporary disruption of these activities, the presence of contaminated sediments may impact the ability to conduct future maintenance dredging activities, impacting future maritime and industrial uses of the waterway.

2.2 Alternative 2: Proposed Action

As discussed in Section 1, the proposed action is the selected remedy for cleanup of the LDW as described in Section 13 of the ROD and modified in the ESD (EPA 2014, 2021). The remedial actions and technologies described in the Final (100%) RD BODR are compliant with the ROD and were designed consistent with the EPA-approved *Remedial Design Work Plan for the Lower Duwamish Waterway Upper Reach* (Anchor QEA and Windward 2019) with EPA review and comments at each remedial RD phase at 30%, 60% and 90% RD.

2.2.1 Proposed Action Description

The Data Evaluation Report (DER) for the LDW upper reach (Anchor QEA and Windward 2022) identified areas of sediment quality that exceeded ROD-defined RALs. The RAL exceedance areas were developed into remedial action areas (RAAs) during Preliminary (30%) RD and further refined during subsequent design stages (60%, 90%, and 100%). The RAAs have a larger footprint than the RAL exceedance areas and encompass the RAL exceedance areas to account for engineering and constructability considerations. The technologies that will be used to remediate each RAA are based

on ROD criteria with subsequent refinements. The remedial technologies selected for cleanup include a combination of the following:

- **Dredging:** Mechanical dredging will be the primary dredging method to remove contaminated sediments from the RAAs within and outside of the federal navigation channel (FNC). It will ultimately be up to the selected Remedial Action Contractor (contractor) to determine the specific dredging method(s) to be used during construction. Hydraulic dredging is unlikely to be used except potentially in small areas within difficult-to-access locations outside of the FNC (e.g., underpier areas).
- **Partial Dredge and Capping:** This includes placing an engineered cap in dredge areas where the dredge prism does not remove the full vertical extent of RAL exceedances. The engineered cap is designed to remain stable against erosive forces and isolate the buried contaminants. The top of the engineered cap must be at least 4 feet below the FNC authorized depth when a cap is located within the FNC.
- **Enhanced Natural Recovery (ENR):** This includes placing a thin layer (nominal 6 to 12 inches) of clean imported material (sands and gravels) in areas that meet the criteria for ENR.
- **Backfill Placement:** This includes placing clean backfill imported materials (sands and gravels) to return habitat areas that are dredged (i.e., areas with elevation of -10 feet mean lower low water [MLLW] or higher) back to their pre-remedial action elevations.
- **Location-Specific Cleanup Technologies**: This technology, which involves placing an amended (using activated carbon) cover material, would be applied to contaminated sediment in underpier areas or areas with structural or access restrictions or offsets (e.g., in the vicinity of dolphins/pilings, structures, and riprapped or engineered banks)
- **Residuals Management Cover (RMC):** This includes placing RMC, which is clean imported sands, over the dredge footprints and additional dredge area perimeter to address potential residual contamination from dredging induced suspended sediment so that the post-construction surface concentrations are less than the surface RAL concentration.
- **Monitored Natural Recovery (MNR):** This includes monitoring natural recovery of these areas to demonstrate that they meet the cleanup objectives over time.
  - **MNR to Benthic Sediment Cleanup Objectives (SCOs):** Surface sediment contaminant concentrations are greater than benthic SCOs but below RALs.
  - **MNR Below Benthic SCOs:** Surface sediment contaminant concentrations are below RALs and benthic SCOs but greater than human health-based cleanup levels.

Dredged sediment and debris materials will require in-water transport by barge to a transloading facility, barge offloading, upland transport by rail or trucks, and disposal at a permitted commercial landfill. Clean material used for cap, ENR, backfill, amended cover, and RMC placement will also require barge transport to the upper reach for placement within applicable RAAs. MNR is included as

part of the remedy and requires long-term monitoring of specific areas to assess improvements in sediment quality rather than active remediation.

The proposed action described in this section is consistent with what was described in the BA (BODR Appendix E). The BA was based on Intermediate (60%) RD plus significant contingency acreages added to ensure that the BA evaluation captured the maximum potential impacts during remedial action. The Final (100%) RD overall acreages and impacts are less than what was assumed for the BA. For example, Table C2-1 below compares key acreages of impact assumed in the BA versus the actual Final (100%) RD acreages.

Table C2-1
Comparison of Acreages from BA Versus 100% RD

Project Element	Acreage of Impacted Areas from BA (60% RD plus contingency)	Acreage of Impacted Areas from 100% RD
Dredging (and backfill/RMC)	13.6	12.1
Partial dredging and engineered cap	1.6	2.5
ENR/amended cover/perimeter RMC	12.9	8.0
Total	**28.1**	**22.6**

Notes:
BA: *Biological Assessment*
ENR: enhanced natural recovery
RD: remedial design
RMC: residuals management cover

For the 401/404 substantive compliance evaluation, this document also uses the same conservative assumptions for impacted areas as the BA used to avoid confusion between the two documents. Because of this approach, please note that included tables and metrics reference the Intermediate (60%) RD plus contingency, but as noted previously, the Intermediate (60%) RD plus contingency results in a larger impacted area than Final (100%) RD.

Table C2-2, which was presented in the BA, summarizes the approximate area of impact by type of activity.

Table C2-2
Summary of Area of Impact for Dredging and Material Placement Activities

Habitat Type	Area of Impact – Dredging or Excavation and Material Placement[1] (acres)	Contingency[2] Area of Impact – Dredging or Excavation and Material Placement (acres)	Area of Impact – Partial Dredging and Engineered Cap (acres)	Contingency[2] Area of Impact – Partial Dredging and Engineered Cap (acres)	Area of Impact – Material Placement[3] (acres)	Contingency[2] Area of Impact – Material Placement (acres)	Total Area of Impact (including contingency) (acres)
Riparian (higher than +11.3 feet MLLW)	0.004	0.001	0.3	0	0.2	0.1	0.6
Intertidal (-4 to +11.3 feet MLLW)	4.2	0.6	0.1	0	2.9	1.9	9.7
Shallow Subtidal (-10 to -4 feet MLLW)	1.3	0	0	0.22	1.8	1.1	4.4
Deep Subtidal (deeper than -10 feet MLLW)	6.3	1.2	1.0	0	3.0	1.9	13.4
Total	11.8	1.8	1.4	0.22	7.9	5.0	28.1

Notes:

1. Each dredging and material placement area will be covered with either RMC (5.2 acres [plus 0.7 acre of contingency]) or backfill material (6.6 acres [plus 1.1 acres of contingency]) after dredging is complete; therefore, dredging and material placement is combined in these areas to avoid double counting area of impact. Partial dredging and engineered cap areas receive an engineered cap after dredging. The total dredging area is equal to the dredging and material placement area plus the partial dredging and engineered cap area (13.2 acres [plus 2.0 acres of contingency]).
2. Contingency areas were estimated to account for the potential that the RAA boundaries may be revised during Pre-Final (90%) and Final (100%) RD based on new Phase III PDI data.
3. Material placement includes placement of ENR material over 0.41 acre, amended cover over 0.12 acre, and 7.4 acres of RMC outside of the dredge area in the inner dredge perimeter that automatically receives RMC and the outer dredge perimeter that may receive RMC depending on the results of post-dredge confirmation sampling. For area of impact, it is assumed that 25% of the outer perimeter will require RMC. Contingency material placement includes placement of ENR material over 0.21 acre, amended cover over 0.06 acre, and 4.7 acres of RMC outside of the dredge area in the inner dredge perimeter that automatically receives RMC and the outer dredge perimeter that may receive RMC depending on the results of post-dredge confirmation sampling. For contingency area of impact, it is assumed that 100% of the outer dredge perimeter will require RMC.

ENR: enhanced natural recovery
MLLW: mean lower low water
PDI: pre-design investigation
RAA: remedial action area
RD: remedial design
RMC: residuals management cover

2.2.2 Summary of Remedial Activities

As noted previously, conservative assumptions used in the BA (BODR Appendix E) assumed that approximately 28.1 acres of the upper reach could be impacted by remedial activities, including dredging, engineered capping, and placement of backfill, RMC, ENR, and amended cover materials. Additionally, up to thirty 10-inch timber piles are planned to be removed, and up to two 14-inch steel pipe piles are planned to be installed as replacements. Fifteen of the 10-inch timber piles that are planned to be removed are assumed to be creosote-treated. This number is based on structural engineering review of the piles to be removed. This results in a net gain of 14.22 square feet of intertidal habitat from the permanent decrease in pile areal coverage. Approximately 10 temporary piles may be installed during construction to support safe moorage in deep subtidal areas outside of the FNC. These are temporary impacts and will not contribute to a permanent change in aquatic habitat coverage.

The reinforcement of an existing bulkhead wall results in a loss of 240 square feet of intertidal habitat. 0.05 acre (2,160 square feet) of bank protection is expected to be permanently placed at outfalls to protect the remediated bank from erosion. Finally, there will be 665 square feet of habitat gain due to a slight flattening of the bank slope at RAA 27 (i.e., the portion of RAA 27 referred to as Sediment Management Area [SMA] 5). These impacted areas will all be within areas of dredging and/or material placement, so they will not be new areas of construction impact. Overall, approximately 3,051 square feet (net) will be impacted by in-water structure modifications. This includes a resulting net increase of approximately 425 square feet of aquatic habitat compared to existing conditions (i.e., 240 square feet loss of intertidal habitat at the bulkhead area and 665 square feet gain of habitat due to the flattening of the bank slope at SMA 5). After the remedial action is completed within the upper reach, as-built drawings will be prepared that will document the final habitat impact acreages. This information will be used to update the Habitat Equivalency Analysis (HEA) calculation prepared for the BA (BODR Appendix E) for use in evaluating the overall LDW habitat impacts.

Consideration of both the National Marine Fisheries Service (NMFS) Puget Sound Nearshore Conservation Calculator calculations and the semi-quantitative evaluation of sediment remediation areas shows that conservation offsets (i.e., mitigation) are not expected for the upper reach of the LDW. The habitat evaluation that was completed for the BA, and updated by the *Lower Duwamish Waterway Upper Reach Biological Assessment – Habitat Evaluation Addendum* (Habitat Evaluation Addendum; Attachment E.8 to the BA) submitted to EPA in November 2023, resulted in a net positive 0.11 discounted-service-acre-years (DSAYs) of project-related habitat benefit and net improvement of nearshore habitat functions and values to ESA-listed species and their designated critical habitat related to the project. The net positive DSAYs are for the upper reach alone, and actual DSAYs will be reassessed after upper reach remedial actions are completed. Full details of the HEA evaluation are

included in the *Habitat Evaluation*, Attachment E.6 to the BA, as well as the Habitat Evaluation Addendum.

2.2.3 Proposed Action Timing

Project construction for the upper reach remedial action is expected to begin in fall 2024 and require three construction seasons (2024 to 2025, 2025 to 2026, and 2026 to 2027) to complete. In-water construction activities will occur during in-water work window designated for the LDW (to be determined by EPA in consultation with NMFS and the U.S. Fish and Wildlife Service (USFWS) but anticipated to be from approximately October 1 to February 15, or an approved extension) that are set to protect migrating juvenile salmonid species and Washington Department of Fish and Wildlife (WDFW) priority species.

2.2.4 Proposed Action Project Area and Existing Conditions

The setting of the LDW is heavily industrialized over most of its length, and the river shoreline is significantly modified throughout most of its length—especially within the first 6 miles upstream from the mouth of the LDW (at Elliott Bay), due primarily to the existence of the FNC. The upper reach of the LDW has more mixed shorelines conditions, with commercial, industrial, residential, and natural shorelines. The Duwamish River was historically an estuary that supported many fish and wildlife species and remains an important migration corridor for several salmonid species listed under the ESA. The LDW is a transitional zone where anadromous fish migrate from freshwater streams to the marine waters of Puget Sound. Existing habitat conditions within the LDW migration corridor are degraded because the shoreline is highly modified. Recreational and subsistence fishing and other recreational activities occur in the vicinity of the project area, and the LDW is a part of Tribal Usual and Accustomed (U&A) fishing areas.

The project is located within the Green-Duwamish estuary, where aquatic conditions consist of marine waters from Elliott Bay to estuarine waters in Duwamish River, transitioning to freshwater in the Green River. Although highly modified, the upper reach of the LDW provides habitat for salmon and other fish and other wildlife.

Overall, the bank vegetation within the upper reach consists of a mix of native trees, landscaping trees, native shrubs, and non-native shrubs in limited layers. The developed shoreline and armoring extends essentially to the top of the bank, so opportunities for existing vegetation are limited. Where present, vegetation along the shoreline consists of three major plant communities: trees, shrubs, and grasses/ferns/herbaceous. The trees are dominated by native species. Shrubs and herbaceous plants are dominated by non-native species. From RMs 3.3 to 3.6 (Boeing Plant 2 South Site habitat project) on the east bank and RMs 3.3 to 3.4 (King County shoreline habitat restoration project), RMs 3.5 to 3.9 (Duwamish River People's Park and Shoreline Habitat project), RMs 4.3 to 4.4 (Hamm Creek

habitat project), and RMs 4.6 to 4.7 (Turning Basin restoration projects) on the west bank, mitigation and restoration plantings can be found, including more native species.

In-channel habitat for aquatic species and aquatic-dependent species exists in the LDW and extends from the waterward edge of the riparian zone above the elevation of mean higher high water (MHHW; +11.3 feet MLLW) down to the deep subtidal areas of the LDW. These areas are all considered habitat and are divided into the following habitat types based on elevation (NOAA 2002, 2013; EPA 2014):

- **Deep Subtidal:** Deeper than -10 feet MLLW
- **Shallow Subtidal:** -10 feet MLLW to -4 feet MLLW
- **Lower Intertidal:** -4 feet MLLW to +4 feet MLLW
- **Upper Intertidal:** +4 feet MLLW to +11.3 feet MLLW

The habitat types in the LDW include intertidal marshes, intertidal mudflats, sloped and armored intertidal areas, and subtidal areas. Intermittent, shallow benches exist in the intertidal and shallow subtidal zones of the LDW, outside the navigation channel. Overall, the upper intertidal, intertidal, and shallow subtidal habitat types defined for the LDW (i.e., areas shallower than -10 feet MLLW) include the most valuable habitat types within the LDW and include the water depth band that has been shown to be the most important for juvenile salmon, particularly Chinook salmon, and other aquatic and semiaquatic species, including benthic invertebrates (e.g., clams), fish, and shorebirds.

2.3 Alternatives Considered but Not Carried Forward

The ROD for the LDW Superfund Site (EPA 2014) considered 12 remedial alternatives, which implemented the technologies described previously to varying extents. The alternatives were arranged on a spectrum from higher to lower RALs as well as smaller to larger cleanup footprints. Half of the alternative remedies focused primarily on dredging and removal of material, whereas the others combined dredging with other technologies. Of these 12 alternatives, EPA's selected remedy aimed to remediate 157 acres (for the entire LDW; the ROD did not break out the upper reach portion separately) with contaminant concentrations above the second-lowest set of RALs examined, using combined technologies. The remaining eleven alternatives are not evaluated further in this document.

3 Potential Impacts and Determinations

3.1 Evaluation of Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem

Potential impacts on the aquatic ecosystem are primarily associated with dredging and placement of clean materials (e.g., capping, ENR, backfill, amended cover, and RMC), removal and installation of piles, and installation of a bulkhead shoring sheet pile wall. The following subsections summarize existing conditions and evaluate impacts from these activities on physical and chemical characteristics of the aquatic ecosystem.

3.1.1 Substrate

The dominant substrate size ranges from large angular rock, debris, and riprap near the shore grading to sand and silt in the lower intertidal and shallow subtidal zone. As the steeper shoreline levels out from the bank, mudflat areas are exposed at low tide in a small number of areas in the upper reach, typically outside of RAAs. In some cases, the toe of bank may be submerged in subtidal areas where the flatter substrate areas are not exposed during typical tidal swings. The bank slope is generally steep where the large angular rock, debris, and riprap have been placed and then flattens out to a shallower slope as the steep shoreline grades into flatter slopes. Grain size data indicate that surface (0- to 10-centimeter [cm]) and subsurface (0- to 45-cm and 0- to 60-cm) samples located waterward of steep bank areas are predominantly sand and silt, with varying gravel and clay compositions.

In several shoreline areas that fall within RAAs, human-made debris is scattered along the shoreline or on steeper bank areas. A couple of larger debris piles are located within the dredging footprint of RAA 22. There are two large debris piles that are presumed to be waste materials from former industrial activities that have been identified for removal. The shoreline of the LDW upper reach where remedial action is required typically includes armor with rock riprap and intermittent concrete, steel sheet pile, and timber walls and bulkheads. Shoreline fill and armoring has largely disconnected the LDW upper reach from its floodplain and impacts the character of the substrate.

Sediment quality has been extensively evaluated in the LDW, including the upper reach. PCBs are the primary contaminant of concern (COC) in the upper reach with the most RAL exceedances. Additional COCs with at least one RAL exceedance in the design dataset include dioxins/furans, arsenic, carcinogenic PAHs, lead, mercury, zinc, PAHs, 4-methylphenol, benzoic acid, phenol, and butyl benzyl phthalate. Full details can be found in the DER (Anchor QEA and Windward 2022).

The project will change the characteristics of the existing surface by removing contaminated sediments, debris piles, and timber piles and replacing them with clean sand, gravel, and rock fill materials. Caps will be designed according to site-specific conditions using established EPA design

procedures. Also in dredge areas, RMC material will be placed after dredging within the dredge footprint (in areas not backfilled) and dredge perimeter to address potential residual contamination resulting from dredging operations.

In RAA 22, a steel sheet pile wall will be installed waterward of the existing sheet pile wall, and the area landward of the new steel sheet pile wall will be backfilled with clean materials. Any remaining debris that cannot be removed will be contained beneath clean backfill or between the new and existing steel sheet pile walls and covered with clean backfill materials. Removal of scattered riprap and debris in RAA 29 from dredging in this area will result in a habitat change from Degraded Upper Intertidal to Upper Intertidal. Removal of scattered riprap and debris in RAAs 32 and 33/34/35 from dredging will result in habitat changes from Degraded Upper Intertidal to Upper Intertidal and Degraded Lower Intertidal to Lower Intertidal. In the engineered cap area in RAA 27 (i.e., SMA 5), the existing substrate consists of riprap and debris within the SMA 5 cap area. Because the post-construction surface substrate in this area would remain an armor material (i.e., quarry spall is the armor layer-size rock), there is no change in substrate type post-remediation. In the engineered cap area in RAA 14/15/16 (within the FNC), quarry spall sized armor material will also be placed on the top of the cap in a deep subtidal area[1] that is expected to quickly fill in with sediment that will cover the armor rock. As such, no permanent change in substrate type is expected in this area.

The semi-quantitative habitat evaluation of the proposed sediment remediation activities, including dredging and placement of clean materials (i.e., capping, ENR, backfill, amended cover, and RMC) shows that no changes in habitat type (e.g., from intertidal to Shallow Subtidal) are expected in 98% of the remediation areas.

3.1.2 Suspended Particulates/Turbidity

Dredging and placement of engineered capping, backfill, RMC, ENR, and amended cover materials could temporarily increase localized turbidity and suspended sediment levels within the proposed action area during construction activities. The removal of piles, and to a lesser extent, the installation of piles, could also impact water quality, though such impacts are considered negligible due to the number of piling and small disturbance area from these pile removal/installation activities. The outfall bank protection installation is expected to occur in the dry and would not result in any changes to water quality. Of these activities, dredging is expected to generate the highest levels of potential impacts to water quality.

Overall, impacts related to turbidity and suspended solids are expected to be localized and short-term and to be highest during dredging and material placement activities. Washington State water quality

[1] Per the ROD requirements, the top of a cap within the FNC must be no higher than 4 feet below the authorized channel elevation. Within the upper reach, the FNC authorized elevation is -15 feet MLLW, therefore the top of the cap was designed to have a maximum top elevation of -19 feet MLLW.

standards will be met at the applicable compliance zone boundary, which is typically 150 feet away from the construction activity. Impacts related to turbidity and suspended solids are expected to be limited to the 150-foot radius from the construction activity. Impact avoidance, minimization, and conservation measures will be implemented during construction to control turbidity as described in Section 4, and the proposed action will be required to comply with the State of Washington's water quality standards. Water quality monitoring is required by EPA to be conducted during dredging and dewatering activities to control resuspension and transport of contaminated sediment.

Material placement activities for engineered capping, backfilling, RMC placement, ENR placement, and amended cover placement could also result in increases in turbidity and suspended solids as the material settles through the water column due to the presence of some fines within the clean material. However, the specifications for the imported materials will include a requirement for the materials to consist of clean, granular material free of roots, organic material, contaminants, and all other deleterious material. This requirement will minimize the amount of fines being placed and reduce the potential for elevated turbidity during placement. If elevated turbidity does occur during material placement, this condition is expected to be temporary and localized. The duration of elevated turbidity, if it occurs, is expected to be limited to the duration of the placement activity and to be intermittent.

3.1.3 Water Quality

The most recent Washington State Water Quality Assessment identifies locations throughout the LDW and Duwamish River that are impaired based on CWA Section 303(d) criteria (Ecology 2023). The waters in the vicinity of the action area are listed as Category 5 waters for temperature, bacteria (fecal coliform and enterococci), and dissolved oxygen (DO; Ecology 2023). Category 5 is defined as "polluted water that requires a water quality improvement project" (Ecology 2023). Baseline water chemistry data that measured PCBs, metals, and other chemicals showed priority pollutants below aquatic life water quality criteria (Windward 2020).

Dredging and placement of engineered capping, backfill, RMC, ENR and amended cover materials and pile removal and installation potentially could result in minor reductions in DO concentrations in the immediate vicinity of work. These impacts will be temporary and localized and have typically not been observed during the types of remedial activities planned for this project. Short-term and localized decreases in DO due to remedial activities may result in short-term avoidance of immediate work areas by aquatic species. No long-term effects are anticipated.

Physical disturbance of contaminated sediments may occur during dredging and pile removal and driving activities and could cause a temporary increase in dissolved phase concentrations of some chemicals. This can result from the resuspension of contaminated sediments, desorption of the contaminants from sediment particles to porewater, and release of contaminated porewater into

surface water. A water quality impacts evaluation was completed (BODR Appendix M) for RD and predicted that no acute or chronic water quality exceedances will likely occur for metals or PCBs (i.e., primary COCs for water quality) at the compliance distance (e.g., 150 feet) from the dredging activity. Predictive modeling was not performed for pile pulling or installation because those activities disturb much less sediment than dredging, which represents the worst case condition for potentially impacting water quality.

EPA will coordinate the construction design with the Washington State Department of Ecology to assure compliance with CWA Section 401 and State Water Quality Standards. A WQMP has been prepared that specifies mixing zones, monitoring requirements, and BMPs to be implemented during in-water work. The WQMP (100% RD Volume II, Part I, Appendix A) identifies the specific requirements for monitoring water quality during in-water dredging, including steps to be taken to mitigate exceedances of water quality criteria, if any occur.

3.1.4 Current Patterns and Water Circulation

Circulation in the project area is influenced primarily by general circulation patterns in the LDW. Project activities may cause temporary, localized changes in currents and water circulation due to the presence of barges and equipment required to complete construction. These potential temporary impacts are anticipated to be negligible because they will be insignificant localized impacts. Therefore, impacts on currents, water circulation, and normal water fluctuations are anticipated to be negligible as a result of the project.

3.1.5 Normal Water Fluctuations

The proposed action will not disrupt the normal ebb and flow of the tide at the upper reach site during or after construction.

3.1.6 Salinity Gradients

The proposed action will have no effect on salinity gradients at the LDW project site in the upper reach or within the LDW as a whole.

3.2 Evaluation of Impacts on Biological Characteristics of the Aquatic Ecosystem

3.2.1 Threatened and Endangered Species

The following ESA-listed species may occur in the project area:

- Marbled murrelet (*Brachyramphus marmoratus*)
- Bull trout (*Salvelinus confluentus*) Coastal-Puget Sound Distinct Population Segment (DPS)

- Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound Evolutionarily Significant Unit
- Steelhead (*O. mykiss*) Puget Sound DPS

The potential effects that may occur to ESA-listed species during construction include underwater noise, entrainment, water quality criteria exceedances related to turbidity and the resuspension of contaminants, changes to food resources, and modification of habitat. Most of the potential effects are short-term construction-related impacts and would not cause new jeopardy, deepen the jeopardy by causing additional harm, or cause a deterioration in the species' pre-action condition. The impacts are expected to occur mainly in the LDW and to potentially affect Chinook salmon, steelhead, and bull trout. In-water construction activities only will occur during EPA-approved in-water work windows that are established to minimize potential impacts on ESA-listed species. Avoidance, minimization, and conservation measures and BMPs will be employed to avoid and minimize construction effects, as described in Section 4. Negligible impacts are expected on marine species present in Elliott Bay. The proposed action is expected to improve sediment quality and benthic habitat conditions that will benefit listed species in the upper reach. EPA will also consult with NMFS and USFWS about the potential adverse effects of removal activities and ways to minimize those effects. Full details on the remedial action impacts to ESA-listed species are included in the BA (BODR Appendix E).

3.2.2 Fish, Crustaceans, Mollusks and Other Aquatic Organisms in the Food Web

The contaminated sediment in this area has the potential to adversely impact organisms in the aquatic food chain. Further, the many chemicals at this site are bioaccumulative and have the potential to adversely affect higher trophic-level organisms. Monitoring of shellfish and other species at the site is conducted periodically per EPA requirements to evaluate existing conditions. The dredging and capping activities will remove or isolate the contaminants in sediments from the food chain. The removal action is expected to be beneficial to fish and shellfish by greatly reducing their potential exposure to contaminants and by increasing their available habitat. Dredging and placement of engineered capping, backfill, RMC, ENR and amended cover materials, and pile removal and installation will temporarily disturb benthic and epibenthic organisms and habitats; however, these impacts are temporary. The benthic community in disturbed areas is expected to recover within 1 to 2 years with species from nearby areas moving into the disturbed area to recolonize, though this recovery will happen in stages because work will occur over multiple years.

3.2.3 Other Wildlife

Aquatic ecosystem functions associated with habitats where construction will occur include foraging habitat for migratory and resident birds and food chain support for small mammals. Some bird and wildlife species may be disrupted during construction activities; however the project is occurring

within a heavily modified commercial waterway with some restoration areas along the shoreline. Impacts to other wildlife are expected to be short-term and minor in nature.

3.3 Potential Impacts on Special Aquatic Sites

Mudflats are the only special aquatic site present within the LDW upper reach RAAs. Wetlands are not present within any RAA, and their absence is described in Section 3.3.2. Sanctuaries and refuges, vegetated shallows, coral reefs, and riffle and pool complexes are not present in the LDW upper reach and are therefore not discussed further in this analysis.

3.3.1 Mudflats

Mudflats are designated as a category of special aquatic sites per 40 CFR 230 Subpart E. Several intertidal mudflats are present in the LDW upper reach. Potential impacts to mudflats from dredging and discharge of dredge and fill materials can deplete or temporarily eliminate mud flat biota, foraging areas, and nursery areas.

Several RAAs are located within or adjacent to areas with mudflat characteristics, which occur along LDW along less developed (e.g., unarmored) shorelines generally between elevations -4 and +14 feet MLLW. In these areas, the RD includes dredging and backfilling to the original grade. Because backfilling with mud is not feasible, clean sand or a gravelly sand will be placed to restore the existing elevations in the intertidal mudflat area. Because the post-construction bathymetry remains the same, inundation and sedimentation patterns that created the mudflats are expected to restore the substrate to mud over time.

3.3.2 Wetlands

An evaluation was completed to determine wetland presence or absence at SMA 5 (i.e., the bank portion of RAA 27). SMA 5 is the only remedial action area that has a portion of the SMA above MHHW. The evaluation used a combination of desktop analysis of existing information and pre-design investigation (PDI) field data to determine the presence or absence of a wetland in a manner consistent with U.S. Army Corps of Engineers technical guidance. Based on the lack of hydrophytic vegetation and the unlikely presence of hydric soils and wetland hydrology, the evaluation indicates that a wetland is not present at SMA 5. Full details can be found in the *Lower Duwamish Waterway Upper Reach RAA 27 (SMAs 5 and 6) Wetland Evaluation Memorandum* (Attachment C.1).

3.4 Potential Effects on Human Use Characteristics

3.4.1 Municipal and Private Water Supplies

Implementation of the proposed cleanup remedy is not anticipated to impact industrial and/or manufacturing water uses in the LDW. Implementation of the proposed cleanup remedy would have no impact on identified water rights, if any, or municipally supplied drinking water within the vicinity of the project area.

3.4.2 Recreational and Commercial Fisheries

The upper reach of the LDW is primarily used for recreational fishing. Impacts to recreational fisheries are anticipated to be negligible because in-water construction activities will occur in a portion of the waterway where active commercial vessel traffic is common and will be temporary in duration. After construction, the cleaner sediments of the site will improve fish habitat and may contribute to a healthier fishery for the area.

Construction activities could potentially interfere with Tribal U&A fishing activities because adult salmon return during the early part of the in-water work window. The design specifications require that Tribal fishing takes priority over the remedial construction activities, and the contractor will not interfere with Tribal fishing. The Lower Duwamish Waterway Group is coordinating with affected Tribes to avoid, minimize, or mitigate for potential fishing disruptions during construction. Coordination during construction will include notifying affected Tribes about anticipated barge movements through the LDW. The project is expected to result in long-term benefits to the fishery as described previously.

3.4.3 Water-Related Recreation

The LDW is in a commercial waterway; however, recreational activities within and near the proposed cleanup remedy may include kayaking, canoeing, motorboating, and fishing. Recreational and navigational use of the area may be restricted during active remediation, but these impacts will not be significant, will be limited to the small footprint where dredging or material placement is occurring, and will be limited in duration.

3.4.4 Aesthetics

The project will not significantly change the aesthetic or general character of the upper reach of the LDW. Construction activities will involve equipment and barges that would be temporarily in place and consistent with the industrial/commercial nature of the LDW. As such, minor impacts from the

proposed cleanup remedy to the aesthetic character of the LDW would be temporary and localized to the area where the construction activities are being conducted.

3.4.5 Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

This category is not applicable because none of these federally protected features are present with the LDW upper reach.

3.5 Cumulative Effects on the Aquatic Ecosystem

Cumulative impacts are the changes in an aquatic ecosystem that are attributable to the collective effect of a number of individual discharges of dredged or fill material. Although the impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous such piecemeal changes can impair water resources and interfere with the productivity and water quality of existing aquatic ecosystems (40 CFR 230.11(g)(1)).

Existing habitat conditions within the LDW migration corridor are degraded because the shoreline is highly modified. Other reasonably foreseeable future actions that are expected to occur in the vicinity of the proposed action include regular maintenance dredging activities and maintenance or development activities associated with existing commercial and industrial uses along the waterway, as well as future cleanup activities associated with the Middle and Lower reaches of the LDW Superfund Site.

Although there would be short-term impacts to the environment during construction, it is expected that these impacts would be mitigated through avoidance and minimization measures and BMPs implemented during construction. Over the long term, there would be a net improvement to the aquatic ecosystem from the remediation of sediment contamination, which would improve sediment quality and benthic habitat conditions that will benefit listed species in the upper reach. For these reasons, the proposed action will not result in significant cumulative impacts on the aquatic ecosystem.

3.6 Secondary Effects on the Aquatic Ecosystem

Secondary effects are effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials but do not result from the actual placement of the dredged or fill material (40 CFR 230.11(h)(1)). Examples of secondary effects include changes in flow regime, fragmentation of aquatic habitats, and contaminated runoff from development on fill. The proposed action will be designed so that it does not contribute to erosion, runoff, or downstream sedimentation. The cleanup will also restore the substrate to existing elevations in most of the RAAs, so flow and other

riverine forces are not expected to be significantly altered from the action compared to existing conditions.

As discussed in Section 5, mitigation may be required to offset unavoidable adverse impacts to habitat, but the need for mitigation will be evaluated as a combined project across all reaches (upper, middle, and lower) of the LDW. Compensatory mitigation activities will not cause other significant impacts to occur that would adversely affect the aquatic environment. The cleanup action will improve sediment quality within the LDW, and compensatory mitigation, if required, will result in habitat improvements from existing conditions.

4 Impact Avoidance and Minimization Measures

Impact avoidance and minimization measures apply to remedial activities implemented as part of the proposed action, including dredging; barge loading and dewatering; transport and transloading of dredged material; oil and other hazardous substance spillage prevention and control; decontamination of construction equipment; engineered capping; placement of backfill, RMC, ENR, and amended cover materials; piling removal/installation; and any associated in-water work. The avoidance and minimization measures described in this section are measures taken to first avoid impacts to the aquatic environment, but where impacts may be unavoidable, measures to minimize the impacts are planned. The impact avoidance and minimization measures and BMPs described in the following sections are also discussed in Section 11.2 of the BODR and in the BA (BODR Appendix E) and represent specified measures and BMPs that will be used during construction. The contractor is required to develop their Remedial Action Work Plan (RAWP) that will describe the BMPs it will implement during construction, which may include additional BMPs. The RAWP is a pre-construction submittal that will be reviewed and approved by EPA, and construction inspection and monitoring will take place to ensure the contractor is complying with its approved RAWP.

4.1 General

The following impact avoidance and minimization measures will apply to all in-water construction activities, including dredging; engineered capping; placement of backfill, RMC, ENR, and amended cover materials; and in-water structure removal and installation:

- All in-water work will be conducted during a regulatory in-water work window when juvenile salmonids and WDFW priority species are expected to either not be present or present only in low numbers. The in-water work window designated for the LDW is anticipated to be from approximately October 1 to February 15. The work window requirement is expected to apply to activities occurring in the water that have the potential to impact listed species. Coordination with federal and state resource agencies and co-managers will occur to ensure any deviations in the timing of fish runs are accounted for in work start and end dates to aid in balancing the overall impact of the work to be performed (e.g., a small extension of the window to avoid an entire additional field season of work for a particular area may be of an overall lesser impact and preferred).
- Water quality in the action area will be monitored and compared against applicable water quality standards (Washington Administrative Code 173-201A-210). This includes required limits measured in the water column for turbidity, DO, pH, and temperature, and for select COCs (e.g., PCBs) pursuant to the CWA Section 404 ARAR Memorandum that will be issued by EPA prior to implementation and the WQMP completed as part of the Final (100%) RD (Volume II, Part I, Appendix A).

- Operational controls will be used for control of turbidity and resuspended sediment. For example, if turbidity exceedances occur, construction activities can be progressively slowed to minimize sediment suspension until turbidity exceedances are no longer detected outside of the compliance boundary, or dredging cycle times can be increased to decrease turbidity plumes until the suspended sediment settles.
- A spill plan will be kept on site during construction activities and will contain notification procedures, specific cleanup and placement instructions for different products, quick response containment and cleanup measures that will be available, proposed methods for placement of spilled materials, and employee training for spill containment.

4.2 Dredging

Measures that will be required to reduce impacts from dredging include the following:

- Removal of identified debris will be required prior to dredging in known debris areas.
- Multiple bites by the dredge bucket on the waterway bed before the bucket is raised will be prohibited so that bed disturbance by the bucket is reduced.
- "Sweeping" (i.e., dragging a bucket or beam), or leveling of the waterway bed by pushing bottom sediments around with the dredge bucket to knock down high spots to achieve required dredge elevations, will be prohibited. Instead of leveling to remove high spots, the contractor may be required to make an additional dredging pass to remove any high spots that are identified during post-construction surveys.
- Interim underwater stockpiling of dredged material will be prohibited (i.e., taking small dredge cuts and temporarily stockpiling material at the waterway bed in a mound to allow the dredge operator to grab a fuller bucket). Such action could create a pile of loose sediment that can easily be resuspended.
- Overfilling of conventional clamshell and environmental buckets will be prohibited. When the dredge bucket penetrates soft sediment, there is the potential for the bucket to penetrate beyond the designed digging depth of the bucket. If the bucket is overfilled, a portion of the dredged material cannot be contained within the bucket and may be lost and resuspended in the water column as the bucket is raised. If bucket overloading is observed, measures will be taken to reduce this potential (e.g., decrease the maximum cut thickness or lower bucket descent rate).
- The contractor will be required to use an environmental bucket as the primary method for dredging. However, the contractor may propose to use a standard clamshell digging bucket when site conditions are not appropriate for the environmental bucket (i.e., buried debris or dense sediment conditions).
- Specific dredging procedures (e.g., shallow top-to-bottom slope cuts) will be specified to prevent the potential for slope failures and slope movement that would cause excessive sediment resuspension.

- Additional BMPs that are optional for the contractor to propose and implement to reduce sediment resuspension as needed to manage water quality and meet turbidity criteria include the following:
  - The rate of dredge bucket descent and ascent will be slowed down; however, this BMP needs to be carefully implemented based on the physical characteristics of the sediments being removed (e.g., soft sediments versus hard digging, presence of debris, or water depths) because limiting the velocity of the descending bucket in dredge operations may reduce the volume of sediment that is picked up by the bucket, thus requiring multiple bites to remove the project sediment and increasing the overall project duration and associated duration of short-term water quality impacts.
  - After dredged sediment is placed into the haul barge, the opened bucket will be held open for a short period of time above the barge to allow residual materials from the bucket to fall into the barge.
  - The contractor will use the lowest safe operating power for tug operations in shallow-water areas and during dredge plant and barge relocation for dredging, barge transport, and equipment relocations for commercial vessel traffic or will wait for a higher tide to move marine equipment to minimize disturbance of bottom sediments.

4.3 Barge Loading and Dewatering

Measures that will be required to reduce the potential for loss of dredged material during haul barge filling and dewatering include the following:

- Uneven filling or overfilling of barges will be prohibited to prevent spillage of sediment and unfiltered dredge return water from barges.
- Haul barges will be loaded evenly to maintain barge stability.
- For dredged sediment dewatering occurring on haul barges, the dredge return water will be discharged back into the LDW within the active dredging work zone. The contractor will be required to equip the barges with appropriate BMPs (e.g., filtering all water prior to discharge to remove suspended solids from the dredge return water) to maintain compliance with water quality criteria.
- With the exception of dredge return water drainage ports, haul barges will be watertight during all operations, and no unfiltered dredge return water will be allowed to discharge into the LDW.

4.4 Transport and Transloading of Dredged Material

Measures will be required to reduce the potential loss of dredged material during transport and transloading of dredged materials off the barge (at the transload facility) or from a temporary upland stockpile area (if intertidal sediment and shoreline bank soil excavation occurs). Measures will also be

required during transport of dredged/excavated material from the transload facility to the approved disposal facility. Such measures include the following:

- All barges transporting dredged materials will be certified as seaworthy by a marine inspector prior to barge use, and the barge will be fully sealed prior to transport to prevent any dredge return water discharge during transit to the transload facility or during transloading of the barge.
- Any effluent generated by dewatering at the transload facility, or via dredging, will be managed (contained and, if necessary, treated) and disposed of in accordance with facility permits or authorizations for wastewater disposal.
- To prevent dredged material spillage when transloading materials between the haul barge and transload facility, spill aprons will be set up and used to direct bucket spillage back into the barges or onto the uplands and not into the adjacent water.
- Inside the transload facility, material captured by spill aprons will land on secondary containment areas outside the area typically traveled by trucks or railcars to avoid tracking material on tires or wheels.
- The bucket swing path from the haul barge to the upland transload facility will not be allowed to occur over open water. The contractor will need to swing the offloading bucket over either the derrick barge or a "spanning" barge that will capture any spillage from the offloading bucket.
- All haul trucks and railcars (e.g., containers or gondolas) will be required to be lined, covered, and secured for upland transportation. Visual monitoring will be performed by the contractor to determine if the transport of dry dredged/excavated materials creates dust or leakage.
- When wet materials are transported over land, haul trucks or railcar containers will be lined or sealed to reduce the chance of sediment or water release during transport.
- For dredged material transfer from a temporary upland stockpile area, truck loading will occur within the transfer area, and the trucks will be decontaminated and inspected within a designated contained footprint before they leave the transfer area.
- Trucks or railcars will not be overloaded to prevent loss due to spilling (minimum freeboard height of 6 or 36 inches, respectively, will be required to be maintained).
- Truck loading areas will be swept frequently to reduce the probability of truck tires tracking dredged materials outside of the loading areas. The permit for the transloading facility will address this and other requirements to reduce tracking, which may include wheel washing.
- The trucks, truck loading area, and access route will be visually inspected to confirm there is no loss of material from the trucks prior to releasing the truck from the transload facility to public roads.
- Tires and truck or railcar bodies will be cleaned to remove dredged material, if necessary, before leaving the site (e.g., dry brushing and tire/wheel washing).
- The fluid collected from transloading operations will be disposed of with the other waste generated from the site (included with the sediment for disposal) or treated and discharged in

accordance with approved permits of the transload facility or disposed at a permitted commercial facility.

4.5 Oil and Other Hazardous Substance Spillage Prevention and Control

For compliance with the National Contingency Plan, the Oil Pollution Prevention regulation (40 CFR I), and the Oil and Hazardous Substance Spill Prevention and Response (Revised Code of Washington 90.56), the contractor will be required to prepare and implement a Spill Prevention, Control, and Countermeasure Plan (to be submitted as part of the contractor's RAWP), have a spill kit available during all on-water construction activities, and have a marine spill response contractor on call. BMPs to prevent and control spills of oil and other hazardous substances that will be required include the following:

- The contractor will use environmentally sensitive hydraulic fluids that are nontoxic to aquatic life and that are readily or inherently biodegradable.
- The contractor will contain all visible floating oils with booms, dikes, oil-absorbent pads, or other appropriate means and remove such materials from the water prior to discharge into state waters.
- The contractor will immediately contain all visible oils on land using dikes, straw bales, or other appropriate means; remove using sand, ground clay, sawdust, or other absorbent material; and properly dispose.
- The contractor will temporarily store waste materials in drums or other leak-proof containers after cleanup and during transport to disposal.
- The contractor will dispose waste materials off property at an approved and permitted disposal facility and obtain certificates of disposal.
- Dredge vessel personnel will be trained in hazardous material handling and spill response and will be equipped with appropriate response tools, including oil-absorbent booms or pads, an oil-skimming system, oil dry-all gloves, and plastic bags. If a spill occurs, spill cleanup and containment efforts will begin immediately and will take precedence over normal work.
- The National Response Center (1-800-424-8802), the Washington Department of Emergency Management (1-800-645-7911), and the U.S. Coast Guard (206-217-6002) will be notified immediately if a spill occurs.
- The contractor will inspect fuel hoses, oil or fuel transfer valves and fittings, lubrication equipment, hydraulically operated equipment, and oil drums on a regular basis for drips, leaks, or signs of damage and maintain and store properly to prevent spills into the surface water.

4.6 Placement of Engineered Cap, Backfill, RMC, ENR, and Amended Cover Materials

Impact avoidance and minimization measures and conservation measures that may be applied to this work include the following:

- The specifications for the imported material will include a requirement for the materials to consist of clean, granular material free of roots, organic material, contaminants, and all other deleterious material. This requirement will minimize the amount of fines being placed and reduce the potential for elevated turbidity during placement.
- Engineered cap, backfill, or RMC material will be placed as soon as possible after dredging to minimize recontamination risk from dredge residuals.
- To ensure proper material placement, import materials will be placed in a controlled and accurate manner.
- The contractor is required to identify its placement means and methods in its RAWP that will be reviewed and approved by EPA.
- The quality of engineered cap, backfill, ENR, RMC, and amended cover materials must be approved before use; therefore, testing of the borrow source material will be required of the contractor to demonstrate that the source material meets specifications (i.e., chemical and physical criteria).

4.7 Pile Installation

The following measures will be implemented during pile installation activities, to the extent practicable:

- Piles will be installed using vibratory methods that are suitable for the substrate conditions within the LDW. Vibratory methods are typically preferred because they reduce potential noise impacts to salmon, steelhead, and bull trout.
- An impact hammer is not required to drive piles to design depths and will not be used to proof any piles.
- Hydraulic jetting devices will not be used to install pilings.

4.8 Pile Removal

Pile removal will be completed following procedures outlined in the *EPA Region 10 Best Management Practices for Piling Removal and Placement in Washington State* (EPA 2016).

4.9 Evaluation and Testing of Discharge Material

EPA, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act's RD process, required appropriate and site-specific testing and evaluation of the upper reach sediment to determine the need for remedial action. The chemical and physical characteristics of the sediments

that will be dredged or excavated at the project site are documented in the DER (Anchor QEA and Windward 2022). The sediments being remediated exceed the RALs established in the ROD. They will be disposed of off-site in an approved upland disposal facility that can ensure isolation and control of the contaminants.

All capping and in-water fill material will consist of clean natural sands, gravels, and quarry spalls that will meet EPA LDW ROD cleanup levels for use as clean backfill, ENR, amended cover, RMC materials, and engineered caps. Most materials to be imported will be tested for both physical and chemical concentrations (with the exception that quarry spalls and granular activated carbon do not need to be tested for chemical concentrations). Materials will be required to meet chemical quality criteria as outlined in the material placement specifications as approved by EPA and are not expected to have significant adverse impacts on water quality or species in the short or long term.

5 Compensatory Mitigation

Mitigation may be required to offset unavoidable adverse impacts to habitat, but the need for mitigation will be evaluated as a combined project across all reaches (upper, middle, and lower) of the LDW. The design for the upper reach sought to maintain a positive net habitat value for the work in the upper reach by itself, which was accomplished as described in the BA (BODR Appendix E). The same habitat evaluation method will be used for the middle and lower reaches to calculate the resulting overall net habitat impacts or benefits for each reach and the overall LDW. The intent of this approach is to balance potential credits or impacts generated in different reaches to better develop a LDW mitigation approach if appropriate. Because the upper reach is the first project to be designed and constructed, the design intended to result in net neutral or positive habitat value. If it is determined that mitigation is needed after considering all three reaches of the LDW, a draft and final Compensatory Mitigation Plan will be included in the RD submittals for the lower reach, and temporal impacts will be accounted for.

Both quantitative and semi-quantitative methods were used to evaluate the habitat value for the upper reach remedial action impacts. Consideration of both the Puget Sound Nearshore Conservation Calculator calculations and the semi-quantitative evaluation of sediment remediation areas shows that conservation offsets (i.e., mitigation) are not expected to be necessary to address upper reach remedial action impacts. The habitat evaluation that was completed for the BA (BODR Appendix E), and updated by the Habitat Evaluation Addendum submitted to EPA in November 2023 (BODR Appendix E, Attachment E.8), resulted in a net positive 0.11 DSAY of project-related habitat benefit and net improvement of nearshore habitat functions and values to ESA-listed species and their designated critical habitat related to the project; the net positive DSAYs are for the upper reach alone, and actual DSAYs will be re-assessed after upper reach remedial actions are completed. Full details of the HEA evaluation are included in the *Habitat Evaluation* (BODR Appendix E, Attachment E.6) as well as the Habitat Evaluation Addendum.

6 EPA Region 10 Decision Framework and Findings

The following sections explain why the remedial action is considered to be in compliance with the substantive requirements of Section 404(b)(1) and will not result in unacceptable adverse impacts to the aquatic environment as outlined in the *Region 10 Decision Framework for Determining Clean Water Act Section 404 Compliance at Superfund Sites* (EPA 2000). EPA will make the determination as to the project's compliance with Section 404.

1. **There are no other practicable alternatives that will result in less impact to the aquatic environment.**

   Alternative 2 (the remedial technologies selected for cleanup) includes a combination of dredging, ENR, engineered capping, and MNR. The current design minimizes dredge and fill discharges to the extent possible while addressing contaminated sediments and restores existing habitat elevations to meet the intent of the ROD (EPA 2014). The BA (BODR Appendix E) includes conservation measures and construction BMPs designed to avoid or minimize potential impacts to the environment. There are no other practicable alternatives that will result in less impact to the aquatic environment while meeting the intent of the ROD, which selected the preferred alternative as the remedy for the LDW Superfund Site.

2. **The discharge will not cause or contribute to violations of water quality standards or toxic effluent standards, jeopardize an endangered or threatened species, destroy or adversely modify critical habitat, or impair a protected marine sanctuary.**

   The proposed cleanup remedy is designed to minimize the potential for exceedances of ambient water quality criteria to the extent practicable This includes implementing water quality monitoring described in the WQMP (100% RD Volume II, Part I, Appendix A) for compliance with Washington State water quality standards. The construction contractor will be required to employ BMPs to limit water quality impacts, as described in the specifications (100% RD Volume III). Should monitoring identify water quality exceedances, the contractor will be required to modify operations to correct the exceedances.

   The BA (BODR Appendix E) describes how the project will not jeopardize ESA-listed species or destroy or adversely modify critical habitat. The project will implement conservation measures and construction BMPs to avoid or minimize potential impacts to ESA-listed species or critical habitat as described in the BA. This includes working during the approved in-water work window for the LDW when ESA-listed species are least likely to be present.

   Work will not occur within nor will it impair a protected marine sanctuary.

3. The discharge will not result in significant degradation to waters of the United States.

The proposed cleanup remedy is designed to minimize the potential for exceedances of ambient water quality criteria to the extent practicable, as described in Section 3.1.3. Water quality monitoring will be conducted under an EPA-approved WQMP (100% RD Volume II, Part I, Appendix A) for compliance with Washington State water quality standards during construction. The construction contractor will be required to employ BMPs to limit water quality impacts, as described in the specifications (100% RD Volume III). Should monitoring identify water quality exceedances, the contractor will be required to modify operations to correct the exceedances.

All dredge areas will also include either backfilling to grade, placement of an engineered cap, or placement of RMC within the dredge footprint such that the entire dredge prism will have a cover of clean material post-construction. In addition, RMC will be placed within an approximate 20- to 40-foot perimeter (or greater as approved by EPA) from the dredge footprint. The completed cleanup remedy will result in no significant degradation of waters of the United States.

4. Potential adverse impacts to the aquatic ecosystem are minimized to the extent practicable and appropriate.

The proposed cleanup remedy fully and most effectively meets the purpose and need of the project and balances dredging and alternate technologies to remediate the LDW upper reach portion of the site consistent with the ROD. The ROD-selected remedy includes use of ENR and MNR where those technologies can be effective, which reduces adverse impacts as compared to dredging. Although there would be short-term impacts to the environment during construction, it is expected that these impacts would be mitigated through avoidance and minimization measures and BMPs implemented during construction, as described in Section 4 of this document, the Final (100%) RD BODR, and the BA (BODR Appendix E). Over the long term, there would be a net improvement to the aquatic ecosystem from the remediation of sediment contamination. There will be long-term monitoring to assess the success of the remedy in achieving cleanup levels.

7 Review of Conditions for Compliance

The potential for impacts on the aquatic ecosystem resulting from implementation of the proposed action would be minimized through the application of impact avoidance and minimization measures described in Section 4 and through the use of ENR and MNR technologies in areas where the ROD criteria identify those technologies as effective. According to restrictions on discharge regulations, "No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences" (40 CFR 230.10 (a)).

7.1 Availability of Practicable Alternatives

As described in Section 2.1, the No Action Alternative does not meet the purpose and need; therefore, there is no practicable alternative to implementing the proposed action. The proposed action is the required next step to comply with the EPA's Administrative Order on Consent; the EPA's November 2014 ROD (EPA 2014) as modified by the ESD (EPA 2021); and the EPA-approved *Remedial Design Work Plan for the Lower Duwamish Waterway Upper Reach* (Anchor QEA and Windward 2019).

7.2 Compliance with Pertinent Legislation

The LDW ARARs, as detailed in the ROD (EPA 2014), are used as evaluation criteria for this evaluation. On-site actions (i.e., those taken within the LDW Superfund Site) must comply with the substance of any identified legally applicable requirement to the extent practical considering the circumstances of the situation or by receiving an ARAR waiver allowed by EPA guidance under certain circumstances. On-site actions do not have to comply with the corresponding procedural requirements, such as permit applications, reporting obligations, and recordkeeping requirements. Off-site actions must comply with all substantive and procedural legally applicable requirements. Appendix B of the Final (100%) BODR includes ARARs for the LDW. These ARARs include meeting water quality standards, effluent standards, and ESA requirements, among others. Overall, the proposed action is expected to comply with the ARARs described in the ROD.

8 Findings

The proposed discharges associated with the LDW Superfund Site are found to comply with the requirements of the CWA Section 401, Section 404(b)(1) guidelines, and RHA Section 10 with the implementation of impact minimization measures and BMPs. The proposed action is the required next step as the preferred design alternative meeting the purpose and need of the project and is the least environmentally damaging and practicable alternative.

9 Rivers and Harbors Act Section 10 Compliance

Section 10 of the RHA prohibits the unauthorized obstruction or alteration of any navigable waters of the United States (33 United States Code Section 403), As described in the Final (100%) RD BODR, requirements for dredging, capping, ENR, and backfill elevations have been established in the ROD (EPA 2014) and were designed to accomplish the following: 1) preserve navigation and commerce by maintaining elevations below the authorized depth in the FNC and below the operating depth in berthing areas per the ROD; and 2) preserve habitat at elevations between -10 feet MLLW and MHHW (or within an elevation band defined by EPA). Preserving habitat areas is accomplished by complying with the ROD requirement to return dredged areas in these habitat areas to pre-construction elevations by backfilling the dredged areas with habitat suitable materials.

Any existing structures that are demolished or modified as part of the project will be either restored to provide the functional equivalent of existing conditions or permanently removed with consent of the owner (if privately owned). The *Section 408 Substantive Compliance Report* prepared as BODR Appendix D describes how the project will coordinate with commercial and recreational vessels during construction to avoid or minimize potential impacts to navigable waters of the United States.

10 References

Anchor QEA and Windward (Anchor QEA, LLC; Windward Environmental LLC), 2019. *Remedial Design Work Plan for the Lower Duwamish Waterway Upper Reach.* December 2019.

Anchor QEA and Windward, 2022. *Pre-Design Investigation Data Evaluation Report for the Lower Duwamish Waterway Upper Reach*. Prepared for EPA. July 15, 2022.

Ecology (Washington State Department of Ecology), 2023. "Water Quality Assessment and 303(d) List." Accessed October 17, 2023. Available at: https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d.

EPA (U.S. Environmental Protection Agency), 2000. Letter to: Office of Environmental Cleanup, Office of Ecosystems and Communities and Office of Regional Counsel Superfund Project Staff. Regarding: Region 10 Decision Framework for Determining Clean Water Act Section 404 Compliance at Superfund Sites. June 26, 2000.

EPA, 2014. *Record of Decision*. Lower Duwamish Waterway Superfund Site. November 2014.

EPA, 2016. *EPA Region 10 Best Management Practices for Piling Removal and Placement in Washington State.* February 18, 2016.

EPA, 2021. *Explanation of Significant Differences.* Lower Duwamish Waterway Superfund Site. September 2021.

NOAA (National Oceanic and Atmospheric Administration), 2002. *Hylebos Waterway Natural Resource Damage Settlement Proposal Report: A Habitat Restoration-Based Approach for Resolving Natural Resource Damage Claims Relating to the Hylebos Waterway of the Commencement Bay Nearshore/Tideflats Superfund Site, Combined with a Proposal for Allocating Liability for Settlement Purposes*. Public Review Draft. March 14, 2002.

NOAA, 2013. *Final Lower Duwamish River NRDA Restoration Plan and Programmatic Environmental Impact Statement*. Prepared by the National Oceanic and Atmospheric Administration on behalf of the Lower Duwamish River Natural Resource Damage Assessment Trustee Council. June 2013.

Windward (Windward Environmental LLC), 2020. *Lower Duwamish Waterway Pre-Design Studies Data Evaluation Report (Task 6)*. June 26, 2020.

Figures

Windward environmental LLC

ANCHOR QEA

Lower Duwamish Waterway Group

City of Seattle / King County / The Boeing Company

Figure C1-1. LDW Superfund Site vicinity map and identification of upper reach

100% Remedial Design Basis of Design Report for the LDW Upper Reach

JANUARY 16, 2024

Prepared by craigh, 1/25/23. W:\Projects\Duwamish AOC4\GIS\Maps and Analyses\Phase III\60 Percent Design\BODR\Fig 02-1 7059 Vicinity map.mxd

River mile
Federal navigation channel
Remedial Action Area (RAA)

2.8
2.9
3.0
3.1
3.2
3.3
3.4
3.5
3.6
3.7
3.8
3.9
4.0
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
1/2/3
4/5/6
7
8
10
12
13
14/15/16
17
36
19/20
22
23
24/25/26
27
28
29
30
31
32
33/34/35
cPAH-only RAA

Windward environmental LLC
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Lower Duwamish Waterway Group
City of Seattle / King County / The Boeing Company

N

0 650 1,300 Feet
0 100 200 Meters

Figure C1-2. Remedial action areas within the upper reach

100% Remedial Design Basis of Design Report for the LDW Upper Reach
JANUARY 16, 2024

Prepared by jlarson, 12/15/2023; \\orcas\GIS\Jobs\KingCounty_0067\LDWMaps\Reports\BasisDesignReport\LDW_BDR_100pct.aprx

Appendix C – Clean Water Act Sections 401/404 and Rivers and Harbors Act Section 10 Substantive Compliance Report

Attachment C.1
Lower Duwamish Waterway Upper Reach RAA 27 (SMA 5 and 6) Wetland Evaluation

TABLE OF CONTENTS

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ABBREVIATIONS

ARAR	Applicable and Relevant or Appropriate Requirement
bgs	below ground surface
EPA	U.S. Environmental Protection Agency
FAC	facultative
FACU	facultative upland
FACW	facultative wetland
LDW	Lower Duwamish Waterway
MHHW	mean higher high water
MLLW	mean lower low water
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
OBL	obligate
PDI	pre-design investigation
PHS	Priority Habitats and Species
RAA	remedial action area
RCW	Revised Code of Washington
RD	remedial design
RM	river mile
ROD	*Record of Decision*
SMA	sediment management area
UPL	upland
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife

1 Introduction

This attachment has been prepared to evaluate whether there are any identified wetlands in the proposed sediment remediation and planting area within the Lower Duwamish Waterway (LDW) upper reach Remedial Action Area (RAA) 27,[1] located along the shoreline at 9229 East Marginal Way South in Tukwila, Washington. Sediment Management Area (SMA) 6 is an intertidal and subtidal area, whereas SMA 5 includes intertidal and upland areas. The shoreline bank in this area (SMA 5) is currently characterized as a steep riprap bank with mostly non-native shrubs that have recruited along the shoreline over time. As described in the *Final (100%) Remedial Design Basis of Design Report for the Lower Duwamish Waterway Upper Reach*, the existing bank and vegetation will be removed to support remedial activities.

Contaminated sediment may be present beneath the existing riprap armor in this area. To address this potential, the existing bank in this area will be reconstructed as an engineered cap to contain contaminated sediment if present. The engineered cap will include a slightly flatter slope armoring to address slope stability and erosion protection needs, and the top of the bank above the armor material will be replanted with native riparian vegetation. The proposed replanting area is located at the top of east bank from river miles (RMs) 3.98 to 4.13 and is offset from the proposed top of the SMA 5 engineered cap at a typical elevation of 20.8 feet above mean lower low water (MLLW). This location is above mean higher high water (MHHW), which is +11.3 feet MLLW, and above the highest astronomical tide level of +13.3 feet MLLW. A vicinity map showing the location of SMA 5 is presented in 100% RD Volume I, Appendix C, Figure C1-1. The proposed top of bank planting plan is shown in 100% RD Volume III, Sheet L101.

The evaluation documented in this attachment concludes that there are no wetlands located within the proposed remediation and planting area. The remainder of this attachment describes the methodology used to evaluate the potential for wetland characteristics at the site, provides existing conditions details, and evaluates the potential for wetland characteristics based on a combination of desktop and site survey data. This memorandum is provided for substantive compliance with the Clean Water Act Section 404 Applicable or Relevant and Appropriate Requirements (ARARs) specified in the U.S. Environmental Protection Agency (EPA) November 2014 *Record of Decision* (ROD; EPA 2014) for the site.

[1] In the 100% Remedial Design (RD), the offshore area in RAA 27 is referred to as Sediment Management Area (SMA) 6, and the bank area in RAA 27 is referred to as SMA 5.

2 Methods

Anchor QEA, LLC, biologists reviewed LDW upper reach Pre-Design Investigation (PDI) bank vegetation field observations (Anchor QEA and Windward 2022, Appendix I) and completed a desktop survey of the site to compile relevant data at SMA 5 to assess wetland potential. Field observations include top of bank substrate, plant species, and plant percent cover observations collected along the LDW upper reach on June 20 and July 1, 2021. The following supporting sources of information were also reviewed:

- City of Tukwila, Washington, Municipal Code (City of Tukwila 2023)
- King County iMap of hydrology and wetlands (King County 2023)
- Natural Resources Conservation Service (NRCS) online Web Soil Survey (NRCS 2023)
- U.S. Fish and Wildlife Service (USFWS) NWI (National Wetland Inventory) Wetlands Mapper (USFWS 2023)
- Washington Department of Fish and Wildlife (WDFW) PHS (Priority Habitats and Species) on the Web mapping (WDFW 2023)
- National Oceanic and Atmospheric Administration (NOAA) Annual Prediction Tide Tables for Duwamish Waterway, Eighth Avenue South, Washington (9447029) (NOAA 2023)
- Historical and current aerial photographs publicly available via Google Earth (2022) and King County iMap (King County 2023)
- Site-specific shoreline soil and groundwater characterization data (AMEC 2012)

Per Section 2 of the City of Tukwila *Sensitive Areas Ordinance Best Available Science Review and Gap Analysis* (The Watershed Company 2018), the presence or absence of wetlands should be determined by methods consistent with Washington Administrative Code 173-22-035, which specifies using the approved federal wetland delineation manual and applicable regional supplements. For the LDW upper reach, these methods are defined in the U.S. Army Corps of Engineers (USACE) *Wetland Delineation Manual* (Environmental Laboratory 1987) and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* (USACE 2010). The USACE *Wetland Delineation Manual*, Washington State Shoreline Management Act (Revised Code of Washington [RCW] 90.58), and Washington State Growth Management Act (RCW 36.70) all define wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."

Identifying wetlands is based on the presence of the following three parameters: 1) hydrophytic vegetation; 2) hydric soils; and 3) wetland hydrology (Environmental Laboratory 1987). The technical guideline for wetlands requires that a positive wetland indicator be present for each parameter (vegetation, soils, and hydrology), except in limited instances (e.g., "problematic" vegetation or soils)

identified in the manual (Environmental Laboratory 1987) or regional supplement (USACE 2010). The three parameters are defined as follows:

- **Hydrophytic vegetation** is "macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present."
- **Hydric soils** are "saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation."
- **Wetland hydrology** "encompasses all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface at some time during the growing season."

A plant species' wetland indicator status is based on the probability that it occurs in a wetland. From least to most probable of occurring in a wetland, wetland indicator statuses consist of the following: upland (UPL), facultative upland (FACU), facultative (FAC), facultative wetland (FACW), and obligate (OBL). The USACE Wetland Determination Data Form – Western Mountains, Valleys and Coast Region (USACE 2023) is used to evaluate whether plant species observed in the field constitute hydrophytic vegetation using several possible tests, including the following:

- **Rapid Test for Hydrophytic Vegetation:** All dominant species across all strata are rated OBL or FACW, or a combination of these two categories.
- **Dominance Test:** More than 50% of the dominant plant species across all strata are rated OBL, FACW, or FAC.
- **Prevalence Index:** At least 80% of the total vegetation cover on the plot must be identified and assigned wetland indicator status. A prevalence index of 3.0 or less indicates that hydrophytic vegetation is present.

3 Existing Conditions

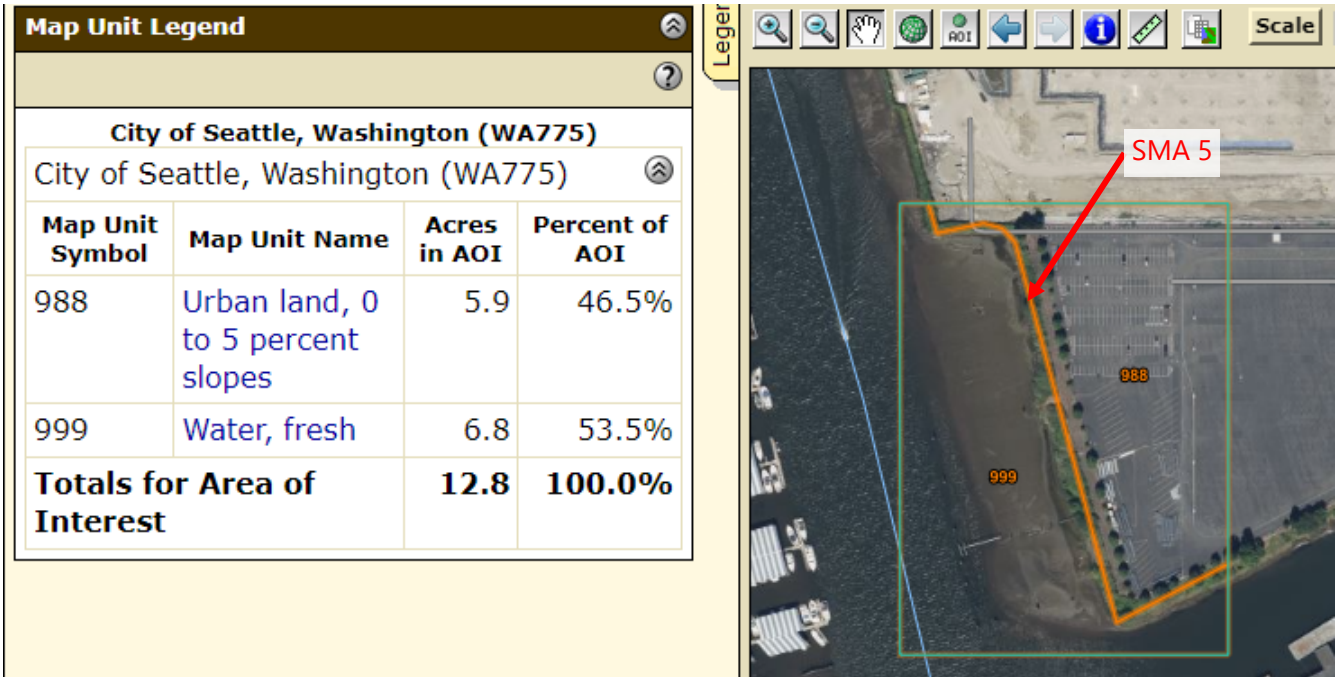
The following was determined from review of the supporting information:

- The King County iMap website (King County 2023) does not map any wetlands within 1,000 feet of SMA 5 (Figure C.1.3-1).
- The NRCS Web Soil Survey (NRCS 2023) maps the upland areas at SMA 5 as urban land with 0% to 5% slopes. This category is not classified as hydric soil (Figure C.1.3-2).
- The USFWS NWI (USFWS 2023) classifies the upper reach of the LDW as Subtidal Estuarine Aquatic Habitat with unconsolidated bottom. No adjacent wetlands are mapped at the top of bank at SMA 5 (Figure C.1.3-3).
- WDFW PHS on the Web mapping (WDFW 2023) classifies the upper reach of the LDW as Bay/Estuary Aquatic Habitat. No adjacent wetlands are mapped at the top of bank in the proposed planting area (Figure C.1.3-4).
- Aerial imagery from 1936 (Figure C.1.3-5) shows the LDW with access to its historical adjacent floodplain in the vicinity of the proposed planting location (King County 2023). Aerial imagery from 1990 (Figure C.1.3-6) shows development along the LDW that has disconnected the waterway from the historical floodplain for at least the last 33 years (Google Earth 2022). No high-resolution aerial imagery was available for years between 1936 and 1990.
- During the 6-year period from 2020 to 2025, NOAA annual predicted tides reach maximum surface elevation of +12.71 feet MLLW (NOAA 2023), indicating that surface water levels will be well below the typical proposed planting elevation of +20.8 MLLW.
- Surficial soils along the SMA 5 top of bank are composed primarily of poorly graded sands to a depth of approximately 5 to 10 feet below ground surface (bgs), which is approximately +10 to +15 feet MLLW (AMEC 2012). At soil and groundwater sampling locations along the bank, groundwater was encountered between 9 and 14 feet bgs (+ 6 to +11 feet MLLW; AMEC 2012).

Figure C.1.3-1
King County iMap Wetlands in the Vicinity of SMA 5

Source: King County 2023

Figure C.1.3-2
NRCS Web Soil Survey Mapped Soils at SMA 5



Map Unit Legend

City of Seattle, Washington (WA775)

City of Seattle, Washington (WA775)

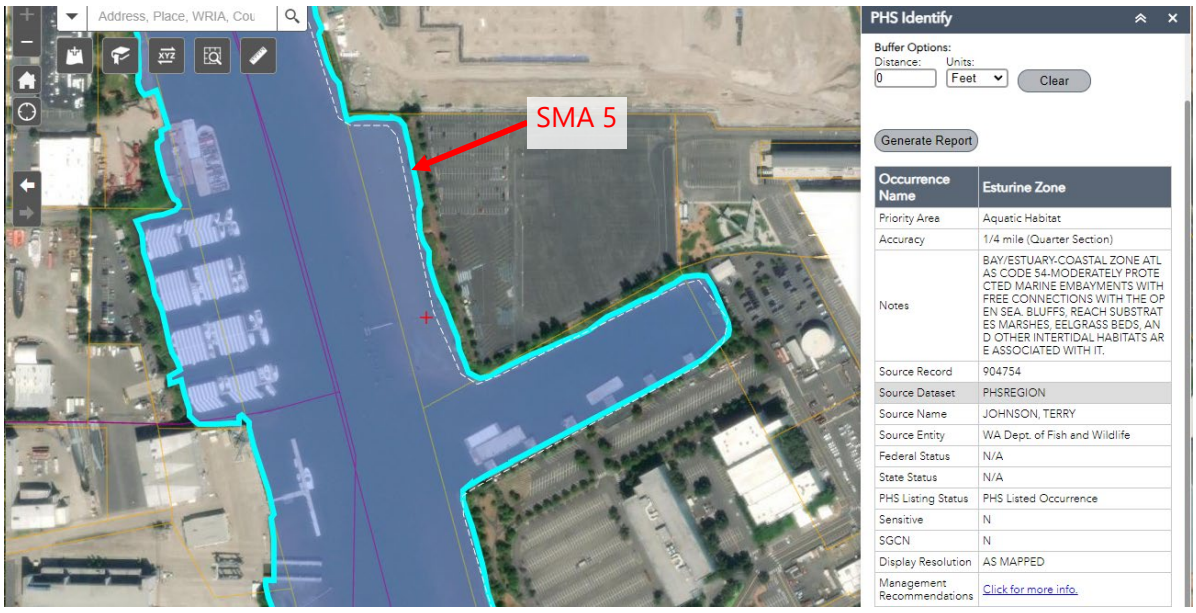
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
988	Urban land, 0 to 5 percent slopes	5.9	46.5%
999	Water, fresh	6.8	53.5%
Totals for Area of Interest		**12.8**	**100.0%**

Note: Neither map unit symbol 988 or 999 is rated as a hydric soil.

Figure C.1.3-3
USFWS NWI Mapped Aquatic Habitat near SMA 5

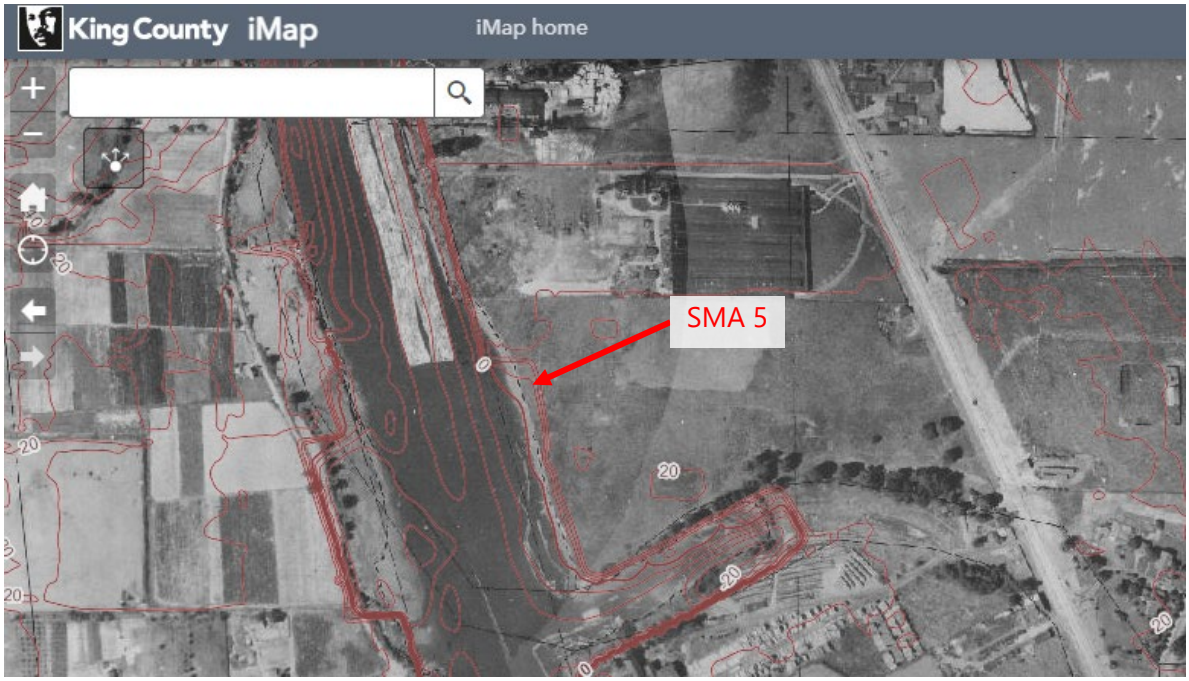
Note: NWI mapping shows deepwater aquatic habitat of the LDW and no adjacent wetlands in the proposed planting area.

Figure C.1.3-4
WDFW PHS on the Web Mapped Habitat near SMA 5



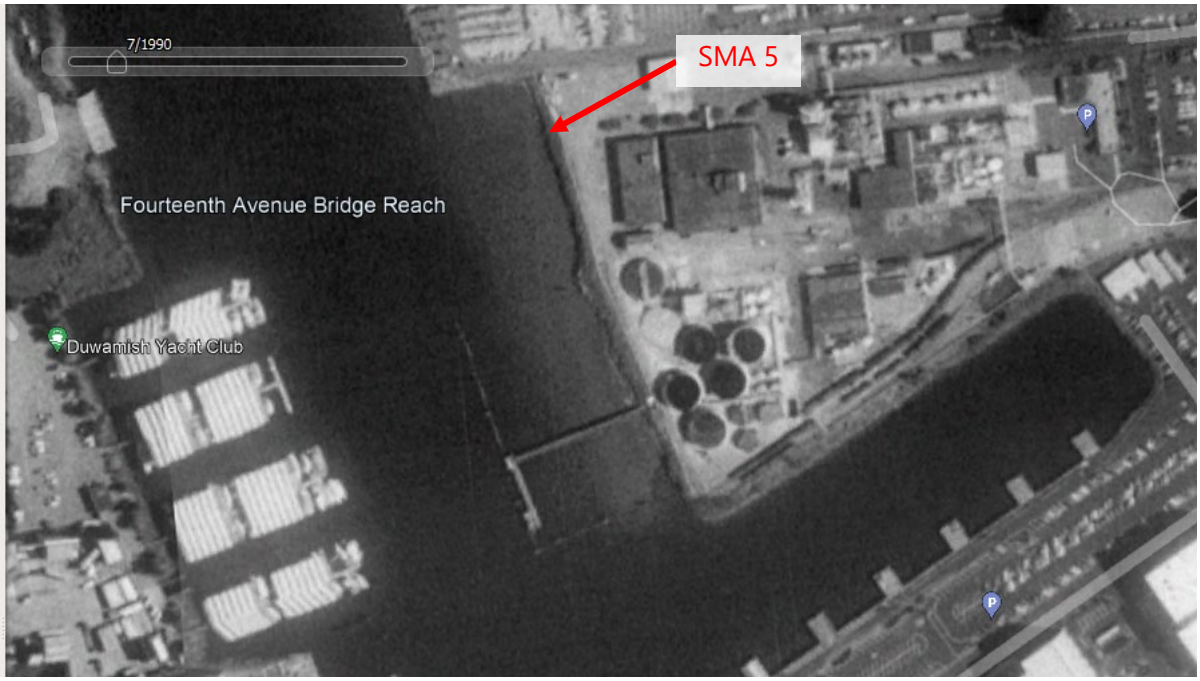
Note: PHS mapping shows estuary zone aquatic habitat of the LDW and no adjacent wetlands in the proposed planting area.

Figure C.1.3-5
King County iMap 1936 Aerial Photography of SMA 5



Note: Current elevation contours are shown for reference.

Figure C.1.3-6
Google Earth 1990 Aerial Imagery of SMA 5



4 Wetland Plant Data Evaluation

On June 20 and July 1, 2021, Anchor QEA biologists completed a top of bank substrate and vegetation survey along the east bank of the LDW, including at SMA 5. Data collected during that survey are presented in Table C.1.4-1, and Photographs C.1.4-1 through C.1.4-4 show the bank conditions during the survey.

Evaluation of top of bank vegetation data at LDW upper reach RM 4.0 east (E) and RM 4.1E using the USACE Wetland Determination Data Form (Attachment C.1.1) shows the following:

- Vegetation present at RM 4.0E fails the Rapid Test for Hydrophytic Vegetation because all dominant species across all strata are not OBL or FACW. It also fails the Dominance Test because >50% of dominant species are not OBL, FACW, or FAC, and it fails the Prevalence Test with a score of 3.8.
- Vegetation present at RM 4.1E fails the Rapid Test for Hydrophytic Vegetation because all dominant species across all strata are not OBL or FACW. It also fails the Dominance Test because more than 50% of dominant species are not OBL, FACW, or FAC, and it fails the Prevalence Test with a score of 3.9.

Table C.1.4-1
LDW Top of East Bank Plant Species and Percent Cover at SMA 5

River Mile	Substrate	Species Name	Common Name	Native Status	Wetland Indicator Status	Stratum	Percent Cover
4.0E	Medium riprap	*Rubus armeniacus*	Himalayan blackberry	Non-native	FAC	Shrub	75
		Buddleja davidii	Butterfly bush	Non-native	FACU	Shrub	25
4.1E	Riprap, concrete debris, fill	*Populus nigra*	Lombardy poplar	Native	UPL	Tree	10
		Fraxinus latifolia	Oregon ash	Native	FACW	Tree	5
		Populus balsamifera	Black cottonwood	Native	FAC	Tree	5
		Cupressus leylandii	Leyland cypress	Non-native	UPL	Tree	5
		Buddleja davidii	Butterfly bush	Non-native	FACU	Shrub	45
		Rubus armeniacus	Himalayan blackberry	Non-native	FAC	Shrub	10

River Mile	Substrate	Species Name	Common Name	Native Status	Wetland Indicator Status	Stratum	Percent Cover
4.1E	Riprap, concrete debris, fill	*Rubus laciniatus*	Cutleaf evergreen blackberry	Non-native	FACU	Shrub	5
		Hypericum perforatum	St. John's-wort	Non-native	FACU	Herb	5
		Hedera helix	English ivy	Non-native	FACU	Woody Vine	10

Notes:
Wetland indicator status for plant species was determined by consulting the USACE *Western Mountains, Valleys, and Coasts 2016 Regional Wetland Plant List* (Lichvar et al. 2016). If the species was not listed in the USACE plant list, the *WSDOT Wetland Monitoring Plant List* (WSDOT 2016) was consulted. Leyland cypress was determined to be a horticultural cross commonly used for hedges and was therefore assigned upland status.
E: east
FAC: facultative
FACU: facultative upland
FACW: facultative wetland
UPL: upland

Photograph C.1.4-1
Bank Conditions at the Northern End of SMA 5, Looking East

Photograph C.1.4-2
Bank Conditions at the Northern End of SMA 5, Looking East

Photograph C.1.4-3
Bank Conditions at the Middle and Southern End of SMA 5, Looking East

Photograph C.1.4-4
Bank Conditions at the Middle and Southern End of SMA 5, Looking East

5 Conclusions

This evaluation confirms the absence of wetlands at SMA 5 (LDW upper reach RMs 3.98E to 4.13E). The evaluation used a combination of desktop analysis of existing information and PDI field data to determine the presence or absence of a wetland in a manner consistent with USACE technical guidance. Per the technical guidance, the presence of a wetland is based on three parameters being present: 1) hydrophytic vegetation; 2) hydric soils; and 3) wetland hydrology (Environmental Laboratory 1987). The following summarizes the results of this evaluation based on the three criteria for wetland presence or absence:

- **Hydrophytic Vegetation – Not Present:** The vegetation present in the proposed planting area at SMA 5 (top of bank at RMs 4.0E and 4.1E; Table C.1.4-1) does not meet the technical guidance for hydrophytic vegetation.
- **Hydric Soils – Unlikely to be Present:** No soil profile was collected during the field survey; however, existing site information characterizes top of bank surficial soils at SMA 5 as poorly graded sand, which is expected to be a well-drained type of soil. Additionally, the NRCS Web Soil Survey does not map hydric soils at SMA 5 (Figure C.1.3-2).
- **Wetland Hydrology – Unlikely to be Present:** Field observations, tidal data, and topography indicate that wetland hydrology is not present at SMA 5. During the vegetation field survey during the growing season, typical surface water levels, as defined by bank riprap algae line, were well below top of bank (Photographs C.1.4-1 through C.1.4-4). Comparison of aerial imagery from 1936 and 1990 shows that the post-developed elevation of the bank in this area is likely much higher than when the waterway was connected to its historical floodplain. NOAA-predicted tide data over the 6-year period from 2020 to 2025 indicates that surface water elevations are expected to reach a maximum of +12.71 feet MLLW (NOAA 2023), and SMA 5 bank groundwater water levels are documented to be +6 to +11 feet MLLW (AMEC 2012). This indicates that surface and groundwater levels are well below the proposed planting typical elevation of +20.8 MLLW.

Based on the lack of hydrophytic vegetation and the unlikely presence of hydric soils and wetland hydrology, this evaluation indicates that a wetland is not present at SMA 5.

6 References

Anchor QEA (Anchor QEA, LLC) and Windward (Windward Environmental LLC), 2022. *Pre-Design Investigation Data Evaluation Report for the Lower Duwamish Waterway Upper Reach*. Final. Submitted to EPA July 15, 2022.

City of Tukwila, 2023. Wetlands and Streams Code Update to Chapter 18.45 of Tukwila Zoning Code. Accessed October 9, 2023. Available at: https://www.tukwilawa.gov/departments/community-development/community-planning/wetlands-streams-slopes-codeupdate/.

Environmental Laboratory, 1987. *Corps of Engineers Wetland Delineation Manual*. Technical Report Y-87-1. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

EPA (U.S. Environmental Protection Agency), 2014. *Record of Decision*. Lower Duwamish Waterway Superfund Site. U.S. Environmental Protection Agency Region 10. November 2014.

Google Earth, 2022. Google Earth Pro version 7.3.6.9345 (64-bit). Build Date: Thursday, December 29, 2022 10:50:09 PM UTC.

King County, 2023. King County iMap. Accessed October 9, 2023. Available at: https://gismaps.kingcounty.gov/iMap/?mapset=wria

NOAA (National Ocean and Atmospheric Administration), 2023. Annual Prediction Tide Tables for Duwamish Waterway, Eighth Ave. South, WA (9447029). Accessed October 9, 2023. Available at: https://tidesandcurrents.noaa.gov/noaatideannual.html?id=9447029

NRCS (Natural Resources Conservation Service), 2023. Web Soil Survey. Accessed October 9, 2023. Available at: https://websoilsurvey.nrcs.usda.gov/app/.

The Watershed Company, 2018. *Best Available Science Review and Gap Analysis, City of Tukwila Sensitive Areas Ordinance*. Prepared for City of Tukwila. October 2018. Revised November 2018.

USACE (U.S. Army Corps of Engineers), 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)*. Editors, J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-10-3. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

USFWS (U.S. Fish and Wildlife Service), 2023. National Wetlands Inventory Wetlands Mapper. Accessed October 9, 2023. Available at: https://www.fws.gov/wetlands/data/Mapper.html.

WDFW (Washington Department of Fish and Wildlife), 2023. Priority Habitats and Species: Maps. Accessed October 9, 2023. Available at: https://wdfw.wa.gov/species-habitats/at-risk/phs/maps.

WSDOT (Washington State Department of Transportation), 2016. WSDOT Wetland Plant Monitoring Plant List. Updated May 2016. Accessed October 9, 2023. Available at: https://wsdot.wa.gov/sites/default/files/2021-10/Env-Wet-PlantList.pdf.

Attachment C.1 – Lower Duwamish Waterway Upper Reach RAA 27 (SMA 5 and 6) Wetland Evaluation

Attachment C.1.1
Wetland Data Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Lower Duwamish Waterway Upper Reach City/County: King County Sampling Date: 6/21 & 7/1 2021
Applicant/Owner: LDWG State: WA Sampling Point: RM 4E
Investigator(s): Sydney Gonsalves (data only) Section, Township, Range: T24N R4E S33
Landform (hillslope, terrace, etc.): River bank/top of bank Local relief (concave, convex, none): convex Slope: ?H:1V (bank
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.520333 Long: -122.305408 Datum: Web
Soil Map Unit Name: Water fresh (999) and Urban land, 0 to 5 percent slope (988) NWI Classification: E1UBL
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No (If no, explain in Remarks)
Are Vegetation x, Soil x, or Hydrology x significantly disturbed? Are "Normal Circumstances" Present? Yes x No
Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No **X**	**Is the Sampled Area within a Wetland?** **Yes** **No X**
Hydric Soil Present?	Yes	No	
Wetland Hydrology Present?	Yes	No	

Remarks: This data form evaluates vegetation survey data only. Although the site is is human altered, "normal circumstances" are assumed to be present because site conditions during the vegetation survey were consistent with conditions over the last 30+ years based on aerial imagery.

VEGETATION

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status?
1.			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	**0**		
Sapling/Shrub Stratum (Plot size:)			
1. *Buddleja davidii*	75	Yes	FACU
2. *Rubus armeniacus*	25	Yes	FAC
3.			
4.			
5.			
50%= 50 20%= 20 Total Cover:	**100**		
Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 0 20%= 0 Total Cover:	**0**		
Woody Vine Stratum (Plot size:)			
1.			
2.			
Total Cover:	**0**		

% Bare Ground in Herb Stratum **100** % Cover of Biotic Crust

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)

Total Number of Dominant Species Across All Strata: **2** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **50%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	**0**	x1 =	**0**
FACW species	**0**	x2 =	**0**
FAC species	**25**	x3 =	**75**
FACU species	**75**	x4 =	**300**
UPL species	**0**	x5 =	**0**
Column Totals:	**100** (A)		**375** (B)

Prevalence Index = B/A = **3.8**

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- 2 - Dominance Test is >50%
- 3 - Prevalence Index is ≤3.0[1]
- 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
- 5 - Wetland Non-Vascular Plants[1]
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** **No X**

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Lower Duwamish Waterway Upper Reack City/County: King County Sampling Date: 6/21 & 7/1 2021
Applicant/Owner: LDWG State: WA Sampling Point: RM 4.1E
Investigator(s): Sydney Gonsalves (data only) Section, Township, Range: T24N R4E S33
Landform (hillslope, terrace, etc.): River bank/top of bank Local relief (concave, convex, none): convex Slope: 2H:1V (bank)
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 47.520333 Long: -122.305408 Datum: Web
Soil Map Unit Name: Water fresh (999) and Urban land, 0 to 5 percent slope (988) NWI Classification: E1UBL
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No (If no, explain in Remarks)
Are Vegetation x, Soil x, or Hydrology x significantly disturbed? Are "Normal Circumstances" Present? Yes x No
Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No	X
Hydric Soil Present?	Yes	No	
Wetland Hydrology Present?	Yes	No	

Is the Sampled Area within a Wetland? Yes No X

Remarks: This data form evaluates vegetation survey data only. Although the site is is human altered, "normal circumstances" are assumed to be present because site conditions during the vegetation survey were consistent with conditions over the last 30+ years based on aerial imagery.

VEGETATION

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Populus nigra*	10	Yes	UPL
2. *Fraxinus latifolia*	5	Yes	FACW
3. *Cupressus leylandii*	5	Yes	UPL
4. *Populus balsamifera*	5	Yes	FAC
5.			
50%= 12.5 20%= 5 Total Cover:	**25**		
Sapling/Shrub Stratum (Plot size:)	**CHECK RANKED VALUES**		
1. *Buddleja davidii*	45	Yes	FACU
2. *Rubus armeniacus*	10	No	FAC
3. *Rubus laciniatus*	5	No	FACU
4.			
5.			
50%= 30 20%= 12 Total Cover:	**60**		
Herb Stratum (Plot size:)			
1. *Hypericum perforatum*	5	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 2.5 20%= 1 Total Cover:	**5**		
Woody Vine Stratum (Plot size:)			
1. *Hedera helix*	10		FACU
2.			
Total Cover:	**10**		
% Bare Ground in Herb Stratum **95** % Cover of Biotic Crust			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)

Total Number of Dominant Species Across All Strata: **6** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **33%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	**0**	x1 =	**0**
FACW species	**5**	x2 =	**10**
FAC species	**15**	x3 =	**45**
FACU species	**65**	x4 =	**260**
UPL species	**15**	x5 =	**75**
Column Totals:	**100** (A)		**390** (B)
Prevalence Index = B/A =	**3.9**		

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- 2 - Dominance Test is >50%
- 3 - Prevalence Index is ≤3.0[1]
- 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
- 5 - Wetland Non-Vascular Plants[1]
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes No X

Remarks: