INTERIM ACTION WORK PLAN
UPLAND INTERIM ACTION
DUWAMISH SHIPYARD, INC. SITE

Prepared for

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TABLE OF CONTENTS

List of Tables

List of Figures

LIST OF ACRONYMS AND ABBREVIATIONS

Abbreviation	Definition
ACOE	U.S. Army Corps of Engineers
AML	Alaska Marine Lines
AO	Agreed Order
bgs	below ground surface
CAP	Cleanup Action Plan
COC	contaminant of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
cy	cubic yards
DSI	Duwamish Shipyard, Inc.
Ecology	Washington Department of Ecology
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
Glacier	Glacier Northwest, Inc.
GCMP	Groundwater Compliance Monitoring Plan
IAWP	Interim Action Work Plan
LDW	Lower Duwamish Waterway
MLLW	mean lower low water
MTCA	Model Toxics Control Act
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
ppm	parts per million
Port	Port of Seattle
QAPP	Quality Assurance Project Plan
RCW	Revised Code of Washington
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
SEPA	State Environmental Policy Act
Site	DSI property
SMA	Shoreline Management Act

Abbreviation	Definition
SSDP	Shoreline Substantial Development Permit
SVOC	semivolatile organic carbon
TPH	total petroleum hydrocarbon
UST	underground storage tank
WAC	Washington Administrative Code

1 INTRODUCTION

Anchor QEA, LLC (Anchor QEA) has prepared this Interim Action Work Plan (IAWP) on behalf of Duwamish Shipyard, Inc. (DSI) for the cleanup of upland media and implementation of property redevelopment improvements necessary for ongoing business operations at the DSI property (Site). The Site is located on the Duwamish River south of downtown Seattle, Washington, as shown on Figure 1. An interim action is distinguished from a cleanup action in that an interim action partially addresses the cleanup of the Site (Washington Administrative Code [WAC] 173-340-430). Interim actions are generally implemented before the full extent of contamination and associated risks have been determined through the Remedial Investigation/Feasibility Study (RI/FS) process, but following completion of RI activities.

DSI will perform the interim action in cooperation with Alaska Marine Lines (AML) under oversight by the Washington Department of Ecology (Ecology), and in accordance with Agreed Order (AO) No. DE-6735. This interim action will be performed consistent with the cleanup requirements of the Model Toxics Control Act (MTCA), Revised Code of Washington (RCW) 70.105D and its implementing regulations, WAC 173-340. Additionally, this interim action will be conducted consistent with Section VI.E. of the AO, in order to reduce or eliminate risks to the aquatic environment and to facilitate future sediment cleanup adjacent to the Site.

Ongoing plans for improvements at the Site include development of a container and equipment storage and handling facility in coordination with the adjacent property owner and current occupant of the Site, AML. These plans include source control, development and cleanup elements. Source control and cleanup elements will most efficiently be accomplished prior to or in concert with upland redevelopment of the Site. The following elements are proposed for the interim action:

- Planning and coordination with DSI and Ecology to ensure that interim action elements meet regulatory requirements;
- Preparation of draft and final IAWP documents describing the interim action elements for review and approval by the public and Ecology;
- Permitting to obtain regulatory and other agency approvals to implement the interim

action;

- Construction of retaining walls to facilitate removal of upland contaminated soil and to support future sediment area cleanup activities;
- Contaminated soil excavation to remove source material from the upland area of the Site;
- Stormwater collection and treatment system construction to capture and treat all Site stormwater to levels that meet permit discharge requirements. AML currently manages stormwater compliance for the DSI property under a National Pollutant Discharge Elimination System (NPDES) permit. It has implemented a Level 3 treatment best management practice (BMP) to improve the quality of stormwater discharge;
- Backfilling and grading to construct desired operational grades within the upland area of the Site;
- Pavement section construction to accommodate future Site operations and to prevent stormwater infiltration;
- Preparation of draft and final Interim Action Completion Report documents to describe the as-built condition of the interim action and plans for future Site monitoring throughout the RI/FS process; and
- Implementation of post-interim action monitoring to ensure that upland cleanup requirements are met.

A detailed description of these proposed interim action elements is provided in Section 4. Through implementation of the Phase 1 upland RI effort, Anchor QEA has identified the areas of upland media that require cleanup as part of this interim action. DSI may conduct Phase 2 upland investigations in 2011 to fill Phase 1 RI data gaps and provide additional design information for implementation of the proposed interim action.

1.1 Purpose of Interim Action

The purpose of this interim action is to implement upland source control and cleanup activities, with Ecology approval, under the AO consistent with MTCA and LDW source control requirements. In addition, information obtained during design and implementation of the interim action will facilitate future planning and design of sediment cleanup activities

at the Site. Consistent with MTCA's requirements for interim actions (WAC 173-340-430), this IAWP documents the proposed upland interim action elements and provides the necessary information to support an evaluation of source control to the LDW. Although the cleanup activities are proposed as an interim action, DSI anticipates that the interim action will be acknowledged as an integral part of the final remedy that will be selected following the completion of the RI/FS and in the future Cleanup Action Plan (CAP). The key to success for completion of these project activities will be a collaborative relationship between DSI and Ecology (and the U.S. Environmental Protection Agency [EPA]) throughout the interim action and Site cleanup processes. The team will hold regular coordination meetings to discuss planning, design, and construction considerations as they arise.

1.2 Interim Action Objectives

The interim action objectives take into account the following considerations: protection of human health and the environment; land use planning; and ongoing cleanup and source control for the LDW. The interim action objectives are as follows:

- Implement interim action consistent with anticipated requirements of the future CAP for the entire Site;
- Implement interim action in coordination with LDW cleanup and source control requirements, such that all sources of upland Site contaminants of concern (COCs) to sediment and surface water of the LDW are controlled or eliminated;
- Reduce or eliminate human and ecological exposure to any contaminated media that may lead to potential current or future unacceptable risks; and
- Meet future Site redevelopment and operational use requirements.

1.3 Interim Action Alternatives

Aggregation and evaluation of interim action alternatives was not conducted for this Site. The proposed interim action (described in detail in Section 3) will be designed and constructed as a permanent alternative that maximizes environmental benefits associated with the requirements for selection of cleanup actions in WAC 173-340-360, including:

- Protection of human health and the environment;
- Compliance with cleanup standards;

- Compliance with applicable state and federal laws;
- Compliance monitoring;
- Use of permanent solutions to the maximum extent practicable;
- Reasonable restoration timeframe; and
- Consideration of public concerns.

DSI will implement the proposed interim action so that all upland Site sources of contamination are controlled or eliminated. Additionally, implementation will occur in a manner that is protective of surface water and sediment quality within the LDW.

1.4 Relation to RI/FS and Cleanup Process

RI/FS activities are being conducted and will be completed by DSI pursuant to AO No. 6735 executed by Ecology on September 13, 2010. The purpose of the RI/FS is to characterize the nature and extent of potential upland and aquatic contamination at the Site in order to recommend and implement a Site-wide remedial action that will be protective of human health and the environment. A RI/FS Work Plan (Anchor QEA 2010a) is attached as Exhibit B to the AO and outlines the existing data gaps and steps necessary to complete the RI/FS process at the Site.

DSI performed a preliminary investigation at the Site in 2006 according to the Preliminary Investigation Work Plan (Anchor 2006a). The results of this investigation are presented in the Preliminary Investigation Data Report (Anchor 2006b). In advance of Ecology finalizing the AO and RI/FS Work Plan, DSI performed the upland RI activities during July 2009 consistent with a draft Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP). DSI submitted the documents to Ecology in December 2008 (Anchor 2008). In addition, it submitted a June 2009 update (Anchor QEA 2009) of the upland RI in coordination with comments received from Ecology. DSI provided a supplemental Draft SAP/QAPP document to Ecology in October 2010 (Anchor QEA 2010b). It submitted a Final SAP/QAPP for Ecology approval in May 2011 (Anchor QEA 2011a). Additional Phase 2 upland investigations are planned for completion in 2011 to address data gaps that may be identified based on review of the 2006 and 2009 investigation data.

Anchor QEA developed this IAWP using information obtained from previous environmental investigations completed in 2006 and 2009. Following additional upland and sediment data collection efforts and implementation of the interim action, Anchor QEA will prepare a comprehensive RI/FS document and use it to develop a CAP for the Site. Based on the current understanding of the Site and future property uses, DSI is implementing this interim action consistent with future cleanup activities that will be necessary in the aquatic areas of the Site. The intent of this interim action is to constitute an upland cleanup action and achieve cleanup standards for the upland portions of the Site, including protection of LDW sediment and surface water.

1.5 Document Organization

Anchor QEA prepared this IAWP consistent with the requirements of MTCA. It incorporates information collected during the upland RI activities. The IAWP document is organized as follows:

- Section 1: Provides the context for the current report;
- Section 2: Provides a summary of the Site background and operational history, and an overview of the existing environmental conditions;
- Section 3: Presents the requirements for the proposed interim action;
- Section 4: Presents a description of the proposed interim action;
- Section 5: Presents a summary of actions to be performed following implementation of the interim action;
- Section 6: Presents the interim action schedule and reporting process; and
- Section 7: Provides references cited in this IAWP.

Anchor QEA also has provided figures to supplement the information contained in this IAWP.

2 BACKGROUND AND EXISTING SITE CONDITIONS

This section describes the background information relevant to the proposed upland interim action at the Site. Information presented in this section includes the following:

- Property description and physical Site conditions;
- Summary of historical and current uses;
- Summary of previous remedial actions and investigations; and
- Additional RI/FS and interim action investigations.

2.1 Property Description and Physical Site Conditions

The Site includes approximately 5 acres of land owned by DSI and is located on the west bank of the LDW. The upland property area is bounded by the AML property to the north, the Glacier Northwest (Glacier) property to the south, West Marginal Way to the west and the Duwamish River to the east as shown on Figure 2. The berth and waterway areas adjacent to the Site are owned by the Port of Seattle (Port). The U.S. Army Corps of Engineers (ACOE) maintains the waterway channel for navigation in conjunction with the Port. Portions of the berth area contain a former timber marine railway structure and over-water timber pier.

The Site is located in a highly industrialized area and is currently zoned for General Industrial (IG1 U/85) use. The eastern property boundary abuts the LDW, which EPA placed on the National Priorities List (NPL) in September 2001. EPA is currently in the process of completing an FS to recommend a preferred cleanup approach for the LDW. Additionally, the cleanup evaluations of the Site are being conducted under the state's MTCA RI/FS process and the AO with Ecology.

The upland topography of the Site is relatively flat, ranging from elevations 14 to 18 feet mean lower low water (MLLW; Figure 2). A timber bulkhead is present along a portion of the shoreline (adjacent to the marine railway), and armored slopes have been constructed along the northern and southern portions of the shoreline. Bathymetry within the berth and waterway areas consists of gentle to steep slopes that drop to meet the waterway navigation elevation of -30 feet MLLW.

The geology of the Site has been defined by a number of soil and sediment samples completed at the Site and at neighboring properties. The upland surface is underlain by a relatively thin layer of fill, which consists of compact sand and gravel. The fill extends from 2 to 10 feet below ground surface (bgs) in the upland areas. Existing borings identify a silt layer (containing organic matter) at the base of the fill and extending to a depth of approximately 12 to 15 feet bgs, which may represent the uppermost native soil. Underlying the silt layer is gray sand with intermittent silt interbeds and layers. Armoring and bulkheading have modified the shoreline in the eastern portion of the Property. Sediments generally consist of recent, soft silt deposits (ranging from approximately 1 to 10 feet in thickness) overlying the gray native sand observed in the upland area.

Groundwater is located approximately 5 feet bgs throughout the upland areas and fluctuates during periods of high and low tide. Groundwater gradients generally slope to the east (towards the LDW) and the area of tidal fluctuation of groundwater is estimated to be within 200 to 300 feet of the shoreline. Tidal fluctuation results in a tidally-influenced mixing of groundwater along the nearshore area prior to discharge into the LDW.

Additional details regarding the description and physical conditions of the Site are discussed in the RI/FS Work Plan (Anchor QEA 2010a).

2.2 Historical and Current Property Uses

Sections 2.2.1 and 2.2.2 present a summary of historical and current operational uses at the Site. A detailed description of the Site history, shipyard operational history, and history of adjacent properties is provided in the RI/FS Work Plan (Anchor QEA 2010a).

2.2.1 Historical

DSI purchased the main portions of the property in 1941 from King County. Early operations at the property included vessel and equipment repair and maintenance, including tugboats, barges, dredges, fishing vessels, small passenger vessels and other types of commercial vessels. The timber marine railway structure was constructed in the early 1940s and was primarily used to raise and sidetrack wooden fishing boats for repair and maintenance. Sidetracking operations continued at the property until the late 1950s. The

upland property consisted of several buildings, sheds and office structures that were used to store shipyard materials and supplies and support vessel maintenance and repair operations. Locations of offshore historical operations and the upland office and shipyard buildings are shown on Figure 3.

DSI acquired two floating drydock structures in 1967 and 1969 in order to enhance maintenance and repair services, following completion of sidetracking operations at the marine railway. The first floating drydock (purchased in 1967) was a small steel structure that was moored within the berth areas shown on Figure 3. DSI acquired a second, larger wooden drydock in 1969. This structure was moored adjacent to the steel drydock within the berth areas. DSI operated both drydocks as its main vessel maintenance and repair facilities where machine and electrical work, carpentry, steel fabrication, pipe-fitting, sand blasting, pressure washing and painting were performed.

In 1990, DSI sold the large wooden drydock. It replaced the drydock with a larger steel drydock. Both steel drydocks were then updated in the 1990s to provide containment of pressure wash wastewater. DSI continued to provide vessel maintenance and repair services at the two steel drydock facilities from the 1990s through 2007, servicing approximately 65 vessels per year. DSI sold the two steel drydocks in 2007 and removed them from the property.

2.2.2 Current

DSI ceased property vessel maintenance and repair activities in April 2007. At that time, it relocated the two steel drydocks. DSI demolished several of the upland shipyard storage and office buildings. AML currently is leasing the upland portion of the property for container storage and truck access. The berthing areas are currently used by AML for barge moorage and vessel layup to support vessel loading and unloading operations conducted at the AML property. Figure 4 presents the current property layout and key features of current upland and offshore property use.

2.3 Previous Remedial Actions and Investigations

Several remedial actions and investigations have been conducted at the Site since the mid-1980s. The majority of these activities were conducted in the uplands. Environmental reports prepared to date for the Site subdivide the uplands (based on historical operations) into the following areas, as shown on Figure 5:

- **Northwestern Area**: The northwestern area included a machine shop that was operated for small and large parts fabrication, engine work and pump work. Materials used at the machine shop included cutting tool coolant, small parts degreasers and used oil. DSI stored spent sand blast grit in a covered shed adjacent to the machine shop. A 500-gallon gasoline underground storage tank (UST) was located between the storage shed and machine shop.
- **Rail Spur Area**: The rail spur area is located along the south property boundary. It served as the terminus of the former Northern Pacific Railway easement rail spur, where rail cars were temporarily parked for use at the Glacier property to the south. The rail spur area also included a wood (joiner) and electrical shop that were operated for vessel interior work such as carpentry, and electrical system and component repair and testing. Materials used in these buildings included wood stains, varnishes, wiring, switches, breakers and contact cleaners.
- **Central Area**: The central area is located in the interior upland area, approximately 200 feet from the shoreline. It historically was used for shipyard staff vehicle parking. Administrative office buildings were also present within this area.
- **UST Removal Area**: This area is located south of the central area. It represents the location of UST removal and soil excavation activities that were completed in 2000. DSI historically utilized the former gasoline and diesel USTs for vehicle and vessel fueling operations.
- **South Property Area**: The south property area is located to the east of the rail spur area, along the southern Site boundary. DSI historically used this area for material storage (spent blasting grit, used oil, paint, hazardous waste and solvents) and paint work.
- **Shipyard Nearshore Area**: The shipyard nearshore area includes the upland areas adjacent to the marine railway structure, within approximately 150 feet of the shoreline and existing bulkhead. Historical shipyard operations in this area included

vessel sidetracking for maintenance and repair, crane and winch activities, sandblasting and grit handling, wastewater treatment, and operation of a steel pipe shop. The nearshore area also periodically was filled up to the current bulkhead location using soil, broken concrete, scrap steel, and riprap.

- **Parcel D Nearshore Area**: This nearshore area is located to the south of the shipyard nearshore area (in the southeastern corner of the Site). It historically was used for miscellaneous storage and operation of a small parts blasting shed.

Remedial actions and investigations associated with these upland areas have been completed at the Site over the past 15 years and are summarized in Sections 2.3.1 through 2.3.3.

2.3.1 Upland Remedial Actions

DSI has performed remedial actions in upland portions of the Site, including the decommissioning of USTs in two areas and the completion of an independent remedial action in the northwestern portion of the property. The locations of these remedial actions are shown on Figure 6 and are summarized as follows:

- **1986 UST Closure:** In 1986, DSI had a 500-gallon gasoline UST closed in place in the northwestern area, adjacent to the former machine shop and storage shed buildings (Figure 6). The UST was closed in place because it was located adjacent to an electrical power pole and building foundation. At the time of closure, no subsurface samples were collected.
- **1993 Remedial Action:** Petroleum-impacted soil was discovered in 1993 on a parcel of land (currently owned by AML) located west of the northwestern area of the Site (Figure 6). DSI formerly owned this parcel. DSI leased it to various entities for storage of used machinery, parking of trucks and trailers, and storage and distribution of lumber.

In August 1993, DSI excavated approximately 650 cubic yards (cy) of contaminated soil and collected confirmation samples. Confirmation sample results indicated that some residual petroleum contamination remained. However, structural restrictions prevented removal of additional soil material. The excavation was then backfilled with clean material and capped

with asphalt. A groundwater monitoring well (MW-5) was installed on the current Site to assess downgradient groundwater quality.

Groundwater was collected from MW-5 during four monitoring events in 1994 and during one event in 1999. Total petroleum hydrocarbon (TPH) concentrations in groundwater samples collected at MW-5 met MTCA groundwater cleanup levels. Other hydrocarbon constituents (benzene, toluene, ethylbenzene, and xylene) were not detected.

- **2000 Diesel and Gasoline UST Excavations:** In 2000, four USTs containing diesel fuel and unleaded gasoline were excavated and removed from the UST removal area (Figure 6). Approximately 80 cy of soil was removed as part of the tank removal activities. Soil confirmation samples were collected from the excavation area. Results of confirmation testing indicated some petroleum concentrations exceeded the MTCA Method A cleanup level for gasoline. However, DSI did not complete an additional excavation. The excavation area was backfilled with clean material to restore grade.

Additional details regarding the completion of these remedial actions at and adjacent to the Site is provided in the RI/FS Work Plan (Anchor QEA 2010a).

2.3.2 Upland Remedial Investigations

Upland RIs were completed at the Site in 2006 (Preliminary Site Investigation; Anchor 2006a and 2006b) and 2009 (Phase 1 Upland Site Investigation; Anchor 2008; Anchor QEA 2009 and 2010b). Figure 7 presents locations of the boring and monitoring well explorations that were completed as part of these investigations.

The 2006 Preliminary Site Investigation included sampling soil and groundwater from 12 temporary soil borings (two soil samples and one groundwater sample were collected from each location), and re-sampling of existing groundwater monitoring wells (MW-4 and MW-5). The results of these sampling efforts indicated the following:

- A slightly elevated arsenic concentration was detected in surface (0 to 3 feet bgs) soil and groundwater in the boring located within the rail spur area.
- Slightly elevated concentrations of gasoline (TPH-G) in soil and diesel (TPH-D) in groundwater were detected at depth (5 to 6.5 feet bgs) in the boring located in the

northwestern area. Gasoline was not detected in the groundwater sample collected at this location.

- Slightly elevated gasoline (TPH-G) concentrations ranging from 74 to 120 parts per million (ppm) were detected in surface (0 to 3 feet bgs) soil at two boring locations within the UST removal area. Benzene was also detected in these surface soil samples. Gasoline was also detected at an elevated concentration in groundwater at one of the temporary soil boring locations in this area.
- Slightly elevated diesel (TPH-D) concentrations, ranging from 2,200 to 2,700 ppm, were detected in surface and subsurface samples (to a depth of approximately 6 feet bgs) at one location within the UST removal area. Diesel concentrations in groundwater were also elevated at this location.
- An elevated gasoline (TPH-G) concentration of 200 ppm was detected in a subsurface (3 to 5 feet bgs) soil sample at one boring location on the northern shipyard nearshore area. This subsurface soil sample also had an elevated lead concentration of 4,940 ppm and slightly elevated concentrations of arsenic (20.2 ppm).
- Semivolatile organic compound (SVOC) concentrations were elevated in surface and subsurface (to approximately 5 feet bgs) soil and groundwater samples at one boring location in the Parcel D nearshore area. Additionally, diesel was detected at elevated concentrations in groundwater at two locations in the Parcel D nearshore area.

A summary of these results is presented on Figures 8 through 11. A detailed presentation and discussion of the 2006 Preliminary Site Investigation data is included in the RI/FS Work Plan (Anchor QEA 2010a) and the Preliminary Investigation Data Report (Anchor 2006b).

The 2009 Phase 1 Upland Site Investigation included sampling soil from 20 temporary boring locations, and groundwater from 14 temporary boring locations and 10 permanent monitoring well locations. Boring and monitoring well locations were selected to compare 2009 data to 2006 data in the upland area of the Site and to further delineate soil and groundwater contamination in the nearshore area of the Site. The results of the 2009 Phase 1 Upland Site Investigation effort indicated the following:

- Arsenic was detected at low concentrations in surface and subsurface soil samples at the two temporary soil boring locations in the rail spur area. However, a slightly elevated arsenic concentration was detected in the surface soil sample collected at

permanent monitoring well location MW-01. Elevated arsenic concentrations were detected in groundwater at all three 2009 sampling locations within the rail spur area. Elevated concentrations of arsenic in soil and groundwater samples were also detected at locations within the south property area and Parcel D nearshore area.

- Gasoline (TPH-G) was detected at elevated concentrations in soil at one soil boring and one monitoring well location within the northwestern area to an approximate depth of 9 feet bgs. Diesel (TPH-D) was not detected in soil or groundwater samples collected in the northwestern area as part of the 2009 investigation.
- Elevated concentrations of gasoline and diesel were detected in surface and subsurface soil samples within the south property area and UST removal area. However, groundwater sample concentrations were not detected (or detected at low concentrations) at the 2009 sample locations.
- Elevated concentrations of gasoline and diesel were observed in surface and subsurface soil samples within the shipyard nearshore area. However, groundwater sample concentrations were not detected (or detected at low concentrations) at the 2009 sample locations. Gasoline and diesel were not detected at elevated concentrations within the Parcel D nearshore area.
- Similar to the results of the 2006 investigation, carcinogenic polycyclic aromatic hydrocarbons (cPAHs) were detected in soil and groundwater samples (surface and subsurface) during the 2009 investigation effort at elevated concentrations in the Parcel D nearshore area.
- Residual concentrations of vinyl chloride were detected in groundwater samples only at select locations.

A summary of the results of the 2009 Phase 1 Upland Site Investigation is presented on Figures 8 through 11. A detailed presentation and discussion of the 2009 Phase 1 Upland Site Investigation data will be included in the Draft Phase 1 Data Memorandum (Anchor QEA 2011b).

2.3.3 Phase 1 RI/FS Sediment Investigation

DSI completed the Phase 1 Sediment Investigation effort at the Site in March 2011 to complement the 2009 Phase 1 Upland Site Investigation. DSI will use the results of the Phase 1 Sediment Investigation to inform future decisions regarding cleanup of the offshore

Site areas, following implementation of this proposed upland interim action. DSI will present the data collected during the Phase 1 Sediment Investigation in the Phase 1 Data Memorandum (Anchor QEA 2011b), to be submitted to Ecology in summer 2011. It will use the results of this investigation effort to determine the scope of additional sediment sampling to be completed as part of Phase 2 investigations in fall/winter 2011.

2.4 Additional RI/FS and Interim Action Investigations

Additional upland and sediment investigations may be required to complete the RI phase for the Site. These investigations currently are designated as Phase 2 upland and sediment data collection efforts, as described in the AO for the Site. Pending Ecology review and comment on the Draft Phase 1 Data Memorandum (Anchor QEA 2011b), Anchor QEA will prepare a separate amended SAP and amended QAPP (if necessary), which will describe the proposed additional upland and sediment sample collection efforts for the Site.

In order to meet the schedule requirements for implementation of the proposed upland interim action, any Phase 2 upland investigations are planned for completion in fall/winter 2011. Anchor QEA will prepare the amended SAP/QAPP document following receipt of Ecology comments on the Phase 1 Data Memorandum. The amended SAP/QAPP document will be designed to complete investigation requirements for both the proposed upland interim action and RI/FS processes.

3 INTERIM ACTION REQUIREMENTS

This section describes the interim action requirements that are expected to be met as part of the implementation of the interim action. Consistent with MTCA requirements, this section addresses point of compliance and applicable local, state, and federal laws. Section 3.1 discusses the point of compliance. Section 3.2 discusses applicable laws and how they will be addressed during implementation of the proposed interim action.

3.1 Point of Compliance

Consistent with MTCA regulations, the point of compliance must be identified for the proposed upland interim action at the Site. Anchor QEA will identify the point of compliance at nearshore monitoring wells prior to groundwater discharge to surface waters of the LDW. No cleanup levels will be defined by Ecology for completion of this interim action. However, groundwater screening levels will be used to ensure that groundwater quality leaving the Site will be protective of surface water quality in the LDW. Ecology currently is in the process of aggregating screening levels as part of source control efforts for the LDW. Site-specific screening levels will be developed prior to final approval of this IAWP.

The groundwater pathway is selected for monitoring interim action compliance because all other pathways (e.g., soil direct contact/ingestion, soil migration, stormwater transport, and vapor inhalation) will be controlled through implementation of the interim action elements. Those elements include the construction of a nearshore sheetpile wall, removal and disposal of contaminated soil, construction of a stormwater collection and treatment system, and placement of an impervious pavement section throughout the Site.

Anchor QEA will develop groundwater screening levels for Site COCs in collaboration with Ecology. All proposed screening levels will be consistent with the screening level framework and rationale for the LDW. The groundwater screening levels will ensure protection of surface water quality. Details regarding the location of compliance monitoring wells and the process for post-construction interim action monitoring are provided in Section 5.

3.2 Applicable Local, State and Federal Laws

Interim actions (and cleanup actions) must comply with applicable local, state and federal laws and, in certain cases, a permit is required. Currently, a new stormwater collection and treatment system (including a new discharge outfall) is planned for installation as part of the interim action. A new outfall is expected to be constructed. Therefore, Ecology will require that the discharge be permitted under an NPDES permit. Discharge from this new outfall structure will be required to meet the general conditions of the permit.

The interim action also must comply with other substantive requirements, but is exempt from the procedural requirements (RCW 70.105D.090 and 90.48.039; WAC 173-340-710). The proposed interim action at the Site must meet the substantive requirements of the permits and approvals listed below. It also must include formal approval of the IAWP by Ecology. DSI will work with each agency listed for the following items to ensure compliance with substantive requirements:

- State Environmental Policy Act (SEPA) Determination (Ecology);
- Shoreline Substantial Development Permit (SSDP; City of Seattle); and
- NPDES Permit (Ecology).

Section 4 provides additional information regarding project permitting plans and requirements. The current NPDES permit may need to be modified pending decisions regarding construction of a new stormwater collection/treatment system and/or tying into the existing system that is currently operated and maintained by AML.

4 IMPLEMENTATION OF INTERIM ACTION

This section describes the proposed interim action elements in detail, the means and methods that will be used to construct each element, and the tasks that comprise them. The elements for this proposed interim action include planning and coordination, permitting, retaining wall construction, contaminated soil removal and disposal, stormwater collection/treatment system installation, backfilling and grading, and construction of a new Site-wide pavement section. Figure 12 presents the plan view summary for the proposed interim action elements. This figure shows existing conditions as well as locations of new structures, approximate areas of contaminated soil removal, the stormwater collection and treatment system, and post-interim action grades for the Site. The interim action elements and associated tasks are described in Sections 4.1 through 4.7.

4.1 Planning and Coordination

Planning and coordination will be required between DSI, AML and Ecology prior to design and implementation of the interim action at the Site. DSI will work with Ecology to develop this draft IAWP into a draft final format that will then be made available for public comment. Following closure of the public comment period, Ecology will prepare a Responsiveness Summary that will summarize the public comments received and the course of action that will be taken to address any comments. DSI then will prepare a Final IAWP that will serve as the governing document describing how the interim action will be implemented, identifying additional upland data collection needs to support design of the interim action, and describing the details regarding post-construction monitoring and reporting requirements. DSI will coordinate with Ecology throughout development of the draft and final IAWP documents in order to address Ecology (and public) comments and concerns, and to ensure that the final IAWP presents a plan for complete remediation of the upland area of the Site.

4.2 Permitting

As discussed in Section 3, the AO for the Site requires compliance with the substantive requirements of local and state permitting authorities. Nevertheless, the issuance of construction permits for the proposed interim action is not required (with the exception of

stormwater discharge permits if a new stormwater outfall is constructed). The following are the approvals that are anticipated to be necessary for implementation of the interim action:

- **SEPA:** Anchor QEA will develop a SEPA checklist and submit it to the City of Seattle to consider the potential environmental impacts associated with the proposed interim action and Site redevelopment activities. No prior environmental review was completed during the development of the AO. Therefore, a SEPA determination of "no significant impact" is required prior to the start of construction activities.
- **SSDP:** Site development or redevelopment activities conducted within 200 feet of waters of the state must be reviewed for compliance with the provisions of the Shoreline Management Act (SMA). Anchor QEA will prepare a SSDP application and submit it to the City of Seattle. The interim action does not require that a new permit be issued, but the application process is the process for obtaining a permit exemption from the City of Seattle for proposed construction activities to be performed as part of the interim action.

If a new stormwater collection and treatment system is constructed, which includes a new or relocated outfall structure, as part of the interim action (as currently planned), then the following permit may be required:

- **Construction Stormwater General Permit:** A construction stormwater general permit is required when construction activities take place on a 1 acre or larger area, and when there is a discharge of stormwater to surface water or storm drains that discharge to surface water. Anchor QEA will work with Ecology to obtain any necessary permit.

DSI and AML currently are planning the layout and capacity of the new stormwater collection and treatment system to be installed on Site, and the final details regarding the configuration of that system are still under discussion.

4.3 Retaining Walls

A steel sheetpile wall (or similar structure) will be constructed along the eastern edge of the upland portion of the Site (for approximately 500 lineal feet) along the existing riverbank and

within the Site boundary, as shown on Figure 12. The purposes of the steel sheetpile wall are as follows:

- Provide a barrier that contains upland soils and prevents potential contamination migration from the upland area of the Site to the LDW and sediments; and
- Allow for the completion of future cleanup and Site redevelopment activities in the sediment area of the Site.

The steel sheetpile wall will be installed using upland-based vibratory and impact hammers, and will not be completed as in-water work. Installation of the steel sheets will not result in degradation of water quality or disruption to the LDW sediments. Thus, it is assumed that in-water work permits will not be required.

Following completion of construction, the sheetpile wall will be left in-place to serve as the permanent bulkhead, separating the upland soils from the LDW and associated sediments. The sheetpile wall will be driven to sufficient depths that will allow for removal of contaminated sediment as part of future Site cleanup activities. Additionally, the sheetpile wall design will address loading requirements that will occur during implementation of the interim action and post-construction operational loads for equipment that will occupy the Site.

The sheetpile wall will also include a retaining system that consists of tie-back anchors or a dead-man anchor system. Soil excavation will be required upland of the sheetpile wall to facilitate installation of this anchoring system and to allow for removal of contaminated sediment. Soil excavation associated with these requirements is discussed in Section 4.4.

Additional retaining wall structures will be constructed along the southern Site boundary to accommodate the difference in Site surface elevations following implementation of the interim action. The approximate locations of these additional retaining wall structures are shown on Figure 12. These retaining walls will also serve as a barrier to prevent any soil migration to or from the Site. It is anticipated that these retaining structures will be concrete footing walls that will be cast in place prior to backfilling and installation of the final pavement section as part of other interim action activities.

Anchor QEA will collect engineering data during the design phase of the interim action in order to obtain the necessary information required to complete design of the sheetpile wall and concrete footing retaining wall structures. This data collection likely will involve completion of geotechnical borings and analysis of soil samples to determine physical strength properties of the soils. Additionally, Anchor QEA will complete a groundwater flow evaluation for the upland Site area in order to evaluate the potential impacts to groundwater flow and velocity that may result from construction of the retaining wall structures. Results of the groundwater flow evaluation will be used to develop the Groundwater Compliance Monitoring Plan (GCMP) that will be implemented following completion of construction activities.

4.4 Contaminated Soil Removal and Disposal

The objective of this interim action element is to remove contaminated soil (source) material from the upland area of the Site so that any ongoing Site sources of contamination leaching to groundwater are minimized. The preliminary lateral and vertical extent of soil contamination within the upland area of the Site has been determined through completion of the investigations described in Section 2, and is shown on Figure 12. The maximum depth of contaminated soil within the UST removal area is approximately 5 feet bgs and is generally located within the unsaturated soil zone. The depth of contaminated soil and fill in the nearshore area extends to approximately 7 feet bgs. Removal of contaminated soil and fill is necessary for remediation and for installation of the sheetpile wall anchoring system. The contaminated soil located within these areas is designated for removal and disposal as part of the interim action.

Additional upland investigation and environmental data collection activities may be required as part of Phase 2 RI/FS activities under the AO, which will further inform the excavation and disposal of contaminated soil. Anchor QEA will develop an excavation plan during the design phase for the interim action. It will specify cut lines and side slopes to fully remove the contaminated soil, while maintaining the safety of workers implementing the interim action. Anchor QEA does not anticipate the need for temporary shoring for excavation activities associated with this interim action.

Excavation activities will be performed using conventional excavation equipment (e.g., excavators and dozers) to remove, temporarily stockpile and load contaminated soil onto trucks for transport and disposal. The excavation contractor will be required to manage all soil and construction water during completion of excavation activities using best management practices (e.g., stockpile covering, equipment decontamination, and direct loading into trucks). Sources of construction water may include groundwater that ponds in excavation areas, stormwater that comes in contract with the excavation, temporary soil stockpile and truck loading areas, and water used for decontamination of contractor equipment and personnel.

The excavation contractor will keep records of the loads of soil removed from the Site and received at the disposal facility. Records also will be provided in the contractor's daily log. Soil excavated as part of this interim action will be taken to a licensed and permitted landfill facility for disposal. Following completion of soil excavation and confirmation sampling activities, the Site will be surveyed by a professional land surveyor to document that impacted soils have been removed or that remaining impacted soils can be contained through other remedial approaches, such as soil stabilization and capping.

4.5 Stormwater Collection and Treatment System

The existing Site stormwater system configuration shown on Figure 4 is representative of current locations for collection, management and discharge of stormwater to the LDW. The existing stormwater system is dedicated solely to the Site. It does not collect and discharge stormwater that originates from adjacent properties or other municipal drainage lines. All Site stormwater currently is discharged to the LDW at Outfall 005, as shown on Figure 4. A separate stormwater collection and treatment system is present on the AML property (north of the Site). The system discharges stormwater collected from the AML property to the LDW at Outfall 003 (Figure 4). AML currently is responsible for maintaining NPDES permit compliance for discharges of stormwater at these two outfall locations. It is in the process of implementing temporary upgrades (level 3 BMP) to the existing treatment system in order to meet permit requirements.

As part of the proposed interim action, the existing stormwater system at the Site will be demolished and replaced with a new collection and treatment system, which will manage all stormwater collected on the AML and DSI properties. The new, combined-property stormwater management system will consist of new drainage lines, a Site-specific treatment system, and a new outfall. It will be located along the southern boundary of the Site, as shown on Figure 12.

The new stormwater collection and treatment system will be installed following completion of excavation activities, and concurrent with backfilling activities as described in Section 4.6. Stormwater collection and routing pipes will be sized based on the design criteria established for future Site use. The treatment system will be designed based on presence of known contaminants in Site stormwater and according to the general requirements of the stormwater permit. Prior to discharge to the LDW, the stormwater will run through the treatment system and a filter to remove particles and debris so that water discharged to the LDW is in compliance with the stormwater permit. AML will be responsible for maintenance and monitoring of the new, combined-property stormwater collection and treatment system to ensure compliance with all stormwater permit requirements.

4.6 Backfilling and Grading

Following completion of excavation, soil removal and stormwater system installation activities, the Site will be backfilled (where necessary) with clean backfill material and graded to elevations that will support construction of the pavement section, as described in Section 4.7.

Backfill material will be clean sand and sandy gravel that is free of debris. The backfill will be chemically tested before being brought to the Site to ensure that it does not contain contaminants. Additionally, the backfill material will be tested to ensure that it meets geotechnical engineering requirements for placement of the pavement section and to support future operational loads.

Backfill material will be placed and graded using conventional construction equipment (backhoe, dozer, etc.). Backfill will be placed in loose lifts and then compacted to meet design requirements.

4.7 Pavement Section

Following completion of backfilling and Site grading activities, a low-permeability pavement section will be constructed over the entire Site area. The pavement section will be designed and constructed to prevent stormwater infiltration into underlying soil and to support loading requirements for container handling equipment that will be used at the Site. The pavement sections will be constructed to serve as a cap over the entire Site and will minimize the potential for infiltration of water into the subsurface soils.

Figure 12 shows the proposed plan for approximate areas where the different pavement sections will be placed at the Site. Thicker pavement sections will be placed in areas that will be used for container loading/unloading and marshaling equipment. Thinner sections comprised primarily of asphalt will be placed in areas of the Site with lower load requirements.

Following completion of pavement section construction activities, the entire Site will be paved, thereby minimizing the potential for infiltration of stormwater. The pavement sections will serve as caps for any residual contaminated soils that remain and will prevent direct exposure or contact with underlying soil material. The Site stormwater collection and treatment system will be designed to meet stormwater management requirements for the entire paved area of the Site.

5 POST-INTERIM ACTION MONITORING

Implementation of the interim action will include post-construction monitoring activities to ensure continued protection of human health, the environment, and LDW surface water and sediment. Monitoring activities will be conducted throughout the RI/FS process and will be re-evaluated following selection of the overall recommended remedial alternative for the Site (including cleanup of nearshore sediments). The results of post-interim action monitoring activities will be submitted to Ecology in the form of monitoring data reports.

5.1 Nearshore Groundwater Compliance Monitoring

As previously stated, the proposed points of compliance for the upland interim action are the nearshore shallow and deep monitoring wells. A GCMP consistent with WAC 173-340-410 will be produced for Ecology review and approval. The GCMP will provide details regarding the frequency of groundwater sample collection, the proposed approach for completion of analytical testing, and the process for reporting data to Ecology. The GCMP will also propose screening levels that will be used to demonstrate compliance with surface water criteria in the nearshore monitoring wells for the protection of LDW sediment and surface water.

Groundwater compliance wells will be located within the nearhsore area of the DSI property. Due to the requirement for removal of nearshore soils to support installation of the sheetpile wall and cleanup of this area (including future sediment removal), the existing nearshore groundwater monitoring wells will be decommissioned and new wells will be installed following completion of the upland interim action. The new wells will be installed so that groundwater samples can be collected from both near-surface and subsurface depth intervals.

The GCMP will present all details of the post-construction groundwater compliance monitoring activities. That document will be submitted to Ecology for review and approval following final approval of this IAWP and prior to completion of the upland interim action construction activities.

5.2 Institutional Controls

Construction activities associated with the proposed upland interim action are designed to address remediation of soil and groundwater (and stormwater) so that the upland area of the Site will be in compliance with regulatory requirements and no further upland cleanup will be required as part of overall Site remediation. Anchor QEA will develop the screening levels to be utilized for implementation of this interim action in collaboration with Ecology so that they are consistent with current and projected future industrial use of the Site as well as cleanup considerations for the LDW.

Implementation of the upland interim action (i.e., limited soil removal, stormwater collection/treatment improvements, and paving) will control exposure pathways to soil, groundwater, and stormwater. Removal of select soils will eliminate source material and reduce leaching of contaminants to groundwater. The GCMP will demonstrate that sources have been controlled, such that groundwater is protective of LDW surface water and sediments. Additionally, replacement of the existing stormwater collection and discharge system with a new treatment system will demonstrate stormwater source control from the upland area (e.g., end of pipe). Following completion of these activities, the upland areas will be paved and capped to prevent exposure of residual contamination to human and ecological receptors (the RI/FS report will address the Terrestrial Ecological Evaluation).

In conjunction with completion of the proposed upland interim action activities (or part of the final Site CAP), institutional controls will be required at the Site. The institutional controls will be recorded as part of the property deed to control future activities that could result in the exposure of potentially impacted soil or groundwater that may remain or as identified during post-interim action compliance monitoring.

5.3 Abandonment of Damaged Wells

During implementation of the proposed upland interim action, a contractor will decommission and abandon existing monitoring wells that are not identified as necessary for future groundwater compliance monitoring. It was determined during the 2009 Phase 1 Upland Site Investigation that existing monitoring wells MW-4 and MW-5 were potentially damaged. Additionally, it is assumed that the existing nearshore wells will need to be

replaced due to the need for soil excavation to support installation of the sheetpile wall and remediation of impacted soils in this area of the Site. These wells, including any others that are not needed for monitoring efforts, will be located and decommissioned consistent with WAC 173-160-381 as part of this interim action.

6 INTERIM ACTION SCHEDULE AND REPORTING

The proposed schedule for completion of interim action planning, additional Site investigation work, regulatory agency approvals, construction and post-construction monitoring and reporting activities is presented in Table 1. Interim action design and permitting efforts will commence prior to final regulatory approval of the interim action. However, construction activities will not begin until all regulatory agency approvals and permits have been obtained.

Table 1
Proposed Schedule

Interim Action Activity	Estimated Schedule for Completion
Submit draft IAWP to Ecology	August 2011
Begin interim action design and permitting process	August 2011
Complete Phase 2 upland investigations (as necessary)	Fall 2011 (following receipt of Ecology comments on the draft IAWP)
Submit draft final IAWP	Winter 2011
Public comment period and Responsiveness Summary	Spring 2012
Anticipated Ecology approval of Final IAWP	Spring 2012
Submit draft Groundwater Compliance Monitoring Plan	Spring 2012
Implement interim action construction activities	Summer 2012 through fall 2012
Anticipated Ecology approval of Groundwater Compliance Monitoring Plan	Fall 2012
Implement groundwater monitoring compliance program	Fall 2012
Submit draft and final Construction Completion Report	Fall 2012 through winter 2012

7 REFERENCES

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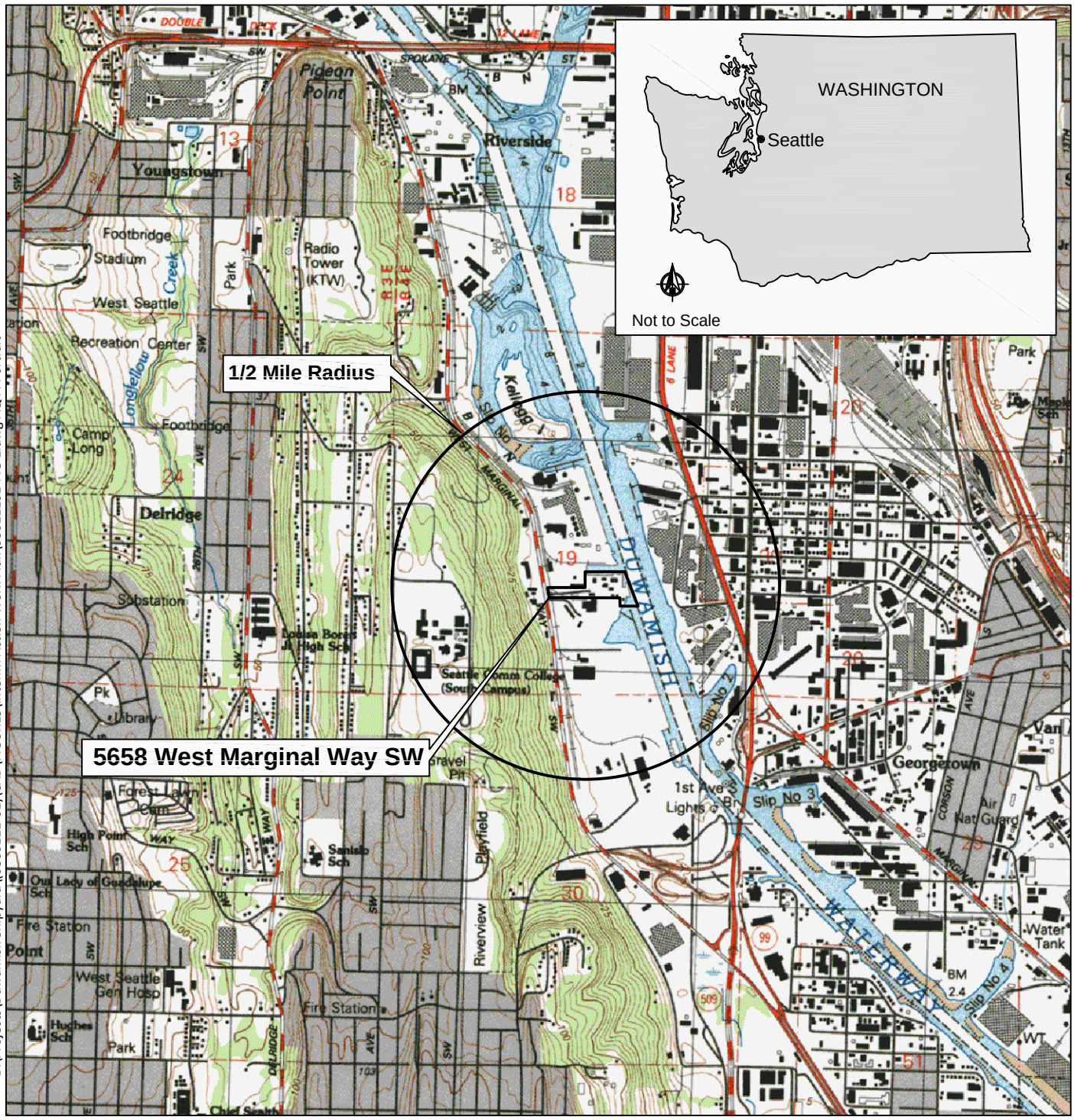
Anchor QEA, 2009. DSI Upland Activities Memorandum. Prepared for Washington Department of Ecology. June 29, 2009.

FIGURES



B:\Projects\Duwamish Shipyard\(0800111-01)\CAD\FIGURES\Interim Action Work Plan\080111101-FIG 1.dwg AQ-A-Portrait

Jun 30, 2011 10:07am epipkin

SOURCE: Base map prepared from Terrain Navigator Pro, USGS 7.5 minute quadrangle map, South Seattle.

Figure 1
Site Vicinity Map
Interim Action Work Plan
Duwamish Shipyard, Inc.

ANCHOR QEA

B:\Projects\Duwamish Shipyard\(0800111-01)\CAD\FIGURES\UPDATES TO HISTORIC\REVISED 7-19-11\080111101-FIG 2.dwg F2

Jul 20, 2011 2:06pm epipkin

ALASKA MARINE LINES PROPERTY

WEST MARGINAL WAY SOUTH

Former Graving Dock Location

Existing Shop

Existing Shop

FORMER DUWAMISH SHIPYARD

Office Building

Current AML Use for Container Storage and Handling

GLACIER NORTHWEST PROPERTY

150'

100'

100'

AML Stormwater Outfall

DUWAMISH WATERWAY

CHANNEL LIMIT

CHANNEL LIMIT

Marine Railway

Outfall 005

Existing Bulkhead

Fixed Wooden Dock

Fixed Dock

SURVEY SOURCE:
Bathymetric survey by Blue Water, 10/2006.
Topographic survey by APS Survey and Mapping, LLC.
Underdock survey by AML and DSI, 12/2006.

HORIZONTAL DATUM: Washington State Plane North, NAD83.
VERTICAL DATUM: Mean Lower Low Water (MLLW, Feet).

LEGEND

Top of Bank

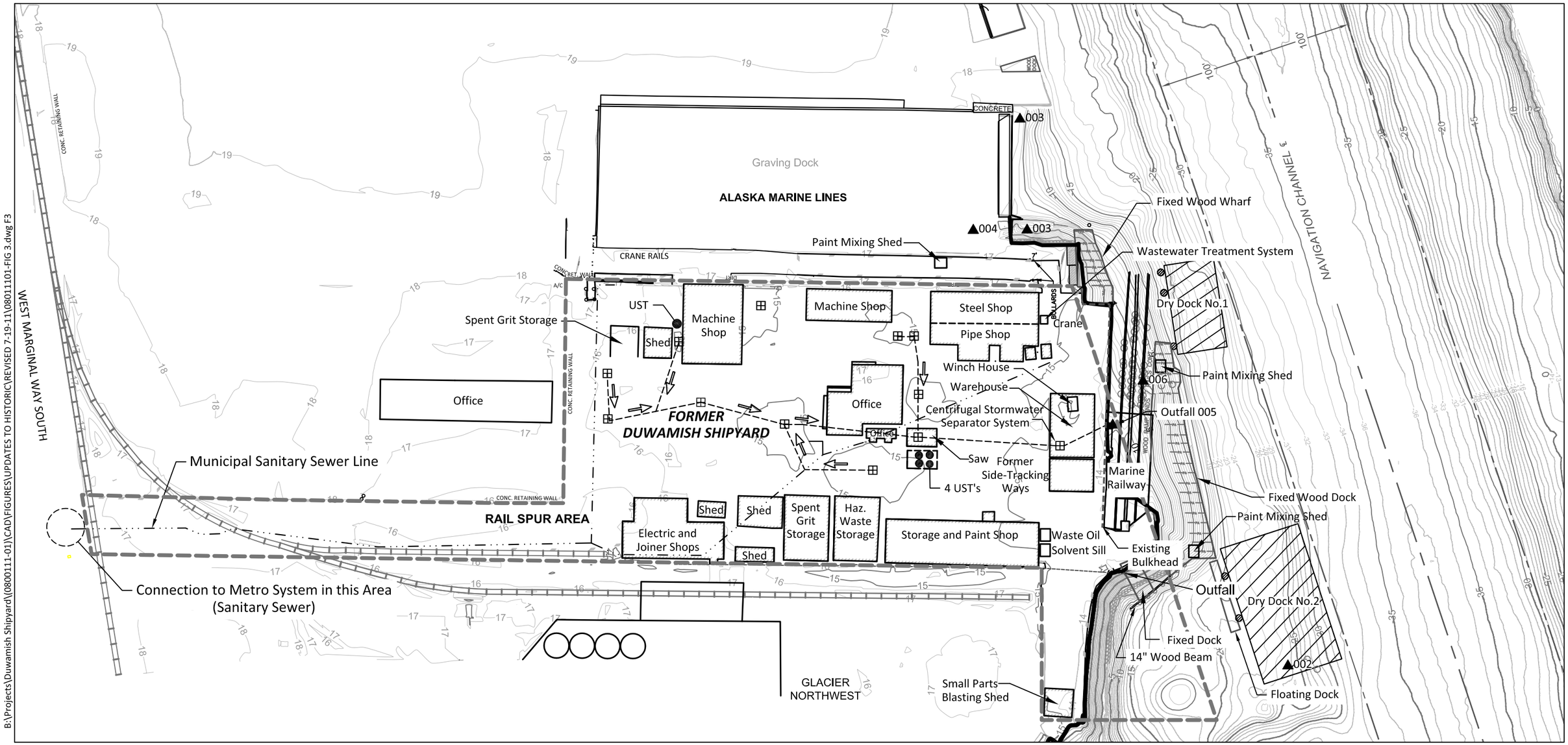
Subject Property Boundary

15 Topographic and Bathymetric Contours in Feet (MLLW)

0 100
Scale in Feet

ANCHOR QEA

Figure 2
Existing Property Features
Interim Action Work Plan
Duwamish Shipyard, Inc.



B:\Projects\Duwamish Shipyard\(0800111-01)\CAD\FIGURES\UPDATES TO HISTORIC\REVISED 7-19-11\080111101-FIG 3.dwg F3

Jul 20, 2011 2:08pm epipkin

SURVEY SOURCE: Bathymetric survey by Blue Water, 10/2006
Topographic survey by APS Survey and Mapping, LLC.
Underdock survey by AML and DSI, 12/2006

HORIZONTAL DATUM: Washington State Plane North, NAD83 Feet.
VERTICAL DATUM: Mean Lower Low Water (MLLW).

LEGEND:

- Former Stormwater Line
- Municipal Sanitary Sewer Line
- Top of Bank
- Subject Property Boundary
- ▲ Former NPDES Outfall
- 15 Topographic and Bathymetric Contours in Feet (MLLW)
- ⊞ Former Catch Basin Location

0 100
Scale in Feet

ANCHOR QEA

Figure 3
Historical Property and Operational Features
Interim Action Work Plan
Duwamish Shipyard, Inc.

B:\Projects\Duwamish Shipyard\(0800111-01)\CAD\FIGURES\UPDATES TO HISTORIC\Revised 8-3-11\080111101-FIG 4.dwg F4

Aug 03, 2011 9:34am epipkin

SURVEY SOURCE:
Bathymetric survey by Blue Water, 10/2006.
Topographic survey by APS Survey and Mapping, LLC.
Underdock survey by AML and DSI, 12/2006.

HORIZONTAL DATUM: Washington State Plane North, NAD83.
VERTICAL DATUM: Mean Lower Low Water (MLLW, Feet).

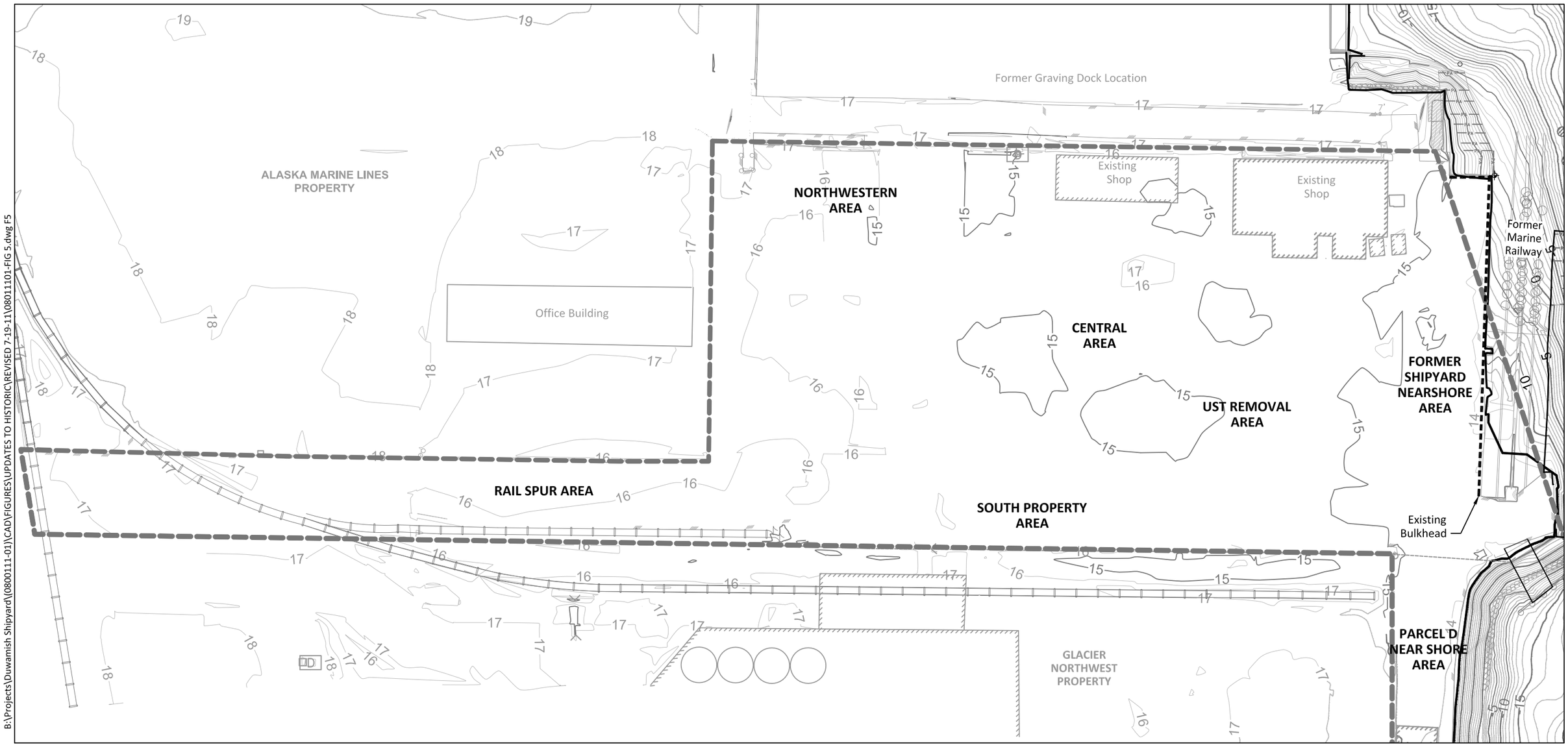
LEGEND

- As-Built Storm Line and Direction of Flow
- Municipal Sanitary Sewer Line
- Top of Bank
- Subject Property Boundary
- Topographic and Bathymetric Contours in Feet (MLLW)
- Former Catch Basin Location

0 100
Scale in Feet

ANCHOR QEA

Figure 4
Current Property and Features
Interim Action Work Plan
Duwamish Shipyard, Inc.



B:\Projects\Duwamish Shipyard\(0800111-01)\CAD\FIGURES\UPDATES TO HISTORIC\REVISED 7-19-11\080111101-FIG 5.dwg F5

Jul 20, 2011 2:10pm epipkin

SURVEY SOURCE:
Bathymetric survey by Blue Water, 10/2006.
Topographic survey by APS Survey and Mapping, LLC.
Underdock survey by AML and DSI, 12/2006.

HORIZONTAL DATUM: Washington State Plane North, NAD83.
VERTICAL DATUM: Mean Lower Low Water (MLLW, Feet).

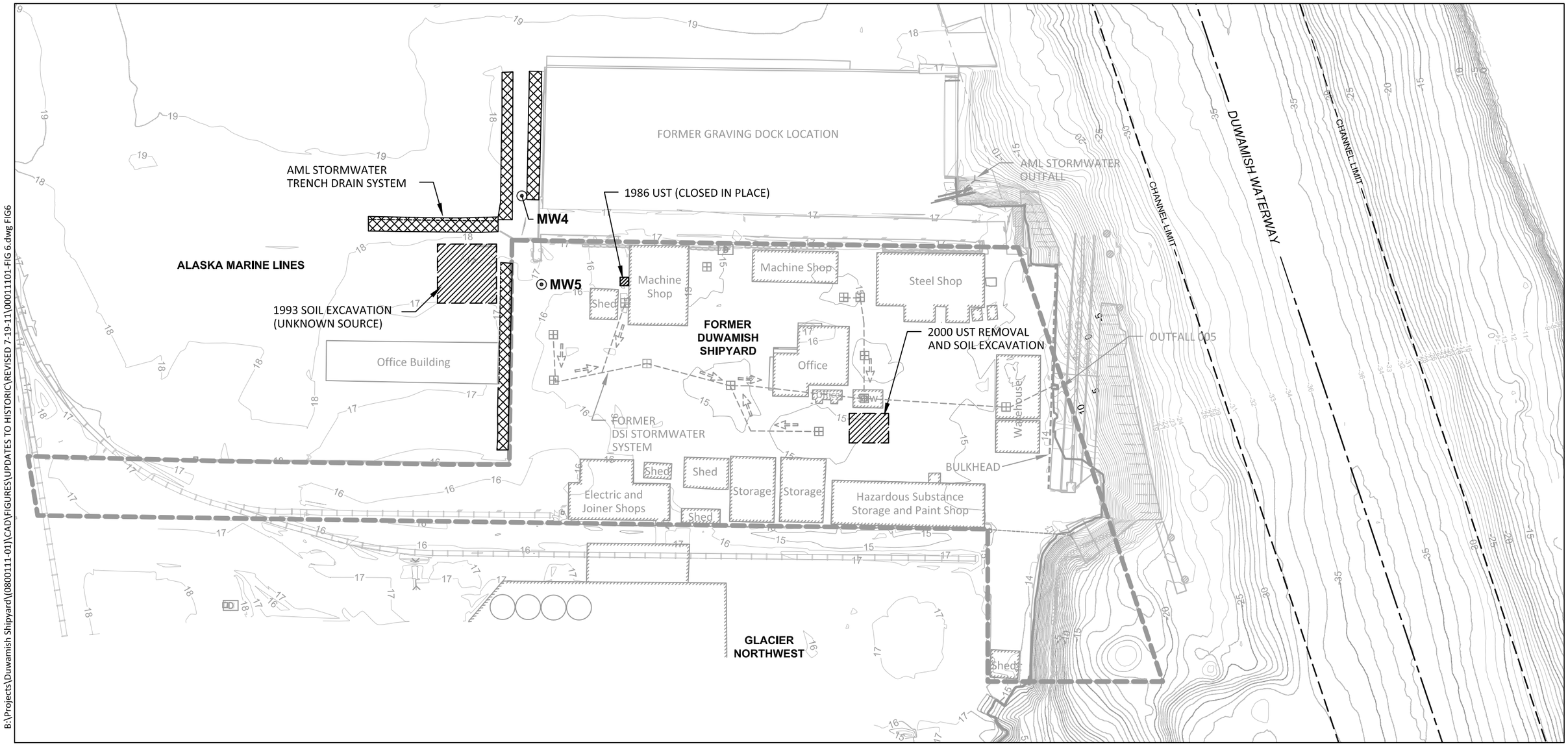
LEGEND

- Top of Bank
- Subject Property Boundary
- Topographic and Bathymetric Contours in Feet (MLLW)

0 70
Scale in Feet

ANCHOR QEA

Figure 5
Upland Site Areas
Interim Action Work Plan
Duwamish Shipyard, Inc.



B:\Projects\Duwamish Shipyard\(0800111-01)\CAD\FIGURES\UPDATES TO HISTORIC\REVISED 7-19-11\00011101-FIG 6.dwg FIG6

Jul 20, 2011 2:11pm epipkin

HORIZONTAL DATUM: Washington State Plane North, NAD83 Feet.
VERTICAL DATUM: Mean Lower Low Water (MLLW).

NOTES:
1. Anchor QEA has not field verified the location of underground structures with subsurface technologies such as cameras.

LEGEND:

- Former Storm Line and Direction of Flow
- Top of Bank (TOB)
- Subject Property Boundary
- Topographic and Bathymetric Contours (MLLW Feet)
- Catch Basin
- Independent Remedial Action Areas
- Trench Drain
- MW4 ⊙ Monitoring Well (Installed in 1993 by Others)

0 100
Scale in Feet

ANCHOR QEA

Figure 6
Independent Remedial Action Areas
Interim Action Work Plan
Duwamish Shipyard, Inc.

B:\Projects\Duwamish Shipyard\(0800111-01)\CAD\FIGURES\UPDATES TO HISTORIC\Revised 8-3-11\000111-DSI-FIGURE-FIG 7-UPLAND SAMPLES.dwg FIG7

Aug 03, 2011 1:37pm epipkin

Former Graving Dock - Filled In

AREA C (UPLAND) AND NEARSHORE BOUNDARY

AML PROPERTY

NORTHWEST AREA

CENTRAL AREA

UST REMOVAL AREA

FORMER SHIPYARD NEARSHORE AREA

RAIL SPUR AREA

SOUTH PROPERTY AREA

GLACIER NORTHWEST PROPERTY

PARCEL D NEARSHORE AREA

RIVER STATION

MW4 MW5 DSI01 DSI02 DSI03 DSI04 DSI05 DSI06 DSI07 DSI08 DSI09 DSI10 DSI11 DSI12

DSI-MW-01 DSI-MW-02 DSI-MW-03 DSI-MW-04 DSI-MW-05 DSI-MW-06 DSI-MW-07 DSI-MW-08 DSI-MW-09 DSI-MW-10

DSI-GP-01 DSI-GP-02 DSI-GP-03 DSI-GP-04 DSI-GP-05 DSI-GP-06 DSI-GP-07 DSI-GP-08 DSI-GP-09 DSI-GP-10 DSI-GP-11 DSI-GP-12 DSI-GP-13 DSI-GP-14 DSI-GP-15 DSI-GP-16 DSI-GP-17 DSI-GP-19 DSI-GP-20 DSI-GP-21

DSI-GT-01 DSI-GT-02

DSI-PZ-01

HORIZONTAL DATUM: Washington State Plane North, NAD83.
VERTICAL DATUM: Mean Lower Low Water (MLLW).

NOTES:
1. Aerial photo acquired from Google Earth Pro, 2010.

LEGEND:

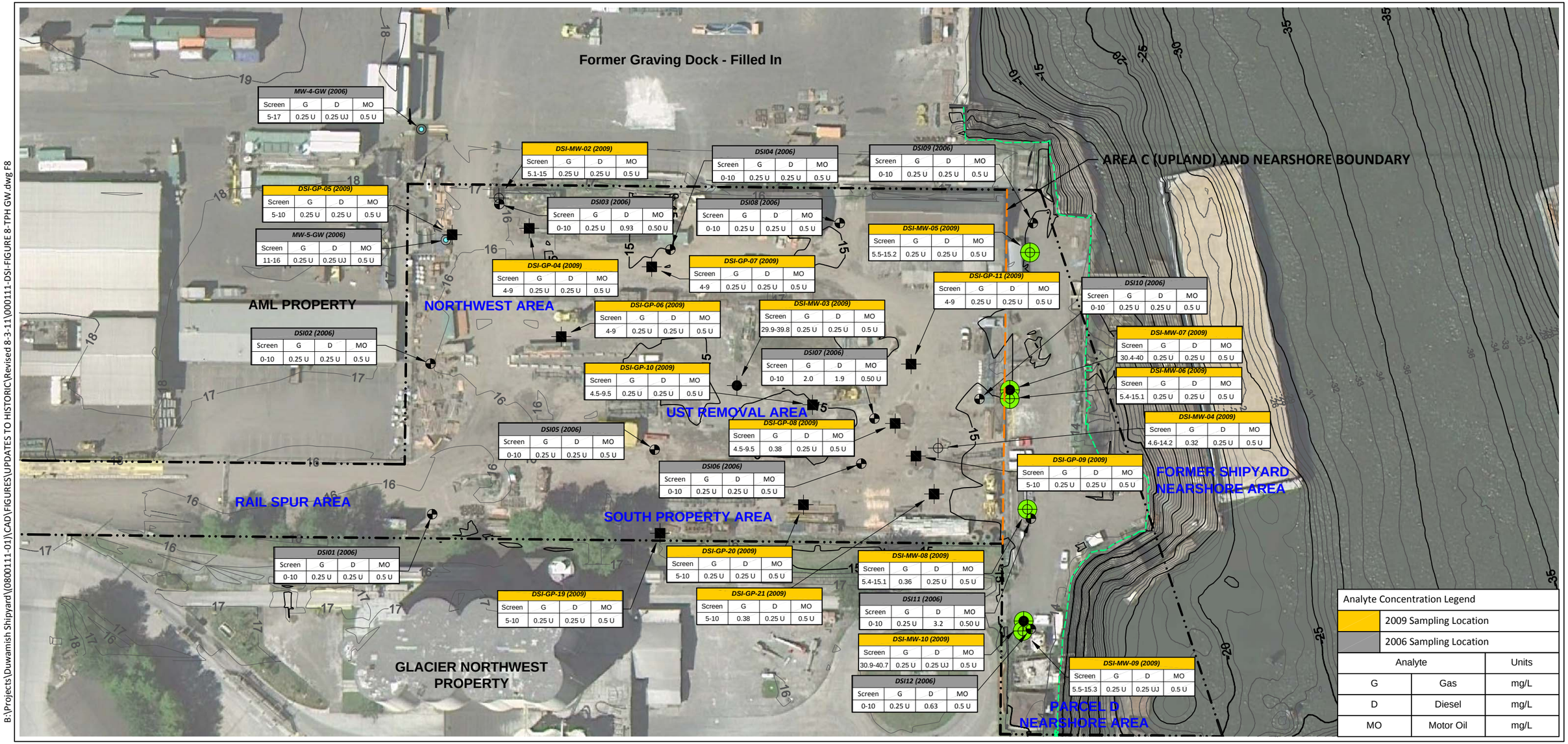
2006 PI LOCATIONS
- Monitoring Well (Not Located in 2009)
- Geoprobe

2009 UPLAND RI LOCATIONS
- Monitoring Well/Piezometer
- Deep Monitoring Well
- Hydrogeologic Testing (Transducer)
- Geoprobe - Soil and Groundwater
- Geoprobe - Soil Only
- Geotechnical Boring
- Nearshore Monitoring Well
- Top of Bank
- Property Boundary

0 80
Scale in Feet

ANCHOR QEA

Figure 7
2006 and 2009 Upland Investigation Sample Locations
Interim Action Work Plan
Duwamish Shipyard, Inc.



B:\Projects\Duwamish Shipyard\(0800111-01)\CAD\FIGURES\UPDATES TO HISTORIC\Revised 8-3-11\000111-DSI-FIGURE 8-TPH GW.dwg F8

Aug 03, 2011 1:15pm epipkin

HORIZONTAL DATUM: Washington State Plane North, NAD83.
VERTICAL DATUM: Mean Lower Low Water (MLLW).

NOTES:
1. Aerial photo acquired from Google Earth Pro, 2010.
2. Screen interval is presented as feet below ground surface.
3. U indicates analyte was not detected.

LEGEND:

2006 PI LOCATIONS
- Monitoring Well (Not Located in 2009)
- Geoprobe

2009 UPLAND RI LOCATIONS
- Monitoring Well/Piezometer
- Deep Monitoring Well
- Geoprobe - Soil and Groundwater
- Nearshore Monitoring Well
- Top of Bank
- Property Boundary

0 80
Scale in Feet

Figure 8
2006 and 2009 Groundwater Sampling Results - Total Petroleum Hydrocarbons
Interim Action Work Plan
Duwamish Shipyard, Inc.

ANCHOR QEA

B:\Projects\Duwamish Shipyard\(0800111-01)\CAD\FIGURES\UPDATES TO HISTORIC\Revised 8-3-11\000111-DSI-FIGURE 9-OTHER GW.dwg FIG9

Aug 03, 2011 1:18pm epipkin

Former Graving Dock - Filled In

AREA C (UPLAND) AND NEARSHORE BOUNDARY

NORTHWEST AREA

AML PROPERTY

RAIL SPUR AREA

SOUTH PROPERTY AREA

UST REMOVAL AREA

FORMER SHIPYARD NEARSHORE AREA

GLACIER NORTHWEST PROPERTY

PARCEL D NEARSHORE AREA

MW-4-GW (2006)				
Screen	As	cPAH	B	VC
5-17	1	0.01 U	0.2 U	0.2 U

MW-5-GW (2006)				
Screen	As	cPAH	B	VC
11-16	3.4	0.01 U	0.6 U	0.6 U

DSI02 (2006)				
Screen	As	cPAH	B	VC
0-10	2.4	0.008	0.2 U	0.2 U

DSI-GP-01 (2009)				
Screen	As	cPAH	B	VC
4-9	388	0.01 U	--	--

DSI01 (2006)				
Screen	As	cPAH	B	VC
0-10	68.4	0.008	0.2 U	0.2 U

DSI-MW-02 (2009)				
Screen	As	cPAH	B	VC
5.1-15	0.5	0.01 U	0.2 U	0.2 U

DSI03 (2006)				
Screen	As	cPAH	B	VC
0-10	1.5	0.031	0.2 U	0.2 U

DSI04 (2006)				
Screen	As	cPAH	B	VC
0-10	2.2	0.01 U	0.2 U	0.6

DSI08 (2006)				
Screen	As	cPAH	B	VC
0-10	1.4	0.008	0.3	0.4

DSI09 (2006)				
Screen	As	cPAH	B	VC
0-10	1.6	0.014	0.2 U	0.2 U

DSI-GP-07 (2009)				
Screen	As	cPAH	B	VC
4-9	--	0.01	0.2 U	0.2

DSI-MW-05 (2009)				
Screen	As	cPAH	B	VC
5.5-15.2	0.5	0.01 U	0.2 U	0.2 U

DSI-GP-06 (2009)				
Screen	As	cPAH	B	VC
4-9	--	0.01 U	0.2 U	0.2 U

DSI-GP-11 (2009)				
Screen	As	cPAH	B	VC
4-9	--	0.01	0.2 U	0.2 U

DSI-MW-07 (2009)				
Screen	As	cPAH	B	VC
30.4-40	2 U	0.01 U	0.2 U	0.2 U

DSI10 (2006)				
Screen	As	cPAH	B	VC
0-10	0.8	0.009	0.2 U	0.2 U

DSI-MW-06 (2009)				
Screen	As	cPAH	B	VC
5.4-15.1	1.1	0.01 U	0.2 U	0.2 U

DSI-MW-03 (2009)				
Screen	As	cPAH	B	VC
29.9-39.8	7.0	0.01 U	0.2 U	0.2 U

DSI-GP-03 (2009)				
Screen	As	cPAH	B	VC
4.5-9.5	3.4	--	--	--

DSI07 (2006)				
Screen	As	cPAH	B	VC
0-10	3.8	0.008	180	0.2 U

DSI-GP-10 (2009)				
Screen	As	cPAH	B	VC
4.5-9.5	--	0.01 U	0.2 U	0.2

DSI-MW-04 (2009)				
Screen	As	cPAH	B	VC
4.6-14.2	2.4	0.01 U	25	0.2 U

DSI05 (2006)				
Screen	As	cPAH	B	VC
0-10	0.6	0.015	0.2	0.3

DSI-GP-08 (2009)				
Screen	As	cPAH	B	VC
4.5-9.5	--	0.03	3.6	0.2 U

DSI-GP-09 (2009)				
Screen	As	cPAH	B	VC
5-10	--	0.03	0.3	0.2

DSI-MW-01 (2009)				
Screen	As	cPAH	B	VC
4.6-14.5	48.4	0.01 U	0.2 U	0.9

DSI06 (2006)				
Screen	As	cPAH	B	VC
0-10	1.8	0.008	0.6	0.2 U

DSI-GP-21 (2009)				
Screen	As	cPAH	B	VC
5-10	0.5 U	0.06	15	0.2 U

DSI-GP-02 (2009)				
Screen	As	cPAH	B	VC
4-9	25.5	0.01 U	--	--

DSI-GP-20 (2009)				
Screen	As	cPAH	B	VC
5-10	0.8	0.01 U	0.2 U	0.2 UJ

DSI-MW-08 (2009)				
Screen	As	cPAH	B	VC
5.4-15.1	2.0	0.01 U	0.2 U	0.2 U

DSI-GP-19 (2009)				
Screen	As	cPAH	B	VC
5-10	1.0	0.01 U	0.2 U	0.2

DSI11 (2006)				
Screen	As	cPAH	B	VC
0-10	0.8	0.008	0.2 U	0.2 U

DSI-MW-10 (2009)				
Screen	As	cPAH	B	VC
30.9-40.7	3.0	0.008	0.2 U	0.2 U

DSI12 (2006)				
Screen	As	cPAH	B	VC
0-10	5.0	4.5	0.2 U	0.2 U

DSI-MW-09 (2009)				
Screen	As	cPAH	B	VC
5.5-15.3	1.1	0.011	0.2 U	0.2 U

Analyte Concentration Legend		
	2009 Sampling Location	
	2006 Sampling Location	
Analyte		Units
As	Arsenic	µg/L
cPAH	cPAH TEQ (U=1/2)	µg/L
B	Benzene	µg/L
VC	Vinyl Chloride	µg/L

HORIZONTAL DATUM: Washington State Plane North, NAD83.
VERTICAL DATUM: Mean Lower Low Water (MLLW).

NOTES:
1. Aerial photo acquired from Google Earth Pro, 2010.
2. Screen interval is presented as feet below surface.
3. U indicates analyte was not detected.

LEGEND:

2006 PI LOCATIONS
- Monitoring Well (Not Located in 2009)
- Geoprobe

2009 UPLAND RI LOCATIONS
- Monitoring Well/Piezometer
- Deep Monitoring Well
- Geoprobe - Soil and Groundwater
- Nearshore Monitoring Well
- Top of Bank
- Property Boundary

0 80
Scale in Feet

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Figure 9
2006 and 2009 Groundwater Sampling Results - Selected Constituents
Interim Action Work Plan
Duwamish Shipyard, Inc.

B:\Projects\Duwamish Shipyard\(0800111-01)\CAD\FIGURES\UPDATES TO HISTORIC\Revised 8-3-11\000111-DSI-FIGURE 10-TPH SOIL.dwg FIG10

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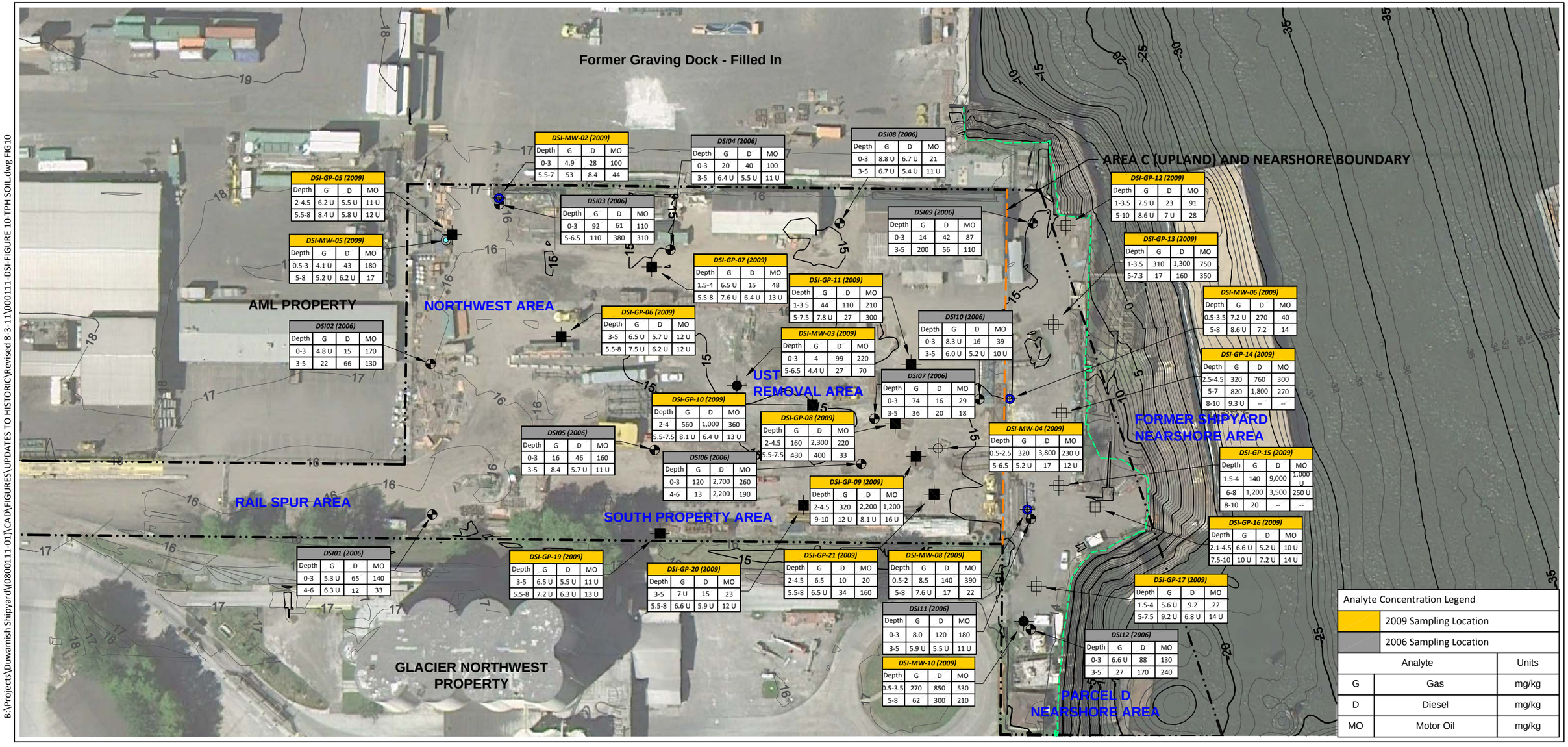

HORIZONTAL DATUM: Washington State Plane North, NAD83.
VERTICAL DATUM: Mean Lower Low Water (MLLW).

NOTES:
1. Aerial photo acquired from Google Earth Pro, 2010.
2. Soil sample depth is presented as feet below ground surface.
3. U indicates analyte was not detected.

LEGEND:

2006 PI LOCATIONS
- Monitoring Well (Not Located in 2009)
- Geoprobe

2009 UPLAND RI LOCATIONS
- Monitoring Well/Piezometer
- Deep Monitoring Well
- Geoprobe - Soil and Groundwater
- Geoprobe - Soil Only
- Top of Bank
- Property Boundary

0 80
Scale in Feet

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Figure 10
2006 and 2009 Soil Sampling Results - Total Petroleum Hydrocarbons
Interim Action Work Plan
Duwamish Shipyard, Inc.

B:\Projects\Duwamish Shipyard\(0800111-01)\CAD\FIGURES\UPDATES TO HISTORIC\Revised 8-3-11\000111-DSI-FIGURE 11-OTHER SOIL.dwg FIG11

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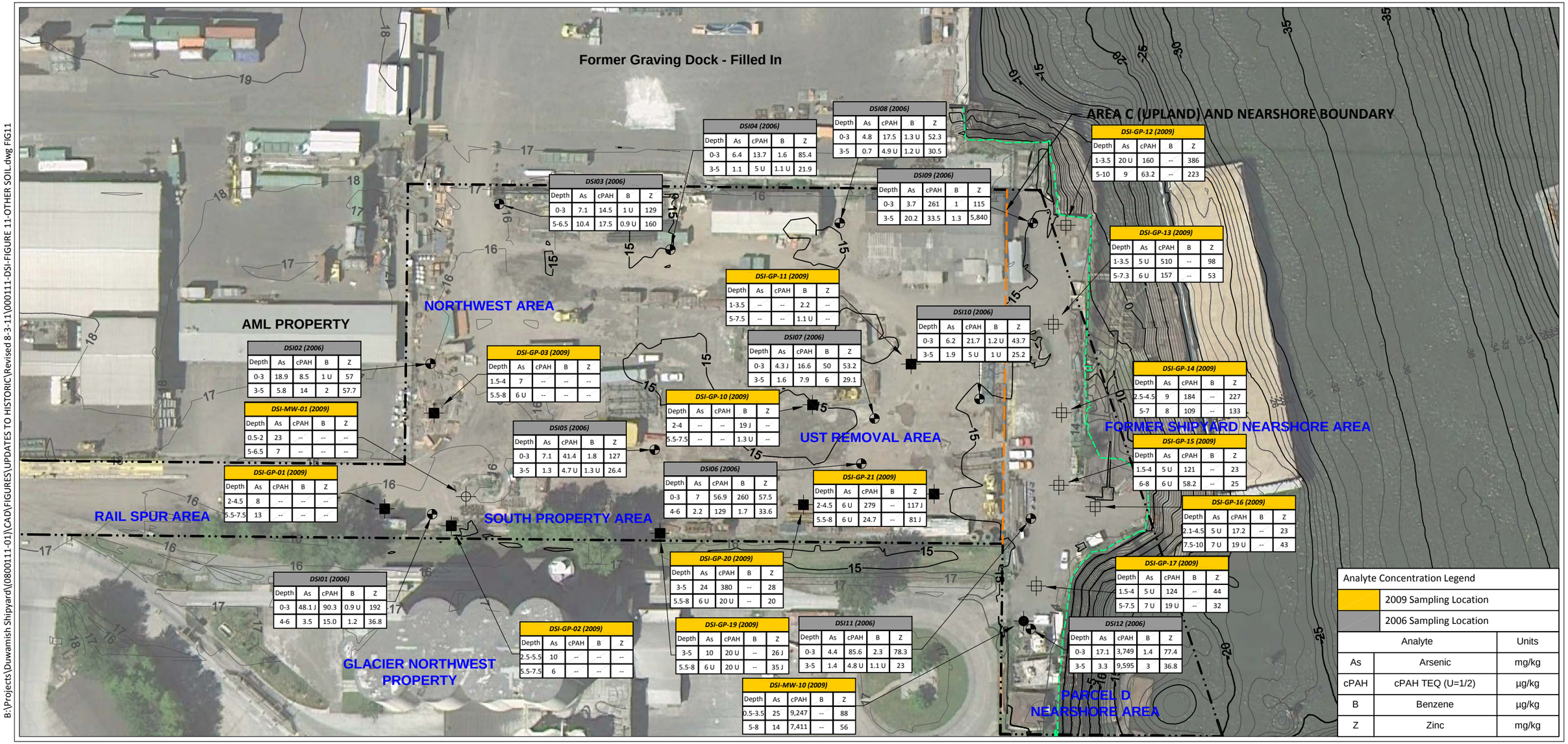

DSI02 (2006)

Depth	As	cPAH	B	Z
0-3	18.9	8.5	1 U	57
3-5	5.8	14	2	57.7

DSI-MW-01 (2009)

Depth	As	cPAH	B	Z
0.5-2	23	--	--	--
5-6.5	7	--	--	--

DSI-GP-01 (2009)

Depth	As	cPAH	B	Z
2-4.5	8	--	--	--
5.5-7.5	13	--	--	--

DSI01 (2006)

Depth	As	cPAH	B	Z
0-3	48.1 J	90.3	0.9 U	192
4-6	3.5	15.0	1.2	36.8

DSI-GP-03 (2009)

Depth	As	cPAH	B	Z
1.5-4	7	--	--	--
5.5-8	6 U	--	--	--

DSI05 (2006)

Depth	As	cPAH	B	Z
0-3	7.1	41.4	1.8	127
3-5	1.3	4.7 U	1.3 U	26.4

DSI-GP-02 (2009)

Depth	As	cPAH	B	Z
2.5-5.5	10	--	--	--
5.5-7.5	6	--	--	--

DSI04 (2006)

Depth	As	cPAH	B	Z
0-3	6.4	13.7	1.6	85.4
3-5	1.1	5 U	1.1 U	21.9

DSI03 (2006)

Depth	As	cPAH	B	Z
0-3	7.1	14.5	1 U	129
5-6.5	10.4	17.5	0.9 U	160

DSI-GP-11 (2009)

Depth	As	cPAH	B	Z
1-3.5	--	--	2.2	--
5-7.5	--	--	1.1 U	--

DSI07 (2006)

Depth	As	cPAH	B	Z
0-3	4.3 J	16.6	50	53.2
3-5	1.6	7.9	6	29.1

DSI-GP-10 (2009)

Depth	As	cPAH	B	Z
2-4	--	--	19 J	--
5.5-7.5	--	--	1.3 U	--

DSI06 (2006)

Depth	As	cPAH	B	Z
0-3	7	56.9	260	57.5
4-6	2.2	129	1.7	33.6

DSI-GP-20 (2009)

Depth	As	cPAH	B	Z
3-5	24	380	--	28
5.5-8	6 U	20 U	--	20

DSI-GP-19 (2009)

Depth	As	cPAH	B	Z
3-5	10	20 U	--	26 J
5.5-8	6 U	20 U	--	35 J

DSI-MW-10 (2009)

Depth	As	cPAH	B	Z
0.5-3.5	25	9,247	--	88
5-8	14	7,411	--	56

DSI08 (2006)

Depth	As	cPAH	B	Z
0-3	4.8	17.5	1.3 U	52.3
3-5	0.7	4.9 U	1.2 U	30.5

DSI09 (2006)

Depth	As	cPAH	B	Z
0-3	3.7	261	1	115
3-5	20.2	33.5	1.3	5,840

DSI10 (2006)

Depth	As	cPAH	B	Z
0-3	6.2	21.7	1.2 U	43.7
3-5	1.9	5 U	1 U	25.2

DSI-GP-21 (2009)

Depth	As	cPAH	B	Z
2-4.5	6 U	279	--	117 J
5.5-8	6 U	24.7	--	81 J

DSI11 (2006)

Depth	As	cPAH	B	Z
0-3	4.4	85.6	2.3	78.3
3-5	1.4	4.8 U	1.1 U	23

DSI-GP-12 (2009)

Depth	As	cPAH	B	Z
1-3.5	20 U	160	--	386
5-10	9	63.2	--	223

DSI-GP-13 (2009)

Depth	As	cPAH	B	Z
1-3.5	5 U	510	--	98
5-7.3	6 U	157	--	53

DSI-GP-14 (2009)

Depth	As	cPAH	B	Z
2.5-4.5	9	184	--	227
5-7	8	109	--	133

DSI-GP-15 (2009)

Depth	As	cPAH	B	Z
1.5-4	5 U	121	--	23
6-8	6 U	58.2	--	25

DSI-GP-16 (2009)

Depth	As	cPAH	B	Z
2.1-4.5	5 U	17.2	--	23
7.5-10	7 U	19 U	--	43

DSI-GP-17 (2009)

Depth	As	cPAH	B	Z
1.5-4	5 U	124	--	44
5-7.5	7 U	19 U	--	32

DSI12 (2006)

Depth	As	cPAH	B	Z
0-3	17.1	3,749	1.4	77.4
3-5	3.3	9,595	3	36.8

Analyte Concentration Legend	
	2009 Sampling Location
	2006 Sampling Location

Analyte		Units
As	Arsenic	mg/kg
cPAH	cPAH TEQ (U=1/2)	µg/kg
B	Benzene	µg/kg
Z	Zinc	mg/kg

HORIZONTAL DATUM: Washington State Plane North, NAD83.
VERTICAL DATUM: Mean Lower Low Water (MLLW).

NOTES:
1. Aerial photo acquired from Google Earth Pro, 2010.
2. Soil sample depth is presented as feet below ground surface.
3. U indicates analyte not detected.

LEGEND:

2006 PI LOCATIONS
- Monitoring Well (Not Located in 2009)
- Geoprobe

2009 UPLAND RI LOCATIONS
- Monitoring Well/Piezometer
- Deep Monitoring Well
- Geoprobe - Soil and Groundwater
- Geoprobe - Soil Only

- Top of Bank
- Property Boundary

0 80
Scale in Feet

Figure 11
2006 and 2009 Soil Sampling Results - Selected Constituents
Interim Action Work Plan
Duwamish Shipyard, Inc.

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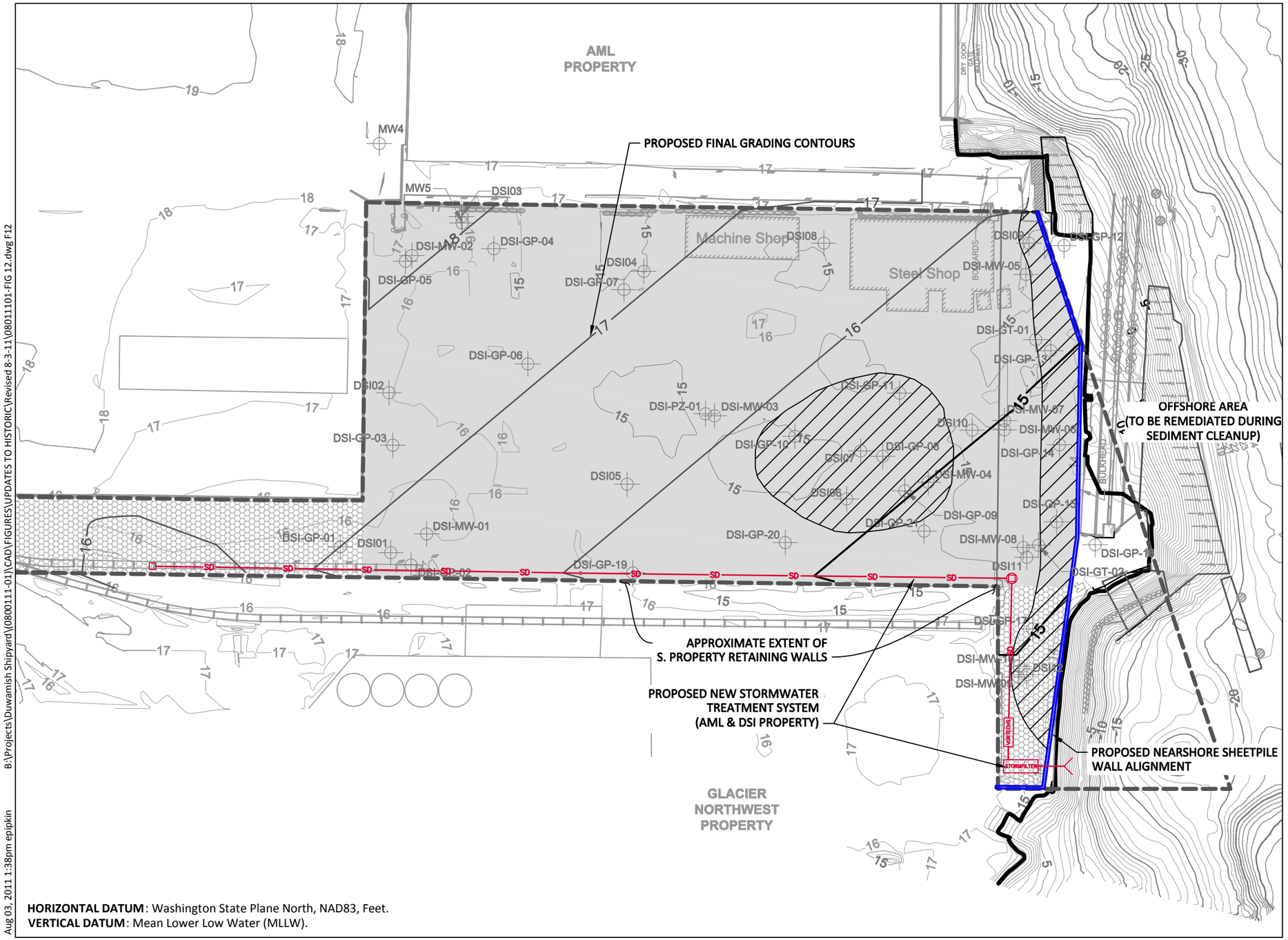

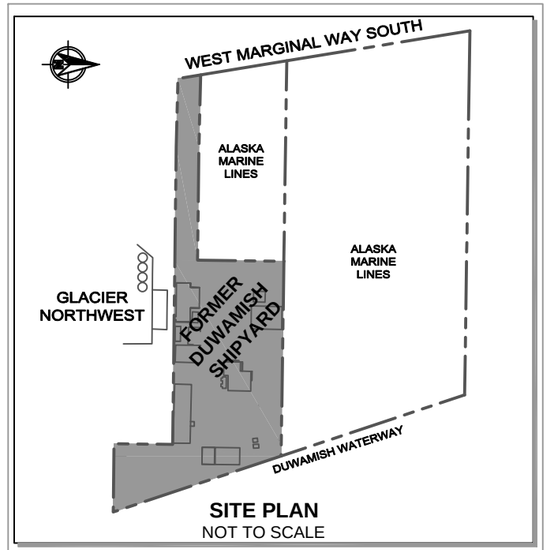

SITE PLAN
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LEGEND:

- Existing Upland Investigation Location (2006 and 2009)
- Subject Property Boundary
- Top of Bank
- Proposed Wall Alignment
- Proposed Approximate Area of Soil Removal[1]
- Heavy Load Pavement Section
- Light Load Pavement Section

NOTE:

1. Approximate areas of soil removal are based on interpretations of data to date, and will be revised during development of subsequent drafts of the Interim Action Work Plan.

0 80
Scale in Feet

HORIZONTAL DATUM: Washington State Plane North, NAD83, Feet.
VERTICAL DATUM: Mean Lower Low Water (MLLW).

B:\Projects\Duwamish Shipyard\(0800111-01)\CAD\FIGURES\UPDATES TO HISTORIC\Revised 8-3-11\080111101-FIG 12.dwg F12
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Figure 12
Interim Action Plan View
Interim Action Work Plan
Duwamish Shipyard, Inc.