Final Removal Action Completion Report
Olympic View Resource Area
Non-Time-Critical Removal Action
Tacoma, Washington

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Prepared for
The City of Tacoma

Work Order DC 1098

U.S. EPA Docket No. CERCLA 10-2001-0069

March 28, 2003
7614

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FINAL
REMOVAL ACTION COMPLETION REPORT
OLYMPIC VIEW RESOURCE AREA
NON-TIME-CRITICAL REMOVAL ACTION
TACOMA, WASHINGTON

This Removal Action Completion Report (RACR) summarizes construction activities for the Non-Time-Critical Removal Action (Removal Action) completed in 2002 at the Olympic View Resource Area (OVRA) in Tacoma, Washington (Figure 1-1). Site construction activities were completed under the requirements of an Administrative Order on Consent (AOC – Docket Number CERCLA 10-2001-0069, dated July 24, 2001) between the City of Tacoma (City) and the U.S. Environmental Protection Agency (EPA). The RACR is prepared in general accordance with the AOC, Appendix A Scope of Work (SOW) to the AOC, and guidance from "Close Out Procedures for NPL Sites" (EPA 540-R-98-016, January 2000).

1.0 INTRODUCTION

This section provides a summary project description, overview of the Removal Action, and the project team. Subsequent sections describe the construction activities completed, construction documentation, results of sediment and soil confirmation sampling and analysis, EPA final inspection, and certifications of completion. Supporting figures, tables, and appendices referenced in the RACR are provided at the end of the report text. Record Plan Sheet drawings depicting post-construction conditions at the OVRA site are provided in Appendix A.

1.1 Project Description and Background

The OVRA is located within the boundaries of the Commencement Bay Nearshore/Tideflats Superfund Site and includes approximately 12.9 acres of intertidal, subtidal, and upland area. The Removal Action involved excavation, backfilling, and capping of approximately 2.26 acres of contaminated marine sediments within the intertidal and subtidal areas (see Record Plan Sheet 2 of 4). Chemical constituents of concern included dioxins (polychlorinated dibenzodioxins and dibenzofurans), metals (arsenic, copper, mercury, and zinc), polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs).

To evaluate alternatives for the Removal Action, the City prepared an Engineering Evaluation/Cost Analysis (EE/CA) in April 2001. The EE/CA was prepared in accordance with Section 300.415(b)(4)(i) of the National

Contingency Plan. The EE/CA also summarized results of previous environmental investigations at the OVRA site. Following a public comment period, the EPA published an Action Memorandum in July 2001, which documented the selected alternative for the OVRA Non-Time-Critical Removal Action.

Final Design Documents describing site construction activities for the Removal Action were completed on January 31, 2002. These documents included the following:

- Design Analysis Report (DAR) describing methods, assumptions, and evaluations used in developing design and construction documents;
- Construction Quality Assurance Plan (CQAP) describing quality assurance/quality control (QA/QC) measures for management of construction activities;
- Water Quality Monitoring Plan (WQMP) describing monitoring activities to assess potential impacts to water quality during sediment removal and other construction activities; and
- Technical Specifications and Design Drawing Plan Sheets for contracting and construction.

Additionally, EPA prepared an assessment of Essential Fish Habitat (EFH) provisions (dated October 24, 2001) for the Removal Action, and a Section 401 Water Quality Certification (dated March 4, 2002) to satisfy requirements of the Clean Water Act for the construction phase of the project. EPA also implemented informal consultation with NOAA, NMFS, and USFWS regarding Section 7 of the Endangered Species Act and prepared a Biological Assessment for the Olympic View Resource Area Superfund Removal Action (dated February 2002).

The City completed contracting and issued a construction Notice to Proceed on March 14, 2002. Remtech, Inc. (Remtech) the selected general contractor, prepared a Removal Action Work Plan (RAWP) describing specific construction methods, procedures, and QA/QC steps to implement the Removal Action. EPA approved the RAWP on May 13, 2002, and mobilization for site construction was initiated. All construction activities were implemented in accordance with the Contractor's Construction Quality Control (CQC) Plan described in the RAWP.

1.2 Overview of Removal Action

Previous site characterization efforts identified five areas where concentrations of chemical constituents in sediment exceeded target compliance levels established for the OVRA Removal Action. These locations are shown on Record Plan Sheet 2 of 4 and include intertidal Areas A, B, C, and D, and subtidal Area E. These areas (excluding Area G) comprise the overall 2.26-acre total area of the Removal Action. Work for the Removal Action also included removal of nearly 600 pile structures that were previously present at the site. Work in Area G consisted of removing piles and constructing a temporary crane pad.

All objectives of the AOC and supporting design were achieved, including:

- Removal or long-term isolation of chemical materials from the environment;
- Elimination or significant reduction of potential human health and environmental risks; and
- Restoration of intertidal, subtidal, and upland areas to enhance habitat value and function as required by the Natural Resource Trustees pursuant to a separate Consent Decree with the City of Tacoma.

All construction activities were completed in accordance with project requirements, with no additional corrective measures or actions necessary following completion of site work. A Long-Term Monitoring Plan will be prepared to evaluate the performance of the engineered caps and habitat function. Several institutional controls are also established to provide notification of site conditions, and to ensure that the capped areas will not be disturbed. Institutional controls include limitations on site uses and vessel anchorage. The site has also been established as an Environmental Reserve through the Washington State Department of Natural Resources.

Intertidal Areas

The selected design alternative for the OVRA Removal Action involved excavating 11,438 tons of sediment and debris from affected intertidal areas. Following excavation, 14,004 tons of sand backfill and capping materials were placed within these areas to restore intertidal habitat. In addition, a total of 2,291 tons of rounded river rock up to 6 inches in diameter were placed over portions of the restored intertidal areas to provide a minimum 6-inch-thick surface erosion protection layer. The areal extent of intertidal sand cap, backfilling, and erosion protection rock placed during construction is shown in

plan view on Record Plan Sheet 4 of 4. Cross sections depicting the depths of sediment removal, and subsequent backfilling and capping (Area C), or capping (Areas A, B, and D) are presented on Record Plan Sheet 3 of 4. Excavated sediments and removed pile structures were shipped for off-site landfill disposal at the Land Recovery, Inc. (LRI) RCRA Subtitle D facility in Puyallup.

Work in the intertidal areas was completed "in-the-dry" during low tide periods for Area A and Area C. Excavation and placement of sand material for backfilling and capping in Area C utilized land-based loading equipment and haul trucks. Temporary roads and access ways to specific areas were created using steel plates on the beach surface. Sheet pile enclosures were necessary to complete excavation and capping in Area B and Area D. The enclosures allowed the work to be completed over multiple tidal cycles, and to control the depth of excavation. Excavation and capping for Area B and Area D were accomplished using equipment staged from within the enclosures, as supported by a crane staged on the outside of the enclosures.

Sediment confirmation samples were collected for laboratory chemical testing prior to backfilling and capping Area C and capping Areas A, B, and D. Samples from some excavation segments of Area C contained dioxin concentrations exceeding the site compliance level. These areas received additional erosion protection and sand materials, as further discussed below in the report text. Placement of the additional materials was approved by the EPA and addressed contingency requirements of the design.

Subtidal Areas

Subtidal Area E was capped with approximately 7,965 tons of sand material placed from a barge-mounted tremie tube. The extent of capping for Area E is shown on Record Plan Sheet 2 of 4. Multiple placement efforts over several weeks were required to achieve the final bathymetric contour elevations. The capping material is expected to promote colonization by eelgrass and other benthic organisms over the restored area.

Upland Sandblast Grit Removal

Soil with visible sandblast grit was discovered during clearing and grubbing near the western boundary of the site. The affected soils were removed to the excavation limits shown on Record Plan Sheet 4 of 4 and transported for off-site landfill disposal. Confirmation samples were collected from the area for chemical analysis. There is no indication of a residual condition that represents a threat to human health and the environment.

1.3 Removal Action Project Team

Figure 1-2 summarizes responsibilities for OVRA project team, including EPA oversight, City of Tacoma project management, and construction contracting. Specific responsibilities and contact information are presented in the RAWP and construction reports from Remtech.

The overall organization of the project team was effective for coordinating work elements of the Removal Action. The organizational structure allowed for timely resolution of problems arising from field conditions during construction, reaching definitive decisions, and documenting the work completed. Additional subcontract activities were contracted by Remtech to address required construction elements of the AOC and design documents. In addition, the City coordinated laboratory testing and other technical support services supporting construction.

2.0 CONSTRUCTION ACTIVITIES

The following sections summarize construction activities completed for the OVRA Removal Action. Project work was completed in accordance with requirements of the AOC and SOW, design documents, and RAWP. Restoration and revegetation of upland areas required by the Natural Resource Trustees pursuant to a separate Consent Decree with the City of Tacoma were also completed in conjunction with the objectives of the AOC, but are not described further for the purposes of this RACR.

2.1 Construction Activities and Phasing

Construction work for the OVRA project was divided into seven separate work phases between May and October 2002. These phases were developed in the RAWP to optimize construction sequencing, and address tidal constraints, limit in-water work, and minimize potential impacts to fish habitat. Figure 2-1 summarizes the chronology of the construction phases along with the specific work activities completed. Following mobilization of equipment to the site on May 13, subsequent phases integrated various tasks to create access to intertidal areas, remove existing pile structures, construct sheet pile enclosures, excavate and cap or backfill intertidal areas, and cap offshore Area E. Throughout the majority of the work, a fish exclusion barrier was maintained around intertidal work areas.

Details for construction phasing were developed by Remtech during preparation of the RAWP. Phasing maximized efficient use of the available tidal windows

throughout the summer and facilitated completion of work in the intertidal areas during low-tide periods. The phasing strategy was key for successfully accomplishing the work "in-the-dry," thus achieving a primary objective of the OVRA Removal Action.

Work Duration

Construction required 23 work weeks between May 13 and October 14, 2002. Each work week included a minimum of 5 days Monday through Friday, plus additional weekend time on:

- June 15 and 16, 22 and 23, and 29 and 30;
- July 6 and 7, 13, 20 and 21, and 27 and 28;
- August 10, 17 and 18, 24 and 25, and 31; and
- September 7, 14, and 21 and 22, 2002.

In general work was completed in single, daytime shifts of up to about 10 hours for work above ordinary high water (OHW). Tasks requiring access to intertidal areas and subtidal areas were completed in typical 4- to 5-hour shifts. Depending on tidal conditions, in-water work windows were as short as 1 hour and as long as 7 hours.

Primary Construction Activities

Construction activities for the OVRA project included five primary work tasks:

- Removing existing piles associated with previous site structures;
- Excavating sediment and backfilling and capping intertidal Area C;
- Installing sheet pile enclosures in Area B and Area D;
- Excavating sediment and capping within intertidal sheet pile enclosures in Area B and Area D; and
- Capping sediment in Area E.

Table 2-1 summarizes the dates, durations, and construction phases for these tasks. Table 2-1 also presents typical production rates for each activity. Pile removal, intertidal sediment excavation, and capping/backfilling were completed

over multiple construction phases because of tidal constraints and the duration of work activities.

The following sections summarize the methods used by work task, along with observations regarding the effectiveness of the methods and problems resolved. Habitat protection measures and supporting tasks for handling and disposal of waste materials are also described.

Materials Inventory and Documentation

The quantity of sediment, piles, and other wastes exported for off-site disposal are summarized in Table 2-2. Table 2-2 also summarizes quantities of import capping and backfill materials. Inventory logs for these materials were prepared and submitted by Remtech with project construction documentation. In addition, contractor billings and contract payment items are included with Appendix B.

2.2 Pile Structure Removal

Work Completed

Nearly 600 wooden piles were removed from the intertidal and subtidal areas of the OVRA site, including about 150 piles with single or multiple concrete pile caps. Piles with concrete caps were untreated and piles without caps were creosote-treated. Pile lengths ranged from about 20 feet to about 60 feet in deeper intertidal areas. Pile diameters were in the 13- to 17-inch range. Design documents and contractor records document locations and type of each individual pile removed. The total pile disposal quantity was 574 tons shipped to the Land Recovery, Inc. (LRI) RCRA Subtitle D landfill in Puyallup. In total, 687 tons of concrete pile caps and debris were shipped to Woodworth and Company in Tacoma for recycling.

Piles were generally removed in an intact condition, although roughly 10 percent broke off near the surface or below the mudline. Table 2-3 identifies the broken piles left in place and their coordinates. These piles were broken off or cut below the final excavation surface in intertidal areas, and below the previous mudline surface in subtidal Area E. Many of the piles with concrete caps were rotted above the mudline and snapped off immediately upon attempting removal. Concrete was removed from these piles after transport to a lined upland staging area for pile load-out.

Pile removal above OHW began on May 29 and continued through August 30. Removal of piles below OHW began on June 7 following approval by EPA.

More than 90 percent of the intertidal piles were removed in-the-dry, including piles removed from within sheet pile enclosures for Area B and Area D. Schedule requirements necessitated pulling some of the piles when the tide was in.

Several piles in the subtidal area were removed at the request of the Natural Resources Trustees pursuant to their settlement with the City of Tacoma (Table 2-4). Removal of these piles was not needed to facilitate capping of Area E, but provided additional habitat restoration benefit.

Vibration monitors were installed during removal of piles. Monitoring results indicated no unacceptable vibration levels relative to potential adverse effects on site buildings.

Methods

Piles were removed using a two-stage process in intertidal areas. In the first stage typically four to eight piles were loosened and pulled up about 10 feet using a crane with a vibratory extractor attached to the crane cable. The crane or excavator equipment with a cable choker would then remove the piles from the ground for transfer to the upland containment area for temporary storage.

In Area E and adjacent subtidal areas, piles were removed during low-tide periods using barge-based extraction equipment. Working at low tide periods allowed the shallowest water to access broken piles and cut them off below the mudline.

Habitat Protection Measures. During extraction of the treated piles, when creosote dripped onto sediments near the pile extraction point, these sediments were hand-shoveled into containment vessels for off-site landfill disposal. This method successfully prevented further migration of creosote into the aquatic environment. No oil sheens or other water quality impacts were noted with incoming tidal waters after pile extraction. As a precautionary measure, floating absorbent booms were placed around the piles to contain potential spills where piles were removed in-the-wet.

Production Rates

Pile removal was completed over a combined total of 44 days for intertidal and subtidal areas (Table 2-1). Typical production rates varied significantly with type of pile and available time windows to work in-the-dry within intertidal areas. Removal rates of up to about eight to ten piles per hour could be achieved for single piles without concrete caps, either above or below OHW. Removal rates

for piles with single concrete caps were on the order of four per hour, with concrete subsequently broken off using a vehicle-mounted impact breaker after the pile was removed. There were also double, triple, or quadruple piles encased in a single concrete cap that had to be chipped in-place before they could be removed. Chipping was completed in-the-dry during low tide periods, slowing the removal rate for multiple encased piles to about one per 2- to 4-hour shift.

2.3 Area C Sediment Excavation and Backfilling and Capping

Work Completed

Sediment removal, backfilling, and capping in Area C occurred between June 18 and August 9. For the purposes of work completed, Area C segments are considered to be backfilled with sand material with exception of segment C-5, which was capped. Additional sand material placed over segment C-5 provided further isolation of residual dioxin concentrations detected in field confirmation samples that exceeded the site target compliance levels, as discussed below. Segment C-6 also received additional sand material, but analytical results of confirmation samples collected prior to sand fill placement detected dioxin concentrations near the 20 nanogram per kilogram (ng/kg) site target compliance level. Therefore, additional sand material placed over segment C-6 is considered to be backfill, rather than a cap.

Area C excavation segments are identified on Record Plan Sheet 2 of 4, and Sheet 3 of 4. Sheet 2 of 4 also provides as-built bathymetry for capped and backfilled portions of intertidal area. The location of these areas conforms with the planned design areas. No field changes were made. With the exception of segment C-6, Area C sediments were removed to an average depth of 1.3 feet below the existing mudline. Minimum and maximum excavation cut depths were 0.9 and 2.9 feet, respectively. With the exception of two isolated points in segments C-8 and C-10, minimum excavation depths were greater than 1.1 feet. Thicknesses of backfilled segments in Area C ranged from 1.3 and 2.9 feet, with an overall average of 1.7 feet. Backfilling and capping efforts restored the intertidal beach surface to near the pre-existing grade. In addition, portions of Area C were further covered with a minimum 6-inch-thick layer of rounded river gravel for erosion protection, as shown on Record Plan Sheet 4 of 4. Excavation cut depths and sand placement thicknesses were consistent with project performance criteria.

As discussed in Section 4.0, results of confirmation sampling and analysis of the post-excavation surface sediments of segments C-3, C-5, C-6, C-7, and C-10 indicated the presence of residual dioxin concentrations exceeding the 20 ng/kg

sediment quality criteria (SQC) for the OVRA site. Several additional actions were therefore taken at the direction of EPA to provide further isolation for certain Area C segments:

- Erosion protection rock was placed over segments C-3 and C-7 to a minimum thickness of 6 inches (not originally planned as part of design);

- Additional sand material was placed over segment C-5, resulting in a minimum total cap thickness of 2.0 feet, followed by a minimum 0.5-foot-thick layer of erosion protection material;

- Segment C-6 was re-excavated to a minimum of 2.0 feet below the pre-existing grade and backfilled with a 0.5-foot layer of sand with high total organic carbon (TOC). Additional sand material was subsequently placed in segment C-6 between September 4 and 7 to a minimum thickness of 2.0 feet. The segment was then covered with a minimum 0.5-foot lift of erosion protection rock. This action provided a protective backfill cover for segment C-6 using the same concept as for Area B and Area D capping described below; and

- Dioxin concentrations in the surface sediment confirmation sample from segment C-10 marginally exceeded the OVRA site SQC. The analytical results for these samples were considered acceptable with no additional actions necessary and the area was backfilled in accordance with the design.

The Area C sediment disposal quantity represents approximately 40 percent of 11,438 tons of sediment removed from intertidal areas of the OVRA site. Sand material imported for backfilling Area C represents approximately 20 percent of the total project quantity of 23,063 tons of sand material imported for the intertidal and subtidal areas. Erosion protection rock imported for Area C represents approximately 60 percent of the 2,291 tons of rock placed in the intertidal area.

Habitat Protection Measures. Excavation and backfilling and capping in Area C had little, if any effect on turbidity of marine waters. Sand material placed in Area C matched the texture and grain size of existing materials, and no obvious visual siltation or erosion was noted. No modifications to construction methods or cycle times were necessary. No spills or equipment line leaks, etc. were noted. Spill containment materials were readily available in such an event, however.

Methods

Sediment removal in Area C was accomplished using track excavators and haul trucks during low tide periods. After sufficient piles were cleared, steel trench plates were placed on the beach surface to support transit of construction equipment to and from the excavation locations in Area C. A tracked excavator was used to first remove and briefly stockpile sediment near the point of excavation. A second excavator loaded the sediment into haul trucks for upland stockpile storage prior to off-site disposal. Surface sediments generally became siltier and softer on the lower beach, making placement and stabilization of the steel trench plates for equipment access more difficult. No problems were encountered with vehicles getting stuck.

Excavation and subsequent backfilling and capping of Area C segments were coordinated to close open cuts before the tide came in. Average tidal windows for excavation were on the order of 5 hours long. Initial excavation in subsegments within C-9 and C-10 could not be backfilled before inundation by the incoming tide on June 21 and 22. This was mainly the result of the presence of remaining piles that could not be broken off below the excavation surface in time to complete the work, as well as logistical problems with staging and handling of sand materials. The affected subsegments in C-9 and C-10 were left open overnight and re-excavated and backfilled the following day after survey verified that requisite excavation grades were attained. This experience provided a good "learning curve," and all subsequent segments of Area C were excavated and backfilled within a single tidal window. Leaving the C-9 and C-10 subsegments open through a tidal cycle and then backfilling these areas on the following shift resulted in no apparent adverse effects. All design objectives were achieved for these subsegments.

A critical aspect of completing daily excavation and sand placement in Area C was the "real time" survey data. Bottom-of-cut survey data were immediately communicated to the equipment operators to maintain appropriate excavation depths. This procedure for controlling excavation cut depth and backfill thickness was successful in achieving contract requirements.

Excavation and sand placement methods in Area C achieved construction performance goals and demonstrated the suitability of in-the-dry excavations in intertidal environments. Good survey control and coordination of excavation, backfilling, and capping activities were essential to the achieving performance goals. Other items essential to the logistical success of the Area C work included:

- Establishing flexible access and retreat corridors to intertidal areas;

- Efficient handling of steel trench plates;
- Effective equipment decontamination to prevent cross-contamination of backfilled excavation segments;
- Ensuring that an adequate supply of import materials is available in convenient staging areas; and
- Proper traffic control.

Production Rates

Overall production rates for Area C were on the order of about 23 square yards (sy) of area excavated and brought back to grade over an average 5-hour tidal window. This equates to approximate roughly 20- by 50-foot subsegment rectangles excavated and brought back to grade each day. Sand material placement over this area averaged about 54 cubic yards (cy) of sand material per 5-hour work shift. The actual range of tidal work windows varied from about 1 to 7 hours, with production rates varying accordingly.

Equipment was well-maintained and generally did not affect the overall production rate. The equipment used also would be suitable for harder or softer sediments. A slightly harder sediment surface also would be beneficial for stabilizing access pathways. Stickier sediments could have slowed down the equipment decontamination procedure, however.

2.4 Area A, Area B, and Area D Sediment Excavation and Capping

Work Completed

OVRA Areas A, B, and D were excavated and capped to contain residual concentrations of chemical constituents in the intertidal zone. These locations are identified on Record Plan Sheet 2 of 4 and Sheet 3 of 4. The location of these areas conforms with the planned design areas. No field changes were made. Excavation and capping occurred in Area A between August 13 and 20, in Area B between September 9 to 18, and in Area D between July 15 and 24 (Table 2-1).

Area A sediments were removed to an average depth of 3.1 feet below the existing mudline and capped with a layer of sand material with an average thickness of 3.4 feet. The maximum excavation cut depth was 3.2 feet, with sand cap thicknesses varying between 3.0 and 4.1 feet over the Area A footprint.

Area A was then covered with a minimum 0.5-foot thickness of erosion protection rock.

Area B and Area D sediments were removed to average cut depths of 4.2 and 4.4 feet below the pre-existing mudline, respectively. The maximum cut depths were 4.5 for Area B and 5.2 feet for Area D. Capping materials consisted of a layer of high-TOC sand followed by placement of additional sand material. A geotextile barrier was placed between the high-TOC layer and overlying sand material in each excavation as a precautionary measure to prevent deep burrowing by benthic organisms. The average thicknesses of the composite caps were 4.3 feet for Area B, and 4.5 feet for Area D. Each area was then covered with erosion protection rock placed to a minimum thickness of 0.5 foot above the sand cap. Resulting excavation cut depths and backfill thicknesses were consistent with project performance criteria.

Methods

Similar access and excavation methods used for Area C also proved to be successful for Area A, with the downslope side wall of Area A cut at an angle of 2 horizontal to 1 vertical (2H:1V) to promote stability and merge with adjacent Area C. No particular problems were noted.

In Area B and Area D, sheet pile enclosures were erected to isolate excavation and capping activities. The enclosures were dewatered to facilitate operation of equipment and personnel within each area. Remtech elected to complete excavation and capping within each enclosure in separate subsegments roughly 40 by 80 feet in size in Area B, and 20 by 40 feet in size in Area D. Steel trench plates were used to divide and control excavation and capping of each subsegment. This method also minimized potential for cross-contamination from one subsegment to another. Sand material placed in each new subsegment was overlapped to previous subsegments in a shingle pattern. The resulting cap formed a single continuous layer within each sheet pile enclosure.

Sediment removal within the Area B and Area D enclosures was accomplished using excavators within the sheet pile enclosures. Sediment was first placed in temporary stockpiles and lifted from the enclosure with a crane using a skip box or a clamshell bucket. Excavated sediments were then transferred to haul trucks for transport to the upland stockpile staging area. Capping proceeded by placing high-TOC and overlying sand materials from a Garborough-type bucket swung from the crane. Final grading was completed within each subsegment using excavators and by hand.

During construction of the Area D sheet pile enclosure, surficial sediments from within the enclosure were initially eroded by water draining from the beach face at low tide. The eroded sediments were dark in color and contained suspect contaminants. A limited amount of these discolored sediments escaped the limits of Area D as the sheet piles were being driven, but were scooped up and removed during subsequent excavation in adjacent Area C. Once completed, the sheet pile enclosure, in conjunction with aggressive dewatering efforts effectively contained the tidal seepage waters and affected sediments. No impacts to construction or cross-contamination were noted.

Production Rates

The overall production rate for sediment removal and cap placement in Area A was about 160 sy per average 4-hour shift. Typical subsegment cut and fill areas were approximately 20 by 70 feet in size. The shift durations were constrained by tidal conditions. Average daily capping volumes were approximately 290 cy following sediment excavation in each subsegment of Area A.

Work inside the Area B and Area D enclosures was not affected by tidal constraints as for Area C and Area A. Work could therefore be carried out over typical 8- to 10-hour daytime shifts. Roughly half of the time was spent excavating a subsegments within the enclosures, with the remainder of the time spent placing cap materials to complete each subsegment. Overall production rates were on the order of about 280 sy of area excavated per shift for Area B, and 135 sy for Area D. Respective cap placement rates were 240 cy per shift for Area B and 115 cy for Area D. Work in Area B was logistically easier and proceeded more rapidly than that in Area D.

Overall, the methods and equipment selected facilitated efficient excavation and capping of Area A and within the Area B and Area D enclosures.

2.5 Area B and Area D Sheet Pile Enclosures and Dewatering

Work Completed

Sheet pile installation for Area D required about 20 working days between June 20 and July 10. Dewatering proceeded continuously between July 10 to 15 to drain the interior of the sheet pile enclosure. Following completion of Area D excavation and capping, sheet piles were removed between July 26 and August 5. The sheet piles came out quite clean, in need of only minor decontamination, and were subsequently reinstalled in Area B between August 7 and 15, with initial dewatering between about August 26 and September 6. Completion of

Area B excavation and capping was delayed due to recapping activities in Area C-6. Area B sheet piles were removed between September 19 to 30.

Sheet pile enclosures for Area B and Area D consisted of AZ-26 steel sheets placed in interlocking 4-foot-wide sections around each area. The total linear footage for sheet piles placed around Area B was 460 feet, and the total footage for Area D was 310 feet. Sheet lengths ranged up to 60 feet, with embedment depths of up to about 40 feet below the mudline. The top of the sheet piles extended up to 14 feet above the mudline, providing a minimum of approximately 2 feet of freeboard above the high tide level.

The seams between each sheet pile section were sealed using a conventional foam sealant that effectively minimized seepage of tidal waters into the enclosures. Dewatering of the sheet pile enclosures also allowed the sheet pile seams to bond and seal. To maintain the integrity of the seams, sealant was reapplied several times over the course of excavation and capping in Area B and Area D. The drainage rate through the sheet pile seams at high tide was estimated to be in the 10 gallons per minute (gpm) range or less, based on visual estimates. Slight upward seepage of subsurface water into the enclosures was also noted but easily controlled with the dewatering pumps.

Completing Area B and Area D excavations in subsegments was a key element to preserving the structural function of the sheet piles. Limiting excavation to one subsegments at a time left sediment and/or cap fill materials at other locations within the enclosure to support the sheet pile walls. Slight deformation of the Area D sheets was noted over time but this did not affect the function of the enclosure, inhibit work activities, or create a safety problem.

Methods

All sheet piles were installed and removed using a hydraulic vibratory driver/ extractor cabled to a crane. Installation and removal of the sheet piles were relatively smooth and easy with no notable problems. No obstructions were encountered that prevented installation. Prior to removal, excess erosion protection rock was placed against the sheet pile walls for ballast to prevent disruption of the cap during sheet pile removal. Minimal sediment adhered to the sheet piles upon extraction, and there was no indication that capping materials or surface erosion protection rock were disrupted during the extraction process.

Standard hydraulic ditch/trash pumps with approximate 600 gpm capacity were used for dewatering of the Area B and Area D sheet pile enclosures. Pumping rates varied over time during initial dewatering of the enclosures. All water was

pumped to the City's sanitary sewer following settling in temporary storage tanks.

Production Rates

Sheet pile installation rates approximated 50 linear feet of wall per day for Area B and 35 feet for Area D. The Area D sheets were longer and slightly more difficult to install. Removal rates were roughly 50 linear feet per day for each enclosure. Sheet pile installation and removal were completed during low-tide periods, and were limited to work shifts of 3 to 4 hours on average.

Initial dewatering of the sheet pile enclosures required pumping at a rate of about 57,000 gallons per day . Pumps were subsequently cycled as-needed to reduce accumulation of water seeping into the enclosures during excavation and capping.

2.6 Area E Sediment Capping

Work Completed

Initial placement of sand material in Area E occurred between September 3 and 10. Subsequent hydrographic surveys identified areas where fill placement was insufficient, and additional capping material was placed on September 12, September 19, and October 14 to meet project design objectives. As shown on Record Plan Sheet 2 of 4, final contours for Area E ranged from about elevation –1 feet along the southern edge of the area to –15 feet or deeper on the northern edge. These elevations departed slightly from the original design due to the presence of eel grass at the edges of the "hole" and the desire (in consultation with EPA and NMFS) to prevent covering any more than necessary. A combined total of approximately 9,000 tons of capping material was placed during the Area E capping events. The capping accomplished is expected to promote propagation of eelgrass across the restored Area E over time.

Habitat Protection Measures. Cap fill placement methods controlled generation of excess silt and turbidity plumes, and water quality monitoring results confirmed that no unacceptable impacts occurred.

Methods

Capping was completed using a three-barge system. A deck barge transported cap material to the site in approximate 1,000 cy loads. Cap material from the deck barge was fed into conveyor system feeding a telescoping radial arm

stacker on a second barge. Materials conveyed to the stacker were, in turn, fed to hopper and 1-foot-diameter tremie tube on a third barge for placement.

The tremie tube placement method proved to be relatively inefficient because shallow water depths (often 20 feet or less) inhibited even dispersion of cap material. Use of the small-diameter tremie tube led to inconsistent placement and local mounding or "windrow" distribution of material. The small diameter of the tremie tube also was subject to frequent clogging. The hopper and tremie tube system on the ramp barge also was difficult to maneuver and control. For similar environments in shallow water and irregular bathymetry, placement of capping materials directly from the conveyor would provide more continuous, even distribution over the target area. The final lifts (less than 10 percent of the total) were placed without the tremie tube to facilitate even distribution.

Production Rates

Placement rates for capping material were on the order of 1,000 cy, or roughly one barge load per day. Working shifts were completed in approximate 4-hour windows coinciding with low tide conditions to control placement of the material.

2.7 Upland Soil Removal

Sandblast grit in upland soils was discovered on September 24, 2002, during clearing and grubbing of the western portion of upland riparian restoration area (Record Plan Sheet 4 of 4). Following discussions with EPA, soil with visible sandblast grit was excavated for off-site disposal at the LRI Subtitle D landfill in Pierce County. Soils were removed using conventional excavators and haul trucks. Additional soil was subsequently removed from the edges of the area following laboratory testing of soil confirmation samples. All visibly affected soils were removed, confirmed with appropriate sampling data, resulting in 674 tons for off-site disposal. In total, 485 cy of gravelly sand backfill material were imported to restore the excavation area. An addition 125 cy of backfill material were placed for restoration in adjacent upland areas of the OVRA site.

2.8 Fish Exclusion Barrier and Monitoring

Intertidal construction activities were conducted within a floating barrier to limit fish from the work areas. The barrier was a standard "Baffle/Fish Exclusion Barrier" manufactured by Northwest Linings and Geotextile Products, Inc. The barrier consisted of floating sections to suspend a 3-foot-high geomembrane skirt barrier into the water column. The barrier was anchored to blocks placed

beyond the perimeter of excavation and fill areas in the intertidal zone. The barrier floated up and down freely with the tide.

The barrier was installed on May 28 and removed in portions after August 15 as the work area narrowed. The barrier performed as expected to aid in the exclusion of fish from the work areas. There were no disruptions or delays to construction activities. On June 21, floats in three sections of the fish exclusion barrier became submerged when seams that separate floats split open. Additional floats were affixed to the sinking section to repair the barrier. During excavation and capping of Area B, the barrier was removed in sections from the periphery of the intertidal area and repositioned around the sheet pile enclosure.

Visual monitoring for fish inside the barrier occurred as required through July 15. Fish were noted inside the barrier on several occasions and were successfully herded out without harm.

2.9 Water Quality Monitoring Report

The City of Tacoma conducted water quality monitoring during construction activities for the OVRA Removal Action. Monitoring consisted of field measurements for turbidity, dissolved oxygen, pH, conductivity, and temperature. Monitoring included up-current reference measurements and down-current measurements on the periphery of the intertidal construction area. All construction and monitoring activities were conducted in accordance with requirements established by EPA in the March 4, 2002, Clean Water Act and Section 401 Water Quality Certification. There were no indications of exceedances to water quality criteria (Chapter 173-201A WAC) or adverse impacts to the aquatic environment. Sampling methods, locations, and testing results are summarized in the OVRA Water Quality Report presented in Appendix D.

3.0 CONSTRUCTION DOCUMENTATION

All planned construction reports and documentation were prepared and submitted in accordance with requirements of the AOC and as described in the CQAP. These documents included daily Construction Reports that Remtech submitted weekly to the City of Tacoma. The City added Water Quality Monitoring data and transmitted the package to EPA. Material quantities and disposal records presented with this RACR were included with the weekly Construction Reports or provided by Remtech. Remtech submitted 22 weekly Construction Reports for weeks ending April 26 through October 7, 2002. All required reports documenting inspection and monitoring of construction

activities were also completed as planned. Required reports are listed in Table 2 of the CQAP.

Reports prepared for weekly construction progress, inspection, and monitoring were effective for QA/QC purposes and for determining the adequacy of the construction work performed. Timely acquisition and compilation of elevation survey information from the intertidal excavation areas were particularly useful for verifying when target construction grades had been achieved. In addition, inventory logs for pile removal, import of backfilling/capping materials, and export of wastes for off-site disposal were very beneficial for material tracking purposes.

Additional summary documentation would be of further value for similar projects involving extensive sediment excavation, backfilling/capping, and removal of existing piles:

- Estimated daily excavation volumes for each intertidal subsegment;
- Actual daily work durations for intertidal excavation and backfilling or capping (each subsegment); and
- Actual daily work durations for pile removal in each designated construction area.

These records would provide more information for evaluating production rates and cycle times for various types of methods and equipment.

4.0 SEDIMENT AND SOIL CONFIRMATION SAMPLING AND ANALYSIS RESULTS

Chemical confirmation sampling and analysis was completed to evaluate the effectiveness of intertidal sediment removal. Similar confirmation sampling and analysis was completed in an upland soils area near the western edge of the site following removal of soils with visible sandblast grit. The sandblast grit was discovered in site soils during preparations for upland restoration and planting. Results of sediment and upland confirmation sampling and analysis are summarized below. Laboratory analytical documentation is provided in Appendix E. Sample handling, chemical analysis, and QA/QC procedures are described in the CQAP.

Laboratory results from confirmation samples indicated compliance with sediment quality criteria (SQCs) for the OVRA chemicals of concern, with exception of dioxin in Area C segments C-3, C-5, C-6, C-7, and C-10. EPA

directed placement of supplemental sand and erosion protection materials on segment C-5 in accordance with planned contingency actions described in the CQAP. Segments C-3 and C-7 also received additional erosion protection rock. As discussed above in Section 3.0, sand material placed over segment C-5 is considered to be a cap for the purposes of the OVRA removal action. Segment C-6 was excavated to a deeper depth and filled with sand in a similar manner to the Area B and Area D caps. The additional sand material provide further isolation of dioxins to prevent environmental exposure. As discussed below, the dioxin confirmation sample analytical result for segment C-10 marginally exceeded the OVRA SQC and was considered acceptable with no additional actions necessary other than backfilling, which occurred during construction.

4.1 Intertidal Area C

Sediment confirmation samples were collected following excavation of each of the Area C segments identified on Record Plan Sheet 2 of 4. The objective was to collect samples representative of the final excavation surface before placing sand material. One composite sediment sample was collected from each segment of Area C by combining at least three individual aliquots from within the segment. Some segments required multiple tidal cycles to complete excavation, therefore, one composite may have aliquots from multiple days. Aliquots were stored, as required, at the City's lab until three were collected for compositing. The aliquot locations were selected at random at the time of sampling. Each aliquot consisted of sediment collected from the upper 10 centimeters (cm). Area C confirmation samples were submitted to Southwest Laboratory of Oklahoma, Inc. for analysis of dioxins.

Chemical Analysis Results

Dioxin analysis results are summarized in Table 4-1 for 10 confirmation samples collected from Area C. The concentration of dioxin toxic equivalents (TEQs) was below the OVRA site target SQC compliance concentration of 20 ng/kg, for segments C-1, C-2, C-4, C-8, and C-9. Table 4-1 provides results using both one-half the detection limit (DL) for non-detected dioxin constituents, and DL equal to 0 ng/kg for non-detects. The 21.1 ng/kg concentration at segment C-10 marginally exceeded the 20 ng/kg SQC and was considered acceptable.

TEQ concentrations for composite samples from segments C-3, C-5, and C-7, were 23.1, 38.7, and 23.0 ng/kg, respectively (using 0.5 DL for non-detects). At the direction of EPA, a minimum additional 0.5-foot thickness of erosion protection rock was placed over segments C-3 and C-7 after placement of the sand backfill material during construction. For segment C-5, EPA required placement of supplemental sand material to create a cap.

The detected TEQ concentration for the segment C-6 was initially 245 ng/kg. EPA directed that this segment be further excavated to a minimum of 2 feet below the pre-existing grade and then filled with a 0.5-foot layer of high-TOC sand, followed by a minimum 2-foot thickness of sand material, and 0.5-foot of erosion protection rock. The final excavation bottom was subsequently sampled, with a resulting concentration of 38.3 ng/kg (using 0.5 DL for non-detects). Thus, the additional excavation and backfill for segment C-6 provided considerable additional environmental protection for this segment. It should also be noted that the resulting dioxin concentration in the confirmation sample from this segment was 22.3 ng/kg (DL equal to 0) for non-detected dioxin constituents comprising the TEQ. For this reason, sand material placed over segment C-6 is considered to be backfill, rather than a cap.

4.2 Intertidal Area B and Area D

Three sediment confirmation samples (plus two field duplicates) were collected from segments B-1, B-2, and D-1 for analysis of dioxin (Table 4-1), and PCBs (Table 4-3, Area B only). These samples were collected in the same manner as described for Area C, and prior to placing capping materials in each Area B and Area D segment. Dioxin concentrations ranged from 1.1 to 646.6 ng/kg. PCBs were detected at approximately 2 times the SQC in segment B-1, while PCBs were not detected in B-2. Although dioxin concentrations in segments B-1 and D-1 exceeded the SQC, Area B and Area D caps contained high-TOC material designed to be sufficiently protective of the residual dioxin condition. Therefore, no additional actions were identified as necessary for these areas.

4.3 Intertidal Area A

Two sediment confirmation samples (plus one field duplicate) were collected at segments A-1 and A-2 for analysis of total metals (arsenic, copper, lead, mercury, and zinc; Table 4-2). These samples were analyzed by the City of Tacoma analytical testing laboratory. Concentrations of arsenic and zinc exceeded the SQC. The maximum exceedance for each of these analytes was 3.5 and 1.4, respectively. Copper exceeded the SQC in segment A-1 only, at a factor of 3.2 times. The 3-foot cap was appropriate for this condition.

4.4 Upland Sandblast Grit Area

Sandblast grit was encountered on September 24, 2002, during clearing and grubbing of the western portion of upland Riparian Restoration Area A (Record Plan Sheet 4 of 4). Following discussions with EPA, soil with visible sandblast grit was excavated for off-site disposal at the LRI Subtitle D landfill in Pierce County. Confirmation samples were then collected from the side walls and the bottom of

the excavation for chemical analysis of total arsenic, copper, lead, and zinc at the City's analytical testing laboratory (Table 4-3). Each sample was a composite of at least three aliquot locations. The side wall samples contained elevated concentrations of each metal, ranging up to 2,000 milligrams per kilogram (mg/kg) zinc. The excavated material was stockpiled and analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) for arsenic and lead. Detected concentrations of these TCLP constituents were well below the threshold for designation as Dangerous Waste under Chapter 173-303 WAC.

Following discussions with EPA, additional side wall soils were excavated and four separate side wall composite samples (North, South, East, and West) were collected on October 2, 2002. Metals concentrations decreased from the first sampling round but remained at elevated concentrations in the North and West side wall samples. Subsequent excavation removed side wall soils to near the limits of the OVRA property on the north and west in the affected area (Record Plan Sheet 4 of 4). Excavation of the sandblast grit area was complete at this point and no additional confirmation samples were required.

4.5 Import Materials Testing

Import sand material was subject to chemical testing to verify the background concentrations of dioxins, selected metals, semivolatile organic compounds (SVOCs), PCBs, organochlorinated pesticides, volatile organic compounds (VOCs), and total organic carbon (TOC). As established in the CQAP, approximately one sample per 1,000 cy of import sand materials was collected. Accordingly, representative sand material samples from off-site sources were submitted during the construction bidding process, and during the 2002 construction work on June 11, 20, and 27; July 9, 17, and 24; August 9 and 26; and September 9 and 13. Dioxin testing was limited to the initial 1,000 cy of sand material sampled during contract bidding. Additional testing of import sand material for dioxin was not feasible because of the long lead time for laboratory analysis.

Summary tables of testing results for import sand material are provided in Appendix E, along with laboratory analytical documentation.

Acceptance Criteria and Results

Sample testing results were compared against acceptance criteria established in the CQAP. These criteria included site-specific SQCs for OVRA chemicals of concern. Additional SVOC, pesticide, VOC, and metal compounds that were not OVRA chemicals of concern were analyzed for background characterization purposes. Acceptance criteria were established as the most restrictive of:

- Sediment Quality Objectives (SQOs) established in the Record of Decision (ROD) issued by the EPA for the Commencement Bay Nearshore/Tideflats Superfund Site (EPA 1989), as amended in the Explanation of Significant Differences (EPA 2000); or

- Sediment Quality Standards (SQS) listed in the Sediment Management Standards for the State of Washington (Chapter 173-204 WAC).

With the exception of several SVOC compounds tested with the August 26, 2002, sample, samples met acceptance criteria for OVRA dioxins, SVOCs, PCBs, and metals. Although none of these SVOC compounds were detected above their respective analytical detection limits, the detection limits slightly exceeded the applicable acceptance criteria. The detection limits represented the lowest achievable level, and testing results were deemed acceptable for project purposes. SQC, SQO, or SQS acceptance criteria are not established for some of the SVOC, pesticide, VOC, and metal compounds tested. No elevated concentrations indicative of source contamination were noted for these constituents, however.

In addition, Remtech provided a certification of the purity of the granular activated carbon used for the high-TOC sand. Remtech also provided a certification that rounded river rock placed for surface erosion protection in the intertidal area was obtained directly from native bedrock quarried locally.

4.6 Laboratory Data Validation Summary

The analytical data were subject to a data validation review to verify that the data generated met specified QC acceptance criteria for the project. The data validation review is based on quality control requirements described in the Quality Assurance Project Plan (QAPP) for the OVRA design documents, and the following:

- EPA National Functional Guidelines for Organic Data Review (EPA 1994a);

- EPA National Functional Guidelines for Inorganic Data Review (EPA 1994b); and

- EPA Region 10 Standard Operating Procedure for Validation of Dioxin Data (1999), as modified to include specific criteria of individual analytical methods.

Specific QC objectives are listed in the OVRA QAPP, including data validation qualifier flags, field quality control parameters, and laboratory quality control

parameters (precision, accuracy, representativeness, comparability, and completeness).

The data obtained are of acceptable quality and are suitability for their intended use, with minor qualifications as noted. Data validation reports and related documentation are provided in Appendix E.

5.0 FINAL INSPECTION

EPA completed a final site inspection on October 28, 2002, to review construction activities completed for the Removal Action. The City of Tacoma issued a notice to the contractor of completion of construction as of November 15, 2002. No outstanding issues regarding OVRA construction activities have been noted by EPA.

6.0 REMOVAL ACTION COSTS

Costs for the OVRA Removal Action include City coordination, contract support, and technical consulting assistance for tasks listed in the AOC and SOW. For the purposes of presenting a good faith cost estimate, these tasks can be grouped into the following general cost categories:

- Pre-Construction EE/CA and Design Document Preparation Costs;
- Site Construction Costs; and
- Post-Construction Documentation Preparation Costs.

The following table presents a summary of these costs by category:

Pre-Construction EE/CA and Design Document Preparation

City Coordination	$176,000
Technical Consulting Assistance for Engineering Design	$385,000

Site Construction

City Coordination/Laboratory Costs	$328,000
Contractor Costs	$2,178,000
Technical Consulting Assistance	$12,000

Post-Construction Documentation Preparation
(Removal Action Completion Report and Long-Term Monitoring Report)

City Coordination	$25,000
Technical Consulting Assistance	$25,000
Estimated Good Faith Total OVRA Project Cost	$3,129,000

The good faith estimate is based on available invoice records and estimates of City labor and direct costs to date. Estimated post-construction costs are based on the projected level of effort to complete required documentation per the AOC and SOW. EPA oversight costs are included in City coordination. Costs for establishing a site lease, purchasing marker buoys, and signs are also included in City coordination.

7.0 INSTITUTIONAL CONTROLS

The institutional controls established the OVRA site include:

- Designation as a City Natural Resource Damage Assessment (NRDA) Settlement Site;
- Designation as a Washington State Department of Natural Resources (DNR) Environmental Reserve;
- Execution of a 30-year lease with DNR by the City to maintain access and control over the capped areas;
- Creation of a U.S. Coast Guard Regulated Navigation Area (RNA);
- Establishing off-shore buoys per Coast Guard requirements to prohibit moorage or anchorage; and
- Posting the upland portion of the site with signage to limit disturbance by the general public.

The objective of the OVRA site institutional controls is to prohibit activities that would disturb the capped areas of the site. Navigation of vessels through the area will continue to be allowed. In addition to the above-listed institutional controls, the City is developing a long-term monitoring plan to evaluate the performance of engineered controls for the Removal Action and identify contingency mitigation responses.

Institutional controls for the OVRA site were developed based on reasonably expected future uses of the site for non-commercial purposes. Consistent with EPA's September 2000 Institutional Controls Site Manager's Guide (OSWER 9355.0-74FS-P, EPA 540-F-00-005), these controls provide a layered approach by applying several types of administrative measures and ensure long-term protection. Consistent with the EPA guidance document, designations of the OVRA site as a NRDA Settlement Site, Environmental Reserve, and RNA represent governmental controls and restrictions over site uses. Sign posting controls are informational devices to provide notification of site conditions.

Institutional controls for the OVRA site are expected to provide effective, long-term protection with regard to applicable CERCLA balancing criteria. These criteria include 1) short-term effectiveness, long-term effectiveness, and permanence; 2) implementability; and 3) cost.

- Governmental controls at the OVRA site provide short-term and long-term legal protection to enhance the effectiveness and permanence of the engineered remedy. Informational devices (i.e., posted signs) provide further physical notification of site conditions;

- Institutional controls have been, or will readily be implemented, thus demonstrating their administrative feasibility; and

- Costs to establish and maintain institutional controls are primarily administrative, with on-going commitments from the responsible agencies to fund and support these efforts.

Copies of the DNR Environmental Reserve Designation and Coast Guard RNA are provided in Appendix F.

NRDA Settlement Site

The City of Tacoma signed a Consent Decree with the Commencement Bay Natural Resource Trustees establishing this site (among others) as a settlement site. This decree places many long-term institutional controls on the site that must be implemented by the City. Chief among these are:

- Prohibitions against taking or permitting another to take any action that may jeopardize the function of the restored areas; and

- Deed restrictions and/or equivalent methods to prevent any land use on the site at odds with the project goals.

Most, if not all, potential threats to the Removal Action are addressed by these NRDA Consent Decree restrictions.

DNR Environmental Reserve

On May 24, 2000, the State Commissioner of Public Lands established the OVRA project area as part of an environmental reserve under RCW 79.68.060. The reserve is administered by the DNR to protect the area from further commercial use and potential development or commercial leasing. This land use restriction will serve to protect the integrity of the Removal Action.

City of Tacoma Long-Term Lease

In December 2002, the City of Tacoma executed a 30-year lease with DNR to cover the capped areas of the OVRA project site. This lease will allow the City to maintain access to and control over the project site during long-term monitoring. The lease includes provisions for additional periods after the first 30 years if additional monitoring and/or corrective action are required by EPA.

Coast Guard RNA

The Coast Guard has proposed to create a permanent RNA in Commencement Bay to preserve and protect the integrity of the OVRA site. The RNA was proposed as rulemaking under 33 Code of Federal Regulations Part 165 as presented in Federal Register Volume 67, No. 231 (December 2, 2002). The proposed RNA prohibits activities that would disturb the seabed, such as anchoring, dredging, spudding, laying cable, or other disturbance of the bottom. The regulated area is identified on Record Plan Sheet 4 of 4. The Coast Guard is responsible for enforcing provisions of the RNA.

The proposed RNA and status update from the Coast Guard are provided in Appendix F. The Final Rule for the RNA is expected to be published in the Federal Register on or about April 1, 2003. The Final Rule will be forwarded when published.

Signage Posting

Signs are being installed to inform the public of the need to limit any disturbance on upland, intertidal, and offshore areas of the site. This will take the form of educational displays, prominently visible to the general public from land areas of the site. The content of this signage will discuss the project goals and clearly encourage the public to avoid any disturbance of the site. Signage at the waterward edge will consist of signs prohibiting any moorage or anchorage. Off-

shore buoys marking the RNA will conform to requirements described in CFR Title 33 Part 66, Private Aids to Navigation (PATON). The PATON buoys are orange and white regulatory markers to indicate the exclusionary area for boaters. This will protect off-shore areas of the OVRA site from any disruptions resulting from vessel traffic, such as dragging anchor. DNR will procure and install the buoys and the City will be responsible for the maintenance.

Sign posting will be completed by the City following review and comment by the EPA and Natural Resource Trustees on language to be provided in the long-term monitoring report. The City will continue to maintain the signs and ensure that they remain in-place.

8.0 CERTIFICATIONS

In accordance with AOC Item V.B.3, the following certification is made by a person who supervised or directed the preparation of the report.

Under penalty of law, I certify that to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of the report, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

_____

John O'Loughlin, P.E., Project Manager (City of Tacoma)

_____

Richard F. Moore, L.E.G. (Hart Crowser, Inc.)

In accordance with AOC SOW Item V Task 5, the following certification is made by a Registered Professional Engineer and the City of Tacoma:

The Remedial Action has been constructed in accordance with the design and specifications.

_____

Sara J. Carroll, P.E. (Hart Crowser, Inc.)

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Table 2-1 - OVRA Construction Activities Summary

Construction Activity	Contractor Construction Phase	Duration in Days	Dates (2002)	Approximate Production Rates
Pile Removal[1]				
Piles above Ordinary High Water	1	4	May 29 to June 3	> 35 piles per average 8-hr shift
Area G and Area A	2	13	June 7 to June 21	
Area C	3	15	June 22 to July 6	35 single timber piles per average 5-hr shift
Area D	3	2	June 19 to June 20	20 single concrete cap piles per average 5-hr shift
Area G and Area A Crane Support Piles	6	8	August 13 to August 20	1 multiple concrete cap pile per average 5-hr shift
Area E	7	2	August 29 to August 30	16 piles per average 4-hr shift
Construct Area D and Area B Enclosures				
Install Area D Sheet Piles	3	20	June 20 to July 10	35 lf per average 3-hr shift (9 sections)[2]
Dewater Area D Enclosure	4	5	July 10 to July 15	57,000 gpd (24-hr day)
Remove Area D Sheet Piles	4	9	July 26 to August 5	50 lf per average 3-hr shift (12 sections)
Install Area B Sheet Piles	5	9	August 7 to August 15	50 lf per average 4-hr shift (12 sections)
Remove Area B Sheet Piles	6	8	September 19 to September 30	50 lf per average 4-hr shift (12 sections)
Sediment Removal and Backfilling				
Area C East	3	49	June 18 to August 8	Excavation of 25 sy per shift (20 ft by 50 ft subsegments) Backfilling 50 cy per shift following excavation Average shift duration 5 hours
Area C West	5	30	July 8 to August 9	
Area C Segments C-3 and C-7 Erosion Protection Material Placement	5	3	August 7 to August 9	
Area C Segment C-6	6	4	September 4 to September 7	

Table 2-1 - OVRA Construction Activities Summary

Construction Activity	Contractor Construction Phase	Duration in Days	Dates (2002)	Approximate Production Rates
Sediment Removal and Capping				
Area A	6	8	August 13 to August 20	Excavation of 160 sy per shift (20 ft by 70 ft subsegments) Capping 290 cy per shift following excavation Average shift duration 4 hours
Area B	6	9	September 9 to September 18	Excavation of 280 sy per shift Capping 240 cy per shift following excavation
Area C Segment C-5	5	3	July 8 to August 9	
Area D	4	10	July 15 to July 24	Excavation of 135 sy per shift Capping 115 cy per shift following excavation
Area E (Capping Only)	7	5	September 4 to September 9	

Notes:

1 Approximately 90 percent of piles in the intertidal zone were removed in-the-dry during low-tide periods
2 Sheet piles for Area B and Area D enclosures were installed and removed in-the-dry during low-tide periods

Table 2-2 - OVRA Project Import and Export Materials Quantities

Export Materials	**Tons**
Piles	574
Concrete for Recycle	687
Upland Soil with Sandblast Grit	674
Contaminated Intertidal Sediment and Debris	11,438
Import Materials	
Sand Material	23,063
Erosion Protection Rock - Material "A" (6-inch minus)	1,582
Erosion Protection Rock - Material "B" (4-inch minus)	709
Backfill for Upland Sandblast Excavation Area and Shore Terminals Restoration	610
Total Wastewater Discharged to City of Tacoma Sanitary Sewer in Millions of Gallons	4.4

Table 2-3 - Coordinate Locations of Remaining Piles at the OVRA Site (Broken-Off Below Mudline)

Date Removed	Piling ID #	Northing	Easting	Pile Type	Treated/ Untreated
06/18/02	C309	709489	1160104	Concrete Encased Timber Pile	Untreated
06/20/02	C312	709478	1160095	Concrete Encased Timber Pile	Untreated
06/20/02	C314	709474	1160084	Concrete Encased Timber Pile	Untreated
06/18/02	C315	709476	1160071	Concrete Encased Timber Pile	Untreated
06/20/02	C316	709469	1160074	Concrete Encased Timber Pile	Untreated
06/18/02	C317	709474	1160065	Concrete Encased Timber Pile	Untreated
06/20/02	C319	709468	1160054	Concrete Encased Timber Pile	Untreated
06/10/02	C415	709455	1160165	Concrete Encased Timber Pile	Treated
06/10/02	P304	709494	1160139	Timber	Treated
06/10/02	P419	709450	1160166	Timber	Treated
06/10/02	P154	709533	1160150	Timber	Treated
06/11/02	P448A	709420	1160143	Timber	Untreated
06/12/02	C390	709444	1160121	Concrete Encased Timber Pile	Untreated
06/12/02	C408	709434	1160113	Concrete Encased Timber Pile	Untreated
06/12/02	P369	709418	1160039	Timber	Treated
06/11/02	P453	709409	1160138	Timber	Untreated
06/11/02	P455	709411	1160134	Timber	Untreated
06/11/02	P456	709410	1160132	Timber	Untreated
06/12/02	P433	709393	1160061	Timber	Untreated
06/12/02	P400	709404	1160045	Timber	Treated
06/12/02	P478	709362	1160063	Timber	Treated
06/12/02	P527	709347	1160069	Timber	Treated
06/13/02	P30	709502	1160275	Concrete Encased Timber Pile	Treated
06/18/02	C313	709480	1160081	Concrete Encased Timber Pile	Untreated
06/24/02	P271	709651	1160170	Timber	Treated
06/24/02	P273	709634	1160133	Timber	Treated
06/24/02	P274	709618	1160102	Timber	Treated
06/26/02	P276	709582	1160137	Timber	Treated
06/27/02	P270	709655	1160220	Timber	Treated
06/27/02	P272	709605	1160188	Timber	Treated
07/10/02	C475	709348	1160035	Concrete Encased Timber Pile	Untreated
07/10/02	C476	709354	1160047	Concrete Encased Timber Pile	Untreated
07/08/02	C429	709407	1160069	Concrete Encased Timber Pile	Untreated
07/08/02	C404	709419	1160073	Concrete Encased Timber Pile	Untreated
07/10/02	P322	709451	1160026	Timber	Treated/
07/08/02	C330	709453	1160060	Concrete Encased Timber Pile	Untreated
07/08/02	C331	709447	1160063	Concrete Encased Timber Pile	Untreated
07/08/02	C365	709440	1160067	Concrete Encased Timber Pile	Untreated
07/08/02	C374	709434	1160069	Concrete Encased Timber Pile	Untreated
07/11/02	P234	709518	1160020	Timber	Treated/
07/08/02	C366	709435	1160056	Concrete Encased Timber Pile	Untreated
07/08/02	C396	709423	1160061	Concrete Encased Timber Pile	Untreated
07/10/02	P321	709470	1160023	Timber	Treated
07/13/02	P207A	709524	1160086	Timber	Treated
07/15/02	C184	709516	1160107	Concrete Encased Timber Pile	Untreated
07/15/02	C185ABC	709512	1160093	Concrete Encased Timber Pile	Untreated
07/15/02	C186	709505	1160080	Concrete Encased Timber Pile	Untreated
07/15/02	C188	709497	1160059	Concrete Encased Timber Pile	Untreated

Table 2-3 - Coordinate Locations of Remaining Piles at the OVRA Site (Broken-Off Below Mudline)

Date Removed	Piling ID #	Northing	Easting	Pile Type	Treated/ Untreated
07/15/02	C189ABC	709496	1160055	Concrete Encased Timber Pile	Untreated
07/15/02	C282	709509	1160109	Concrete Encased Timber Pile	Untreated
07/15/02	C283	709504	1160096	Concrete Encased Timber Pile	Untreated
07/15/02	C284	709499	1160083	Concrete Encased Timber Pile	Untreated
07/15/02	C286	709491	1160066	Concrete Encased Timber Pile	Untreated
07/15/02	C287	709487	1160057	Concrete Encased Timber Pile	Untreated
07/15/02	C290ABC	709483	1160062	Concrete Encased Timber Pile	Untreated
07/15/02	C291	709484	1160068	Concrete Encased Timber Pile	Untreated
07/15/02	C292	709487	1160077	Concrete Encased Timber Pile	Untreated
07/15/02	C293	709491	1160087	Concrete Encased Timber Pile	Untreated
07/15/02	C294ABC	709498	1160099	Concrete Encased Timber Pile	Untreated
07/15/02	C295	709501	1160109	Concrete Encased Timber Pile	Untreated
08/06/02	C407A	709428	1160106	SPP	Untreated

Table 2-4 - Coordinate Locations of Subtidal Piles Removed at the Request of the Natural Resource Trustees

Piling ID #	Northing	Easting
P239	1159895	709508
P255	1160133	709726
P256	1160166	709774
P257	1160176	709754
P258	1160179	709751
P259	1160180	709748
P260	1160183	709750
P261	1160183	709746
P262	1160181	709745
P263	1160184	709741
P264	1160186	709742

Table 4-1 - OVRA Sediment Confirmation Sampling Results (Dioxin TEQs)

Composite Sample No.	Date Collected	Grid No.	Dioxin TEQ Concentration in ng/kg (0.5 DL for Non-Detects)	Dioxin TEQ Concentration in ng/kg (DL = 0 for Non-Detects)
Area C				
C-1	7/12/2002	C-1	3.6	3.3
C-2	7/23/2002	C-2	5.9	5.5
C-3	7/13/2002	C-3	23.1	21.3
C-4	7/13/2002	C-4	0.8	0.6
C-5	6/25/2002	C-5	38.7	34.8
C-6	8/7/2002	C-6 (Initial Sample)	245.1	245.1
C-6B	9/5/2002	C-6 (Deeper Resample)	30.3	22.3
C-7	6/26/2002	C-7	23.0	21.7
C-8	8/7/2002	C-8	2.9	2.7
C-9	6/23/2002	C-9	7.2	6.8
C-10	6/28/2002	C-10	21.1	21.1
Area D				
D-1	7/19/2002	D-1	533.7	533.7
D-2	7/19/2002	D-1	644.5	644.2
Area B				
B-1	9/10/2002	B-1	24.9	21.6
B-2	9/17/2002	B-2	1.1	0.9
B-3	9/10/2002	B-1	24.5	20.8
OVRA Target Compliance Concentration				20.0

Notes:
All samples collected as minimum 3-point composites from the upper 10 cm of the post-excavation surface.
See Appendix F for complete listing of dioxin TEQ constituents and laboratory analytical documentation.
Sample D-2 is a field duplicate of sample D-1.
Sample B-3 is a field duplicate of sample B-1.
Sample aliquots were collected over a period of days as the particular grid was excavated, date listed is date of final grab for the composite.
DL Detection Limit
Dioxin TEQs were calculated using World Health Organization Toxic Equivalency Factors.

Table 4-2 - OVRA Area A Sediment Confirmation Sample Analytical Results (Total and TCLP Metals)

Composite Sample No.	Date Collected	Grid No.	Total Metals Concentration in mg/kg				
			Arsenic	Copper	Lead	Mercury	Zinc
A-1	8/19/2002	A-1	64.5	1230	91.7	0.158	581
A-2	8/20/2002	A-2	138	314	99.5	0.118	482
A-3	8/20/2002	A-2	202	328	137	0.139	428
OVRA Target Compliance Concentration			57	390	450	0.41	410
Area A Stockpile Sample	Date Collected		**TCLP Metals Concentration in mg/L**				
Composite #1	8/21/2002	Not Applicable	0.0224	NA	0.22	NA	NA
Composite #2	8/21/2002	Not Applicable	0.0379	NA	0.127	NA	NA
Composite #3	8/21/2002	Not Applicable	0.0352	NA	0.0991	NA	NA
Composite #4	8/21/2002	Not Applicable	0.0376	NA	0.241	NA	NA
Composite #5	8/21/2002	Not Applicable	0.0387	NA	0.0936	NA	NA
Composite #6	8/21/2002	Not Applicable	0.0424	NA	0.0868	NA	NA
Dangerous Waste Designation Concentration			5		5		

Notes:
All samples collected as minimum 3-point composites from the upper 10 cm of the post-excavation surface.
See Appendix E for complete laboratory analytical documentation.
Sample A-3 is a field duplicate of sample A-2.
Sample aliquots were collected over a period of days as the particular grid was excavated, date listed is date of final grab for the composite.
Stockpile composite sample #6 is a field duplicate of sample #5.
NA Not Analyzed

Table 4-3 - OVRA Area B Sediment Confirmation Sample Analytical Results (PCBs)

Composite Sample No.	Date Collected	Grid No.	PCB Concentrations in ug/kg							
			Total PCB	Ar-1016	Ar-1221	Ar-1232	Ar-1242	Ar-1248	Ar-1254	Ar-1260
B-1	9/10/2002	B-1	470	< 80	< 80	< 80	< 80	< 80	470	< 80
B-2	9/17/2002	B-2	< 78	< 78	< 78	< 78	< 78	< 78	< 78	< 78
B-3	9/10/2002	B-1	590	< 80	< 80	< 80	< 80	< 80	590	< 80
OVRA Target Compliance Concentration			300							

Notes:
All samples collected as minimum 3-point composites from the upper 10 cm of the post-excavation surface.
See Appendix E for complete laboratory analytical documentation.
Sample B-3 is a field duplicate of sample B-1.
Sample aliquots were collected over a period of days as the particular grid was excavated, date listed is date of final grab for the composite.
Less-than sign indicates result below analytical detection limit indicated.

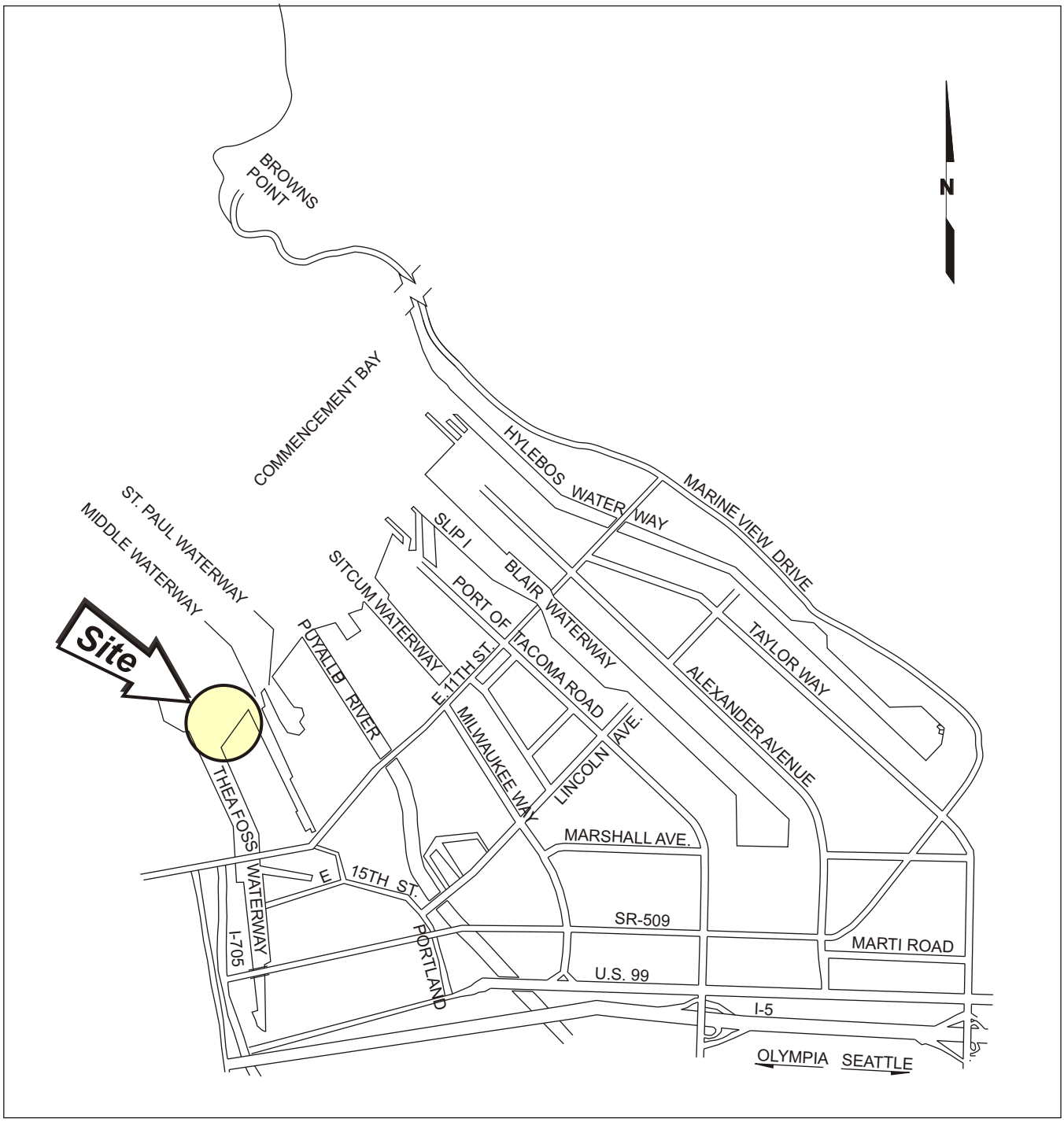
Table 4-4 - OVRA Upland Soils/Sandblast Grit Confirmation Sample Analytical Results (Total and TCLP Metals)

Composite Sample No.	Date Collected	Total Metals Concentration in mg/kg			
		Arsenic	Copper	Lead	Zinc
Side wall composite	9/24/2002	224	656	230	2000
Bottom composite	9/24/2002	3.7	18.8	14.9	47.6
Side wall Resample: North wall	10/2/2002	47	NA	NA	NA
Side wall Resample: South wall	10/2/2002	2.5	NA	NA	NA
Side wall Resample: East wall	10/2/2002	67.2	NA	NA	NA
Side wall Resample: West wall	10/2/2002	4.1	NA	NA	NA

Composit Sample No	Date Collected	TCLP Metals Concentration in mg/L	
		Arsenic	Lead
Sand blast grit stockpile	9/24/2002	0.19	0.037
Dangerous Waste Designation Concentration		5	5

Notes:
NA Not Analyzed
All samples collected as minimum 3 point composites.
Concentrations for designation as Dangerous Waste based on Chapter 173-303 WAC.
See Appendix E for complete laboratory analytical documentation.

Vicinity Map



CAS 12/20/2002 7614AB (DAR).CDR

NOT TO SCALE

WASHINGTON

HARTCROWSER

7614 ***12/02***

Figure 1-1 ***RACR***

OVRA Project Team
2002 Removal Action

Project Management and Oversight
EPA
Karen Keeley

Corps of Engineers, Seattle District
Field Oversight and Quality Assurance
John Wakeman
Joe Marsh

Project Execution and Management
City of Tacoma (Respondent)
Project Coordinator
Quality Assurance Official (QAO)
John O'Loughlin
Project Engineer
Jim Parvey

Natural Resource Trustees
Habitat Restoration Issues Pursuant to the City's NRDA Settlement for the CB/NT Site

- Survey Checking
- Water Quality Monitoring
- Sediment Confirmation Sampling

Laboratory Chemical Analysis

City of Tacoma Laboratory
- Sediment Testing (Metals, PAHs, PCBs)
- Water Quality Testing
- Soil Testing (Upland Sandblast Grit)
- Quality Assurance and Data Validation (Except Dioxins)

Triangle Laboratories
- Sediment Testing (Dioxins)

EcoChem
- Dioxin Quality Assurance and Data Validation

Technical Coordination

Technical Consultanting
- Geotechnical
- Engineering
- Environmental

Hart Crowser, Inc.
Project Manager
Rick Moore
Lead Engineer
Sara Carroll

Construction Contractor
Remtech, Inc.

Project Superintendent
Mark Henry

Construction Quality Assurance (CQA) Officer
Steve Krueger

Health & Safety Manager
Patrick Tierney

Site Supervisor
Keith Carpenter

Subcontractors

Pile Removal Support
Keppler Construction

Shoring Design and Installation Support
Keppler Construction

Fisheries Biologist
Adolfson & Associates

Mitigation Specialist
Adolfson & Associates

Area E Capping and Barge
JTC Barge Services

Trucking
Import Materials
Interwest Development
Export Materials
Land Recovery, Inc. (LRI)
On-Site
Roadway Construction

Surveying
Kegel Engineering

Hydrographic Survey
Bluewater Engineering

Eel Grass Survey
Marine Resource Consultants

Off-Site Disposal Facilities

Sheet Pile Enclosure Dewatering Water
City of Tacoma POTW

Sediment, Upland Soil, Piles, and Contaminated Debris
RCRA Subtitle D Landfill, Hidden Valley
LRI, Inc., Puyallup, WA

Concrete Recycling
Woodworth and Company, Tacoma, WA

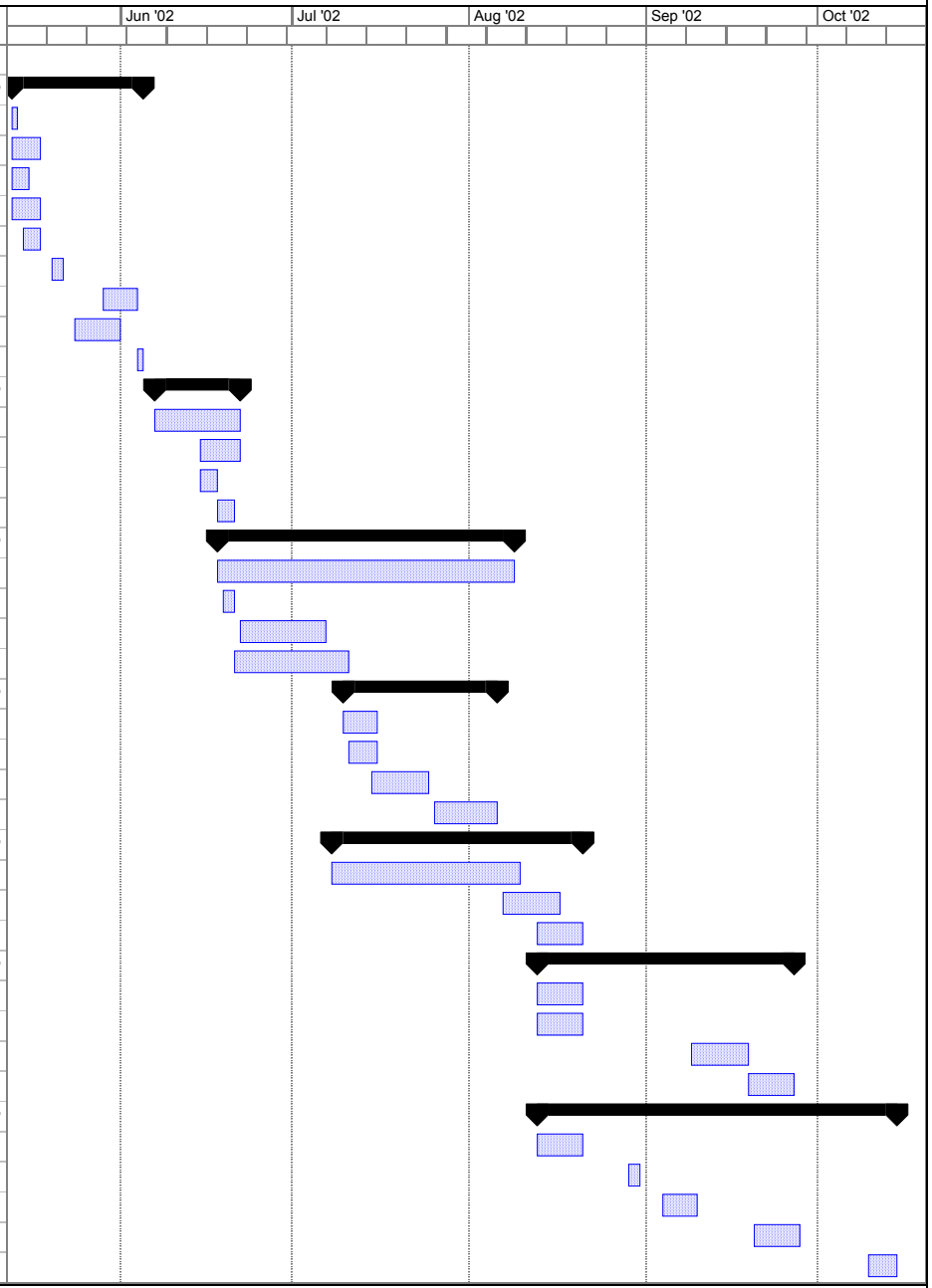
Regulatory Agency
Party under Direction of Respondent
Party under Direction of Contractor

HARTCROWSER
7614
Figure 1-2
12/02
RACR

7614c(CQAP).cdr HEL 3/20/03

Figure 2-1 Construction Task Chronology and Phasing

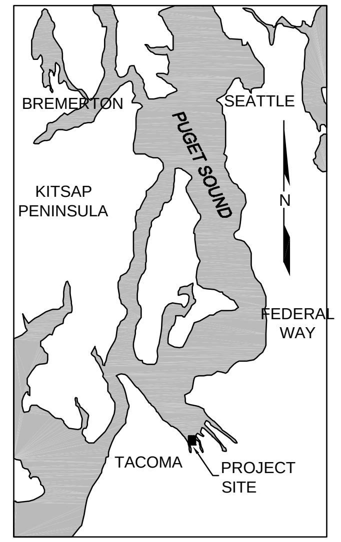
ID	Task Name	Duration	Start	Finish	% Comp.
1					
2	**Construction Phase 1**	**17 days**	**Mon 5/13/02**	**Tue 6/4/02**	**0%**
3	Mobilize Equipment	1 day	Mon 5/13/02	Mon 5/13/02	0%
4	Initial Surveys (Upland, Intertidal, and Eel grass)	5 days	Mon 5/13/02	Fri 5/17/02	0%
5	Install Silt Fence and Fish Exclusion Barrier	3 days	Mon 5/13/02	Wed 5/15/02	0%
6	Clear and Grub Upland Area and Construct Access Roads	5 days	Mon 5/13/02	Fri 5/17/02	0%
7	Prepare Stockpile Areas	3 days	Wed 5/15/02	Fri 5/17/02	0%
8	Prepare Decon Area	2 days	Mon 5/20/02	Tue 5/21/02	0%
9	Remove Piles Above Ordinary High Water	4 days	Wed 5/29/02	Mon 6/3/02	0%
10	Install Water Conveyance System for Dewatering	6 days	Fri 5/24/02	Fri 5/31/02	0%
11	Test Water Conveyance System	1 day	Tue 6/4/02	Tue 6/4/02	0%
12	**Construction Phase 2**	**13 days**	**Fri 6/7/02**	**Fri 6/21/02**	**0%**
13	Remove Selected Area A and Area G Piles	13 days	Fri 6/7/02	Fri 6/21/02	0%
14	Construct Access Ramp Area G to Area Area C-East	7 days	Sat 6/15/02	Fri 6/21/02	0%
15	Construct Area G Crane Pad	3 days	Sat 6/15/02	Mon 6/17/02	0%
16	Construct Access Corridor Area A to Area C-West	3 days	Tue 6/18/02	Thu 6/20/02	0%
17	**Construction Phase 3**	**49 days**	**Tue 6/18/02**	**Thu 8/8/02**	**0%**
18	Excavate and Backfill Area C-East	49 days	Tue 6/18/02	Thu 8/8/02	0%
19	Remove Selected Area D Piles	2 days	Wed 6/19/02	Thu 6/20/02	0%
20	Remove Selected Area C Piles	15 days	Sat 6/22/02	Sat 7/6/02	0%
21	Install Area D Sheet Piles	20 days	Fri 6/21/02	Wed 7/10/02	0%
22	**Construction Phase 4**	**24 days**	**Wed 7/10/02**	**Mon 8/5/02**	**0%**
23	Dewater Area D Enclosure	5 days	Wed 7/10/02	Mon 7/15/02	0%
24	Complete Area D Pile Removal	4 days	Thu 7/11/02	Mon 7/15/02	0%
25	Excavate and Cap Area D	10 days	Mon 7/15/02	Wed 7/24/02	0%
26	Remove Area D Sheetpile	9 days	Fri 7/26/02	Mon 8/5/02	0%
27	**Construction Phase 5**	**40 days**	**Mon 7/8/02**	**Tue 8/20/02**	**0%**
28	Excavate and Backfill Area C-West	30 days	Mon 7/8/02	Fri 8/9/02	0%
29	Install Area B Sheetpile	9 days	Wed 8/7/02	Fri 8/16/02	0%
30	Remove Area D Cranepad	8 days	Tue 8/13/02	Tue 8/20/02	0%
31	**Construction Phase 6**	**42 days**	**Tue 8/13/02**	**Thu 9/26/02**	**0%**
32	Remove Remaining Area G Cranepad Piles	8 days	Tue 8/13/02	Tue 8/20/02	0%
33	Excavate and Cap Area A	8 days	Tue 8/13/02	Tue 8/20/02	0%
34	Excavate and Cap Area B	9 days	Mon 9/9/02	Wed 9/18/02	0%
35	Remove Area B Sheetpile	8 days	Thu 9/19/02	Thu 9/26/02	0%
36	**Construction Phase 7**	**54 days**	**Tue 8/13/02**	**Mon 10/14/02**	**0%**
37	Place Area G Erosion Protection Rock	8 days	Tue 8/13/02	Tue 8/20/02	0%
38	Remove Area E Piles	2 days	Thu 8/29/02	Fri 8/30/02	0%
39	Cap Area E	5 days	Wed 9/4/02	Mon 9/9/02	0%
40	Remove Ramps, Roads, and Corridors	8 days	Fri 9/20/02	Fri 9/27/02	0%
41	Demobilize	3 days	Thu 10/10/02	Mon 10/14/02	0%



Project: Constructionsum
Date: Thu 4/17/03

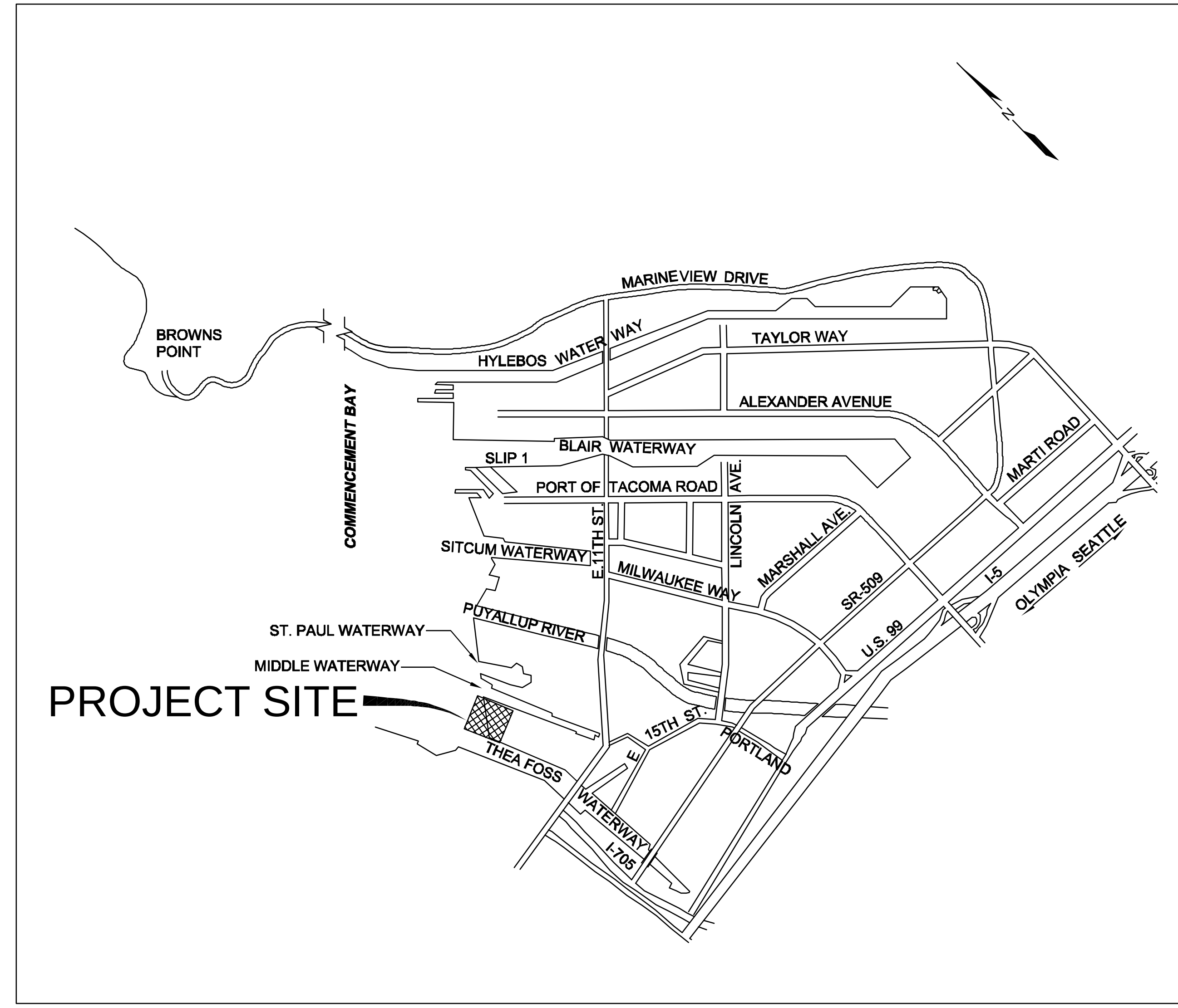
Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

APPENDIX A
RECORD PLAN SHEETS



AREA MAP

CITY OF TACOMA
DEPARTMENT OF
PUBLIC WORKS



NOT TO SCALE

VICINITY MAP

OLYMPIC VIEW RESOURCE AREA REMOVAL ACTION

ADMINISTRATIVE ORDER ON CONSENT
U.S. EPA DOCKET NO. CERCLA 10-2001-0069

SHEET INDEX

1 **Title Sheet**
2 **Excavation, Backfilling, and Capping Area Plan**
3 **Construction Details**
4 **Surface Material Plan**

SARA J CARROLL
STATE OF WASHINGTON
38780
REGISTERED PROFESSIONAL ENGINEER
EXPIRES 10/20/2003

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No.	Revision	Date	By
REV-1		3/20/03	CAS

ENVIRONMENTAL SERVICES-SCIENCE AND ENGINEERING DIVISION MANAGER

POST-CONSTRUCTION PLAN SHEET RECORD DRAWINGS

CITY OF TACOMA
DEPARTMENT OF PUBLIC WORKS

HART CROWSER
PENTEC ENVIRONMENTAL
1910 FAIRVIEW AVENUE EAST
SEATTLE, WASHINGTON 98102-3699

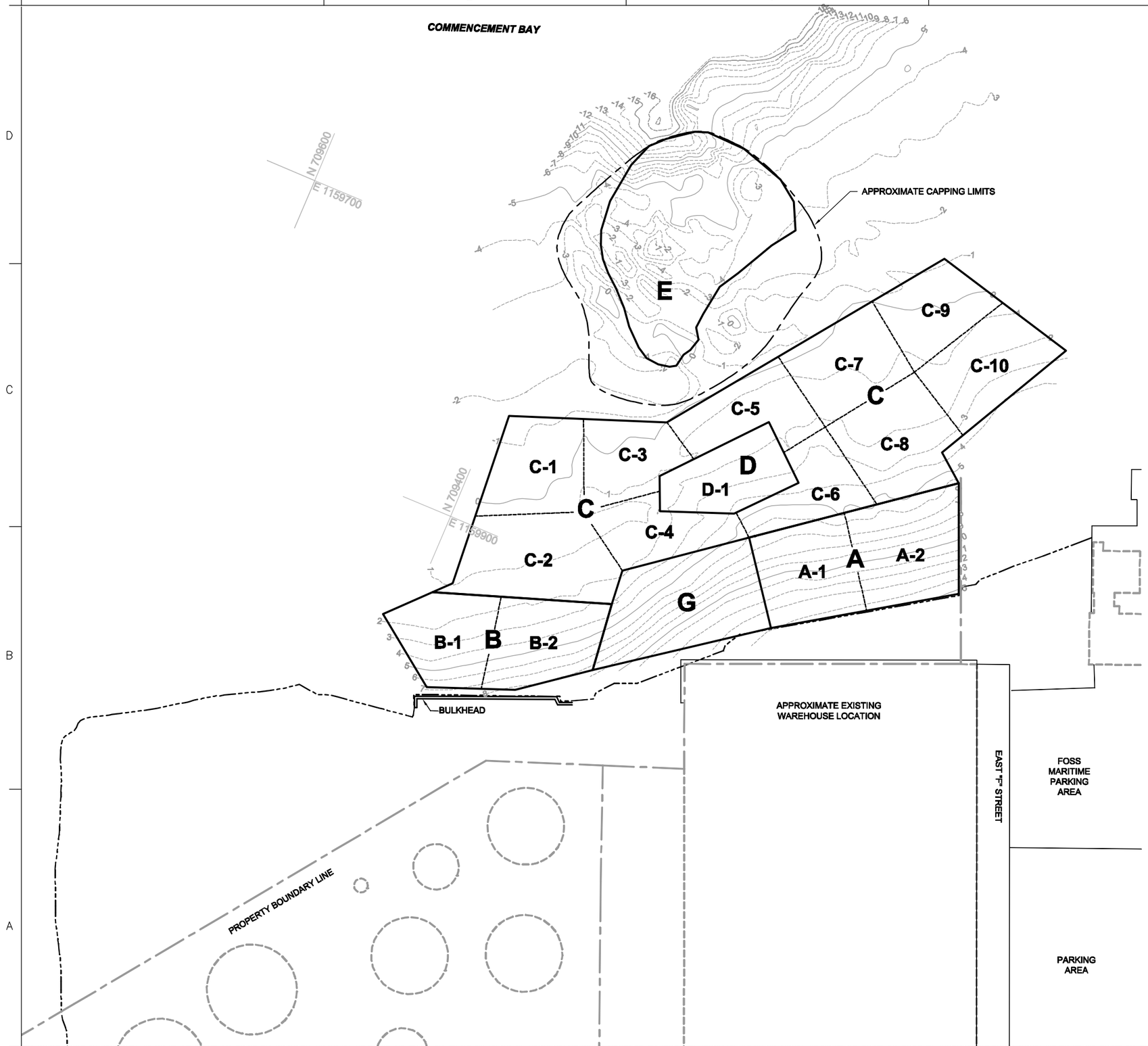
Designed by: RFM
Dwn by: CAS Ckd by: GTB
Reviewed by: SJC
Project Mgr.: RFM
File name: 761400000_REV-1.DWG
Plot date: 3/20/2003
Plot scale: N/A

OLYMPIC VIEW RESOURCE AREA REMOVAL ACTION

TITLE SHEET

SHEET 1

SHEET 1 OF 4



LEGEND:

-10- POST-CONSTRUCTION ELEVATION CONTOUR IN FEET (CORPS DATUM)

A-1 INTERTIDAL CONFIRMATION SAMPLING SEGMENT BOUNDARY AND DESIGNATION

NOTES:

1) AREA A CAPPING-SEE DETAIL 1/2|3
2) AREAS B AND D CAPPING - SEE DETAIL 2/2|3
3) SEGMENTS C-1, C-2, C-3, C-4, C-7, C-8, C-9, AND C-10 BACKFILLING - SEE DETAIL 3/2|3
4) SEGMENT C-5 SUPPLEMENTAL CAPPING AND EROSION PROTECTION ROCK PLACEMENT - SEE DETAIL 4/2|3
5) SEGMENT C-6 SUPPLEMENTAL BACKFILLING AND EROSION PROTECTION ROCK PLACEMENT- SEE DETAIL 5/2|3
6) POST-CONSTRUCTION BATHYMETRY BASED ON SURVEY DATA PROVIDED BY KEGEL ENGINEERING
7) TOTAL CONTAMINATED INTERTIDAL SEDIMENT REMOVED FROM AREAS A THROUGH D - 11,438 TONS (INCLUDING DEBRIS)
8) TOTAL PILE QUANTITY REMOVED - 574 TONS
9) TOTAL IMPORT SAND CAP MATERIAL FOR AREAS A THROUGH D, AND AREA E - 23,063 TONS
10) TOTAL IMPORT EROSION PROTECTION MATERIAL FOR AREAS A THROUGH D, AND AREA G - 2,291 TONS
11) AREA G-PILING AND DEBRIS REMOVAL WITH EROSION PROTECTION ROCK PLACEMENT IN SOME AREAS

DATUM:

HORIZONTAL DATUM IS WASHINGTON STATE PLANE, SOUTH ZONE, NAD 83.

PROJECT N / TRUE N

0 40 80 160
SCALE IN FEET

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38780
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Reviewed by: SJC | Project Mgr.: RFM | Plot scale: 1"=40'

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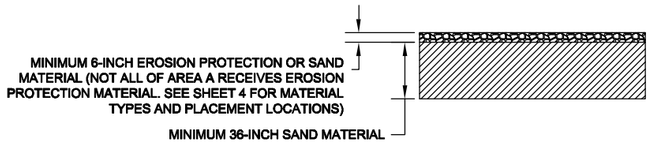
POST-CONSTRUCTION PLAN SHEET RECORD DRAWINGS

OLYMPIC VIEW RESOURCE AREA REMOVAL ACTION

EXCAVATION, BACKFILLING, AND CAPPING AREA PLAN

SHEET 2

SHEET 2 OF 4



AREA A CAP DETAIL (TYP.) 1 (2 | 3)
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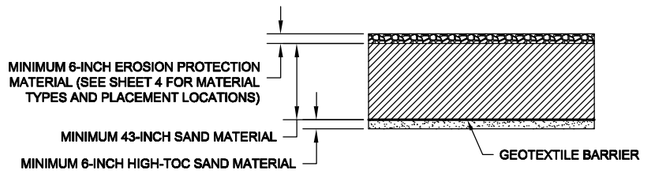
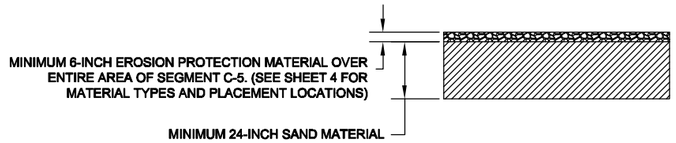


AREA B AND AREA D CAP DETAIL (TYP.) 2 (2 | 3)
NOT TO SCALE

AREA C BACKFILL DETAIL (TYP.) (EXCLUDING SEGMENTS C-5 AND C-6) 3 (2 | 3)
NOT TO SCALE

NOTE: APPROXIMATE EXCAVATED THICKNESS IS INDICATED BY THICKNESS OF SAND BACKFILL OR CAP MATERIAL IN EACH SECTION DETAIL.



SEGMENT C-5 SUPPLEMENTAL CAP DETAIL (TYP.) 4 (2 | 3)
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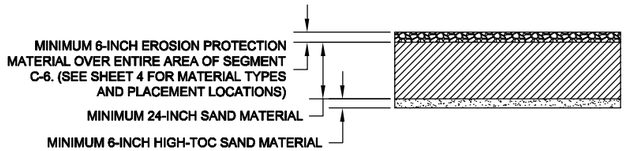

SEGMENT C-6 SUPPLEMENTAL BACKFILLING AND EROSION PROTECTION ROCK PLACEMENT DETAIL (TYP.) 5 (2 | 3)
NOT TO SCALE

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No.	Revision	Date	By
REV-1		3/20/03	CAS

ENVIRONMENTAL SERVICES-SCIENCE AND ENGINEERING DIVISION MANAGER

File names: TS1400S8_REV-1.DWG
Plot date: 3/20/2003
Plot scale: N/A

Designed by: SJG
Drn by: CAS | Ckd by: GTB
Reviewed by: SJC
Project Mgr.: RFM

CITY OF TACOMA
DEPARTMENT OF PUBLIC WORKS

HART CROWSER
PENTEC ENVIRONMENTAL
1910 FAIRVIEW AVENUE EAST
SEATTLE, WASHINGTON 98102-3699

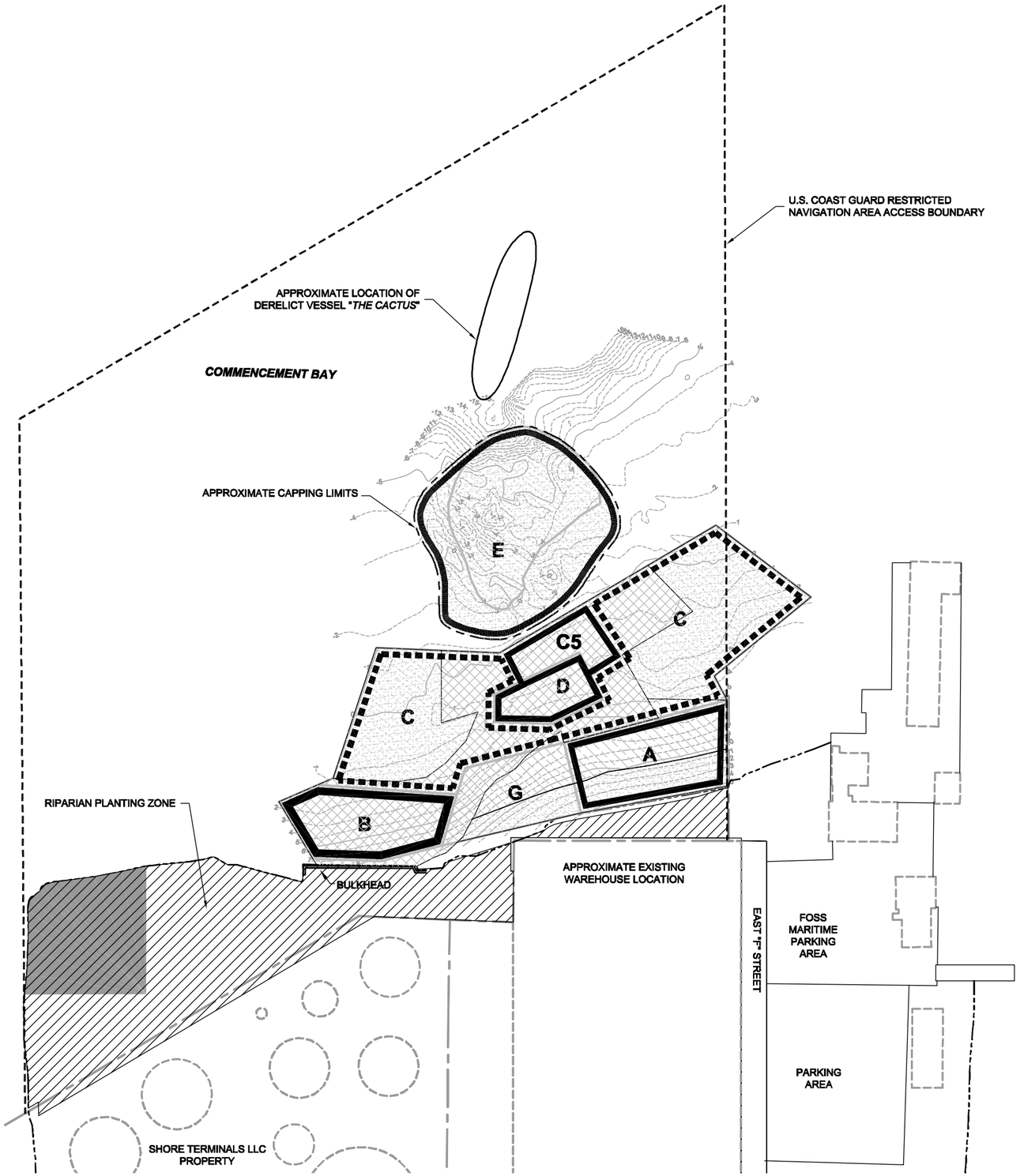
POST-CONSTRUCTION PLAN SHEET RECORD DRAWINGS

OLYMPIC VIEW RESOURCE AREA
REMOVAL ACTION

CONSTRUCTION DETAILS

SARA J CARROLL
STATE OF WASHINGTON
38780
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES 10/20/2003

SHEET
3
SHEET 3 OF 4



LEGEND:

-10- POST-CONSTRUCTION ELEVATION CONTOUR IN FEET (CORPS DATUM)

RIPARIAN PLANTING ZONE

BACKFILLED AREA

CAPPED AREA

MATERIAL TYPES AND LOCATION

UPPER BEACH EROSION PROTECTION-EROSION PROTECTION MATERIAL B PLACED OVER SAND MATERIAL

LOWER BEACH EROSION PROTECTION-EROSION PROTECTION MATERIAL A PLACED OVER SAND MATERIAL

SAND MATERIAL

UPLAND SOIL SANDBLAST GRIT EXCAVATION AREA

NOTES:

1) THE SITE AREA BOUNDARIES SHOWN HEREON ARE BASED ON THE SITE AREA CONTROL POINTS PRESENTED ON SHEET 3 OF 9 OF THE "OLYMPIC VIEW RESOURCE AREA REMOVAL ACTION - FINAL DESIGN SUBMITTAL" DRAWINGS DATED JANUARY 17, 2002.

2) THE POST-CONSTRUCTION CAP AREAS ARE IN GENERAL CONFORMANCE WITH THE SITE AREA BOUNDARIES SHOWN ON THE FINAL DESIGN SUBMITTAL DRAWINGS (SEE NOTE 1).

3) THE TOTAL AREA OF CAP IS 1.18 ACRES. SEE TABLE BELOW.

4) THE TOTAL AREA OF BACKFILL IS 1.08 ACRES. SEE TABLE BELOW.

CAP ACREAGE	
AREA A	0.29
AREA B	0.24
AREA C-5	0.07
AREA D	0.19
AREA E	0.39
BACKFILL ACREAGE	
AREAS C-1, C-2, C-3, C-4, AND C-6	0.57
AREAS C-7, C-8, C-9, AND C-10	0.51

5) SOIL CONFIRMATION SAMPLES WERE COLLECTED FROM THE UPLAND SAND BLAST GRIT EXCAVATION AREA FOR LABORATORY CHEMICAL TESTING.

6) FOR THE PURPOSES OF WORK COMPLETED, AREA C SEGMENTS ARE CONSIDERED TO BE BACKFILLED WITH SAND MATERIAL, WITH EXCEPTION OF SEGMENT C-5, WHICH WAS CAPPED. SEGMENT C-6 ALSO RECEIVED ADDITIONAL SAND MATERIAL, BUT SUBSEQUENT RESULTS OF CONFIRMATION SAMPLES COLLECTED PRIOR TO CAPPING INDICATED DIOXIN CONCENTRATIONS NEAR THE SITE CLEANUP LEVEL. THEREFORE, ADDITIONAL SAND MATERIAL PLACED OVER SEGMENT C-6 IS CONSIDERED TO BE BACKFILL, RATHER THAN A CAP.

DATUM:

HORIZONTAL DATUM IS WASHINGTON STATE PLANE, SOUTH ZONE, NAD 83.

PROJECT TRUE N

0 60 120 240

SCALE IN FEET

SARA J. CARROLL STATE OF WASHINGTON 38780 REGISTERED PROFESSIONAL ENGINEER

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No.	Revision	Date	By
REV-1		3/20/03	CAS

ENVIRONMENTAL SERVICES-SCIENCE AND ENGINEERING DIVISION MANAGER

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File name: P:\400093_REV-1.DWG
Plot date: 3/20/2003
Plot scale: 1"=60'

CITY OF TACOMA
DEPARTMENT OF PUBLIC WORKS

HART CROWSER
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1910 FAIRVIEW AVENUE EAST
SEATTLE, WASHINGTON 98102-3699

POST-CONSTRUCTION PLAN SHEET RECORD DRAWINGS

OLYMPIC VIEW RESOURCE AREA
REMOVAL ACTION

SURFACE MATERIAL PLAN

SHEET
4
SHEET 4 OF 4

APPENDIX B
CONTRACTOR PAYMENTS AND BILLINGS

APPENDIX C
TABULATED SURVEY DATA
KEGEL ENGINEERING

APPENDIX D
WATER QUALITY MONITORING RESULTS

APPENDIX D
WATER QUALITY MONITORING RESULTS
OLYMPIC VIEW RESOURCE AREA (OVRA)
REMOVAL ACTION COMPLETION REPORT
CONTAMINATED SEDIMENT NON-TIME-CRITICAL REMOVAL ACTION
TACOMA, WASHINGTON

This appendix presents the results of water quality monitoring conducted during the OVRA Removal Action. The purpose of water quality monitoring was to assess potential water quality impacts from sediment removal and other construction activities during the OVRA Removal Action. Construction activities took place between May and October 2002 and included intertidal sediment excavation and capping/backfilling in Areas A through D, and subtidal capping in Area E. Area-specific activities are described in the text of the OVRA Removal Action Completion Report (RACR).

The objectives of water quality monitoring were as follows:

- Establish ambient background water quality before and during construction;
- Ensure dissolved oxygen remains above the minimum threshold limit;
- Ensure turbidity remains below the maximum threshold limit;
- Allow for appropriate adjustment of construction activities in a manner that ensures protection of the environment; and
- Document the results of the water quality performance monitoring.

All monitoring was performed in accordance with requirements of the Clean Water Act and Section 401 Water Quality Certification (WQC). EPA approved the WQC on the March 4, 2002. Monitoring objectives, methods, monitoring parameters, and contingency mitigation measures were described for the OVRA project in the Water Quality Monitoring Plan (WQMP) provided with the Final (100 Percent) Design Documents (December 10, 2001, amended January 31, 2002).

A summary and discussion of the water quality monitoring methods and results during the OVRA Removal Action are presented below.

Monitoring Methods

Monitoring during OVRA construction activities was completed between June 10 and October 2, 2002, during daily events. Monitoring locations and rationale, readings, sampling times, tidal information, and equipment used were documented daily in monitoring logs.

For intertidal areas, water quality monitoring was conducted at target up-current and down-current locations on the periphery of the intertidal construction area, as shown on Figure D-1. Each monitoring location was typically within about 10 feet of the outside of a fish exclusion barrier installed around the site work areas. In addition, monitoring at a point of compliance located 300 feet down-current of the construction area was planned if potential water quality concerns were identified at the construction perimeter locations. No potential water quality impacts were noted, and no point-of-compliance monitoring was conducted.

During capping of subtidal Area E, up-current and down-current monitoring locations were selected based on wind and current flow patterns. These patterns generally resulted in up-current monitoring locations along the eastern periphery of Area E, and down-current locations within about 50 feet of the western periphery of the area. Wind and current changes reversed this pattern on several occasions.

During each monitoring event, daily readings were obtained to capture tidal conditions representing the most sensitive cases for detecting potential turbidity associated with construction activities. Up-current locations were monitored to provide reference readings to document ambient background conditions, while the down-current locations provided a basis for evaluating potential turbidity plumes emanating from construction areas. To capture conditions for the expected "most sensitive case," up-current and down-current readings from the intertidal area were obtained during:

- Late ebb tide (within 1 hour of the lowest daily tide) where the water depth was approximately 1 foot deep; and/or

- Early flood tide (2 to 4 hours after the lowest daily tide) where the water depth was approximately 3 feet deep.

On several dates the intertidal sampling points were adjusted along the barrier to access water of suitable depth and proximity to construction areas. These locations are detailed in the daily water quality monitoring logs. Late ebb tide readings could not be obtained on many dates because of low tide conditions.

For monitoring locations associated with Area E in deeper water, monitoring was conducted near the bottom, mid-depth, and surface of the water column as practical.

Water Quality Parameters

Water quality monitoring included field measurements for pH, conductivity, turbidity, dissolved oxygen (DO), temperature, and salinity using electronic monitoring equipment. Two compliance standards applicable to Commencement Bay as Class B water under WAC 173-201A-140 (Specific Classifications – Marine Waters) were required to be met to achieve compliance as follows:

DO	>5.0 mg/L at down-current compliance location; or >0.2 mg/L decrease from up-current reference location when DO is depressed near or below 5.0 mg/L.
Turbidity	10 nephelometric turbidity units (NTUs) increase over up-current reference location when up-current level is 50 NTU or less; or 20 percent increase over up-current level when up-current level is greater than 50 NTU.

Summary of Results

Monitoring data obtained during the OVRA Removal Action were evaluated to assess the effectiveness of construction methods to prevent water quality impacts. The following ranges for the field parameters measured were obtained for up-current and down-current monitoring locations.

DO

Up-current DO readings ranged between 8.16 mg/L on August 16 to 18.64 mg/L on June 11. Down-current readings ranged from 8.13 mg/L on October 1, to 15.47 mg/L on July 12.

Turbidity

Up-current turbidity readings ranged between 5 NTUs on July 18 and September 11, to 395 NTUs on August 13. Down-current readings ranged from 2 NTUs on August 1 and September 11, to 211 NTUs on August 10.

pH

Up-current pH readings ranged between 6.09 on July 30 and August 12, to 8.53 on June 11. Down-current readings ranged from 6.19 on August 13 to 8.26 on June 10.

Conductivity

Up-current conductivity readings ranged between 16.6 milli-Siemens on July 12 and 37.6 milli-Siemens on September 12. Down-current readings range from 16.8 milli-Siemens on August 12 to 36.2 milli-Siemens on June 10.

Temperature

Up-current temperature readings ranged between 12.4 degrees Celsius on October 1 and 22.1 degrees Celsius on August 10. Down-current readings ranged from 12.7 degrees Celsius on October 1 to 22.7 degrees Celsius on August 9.

Salinity

Up-current salinity readings ranged between 0.93 parts per thousand (ppt) on July 16 and 2.36 ppt on September 12. Down-current readings ranged from 0.89 ppt on July 16 and 2.25 ppt on August 19.

Conclusions

The water quality monitoring parameters, except turbidity, did not exhibit high variability between up-current and down-current monitoring locations and remained fairly constant during the monitoring period. DO concentrations were well above the 5.0 mg/L minimum threshold and met the DO water quality standard throughout the OVRA Removal Action period. Turbidity levels at the down-current monitoring location were always lower than those at the up-current location, resulting in compliance with water quality standards. This is likely attributable to the influence of the nearby Puyallup River, and other ambient sources of turbidity. Tidal currents often transported visibly turbid water toward the peninsula where the OVRA site is located. The fish exclusion barrier acted as silt curtain in this regard, and excluded much of the ambient turbidity from entering the intertidal work areas. In addition, pH, conductivity, temperature, and salinity were typical of marine waters, with influence from construction activities indicated.

In conclusion, no exceedances of water quality criteria (i.e., compliance violations) were noted throughout the OVRA Removal Action during water quality monitoring. Consequently, no operational modifications and/or stoppage of construction activities occurred, which in turn led to the timely and successful completion of the project. Construction strategies for working during low tide periods and within sheet pile enclosures in the intertidal zone were effective for preventing water quality impacts.

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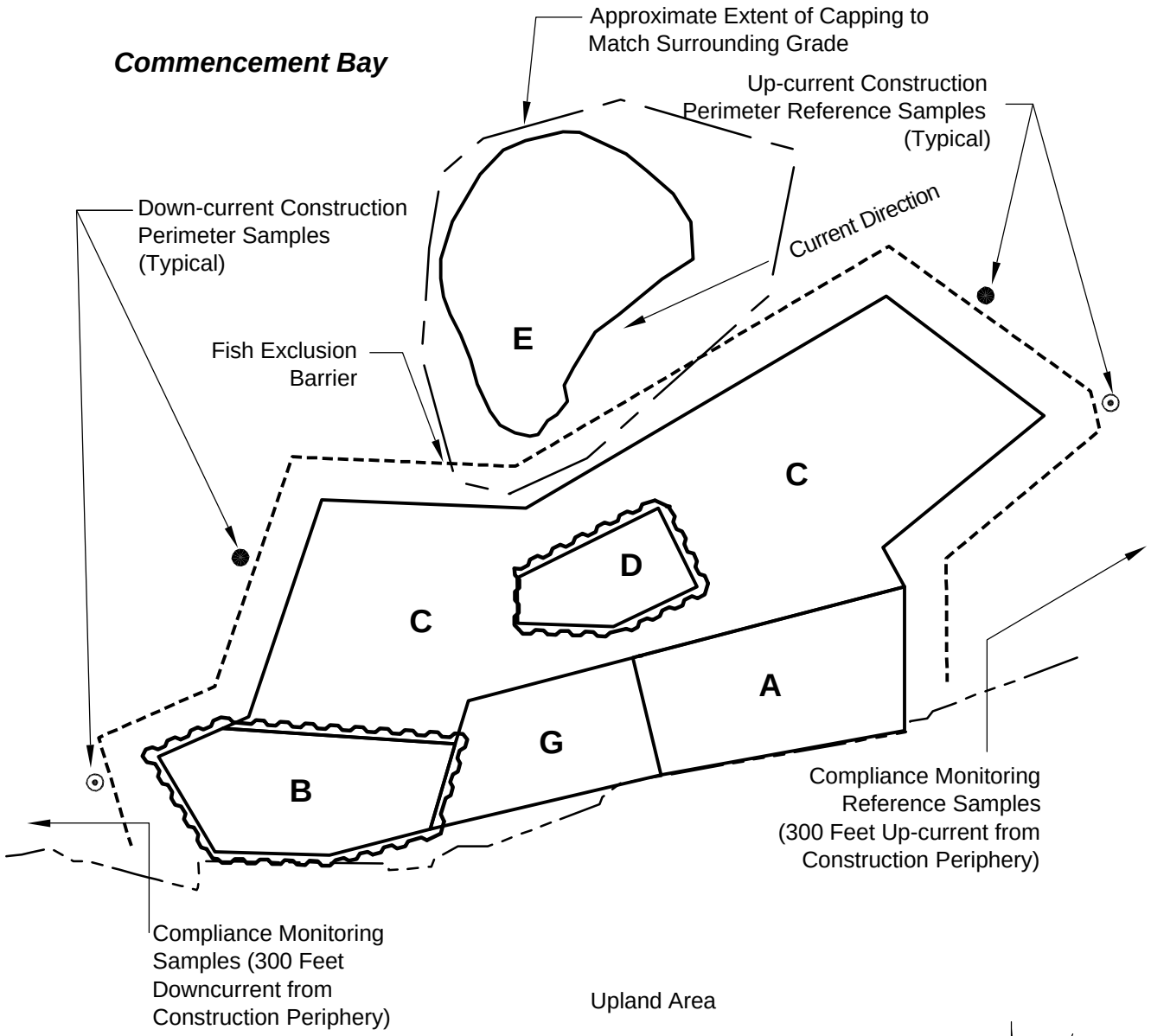
Water Quality Monitoring Location Plan



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LEGEND:

- A — Site Area Boundary and Designation
- Approximate Top of Bank Line
- Approximate Sheet Pile Location
- Typical Water Quality Sampling Location Late Ebb Tide (Within 1 Hour of Lowest Daily Tide)
- Typical Water Quality Sampling Location Early Flood Tide (2 to 4 Hours after Lowest Daily Tide)

PROJECT TRUE N

0 50 100 200

Scale in Feet

HARTCROWSER

7614 *12/02*

Figure D-1

APPENDIX E
LABORATORY ANALYTICAL AND FIELD SAMPLING DOCUMENTATION

SEDIMENT CONFIRMATION SAMPLES

IMPORT SAND MATERIAL SAMPLES

AREA A SEDIMENT STOCKPILE SAMPLES

UPLAND BLAST GRIT SOIL SAMPLES

SANITARY SEWER WATER DISPOSAL

FIELD NOTES

QA REVIEW REPORTS

CHAIN OF CUSTODY FORMS

SEDIMENT CONFIRMATION SAMPLES

IMPORT SAND MATERIAL SAMPLES

AREA A SEDIMENT STOCKPILE SAMPLES

UPLAND BLAST GRIT SOIL SAMPLES

SANITARY SEWER WATER DISPOSAL

FIELD NOTES

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CHAIN OF CUSTODY FORMS

APPENDIX F
PERMITS AND AGREEMENTS

US COAST GUARD NOTICE OF RESTRICTED NAVIGATION AREA

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES AQUATIC LANDS LEASE

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES AQUATIC RESERVE WITHDRAWAL ORDER

CITY OF TACOMA WASTEWATER DISCHARGE PERMIT

US COAST GUARD NOTICE OF RESTRICTED NAVIGATION AREA

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES
AQUATIC LANDS LEASE

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES
AQUATIC RESERVE WITHDRAWAL ORDER