Attachment B

CLEANUP ACTION PLAN
CASCADE POLE COMPANY SITE
SEDIMENTS OPERABLE UNIT

1.0 INTRODUCTION

This cleanup action plan (CAP) is provided to describe the proposed remediation for the Cascade Pole Company (CPC) Sediments Operable Unit. The Sediments Operable Unit is the marine portion of the CPC site, located on Port of Olympia property at the northern end of the peninsula that extends into Budd Inlet in Olympia, Washington.

This CAP has been prepared to satisfy the requirements of the Model Toxics Control Act (MTCA). The purposes of this CAP are to 1) describe the CPC site, including a summary of its history and extent of contamination; 2) identify the site-specific cleanup standards for the Sediments Operable Unit; 3) summarize the remedial alternatives presented in the Sediments Feasibility Studies (FS); and 4) identify and describe the selected remedial alternative for the Sediments Operable Unit.

The remedial actions selected for the Sediments Operable Unit are to occur under an Agreed Order between the Port of Olympia (Port) and the Washington State Department of Ecology (Ecology). This agreement will provide the legal framework for Sediments Operable Unit activities at the site including the scope and schedule of sediment remedial actions. Ecology believes that this project provides a public benefit by redeveloping adjacent vacant industrial land, and providing sediment remediation at the site.

2.0 SITE DESCRIPTION

The former CPC wood-treatment site is located approximately one mile north of downtown Olympia, at the northern end of the peninsula that extends into Budd Inlet (Figure 1). The Port of Olympia owns the property, adjacent parcels, and adjacent in-waterway sediments. The Sediments Operable Unit is comprised of the intertidal and subtidal sediments that lie north and east of the former wood-treatment site (see Figure 2). Figure 2 shows the relationship of the Sediments Operable unit to the upland portion of the site and other features (e.g., the East Bay Waterway), as well as the property boundaries and navigational channels in the vicinity of the Sediments Operable Unit.

Site History. During the late 1800s, the surrounding shoreline of Budd Inlet was located near the present city center. The Port peninsula and some of the City of Olympia shoreline was subsequently created by filling of intertidal and subtidal lands. Filling began in the 1920s with sediment dredged from West Bay. Several fill episodes followed this initial fill episode, beginning in the 1930s and concluding in the early 1980s. The last fill involved sediment dredged for the East Bay Marina that was placed along the eastern peninsula shoreline. The approximate fill history of the Port peninsula is shown on Figure 3. Details of the pre-1980 shorelines of the CPC site are shown on Figure 4.

Operational History. From about 1939 through 1986, the CPC Site was used for wood treating operations by various plant owner/operators, on property owned by the Port of Olympia. CPC operated the site from approximately 1957 to 1986, when active operations at the site ceased. Until the early 1960s, creosote, which is primarily composed of polycyclic aromatic hydrocarbons (PAHs), was the predominant wood preservative used in wood treating operations. At that time, although creosote was still in use, pentachlorophenol (PCP) dissolved in a carrier oil became the primary wood preservative. The PCP wood-treating solution was reportedly prepared at the site by dissolving PCP in a medium aromatic oil to form a five percent PCP solution. In addition, copper treatment using electrodes may have been utilized as a wood preservative prior to CPC operations at the site.

3.0 CHARACTERIZATION OF SITE CONTAMINATION

The Sediments RI, completed in 1993, confirmed the presence of contaminants in the Sediments Operable Unit that are associated with historical wood-treatment activities at the site. The lateral distribution of the highest levels of creosote-related contamination is primarily to the east of the former wood-treatment plant (and historical log pond), with some spreading north and northeast. The vertical distribution of the creosote-related contamination in this area is such that the highest concentrations were found in the depth intervals of 10-55 cm and 55-100 cm (0.33-1.8 feet and 1.8 to 3.3 feet) below the surface of the sediment. The vertical extent of wood treatment-related contamination generally was found to be limited by the presence of an underlying silt and clay layer.

A second, smaller area of contamination exists in the nearshore area northwest of the former wood treatment plant is PCP-related. The highest levels of PCP-related contaminants are located nearshore in the upper 10-cm of sediment. This contamination appears to be due to either overland surface runoff, or discharge from a shoreline seep or stormwater pipeline located along the northern shoreline.

The contamination in the sediment exists primarily as sorbed chemicals, with some occurrences of nonaqueous phase liquids (NAPL). The NAPL appears to be limited to an area generally northeast of the former wood treatment plant.

With two exceptions, surface water ponded on or flowing in channels in the surface of the sediment, and in the water column above the sediment, was not found to be affected by contamination from the site that exceeded regulatory criteria. These criteria include current federal and state marine acute and chronic criteria for protection of the environment (and levels that exceed the federal criteria that address human consumption of fish from the marine environment). The only exceptions to this were: 1) all site water samples (as well as those taken elsewhere in Budd Inlet as a basis of comparison to site samples) obtained during the Sediments

RI contained dioxin above the federal criteria that address human consumption of fish from the marine environment, and 2) one drainage channel, just east of the former wood treatment plant, flowing in the channel at low tide contained chemical concentrations that exceeded health-based water quality criteria for six PAHs.

Clams obtained onsite from an area of elevated sediment chemical concentrations contained levels of wood-treating chemicals significantly above concentrations reported in clam samples that were obtained from Eld Inlet (a south Puget Sound location that is removed from sources of contamination). Clams obtained elsewhere onsite, from an area with lower sediment contaminant concentrations, contained contaminant levels above those reported for the Eld Inlet sample, but significantly below those in the clams from the more contaminated site sediment.

4.0 INTERIM REMEDIAL ACTIONS

The Port of Olympia has implemented several interim remedial actions at the CPC site. These interim actions were implemented to prevent potential migration of hazardous substances into the adjacent surface water and Sediments Operable Unit. A groundwater extraction and non-aqueous phase liquid (NAPL) recovery and treatment system was installed on site in 1991-1992. This system has been operating since 1992. In early 1993, a dense non-aqueous phase liquid (DNAPL) recovery trench and an associated sheet pile cutoff wall were installed along a portion of the shoreline to eliminate the migration of DNAPL into Budd Inlet. The cutoff wall was extended to encircle the site by the installation of a bentonite slurry wall in 1996 and 1997. The bentonite slurry cutoff wall was keyed into the aquitard and encompasses the former wood treating facility and treated pole storage yards, as well as areas where NAPL has been observed or where groundwater exceeds Ecology cleanup standards.

In addition to the above interim corrective measures, the Port has taken action to better control storm water and paved a major portion of the site in the fall of 1997 and summer of 1998. Over one-third of the site has been contained with a permanent cap. The Port has also expanded the current groundwater extraction system to include six (6) new extraction wells for better hydraulic control.

Groundwater Extraction and Treatment. In late 1992, a groundwater extraction and treatment system was placed in operation in response to the discovery of light non-aqueous phase liquid (LNAPL), dense non-aqueous phase liquid (DNAPL), and impacted groundwater migrating towards Budd Inlet. The original extraction system consisted of ten extraction wells and one extraction sump located across a portion of the uplands site. Since 1992, one extraction well has been abandoned and six new groundwater-only extraction wells have been installed outside the areas of NAPL occurrence. The purpose of the extraction system was to provide groundwater gradient control in the uplands area, to recover LNAPL in the vicinity of the former wood treating plant, and to recover DNAPL from wells where recoverable quantities were present. Approximately six product pumps are rotated between the original extraction wells depending on the occurrence of product. Hand bailing of product is conducted during monthly well gauging, and results in the majority of product recovered from the well field.

Approximately 200 to 250 gallons of product are recovered per year from the extraction system and from hand bailing activities.

The groundwater and product extracted from the wells are conveyed to a treatment system located in the northwest portion of the site. The current treatment process consists of density separation of product and water, primary treatment of groundwater using a bioreactor and associated processes, and final polishing using granular activated carbon. The treatment system, registered with Olympic Air Pollution Control Authority, is monitored monthly for ambient air emissions of volatile organic compounds.

The treatment system, operating since December 1992, has processed 51 million gallons of water. During this period, the system has successfully removed approximately 2,900 pounds of PCP, 600 pounds of tetrachlorophenol (TCP), and 5,400 pounds of total PAHs. Following treatment, the effluent is discharged in accordance with NPDES permit no. WA-004053-3 to the LOTT sewage treatment plant outfall line. Although the existing treatment system has proved effective in meeting discharge permit requirements, the original extraction pumps and bioreactor require much supervision and labor for proper system operation.

Sheet Pile Wall and Product Recovery Trench. In early 1993, a steel sheet pile wall and product recovery trench were constructed along the northeastern shoreline of the site. The sheet pile wall and product recovery trench was constructed following discovery of a significant volume of dense non-aqueous phase liquid (DNAPL) that had accumulated in that area. The sheet pile wall was designed to serve two purposes: 1) to provide a physical barrier to DNAPL migration towards Budd Inlet, and 2) to minimize the amount of seawater infiltration from Budd Inlet to the groundwater and LNAPL recovery system. The trench was installed to collect DNAPL migrating toward the trench along the top of the aquitard. Groundwater and LNAPL were extracted from the trench in order to provide an area of decreased hydrostatic pressure to possibly enhance DNAPL flow towards and mounding in the trench.

The sheet pile wall and product recovery trench were constructed along a 350-foot long portion of the site that spans the mouth of the former log pond area. The sheet pile wall was installed in 24- to 30-foot lengths using a hydraulic vibratory hammer. The pile lengths were matched to the topography of the ground surface to provide two to three feet of aquitard embedment. The product recovery trench was installed approximately 15 feet upland of the sheet pile wall. The trench is approximately one foot wide and is backfilled with sand. The trench extends from a depth of approximately 5 feet below ground surface to approximately 2 feet into the aquitard. The trench slopes from the outside ends towards two sumps located near the center of the trench for groundwater and product recovery. This sheet pile wall will remain as part of the site-wide cleanup action. A Nearshore Containment wall will complement the existing sheet pile wall.

Slurry Cutoff Wall. Between December 1996 and May 1997, a slurry cutoff wall was constructed to encircle known areas of soil and groundwater contamination (see Figure 5). The bentonite slurry cutoff wall encircles the former wood treating facility and treated wood storage yards. The slurry wall ties in to the existing sheet pile wall and is keyed into the aquitard to provide a secure seal at the base. The cutoff wall is approximately 3,600 lineal feet (including the sheet pile wall) and extends from a few feet below ground surface to approximately 2 to 3 feet into the aquitard. The cutoff wall encompasses approximately 18 acres. The slurry cutoff wall is an integral part of the site-wide cleanup action and prevents migration of hazardous substances to the adjacent sediments, surface water, soil, and groundwater.

Storm Drain Remediation and Replacement. The storm drains and storm water detention basin encompassed by the western portion of the slurry cutoff wall were replaced during the slurry cutoff wall interim action. These storm water facilities were primarily replaced to eliminate the discharge of contaminated groundwater to the storm water system.

5.0 RISK ASSESSMENT

A baseline risk assessment was performed in 1992 to evaluate potential human health risks associated with current or future occupational and recreational exposures to sediment, surface water, seeps, and clam tissue. The risk assessment showed that 1) exposure to current levels of noncarcinogenic chemicals in the Sediments Operable Unit are not of concern for human health, and 2) modeled exposures to current concentrations of carcinogenic chemicals exceeded EPA risk range guidelines and MTCA cleanup levels for occupational dermal contact, recreational contact (dermal and ingestion), and recreational clam ingestion.

The risk assessment also evaluated risk to the environment, and concluded that in the nearshore area east-northeast of the former wood-treatment plant, the upper 55 cm (1.8 feet) of sediment contains wood-treating related chemicals at levels that represent potential adverse effects to the benthic environment. The conclusion was based on observed exceedances of state Sediment Management Standards (WAC 173-204) and differences in benthic abundance and diversity observed between site sediment and sediment from a relatively unaffected area of Puget Sound.

6.0 SUMMARY OF CLEANUP ALTERNATIVES

The *Sediments Operable Unit Feasibility Study Report* for the CPC Site was submitted to Ecology in October 1993. Seven alternatives were evaluated in the Feasibility Study (FS).

Alternative 1. No Action

The no action alternative involves no response to the presence of contaminants, but provides a baseline against which other remedial alternatives can be compared. The effects of natural recovery are not specifically considered in this alternative although this phenomenon will occur. Chemical monitoring of sediment, bioassays (biotoxicity tests), and benthic faunal surveys will be undertaken as part of the mandated review process. No environment or land use permits would be required under the No Action alternative.

Alternative 2. Natural Recovery with Institutional Controls

Alternative 2 consists of allowing natural recovery of sediment and establishing a sediment natural recovery zone, establishing institutional controls, and conducting compliance monitoring, and 5-year reviews. This alternative combines the effects of natural recovery of the sediment and the implementation of institutional controls, leading to a reduction in human health risk and continued reduction of adverse environmental effects. Because not all of the Sediments Operable Unit would recover to acceptable levels within a reasonable time frame (10 years), the designation of a natural recovery zone and implementation of other institutional controls alone will not satisfy the Sediment Management Standards or the threshold requirements of MTCA. Therefore, this alternative is not carried forward as part of the preferred remedial alternative for the CPC Site.

Alternative 3. Consolidation Onsite by Nearshore Containment

Alternative 3 consists of constructing a nearshore containment structure, dredging all sediment outside the containment structure that exhibit constituent concentrations above the action levels and transporting the sediment to the nearshore containment structure, dewatering the dredged sediment and treating the dewatering water (if necessary), capping the dredged sediment in the containment area (coordinated with the onshore capping remedial activities, if appropriate), backfilling/regrading the excavated (dredged) area, providing habitat mitigation, and establishing institutional controls.

The nearshore containment for the Sediments Operable Unit would consist of a granular dike as the seaward side of the confined disposal structure, and the existing shoreline as the shoreward side. The final elevation of the top of the containment structure would approximate that of the adjacent upland topography, once a cap was placed (approximately 18 ft MLLW). The dike would be constructed of sand and gravel imported to the site and could include low-permeability layers. Riprap armoring would be placed on the seaward-facing portion of the dike to protect the structure from wave erosion. For the FS, it was assumed that a horizontal migration cutoff in the form of a vertical interlocking sheet pile wall would extend through the containment dike into the underlying aquitard.

The proposed configuration of the containment structure was chosen to cover the areas of highest sediment contamination. The proposed configuration completely covers the NAPL design subarea, thus precluding the need to dredge NAPL-contaminated sediment. Approximately 21,200 CY of contaminated sediment, which is not already within the boundary of the nearshore containment structure, would be excavated or dredged by closed clamshell using both land-and barge-based dredging equipment and placed within the containment area (this quantity includes provisions for about 1.5 feet of overexcavation). Land-based excavation and dredging would require the construction of temporary access roads over the intertidal sediment. For the FS, it was assumed that dredged water sediment would be treated using biological treatment and carbon polishing prior to discharge to Budd Inlet or the LOTT treatment plant.

A multilayer cap of at least 3-4 feet in total thickness would be placed above the dredged sediment within the nearshore fill area. The surface area of the cap would be about 2.3 acres. The cap design would be an asphaltic covered layered cap. The pavement section would consist of a crushed rock layer overlain by asphalt concrete. The pavement section would need to be constructed over a stable subgrade. The surface of the dredged sediment is expected to be very soft and would require placement of a geotextile and a 2-3 feet layer of sand or sand and gravel to establish a firm, stable surface for the pavement section. The geotextile would provide subgrade reinforcement and separation of the overlying fill from the dredged sediment.

Intertidal habitat would be lost due to the construction of the nearshore containment structure. Mitigation would be required and would be accomplished by creating replacement intertidal habitat in the vicinity of the Site within Budd Inlet. Confined nearshore fill and containment that results in development of the area by filling and land extension is a site-wide alternative that is consistent with the Port Master Plan. Environmental permits would be required for the remedial activities and permitting is expected to be more difficult than for other alternatives because of the additional requirement for the creation of intertidal habitat as replacement for the loss of intertidal habitat due to filling.

Alternative 4. Containment In-Place by Capping

Alternative 4 consists of constructing a layered cap that covers all contaminated sediment with constituent concentrations that exceed action levels, constructing breakwater islands for cap wave erosion protection, establishing institutional controls, and conducting compliance monitoring and 5-year reviews. The purpose of capping at the CPC Site would be to contain the contaminated sediment and to reduce or eliminate the risk of human exposure and contact of marine organisms with the contaminated sediment.

The intertidal region that would be covered by the cap covers 5.9 acres. In the NAPL design subarea, the base of the cap would be composed of geosynthethic (or other low-permeability material). The purpose of this layer would be to provide a barrier between contaminated sediment and the subsequent capping layers, thus limiting the vertical migration of NAPL as subsequent layers are placed, and providing a physical barrier to humans or biota. A granular fill cap would be placed over the geosynthetic layer and would be extended to cover the remaining contaminated sediment with no NAPL. The conceptual design considered in the FS includes an initial layer of approximately 1-2 feet of silty sand and sand and a cap thickness on the order of 3 to 4.5 feet. The initial layer would be overlain by a geotextile and by an approximately 1 to 1.5 foot layer of armor (gravel). The top layer of the cap would consist of a finer grained sediment, such as sand or silty sand suitable for recolonization by indigenous organisms. The FS assumes a perimeter sheet pile wall. Filling by capping or construction of breakwaters could potentially raise the surface in a few areas above the intertidal zone, which will result in a loss of intertidal habitat. In these areas, design-stage modifications to the cap design may be required to maintain an elevation within the intertidal zone, or some replacement habitat may be required to compensate for this relatively small area that could be slightly above the intertidal zone.

Although capping and construction of the offshore breakwaters will alter the elevation and existing character of the existing intertidal habitat, this action also presents a unique opportunity to create an enhanced intertidal habitat. The offshore breakwaters would create an area of protected shallow water. The intertidal zone after capping would extend the full range of intertidal elevations between mean lower low water and mean higher high water. The gradation of the surficial habitat sediment as a part of the cap could be varied to provide substrate for a variety of organisms.

Sediment that is not covered by the cap would continue to recover naturally; human exposure to this sediment would be controlled by implementing institutional controls similar to those in Alternative 2. Environmental permits will be required for the remedial activities.

Alternative 5. Removal of NAPL-Contaminated Sediment and Treatment by Solvent Extraction/Containment of Remaining In-Place Sediment by Capping/Management of Solvent Extract

Alternative 5 consists of preparing an upland (onsite) temporary containment area for removed sediment, installing a solvent extraction system, excavating NAPL-contaminated sediment and transporting the sediment to the temporary containment area (onshore), backfilling the excavated (dredged) area and capping remaining in-place sediment with concentrations of the constituents of concern above action levels, dewatering the sediment and treating the water (if necessary), treating the excavated sediment in the solvent extraction system, disposing of treated sediment (use as fill during backfilling of the excavated area or capping in the intertidal zone, or as fill under an upland cap), managing concentrated solvent extraction (treatment residual), and establishing institutional controls. During and following implementation, compliance monitoring and 5-year reviews would be conducted.

In this alternative, approximately 10,500 CY of NAPL-contaminated sediment would be excavated and treated onshore by solvent extraction (this quantity includes approximately 1.5 feet of overexcavation). The sediment would be held in a temporary onshore containment area underlain by a flexible membrane liner prior to treatment. Excavation methods similar to those described in Alternative 3 would be used. One difference in the excavation between Alternatives 3 and 5 is that Alternative 5 involves excavation of NAPL-containing sediment. Steps to control NAPL redistribution by spillage or migration during dredging would include placement of absorbent booms at the water surface. Standard methods for reduction of sediment dispersion during dredging would be applied as appropriate, potentially including installation of silt curtains (or silt screens).

The treated sediment would be either returned to the intertidal area or contained within the upland site cap. Similar to Alternative 3, water produced during the dewatering of sediment or the extraction process would be treated, if needed, through biological treatment (with carbon polishing, if necessary) and discharged to Budd Inlet via an NPDES permit or to the LOTT POTW or outfall pipeline. If design-stage testing indicates that no treatment is necessary, the water could be discharged directly to Budd Inlet or the LOTT outfall pipeline.

The intertidal area from which the NAPL-contaminated sediment was removed would be completely backfilled and the remainder of the in-place contaminated sediment would be capped. The cap would cover an area of approximately 4.4 acres. A series of submerged breakwaters outside the perimeter of the cap would be constructed to protect the cap from storm waves.

The concentrated solvent extract (on the order of 5,000 gallons) would be collected and would require management. Incineration of the extract is technically feasible; however, incineration would need to be performed at high cost (due to the dioxin content)

Sediment that is not covered by the cap would continue to recover naturally; human exposure to this sediment would be controlled by implementing institutional controls similar to those in Alternative 2. Environmental permits will be required for the remedial activities.

Alternative 6. Removal of NAPL-Contaminated Sediment and Containment Onsite Upland/Containment of Remaining In-Place Sediment by Capping

Alternative 6 consists of constructing a permanent containment facility at an upland site location, installing temporary dewatering and water treatment facilities onsite, removing sediment and transporting it to the upland dewatering facility, dewatering removed sediment and treating the water (if required), capping the excavated sediment on the upland portion of the site, backfilling the excavated (dredged) intertidal area, and establishing institutional controls. During and following implementation, compliance monitoring and 5-year reviews would be conducted.

Under this alternative, approximately 10,500 CY of NAPL-contaminated sediment would be removed by land-and/or barge-based closed clamshell excavation (this quantity includes 1.5 feet of overexcavation). A permanent containment site would be identified within the upland portion of the site, which could accommodate the excavated sediment. For purposes of this FS design, it is assumed that a temporary onshore containment structure would be needed and dewatering would be accomplished by mechanical methods at a rate consistent with filling of the upland containment system.

Water produced during the dewatering of sediment or the extraction process would be treated, if needed, through biological treatment (with carbon polishing, if necessary) and discharged to Budd Inlet via an NPDES permit or to the LOTT POTW or outfall pipeline. If design-stage testing indicates that no treatment is necessary, the water could be discharged directly to Budd Inlet or the LOTT outfall pipeline.

Sediment removal would take place as described in Alternative 3. Capping and monitoring would take place as described in Alternative 5. Human exposure to sediment that is not covered by the cap, and that is being allowed to recover naturally, would be controlled by implementation of institutional controls similar to those described in Alternative 2. Environmental permits would be required for the remedial activities.

Alternative 7. Removal of All Contaminated Sediment (Exceeding the Potential Action Levels) and Containment Onsite (Upland)

Alternative 7 consists of constructing a permanent containment facility at an upland site location, installing temporary dewatering and water treatment facilities onsite, removing sediment and transporting it to the upland dewatering facility, dewatering removed sediment and treating the water (if required), capping the excavated sediment on the upland portion of the site, backfilling the excavated (dredged) intertidal area, and establishing institutional controls. During and following implementation, compliance monitoring and 5-year reviews would be conducted. This alternative is similar to Alternative 6 except that approximately 31,600 CY of sediment would be removed, representing all sediment exceeding proposed action levels identified in the FS and including 1.5 feet of overexcavation. Clean sediment would be backfilled in the dredged area. Remediating the increased volume would require a longer excavation period, larger holding and confinement areas, and more backfill material. This volume of material would be difficult to accommodate on the upland portion of the site because of the size of area required, and the logistics and potential interferences with the implementation of the onshore remedial action. Human exposure to sediment that is not covered by the cap would be controlled by implementation of institutional controls similar to those described in Alternative 2. Environmental permits will be required for those remedial activities.

7.0 CLEANUP LEVELS

The sediment cleanup levels for the Site were developed by Ecology and are based on the State of Washington Sediment Management Standards (SMS) minimum cleanup levels ($MCUL_0$) in WAC 173-204-520, a dioxin action level, and a human health action level for carcinogenic PAHs (cPAHs).

- The $MCUL_0$ represents the minimum cleanup levels for surface sediments such that the sediments are at or below levels which cause minor adverse effects in marine biological resources. The $MCUL_0$ is conservatively protective since it does not incorporate natural recovery.

- The dioxin cleanup level is a biological-based action level that was developed by Ecology based on the amount of accumulation of dioxin in fish egg tissue. Due to the lack of data regarding marine fish species, the available data on fresh water fish species from the literature were used to develop the dioxin level.

- The cPAH human health-based cleanup action level was calculated based on an excess cancer risk of approximately $1x10^{-4}$.

The sediment cleanup levels for the CPC Sediment Operable Unit developed for protection of marine biota are primarily based on Washington State Sediment Management Standards (SMS, WAC 173-204) minimum cleanup levels (MCUL $_0$) chemical criteria, except as discussed above for dioxin. The following are sediment cleanup levels based on protection of marine biota:

LPAH	780 ppm Total Organic Carbon (TOC)
Naphthalene	170 ppm TOC
Acenaphthylene	66 ppm TOC
Acenaphthene	57 ppm TOC
Fluorene	79 ppm TOC
Phenanthrene	480 ppm TOC
Anthracene	1,200 ppm TOC
2-Methylnaphthalene	64 ppm TOC
HPAH	5,300 ppm TOC
Fluoranthene	1,200 ppm TOC
Pyrene	1,400 ppm TOC
Benzo(a)anthracene	270 ppm TOC
Chrysene	460 ppm TOC
Total benzofluoranthenes	450 ppm TOC
Benzo(a)pyrene	210 ppm TOC
Indeno (1,2,3 –c,d)pyrene	88 ppm TOC
Dibenz(a,h)anthracene	33 ppm TOC
Benzo(g,h,i)perylene	78 ppm TOC
Dibenzofuran	58 ppm TOC
Pentachlorphenol	690 ppb dry weight
Dioxin	80ppt TEQ dry weight

Sediment cleanup levels were also developed for protection of human health consistent with MTCA requirements and US Environmental Protection Agency (EPA) guidance. Two organic compounds (dioxin, cPAH) were identified as constituents of concern in sediment for protection of human health. Using risk-based equations based on protecting risk from direct contact and consumption of seafood, the calculated cleanup levels are 1.4 ppt TEQ dry weight for dioxin and 300 ppb dry weight for cPAHs. However, background levels in Budd Inlet for both dioxin and cPAH exceed the risk-based cleanup levels so cleanup action levels were identified for both constituents.

The portion of the Sediments Operable Unit that is presently identified as exceeding the cleanup action level will be actively remediated (described as area within the Multiple Benefits Line in Section 8). The remaining areas of the Operable Unit will be subjected to institutional controls (to prevent sediment contact and shellfish harvesting) while natural recovery occurs until human-based cleanup levels are achieved throughout the site for both cPAH and dioxin. The dioxin action level for protection of human health will be the cleanup level previously identified for protection of marine biota (80 ppt TEQ dry weight). The cPAH cleanup action level will be 4,300 ppb (dry weight) based on $1X\ 10^{-4}$ excess cancer risk.

The range of concentrations and number of samples exceeding cleanup levels and cleanup action levels (for cPAHs only) are listed below for site contaminants.

Contaminant of Concern	Units	# of samples	Cleanup Level	Minimum Concentration	Maximum Concentration	# exceeding Cleanup Level
LPAH	Ppm TOC	117	780	6.7	40,000	14
Naphthalene	Ppm TOC	117	170	1.1 U	12,000	15
Acenaphthylene	Ppm TOC	117	66	0.7 U	300	1
Acenaphthene	Ppm TOC	117	57	0.85 U	7400	24
Fluorene	Ppm TOC	117	79	0.7 U	7000	15
Phenanthrene	Ppm TOC	117	480	0.9	12000	9
Anthracene	Ppm TOC	117	1200	0.8	5100	2
2-Methylnaphthalene	Ppm TOC	117	64	0.8	2700	8
HPAH	Ppm TOC	117	5300	7	20000	3
Fluoranthene	Ppm TOC	117	1200	0.9	8300	5
Pyrene	Ppm TOC	117	1400	0.8	5500	3
Benzo(a)anthracene	Ppm TOC	117	270	0.7 U	2400	5
Chrysene	Ppm TOC	117	460	0.7 U	1600	3
Total Benzofluoranthenes	Ppm TOC	117	450	1.4	1700	2
Benzo(a)pyrene	Ppm TOC	117	210	0.7 U	780	2
Indeno(1,2,3-c,d)pyrene	Ppm TOC	117	88	0.7 U	280	2
Dibenz(a,h)anthracene	Ppm TOC	117	33	0.85 U	79	1
Benzo(g,h,i)perylene	Ppm TOC	117	78	0.7 U	280	3
Dibenzofuran	Ppm TOC	117	58	0.7 U	2100	16
Pentachlorophenol	Ppb dw	117	690	1.0 U	240	0
Dioxin	ppt TEQ	28	80	5	1290	13
Total cPAHs (action level)	Ppb dw	117	4300	170	300,000	29

8.0 PREFERRED CLEANUP ALTERNATIVE

The preferred alternative is a combination of the specific remedial elements described in the alternatives summarized in Section 6 and was assembled to meet the cleanup levels presented in Section 7. Ecology has selected this alternative, identified as Alternative 8, which provides additional remedial requirements than those evaluated during the feasibility study. Alternative 8 provides for a sediments cleanup protective of human health and the environment, and is the most cost-effective in the short-term and the long-term. Cleanup components include:

1) Source removal by excavation or dredging of contaminated marine sediments
2) Construction of upland containment cell for dredged contaminated sediments
3) Containment of nearshore contaminated sediments with a sheet pile barrier wall tied to the existing slurry cutoff wall
4) Compliance monitoring
5) Institutional Controls

Marine Sediments Dredging. Contaminated sediments in the intertidal and subtidal areas of the Sediment Operable Unit will be excavated or dredged, and material replaced with clean sediments. The area and depth to be dredged was developed based on the extent of NAPL-impacted sediment combined with sediment that exceeds sediment ecological and human health criteria identified in the *Sediment Feasibility Study Report* (Landau 1993) or specified by Ecology, as described in Section 7.0 above. The area encompassed by the outward extent of these overlapping criteria is referred to by Ecology as the site multiple benefits line (MBL) action area (see Figure 6).

Planned dredge depths range from 1 feet to 5 feet below the existing sediment surface. It is anticipated that higher surface elevations (+2 feet MLLW) will be dredged and backfilled using terrestrial construction equipment such as excavators, front-end loaders and dump trucks. It is anticipated that mechanical marine dredging using a clamshell bucket will be used for dredging below elevation +2 feet MLLW. The estimated neat volume of sediment to be dredged is 32,000 CY.

Environmental controls during dredging will include a Gunderboom©, oil skimmers, and oil absorbent materials (e.g., pads). A Gunderboom© will be used to contain dredging-generated turbidity and floating NAPL during marine dredging. It is assumed that a Gunderboom© with a 25 feet silt curtain will be used. In addition, at least two oil skimmers will be operated during marine dredging in the NAPL area to minimize the recontamination of clean surfaces by contact with floating NAPL released during dredging. Oil absorbent booms, used in conjunction with oil absorbent pads, will be used around the perimeter of the land-based intertidal dredging area.

Excavation methods and environmental controls were evaluated during a pilot dredging study at the site in 1998 (Landau and Hartman, 1999). The project proposed above, reflect methods and controls that were successful at the site during the pilot study.

Sediment Containment Cell. Excavated and dredged NAPL-impacted sediments will be placed in an upland containment cell. The upland containment cell, constructed on top of the uplands Hot Spot, will consist of an earth berm constructed with material currently stockpiled on the site (see Figure 6). The cell will be designed with a 57,700 cubic yard capacity, which includes the following volume components: 32,000 CY (neat volume) dredged sediments, 3,000 CY sediments for 20% NAPL area contingency, 2,500 CY sediments for sideslopes, 11,000 CY sediments for limitations of construction methods, 2,000 CY nearshore sediments, 2,000 CY shoreline debris, 1,000 CY shoreline dredging, 1,000 CY for intertidal haul road surface cleanup, and 3,200 CY for material bulking (10%). The sediment containment cell will be constructed with a 15 –foot crest width, an interior drainage system, an access ramp at the west end of the cell, and erosion control blanket on the top and exterior slopes of the berm. The design criteria and engineering basis will be detailed in the *Sediment Containment Cell Engineering Design Report.* To avoid loss of storage that would result from use of clean fill to construct internal haul roads inside the containment cell, internal haul roads will be constructed of dredged sediments stabilized with cement kiln dust or a similar stabilizing agent. A final low permeability cap, after a period of settlement, will be placed on top of the entire cell including berm material to prevent any potential contact with contaminated soil or sediment.

Nearshore Containment. Contaminated fill and sediments extend to the existing sheet pile cutoff wall and residual NAPL have been identified above the aquitard between the wall and the shoreline. Due to stability issues associated with deep excavation in front of the existing sheet pile cutoff wall, nearshore containment rather than removal is proposed for this area. The location of the nearshore containment area is provided on Figure 6. The alignment of the containment wall may be increased after completion of a pre-remedial design investigation. Containment of nearshore contaminated sediments will be accomplished with a sheet pile barrier wall tied to the existing slurry cutoff wall, a flexible membrane low permeability cap with a soil cover, a reconstructed shoreline slope with rip rap slope protection, and a groundwater extraction system to maintain hydraulic control. The groundwater extraction system will be constructed so that it can be adapted for NAPL recovery in addition to maintaining hydraulic control. The final groundwater extraction system for the Nearshore Containment Area will be designed to be consistent with the final remedy for the uplands. The sheet piles, constructed of either hot-or cold-rolled steel, or aluminum with passive cathodic protection will extend from an elevation of about + 16 feet mean low low water (MLLW) to an embedment depth of a maximum of 10 feet into the aquitard. Dredged excavations in front of the wall will be backfilled using an appropriate granular material. The fill will extend up to the top of the wall and include a 3-foot thick, rip rap blanket for shoreline erosion protection. To limit surface water infiltration, the backfill behind the wall will be capped with a minimum 40-mil, low density polyethylene flexible membrane liner (FML). A clean soil cover will be placed over the FML to protect the FML and provide sufficient soil to promote surface vegetation.

Compliance Monitoring. Compliance monitoring will be performed in accordance with WAC 173-340-410 and will include protection, performance, and confirmational monitoring. The three types of compliance monitoring to be conducted include the following:

- **Protection Monitoring** to confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of the cleanup action.

- **Performance Monitoring** to confirm that the cleanup action has attained cleanup standards and other performance standards.

- **Confirmational Monitoring** to confirm the long-term effectiveness of the cleanup action once cleanup actions and other performance standards have been attained.

A compliance monitoring plan describing the scope and schedule for compliance monitoring activities will be prepared by the Port and submitted to Ecology for review and approval in conjunction with the sediment dredging design documents.

Institutional Controls. The site has posted signs and will remain fenced, with restricted access until completion of the cleanup. The Port will restrict property use from interfering with the cleanup action (e.g., maintain the nearshore containment wall, maintain the sediment containment cell). Site use will be restricted (e.g., no access and no harvesting of shellfish) until constituents of concern in sediments are at concentrations that will not pose an adverse risk to humans.

9.0 JUSTIFICATION FOR THE SELECTED CLEANUP ACTION

The cleanup action, as proposed, is designed to accomplish the following requirements: protect human health and the environment, comply with the cleanup standards per WAC 173-340-700, comply with applicable state and federal laws per WAC 173-340-710, provide compliance monitoring per WAC 173-340-360 (2), (3), (4), (5), (7), and (8); provide a reasonable restoration time frame per WAC 173-340-360 (6) and consider public concerns per WAC 173-340-600. The following sections discusses how the proposed cleanup action will meet these requirements

Protection of Human Health and the Environment.

Removal of contaminated sediments that can be practicably removed without undermining adjacent structures (e.g., existing sheetpile wall) will effectively remove the source of sediment contamination. Containment of the contaminated sediments within an upland engineered containment cell, a second sheet pile wall, a slurry wall, and a hydraulic gradient control system will prevent migration of wood treatment -related hazardous substances from migrating into adjacent sediments and surface water. The combination of removal and dredging will greatly reduce direct human and environmental exposure to hazardous substances.

Comply with Cleanup Standards per WAC 173-340-700 through 760.

Sediment cleanup levels or cleanup action levels (for cPAH and dioxin) will be met throughout the Sediment Operable Unit except for sediments within the nearshore containment wall. Confirmational monitoring will be conducted to confirm and ensure that cleanup actions have attained cleanup standards and performance standards.

Comply with Applicable State and Federal Laws per WAC 173-340-710.

Ecology's selected alternative meets all state and federal laws. All activities carried out to implement the preferred alternative will meet any laws requiring or authorizing local government permits or approval for the remedial action on the site.

Provide Compliance Monitoring per WAC 173-340-410.

The preferred alternative provides for long-term monitoring to ensure that removal and containment of contaminated sediment results in attainment of cleanup standards. During the remedial action, performance monitoring will be conducted to confirm that cleanup actions have attained cleanup standards or action levels. After remedial actions, confirmational monitoring will be conducted to confirm and ensure that cleanup actions have attained (or attain) cleanup standards and performance standards. Protection monitoring will be used to confirm that human health and the environment are adequately protected during construction. The specifics and details of these monitoring activities, locations, number and type of analytes, frequency, duration, and contingency plans will be presented in the Compliance Monitoring Plan, to be developed in accordance with the schedule attached as Attachment C.

Use of Permanent Solutions to the Maximum Extent Practicable per WAC 173-340-360 (4), (5), (7), and (8).

In evaluating cleanup technologies for this site, Ecology did consider in situ treatment options. However, there are no known in situ treatment options effective for contaminated sediments of the nature present at the CPC site. Dredging of contaminated sediments will provide for permanent removal. Containment is still the most practicable technology for contaminated sediments. The dredged contaminated sediments will be contained in an engineered containment cell on the adjacent upland portion of the site or behind a sheetpile wall. Ecology has determined that the remedial alternative selected will provide acceptable overall protectiveness (long and short term) of human health and the environment.

Provide for a Reasonable Restoration Time Frame per WAC 173-340-360 (6).

The alternative selected by Ecology provides for a reasonable restoration timeframe. Ecology specifically selected more protective cleanup levels (cleanup levels that do not incorporate natural recovery in 10 years) to expedite the cleanup schedule.

Consider Public Concerns per WAC 173-340-600.

The public is given the opportunity to comment during a 30-day public comment period. Ecology will consider all comments received. At the end of the comment period, Ecology will prepare a responsiveness summary listing each comment received and Ecology's response to the comment.

10.0 SCHEDULE FOR IMPLEMENTATION

Cleanup will be implemented in accordance with the schedule identified as Attachment C.

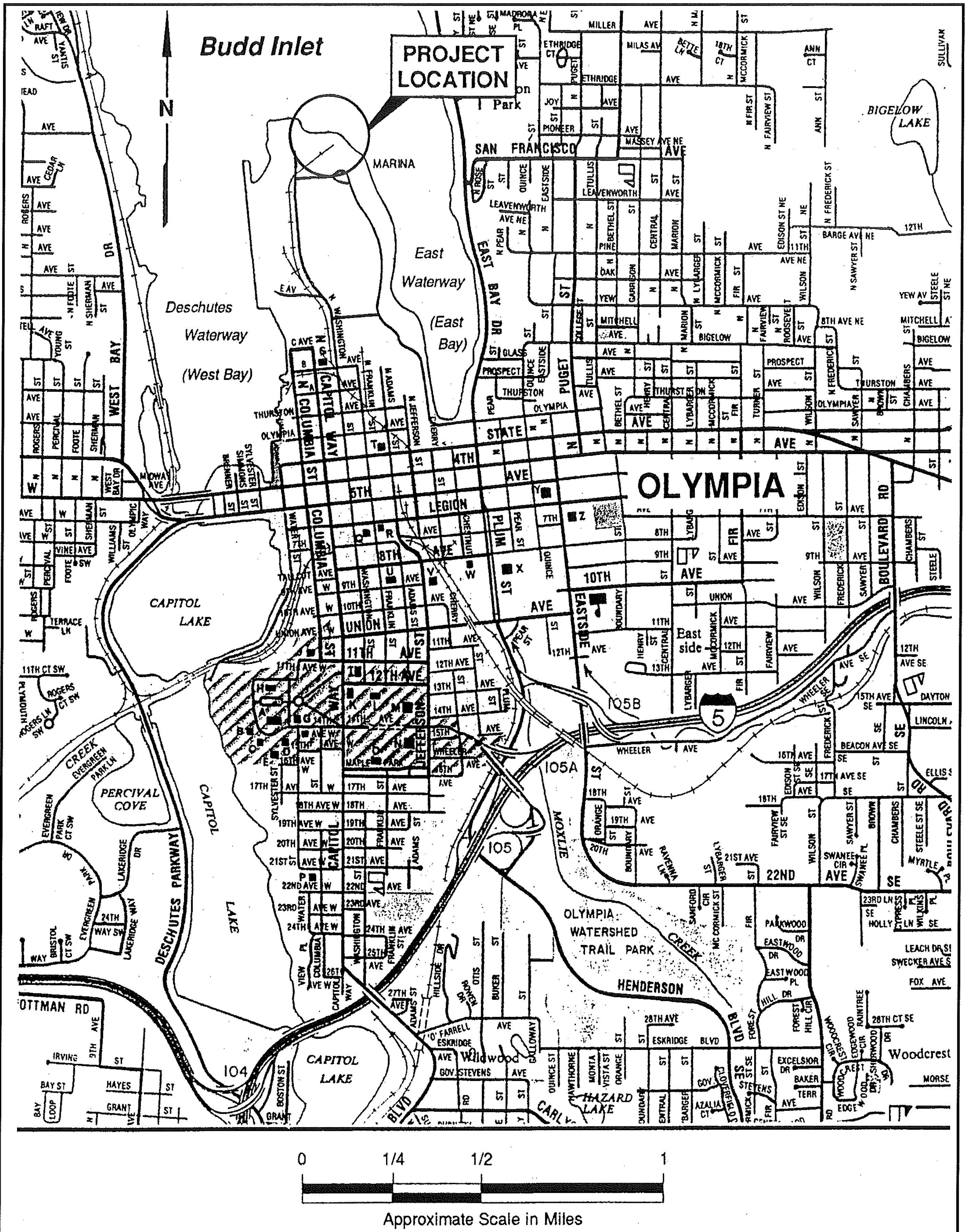
11.0 REFERENCES

Landau Associates and Hartman Consulting Corporation. 1999. Final Report. Pilot Dredging Project Results. Cascade Pole Site. Olympia, Washington. January 28.

Landau Associates. 1998. Alternatives Evaluation for Nearshore Containment. Cascade Pole Site. Olympia, Washignton. June 1998

Landau Associates. 1993. Feasibility Study. Sediment Operable Unit. Cascade Pole Site. Olympia, Washington. Prepared for Port of Olympia. October 1993.

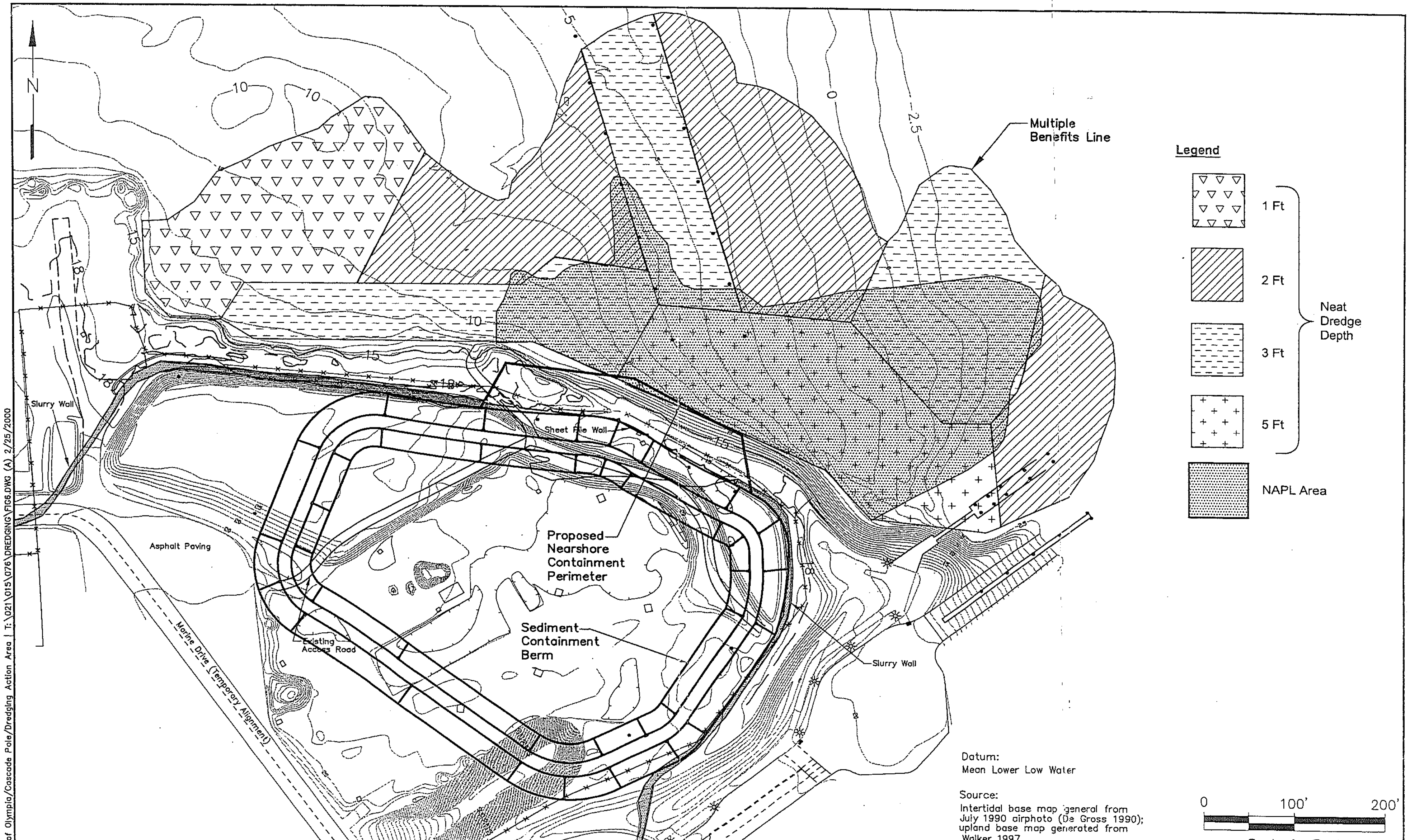
Landau Associates. 1993. Remedial Investigation Report. Sediment Operable Unit. Cascade Pole Site. Olympia, Washington. Prepared for Port of Olympia. January 1993.



Vicinity Map

Figure 1

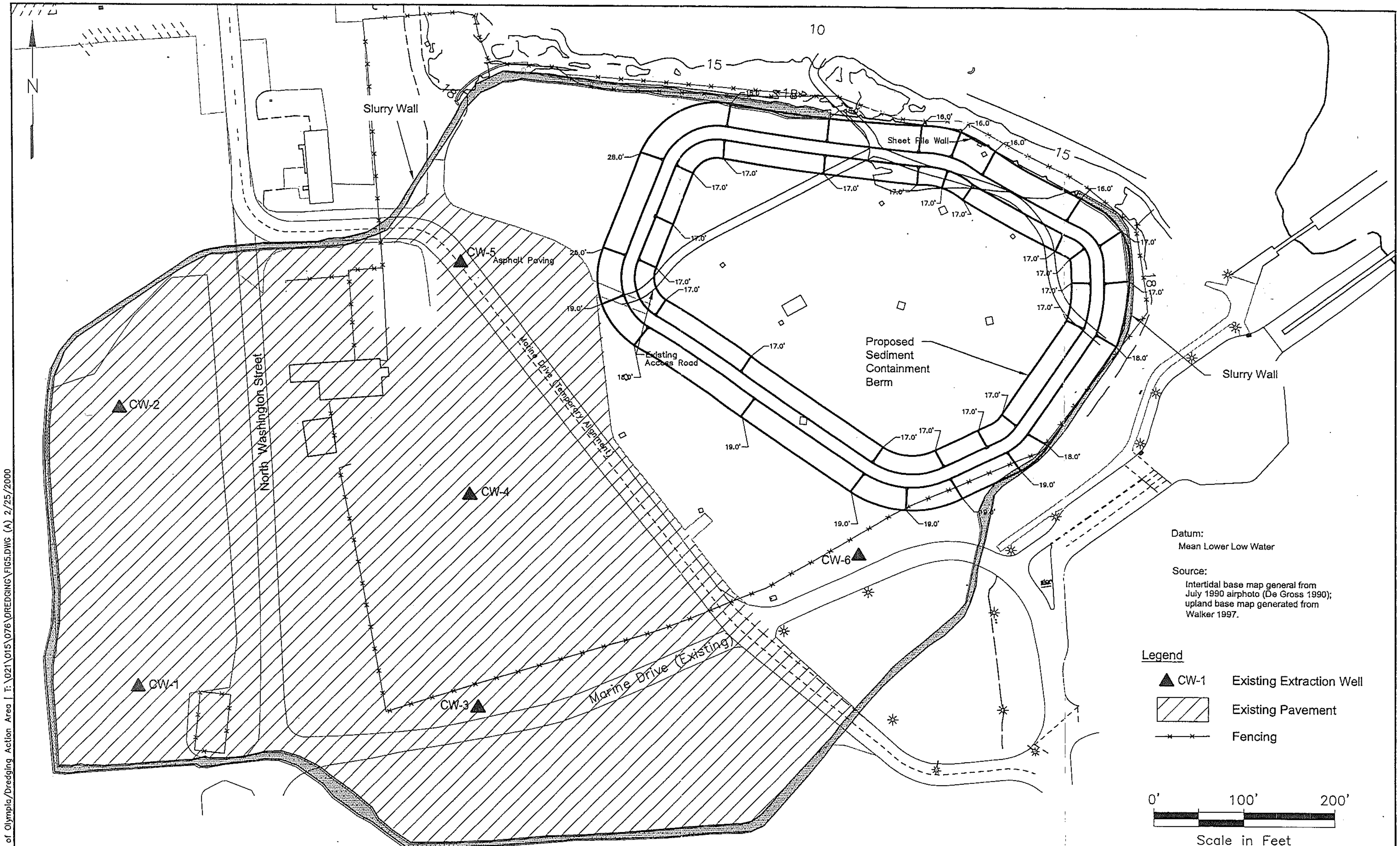
Port of Olympia/CPC Site | T:\021\015\076\DREDGING\FIG1.DWG (A) 2/25/2000



Sediment Multiple Benefit Action Area

Figure 6

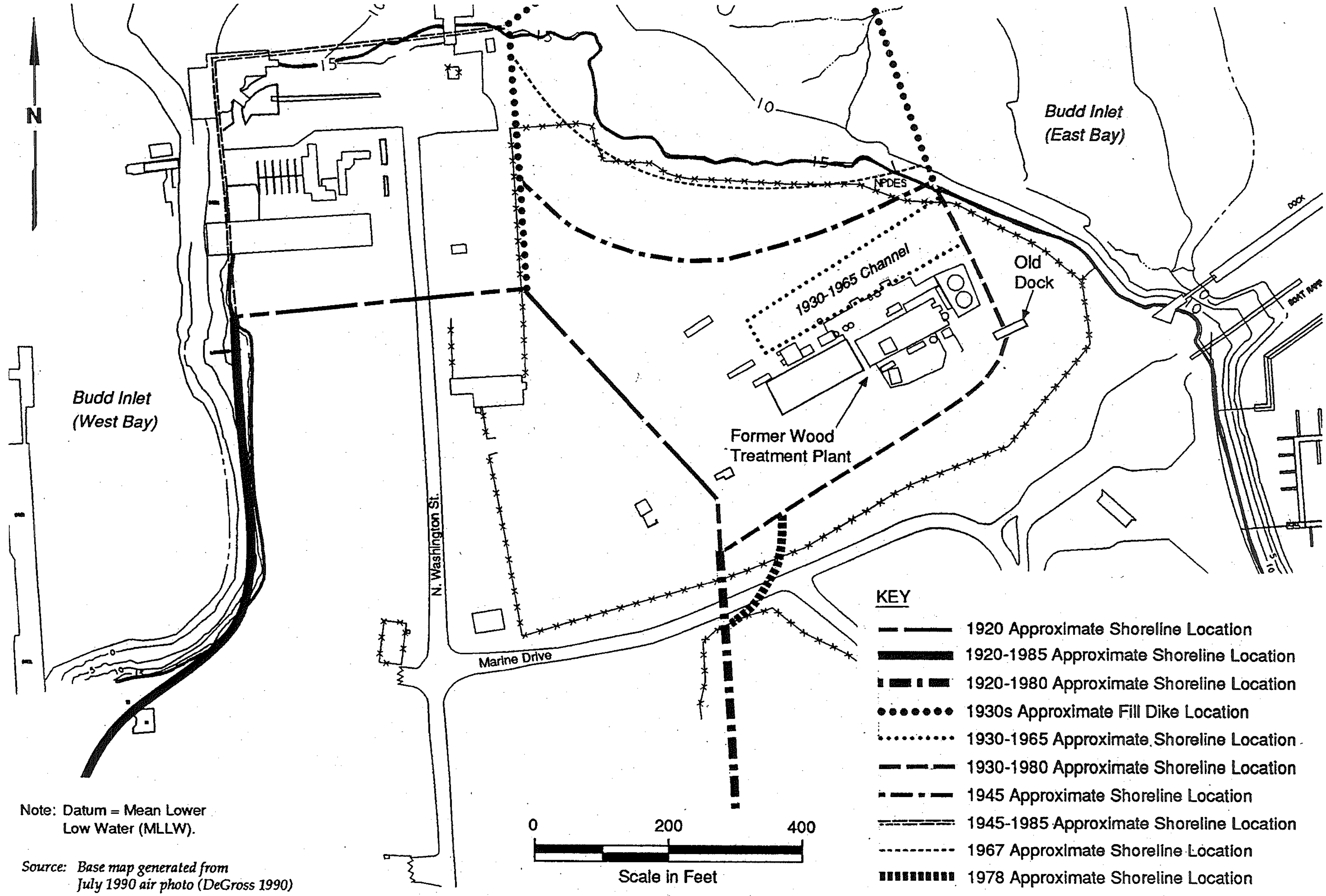
Port of Olympia/Cascade Pole/Dredging Action Area | T:\021\015\076\DREDGING\FIG6.DWG (A) 2/25/2000



Slurry Wall Alignment and Selected Interim Action Features

Figure 5

Port of Olympia/CPC Site/ | T:\021\015\076\FIG4.DWG (A) 2/25/2000



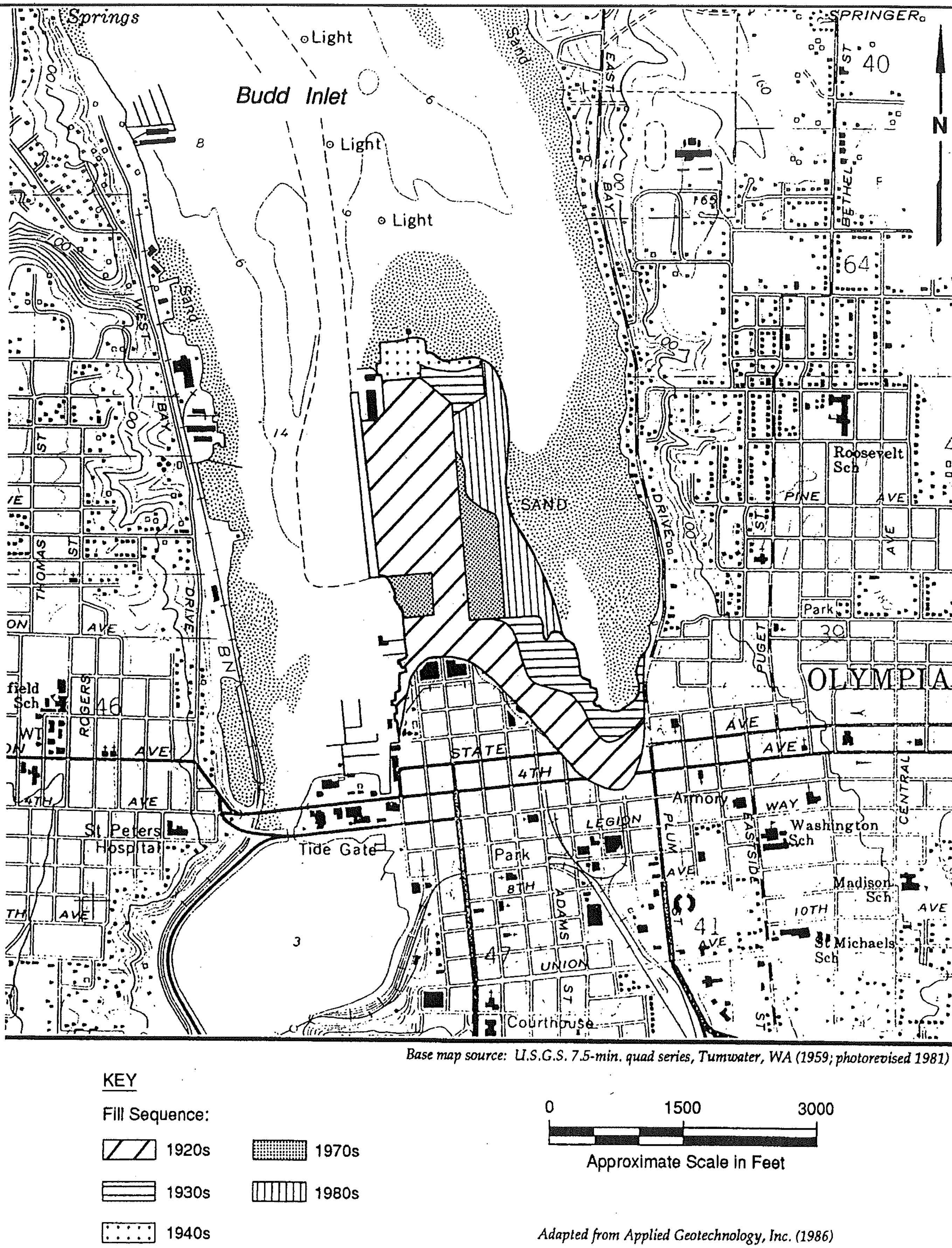
Note: Datum = Mean Lower Low Water (MLLW).

Source: Base map generated from July 1990 air photo (DeGross 1990)

Adapted from Applied Geotechnology, Inc. (1986)

Historical Shorelines

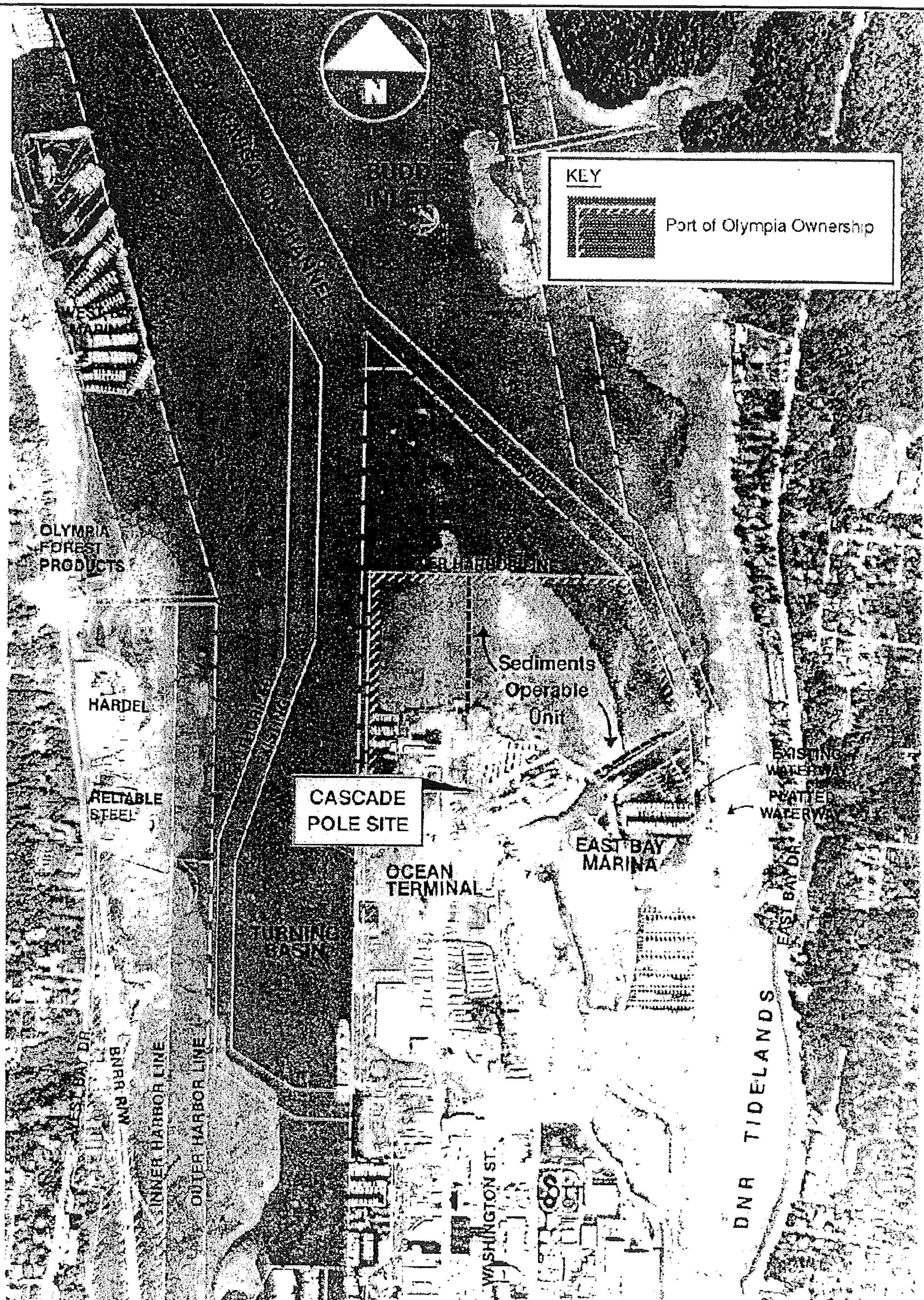
Figure 4



Port Peninsula Fill History

Figure 3

Port of Olympia/CPC Site | T:\021\015\076\DREDGING\FIG3.DWG (A) 2/25/2000



Sediments Operable Unit in Relation to Port of Olympia Ownership and Federal Harbor Lines

Figure 2

Port of Olympia/CPC Site | T:\021\015\076\DREDGING\FIG2.DWG (A) 2/25/2000