July 18, 2006 DRAFT
Sediment Management Standards Interim Remedial Action Plan: Port Gamble Bay

1.0 INTRODUCTION AND SUMMARY

This Interim Remedial Action Plan (Interim RAP) has been prepared by the Washington State Department of Ecology (Ecology) for cleanup of contaminated sediment within a portion of the former Pope & Talbot (P&T) mill site in Port Gamble Bay (Sheet 1). The interim cleanup action is being conducted by Ecology under a cooperative partnership with the Washington State Department of Natural Resources (DNR) and P&T. Final cleanup actions at the site will be developed following completion of the interim action.

A series of detailed sediment characterization studies have been performed at the former P&T mill site to evaluate sediment conditions with respect to chemical and biological criteria as defined in the Sediment Management Standards (SMS) (Chapter 173-204 WAC). Results of initial characterization studies are discussed in Parametrix (2002a). To support continued navigation uses of this area, and in consideration of the available sediment data, in 2003 P&T implemented a maintenance dredging project that removed approximately 13,500 cubic yards (cy) of sediments over an area of approximately 1.8 acres (Sheet 2). The dredged material contained relatively high amounts of bark and wood chips, compared to other areas of the site. Sediment and wood debris removal occurred over an elevation range of approximately -2 to -15 feet mean lower low water (MLLW), and included cuts up to 12 feet thick. Because of chemical concentrations complicating beneficial reuse, material dredged in 2003 was disposed off-site.

Present-day physical, chemical, and biological analyses of sediments at the former P&T mill site are discussed in the *Existing Data Compilation Report, Former Mill Site Sediments, Port Gamble, Washington* (Anchor 2006). These data reveal that an approximate 5.6-acre zone immediately adjacent to the 2003 dredge area contains surface sediments that exceed SMS sediment quality standards (SQS) due to apparent sediment toxicity to sensitive aquatic life. Sediment toxicity at this site appears to be localized within the general footprint of the interim action area, and is partly attributed to accumulation of wood debris degradation products such as sulfide. This area will be addressed by the interim action described herein (Sheet 2). While sediments in this area exceed SQS biological (i.e., bioassay-based) criteria for the protection of marine aquatic life, these materials do not exceed State Model Toxics Control Act (MTCA; Chapter 173-340 WAC) soil cleanup levels for unrestricted upland uses, and are thus potentially suitable for beneficial reuse.

As part of the Interim RAP, approximately 12,000 cy of sediment containing wood debris, sand, and silt will be dredged from a 5.6-acre area (Sheets 2 and 3). The purpose of the interim sediment cleanup action is to remove the greatest remaining accumulations of wood debris from the marine environment and restore sediment-associated habitat functions within this portion of Port Gamble Bay.

It is anticipated that dredging would occur between October 1, 2006 and February 15, 2006, and would require approximately 6 weeks to complete. This schedule will be refined based on specific permitting requirements, procurement schedules, and contractor availability.

This Interim RAP provides Ecology's determination that the interim cleanup action is consistent with the requirements of Chapter 173-340 WAC, MTCA Rules and Chapter 173-204 WAC Sediment Management Standards. This determination was made following review of the available data for the project site, as generally summarized in the *Existing Data Compilation Report, Former Mill Site Sediments, Port Gamble, Washington* (Anchor 2006). Following this Interim RAP, Ecology and P&T will continue to evaluate environmental conditions at the site, and discuss technical issues related to determining the nature and scope of final sediment cleanup actions.

This Interim RAP is part of a larger set of documents prepared to support the project:

- The State Environmental Policy Act (SEPA) checklist and Determination of Non-Significance (DNS) prepared by Ecology (July 2006);
- Joint Aquatic Resources Permit Application Form (JARPA), Former Port Gamble Mill Site Interim Sediment Cleanup Action, prepared for Ecology by Anchor Environmental (July 2006); and
- Biological Evaluation, Former Port Gamble Mill Site Interim Sediment Cleanup Action (HUC Code: 17110019), prepared by Anchor Environmental (July 2006)

2.0 SITE DESCRIPTION

Port Gamble Bay is a marine embayment of Hood Canal with depths of up to 60 feet, approximately 2.5 miles long, and with an average range of tide of approximately 10 feet. The former P&T sawmill site (the "site") consists of upland properties previously owned by P&T and State of Washington aquatic lands within and adjacent to the site in Port Gamble.

2.1 Historical Facility Operations

The P&T operations included the former sawmill site, two chip loading facilities, a log transfer facility, and two log rafting and storage areas, including one area located approximately ½-mile south of the mill site. The site operated as a forest products manufacturing facility for a period of approximately 142 years (1853 to 1995). The site underwent several changes over that period including construction and modification of buildings, moving building locations and changes in functions of buildings and structures. During the mill-operating period, logs were rafted and stored offshore of the sawmill site. In the late 1920s, a chip barge loading facility was installed on the north

end of the site. During the mid-1970s, an additional chip barge loading facility (referred to as the alder mill) was constructed at the southeast portion of the mill site, within the general interim action area. P&T transferred ownership of the Town of Port Gamble, including the Mill Site, and the adjacent upland area to Pope Resources in 1985. P&T's mill operations ceased in 1995. The sawmill facility was dismantled and removed in 1997. The site was leased to S.V. Pullin, Inc. in 1997 for use as a log sorting and wood chipping yard. Portions of the site are currently leased to Caicos Corp. (Caicos) for log sorting and material handling.

The majority of logs processed at the mill were delivered by water via tugboats and rafts. Tugboats periodically towed rafts of logs into and out of Port Gamble Bay from other forest product facilities in the Puget Sound Region. Chip barges also operated as part of the mill operation. These barges were loaded with wood chips using over-water pneumatic conveyor systems, which in turn were loaded by front end loaders from wood chip stockpiles on uplands of the former mill site.

Logs were routinely moved into and out of the water by conveyor chains, tug boats, and cranes located on the site uplands.

2.2 Prior Sediment Cleanup Actions

P&T implemented a maintenance dredging project in 2003, under the supervision and with the approval of Ecology, and pursuant to all necessary federal, state and local permits and approvals (Sheet 2). A description of the 2003 dredging project is presented in Parametrix (2003). The dredging footprint covered 1.8 acres, and resulted in the removal of materials containing more than 50 percent wood debris by both volume and surface cover. The dredging plan generally consisted of removing wood debris down to the underlying native sediment. The 2003 dredging footprint is shown in Sheet 2.

Maintenance dredging operations occurred during July and August 2003. The dredging contractor (Caicos) used a clamshell bucket mounted on an extended reach excavator on a barge. Wood debris removal occurred over an elevation range of approximately -2 to -15 feet MLLW, and included dredge cuts up to 12 feet thick. Following completion of initial dredging operations, bathymetric surveys were performed. The post-dredge bathymetric data verified that the dredging action had substantially achieved the target dredge elevations (Parametrix 2004b).

3.0 REGULATORY AUTHORITY AND TYPE OF CLEANUP

The Sediment Management Standards were promulgated under the authority of the State Water Pollution Control Act, Chapter 90.48 RCW and the Model Toxics Control Act, Chapter 70.105D RCW, among others. Ecology may select either of these authorities under which a cleanup may be conducted, as described in WAC 173-204-550, Types of Cleanup and Authority. Ecology has selected Chapter 70.105D RCW, the Model Toxics Control Act, as the appropriate authority for interim actions at the former P&T mill site.

4.0 CLEANUP STUDY SUMMARY

Various plans and reports have been prepared to support the interim action. A list of relevant documents is provided in the bibliography at the end of this Interim RAP. This section summarizes information on the nature and extent of contamination at the site, alternatives for cleanup, and details of the interim cleanup action.

4.1 Site Investigations and Conceptual Site Model

As discussed in Anchor (2006), a series of investigations of wood debris distributions, sediment quality conditions, and physical/oceanographic characteristics have been performed in Port Gamble Bay, including:

- Supporting Documentation P&T Dredge Sediment Landfill (AGI 1990)
- Port Gamble Bay Geophysical Sediment Survey Report/Maps (Parametrix 1999)
- Preliminary Oceanographic Report (Parametrix 2000a)
- Sediment Chemistry Reconnaissance Investigation Report (Parametrix 2000b)
- Underwater Wood Debris Video Survey (Parametrix 2002a)
- Sediment Data Summary and Cleanup Study Plan (Parametrix 2002b)
- Sediment Bioassay Summary Report: Wood Debris Samples (Parametrix 2004a)
- Wood Debris Dredging Report (Parametrix 2003)
- Sediment Cleanup Action Plan (Parametrix 2004a)
- Baseline Natural Recovery Sediment Monitoring Report (Parametrix 2004b)

A conceptual site model (CSM) is a representation of the environmental system and the physical, chemical, and biological processes that determine the transport of contaminants or other substances of concern from sources to receptors. For sediment sites, perhaps even more so than for other types of sites, the CSM can be an important element for evaluating risk and risk reduction approaches. The CSM is a set of hypotheses derived from existing site data and knowledge gained from other sites, and provides a simple understanding of the site based on available data. Essential elements of a CSM generally include information about sources, transport pathways, exposure pathways, and receptors. The CSM can also be a valuable tool in evaluating the potential effectiveness of cleanup alternatives. The available site characterization data, as summarized in Anchor (2006), support the following CSM statements and/or hypotheses:

- Historical releases of wood chips and bark were the primary sources of wood debris in sediment; these sources were controlled between 1995 and 2005.
- Because of relatively low current velocities in the project area, deposition of sediments and wood debris has historically occurred within the proposed interim action area.
- While no MTCA hazardous chemicals of potential concern are present in site sediment above SQS chemical criteria, potential impacts to benthos are indicted by sediments with surface total volatile solids (TVS) or total organic carbon (TOC) levels above 25 percent or 10 percent, respectively (Kendall and Michelsen 1997).
- Based on TVS and TOC data, the primary area of potential woody debris concern is located within the 5.6-acre area depicted on Sheet 2. Woody debris accumulation in this area is variable, ranging from approximately 1 to 6 feet thick.

The thickest accumulations of woody debris currently occur near the boundary of the 2003 dredge area.

- Bioassay data collected in Port Gamble Bay suggest that surface sediments in the 5.6-acre area depicted on Sheet 2 are toxic to varying degrees in laboratory exposures. Interpretation of these data is confounded by the physical characteristics of the woody debris (e.g. different particle sizes of fibrous/flocculent materials, relative to typical sediment). However, the bioassay data suggest that porewater sulfide concentrations could potentially have been a contributing factor to bioassay test performance (Parametrix 2004a, Caldwell 2005). Sulfide is a common wood breakdown product and sediment containing wood debris is a likely source of the sulfide detected in porewater.
- Dissolved oxygen (DO) concentrations measured to date in Port Gamble Bay have been within the acceptable range defined in the State Surface Water Quality Standards for marine waters (Chapter 173-201A WAC). Ecology has rated water quality in Port Gamble Bay as part of the State of Washington's most recent Water Quality Assessment (Ecology 2005). The northern half of the bay – which includes the interim action project area – as well as the very southern area of Port Gamble Bay has been rated Category 1 for DO—meaning that "available data shows attainment of the water quality standard for the parameter for which a water body segment has been tested or studied." In the center of Port Gamble Bay, approximately 0.35 mile south of the proposed project area, waters have been rated Category 2 for DO, which means "there is some evidence of a water quality problem, but not enough to require production of a total maximum daily load at this time." The presence of relatively strong offshore currents and the formation of eddies in both the northern and southern embayments promote circulation and flushing processes in the bay, and likely contribute to maintenance of adequate bottom water DO in the interim action area.
- The 2003 maintenance dredging project successfully removed approximately 13,500 cy of woody debris sediments from the southern mill site area, removing the greatest accumulation of wood waste. However, the dredging action also appeared to have generated residuals that spread woody debris onto the surface of the dredge prism and surrounding areas. This result is typical of dredging projects, and is particularly problematic at wood waste sites, given the low-density flocculent materials characteristic of woody debris sediments.
- Natural recovery is likely slowly (approximately 10 percent per year concentration reductions) but steadily reducing surface sediment TVS concentrations, primarily due to sediment depositional and bioturbation processes. However, the natural recovery time frame to achieve SQS biological criteria within the interim action area has not been determined.

4.2 Cleanup Levels

Sediment cleanup levels were developed according to MTCA/SMS requirements. Two SMS criteria are promulgated by Ecology (WAC 173-340), the Sediment Quality Standards (SQS), which is the concentration below which effects to benthos are unlikely, and the cleanup screening levels (CSL), which is the concentration above which more than minor adverse biological effects may be expected.

Under the SMS, "wood waste" may include a wide range of natural or processed material of woody origin, ranging from lumber on or near the sediment surface, to deposits of sawdust, wood chips, or similar materials, to decomposed fibrous materials mixed with sediments. The point of compliance for sediment cleanup, including wood waste, is the biologically active zone, which is operationally defined as surface sediments collected across the 0-to-10-cm (0-to-4-inch) interval below the mudline. The 10-cm biologically active zone is also consistent with the depth of bioturbation observed during site characterization.

The need for woody debris cleanup arises under MTCA when the effects of decomposition of these materials in the aquatic environment lead to accumulation of compounds such as sulfide that build up in anaerobic sediments to levels that are toxic to benthic organisms. Since wood waste effects in surface sediments are dependant on a number of factors, such as the physical form of the wood, degree of incorporation into sediments, amount of wood waste present, amount of flushing in the area, and the type of wood from which the waste was derived, wood waste cleanup requirements are site-specific and are determined by Ecology on a case-by-case basis.

While there is no promulgated SMS criterion for wood debris in sediment, a SMS Clarification Paper published by Ecology (Kendall and Michelsen 1997) presents an approach to addressing the impacts of wood debris accumulations in sediments. Consistent with the Clarification Paper and general Ecology policy under SMS, surface sediment TOC concentration less than 10 percent (dry weight basis) and TVS levels greater than 25 percent (dry weight basis) are not likely to pose a risk to aquatic life.

Benthic Toxicity

Sediment bioassays are commonly applied as a tool to directly evaluate the potential for benthic toxicity. Under the SMS, two acute tests and one chronic test are required to characterize sediment toxicity. Bioassays must meet strict performance standards to ensure that the tests are acceptable to evaluate sediments relative to the SQS or CSL biological criteria.

The available bioassay data for Port Gamble Bay reveal that surface sediments in the interim action area are toxic to varying degrees in laboratory exposures. Confounding physical and chemical characteristics may have influenced the bioassay tests performed in Port Gamble Bay (Anchor 2006). Because of the flocculent nature of wood debris deposits, such physical effects are particularly problematic for the larval tests (*Crassostrea gigas*) used at Port Gamble, but may also have influenced the amphipod tests as well, given the documented fine-grained sediment. Nevertheless, the available bioassay results reveal locally increased sediment toxicity within the interim action area. Many of the sediment bioassays performed within the interim action area have exceeded CSL biological criteria.

4.3 Cleanup Alternatives Evaluated

A previous sediment cleanup analysis (Sediment Cleanup Action Plan (Parametrix 2004a)) describes various alternatives for cleaning up contaminated sediments at the site. A wide range of technologies was initially considered and screened for applicability using the following criteria:

- Technical effectiveness
- Implementability
- Cost-effectiveness
- Environmental impacts

Because this is a relative small site in a dynamic estuarine environment, a focused feasibility analysis was considered more appropriate than a detailed evaluation of a wide range of alternatives. Using the criteria above, a number of technologies were screened out so the more realistic alternatives could be evaluated in detail. The results of the screening, which builds on Parametrix (2004a) and incorporates more recent evaluations performed by Ecology and P&T, are briefly discussed below:

- **Natural Recovery.** Natural recovery can be an effective alternative if it is determined that natural processes will, by themselves, result in an area cleaning itself up over time. Natural processes that may result in recovery include burial with clean sediments and degradation of organic chemicals. The allowable natural recovery period under the SMS is no more than 10 years. This option may be effective within the 5.6-acre interim action area, but existing data are not sufficient to determine the restoration time frame. Ecology and P&T plan to collect additional data in late 2006 and early 2007 to more accurately characterize natural recovery processes and rates within Port Gamble Bay.

- **Dredging Technologies.** Both mechanical and hydraulic dredging were evaluated for application to the site. In Port Gamble Bay as in other areas of Puget Sound, both mechanical and hydraulic dredging can be performed cost-effectively, with manageable short-term water quality and dredge residual impacts. Both dredging technologies were retained for consideration, with the final determination of which option will be used to be made based on contractor capabilities, work plans and site factors related to upland materials handling (e.g. larger amounts of water may be entrained during hydraulic dredging, requiring a larger dewatering area and additional water management).

- **Upland Beneficial Reuse and/or Disposal.** As discussed above, while sediments in the 5.6-acre interim action area exceed SQS biological (i.e., bioassay-based) criteria for the protection of marine aquatic life, these materials do not exceed MTCA soil cleanup levels for unrestricted upland uses, and are thus potentially suitable for beneficial reuse following sparging to reduce porewater salinity. Debris can be separated from beneficial reuse material (i.e., topsoil and sand) and transported by truck to an upland landfill authorized for such purposes.

- **Capping in Place.** Capping contaminated sediments with a layer of clean sediment can be effective, provided that the cap design isolates chemicals of potential concern (e.g., sulfide) from the overlying biological environment. The cap design is engineered to provide the required isolation thickness and to remain stable against forces such as erosion. Sediments to be used as clean cap material are often obtained from navigation projects in clean areas. Caps are usually divided into two categories based on thickness. Thin caps are often 6 inches to one-foot-thick, and may be designed to accelerate natural recovery rates. Thick caps are usually three-feet-thick and provide maximum isolation of underlying contaminated sediment. If conditions permit, caps can be placed without dredging the contaminated sediment. However, in some cases it is necessary to dredge away some of the contaminated sediment before installing the cap. A separate capping alternative may be considered that includes excavating enough sediment to provide room for the cap to avoid increasing bottom elevations.

The preferred cleanup alternative selected by Ecology for the interim action is dredging. The dredging-only alternative is selected because, at this stage of the overall cleanup process, dredging is considered to provide a "presumptive remedy" and thus greater certainty of environmental protection. Monitoring will be performed during and following implementation of the interim action to ensure environmental protection and to verify performance of the dredging action. In addition, Ecology and P&T will continue to evaluate environmental conditions at the site, and discuss technical issues related to determining the nature and scope of final sediment cleanup actions.

4.4 Description of the Interim Remedial Action

The proposed project consists of dredging approximately 12,000 cy of sediment containing wood debris, sand, and silt from a 5.6-acre area (Sheet 2). Depending on preferences and capabilities of the selected contractor, dredging will either be performed mechanically using a clamshell bucket dredge operating from a barge, or hydraulically using a suction dredge. Wood debris material will be removed from depths between approximately -6 to -33 feet below MLLW, as shown in Sheets 2 and 3. Dredging at relatively shallow and deep depths (e.g., above -10 feet MLLW and below -20 feet MLLW) will typically be between 1 and 2 feet deep. Dredging at intermediate depths may include dredge cuts up to approximately 6 feet deep.

Construction Methods

Mechanically dredged material will be placed on a dewatering barge adjacent to the dredge barge located within the interim sediment cleanup action area footprint. Dredged material, including entrained water, will be transferred from the dewatering barge to an adjacent dewatering/sparging basin located in the 1- to 2-acre upland staging and handling area (Sheet 4). The upland facilities will be located on Pope Resources property immediately adjacent to the interim sediment cleanup action area (Sheet 2). Hydraulically dredged material will be suctioned up and slurried directly into a series of upland settling basins located in the upland staging and handling area (Sheet 4). Settled materials from the upland settling basins will be transferred into the adjacent dewatering/sparging basin. Decant water from the upland settling basins will be

discharged back into Port Gamble through a temporary diffuser designed to meet Washington State Surface Water Quality Standards (Chapter 173-201A WAC).

Sediments within the dewatering/sparging basin (containing wood debris, sand, and silt) that are either mechanically or hydraulically dredged will be sparged with freshwater flows of 5 to 10 gallons per minute applied via sprinklers over an approximate 6-month period. The sparging system will reduce porewater salinity to levels that will allow for upland beneficial reuse of the materials, as appropriate. Return flows from the dewatering/sparging basin will be discharged back to Port Gamble Bay through the temporary diffuser discussed above. Following sparging, sand will be separated mechanically from wood debris/silt materials. Once verification sampling confirms that the remaining dredged materials meet MTCA unrestricted use soil cleanup levels, the wood debris/silt materials will be reused as topsoil on adjacent Pope Resources forest lands. Sand materials will be temporarily stockpiled for subsequent on-site reuse. Debris will be separated from the topsoil and sand materials and transported by truck to an upland landfill authorized for such purposes by the jurisdictional health district pursuant to local and state solid waste statutes. Once all materials are separated and removed, the dewatering/sparging basin and the upland settling basins will be removed from the upland staging and handling area.

Timing
It is anticipated that dredging would occur between October 1, 2006 and February 15, 2007 and would require approximately 6 weeks to complete.

Conservation Measures
To minimize impacts to water quality, all dredge materials will be handled and processed such that they do not re-enter surface waters of the state. Further best management practices (BMPs) will be used to avoid, minimize, or mitigate any detrimental impacts from the dredging. These BMPs include the following measures:

- Adherence to Ecology water quality restrictions (Chapter 173-201A WAC) that specify a mixing zone beyond which water quality standards cannot be exceeded; compliance with Ecology's standards is intended to ensure that fish and aquatic life are being protected to the extent feasible and practical.
- The contractor(s) shall be responsible for the preparation of a Spill Prevention Control and Countermeasures (SPCC) Plan to be used for the duration of the proposed project. The Plan shall be submitted to the Project Engineer prior to the commencement of any construction activities. The contractor(s) will maintain a copy of the Plan, with any updates, at the work site.
    - The SPCC Plan shall identify construction-planning elements and recognize potential spill sources at the site. The Plan shall outline responsive actions in the event of a spill or release and shall identify notification and reporting procedures. The Plan shall also outline contractor management elements, such as personnel responsibilities, project site security, site inspections, and training.
    - The Plan will outline what measures shall be taken by the contractor(s) to prevent the release or spread of hazardous materials, either found on site

and encountered during construction but not identified in contract documents, or any hazardous materials that the contractor stores, uses, or generates on the construction site during construction activities. These items include, but are not limited to, gasoline, oils, and chemicals. Hazardous materials are defined in RCW 70.105.010 under "hazardous substance."
    - The contractor shall maintain at the job site the applicable equipment and material designated in the SPCC Plan.
- The dredging contractor will be required to retrieve any floating debris generated during construction using a skiff and a net.
- A containment boom will be placed around the perimeter of the project site during dredging.
- Any debris in the containment boom shall be removed by the end of the work day or when the boom is removed, whichever occurs first. Captured material shall be disposed of in an upland disposal site.
- Appropriate BMPs will be employed to minimize sediment loss and turbidity generation during dredging. Depending on the results of the water quality monitoring program, BMPs may include, but are not limited to the following:
    - Eliminating multiple bites while the bucket is on the bottom
    - No stockpiling of dredged material on the seabed
    - No seabed leveling
    - Other conditions as specified in the Water Quality Certification from Ecology
- Barges will not be allowed to ground out during construction.
- The dredging contractor will inspect fuel hoses, oil or fuel transfer valves and fittings on a regular basis for drips or leaks in order to prevent spills into the surface water.
- An on-site inspector will be present at key times during construction. The role of the inspector will ensure contract and permit compliance. The inspector and the contractor each have a copy of Contract Plans and Specifications on site and will be aware of all permit requirements.

5.0 REGULATORY DETERMINATIONS

Based on the cleanup study results described above, and the reports referenced above and in the bibliography, Ecology makes the following determinations:

Pursuant to WAC 173-340-430, the Interim RAP will:

- Correct a problem at the site by removing wood waste that could detrimentally impact aquatic organisms during the pendancy of further studies and planning leading up to a final cleanup;
- Provide a partial cleanup by removing wood waste from a significant part of the Site; and
- Not foreclose reasonable alternatives for the final cleanup action.

Based on the above findings, the Department of Ecology selects the interim remedial alternative set forth in Section 4.4 above for the Port Gamble Bay interim action project.

6.0 BIBLIOGRAPHY

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