RESPONSIVENESS SUMMARY

Port Angeles Harbor Sediments Investigation

April 28—May 29, 2008 Public Comment Period

Public Review Draft Sampling and Analysis Plan

Prepared by
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Sediments Investigation Information

Location: Port Angeles Harbor, Clallam County
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The Washington State Department of Ecology (Ecology) is planning a study of pollution in the sediments of Port Angeles Harbor. Past sediment sampling has shown that levels of several toxic chemicals exceed state cleanup standards. This study will look at:

- Gaps in our current understanding of pollution in the harbor.
- The nature and extent of pollution in harbor sediments.
- How sediments and bottom currents move throughout the harbor.
- "Fingerprinting" pollutants to determine where they came from.
- The human health and ecological risk of the contaminants of highest concern.

Background

Port Angeles Harbor (see map on page 4) is one of several Puget Sound bays being targeted for priority cleanup by the Puget Sound Initiative. Ecology is using special funding from this initiative to investigate sediment pollution and develop a strategy for cleaning up the harbor. There are many types of pollutants in the Port Angeles Harbor that may pose a threat to human health and the environment. These pollutants also threaten fisheries, shellfish beds, and the people that depend on them.

Wood debris and pilings can be coated with toxic treatments, such as **creosote**, that leach out into the water. Decomposing wood often removes oxygen from the benthic (bottom) marine environment. Decomposition also produces ammonia and sulfides, which are harmful to plants and animals.

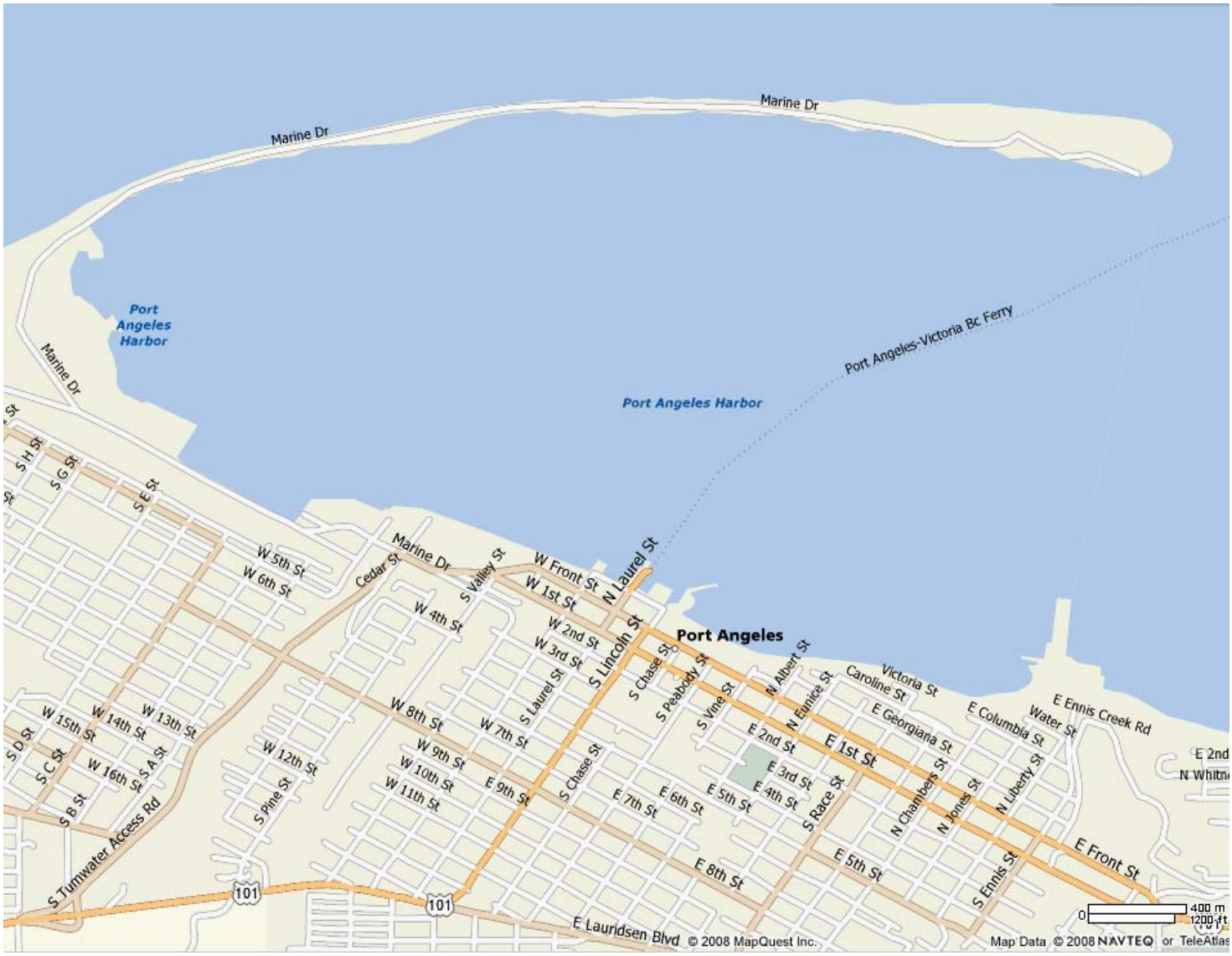
Dioxins and **furans** are toxic chemicals that can cause cancer and may cause reproductive and developmental effects. They are stored in fatty tissues and accumulate as they move up the marine food chain. They come from natural and manmade sources, such as:

- Forest fires.
- Burning seawater-soaked wood.
- Garbage burning.
- Industrial incinerators.
- Chlorine bleaching.
- Other industrial processes.

Polychlorinated biphenyls (PCBs) also accumulate in the marine food chain. These toxins pose a risk to humans eating fish from the harbor, and to organisms living in the harbor. Banned in 1977, PCBs were once used as coolants and lubricants in electrical equipment. Because of their stability, however, these chemicals still persist in the environment. Their health effects are similar to those of dioxins.

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals formed during the incomplete burning of coal, oil, gas, garbage, or other organic substances. They can accumulate in plants, animals, and breast milk. Animal studies have shown that PAHs can cause reproductive and immune system effects. They may also cause cancer in humans.

Port Angeles Harbor map



Comments Received and Ecology Responses

The following comments were received during the April 28 - May 29, 2008 public comment period for the Port Angeles Harbor Sediments Investigation Public Review Draft Sampling and Analysis Plan (SAP), April 2008. The document can be found on Ecology's web site. These comments will be added to the site file and made publicly available.

Comment #1 Daniel Lieberman

(letter in Appendix A)

This is an excellent opportunity for citizen and/or student science. As a teacher of high school students in Port Angeles, I (and my students) would appreciate being involved in data collection or other steps of the sampling procedures beyond simply making comments during a public comment period.

Ecology Response
Ecology appreciates the community's interest in this study. The nature of the sampling often requires field personnel to have 40-hour OSHA training for hazardous waste site operations due to the likely presence of hazardous substances in harbor sediments.

Comment #2 Peter DeFur on behalf of Olympic Environmental Council

(letter in Appendix A)

Olympic Environmental Council Comments on the Port Angeles Harbor Sediment Characterization Study Sampling and Analysis Plan
May 23, 2008

Summary of Issues and Recommendations

- Tributyltin (TBT) needs to be more widely sampled in the harbor and in the tissues of fish, crabs, and clams
- The purpose of the bioassays needs to be more clearly defined and researchers need to acknowledge that many contaminants of concern do not adversely affect invertebrates to the same extent as other organisms
- Tissue samples from crabs and shrimp should also be sampled in the study
- Bioassay should be performed on clams and oysters to evaluate dioxins and dioxin-like compounds
- Perform a bioassay that runs at least one biological system through a full reproductive cycle
- Increase fish tissue, clam types and invertebrate sampling numbers
- Data on benthic invertebrate assemblage composition should be collected

- Ecology should provide information on the combination of Harbor conditions (toxic chemicals, hypoxia, etc.) for RA and evaluation purposes
- Sampling of the intertidal area needs to be performed where people use beaches
- Scientific literature should be reviewed along with regulatory databases for current ecological toxicity values
- Ecology needs to account for the combination of stressors including hypoxia in its evaluations of the harbor.

Ecology Response
See comments identified below.

Comments on the Main Text
Overall the Work Plan addresses most of the major concerns from Rayonier activities and general harbor degradation. It delineates an appropriate spread of sampling and rightly focuses on the activities at the former Rayonier Mill. The Sampling Analysis Plan (SAP) also extends the sampling to the full harbor for characterizing conditions related to multiple activities over many decades. However, portions of the work plan need to be strengthened to include certain types of compounds and better screen samples for further analysis.

Comment 2.1 Given the long history of the harbor marine traffic, there should be at least as much emphasis on tributyltin (TBT), and related organotin compounds, as dioxins and furans. The study is designed to evaluate both contamination from Rayonier and conditions across the harbor. TBT has been used in anti-fouling ship paint in both recreational and commercial settings for decades, and contamination from this compound is widespread in harbors across the world. It is a well documented endocrine disruptor that can cause sex changes in invertebrates at incredibly low doses (deFur et al. 1999).To accurately measure these endpoints, more sampling for TBT is needed. TBT bioaccumulates, and therefore should be examined in tissue samples. Additional sediment samples are also required. Since TBT is listed as a constituent of potential concern in the risk assessment, as many samples as possible need to be collected. There is a known interaction between TBT and polychlorinated biphenyls (PCBs) that increases toxicity (Schmidt et al. 2004), making this sampling even more critical.

Some of the samples in the central harbor area should include organotin compounds like TBT. At the very least, the samples near the anchorage in the central harbor need to include organotin on the list. In light of the organotin contamination issues, the SAP should also collect snails and evaluate organotin in tissues, or provide some comment on how this problem may be addressed in future efforts.

Ecology Response
TBT samples are being collected at areas likely to have TBT contamination (Marina Area, Boat Launch Area, and K-Ply/Valley Creek Area). Additional samples were added in the K-Ply area near likely sources (see Table 4-3). Specifically, TBT has been added for analysis at locations KP02B, KP02C, KP07A, and KP08A. Sediment analytical data will be reviewed after analyzing archive samples. If data indicate that other neighboring samples should be run, it will be considered at that time. Tissue analysis for TBT has not been planned at this time, but may be considered if TBT is found in the Harbor sediment. Final sampling and analytical data will be reviewed and if the data indicate

additional sampling and analyses may be appropriate, a recommendation for this work will be included in the final report.

Comment 2.2 Section 4 explains the sediment sampling, sediment cores, bioassays and tissue sampling. The plan refers to compositing sediment samples and tissue samples. What is the plan for discrete sampling and composite sampling? Compositing samples over a large area does not provide the spatial resolution to determine if toxic chemicals accumulated in more localized areas, but only provides data on the larger areas as a unit. Samples need to be analyzed individually for chemical composition and contamination.

Ecology Response
The SAP does not propose collection of spatially composited surface sediment samples, or composite core samples--each core interval is treated as a discrete sample. Multiple surface grabs may be necessary to collect sufficient sample for analysis at discrete sample locations. Subsurface sample "composites" refer to combining each one foot interval into a sample. The tissue samples are "composites" of multiple individuals at a single location, as available; this is needed to get enough sample mass for laboratory analysis. The bivalve tissue samples will be treated as representing "discrete" areas of the harbor. The SAP has been modified to clarify Section 4.1.

Comment 2.3 Sampling for fish tissue refers to collecting two ling cod fillets and two whole fish. This sample size should be increased to cover a larger area and to better represent conditions. Two fish per sampling location would be a much better approach. Why are forage fishes not sampled for the purpose of assessing uptake/accumulation of chemicals?

Ecology Response
The study will use historical tissue data to assess site conditions, in addition to the tissue samples included in the SAP. Plant, fish, and shellfish tissue data collected during this study will be used with existing data as identified in Appendix D Table 5-1. Clam, crab, shrimp, sole and flounder data is available from the Rayonier Remedial Investigation. Forage fish collection was not seen as beneficial and sampling intensive for the risk assessments planned in this study. Forage fish move in and out of the harbor and are less subject to contaminants found in sediments. No change was made to the SAP in response to this comment.

Comment 2.4 Section 4.1.4 discusses the tissue sampling of clams, fish and plant materials. This plan is a good start, but there is the real possibility that important information will be missed with only these two clam species and one fish, coupled with the limited range of species used in the bioassay. The tissue sampling should include samples of all other clams, combined, and at least three samples of other invertebrates as well. The reason for additional tissues is to determine the extent to which other species or groups of invertebrates serve as avenues for uptake and accumulation of chemicals into a larger segment of the trophic system. The basic biological knowledge of invertebrates is not sufficiently comprehensive that it is possible to say all species

metabolize all chemicals in a similar fashion. Indeed, knowledge of fish biology provides evidence of great diversity in how toxic chemicals such as PCBs, dioxins and chlorinated pesticides are handled.

Ecology Response
See response to Comment 2.3. The invertebrate species chosen are long-lived species that would most reflect bioaccumulative chemicals, the same species as those collected by Rayonier during the Marine Remedial Investigation. They represent benthic invertebrate population, and supplement data already collected in Port Angeles Harbor. Plant materials collected will be used to assist with the ecological risk assessment.

Comment 2.5 The SAP needs to be cautious about inferences concerning specific effects of toxic chemicals on the biotic assemblages based single samples of animal tissues. The issue with this line of investigation not coupled with bioassay is the exclusion of data from animals not surviving *in situ* exposure, or that are otherwise impacted but not observed in collections. If the sediments are indeed toxic to a range of animals, or cause long term harm, then the affected animals may not survive to be collected, or may suffer an abnormality that is not measured via a limited set of samples.

Ecology Response
See response to Comment 2.3.

Comment 2.6 The harbor survey needs to collect samples of sediment for assaying benthic (bottom dwelling) invertebrate biotic assemblage composition. This information will indicate if the area is generally degraded or not. There are several excellent reviews indicating that benthic population diversity and abundance is responsive to low oxygen (Diaz and Rosenberg 1995, see volume by Nancy Rabalais) and these data should be collected.

Ecology Response
There are prior data on benthic invertebrate community assemblages from the 1999 SAIC wood waste study that will be addressed in the Sediment Investigation Report. The presence or absence of bottom dwelling invertebrates, and plant material are also noted during collection of surface and coring samples and may be used to supplement study data. No change was made to the SAP in response to this comment.

Comment 2.7 The specific reason for the bioassays is not clearly defined, and needs to be explained in more detail. What sort of toxicity are researchers interested in determining, specifically? The SAP should state if the intent is to identify toxic responses, uptake rates of contaminants, both, or something else. At least one bioassay should investigate toxicity effects over multiple generations. This type of assay is possible with many invertebrate species and would shed important light on the long term effects of toxic chemicals in the sediment. Multi-generational effects (impacts not on the exposed generation but their offspring) have been documented in a number of invertebrates exposed to endocrine disruptors.

Ecology Response
A clarifying sentence was added to Section 4.1.3 indicating the reasons for the bioassays. Bioassays to be used to confirm designation of Puget Sound marine sediments and their performance standards are defined in the Sediment Management Standards, Chapter 173-204 Washington Administrative Code (WAC), specifically, WAC 173-204-315 and 173-204-320(3). A sentence was added to Section 6.2 clarifying the SAP does not include multi-generation bioassays. Long term effects will be inferred from fish and bivalve tissue concentrations and the ecological risk assessment.

Comment 2.8 Bioassays must be tailored to the chemicals of concern. Invertebrates like amphipods and polychaetes do not seem to have the same receptor (Ah) as vertebrates and respond differently to dioxins and PCBs (Rice et al. 2003). Therefore, dioxin-like compounds do not exert the same influence on these organisms. Requiring a bioassay response as the prerequisite for additional analysis of archived sediments means that any limitation of the bioassay will prevent further analysis of the samples. Unless there is some compelling reason to not analyze archived samples, then these samples need to be used as a source of important information on conditions in the harbor sediments. At the very least, additional analysis should be performed if either the sediment is confirmed by bioassays to be toxic or if toxic chemicals (notably PCBs or dioxins) are detected in a corresponding surface sample.

Ecology Response
A sentence was added to Section 4.1.3 acknowledging that all the bioassay test species are not necessarily sensitive to all of the chemicals of concern (COCs). Based on the toxicity testing lab's input, the larval development acute toxicity test will use species that have been shown to be sensitive to the harbor COCs. Clarifying text was added to Sections 4.1, 4.1.1, and 4.1.3 that states multiple lines of evidence will be used to determine when archived samples will be analyzed. Bioassay results will not be the sole determination for analyzing archived samples.

Comment 2.9 Bivalves (clams and oysters) may be much more appropriate for bioassay work on dioxin-like compounds. Research by R. Van Beneden (University of Maine) has demonstrated toxic biochemical responses by the marine clams *Mya arenaria* and *Mercenaria mercenaria* to dioxin-like compounds. Additionally, recent research in the lab of J. Levine at North Carolina State University has demonstrated the sensitivity of freshwater bivalves to low level PCB exposure, and similar responses may occur in marine bivalves. These two lines of investigation indicate that bivalve bioassays may be better suited to detect responses of invertebrates to dioxin and PCB sediment contamination.

Ecology Response
See Response to Comment 2.8. A sentence was added to Section 4.1.3 acknowledging that not all the bioassay test species are necessarily sensitive to all of the COCs. Based on the toxicity testing lab's input, the larval development acute toxicity test will use species that have been shown to be sensitive to the harbor COCs.

Comment 2.10 Bioassays also need to include one biological system that is carried through a full reproductive cycle. Several compounds like TBT, dioxins, PCBs, bis-phenol-A (BPA), phthalates, and pesticides alter both reproductive function and structure in invertebrates. The appropriate endpoints need to be included in the assays. Including reproductive effects can be accomplished by selecting the correct assay and/or insuring that the assay extends through reproduction and assessing fertility, reproductive rates, and gonadal indices (see deFur et al., 1999 for more details).

Ecology Response
See Response to Comment 2.7. A sentence was added to Section 6.2 clarifying that the SAP does not include multi-generation bioassays. Long term effects will be inferred from fish and bivalve tissue concentrations and the ecological risk assessment.

Comment 2.11 The SAP should include assessments of the benthic invertebrate community diversity and abundance in the harbor for use in the ecological risk assessment. These samples should be collected on a transect from the inner to outer harbor using a grab sampler (van Veen, Ponar, etc.), sieved (0.45 mm) and preserved in the field and all organisms identified at least to family, if not genus and species. The purpose of these data is to assess the current condition of the benthic fauna, gauge the impact of multiple current conditions on the benthos, and estimate the food available to higher trophic levels that rely on the benthos as food. One of the consequences of the conditions in the harbor may likely be a diminished benthic biomass available as prey for benthic feeding fish, crabs, shrimp and even mammals. This reduction would be a serious risk factor in an ecological risk assessment.

Ecology Response
See Response to Comment 2.6.

Comment 2.12 Is the water in the Port Angeles Harbor clear enough to justify the intensity of light proposed in some of the bioassays in the work plan? The SAP is correct that some PAHs are activated by UV light and the opposite is true. Other organic compounds (including PCBs) are actually deactivated by UV light. Given that light does not penetrate more than a few centimeters into the sediment even in the most brightly lit of waters, this protocol may only apply to a few locations.

Ecology Response
This comment refers to the use of "full spectrum lighting" for bioassays. Full spectrum lighting is being used, in response to studies noted in the SAP which suggest photo-activation of certain contaminants of concern may lead to increased acute and chronic toxicity. Ecology's Sediment Sampling and Analysis Plan Appendix (Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards [Chapter 173-204 WAC], February 2008) {SSAPA} specifies that sediment bioassays containing polycyclic aromatic hydrocarbons (PAHs) should be conducted using full spectrum lighting.

The Port Angeles Harbor study area meets both site conditions specified in the SSAPA: (1) the site encompasses more than ½ acre of surface sediments which are 4 meters/12

feet or less sediment depth (MLLW) including intertidal and subtidal zones; and (2) one or more of the list of photoactivated PAHs identified in the SSAPA are present or presumed present at concentrations which exceed the SMS chemical criteria.

The attenuation of UV light is controlled to a great extent by the concentrations of "colored organic matter" in the water, although other factors influence the attenuation of UV light. No studies were available which identify the UV attenuation within Port Angeles Harbor. The SSAPA states "recent investigations have shown pronounced sensitivity to solar UV-B and effects throughout the top 10-15 m of the water column, indicating significant penetration to those depths".

Review of the Malcolm Pirnie Marine Remedial Investigation suggests that previous bioassays conducted on sediment samples from Port Angeles Harbor did not employ full spectrum lighting and so the impacts from PAHs may have been underestimated.

Based on guidance from Ecology, bioassays on Port Angeles Harbor sediment samples collected from 4 meters or less below mean lower low water (MLLW) will be conducted using full spectrum lighting. Full spectrum lighting will NOT be used in bioassays of sediment taken at depths greater than 4 meters below MLLW.

Section 6.2.4 was modified slightly to clarify the requirements for applying the UV methodology in the testing lab.

Comment 2.13 Table 6-6 does not clearly state the criteria of these bioassays.

Ecology Response
Text was added to Table 6-6 to clarify what constitutes failure of a bioassay test.

Comment 2.14 Are all tissues being sampled for total PCBs, or only whole animals? Text and tables do not match descriptions. Some portions of the text refer to only 10 congeners of PCBs being sampled but Table 6-3 lists total PCBs as an analyte.

Ecology Response
Fish and shellfish tissue will be analyzed for 12 coplanar dioxin-like PCB congeners. Referenced to Aroclors and total PCBs were removed from Table 6-3. The reporting limits and units for PCBs were corrected in the table. The reference to 10 congeners was changed to 12 congeners.

Comment 2.15 The SAP should seek to provide information on the combination of conditions in Port Angeles Harbor, hopefully for use in a risk assessment or other evaluation of the responses of the ecosystem. The harbor is stressed with both low oxygen and chemical contamination. The low oxygen is attributed to accumulation of excessive wood waste that decomposes and consumes oxygen. This condition is akin to (but not exactly the same as) eutrophication observed in many waterways around the country. Such conditions are set up by excessive nutrients fueling biological (usually algae) growth that cannot be sustained. When the biomass dies, it sinks, decays and the

decay process consumes oxygen. Presumably the wood waste decomposition fuels the process in Port Angeles. In eastern waters, the low oxygen is accompanied by production of carbon dioxide that depresses water pH, further stressing the biota. Thus, marine life in Port Angeles is exposed to chemical contamination, low oxygen, elevated carbon dioxide and low pH, all at once.

Ecology Response
Historical information on hypoxic conditions in the Harbor will be included in the Sediment Investigation Report. No change was made to the SAP in response to this comment.

Comment 2.16 Sampling in the near shore area in front of the Red Lion Inn needs to include samples in the intertidal area, if not already contemplated. The SAP does not indicate the tidal height of these sample locations and the public use of the beach requires sampling of the intertidal area where people recreate.

Ecology Response
The SAP includes samples in the Hollywood Beach area (RL01 and RL02). Text was added to Table 4-4 indicating these samples are intended to be in or very near the intertidal zone.

Comments on Appendix D- Human Health and Ecological Risk Assessment Plan

Comment 2.17 The risk assessment appendix gives far too much discretion in selecting Indicator Hazardous Substances. It is not enough to say that compounds with "low frequencies of detection" will be eliminated. Ecology needs to select a specific value for this sort of screening for consistency.

Ecology Response
Text was added to Section 3.3.1.3 of Appendix D to clarify that frequency of detection as well as use of screening values will be used to select Indicator Hazardous Substances.

Comment 2.18 Ecology should not just rely on government databases to establish ecological toxicity values. A review of the scientific literature should also be conducted. Many of the entries in the government databases have not been updated in many years and may not reflect the actual risks associated with compounds.

Ecology Response
Ecology intends to use peer reviewed literature in addition to available government databases for these values. No change was made to the SAP in response to this comment, as this is defined in Section 4.1 and 5.1.

Comment 2.19 Again, the plan suffers by not referring to or collecting data for crabs or shrimp. If the analysis will rely on existing data from earlier surveys, then the SAP needs to acknowledge this approach. This omission is a problem since there are no receptors

listed that actively consume larger benthic organisms and crabs are a significant component of seafood consumption for humans in the area. Shrimp forage on the bottom and are sensitive to both water and sediment quality. Notwithstanding the previous sampling efforts, crab and shrimp sampling in the harbor-wide investigation would indicate both presence/abundance and characteristics of the crustacean populations.

Ecology Response
Crab and shrimp data have been collected by Rayonier during the Marine RI studies. These data will be used in risk assessments. Plant, fish, and shellfish tissue data collected during this study will be used with existing data as identified in Appendix D Table 5-1. No change was made to the SAP in response to this comment.

Comment 2.20 The Ecological risk assessment will need to account for the combined stressors of toxic chemicals, low oxygen, altered biotic community and physical disturbance from deposition of materials such as wood waste. Low oxygen (hypoxia) causes metabolic stress, limits growth, reproduction and causes mortality. Chronic hypoxia reduces the abundance or benthic fauna and changes the species composition in a predictable pattern (Diaz and Rosenberg, 1995).

Ecology Response
See Response to Comment 2.15.

Comment #3 Bill Beckley, RIDOLFI, Inc. and Larry Dunn, Lower Elwha Klallam Tribe *(letter in Appendix A)*

LEKT Comments on *Port Angeles Harbor Sediment Characterization Study Sampling and Analysis Plan* (SAP), appendices, and supporting documents.

1. Comments on SAP

Comment 3.1 Section 3.2.2
"If an analyte is not detected in any samples for a particular medium, then it will be assumed that the chemical is not present, and it will not be considered further in the risk assessment"

Will this approach be used independently for harbor areas and background areas? For example, all 17 of the dioxin and furan congeners have been detected in sediments in the harbor, but only a subset of them (5) have been detected in any sediment samples in Freshwater Bay. Would these data sets be treated differently for evaluating sample TEQ concentrations?

Ecology Response
Text was added to Appendix D, Section 3.2.2, to clarify that this approach will be used for both harbor and reference/background areas. Section 8.1 of the main text also describes the approach with reference to Section 3.2.2 in Appendix D.

Comment 3.2 See Sec. 4.1.1, 4.1.2, 4.1.4
"The chemical analyte list, analytical methods, target detection limits, and comparative criteria are discussed in Section 5.1."

These are not discussed in Section 5.1; the reference should be to Section 6.1

Ecology Response
The text was changed to Section 6.0 to include Section 6.0 and 6.1.

Comment 3.3 Section 5.1 line 5 Page 67
Change the parenthetical reference "and set line fishing for the lingcod" to divers will be used to collect lingcod.

Ecology Response
Text was changed to indicate that divers will be used to spear fish for lingcod collections.

Comment 3.4 Section 8.1
"Non-detected values will be assessed as half of the sample reporting limit for data evaluation purposes, except for compliance calculations, which will be assessed as zero"

Can you explain this concept a little more? What are "data evaluation purposes"? Will the procedures described in Section 3.2.2 (discussed above) be employed when a particular analyte has not been detected in a particular medium? If non-detects will be assessed as zero for compliance calculations, getting adequately low detection limits for dioxins and furans will be critical.

Ecology Response
The language regarding treatment of non-detected results was clarified both in Section 8.1 of the SAP and further described in Section 3.2.2 of the risk assessment work plan. Additional considerations beyond MTCA WAC 173-340-740(7), as described in Section 3.2.2 , will pertain to dioxin/furan and dioxin-like PCB congeners and PAHs. Two approaches will be followed to describe concentrations. One approach is that dioxin/furan and dioxin-like PCB congeners and cPAH constituents that are not detected in any sample in the dataset are assigned a value equal to zero. The second approach is for non-detected congeners or cPAH constituents that are detected in one or more samples in the dataset, the detection limit is replaced with a value equal to one-half the method detection limit. Results of both approaches will be present in the risk assessment. This is an alternative statistical method under WAC 173-340-740(7)(f)(v) as described in the October 10, 2007 *Concise Explanatory Statement and Responsiveness Summary for the Amendment of Chapter 173-340 WAC, Model Toxics Control Act Cleanup Regulation Publication: 07-09-108.*

For other compounds, an analyte that is not detected but the detection limit exceeds numeric criteria (i.e., SQS and CSL), will be summarized with detected contaminants above numeric criteria (Section 8.1). For risk assessment, if an analyte is not detected in any investigative samples, for a particular medium, and detection limits are below numeric criteria, then it will be assumed that the chemical is not present and it will not be considered further in the risk assessment. In most cases, if the analyte is assumed to be present based on a detection limit above the numeric criteria, it will be assessed at one-half the detection limit (MDL, see Section 3.2.2 of the SAP).

2. Comments on SAP Appendix D

Comment 3.5 Section 2.2.6, p. 7
The whole first paragraph reference to the Shea et al. 1981 is incomplete and misleading. The Shea report states starting on the bottom of page 463 and continuing to page 464:

> "It is clear that a definite possibility exists that the plume separates into distinct components while in the near field region, and that certain of these components may travel in the subsurface waters, or precipitate out onto bottom sediments. Unfortunately, neither laboratory (separation and settling experiments) nor field (detailed subsurface and sediment sampling) studies have been carried out to investigate this phenomenon. It is important to note that the separation of the plume into components implies the possibilities that 1) toxic components may be present with little or no detectable SSL and 2) that toxic components may be carried by subsurface currents to areas much different than those indicated by surface current analysis."

The net flow in the harbor is in question and no conclusive studies have been done to map the bottom currents in the harbor, which we contend are significantly different than the surface currents. Our contention is based on observations in the harbor during dives, and they indicate that the bottom currents within the harbor are consistently clockwise and that this is unaffected by the tidal changes. It appears that the harbor bottom

currents are more affected by fluid dynamics and the harbor shape than anything else. Malcom Pirnie's conclusions are conjecture and are not supported so we don't believe it is appropriate to use their statements.

Ecology Response
The first paragraph was deleted. The Sediment Transport Analysis and Current Monitoring should further define bottom currents and sediment transport.

Comment 3.6 Section 3.3.1.4
"The reference area for this investigation is Dungeness Bay. Site-specific background samples from Dungeness Bay will be used to compare reference and site investigation data, as appropriate. Additional discussion of the use of any reference data will be provided in the risk assessment report."

The use of an area for reference sediment samples (as defined in the SMS) and as site-specific background, which may be the basis for setting cleanup levels, are not exactly the same thing. Is Dungeness Bay sediment intended to be used for both purposes? (See also comment below on SEIDG Sec. 3.1.3)

Ecology Response
Text was added to Appendix D, Section 3.3.1.4, clarifying that Dungeness Bay will serve as both reference and background locations. The discussion of the outer harbor area as background was removed from the text. Further discussion of the selection of Dungeness Bay as a background location is provided in Appendix C of this document (E&E 2008). Ecology will examine the outer harbor and eastern shoreline areas for their potential either as areal background areas for the Harbor, or as natural background areas with approximate levels associated with Dungeness Bay.

A group of federal and state agencies (Ecology, DNR, EPA, Corps, and the Puget Sound Partnership) are working together to identify non-urban area sediment concentrations for Puget Sound and compare them to project data. The project will include collection of all existing dioxin/furan data, as well as a field sampling effort to collect 70 additional dioxin/furan/PCB congener samples. Ecology will examine these data to determine whether Dungeness Bay is within this framework for Puget Sound.

Comment 3.7 Section 5.4.1.4, p. 36
The harbor seal is an opportunistic feeder and is not limited to bottom-dwelling fish, invertebrates and pelagic species. They also eat clams and crab, both of which are plentiful and known to be significant bioaccumulators of PCBs and dioxins in Port Angeles Harbor.

FOOD PREFERENCES AND RESOURCES :

1. Adult harbor seals eat squid, crustaceans, molluscs, and a variety of fish; including, rockfish, herring, flounder, salmon, hake, and sand lance.

2. A harbor seal's diet varies seasonally and regionally and often is subject to local prey availability. "Harbor seals don't chew their food. They swallow their food whole or tear it

into chunks. With their back molars, they crush shells and crustaceans."
SeaWorld/Busch Gardens Animals

"The harbor seal diet varies seasonally and regionally. They primarily feed on crustaceans, mollusks, squid, and fish. The food is torn into chunks swallowed whole. The molars crush shells and crustaceans for swallowing, but food is generally not chewed. Adults consume 5-6% of their body weight or 4 to 6 kg of food per day. The diet of Ungava seals has not been well studied, but they are known to prey on salmonids such as small Brook trout, feeding usually takes place near the shore in shallow water they dive to over 200m deep, most often 100m for periods of a few minutes. However, harbor seals have sometimes been known to dive more than 500m for more than 25 minutes."

/Phoca vitulina/ , Harbor Seal - MarineBio.org. Retrieved Wednesday, April 30, 2008, from http://marinebio.org/species.asp?id=158.

Ecology Response
Text added as suggested.

3. Comments on *Summary of Existing Information and Identification of Data Gaps* (SEIDG) *Report*

Comment 3.8 Section 3.1.3, p. 3-5
"Dungeness Bay is considered an appropriate reference area for dioxins in Port Angeles Harbor, as it has some of the lowest dioxin/furan concentrations sampled to date in the Strait of Juan de Fuca or Puget Sound"

Dungeness Bay was one of two background locations used in the Marine RI and Phase II Addendum sampling events; the other was Freshwater Bay. The Freshwater Bay location was added at the Tribe's request, as certain information existed (see Shea et al., 1981) that indicated Dungeness Bay may be within the area of influence of historic mill effluents. There do appear to be differences in sediment concentrations for both dioxins/furans and PCBs between these two locations. Concentrations of both dioxin TEQ and total PCBs are consistently lower in Freshwater Bay than in Dungeness Bay. Mean TEQ concentrations, based only on detected values, were more than 20 times lower in Freshwater Bay as compared to Dungeness Bay; mean TEQ concentrations, treating non-detects at half the detection limit, were three times lower at Freshwater Bay; and mean total PCB concentrations were four to five times lower in Freshwater Bay. (Note: at the 90th percentile [the value used for establishing background] the difference in values for these two locations is even greater.) For dioxins/furans, only 5 of the 17 congeners were detected in any sediment samples from Freshwater Bay, while 13 of 17 were detected at Dungeness Bay.

The Tribe continues to assert that Freshwater Bay is a more appropriate location for determining background sediment concentrations.

Ecology Response
A discussion and comparison of the use of Freshwater versus Dungeness Bays as reference and background locations is provided in the attached "white paper" addressing

this issue (Appendix C, E & E 2008). Based on the analysis provided in the white paper, the reference/background location of Dungeness Bay was not changed in the SAP.

Comment 3.9 Section 3.1.2, p. 3-5
"Concentrations for PCBs and dioxins/furans in tissue at the site increased from initial sample collections of the RI. This was most likely due to changes in tissue separation methodology and labs reporting lower detection limits for sediment."

While there were some differences in tissue separation methodologies, specifically for horse clams and geoduck, we believe there are other explanations for increased concentrations. The highest detected concentrations of dioxins/furans around the Mill site were found in log pond sediments. This area was used for rafting logs and was also the location of one of the historic nearshore outfalls. Following closure of the Mill, log rafting ceased in this area, and the existing log booms and part of the existing jetty structure were removed. This immediately resulted in significant erosion within the log pond and the adjacent shoreline. One of the first actions Rayonier took following site deferral was an emergency action to armor the log pond shoreline to address this issue.

In 2000, Rayonier's consultant conducted a survey of the log pond area, including collecting 6 sediment samples that were analyzed for dioxins and furans. The total TEQ for these samples ranged from 20 to 90 ppt, with an average concentration of 50 ppt (and an average TOC of more than 20%). During sampling for the Marine RI (2002), which was more extensive, TEQ concentrations ranged from 0.6 to 53 ppt (with an average of less than 10 ppt). Finally, during sampling conducted for the Phase II RI Addendum (2006) TEQ concentrations ranged from 0.4 to 46 ppt. Between these successive events, dioxin concentrations, as well as woodwaste accumulations have decreased significantly in all but the most protected areas of the log pond. We believe that if this material was re-suspended due to erosion, and available to be taken up by organisms in the harbor, this may be one explanation for increased concentrations.

Among the most significant increases between the RI and the Phase II sampling events were concentrations of dioxins/furans in Dungeness crab. There were not changes in tissue separation methodologies for Dungeness crab samples, and the increased concentrations are evident in samples analyzed by the same laboratory using the same analytical procedures. Also, it is not apparent that lower detection limits for sediment had any effect on increasing concentrations in tissue.

Ecology Response
The comment regarding increases in tissue concentrations was noted as an alternate hypothesis. Ecology chose laboratory facilities with appropriately low detection limits.

Comment 3.10 Section 2.1, Paragraph 2
"Prior to the advent of the CWA, untreated process effluent from the mill facilities was discharged to the harbor through the early 1970's (table2) (Shea et al. 1981). After passage of the CWA, industrial wastewater discharges to the harbor from mills required treatment. Pulp and paper mill treated effluents continue to be discharged in to the harbor until 2008…"

We are not aware that any pulp and paper treated effluents were discharged into the harbor subsequent to the closure of the Rayonier Mill. What treated pulp effluents are being discharged into the harbor currently? Nippon discharges pulp and paper effluents outside of the harbor; Fiberboard has been closed for decades; and Rayonier has been closed for nearly a decade now. K ply wasn't a pulp or paper mill and had no documented waste effluent discharge. We know of no other sources in the harbor, if there are we would be interested in their location and identity.

Ecology Response
The comment regarding effluent discharge was noted. The text in Appendix D, Section 2.2.1 inferring that Diashowa/Nippon mill effluent was discharged to Port Angeles Harbor after passage of the Clean Water Act was removed.

Comment 3.11 Section 3.2.1.1
"Nippon, formerly Diashowa and Georgia Pacific, still operates a large mill on the western end of the Harbor at the base of Ediz Hook. Process wastewater was discharged into the Harbor until the 1960s, at which point a new discharge pipe was built that redirected effluent to the Strait of Juan de Fuca."

1) Nippon has only had two previous owners according to records, one was Diashowa and the other was Zellerbach who founded the mill in 1921.

2) The waste stream for Zellerbach was split before the 1960's, according to a report: *Investigation of pollution in Port Angeles area; summer, 1957, Washington Pollution Control Commission*

> "Crown Zellerbach, Inc. Located on the north side of the closed end of the harbor, the Crown Zellerbach integrated mill produces approximately 450 tons of ground wood and 95 tons of sulfite pulp daily. About 12,000,000 gallons of water are used per day in the production of pulp and paper. Pulping process wastes are discharged on the Straits side of the mill; wastes from the paper mill are discharged on the harbor side. ... A recently constructed lagoon system effectively reduces solids losses from hydraulic barker wastes."

So it appears that Zellerbach was more knowledgeable about waste streams than Rayonier, discharging the pulping process wastes outside of the harbor, so their dioxin should have been dumped on the outside of the harbor, not in it. We wouldn't want chemical contamination from the pulping process blamed on Nippon or their predecessors if they didn't contribute to them.

Ecology Response
The comment regarding ownership and waste streams was noted. The text in Appendix D, Section 2.2.1 inferring that Diashowa/Nippon mill effluent was discharged to Port Angeles Harbor after passage of the Clean Water Act was removed. Other Lower Elwha Klallam Tribe comments relating to inaccuracies concerning Nippon will be addressed and corrected in the Sediment Investigation Report.

Comment #4 Eycke Strickland, Olympic Environmental Council

(*letter in Appendix A)*

PLAN STRENGTHS

- Overall the Work Plan is good.
- It calls for an appropriate spread of sampling and rightly focuses on the activities at the former Rayonier Mill.

PLAN GAPS

Comment 4.1 Omissions of certain types of compounds and screening of samples for further analysis.

- More sampling for tributyltin (TBT) is needed.
- Because of the Harbor's heavy marine industry, more sampling of TBT should be done.
- TBT builds up (bioaccumulates) in tissue samples and is listed as a constituent of potential concern in the risk assessment, so as much data as possible needs to be collected.
- Interaction between TBT and polychlorinated biphenyls (PCB) increases toxicity making this sampling critical.

Ecology Response

See response to Comment 2.1

Comment 4.2 The specific reason for the bioassays is not yet clearly defined.

- What toxicity are researchers interested in specifically?
- At least one bioassay should investigate toxicity effects over multiple generations.

Multi-generational effects have been documented in a number of invertebrates exposed to endocrine disruptors such as PBTs. This is possible with many invertebrate species and would shed important light on long term effects of toxins in the sediment

Ecology Response

See response to Comment 2.7

Comment 4.3 Bioassays must be tailored to the chemicals of concern.

- Amphipods and polychaetes do not contain the receptor to uptake dioxins and PCBs. Therefore they do not exert the same amount of influence on these organisms. Making this the requirement for additional analysis of archived sediments is unnecessary.
- Without supporting evidence, there is no reason that all archived samples shouldn't be analyzed. At the very least, additional analysis should be performed if either the sediment is confirmed by bioassays to be toxic or if PCBs or dioxins are detected in a corresponding surface sample.

Ecology Response
See response to Comment 2.8.

Comment 4.4 Is the water in the Port Angeles Harbor clear enough to justify the intensity of light proposed by the work plan? UV light deactivates most organic compounds (including PCBs). Given that light does not penetrate more than a few centimeters into the sediment even in the most brightly lit of waters, this protocol seems unnecessary.

Ecology Response
See response to Comment 2.12.

Comment 4.5 Are all tissues being sampled for total PCBs?
Text and tables do not match descriptions. Portions of the text refer to *only* 10 congeners of PCBs being sampled, but Table 6-3 lists *total* PCBs as an analyate. Table 6-6 does not clearly state the criteria of the bioassays.

Ecology Response
See responses to Comments 2.13 and 2.14.

Comments on Appendix D Human Health and Ecological Risk Assessment Plan

Comment 4.6 The risk assessment appendix Indicator Hazardous Substances. Ecology should select a *specific value* for hazardous substances for screening consistency, rather than saying compounds with "low frequencies of detection" will be eliminated.

Ecology Response
See response to Comment 2.17.

Comment 4.7 Ecology should not just rely on government databases to establish ecological toxicity values. A review of the scientific literature should also be conducted. Many of the entries in the government databases have not been updated in years and may not reflect the actual risks associated with compounds.

Ecology Response
See response to Comment 2.18.

Comment 4.8 Sampling crabs should be included. Crabs are a significant component of human seafood consumption in the area and there are no receptors listed that actively consume larger benthos organisms.

Ecology Response
See response to Comment 2.19.

Comment #5 Carla Yetter, Rayonier *(letter in Appendix A)*

Comment 5.1 The amount of sampling and analysis proposed in the SAP (Ecology 2008a) is unnecessary to accomplish the goals as set forth in Section 2.3.

5.1.1 Previous Sampling

Ecology Response
No change was made to the SAP in response to this comment. As identified in Rayonier's cover letter, Ecology requested further vertical and horizontal delineation of contaminants and wood waste and biological testing following review of the Marine Remedial Investigation documents in their January 9, 2008 letter (Appendix B). Rayonier did not sufficiently delineate contaminants and wood waste; bioasssays, background comparisons, and potential for buried contaminants were not adequately addressed. Secondly, the Interim Action performed at the base of Ennis Creek was not complete. Impacted sediment was left near the bridge piles and found in the Mill Dock area during the additional PCB/dioxin sampling. Movement of polychlorinated biphenyls (PCBs) and hydraulic oil containing hydrocarbons could be harmful to the environment and public health.

5.1.2 Precedents

Ecology Response
No change was made to the SAP in response to this comment. Note that some studies listed include screening level investigations and surface sample stations only. In these studies (Oakland Bay, Budd Inlet, Grays Harbor), recommendations included further sampling to determine the nature and extent of wood waste, follow-up action for chemical exceedances, bioassays, and more accurate mapping of wood waste distribution. There were exceedances of SMS criteria, including wood waste compounds. It was recommended that wood waste deposits be removed in some areas and best management practices be used. Final cleanup plans were not included in these documents.

5.1.3 Sediment cores

Ecology Response
The one foot interval for core samples was selected to define the distribution of contaminants in subsurface sediments to the finest interval possible, while still providing sufficient sediment volume for laboratory analysis. Note that a minimum of two of the four 1-foot intervals from each core will be analyzed in the harbor-wide investigation, and all four 1-foot intervals from the Rayonier deepwater outfall area will be analyzed. No change was made to the SAP in response to this comment. In addition, human and ecological removal of burrowing clams would expose receptors to contaminated sediments at depth.

The comment regarding samples proposed in Section 4.2.2 being unnecessary to delineate wood waste was noted. See January 9, 2008 letter (Appendix B) from Ecology

to Rayonier. See Ecology response to Comment 5.1.1. Rayonier took five cores in the Mill Dock area, which Ecology felt was insufficient, as subsurface chemistry was not performed. Cores are planned for the Rayonier Mill area in expectation of finding wood waste, and chemical characterization will be performed. Ecology requested that wood waste data obtained from the current study be used to supplement data from the Rayonier MRI. No change was made to the SAP in response to this comment.

5.1.4 Sediment Bioassays

Ecology Response
See Response to Comment 5.1.1. The comment regarding additional bioassays in the Mill Dock and Log Pond area being unnecessary was noted. Ecology did not feel that three bioassays in the Mill Dock area were sufficient to characterize the area. No bioassays were proposed for the Log Pond area. Ecology requested bioassays for the Mill Dock area for COPCs which did not have SMS criteria, including wood waste compounds, ammonia and sulfides. The one sampling location for the former nearshore outfall is intertidal and labeled C001. No change was made to the SAP in response to this comment.

The comment regarding bioassay testing at the deepwater outfall being unnecessary was noted. Further vertical and horizontal delineation of this area along the outfall was needed to understand transport of contaminants. Bioassays were requested for sediments without SMS criteria. Additional COPCs were identified in the January 9, 2008 (Appendix B) letter. Section 4.2.3 now refers the reader to Section 4.1.3 for description of the bioassays to be used.

5.1.5 Ennis Creek

Ecology Response
The comment about Ennis Creek samples being unnecessary to characterize PCBs and TPH in this area was noted. See January 9, 2008 (Appendix B) letter from Ecology to Rayonier, (Specific Comment #22). Not all residual contamination was dealt with in the interim action. PAHs remain near the bridge and PCBs may be present in the alluvial fan at the mouth of the Creek, which was not included in the RI sampling. No change was made to the SAP in response to this comment.

Regarding bioassays appearing to be on land, the figure was modified to show the creek line extending out into Harbor. However, the scale on this map makes it difficult to identify exact locations of samples. Bioassay samples will be collected from intertidal sediment areas which may be influenced by freshwater.

Regarding bioassays in Ennis Creek possibly requiring toxicity testing with freshwater species, the bioassay test methodology and lab procedures account for salinity variations in the sample material. Modifications to Section 6.2 or the SAP indicate that the toxicity laboratory will adjust the sediment sample upon receipt, if necessary, to appropriate salinities for bioassay testing to match reference samples. *Eohaustorius estuarius*, the species used in the amphipod test, is more tolerant of a wide range of

salinities. Use of the other tests for low salinity sediments can be considered on a case-by-case basis per SSAPA guidance (Ecology 2008).

5.1.6 Appendix D—Human Health and Ecological Risk Assessment

Ecology Response
The comment about the human health risk assessment being duplicative or prior work was noted. Ecology will evaluate the toxicity and assess the risks of chemical contaminants for the Port Angeles harbor area. No change was made to the SAP in response to this comment.

'East' Hook was changed to Ediz Hook.

Table 5-1 was modified to show the correct information in the correct table columns to accurately reflect the narrative description in Section 5.4.1.

Exposure duration may be important for migratory species that spend only a portion of the year in the site area. As such, the term will be retained. No change was made to the SAP in response to this comment.

Comment 5.2 Analytical Chemistry Approach

Ecology Response
The PCDD/PCDF reporting limits and units should be ng/kg (nanograms per kilogram [parts pet trillion]). Tables 6-2 and 6-3 were revised to show the proper units (ng/kg). While not noted in the comments, a similar error was made regarding detection limits for dioxin-like PCB congeners. The correct units should be ng/kg. This error was corrected.

A wide range in congener concentrations is expected. The laboratory will dilute sample extracts to keep congener concentrations within the linear range of each congener. Therefore, multiple instrumental analyses of a sample extract are possible, with data from these analyses being used for different congeners as appropriate. Analyses whose associated quality control criteria are within acceptable ranges are expected to have limited bias in the calculation of toxic equivalents (TEQs). If questions arise as to the differences in concentrations between instrumental analyses, which are not based on exceedances of linear ranges, the data will be reviewed. The data which best meet quality control parameters would be documented and used in further data analysis. No change was made to the SAP in response to this comment.

Comment 5.3 Absence of Information to Allow for Review

5.3.1 Fingerprinting

Ecology Response
Section 8.4 states that "A screening-level "fingerprinting" evaluation will be conducted to provide a preliminary indication of the *usefulness of the analytical data to differentiate*

between sources of contaminants" (emphasis added). The data being generated is "definitive" data. It is not possible at this time to specify exactly what types of statistical analyses may be performed. For example, data may be highly censored (large percentage of non-detect values) which may preclude statistically significant evaluation of the data. No change was made to the SAP in response to this comment.

5.3.2 Bivalves

Ecology Response
Ecology considered purging clams in seawater before processing for whole body analysis. The idea was to flush the grit containing any potentially contaminant-laden sediment from the clam gut ball. This approach would be appropriate for the HHRA, but not preferable for the ERA. Upon further investigation, purging the gut ball would substantially increase field time and introduce sample chain of custody complications.

There are both whole body and edible clam tissue data available from previous studies, so data comparability should not be an issue. The first Rayonier RI study used whole body analysis, while the Phase II RI addendum separated edible tissue and then analyzed both whole tissue and edible tissue. The Expanded Site Investigation (ESI) used whole body analysis, while the WDOH study used edible tissue analysis.

The final SAP specifies that clams not be purged and whole body analysis be conducted. Whole body would include viscera and body fluids, gut ball, and siphon/mantle sheath. Text was added to Sections 4.1.4 and 5.4 to describe this. Text was also added Appendix D Section 3.5, noting that exposure point concentration (EPC) calculations will take into account uncertainties associated with whole body analysis of clams.

5.3.3 Radioisotope Analyses in Cores

Ecology Response
The coring device for the radioisotope cores was modified. The text in Sections 4.1.2, 4.1.2.2, and 5.3.3 were changed accordingly.

The radioisotope processing and shipping procedure was changed in Sections 4.1.2.2, 5.3.2, and 5.3.3 to state that cores will be handled with care and stored in a stable position to avoid mixing sediments prior to processing. The radioisotope cores will be sectioned in the field and shipped as separate sample aliquots.

Subsections 4.2.2.1 through 4.2.2.4 were added to the text to distinguish collection of 4 foot and 12 foot cores in the Rayonier sampling area.

5.3.4 Current Meter Study

Ecology Response
The plan was added to the SAP in Appendix F.

5.3.5 Core Intervals and Archiving

Ecology Response
Section 5.3.2 was modified to include a field decision methodology for section of core intervals for laboratory analysis. The first (top most) core interval will be a 0.5-foot interval (approximately 6 inches to 1 foot) because the upper 6 inches will have been collected in the collocated surface grab sample. Text in the SAP has been modified to account for the fact that not all cores intervals are a full 1 foot in length.

5.3.6 Change Order

Ecology Response
Section 5.7 was modified to more clearly outline the approval and documentation process for changes to the SAP during field operations.

Comment 5.4 Other General Comments

Ecology Response
Section 4.2, last sentence, reference to Figure 2-4 changed to 4-2a.

Incorrect description of Table 5-1. Text was added to Section 5.3 to correctly identify the content of Table 5-1.

There are additional performance criteria for the polychaete test. Text was added to Section 7.3.1 referring the reader to Section 6.2 on bioassay performance standards.

Comment #6 Paul Perlwitz, Nippon Paper

(letter in Appendix A)

Comment 6.1 Limited Dioxin/Furan Source Analysis

Ecology Response
Dioxin/furan analyses were added to surface (A) samples of FT01 to capture CSO 6, FT04 to capture CSO 7 and 8, the waste water treatment outfall location WW01, and to FT13 for the full chemical analysis at this location. Two samples, RL03 and LP01 are archived or analyzed for dioxin/furans to potentially capture CSO 10 as shown in the final SAP (June 26, 2008). Tables 4-4 and 4-6 have been changed to reflect this rationale. Ecology does not expect residential burning to be a significant source of dioxin/furans in Port Angeles; Outer Harbor, Reference, and Eastern Intertidal samples will likely pick up these lower levels which may approach background conditions.

Comment 6.2 Representativeness of Radioisotope Dating Cores

Ecology Response
The results of these core samples will be carefully described in the Sediment Investigation Report and attention will be given to the spatial limitations of the data. The core data will be used with other collected sediment transport and current data to provide an overall understanding of sediment dynamics in the harbor. No change was made to the SAP in response to this comment.

Ecology changed the coring device to a gravity corer for better data collection. The text in Sections 4.1.2, 4.1.2.2, and 5.3.3 were changed accordingly.

Comment 6.3 Alternative Sampling for Fish Samples

Ecology Response
LEKT staff have assured Ecology that the locations for sampling identified in the SAP are known to be high concentration areas for the species identified for collection. Furthermore, the risk assessments will utilize benthic organism tissue and fin fish tissue data from previous investigations. No change was made to the SAP in response to this comment.

Comment 6.4 Use of Full Spectrum Lighting

Ecology Response
See response to Comment 2.12.

Comment 6.5 Appendix D, Human Health Ecological Risk Assessment Work Plan

6.5.1 Section 2.2.1. Inaccurate description of historical discharge stream from Diashowa/Nippon.

Ecology Response
The text in Appendix D, Section 2.2.1 inferring that Diashowa/Nippon mill effluent was discharged to Port Angeles Harbor after passage of the Clean Water Act was removed.

6.5.2 Section 2.2.2 Demographics and Land Use

Ecology Response
It is recognized that marine structures may have changed the shoreline over time. No change was made to the SAP in response to this comment.

Comment 6.6 Data Needs for the Human Health Risk Analysis
Need to conduct a current and independent shellfish habitat assessment/survey to evaluate locations/quantity of shellfish beds in Harbor, and ground truth proposed LEKT fish consumption rate.

Ecology Response
A shellfish habitat assessment and survey will not be part of the study. Existing information about shellfish beds will be used in the HHRA/ERA. THE HHRA/ERA report will include a discussion of uncertainties or limitations with using the existing data, particularly as it relates to site use factors/fraction of ingested fish and shellfish from the Harbor. This discussion will also address uncertainties about the fish/shellfish consumption rates for the recreational fisher/shellfisher and subsistence (LEKT) fisher/shellfisher. Additionally, the ERA will look at sediment habitat quality as impacted by wood waste distribution to help evaluate potential impacts to seagrasses/macroalgae and benthos (including shellfish). This is listed as a measure in Table 5-1. Hence, although we are not conducting a formal shellfish habitat assessment/survey, we are not ignoring impacts to potential shellfish habitat in the Harbor.

In addition to wood waste, there have been concerns associated with outfalls related to biological / chemical contamination that impacts shellfish and habitat quality. With the reductions in CSOs and discharges from pulp paper mills, observational diving shows that shellfish are beginning to repopulate the harbor. Documented shellfish areas are available from the Department of Fish and Wildlife and Commercial Fishing areas from Department of Health. Habitat exists for geoducks, clams, and hardshell clams.

No change was made to the SAP in response to this comment.

Comment #7 Heather Trim, People for Puget Sound

(letter in Appendix A)

Comment 7.1 Sampling analysis. Our experience has been that almost every sediment cleanup site in Puget Sound has had inadequate sampling that required more sampling to fill in later. We suggest that the sampling site selection be reviewed to ensure that this round of sampling will be definitive. We have had years of sampling in the Port Angeles Harbor area and the process should not drag out for many more years.

Ecology Response
This investigation is the beginning of several steps that will lead to fully identifying and cleaning up contamination in Port Angeles Harbor. The purpose of this first step is to fill in gaps in our knowledge of harbor contamination and determine where it came from. Those responsible for the contamination will need to do further investigation and complete any necessary cleanup. Ecology is leading this harborwide study to move the process forward and identify potentially liable persons. No change was made to the SAP in response to this comment.

Comment 7.2 CSO and sewage treatment plant. Special attention should be paid to these outfalls. We do not think that adequate sampling has occurred in these areas to date, especially for dioxin.

Ecology Response
See response to Comment 6.1. Dioxin/furan analysis has been added for CSOs in the Landings Pier area and the wastewater treatment plant outfall.

Comment 7.3 Biotic community. We believe that analysis of biotic community should be conducted as well as bioassays. This would yield better data about benthic long-term health.

Ecology Response
See responses to Comments 2.3, 2.6, 2.11, and 2.19. There are prior data on benthic invertebrate community assemblages from the 1999 SAIC wood waste study that will be addressed in the Sediment Investigation Report. The study will use historical tissue data to assess site conditions in addition to the tissue samples included in the SAP. Plant, fish, and shellfish tissue data collected during this study will be used with existing data as identified in Appendix D Table 5-1. Clam, crab, shrimp, sole and flounder data are available from the Rayonier Remedial Investigation. No change was made to the SAP in response to this comment.

Comment #8 North Olympic Timber Action Committee
(letter in Appendix A)

Ecology Response
Thank you for your comment. Wood waste byproducts include ammonia, sulfides, and resins which may be toxic to aquatic life. Wood waste is a concern because it can impact aquatic life and sediment quality when present in sufficient quantities. Excessive wood waste can lead to anaerobic sediment conditions (yielding ammonia and sulfides which are toxic to aquatic life), leach compounds toxic to aquatic life (e.g. phenols, benzoic acid, and benzyl alcohol), and may not provide an appropriate substrate for benthic organisms. Low dissolved oxygen has also been observed in high wood waste areas. No change to the SAP was made in response to this comment.