Dalton, Olmsted & Fuglevand, Inc. *Environmental Consultants*

19017 120th Avenue N.E., Suite 107 • Bothell, Washington 98011
Telephone (206) 486-7905 (FAX 486-7651)

MEMORANDUM

TO: Nadine Romero - Department of Ecology

FROM: Stuart Triolo - Weyerhaeuser Company
Matthew Dalton - Dalton, Olmsted & Fuglevand, Inc.

DATE: Draft - November 1, 1995

DRAFT

SUBJECT: Remediation Alternatives and Estimated Costs
Weyerhaeuser East Site
Everett, Washington

REF. NO: WEY-011 (tech2.doc)

This technical memorandum presents Weyerhaeuser's proposed remedial approach for selected areas on the Weyerhaeuser East Site located in Everett, Washington. This memorandum meets the substantive requirements of a Feasibility Study as defined in WAC 173-340-350 and a cleanup action as described in WAC 173-340-360. Presented below is an analysis of cleanup levels and remedial alternatives, proposed remedial approach and estimated costs for portions of the East Site that exceed Model Toxics Control Act (MTCA) cleanup levels.

Areas that potentially require remediation were identified using soil and ground-water data summarized in our draft technical memorandum dated August 9, 1995 (DOF 1995a) and the ground-water quality report (DOF 1995b) which presents the results of a recent low-flow sampling event. These reports, along with the EMCON (1995) report, encompass our Remedial Investigation. We believe the work meets the substantive requirements of WAC 173-340-350. A review of the site history and soil data indicates that petroleum fuels (TPH), wood treating solutions containing pentachlorophenol (PCP), and oils containing polychlorinated biphenyls (PCBs) are the likely primary source materials of concern. Figures 1 and 2 show the locations of the identified potential remediation areas based on our initial review of the available data.

While preparing this memorandum, additional soil quality data was identified. This additional data is summarized in attached Table 1 and has been incorporated into our evaluations.

Figures and tables 1, 3, 8 and 9 are attached at the end of the main body of this technical memorandum. Tables 2, 4, 5, 6, and 7 are included in the memorandum text.

DRAFT

CLEANUP LEVELS ANALYSIS

MTCA Cleanup Level Methods

MTCA provides three methods for determining cleanup levels. The three methods are described briefly below.

MTCA Method A: Method A applies to sites undergoing routine cleanup actions or to sites where numerical standards are available for all indicator hazardous substances in all media of concern. Predetermined cleanup levels are provided for approximately 25 chemicals in tables in MTCA. These cleanup levels are easy to use, but often are overly conservative. Method A Cleanup Levels are available for both residential and industrial sites.

MTCA Method B: Method B is the standard approach applicable to all sites. Cleanup levels are determined according to risk-based equations provided in the regulation and by using the most current toxicity data available on United States Environmental Protection Agency's (EPA's) Integrated Risk Information System (IRIS) database. The cleanup levels for soil are calculated assuming incidental ingestion of contaminated soil by a young child; this often represents an overly conservative scenario for an industrial site.

Cleanup levels for ground water are established in MTCA, assuming drinking water as the beneficial use, unless the following criteria [WAC 173-340-720(1)(a)] are met to demonstrate that the aquifer is not potable:

- Ground water is not a current source of drinking water.
- Ground water is not a potential future source of drinking water (e.g., insufficient yield, natural background contamination, or recovery technically not practical).
- It is unlikely that contaminants will be transported to an aquifer that is or could be used for drinking water.

Ground water at the East Site is not a current or potential future source of drinking water for the following reasons:

- Site ground water has not been used as a drinking water source historically or currently. Because the Water Table Zone at the East Site is perched, the yield is expected to be too low for use as a potable water source. For example, recent test pit excavations in remediation area RA8-3 revealed that the saturated thickness of the Water Table Zone at this location is only one to two feet thick. Natural ground-water quality would also preclude its use as a drinking water source. Concentrations of naturally occurring iron and manganese typically exceed drinking water standards in shallow ground-water zones in western Washington.

- The site and the surrounding area are supplied by municipal water obtained from the City of Everett, from reservoirs located in the Cascade mountains.

- The uppermost aquifer (Water Table Zone) is too shallow to be used effectively as a drinking water source, and a potential potable water well installed in the aquifer would not meet Ecology well construction standards (WAC 173-16-265).

- Institutional controls, consistent with WAC 173-360-745(1)(v), will be implemented as part of the remedial action which will restrict the site use to industrial purposes for the foreseeable future.

Ground-water cleanup levels for nonpotable aquifers are determined by Ecology on a case by-case basis. In the following sections, we have developed a basis to determine and support ground-water cleanup levels that are protective at the point-of-compliance.

MTCA Method C: Method C applies in cases where land use meets certain criteria to be classified as industrial, in other special cases where Method A or B Cleanup Levels are below area background concentrations, or in cases where Method A or B cleanup levels are not technically possible to achieve. As with Method B, cleanup levels are calculated by using risk-based equations provided in the regulation and by using current toxicity data available on USEPA's IRIS database. The equations use less conservative assumptions and in some cases allow higher risk levels than Method B. Institutional controls (e.g., site fencing, deed restrictions) are generally required when Method C Cleanup Levels are used.

Chemicals of Concern

The nature of past site operation and soil quality data indicate that petroleum hydrocarbons (TPH), pentachlorophenol (PCP), polychlorinated biphenyls (PCBs) and to some extent carcinogenic polycyclic aromatic hydrocarbons (CPAHs) are the contaminants of concern. Proposed cleanup levels for the identified contaminants of concern are discussed below.

Basis for Soil Cleanup Levels

The criteria for determining whether a site can use industrial site cleanup levels for soil are defined in WAC 173-340-745(b) as follows:

(i) The site is zoned or otherwise officially designated for industrial use;

> The East Site is currently zoned M-2, Heavy Manufacturing, by the City of Everett, and has been zoned M-2 since January 13, 1990. Prior to January 13, 1990, the East Site was zoned M-1. Due to a new definition of M-1 zoning

(commercial land use), the East Site was re-zoned by the City of Everett to maintain its industrial land use status. The East Site has been zoned as an industrial use property since 1956, the earliest records currently available.

(ii) The site is currently used for industrial purposes or has a history of use for industrial purposes;

The East Site has been used for lumber production since approximately 1914.

(iii) Adjacent properties are currently used or designated for use for industrial purposes;

The East Site is bordered on the west by the BNRR train switch and storage yards and tracks; on the north by a former pulp and saw mill; and on the south by historic lumber mills and/or lumber related activities; and on the east by Mill E and former railroad tracks, barge grids and the Snohomish River. Historically, adjacent properties have been used for traditional industrial purposes. Additional Weyerhaeuser operations and several log sorting/chipping operations are located on the north and east sides of the river. The river itself is used for marine transport of industrial materials to independent industrial operations along the river, including manufacturing, processing, and bulk storage facilities such as log sorting, chip handling, cement manufacturing, lumber mills and ship building yards. These features are shown on Figure 1 of DOF 1995a.

(iv) The site is expected to be used for industrial purposes for the foreseeable future due to site zoning, statutory or regulatory restrictions, comprehensive plans, adjacent land use, and other relevant factors;

The site is currently zoned M-2, Heavy Manufacturing, and is expected to continue to be used for industrial purposes for the foreseeable future.

(v) The cleanup action provides for institutional controls implemented in accordance with WAC 173-340-440.

Weyerhaeuser's proposed cleanup action provides for institutional controls.

The Washington Legislature recently passed a bill (ESSB 6123) that amends MTCA to include a definition of industrial properties. This bill requires Ecology to use the industrial cleanup standards for cleanups in areas zoned as industrial and those adjacent to other industrial areas. Industrial properties are defined as:

> *...properties that are or have been characterized by, or are to be committed to, traditional industrial uses such as processing or manufacturing of materials, marine terminal and transportation areas and facilities,*

fabrication, assembly, treatment or distribution of manufactured products, or storage of bulk materials, that are either:

(a) Zoned for industrial use by a city or county conducting land use planning under chapter 36.70A RCW; or

(b) For counties not planning under chapter 36.70A RCW and the cities within them, zoned for industrial use and adjacent to properties currently used or designated for industrial purposes.

The East Site is zoned M-2, Heavy Manufacturing, by the City of Everett. The City of Everett is conducting land use planning under the cited RCW chapter. Because the East Site meets all of the criteria for an industrial site as described above, either Method A (Industrial) or Method C would be appropriate to use in determining soil cleanup levels.

Soil Cleanup Levels

Soil Cleanup Levels. The following table summarizes pertinent MTCA industrial site soil cleanup levels for the identified chemicals of concern.

TABLE 2 - Soil Cleanup Levels - Industrial Sites (WAC 173-340-745)

Contaminant of Concern	Soil Cleanup Level (mg/kg)	
Petroleum Hydrocarbons		
TPH-Gasoline	100	(Method A-Industrial Tables)
TPH-Diesel	200	(Method A-Industrial Tables)
TPH-Other	200	(Method A-Industrial Tables)
PCP	1090	(Method C-Industrial-Calculated)
PCBs	17	(Method C-Industrial-Calculated)
CPAHs	18	(Method C-Industrial-Calculated)

Each of the contaminants of concern are discussed below. Figures 3 to 10 show the concentrations of petroleum hydrocarbons (diesel and heavy oil ranges), PCBs, and PCP in the vicinity of potential remediation areas RA7-1, RA7-2, RA8-1, RA8-2, RA8-3, RA9-1, RA10-2, RA10-3 and RA10-4. Potential remediation areas RA3-1, RA10-1 and newly identified location RA8-4 (sample location A8-1SA) are shown on Figures 1 and 2.

To verify the presence of affected media, environmental consultants selected sample locations based on historical evidence or operations that indicated a potential environmental concern. Furthermore, samples typically selected for analysis displayed some indication of the presence of soil contamination. Complete text regarding the sampling rationale and remedial investigation findings is discussed in the EMCON (1995) report.

Petroleum Hydrocarbons. Petroleum hydrocarbons are the primary contaminants of concern on the East Site. Soil samples collected on the site indicate that the petroleum hydrocarbons are predominately (60% to 80%) composed of heavy-oil hydrocarbons. Heavy oil hydrocarbons typically have low solubility and mobility in the subsurface environment. With one exception (discussed later in this memorandum), gasoline range hydrocarbons were generally not detected based on WTPH-HCID analyses.

Histograms showing the range of diesel and heavy oil hydrocarbon concentrations in samples are presented in attached Figure 11. As shown on Figure 11, the majority of the samples analyzed were below 200 mg/kg. Approximately 83% of the diesel range concentrations and 66% of the heavy oil hydrocarbons were below 200 mg/kg.

MTCA Method A tables indicates a soil cleanup level of 200 mg/kg for diesel and heavy oil range hydrocarbons. These levels are not applicable to the site because they were set for protection of aesthetic (non-health based) characteristics of ground water used for drinking water purposes. As later discussed in the ***Ground-Water Cleanup Levels*** section, ground water beneath the site meets cleanup levels at the point-of-compliance.

Remediation of TPH-contaminated soil to a cleanup level of 200 mg/kg for diesel/heavy oil range hydrocarbons is not practical for the East Site. Based on comparison of risk to cost as a function of soil volume, cleanup to these levels is substantial and disproportionate to the level of risk reduction achieved.

To develop a proposed soil cleanup action level, soil volumes exceeding various concentrations were estimated. Figures 1 to 10 show the areas used to make the volume calculations. Additional details on how the estimates were made are contained in a later section titled "***Remediation Approach and Estimated Costs***" and in Attachment A. A summary of soil volumes exceeding specified TPH concentrations is presented in Table 3. Figure 12 graphically shows the results of the analysis. The estimated post-remediation distribution of available soil quality data is presented in Figure 13. As shown on Figure 12, the volumes of soil rapidly increase at potential cleanup action level concentrations less than approximately 10,000 mg/kg. Based on this analysis, a soil cleanup action level for TPH is proposed at 10,000 mg/kg. This recommendation is based on the following additional considerations:

- Soils in several of the identified potential remediation areas with TPH also contain varying amounts of decomposed wood products, primarily wood chips. Interference with TPH analysis due to the presence of biogenic compounds (naturally occurring wood derivatives) is a documented problem in Washington and other states. Weyerhaeuser has scientific evidence that wood, peat, and natural organics causes this interference using the available analytical testing procedures. This evidence has been previously submitted to Ecology:

1. "Independent Remedial Action, Weyerhaeuser Smith Island, Former Wood Waste Recovery Site" prepared by EMCON, April 26, 1995 (Submitted to the Ecology N.W. Regional Office on May 4, 1995).
2. Weyerhaeuser letter to Paul Skyllingstad dated October 17, 1994 concerning WTPH-D Analytical Methods.
3. Weyerhaeuser (Weyco) letter to Nadine Romero submitted in October 1995, to support soil cleanup levels at the Weyco. plywood mill in Longview, Washington.

Unfortunately, to date, no definitive solution has been developed by Weyerhaeuser, Ecology, or commerical analytical laboratories to effectively define the degree/risk effect of the analytical procedure interference. It is therefore our conclusion that the concentrations of refined petroleum hydrocarbons present in soils at the site are lower than the measured TPH concentrations.

- As shown on Figure 12, estimated soil volumes and costs more than double between a TPH soil cleanup action level of 10,000 mg/kg and a soil cleanup action level of 5,000 mg/kg. In a paper presented at a technical seminar on June 21, 1994, Lynn Coleman of the Department of Ecology discussed possible approaches for demonstrating that cleanup costs for a particluar cleanup action are "significant and disproportionate". One of the approaches Ecology suggested in described in *its Sediment Cleanup Standards Users* Manual dated December 1991. The manual indicates that the cost difference is considered significant if the cost is 2 or more times the cost of cleanup to a less stringent standard. Costs are further discussed in a later section of this report.

- Based on the available soil analyses (summarized in Figure 13), post-remediation maximum diesel-range hydrocarbon concentrations will be below 2,500 mg/kg and most concentrations will be below 1,000 mg/kg. Similarly, maximum heavy-oil range hydrocarbons will be below 5,000 mg/kg with most concentrations being less than 2,500 mg/kg. Excavating the TPH concentrations to the proposed levels will further reduce the potential adverse impacts to ground-water quality at the point-of-compliance.

- While not considered by MTCA, potential risks to human health through ingestion of residual concentrations of TPH-contaminated soil will be minimized in remediated areas by placing a sand cover over portions of these areas and implementing site-wide institutional controls.

- As previously noted, the East site is currently zoned M-2, Heavy Manufacturing, and rezoning by the City of Everett to a different classification will be prohibited. Ground water beneath the site is not currently a drinking water source, and is unlikely to be

used as a drinking water source in the future. As such, there is little risk to human health via ingestion of site ground water at any concentration of TPH.

- The 100 mg/kg gasoline or 200 mg/kg diesel/other (petroleum hydrocarbons) MTCA Method A Cleanup Level for soil is based on protection of ground water as a drinking water source to prevent adverse aesthetic characteristics (odor and taste) in drinking water. The MTCA Method A Cleanup Level is not based on human health risk criteria, and to date, Ecology or EPA have not established a TPH concentration that would be harmful to human health as a result of ingestion.

- Under existing (pre-remediation) conditions, concentrations of TPH in ground water at the point-of-compliance (point-of-entry) at the East Site (discussed later in this technical memorandum) are substantially below the Water Quality Guideline of 10 mg/l established for oil and grease discharged to surface water. TPH concentrations in ground water will be reduced even further after excavation of source soil and placement of a soil cover over remediated areas.

With consideration for the substantial and disproportionate volume of soil and related cost required to achieve the incremental degree of protection [WAC 173-340-360(5)(d)(vi)], a soil cleanup action level of 10,000 mg/kg TPH is appropriate for the site. A more detailed discussion of our substantial and disproportionate cost analysis is provided in the later section titled "*Summary of Estimated Remediation Costs*". Determining achievement of the soil action level will be implemented using analytical method WTPH-DX with a silica-gel cleanup (Weyerhaeuser 1994), as was used for cleanup of the Weyerhaeuser West Site.

The only location on the East Site where gasoline range hydrocarbons were detected is potential remediation area RA3-2 (Figure 2). This is the site of a former loading dock area where gasoline range hydrocarbons were reportedly detected at a concentration of 1,140 mg/kg (sample location SEF-05). Benzene, toluene, and ethylbenzene were not detected at SEF-05 or in any of the surrounding locations. Xylene was detected at location SEF-06 at a concentration of 0.011 mg/kg. Diesel and heavy-oil range hydrocarbons were either not detected or were detected at concentrations less than 500 mg/kg. No sheens or petroleum odors have been noted by site environmental engineers over several seasons in an adjacent water filled drainage ditch located approximately 10-feet downgradient of SEF-05.

Potential remediation area RA3-2 is not included in the areas to be remediated because of the very limited extent and volume of soil represented by location SEF-05 and gasoline related constituents have generally not been detected in East Site ground-water samples.

Pentachlorophenol. The MTCA Method C industrial soil cleanup level is 1,090 mg/kg. Figure 11 shows the distribution of pre-remediation sample data. As shown, most samples are less than 50 mg/kg while two samples are greater than 100 mg/kg. The highest PCP

concentration is 200 mg/kg measured at location A8-09 (Figures 1 and 8). Based on a comparison of the maximum concentration with the soil cleanup level, the site meets the MTCA cleanup level. However, based on conversations with Weyerhaeuser staff, PCP concentrations greater than 100 mg/kg may be designatable as a Washington State Dangerous Waste under Chapter 173-303 WAC upon excavation. Recent amendments to the Dangerous Waste Regulations provide guidance on disposal alternatives for "State only" dangerous wastes. This issue is further discussed in a later section of this technical memorandum.

PCBs. Consistent with Method C for industrial sites, a cleanup level of 17 mg/kg was used to estimate soil volumes potentially requiring remediation in this analysis. Figure 11 shows the distribution of pre-remediation sample data. Two samples exceed the cleanup level. These samples are located in potential remediation areas RA9-1 (Figures 1 and 4) and RA 10-2 (Figures 1 and 10). Figure 13 shows the estimated post-remediation distribution of sample data. As shown, if these two areas are remediated, the majority of remaining samples are less than 10 mg/kg. The highest remaining concentration would be 11 mg/kg (location A7-19 - Figure 4).

CPAHs. Consistent with Method C for industrial sites, a soil cleanup level of 18 mg/kg was used to estimate soil volumes potentially requiring remediation in this analysis. CPAHs (using totals analysis) greater than 18 mg/kg were detected at sampling locations SEF-16 (162 mg/kg), TP104 (50 mg/kg); A8-1-SA (131 mg/kg); TP103 (50 mg/kg); and TP113 (51 mg/kg).

Location SEF-16 (in area 3), was previously remediated as documented in the EMCON *Southend Follow-up Summary Report* dated March 17, 1995 (EMCON 1995 - Appendix B). CPAHs at locations A8-1-SA (RA8-4) and TP113 (RA9-1) will be remediated. Locations TP-103 and TP-104 are located in Areas 9 and 7 and will be remediated along with remediation areas 9-1 and 7-2 (Figure 3).

Basis for Ground-Water Cleanup Levels

Because groundwater at the East Site is not a current or potential future source of drinking water, protection of the surface water next to the site is the appropriate endpoint of concern. The water table zone is perched and flow into the adjacent river is limited. The lower aquifer, which is effected primarily by arsenic from an off-site source, discharges into the river. A silt/clay layer is a vertical barrier between the water table zone and the lower sand aquifer.

The Snohomish River adjacent to the site is located approximately 1.5 miles from Puget Sound. The river is tidally influenced and a salt water wedge extends approximately 5-miles upstream of the site. Applicable requirements for protection of surface water are state surface water quality standards and federal ambient water quality criteria (AWQC) for protection of marine aquatic organisms. Therefore, AWQC will be used as ground-

water cleanup levels for the East Site consistent with WAC 173-340-730(2)(ii). No standards have been established for TPH in the AWQC. However, Ecology has established criteria for hydrocarbons in their *Water Quality Guidelines for Oil and Grease* (Ecology, 1987) and these are considered to be appropriate for use at the East Site. The appropriate ground-water cleanup levels will be applied at the point-of-entry into the Snohomish River consistent with WAC 173-340-720(1)(c) which will be considered as the point-of-compliance consistent with WAC 173-340-720(6)(d).

Weyerhaeuser proposes that the point-of-compliance be within the upper sand ground-water zone adjacent to the Snohomish River. Samples would be collected from monitoring wells screened in this zone and located as close as practical to the Snohomish River

Ground-Water Cleanup Levels

The ground-water cleanup levels for the East Site are listed below:

TABLE 4 - Ground-Water Cleanup Levels

Contaminant of Concern	Cleanup Levels	Basis
Petroleum Hydrocarbons	10 mg/l	Ecology Guidance
PCP	7.9 ug/l	Ambient Quality Criteria (chronic)

Ground-water cleanup levels for PCBs and CPAHs are not presented because these chemicals have very low solubilities and mobilities in the subsurface environment and are generally not detectable in ground-water samples with low particulate concentrations.

The available ground-water quality data from East Site wells indicates that ground-water meets the ground water cleanup levels (Table 4) at the site boundary (point-of-compliance) adjacent to the Snohomish River.

Ground-water samples from the site have been collected and analyzed for gasoline, diesel and heavy-oil range hydrocarbons, PCBs, CPAHs and PCP and provide a basis to assess the impact of these constituents in soil on ground-water quality. Ground-water quality data are summarized in Tables 5 and 6 of the earlier technical memorandum dated August 9, 1995 (DOF 1995a). Wells MW-100S,D; MW-101S; MW-102S; MW-103S,D; MW-105S,D; and MW-106S are located on the downgradient side of the site adjacent to the Snohomish River (Figures 1 and 2).

The highest apparent concentrations of petroleum hydrocarbons, PCBs and PAHs were detected in well MW-105S where diesel range hydrocarbons have ranged between 0.18 mg/l to 2 mg/l, and heavy oil hydrocarbons have ranged between 0.37 mg/l to 3 mg/l. These reported concentrations are below the proposed oil and grease cleanup level of 10

mg/l. PCBs (up to 13 ug/l - Aroclor 1254) and CPAHs (up to 22 ug/l) were also measured in samples from this well. The available data indicate that the detections in samples from MW-105S are likely the result of sampling procedures rather than being representative of dissolved concentrations that can migrate in ground water. Heavy oil hydrocarbons, PCBs and CPAHs have low solubilities in water and do not migrate readily in the subsurface environment. Several of the samples sent to the laboratory during previous sampling rounds were silty. Low concentrations of these low mobility constituents, if present in soil, would be extracted during the sample preparation and bias the sample results. This finding is supported by the low-flow sampling event conducted in August 1995 (DOF 1995b), when these contaminants were generally below reporting limits.

Well points WP-2 and WP-3 were located approximately downgradient of remediation areas RA10-3 and RA3-1, respectively. PCP in soil was reported at concentrations between 1.7 mg/kg and 24 mg/kg in these areas. PCP was only detected in a ground water sample from WP-2 at an estimated concentration of 1J ug/l while PCP was not detected in a sample from WP-3 at the sample quantification limit of 26U ug/l.

Well MW-100S is located in the immediate vicinity of sample location A8-1-SA (Figure 1) where PCP was detected at 110 mg/kg. PCP was not detected in samples from this well at sample quantification limits of between 0.1U ug/l and 37U ug/l. Similarly, PCP has not been detected above the ambient water quality criteria in any of the other shallow or deep wells. The ground-water quality data indicate that PCP in soil has not substantially impacted ground-water quality.

As part of the remediation, Weyerhaeuser intends to conduct ground-water monitoring for TPH and PCP at the point-of-compliance. Sampling will be completed using low flow sampling procedures. Sampling will be completed on a quarterly basis for a period of two years. A review of the data will be made at the end of this period. If the data indicates that concentrations are "stable" and that ground-water quality meets the ground-water cleanup levels at the point-of-compilance, monitoring would be discontinued and the wells would be abandoned according to the procedures of WAC 173-160.

Surface Water Cleanup Levels

Surface water cleanup levels have not been established for this remedial action because there are no surface water bodies within the boundaries of remediation for the East Site. Once the remediated areas are covered with paving (in traffic areas only) or sand, there is little potential for site contamination in the remediation areas to adversely impact stormwater quality.

DRAFT

Air Cleanup Levels

Air cleanup levels have not been established for this remedial action because the primary contaminants of concern (oil-range hydrocarbons, PCBs and PCP) are not volatile.

DISCUSSION OF SOIL REMEDIATION ALTERNATIVES

The primary target of the remediation at the East Site is soil which contains petroleum hydrocarbons. However, the soil data indicate that PCP, CPAHs and PCBs are also present in several of the identified areas. The presence of these constituents effects the remedial alternatives which can be practically applied at the site.

A number of remedial options were identified and reviewed based on material type and contaminants present. The options which were evaluated include:

- Excavation and Off-Site Disposal;
- Excavation and Off-site Thermal Desorption; and
- Excavation and On-site Bioremediation (landfarming).

Relative costs to implement each option were also developed. These costs are for comparison purposes only and should not be used for budgeting purposes. The cost of contractor mobilization/demobilization, confirmatory soil sampling, ground-water quality monitoring, agency interaction/reporting and other items are not included. A summary of the relative costs for each of the alternatives evaluated is presented in Table 5. Each alternative is discussed below.

TABLE 5 - Comparison of Remedial Costs

	Cost/ton	Cost/cubic yard(1)
• Excavation and Off-site Landfilling	$52	$88
• Excavation and Off-site Thermal Desorption	$55	$93
• Excavation and On-site Landfarming	$51	$87

(1) - Assumes 1.7 tons per cubic yard

Excavation and Off-Site Disposal

Identified soils exceeding cleanup action levels would be excavated and disposed of off-site. Two possible disposal facilities were evaluated including the Regional Disposal Company Landfill in Roosevelt, Washington and the Weyerhaeuser Landfill located near Castle Rock, Washington. A third facility, the Chemical Waste Management Solid Waste Landfill in Arlington, Oregon may also be used to dispose of excavated material. This facility is not discussed further because costs are similar to the other two landfills. The excavation and off-site disposal alternative would involve excavating target materials,

transporting the materials by rail or truck to the approved landfill, disposing the materials in the landfill, and placing a sand cover in the excavated area.

A limited volume of soil may have to be disposed of in a hazardous waste landfill. The Chemical Waste Management landfill or an equivalent hazardous waste landfill will be evaluated for disposal of waste (i.e. containing PCBs greater than 50 mg/kg) regulated by the Toxic Substances Control Act (TSCA). Such specialized disposal will be discussed, as appropriate, for the specific areas where this type of disposal may apply.

The Rabanco and Weyerhaeuser landfills have restrictions on the concentrations of certain contaminants which they will accept. The restrictions are listed in Table 6 for those constituents anticipated to be present in East Site soil. In some cases, the available data indicates that discrete samples exceed the landfill acceptance criteria. In those locations, soils will be excavated and stockpiles will be sampled using composite methods. The results will be compared to the selected landfill's criteria to determine acceptability.

TABLE 6 - Landfilling Acceptance Criteria

Constituent	Rabanco Landfill	Weyerhaeuser Landfill
• TPH (total)	+30,000 mg/kg (1)	na
• TPH - gasoline	na	2,500 mg/kg
• TPH - diesel	na	5,000 mg/kg
• TPH - heavy oil	na	20,000 mg/kg
• PCP	<100 mg/kg	<100 mg/kg
• PCB	<50 mg/kg	<2 mg/kg

(1) - Requires fish bioassay
na - not applicable

The estimated costs of excavation, transportation and disposal at each of the facilities are as follows:

• Excavation and On-site Stockpiling	$8/ton
• Debris Screening (if required)	$5/ton
• Backfilling	$7/ton
• Transportation and Disposal	
Regional Disposal Co. Landfill	$37/ton
Weyerhaeuser Landfill	$38/ton

The estimated relative cost of the landfilling alternative is approximately $52/ton, not including screening. Using a conversion of 1.7 tons per cubic yard, the estimated relative cost is approximately $88/cubic yard. $88/yd.

Excavation and Treatment by Thermal Desorption

Identified soils exceeding cleanup action levels would be excavated and treated off-site. The Associated Sand and Gravel thermal desorption treatment facility is located approximately 7 miles from the East Site. The alternative would involve excavating target materials, transporting the materials to the facility, treating the materials, and placing a clean sand cover or treated material back in the excavated area.

The thermal desorption unit has restrictions on the concentrations of certain contaminants and the physical nature of the types of materials that can be treated. The restrictions are listed in Table 7 for those constituents anticipated to be present in East Site soil.

TABLE 7 - Thermal Desorption Acceptance Criteria

Constituent	Thermal Desorption
TPH (total)	<32,000 mg/kg
PCP	100 mg/kg
CPAHs	1 mg/kg
PCB	0 mg/kg

Note: Soils must consist of sand and gravel. No greater than 5% of organic materials such as wood chip, peat etc. can be accepted.

The estimated costs of excavation, transportation and treatment at the Associated Sand and Gravel thermal desorption facility are as follows:

- Excavation and On-site Stockpiling $8/ton
- Debris Screening (if required) $5/ton
- Backfilling $7/ton
- Transportation $5/ton
- Treatment $35/ton(1)

(1) Assumes a treatment volume of approximately 10,000 cubic yards

The estimated relative cost of the thermal desorption alternative is approximately $55/ton, not including screening. Using a conversion of 1.7 tons per cubic yard, the estimated relative cost is approximately $93/cubic yard. Since no PCBs or material containing greater than 5% wood waste can be accepted by the thermal treatment facility, use of this technology may be limited. Thermal treatment was included for cost comparison purposes. $93/yd.

Bioremediation by Landfarming

TPH impacted soil may be remediated by bioremediating the soil in a constructed landfarm cell. This process may also remediate PCP but is not applicable to PCB. Typically soil is placed in 18-inch lifts for treatment. Multiple lifts are often stacked because of space

constraints and each lift is treated after the previous one has been cleared. During treatment, nutrient supplements may be added, soil moisture is maintained at specified levels, and the soil is aerated by tilling (EMCON 1993).

EMCON (1993) estimated the cost for landfarming of soil assuming a soil volume of 10,000 cubic yards and a four-month treatment period during dry and warm weather conditions (summer months). The estimated costs are summarized below:

- Excavation and On-site Handling $8/ton
- Debris Screening (if required) $5/ton
- Backfilling $8/ton
- Treatment $35/ton(1,2)

(1) Assumes a treatment volume of approximately 10,000 cubic yards
(2) Cell construction, contractor pile maintenance and analytical costs are not included. The actual cost would be higher.

Landfarming of soils is not considered a practical alternative for remediation of soils at the East Site. The technology will not remediate PCBs and extended treatment periods may be required because of the presence of significant concentrations of heavy oil hydrocarbons. The end point concentrations that can be achieved in treated soil are uncertain and treatability studies would be required to establish these endpoints and optimize treatment. However, the costs of landfarming have been estimated for comparison purposes.

$87/yd.

The estimated relative cost of the landfarming alternative is approximately $51/ton, not including screening. Using a conversion of 1.7 tons per cubic yard, the estimated relative cost is approximately $87/cubic yard.

REMEDIATION APPROACH AND ESTIMATED COSTS

This section reviews potential contaminants of concern in each of the potential remediation areas; affected material types and volumes; estimated costs and remedial approach; and proposed remediation. Isoconcentration contours and shaded areas shown in Figures 3 to 10 and volumes summarized in attached Table 3 are only considered starting points for soil remediation. Estimated costs presented in this section are based primarily on petroleum hydrocarbon isoconcentration contours greater than 10,000 mg/kg.

The approach to remediation will encompass a delineated initial soil excavation followed by testing and, perhaps, further excavation. Overburden materials consisting of wood chips would stockpiled for later reuse. Concrete removed from remediation areas would be stockpiled for crushing and reuse. Soil excavation would proceed until either petroleum hydrocarbon concentrations are reduced to below soil cleanup action levels or to the depth of ground water. The conceptual soil confirmation sampling plan is discussed

in a later section. Following confirmation sampling, clean sand will be placed in all excavations and asphalt will be placed in existing roadways.

Potential Remediation Area RA3-1

Contaminants of Concern. RA 3-1 is associated with a former dip tank (Figure 2). Samples from test pits A3-03A, A3-03B, A3-03C and A3-03D were obtained and analyzed for PCP. PCP was detected at location A3-03D at a concentration of 7.7 mg/kg. Substantially lower PCP concentrations were measured in samples from the other three locations. The highest PCP concentration is well below the MTCA soil cleanup level of 1,090 mg/kg. In addition, PCP was not detected in a ground-water sample from well point WP-3, located generally downgradient of RA3-1.

Based on this data, no remediation is required in Area RA3-1.

Potential Remediation Area RA3-2.

Contaminants of Concern. Gasoline range hydrocarbons were detected at the RA3-2 location (Figure 2) and is associated with a former loading dock area. Analysis of a sample from location SEF-05 detected the presence of gasoline at a concentration of 1,140 mg/kg at a sampling depth of 1.5-feet to 3-feet below ground surface. Benzene, toluene, and ethylbenzene were not detected at SEF-05 or in any of the surrounding sample locations. Xylene was detected at location SEF-06 at a concentration of 0.011 mg/kg. Diesel and heavy oil hydrocarbons were either not detected or were detected at concentrations less than 500 mg/kg. PCP was not detected at any of the RA3-2 sample locations with the exception of A3-05 where PCP was detected at 1.8 mg/kg.

An open drainage ditch about 3-feet to 4-feet deep is located approximately 10-feet hydraulically downgradient from SEF-05. No sheen or odor has been observed in the drainage ditch by site environmental engineers from the time period (1993) of sampling to the present.

No remediation is required in RA3-2 because of the very limited extent and volume of soil represented by location SEF-05 and gasoline related constituents have generally not been detected in East Site ground-water samples or observed in a near-by ditch.

Remediation Area RA 7-1

Contaminants of Concern. RA 7-1 is the site of a former oiling room (Figures 1, 5 and 6). A sample from test pit A7-06 was obtained and analyzed for petroleum hydrocarbons. The results are summarized below:

DRAFT

	A7-06
TPH - Diesel Range	<420 mg/kg
TPH - Heavy Oil Range	87,000 mg/kg

The sample from A7-06 was not analyzed for PCP, PCPs or PAHs. However, analyses of other samples from adjacent locations (A7-05, A7-16 and A7-17) did not detect the presence of these constituents above cleanup levels. The analytical data indicate that petroleum hydrocarbons are the primary contaminants of concern. The hydrocarbons predominately consist of heavy oil range hydrocarbons.

Estimated Volumes and Material Types. The test pit log of A7-06 indicates that two feet of wood chips overlie, in turn, 0.75-feet of silty gravel, 0.75-feet of debris (burnt wood, tyvek and charcoal) and sand. The sample submitted to the laboratory for analysis was of the sand deposits (depth 3.4 to 4.3 feet) which underlie the wood chips, gravel and debris. The water table was not encountered to a depth of 4.25 feet.

Data is not available to base even a rough estimation of material volumes. Assuming an excavation area of 500 square feet (approximately 20-feet by 25-feet) and a contaminated material depth of 5 feet, a volume of approximately 100 cubic yards (170 tons) is estimated.

Estimated Cost - RA 7-1. Assuming the volume of soil discussed above is representative of the site conditions at RA7-1, the estimated relative cost to remediate this area is approximately $10,000 as summarized below:

	Landfill	Thermal
• Excavation and On-site Stockpiling	$1,360	$1,360
• Screening (if required)	not req.	not req.
• Backfilling	$1,190	$1,190
• Transportation/Disposal/Treatment	$6,290	$6,800
• ESTIMATED TOTAL	$8,840	$9,350

Remedial Approach - RA 7-1. The wood chips would be stripped from the remediation area and be placed in a separate stockpile. The debris layer would be separated and disposed of off-site in a landfill. Soil which exceeds the TPH action level would be thermally treated or landfilled.

Remediation Area RA7-2

Contaminants of Concern: RA7-2 is located in the northern portion of Area 7 and is the site of the former sawmill and powerhouse and lies within a portion of the Mill B fire area. A portion of the area lies within Area 9. The initial delineation of this area presented in the initial August 1995 memorandum (Figure 1) was refined as shown on Figures 3 and 4.

Because of the nature of the materials (soil, wood chips and demolition debris), this area potentially would be one of the more complicated areas to remediate.

Samples from test pits A9-08, A9-09, TP-113 and TP-103 define the RA7-2 remediation area. The analytical results and materials encountered in the test pits are summarized in Table 8. As shown on Figures 3 and 4 and summarized in Table 8:

- Test pit A9-09 defines an area of PCB concentrations which exceed soil cleanup levels and where petroleum hydrocarbons were reportedly not detected;
- Test pits A9-08 and TP-113 define an area with concentrations CPAHs which exceed soil cleanup levels. PCBs were also detected in this area at concentrations below cleanup levels; and
- CPAHs above soil cleanup levels were measured in a sandy debris sample from test pit TP-103 (2 to 4 feet). The sampled material lies between concrete footings based on the test pit log.

Estimated Volumes and Material Types. The test pit logs indicate that a wide variety of materials would be encountered during remediation of area RA7-2. These materials include wood chips and demolition debris. During excavation, it can be anticipated that concrete foundations and footings, and wood decking will be encountered.

For cost estimating purposes, possible excavation volumes were estimated using the following assumptions:

- The general remediation area for location A9-09 on Figures 3 and 4,
- Wood chips do not require remediation, and
- The depth of excavation is limited by concrete foundations or wooden decking at location A9-09.

Based on these assumptions, we estimate the excavation and disposal quantities at A9-09 to be approximately 225 cubic yards (383 tons).

Estimated Cost - RA7-2. Assuming the volume of soil discussed above is representative of the site conditions, the estimated cost to remediate this area is approximately $22,000 as summarized below:

	Landfill
• Excavation and On-site Stockpiling	$4,590(1)
• Screening (if required)	(2)
• Backfilling	$2,680
• Transportation/Disposal/Treatment	$14,170
• ESTIMATED TOTAL	$21,440

Notes: (1) - The cost of excavation was adjusted upward to $12/ton to account for the increased difficulty of excavating the target materials.
(2) - Some screening may be warranted. However, a cost to screen cannot be reliability predicted with the available data.

Remedial Approach - RA7-2. The wood chips would be stripped from the remediation area and be placed in a separate stockpile. Soils which exceed action levels would disposed of in an off-site landfill. Thermal treatment of materials from this area is not possible because of the presence of PCBs and the physical nature of the materials. A clean sand cover would be placed over the TP-103, A9-08, and TP-113 areas where CPAHs exceed the soil cleanup level.

Potential Remediation Area RA 8-1

Contaminants of Concern. RA 8-1 is the site of a former chip-dumper (Figures 1, 5 and 6). Samples from test pits A8-02A and A8-03 were obtained and analyzed for petroleum hydrocarbons, PCBs, PCP and CPAHs. The results are summarized below:

	A8-02A	**A8-03**
TPH - Diesel Range	<21 mg/kg	770 mg/kg
TPH - Heavy Oil Range	3,900 mg/kg	3,300 mg/kg
PCP	0.14 mg/kg	0.047 mg/kg
PCB	---------	<0.035 mg/kg
CPAHs	not detected	0.054 mg/kg

The analytical data indicate that chemicals of concern in the RA8-1 area are below the soil cleanup action levels.

Based on this data, no remediation is required in Area RA8-1.

Remediation Area RA 8-2

Contaminants of Concern. RA 8-2 is associated with a former dip tank (Figures 1, 5 and 6). Samples from test pits A8-02B, TP9 and surface location CL1-SS1 were obtained and analyzed for petroleum hydrocarbons, PCBs, PCP and CPAHs. The results are summarized below:

	A8-02B	**CL1-SS1**	**TP-9**
TPH - Diesel Range	38 mg/kg	--------	---------
TPH - Heavy Oil Range	60 mg/kg	87,000 mg/kg	---------
PCP	32 mg/kg	0.32 mg/kg	0.42 mg/kg
PCB	---------	0.17 mg/kg	0.19 mg/kg
CPAHs	---------	1.2 mg/kg	0.4 mg/kg

The analytical data indicate that petroleum hydrocarbons exceed the soil cleanup action level of 10,000 mg/kg in the surface grab sample CL1-SS1. The hydrocarbons predominately consist of heavy oil range hydrocarbons.

Estimated Volumes and Material Types - RA8-2. The test pit logs indicate that approximately two feet of wood chips overlie sand to silty sand. Sample A8-02B was of sand below the wood chips (depth 2 to 3.5 feet) and sample TP-9 was of sand from a reported depth of 2-feet. The water table lies at a depth of approximately 5-feet. Approximately 190 cubic yards (323 tons) of wood chips and 100 cubic yards (170 tons) of contaminated soil are estimated to be present in the RA 8-2 area based on a remediation area of approximately 55-feet by 45-feet; a wood chip thickness of 2-feet; and a contaminated soil thickness of 1-feet.

Estimated Cost - RA 8-2. The estimated cost to remediate this area is approximately $15,000 as summarized below:

	Landfill	**Thermal**
• Excavation and On-site Stockpiling	$3,950	$3,950
• Screening (if required)	not req.	not req.
• Backfilling	$3,450	$3,450
• Transportation/Disposal/Treatment	$6,290	$6,800
• ESTIMATED TOTAL	$13,690	$14,200

Remedial Approach - RA 8-2. The wood chips would be stripped from the remediation area and be placed in a separate stockpile. Soils which exceed action levels would be disposed of in an off-site landfill.

Remediation Area RA8-3

Contaminants of Concern. Area RA8-3 is apparently associated with wood treating (sap stain prevention and end seal) and fuel storage (Figures 1, 7 and 8). Samples A8-07 and A8-06 are associated with an above ground storage diesel tank. Samples A8-09 and TP-111 are associated with the former wood treatment area. These two areas were separated by railroad tracks and the former framing shop. Samples from test pits A8-06, A8-07, A8-09, A8-10 and TP111 were obtained in 1993 and analyzed for:

	A8-06	**A8-07**	**A8-09**	**A8-10a**	**TP111(S1)**
TPH - Diesel Range	190 mg/kg	43 mg/kg	29,000 mg/kg	<20	--------
TPH - Heavy Oil Range	3,400 mg/kg	510 mg/kg	47,000 mg/kg	2,300	1,700 mg/kg
PCP	---------	-------	200 mg/kg	0.039 mg/kg	5.9J mg/kg
PCB	---------	-------	--------	--------	--------
CPAHs	---------	-------	<36 mg/kg	<1.6 mg/kg	0.63J mg/kg
Volatile Organic Chemicals					
2-Butanone	0.005J	-------	<0.05 mg/kg	not detected	--------
Xylenes	<0.011	-------	0.014J mg/kg	not detected	--------

In October 1995, a series of additional test pits were excavated to assist in refining the remediation requirements in this area. Specifically, testing is being completed to assess the extent of soil which may be designated as a Washington State Dangerous Waste under

Chapter 173-303 WAC because of the presence of PCP greater than 100 mg/kg. The results of the laboratory testing of these samples are expected to be available in late October 1995.

Estimated Volumes and Material Types - RA8-3. The test pit logs of A8-06, A8-07, A8-09, and A8-10 indicate that RA8-3 is underlain by approximately 0.75-feet to 1.5-feet of asphalt and sandy gravel base which in turn is underlain by sand. The upper portion (approximately one foot thick) of the sand is blackish in color. The water table was encountered at depths between 4-feet and 7.75-feet during the test pit excavations in December 1993. In October 1995, the water table was encountered at depths of between 4-feet and 5-feet. The deepest depth to water was at location A8-06 adjacent to the Snohomish River. The water table at A8-06 can be expected to vary with tides. In 1995, an oily material was observed on the water table in several of the test pits immediately surrounding location A8-09.

The samples collected and analyzed from the test pits (in 1993) ranged in depth from approximately 1-foot to 4-feet. Deeper samples were also obtained from locations A8-10 (2.2- to 3.2-feet) and TP111 (2.3- to 3.0-feet). The analytical results from these samples indicate the presence of soil which meets the soil cleanup action level. Based on the soil quality analyses and depth to the water table, an excavation depth of 4-feet is assumed to estimate an excavation volume.

Figures 7 and 8 show the area used to estimate excavation volumes. The available data only allows a rough estimation of volumes because no data is available to define a south boundary of the area requiring remediation. Assuming an excavation area of approximately 10,400 square feet, to a depth of 4-feet, an excavation volume of approximately 1,540 cubic yards (2,620 tons) is estimated. Assuming that the top 1-feet of paving material would be separated and stockpiled, a disposal volume of approximately 1,160 cubic yards (1,970 tons) is estimated.

Estimated Cost - RA8-3. Assuming the volume of soil discussed above is representative of the site conditions at RA8-3, the estimated cost to remediate this area is approximately $191,000 as summarized below:

	Landfill
• Excavation and On-site Stockpiling	$20,960
• Screening (if required)	not req.
• Backfilling	$18,340
• Transportation/Disposal/Treatment	$72,970
• ESTIMATED TOTAL	$112,270

Remedial Approach - RA8-3. No excavation of petroleum containing soil from locations A8-06 and A8-07 is necessary because TPH concentrations are below the soil cleanup action level.

Soils which exceed cleanup levels in the vicinity of the former treating shed would be excavated and be disposed of in an off-site landfill. Thermal treatment of soils from this area is not possible because of the presence of PCP greater than 100 mg/kg.

As previously discussed, soil containing PCP concentrations greater than 100 mg/kg may be designatable as a "State only" dangerous waste under WAC 173-303. In the past such soil would have had to be disposed of at a hazardous waste landfill. However, under amendments to the Dangerous Waste Regulations (see new Section 5 to Chapter 70.105 RCW), such materials potentially can be disposed of at landfills that meet the applicable minimum functional standards for the disposal of municipal solid waste provided that:

- The solid waste is generated pursuant to a consent decree issued under Chapter 70.105D; and
- The consent decree charaterizes the solid waste and specifies a department approved disposal location.

It is Weyerhaeuser's understanding that the landfills being considered for disposal meet the necessary requirements. Weyerhaeuser intends to work with Ecology to assess disposal options for soil containing greater than 100 mg/kg PCP from Remediation Area RA 8-3.

Remediation Area RA 8-4

Contaminants of Concern: Remediation area RA8-4 is located south of RA8-3 in the immediate vicinity of wells MW-100S and MW-100D (Figure 1). Surface soil sample A8-01-SA was reportedly obtained from a small surface stained area adjacent to railroad tracks which bisect the area. The results of the analysis indicated the following constituent concentrations:

	A8-01-SA
TPH - Diesel Range	NA
TPH - Heavy Oil Range	NA
PCP	110 mg/kg
CPAHs	131 mg/kg

NA- not analyzed

Estimated Volumes and Material Types. The log of MW-100S and 100D indicate that approximately 8-feet to 9-feet of sand overlies the fine grained clay deposits. The log of MW-100D indicates no noticeable odors were encountered during drilling and soil sampling. Analysis of ground-water samples from well MW-100S indicates that the ground-water cleanup levels are attained at this location. PCP was not detected at a sample quantitation limit of 0.1U ug/l. The available information suggests that only a limited volume of soil (likely less than 5 to 10 cubic yards) exceeds the PCP action level of 100 mg/kg.

Remedial Approach - RA8-4. The exact location of the surface sample is unknown, therefore a shallow surface scrape will be performed with an excavator and soils which exceed cleanup levels would be excavated and be disposed of in an off-site landfill. This work would be completed as an extension of remediation of RA8-3.

Remediation Area RA9-1

Contaminants of Concern. Area RA9-1 lies within the area of the former machine shop (Figures 1, 3 and 4). A portion of the remediation area also lies within the area of the Mill B fire. Because of the nature of the materials (soil, wood chips and demolition debris), this area potentially will be one of the more complicated areas to remediate.

Samples from test pits A9-11 and TP-93 define the RA9-1 remediation area. The analytical results and materials encountered in the test pits are summarized in Table 8.

As shown on Figures 3 and 4 and summarized in Table 8:

- Test pits A9-11 and TP-93 define an area of petroleum hydrocarbon concentrations which exceed the TPH soil action level.

Estimated Volumes and Material Types. The test pit logs indicate that a wide variety of materials will be encountered during remediation in the RA9-1 area. These materials include wood chips and demolition debris. During excavation, it can be anticipated that concrete foundations will be encountered.

The RA9-1 (and RA7-2) areas pose the highest uncertainty, compared to other areas on the site, with respect to estimating the volume of material which may have to be excavated. The uncertainty is associated with both the horizontal and vertical extent of the contaminants. For cost estimating purposes, possible excavation volumes were estimated using the following assumptions:

- The general remediation area is shown on Figures 3 and 4,
- Wood chips do not require remediation, and
- The depth of excavation is limited by the water table at A9-11.

Based on these assumptions, we estimate the excavation quantities to be approximately 300 cubic yards (510 tons) and disposal quantities to be 240 cubic yards (408 tons).

Estimated Cost - RA9-1. Assuming the volume of soil discussed above is representative of the site conditions, the estimated cost to remediate this area is approximately $25,000 as summarized below:

	Landfill
• Excavation and On-site Stockpiling	$6,120(1)
• Screening (if required)	(2)
• Backfilling	$ 3,570
• Transportation/Disposal/Treatment	$15,096
• ESTIMATED TOTAL	$24,786

Notes: (1) - The cost of excavation was adjusted upward (to $12/ton) to account for the increased difficulty of excavating the target materials.
(2) - Some screening may be warranted. However, a cost to screen cannot be reliability predicted with the available data.

Remedial Approach - RA9-1. The wood chips would be stripped from the remediation area and be placed in a separate stockpile. Concrete and other debris will be separated and stockpiled on-site. Soils which exceed action levels would disposed of in an off-site landfill. Thermal treatment of materials from this area is not possible because of the nature of the materials.

Remediation Area RA 10-1

Contaminants of Concern. RA 10-1 is the site of a former above ground diesel fuel tank (Figure 1). Samples from test pits A10-03 and A10-04 were obtained and analyzed for petroleum hydrocarbons. A sample from A10-03 was also analyzed for volatile organic compounds. The results are summarized below:

	A10-03	A10-04
TPH - Diesel Range	4,300 mg/kg	870 mg/kg
TPH - Heavy Oil Range	2,300 mg/kg	1,700 mg/kg
Volatile Organic Compounds	not detected	------

Historical data do not indicate the presence of PCBs, PCP or CPAHs.

The TPH soil concentrations are below the cleanup action level. Based on the data, no remediation is required in RA10-1.

Remediation Area RA10-2

Contaminants of Concern. RA10-2 is reportedly the site of a former transformer (Figures 1, 9 and 10). The primary contaminants of concern are PCBs. The soil quality results of sample A10-05 obtained in 1993 from this location are summarized below.

DRAFT

	A10-05
TPH - Diesel Range	230 mg/kg
TPH - Heavy Oil Range	1000 mg/kg
PCP	<790 mg/kg
PCB	87 mg/kg
CPAHs	<330 mg/kg

In October 1995, seven additional test pits were excavated to assist in refining the remediation requirements in this area (Figures 9 and 10). The purpose of the testing was to assess the extent of soil which may require special disposal because of PCB concentrations greater than 50 mg/kg. The samples were obtained from test pits excavated to the water table that was encountered at depths of between 1.5-feet to 2.5-feet. Excavation of the pits revealed that approximately 1-feet of wood chips overlies a fine to medium sand. Samples were obtained from approximately the top 1-feet of the sand zone.

Seven soil samples were submitted to North Creek Analytical for analysis of PCBs using EPA Method 8081. The results of the laboratory testing of these samples are shown on Figure 10. As shown, PCBs were only detected above the reporting limit of 0.05U mg/kg in sample TP10-2-7 at a concentration of 0.063 mg/kg. All the October 1995 sampling results are well below the PCB soil cleanup level of 17 mg/kg.

Estimated Volumes and Material Types. The test pit logs indicate that approximately 1-foot of wood chips lies over sand. The water table is anticipated to be encountered at depths of between 1-feet and 2.5-feet depending on season and thickness of the wood chips. The A10-05 sample was obtained from a depth interval of approximately 0.75 to 1.25 feet. The available data indicates that PCBs above the cleanup level are localized to the former transformer location. Assuming an excavation 15-feet by 20-feet by 1.5-feet deep, a volume of approximately 15 cubic yards (25 tons) is estimated.

Estimated Cost - Assuming the volume of soil discussed above is representative of the site conditions at RA10-2, the estimated cost to remediate this area is approximately $4,000.

	Landfill
• Excavation and On-site Stockpiling	$200
• Screening (if required)	not req.
• Backfilling	$175
• Transportation/Disposal/Treatment	$3,500
• ESTIMATED TOTAL	$3,875

Proposed Remedial Approach - Soils within the area defined by the test pit sampling would be excavated and disposed of off-site. Based on conversations with Ecology and on the close spacing of the test pits, no confirmation sampling would be performed at this

DRAFT

location. The A10-05 sample exceeds the Regional Disposal Company's PCB acceptance criteria, however, it is anticipated that lower concentrations will be present in the stockpiled soil after excavation when acceptance sampling will be conducted. If the stockpiled soil still exceeds the identified landfill acceptance criteria, the soil will be disposed of as a TSCA regulated waste at the Chemical Waste Management's hazardous waste landfill in Arlington, Oregon or in another approved off-site facility.

Remediation Area RA10-3

Contaminants of Concern. RA 10-3 is apparently associated with a former dip tank (Figures 1, 9 and 10). Petroleum hydrocarbons were detected at concentrations between 4,500 mg/kg and 12, 000 mg/kg (Figure 9). The hydrocarbons are predominately heavy oil range hydrocarbons. PCP was detected at concentrations between approximately 6 mg/kg and 24 mg/kg. Where analyzed, PCBs were not detected above cleanup levels (Figure 10).

Estimated Volumes and Material Types - RA10-3. The logs of test pits in this area indicate that soils consist of approximately one foot of sand fill and wood chips which lie over a sandy silt. The water table was encountered at a depth of 2.5 feet at location A10-10. An estimated 30 cubic yards (50 tons) exceeds the TPH soil action level of 10,000 mg/kg. This volume assumes that excavation will occur to a depth of two feet over an area of approximately 425 square feet.

Estimated Cost - RA10-3 - Assuming the volume of soil discussed above is representative of the site conditions at RA10-3, the estimated cost to remediate this area is approximately $3,000 as summarized below:

	Landfill	**Thermal**
• Excavation and On-site Stockpiling	$400	$400
• Screening (if required)	not req.	not req.
• Backfilling	$350	$350
• Transportation/Disposal/Treatment	$1,850	$2,000
• ESTIMATED TOTAL	$2,600	$2,750

Remedial Approach - RA10-3. Soils which exceed cleanup levels would be disposed of in an off-site landfill. Thermal treatment of materials from this area is not possible because of the physical nature of the materials.

Remediation Area RA 10-4

Contaminants of Concern. RA 10-4 is the site of a former planning mill (Figures 1, 9 and 10). As shown on Figure 9, TPH concentrations consist predominately of heavy oil. The highest concentrations were detected at locations TP-6I (78,000 mg/kg), A10-07

(16,000 mg/kg) and TP-204 (10,000 mg/kg). Figure 10 shows concentrations of PCB and PCP. The sample results are below soil cleanup levels for these constituents. The data indicate that petroleum hydrocarbons are of primary concern for this remediation area.

Estimated Volumes and Material Types - RA 10-4. The test pit logs indicate that soil beneath the identified area consists of a layer of wood chips approximately one foot thick which overlies sand. The depth to the water table is approximately one to two feet.

Within the RA10-4 area, three general locations exceed the TPH cleanup of 5,000 mg/kg including A10-07 and TP-6I (Figure 9). The combined estimated volume which exceeds 10,000 mg/kg TPH is estimated to be approximately 200 cubic yards (340 tons) assuming excavation to the water table (2-feet).

Estimated Cost - RA 10-4. The estimated cost to remediate this area is approximately $20,000 as summarized below:

	Landfill	**Thermal**
• Excavation and On-site Stockpiling	$2,720	$2,720
• Screening (if required)	not req.	not req.
• Backfilling	$2,380	$2,380
• Transportation/Disposal/Treatment	$12,580	$13,600
• ESTIMATED TOTAL	$17,680	$18,700

Remedial Approach - RA 10-4. Soils which exceed cleanup levels would be disposed of in an off-site landfill. Thermal treatment of materials from this area is not possible because of the physical nature of the materials.

SUMMARY OF ESTIMATED REMEDIAL COSTS

Table 9 presents a summary of estimated soil volumes to be handled and disposed of during the remediation along with estimated costs. As shown on the table, the available data indicates that approximately 2,710 cubic yards would be excavated and approximately 2,075 cubic yards would require treatment or disposal to meet the soil cleanup action levels presented in this memorandum. The estimated cost to complete the work is approximately $255,000 as summarized below:

• Excavation and Backfilling	$ 72,500
• Treatment/Disposal	133,000
• Other Costs	49,500
• Estimated Total	$255,000

Note that this estimated cost does not include monitoring ground-water quality.

CONCEPTUAL SOIL CONFIRMATION SAMPLING APPROACH

The general requirements for compliance monitoring of cleanup actions are outlined in WAC 173-340-410 of the MTCA. Typically compliance monitoring consists of:

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

- **Performance Monitoring** to confirm that the cleanup action has attained cleanup standards, and if appropriate, other performance standards; and

- **Confirmation Monitoring** to confirm the long-term effectiveness of the cleanup action once cleanup standards and, if appropriate, other performance standards have been attained.

This conceptual plan focuses on the approach to be used to collect soil samples during the remediation to confirm that the soil cleanup standards have been attained. Protection Monitoring requirements will be addressed in a site specific Health and Safety Plan and Confirmation Monitoring will be addressed in a Ground-Water Quality Monitoring Plan. These latter two plans will be submitted to Ecology for review and approval at a later date. In addition, prior to beginning work, a more detailed sampling and analysis plan will be submitted to Ecology for review and approval. This plan will include quality assurance procedures.

Objectives of Performance Monitoring. The objective of the performance soil monitoring is to provide data to assess whether and where, within the identified remediation areas, soil cleanup action levels are being attained. The soil cleanup action levels for the chemicals of concern are as follows:

- Petroleum Hydrocarbons - 10,000 mg/kg
- PCBs - 17 mg/kg
- Pentachlorophenol (PCP) - 1,090 mg/kg
- CPAHs - 18 mg/kg

Collection of Performance Monitoring Data. Visual observation and field screening (such as sheen testing) will be used to qualitatively assess the extent of excavation required in an area. Following completion of the initial excavation activities, soil samples will be obtained and analyses will be made on selected samples for the target analytes of concern as summarized in Table 9.

- Excavation sidewall samples will be collected at a frequency of one sample for every linear 50-feet of sidewall. One composite sidewall sample will be collected for every

3-feet to 5-feet of vertical excavation, depending on the total depth of excavation. At least four sidewall samples will be obtained from each excavation.

- Where the bottom of the excavation does not encounter ground water, a bottom sample will be randomly collected within grids of approximately 25-feet by 50-feet (approximately every 1,250 square feet) of bottom excavation area. No bottom samples will be obtained in excavations which penetrate the water table.

Sampling Handling and Analysis Procedures. Samples will be obtained using individual stainless steel spoons from representative excavation surfaces. Care will be taken to minimize the potential for cross contamination between samples by using clean individual stainless steel spoons to collect the samples.

Field Locating Sampling Sites. Sample locations will be measured as to horizontal and vertical location using a surveyed control point for each remediation area. A licensed surveyor will survey each control point and sample locations will be measured using a cloth tape or other suitable method by an owner's representative.

Analysis Parameters and Methods. Soil samples will be analyzed for the chemicals of concern using the following methods:

Analyte	Method
Petroleum Hydrocarbons	WTPH-D (extended) w/ silica gel cleanup (see below)
PCBs	EPA Method 8081
PCP	EPA Method 8040
CPAHs	EPA Method 8310

Weyerhaeuser and Ecology have agreed on a TPH method which includes a sulfuric acid/silica cleanup procedure. The details of this procedure are outlined in a Weyerhaeuser (Stuart Triolo) letter to Ecology (Paul Skyllingstad) dated October 17, 1994. The same TPH analytical method is proposed for use at the East Site.

Interpretation of Performance Monitoring Data. The results of the soil samples analyzed as part of the cleanup action and as part of past site studies (as appropriate) will be used to assess performance of the interim action. If the sample results are below the soil action levels, the area represented by the sample will be considered to meet the performance criteria.

REFERENCES

DOF(Dalton, Olmsted & Fuglevand), 1995a, Draft Technical Memorandum - Potential Remediation Areas, Weyerhaeuser East Site, Everett, Washington, August 9, 1995.

DOF(Dalton, Olmsted & Fuglevand), 1995b, Results of Low Flow Ground-Water Sampling, Weyerhaeuser East Site, Everett, Washington, September 21, 1995.

Ecology, 1987, Discharges Containing Oil and Grease of Mineral Origin, Department of Ecology Water Quality Guideline 9, September 1987.

EMCON, 1993, Evaluation of Soil Treatment Alternatives, Weyerhaeuser Everett East Site, August 19, 1993.

EMCON, 1995, South End Follow-Up Summary Report, Weyerhaeuser Everett East Site, March 17, 1995; presented as Appendix B or the EMCON Operable Unit Summary Report, Weyerhaeuser East Site, March 17, 1995.

Weyerhaeuser, 1994, Letter to Paul Skyllingstad, Department of Ecology, WTPH-D Analytical Methods, October 17, 1994.

TABLE 1 - Summary of Additional Soil Quality Data (Key to Table on Page 3 of 3)

Weyerhaeuser East Site, Everett, Washington

Spl. No.	TP-99S1	TP-99S2	TP-9	TP-9	TP-10S1	TP-91S1	TP-91S2	TP-91S3	TP-92S1	TP-93S1	TP-93S2	TP-94S1	TP-95S1	TP-10	TP-10	TP-12S1	TP-12S2	TP-13S1	TP-14S1
Depth	na	na	2	0-6	1	1	2.5	4.5	2	0.5	1	0.75	0.75	0-0.5	1-1.5	na	na	na	na
Source	EMCON	EMCON	Weyer.	Weyer.	EMCON	EMCON	EMCON	EMCON	EMCON	EMCON	EMCON	EMCON	EMCON	Weyer.	Weyer.	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)
Parameter/Area	**6**	**6**	**8**	**8**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**10**	**10**	**10**	**10**
Petroleum Hydrocarbons (mg/kg)																			
HCID	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
WTPH-G	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	<25	<25	<25	<25
WTPH-DX																			
Diesel Range	nd	nd	-----	-----	nd	nd	nd	nd	nd	nd	nd	nd	nd	-----	-----	<25	<25	<25	<25
Heavy Oil	110	47	-----	-----	4	nd	53	6	320	5400	38	89	nd	-----	-----	230	<25	<25	<25
EPA 418.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Type	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
PCBs/Pesticides (mg/kg)																			
beta-BHC	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Aldrin	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4,4'-DDE	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Endrin	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Endosulfan II	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4,4'-DDD	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4,4'-DDT	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Methoxychlor	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Endrinaldehyde	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
alpha Chlordane	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
gamma-Chlordane	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Aroclor-1016	-----	-----	<0.25	<0.25	-----	-----	-----	-----	-----	-----	-----	-----	-----	<0.25	<0.25	-----	-----	-----	-----
Aroclor-1242	-----	-----	<0.25	<0.25	-----	-----	-----	-----	-----	-----	-----	-----	-----	<0.25	<0.25	-----	-----	-----	-----
Aroclor-1254	-----	-----	<0.25	<0.25	-----	-----	-----	-----	-----	-----	-----	-----	-----	<0.25	<0.25	-----	-----	-----	-----
Aroclor-1260	-----	-----	0.19	<0.25	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.2	<0.25	-----	-----	-----	-----
Total PCBs	0.037	nd	-----	-----	0.026	nd	-----	-----	0.009	0.2	nd	nd	nd	-----	-----	-----	-----	-----	-----
Phenols (mg/kg)																			
2,3,5,6-Tetrachlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,3,4,6-Tetrachlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,3,4,5-Tetrachlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pentachlorophenol																			
by GC/MS	nd	-----	0.38J	0.048J	0.0229	nd	-----	-----	nd	0.0106	-----	nd	nd	-----	-----	-----	-----	-----	-----
by GC-ECD	-----	-----	0.42	0.041	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	7.8	0.79	0.07	1.7
Volatiles (mg/kg)																			
Acetone	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2-Butanone	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Xylenes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Semivolatiles (mg/kg)																			
4-Methylphenol	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1,2,4-Trichlorobenzene	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Naphthalene	-----	-----	0.080J	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2-Methylnaphthalene	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Acenaphthylene	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Acenaphthene	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Dibenzofuran	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Fluorene	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4-Nitroaniline	-----	-----	1.7U	1.8U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Phenanthrene	-----	-----	0.23J	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anthracene	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Carbazole	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Fluoranthene	-----	-----	0.36	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pyrene	-----	-----	0.3J	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzo(a)anthracene	-----	-----	0.08J	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Chrysene	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
bis(2-Ethylhexyl) phthalate	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzo(b)fluoranthene	-----	-----	0.11J	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzo(k)fluoranthene	-----	-----	0.062J	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzo(a)pyrene	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Indeno(1,2,3-cd)pyrene	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Dibenzo(a,h)-anthracene	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzo(g,h,i) perylene	-----	-----	0.36U	0.37U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Metals (mg/kg)																			
Arsenic	-----	-----	14	<5	-----	-----	-----	-----	-----	-----	-----	-----	-----	6	<5	-----	-----	-----	-----

TABLE 1 - Summary of Additional Soil Quality Data (Key to Table on Page 3 of 3)

Weyerhaeuser East Site, Everett, Washington

Spl. No.	TP-14S2	TP-15S1	TP-16S1	TP-16S2	TP-16S3	TP-16S4	TP-17CMP	TP-18CMP	TP-19CMP	TP-20S1	TP-20S2	TP-20S3	TP-20S4	TP-21CMP	TP-22CMP	TP-1	TP-1	TP-2
Depth	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0-0.5	1.25	1.25
Source	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)	HartCrowser(1)	Weyer.	Weyer.	Weyer.
Parameter/Area	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Petroleum Hydrocarbons (mg/kg)																		
HCID	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
WTPH-G	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	-----	-----	-----
WTPH-DX																		
Diesel Range	<25	<25	<25	<25	<25	<25	<25	<25	<25	100	72	<25	<25	<25	<25	-----	-----	-----
Heavy Oil	<25	<25	480	6800	8400	310	200	46	200	94	490	81	<25	<25	110	-----	-----	-----
EPA 418.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Type	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
PCBs/Pesticides (mg/kg)																		
beta-BHC	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Aldrin	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4,4'-DDE	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Endrin	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Endosulfan II	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4,4'-DDD	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4,4'-DDT	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Methoxychlor	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Endrinaldehyde	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
alpha Chlordane	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
gamma-Chlordane	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Aroclor-1016	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Aroclor-1242	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Aroclor-1254	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Aroclor-1260	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total PCBs	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Phenols (mg/kg)																		
2,3,5,6-Tetrachlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,3,4,6-Tetrachlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,3,4,5-Tetrachlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pentachlorophenol																		
by GC/MS	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	12	18	0.26J
by GC-ECD	1.2	<0.025	<0.025	<0.025	<0.025	<0.025	0.03	<0.025	<0.025	0.05	0.13	0.1	0.06	<0.025	<0.025	-----	-----	-----
Volatiles (mg/kg)																		
Acetone	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2-Butanone	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Xylenes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Semivolatiles (mg/kg)																		
4-Methylphenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.75U	1.1U	0.8U
1,2,4-Trichlorobenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.75U	1.1U	0.8U
Naphthalene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.14J	0.13J	0.8U
2-Methylnaphthalene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.75U	1.1U	0.8U
Acenaphthylene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.12J	1.1U	0.8U
Acenaphthene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.75U	1.1U	0.8U
Dibenzofuran	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.75U	1.1U	0.8U
Fluorene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.75U	1.1U	0.8U
4-Nitroaniline	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.75U	5.5U	3.9U
Phenanthrene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.61J	0.43J	0.8U
Anthracene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.75U	1.1U	0.8U
Carbazole	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Fluoranthene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2	1.4	0.8U
Pyrene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.6	1.2	0.8U
Benzo(a)anthracene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.0	0.62J	0.8U
Chrysene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.3	0.86J	0.8U
bis(2-Ethylhexyl) phthalate	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.2	2	0.15J
Benzo(b)fluoranthene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.3	0.72J	0.8U
Benzo(k)fluoranthene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.67J	0.64J	0.8U
Benzo(a)pyrene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.95	0.66J	0.8U
Indeno(1,2,3-cd)pyrene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.63J	1.1U	0.8U
Dibenzo(a,h)-anthracene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.75U	1.1U	0.8U
Benzo(g,h,i) perylene	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.75U	1.1U	0.8U
Metals (mg/kg)																		
Arsenic	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	<10	<20	<20

TABLE 1 - Summary of Additional Soil Quality Data (Key to Table on Page 3 of 3)

Spl. No.	TP-2	TP-2	TP-3	TP-3	TP-4	TP-4	TP-5I	TP-5II	TP-6I	TP-6II	TP-6III	TP-6IV	TP-7	TP-8
Depth	1.2-2.2	5.5	0-1	2	0-1.5	1.5	0-2	0-2.5	0-3	0-3	0-3	0-3	0-3	0-2
Source	Weyer.	Weyer.	Weyer.	Weyer.	Weyer.	Weyer.	Weyer.	Weyer.	Weyer.	Weyer.	Weyer.	Weyer.	Weyer.	Weyer.
Parameter/Area	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**
Petroleum Hydrocarbons (mg/kg)														
HCID	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
WTPH-G	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
WTPH-DX														
Diesel Range	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Heavy Oil	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
EPA 418.1	-----	-----	-----	-----	-----	-----	2000	920	78000	5800	6100	500	-----	-----
Type	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
PCBs/Pesticides (mg/kg)														
beta-BHC	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Aldrin	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4,4'-DDE	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Endrin	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Endosulfan II	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4,4'-DDD	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
4,4'-DDT	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Methoxychlor	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Endrinaldehyde	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
alpha Chlordane	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
gamma-Chlordane	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Aroclor-1016	-----	-----	-----	-----	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Aroclor-1242	-----	-----	-----	-----	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Aroclor-1254	-----	-----	-----	-----	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Aroclor-1260	-----	-----	-----	-----	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Total PCBs	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Phenols (mg/kg)														
2,3,5,6-Tetrachlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,3,4,6-Tetrachlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2,3,4,5-Tetrachlorophenol	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pentachlorophenol														
by GC/MS	0.61J	3.1U	5.7U	2.1U	6.8U	2.0U	-----	-----	-----	-----	-----	-----	2.2U	-----
by GC-ECD	-----	-----	0.005	0.011	0.027	0.003	-----	-----	-----	-----	-----	-----	0.03	1.9U
Volatiles (mg/kg)														
Acetone	0.010U	0.24E	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2-Butanone	0.010U	0.062	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Xylenes	0.005U	0.005U	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Semivolatiles (mg/kg)														
4-Methylphenol	0.37U	0.63U	1.2U	0.43U	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
1,2,4-Trichlorobenzene	0.37U	0.63U	1.2U	0.43U	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Naphthalene	0.14J	0.63U	1.2U	0.43U	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.046J	0.39U
2-Methylnaphthalene	0.37U	0.63U	1.2U	0.43U	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Acenaphthylene	0.37U	0.63U	1.2U	0.43U	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Acenaphthene	0.37U	0.63U	1.2U	0.43U	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Dibenzofuran	0.37U	0.63U	1.2U	0.43U	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Fluorene	0.37U	0.63U	1.2U	0.43U	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
4-Nitroaniline	1.8U	3.1U	5.7U	2.1U	6.8U	2.0U	-----	-----	-----	-----	-----	-----	2.2U	1.9U
Phenanthrene	0.049J	0.63U	1.2U	0.064J	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.07J	0.39U
Anthracene	0.37U	0.63U	1.2U	0.43U	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Carbazole	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Fluoranthene	0.039J	0.63U	1.2U	0.13J	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.081J	0.39U
Pyrene	0.044J	0.63U	0.14J	0.14J	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.083J	0.39U
Benzo(a)anthracene	0.37U	0.63U	1.2U	0.053J	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Chrysene	0.37U	0.63U	1.2U	0.081J	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
bis(2-Ethylhexyl) phthalate	0.37U	0.63U	4.1	0.15J	1.8	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Benzo(b)fluoranthene	0.37U	0.63U	1.2U	0.060J	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Benzo(k)fluoranthene	0.37U	0.63U	1.2U	0.076J	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Benzo(a)pyrene	0.37U	0.63U	1.2U	0.062J	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Indeno(1,2,3-cd)pyrene	0.37U	0.63U	1.2U	0.43U	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Dibenzo(a,h)-anthracene	0.37U	0.63U	1.2U	0.43U	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Benzo(g,h,i) perylene	0.37U	0.63U	1.2U	0.43U	1.4U	0.41U	-----	-----	-----	-----	-----	-----	0.45U	0.39U
Metals (mg/kg)														
Arsenic	<5	<20	<20	7	25	<5	5	5	<5	<5	<5	<5	<5	<5

Key to Table 4

---- - Compound not analyzed
U - Not detected at indicated value
< - Not detected at indicated value
nd or ND - Not detected (reporting limit not available)
J - Estimated value
B - Constituent detected in laboratory blank
E - Compound exceeded calibration range of instrument
P - Recovery of standards outside control limits
(1) Hart Crowser screening analysis
T - Total PCBs

DRAFT

TABLE 8 - Selected Soil Data Remediation Areas RA9-1 and RA7-2

Weyerhaeuser East Site
Everett, Washington

Location	Sample Depth (ft)	TPH-D (mg/kg)	TPH-O (mg/kg)	PCP (mg/kg)	PCBs (mg/kg)	CPAHs (mg/kg)	Material Type
Remediation Area RA7-2							
A9-05	4 to 5	950	3600	-----	2.4	-----	0'-4' - wood chips 4'-5' - debris (bricks, ash, sand,demolition debris) 5' - concrete foundation
A9-08	3.25 to 5.75	2886	2948	<52	-----	13.5	0'-3' - wood chips 3'-5.75' - bricks, wood, wire, charcoal, sand 5.75' - wooden deck
TP-113	0 to 1	-----	9000	<0.066	1.8	51.2	0'-3.5' - sod over silty, gravelly sand w/ construction debris (brick, concrete, masonry, mortar, wood and some metal (could not dip deeper)
	1-2.5	-----	1100(1)	-----	1.3	-----	
A9-09	0.7 to 1.9	nd(1)	nd(1)	-----	29	-----	0'-0.5' - debris (bricks, ash,sand, roots, wood, metal) 0.5'-3' - concrete box filled w/ debris (bricks, ash, sand and demolition debris)
TP103	3 to 4	90(1)	660(2)	<0.770	6.2	49.7	0'-2 - silty sandy debris 2'-4' - silty sand w/ debris or sl. silty fine sand (concrete footings)
Remediation RA9-1							
A9-11	1.5 to 5	6900	24000	-----	<0.04	-----	0'-1' - asphalt and gravel 1'-4.5' - silty sand 4.5'-5' - sand
TP-93	0.5	nd	5400	0.011	0.2	-----	0'-0.75' - silt w/ wood and metal
	1	nd	38	-----	nd	-----	0.75'-2 - sand

Notes: (1) - Based on HCID analyses
(2) - Based on 418.1 analyses
< - less than indicated value

TABLE 9 - Summary of Remedial Volumes and Estimated Costs

Weyerhaeuser East Site
Everett, Washington

Remediation Area	Excavation & Backfilling		Disposal		Relative Cost ($)
	Volume (yd3)	Cost ($)	Volume (yd3)	Cost ($)	
RA 3-1	—	—	—	—	—
RA 3-2	—	—	—	—	—
RA 7-1	100	$2,550	100	$6,290	$8,840
RA 7-2	225	$7,270	225	$14,170	$21,440
RA 8-1	—	—	—	—	—
RA 8-2	275	$7,400	100	$6,290	$13,690
RA 8-3	1562	$39,300	1166	$72,970	$112,270
RA 8-4	Included w/ RA 8-3				
RA 9-1	303	$9,690	242	$15,096	$24,786
RA 10-1	—	—	—	—	—
RA 10-2	15	$375	15	$3,500	$3,875
RA 10-3	31	$750	31	$1,850	$2,600
RA 10-4	196	$5,100	196	$12,580	$17,680
Total	2707	$72,435	2075	$132,746	$205,181

Other Costs	
Mob./demob.	$10,500
Field documentation and sampling (45 days)	$12,600
Laboratory Analyses	$14,700
Surveying	$4,200
Final Report	$7,500
Subtotal	$49,500

Estimated Total	**$254,681**

TABLE 3 - Estimated Soil Volumes

Weyerhaeuser East Site
Everett, Washington

TPH - Excavation Volumes (In-place cubic yards)

TPH Conc. (mg/kg)	RA3-1	RA7-1	RA7-2(2)	RA8-1	RA8-2	RA8-3	RA9-1	RA10-1	RA10-2(2)	RA10-3	RA10-4	RA8-4(1)	Totals
>20000	0	100	225	0	275	625	63	0	15	0	74	20	1397
>10000	0	100	225	0	275	1542	303	0	15	31	196	20	2707
>5000	75	100	1319	0	275	2083	793	200	15	561	531	20	5972
>2500	100	100	2871	833	275	3150	1303	400	15	1072	907	20	11046
>1000	150	100	6413	833	275	5658	1730	800	15	1660	2144	20	19798

TPH - Disposal Volumes (In-place cubic yards)

TPH Conc. (mg/kg)	RA3-1	RA7-1	RA7-2(2)	RA8-1	RA8-2	RA8-3	RA9-1	RA10-1	RA10-2(2)	RA10-3	RA10-4	RA8-4(1)	Totals
>20000	0	100	225	0	100	468	50	0	15	0	74	10	1042
>10000	0	100	225	0	100	1156	242	0	15	31	196	10	2075
>5000	75	100	881	0	100	1562	634	200	15	561	531	10	4669
>2500	100	100	1812	500	100	2362	1042	400	15	1072	907	10	8420
>1000	150	100	3937	500	100	4243	1384	800	15	1660	2144	10	15043

TPH - Excavation Volumes (In-place cubic yards)

TPH Conc. (mg/kg)	Volume
>20000	1397
>10000	2707
>5000	5972
>2500	11046
>1000	19798

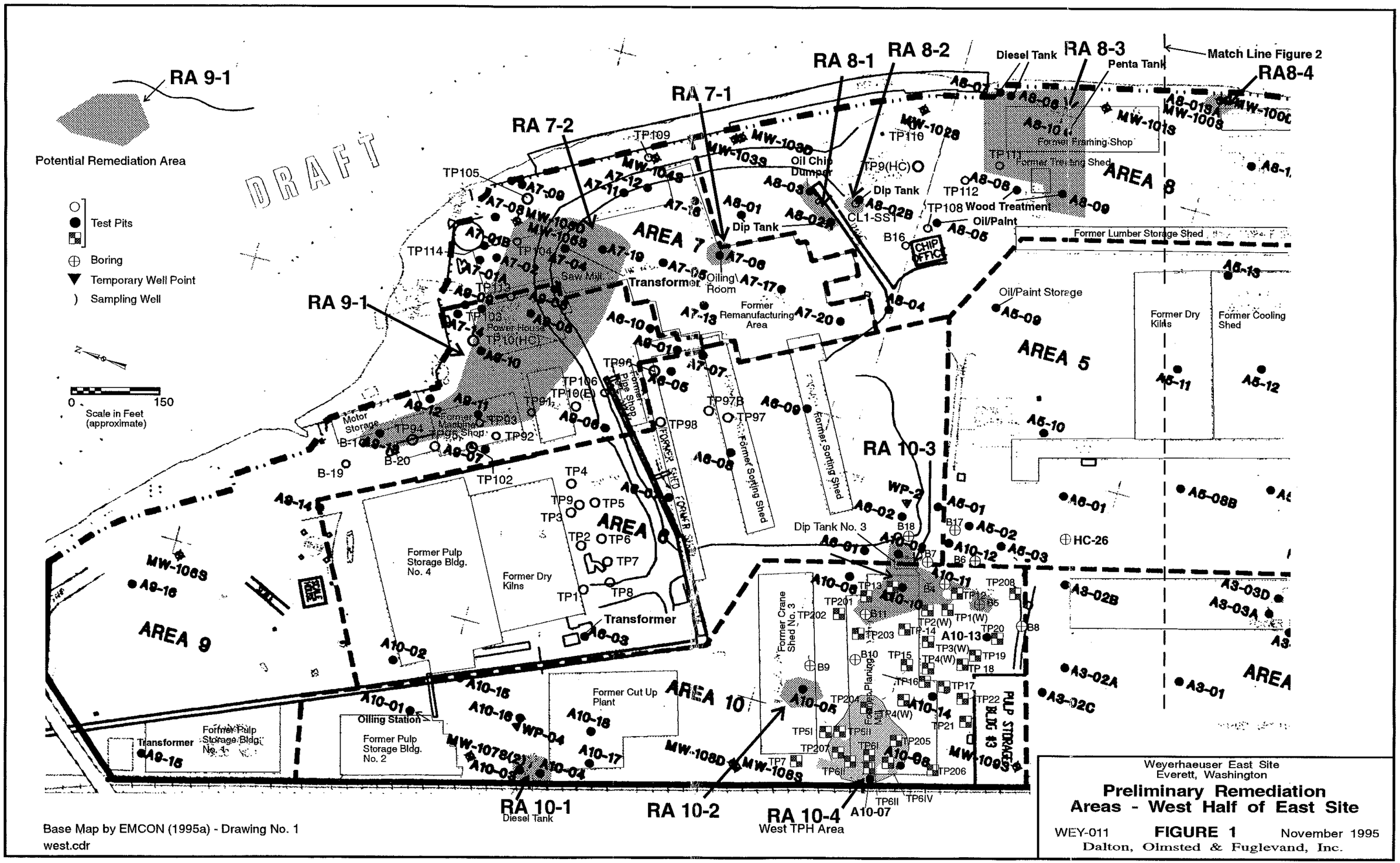
$205,000
$836,509
$1.5

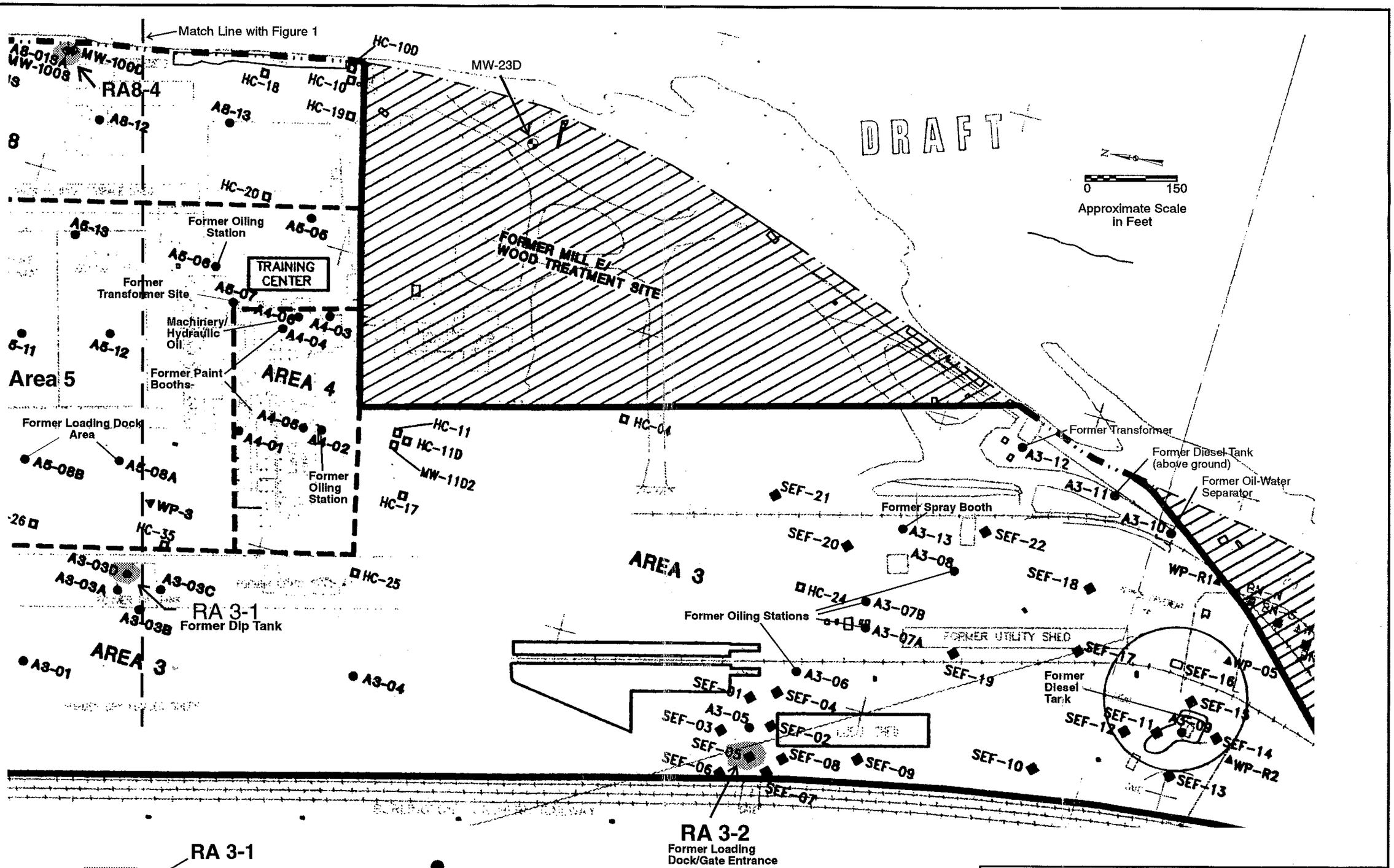
Notes: > - Greater than indicated value
(1) Remediation based on removal of soil containing pentachlorophenol greater than 100 mg/kg.
(2) Remediation based on removal of soil containing PCBs.

DRAFT

TPH - Disposal Volumes (In-place cubic yards)

TPH Conc. (mg/kg)	Volume
>20000	1042
>10000	2075
>5000	4669
>2500	8420
>1000	15043


RA 9-1
Potential Remediation Area
DRAFT
Test Pits
Boring
Temporary Well Point
Sampling Well
0
150
Scale in Feet
(approximate)
RA 7-2
RA 7-1
RA 8-1
RA 8-2
RA 8-3
RA8-4
Match Line Figure 2
Diesel Tank
Penta Tank
Oil Chip Dumper
Dip Tank
Wood Treatment
Oil/Paint
CHIP OFFICE
Former Framing Shop
Former Trimming Shed
Former Lumber Storage Shed
AREA 8
AREA 7
AREA 5
AREA 9
AREA 10
Saw Mill
Transformer
Oiling Room
Former Remanufacturing Area
Power House
Former Pipe Shop
Former Machine Shop
Motor Storage
Former Pulp Storage Bldg. No. 4
Former Dry Kilns
Former Pulp Storage Bldg. No. 1
Former Pulp Storage Bldg. No. 2
Former Cut Up Plant
Oiling Station
Former Crane Shed No. 3
Former Planing Mill
Former Dry Kilns
Former Cooling Shed
Oil/Paint Storage
PULP STORAGE BLDG #3
Former Sorting Shed
RA 9-1
RA 10-3
RA 10-1
Diesel Tank
RA 10-2
RA 10-4
West TPH Area
Dip Tank No. 3
HC-26
Base Map by EMCON (1995a) - Drawing No. 1
west.cdr
Weyerhaeuser East Site
Everett, Washington
Preliminary Remediation Areas - West Half of East Site
WEY-011
FIGURE 1
November 1995
Dalton, Olmsted & Fuglevand, Inc.



Base Map by EMCON (1995a) - Drawing No. 1
east.cdr

Weyerhaeuser East Site
Everett, Washington

Potential Remediation Areas - East Half of East Site

WEY-011 **FIGURE 2** November 1995

Dalton, Olmsted & Fuglevand, Inc.

DRAFT

TPH-DIESEL (mg/kg)
TPH-OIL (mg/kg)

TRPH (418.1) = *
HCID / Field Screening = **

NA - Not analyzed
ND - Not detected

Estimated Area Where PCBs >17 mg/kg

5000 Estimated TPH Conc. Contour in mg/kg

0 75
Scale in Feet (approximate)

RA 7-2

RA9-1

RA 7-1

AREA 7

AREA 9

Pier Ruins

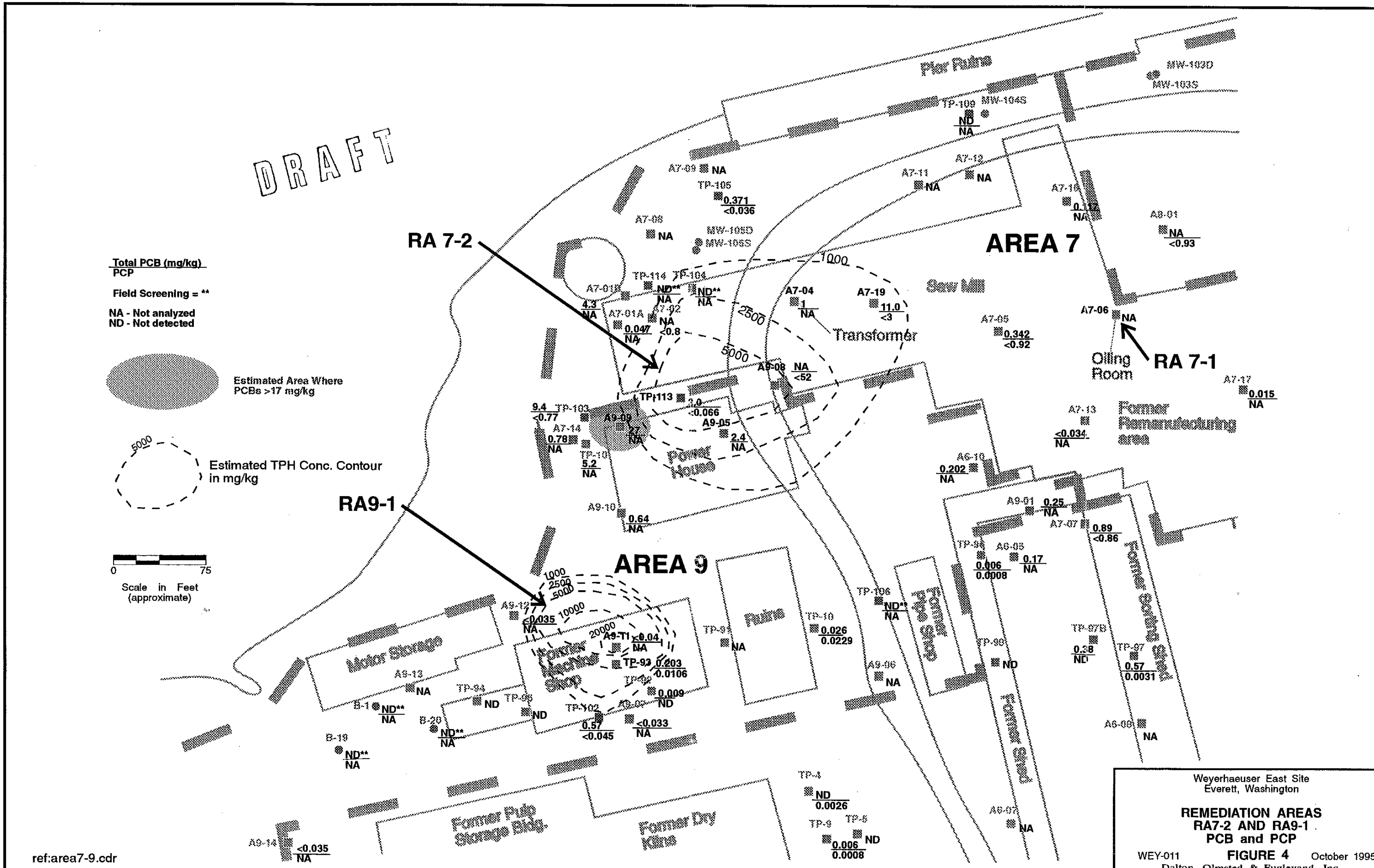
MW-103D
MW-103S
TP-109 350**
MW-104S
A7-09 <19 / 600
TP-105 70**
A7-11 ND
A7-12 ND
A7-10 <19 / 1,400
A8-01 ND
A7-08 431 / 620
MW-105D
MW-105S
TP-114 120**
TP-104 2,300*
A7-01B ND
A7-02 ND
A7-01A <19 / 230
1000
2500
5000
A7-04 NA
A7-19 363 / 1,174
Saw Mill
Transformer
A7-05 NA
A7-06 <420 / 23,000
Oiling Room
A9-08 2,886 / 2,948
TP-113 5,000*
A7-17 <2 / 89
A7-13 ND
Former Remanufacturing area
TP-103 1,610**
A9-09 ND
A7-14 50 / 176 NA
TP-101
A9-05 959 / 3,600
Power House
A9-10 NA
A6-10 110 / 730
A9-01 77 / 270
A7-07 <3 / 140
TP-98
A6-05 NA / 55 / 340
Former Sorting Shed
TP-106 73**
Former Pulp Storage Bldg.
TP-97B ND / 230
TP-97 ND / 140
Former Pulp Storage Bldg.
TP-96 ND / 94
A9-06 23 / 240
A6-09 <3 / 54
A9-12 52 / 410
10000
20000
A9-11 6,900 / 24,000
TP-93 ND / 5,400
Motor Storage
Former Machine Shop
Pulps
TP-9 ND / 53
TP-10 ND / 4
A9-13 58 / 550
TP-94 ND / 89
TP-95 ND
TP-92 ND / 320
TP-102
A9-07 39 / 260
B-1 1,300**
B-20 98**
B-19 ND
TP-4 ND
TP-8
TP-5 ND<3
ND / 3
A6-07 <3 / 15
A9-14 19 / 140
Former Pulp Storage Bldg.
Former Dry Kilns

ref:area7-9.cdr

Weyerhaeuser East Site
Everett, Washington

REMEDIATION AREAS RA7-2 AND RA9-1 TPH

WEY-011 **FIGURE 3** October 1995
Dalton, Olmsted & Fuglevand, Inc.



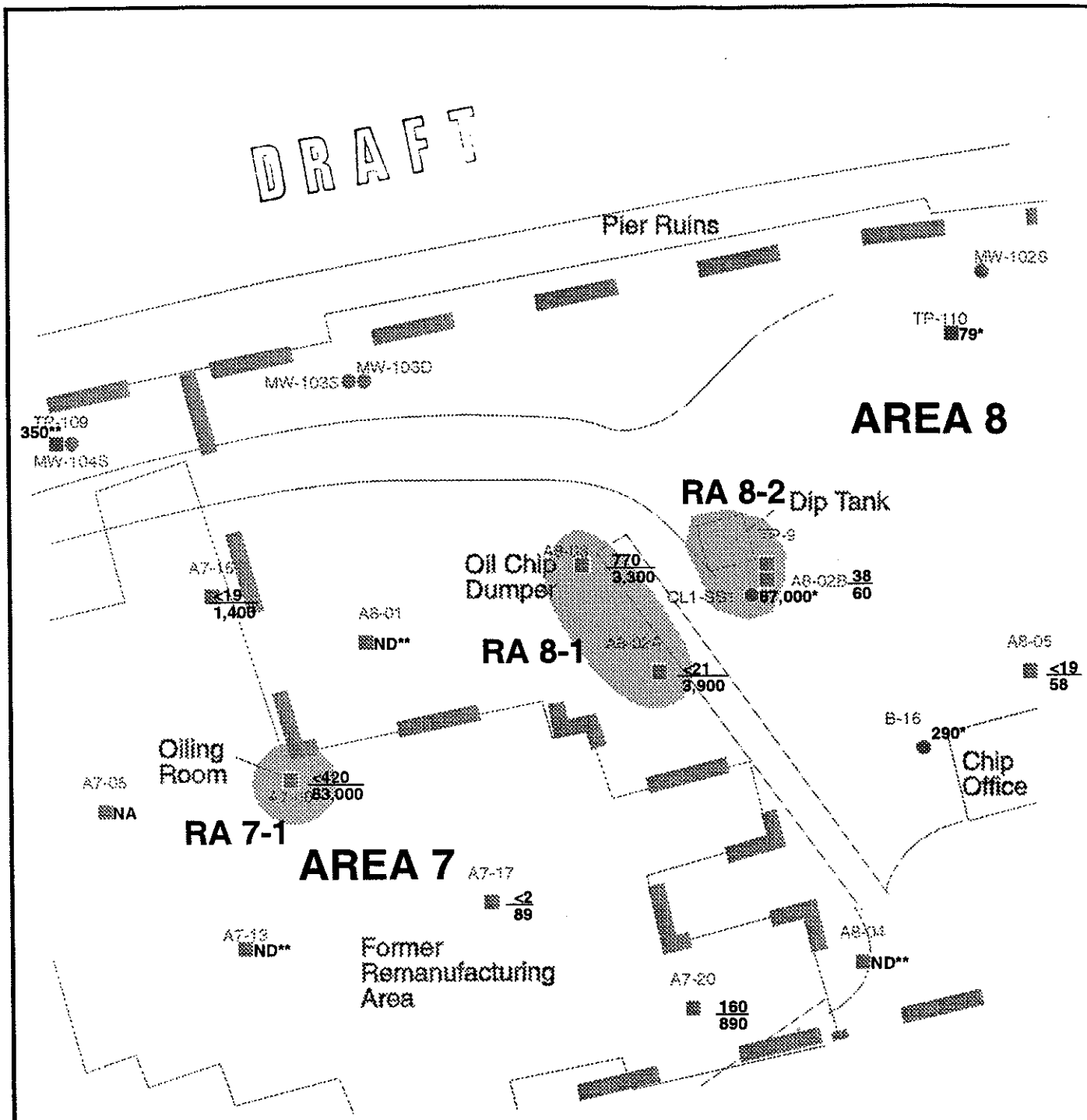
ref:area7-9.cdr

Weyerhaeuser East Site
Everett, Washington

REMEDIATION AREAS RA7-2 AND RA9-1 PCB and PCP

WEY-011 **FIGURE 4** October 1995

Dalton, Olmsted & Fuglevand, Inc.

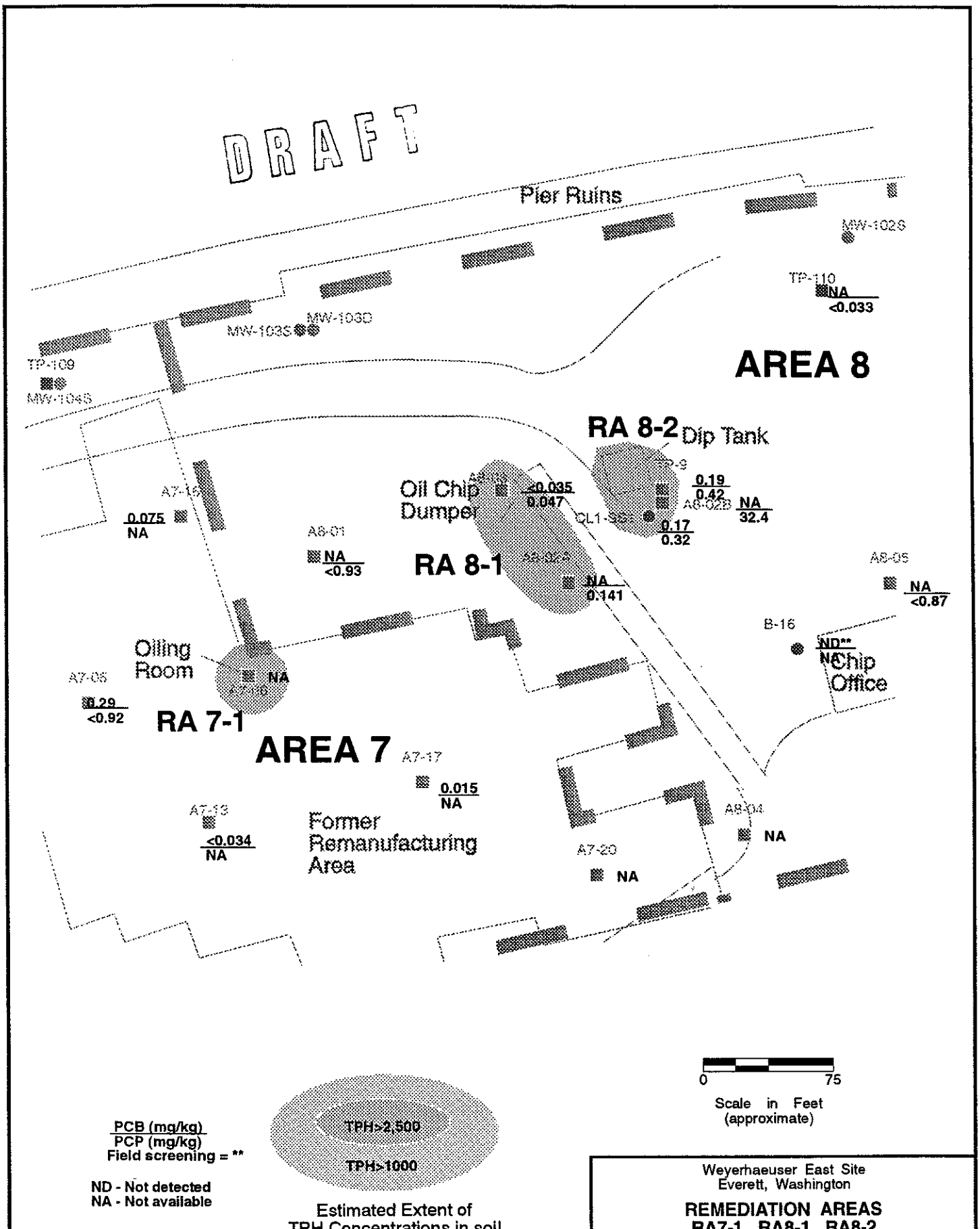


Weyerhaeuser East Site
Everett, Washington

REMEDIATION AREAS
RA7-1, RA8-1, RA8-2
TPH

WEY-011 **FIGURE 5** October 95
Dalton, Olmsted & Fuglevand, Inc.

ref: area7-8.cdr



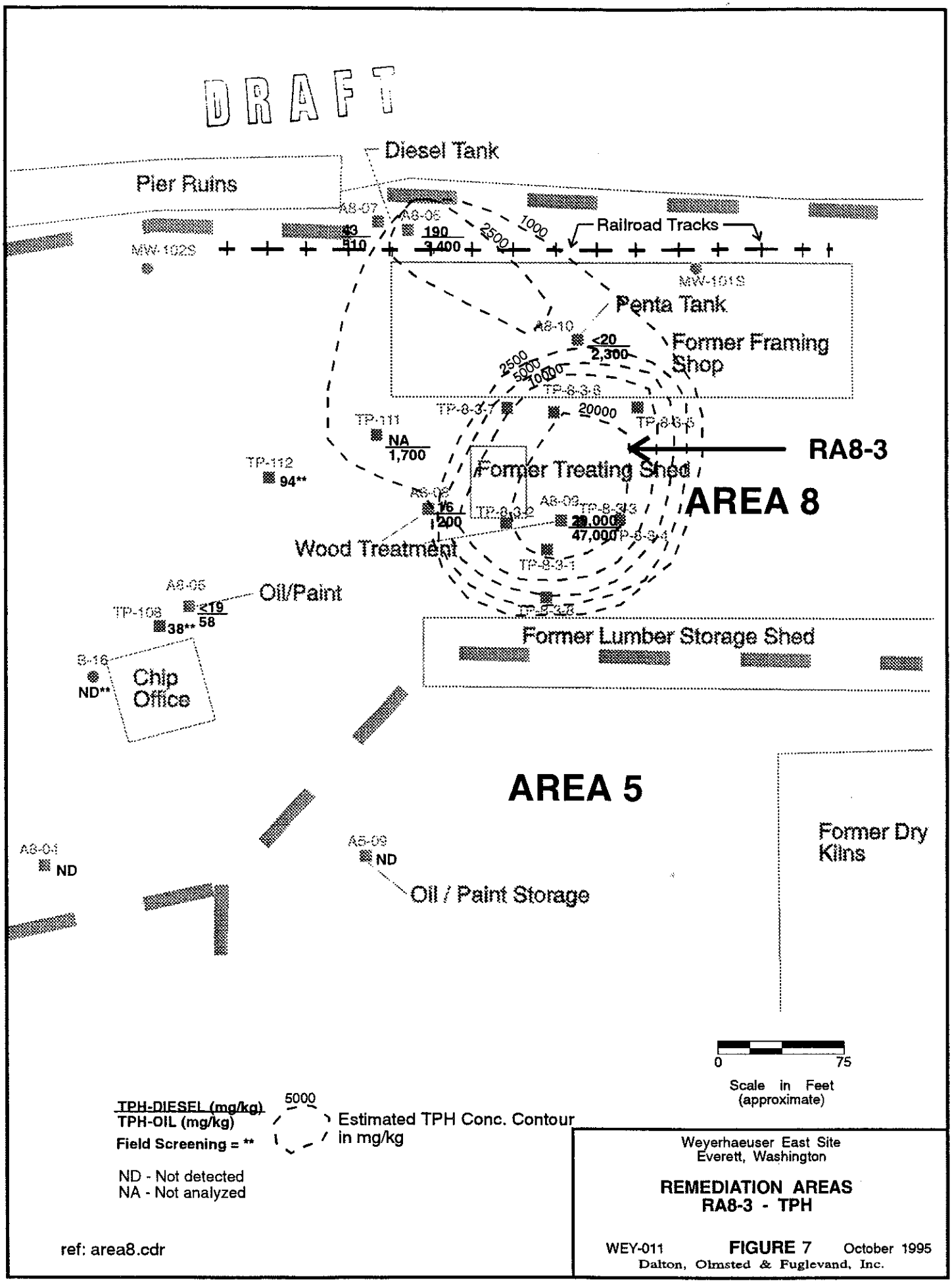
Weyerhaeuser East Site
Everett, Washington

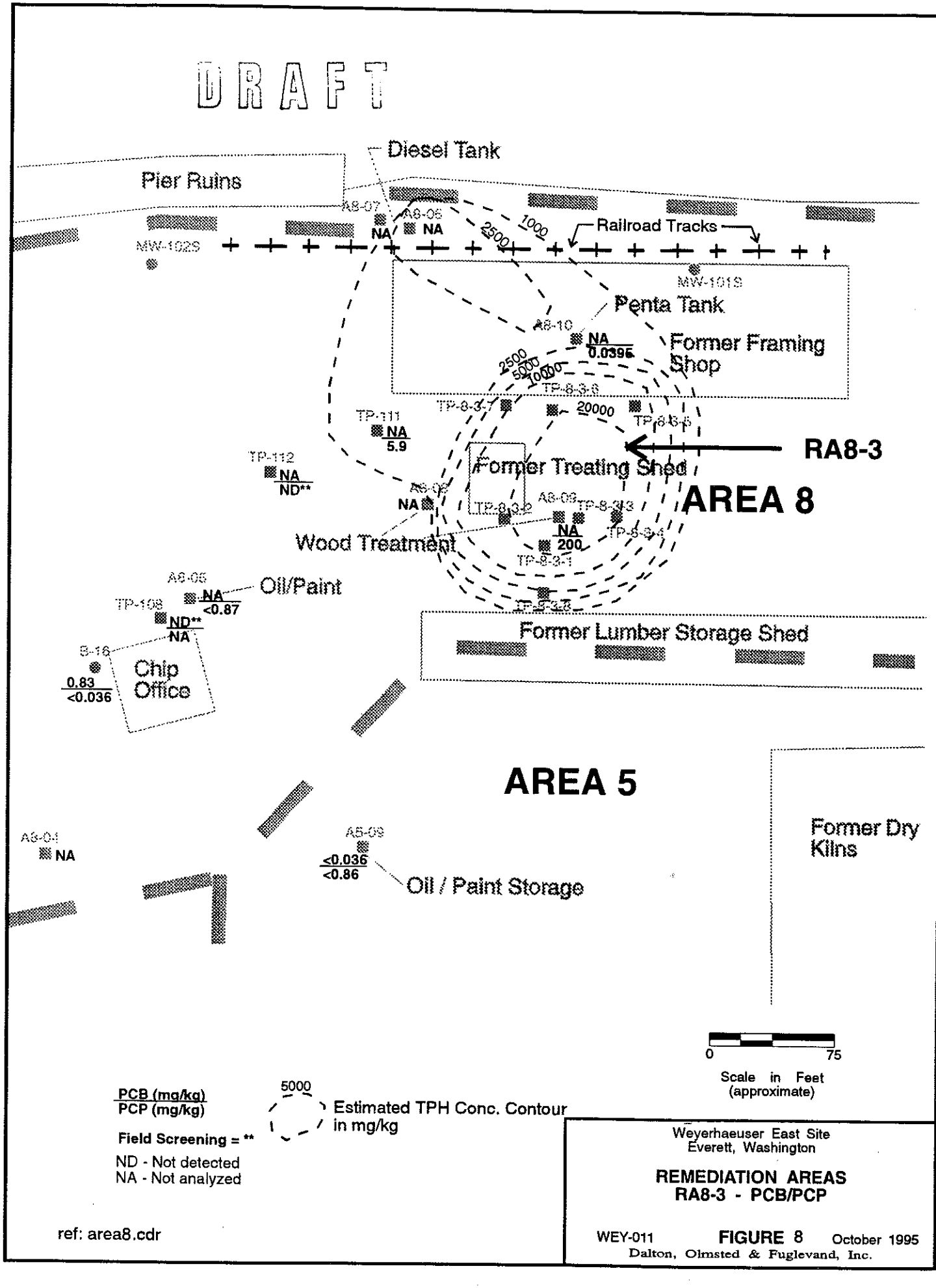
REMEDIATION AREAS
RA7-1, RA8-1, RA8-2
PCP/PCB

WEY-011 **FIGURE 6** October 95

Dalton, Olmsted & Fuglevand, Inc.

ref: area7-8.cdr

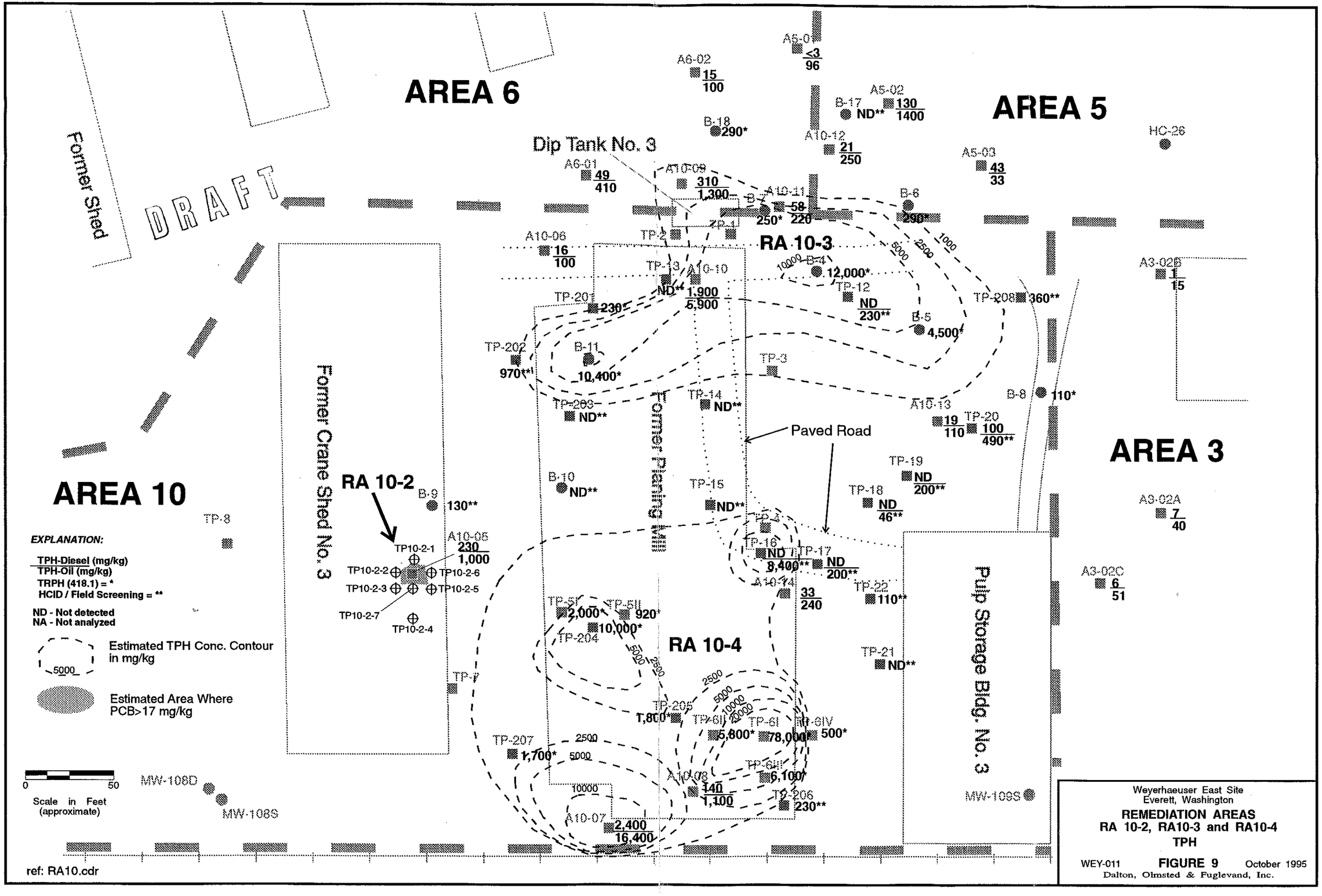

DRAFT
Diesel Tank
Pier Ruins
A8-07
A8-06
43
510
190
3,400
2500
1000
Railroad Tracks
MW-102S
MW-101S
Penta Tank
A8-10
<20
2,300
Former Framing Shop
2500
5000
1000
TP-8-3-8
TP-8-3-7
20000
TP-8-3-6
TP-111
NA
1,700
RA8-3
TP-112
94**
Former Treating Shed
AREA 8
A8-04
16
200
TP-8-3-2
A8-09
20,000
47,000
TP-8-3-3
TP-8-3-4
Wood Treatment
TP-8-3-1
A8-05
Oil/Paint
TP-108
<19
58
38**
Former Lumber Storage Shed
B-16
ND**
Chip Office
AREA 5
A8-01
ND
A8-09
ND
Oil / Paint Storage
Former Dry Kilns
0
75
Scale in Feet (approximate)
TPH-DIESEL (mg/kg)
TPH-OIL (mg/kg)
Field Screening = **
5000
Estimated TPH Conc. Contour in mg/kg
ND - Not detected
NA - Not analyzed
ref: area8.cdr
Weyerhaeuser East Site
Everett, Washington
REMEDIATION AREAS
RA8-3 - TPH
WEY-011
FIGURE 7
October 1995
Dalton, Olmsted & Fuglevand, Inc.



Weyerhaeuser East Site
Everett, Washington

REMEDIATION AREAS
RA8-3 - PCB/PCP

WEY-011 **FIGURE 8** October 1995
Dalton, Olmsted & Fuglevand, Inc.



Weyerhaeuser East Site
Everett, Washington

REMEDIATION AREAS
RA 10-2, RA10-3 and RA10-4
TPH

WEY-011 **FIGURE 9** October 1995
Dalton, Olmsted & Fuglevand, Inc.

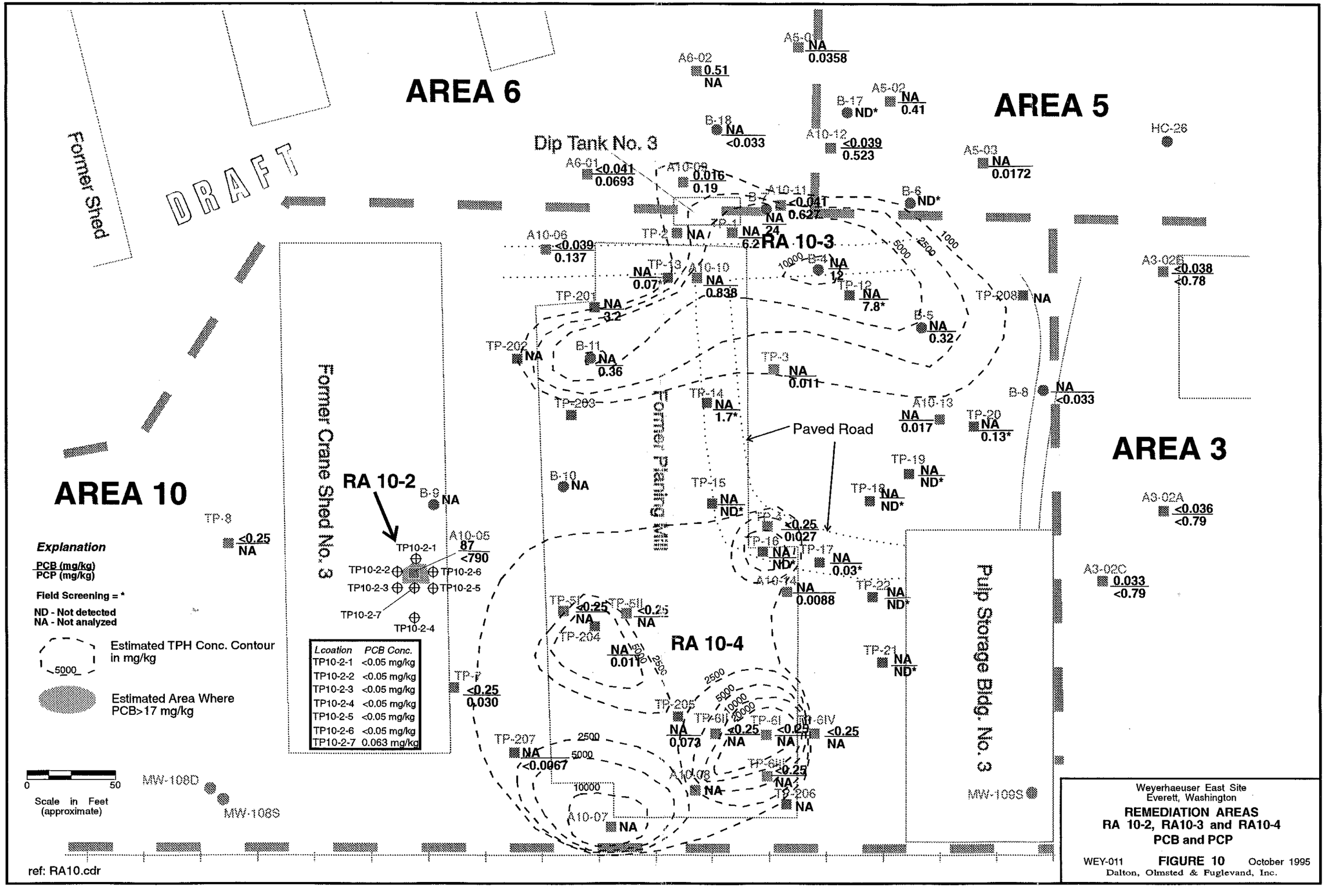
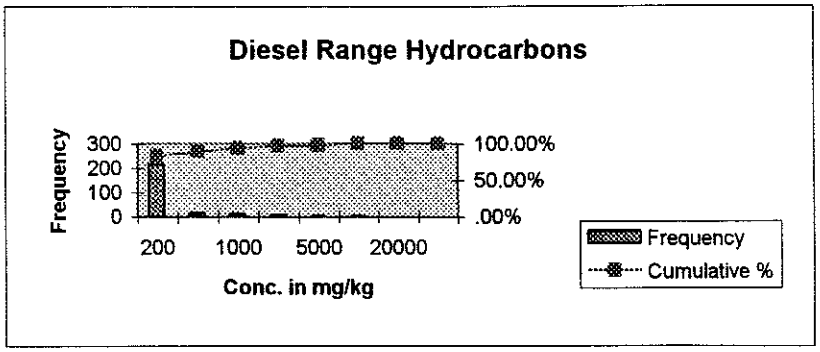

AREA 6
AREA 5
AREA 3
AREA 10
DRAFT
Former Shed
Former Crane Shed No. 3
Former Planing Mill
Pulp Storage Bldg. No. 3
Dip Tank No. 3
Paved Road
RA 10-2
RA 10-3
RA 10-4
A6-02 0.51 NA
A5-01 NA 0.0358
A5-02 NA 0.41
B-17 ND*
B-18 NA <0.033
A10-12 <0.039 0.523
HC-26
A5-03 NA 0.0172
A6-01 <0.041 0.0693
A10-08 0.016 0.19
A10-11 <0.041 0.627
B-7 NA 24
B-6 ND*
TP-1 NA 6.2
TP-2 NA
A10-06 <0.039 0.137
TP-13 NA 0.07*
A10-10 NA 0.838
B-4 NA 12
TP-12 NA 7.8*
A3-02B <0.038 <0.78
TP-201 NA 3.2
TP-208 NA
B-5 NA 0.32
TP-202 NA
B-11 NA 0.36
TP-3 NA 0.011
TP-203
TP-14 NA 1.7*
A10-13 NA 0.017
TP-20 NA 0.13*
B-8 NA <0.033
TP-19 NA ND*
B-10 NA
TP-15 NA ND*
TP-18 NA ND*
B-9 NA
A3-02A <0.036 <0.79
TP-3 <0.25 0.027
TP-16 NA ND*
TP-17 NA 0.03*
A10-14 NA 0.0088
TP-22 NA ND*
A3-02C 0.033 <0.79
TP-5I <0.25 NA
TP-5II <0.25 NA
TP-204
TP-21 NA ND*
TP-7 <0.25 0.030
TP-205 NA 0.073
TP-6II <0.25 NA
TP-6I <0.25 NA
TP-6III <0.25 NA
TP-207 NA <0.0067
TP-6II <0.25 NA
A10-09 NA
TP-206 NA
A10-07 NA
MW-109S
TP-8 <0.25 NA
A10-05 87 <790
TP10-2-1
TP10-2-2
TP10-2-3
TP10-2-4
TP10-2-5
TP10-2-6
TP10-2-7
Explanation
PCB (mg/kg)
PCP (mg/kg)
Field Screening = *
ND - Not detected
NA - Not analyzed
Estimated TPH Conc. Contour in mg/kg
5000
Estimated Area Where PCB>17 mg/kg
Lcoation PCB Conc.
TP10-2-1 <0.05 mg/kg
TP10-2-2 <0.05 mg/kg
TP10-2-3 <0.05 mg/kg
TP10-2-4 <0.05 mg/kg
TP10-2-5 <0.05 mg/kg
TP10-2-6 <0.05 mg/kg
TP10-2-7 0.063 mg/kg
0
50
Scale in Feet (approximate)
MW-108D
MW-108S
ref: RA10.cdr
Weyerhaeuser East Site
Everett, Washington
REMEDIATION AREAS
RA 10-2, RA10-3 and RA10-4
PCB and PCP
WEY-011
FIGURE 10
October 1995
Dalton, Olmsted & Fuglevand, Inc.

FIGURE 11 - Distribution of Pre-Remediation Sample Data

Weyerhaeuser East Site
Everett, Washington

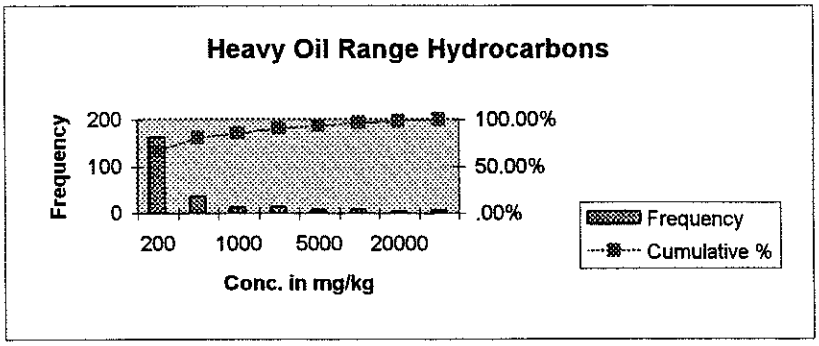
Diesel Range Hydrocarbons

Conc.(mg/kg)	*Frequency*	*Cumulative %*
0-200	217	83%
200-500	16	89%
500-1000	12	94%
1000-2500	9	97%
2500-5000	3	98%
5000-10000	3	100%
>20000	0	100%
More	1	100%



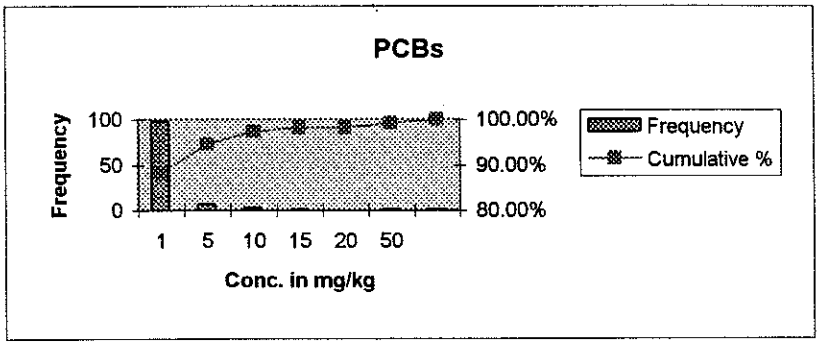
Heavy Oil Range Hydrocarbons

Conc.(mg/kg)	*Frequency*	*Cumulative %*
0-200	162	66%
200-500	35	80%
500-1000	12	85%
1000-2500	14	91%
2500-5000	7	93%
5000-10000	8	97%
>20000	3	98%
More	5	100%



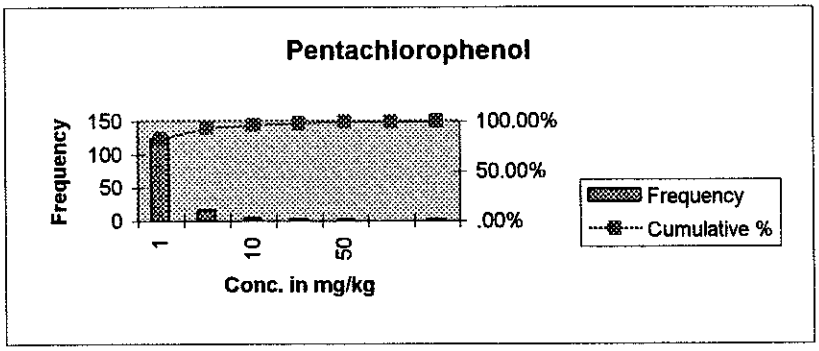
PCBs

Conc.(mg/kg)	*Frequency*	*Cumulative %*
0-1	98	88%
1-5	7	95%
5-10	3	97%
10-15	1	98%
15-20	0	98%
20-50	1	99%
More	1	100%



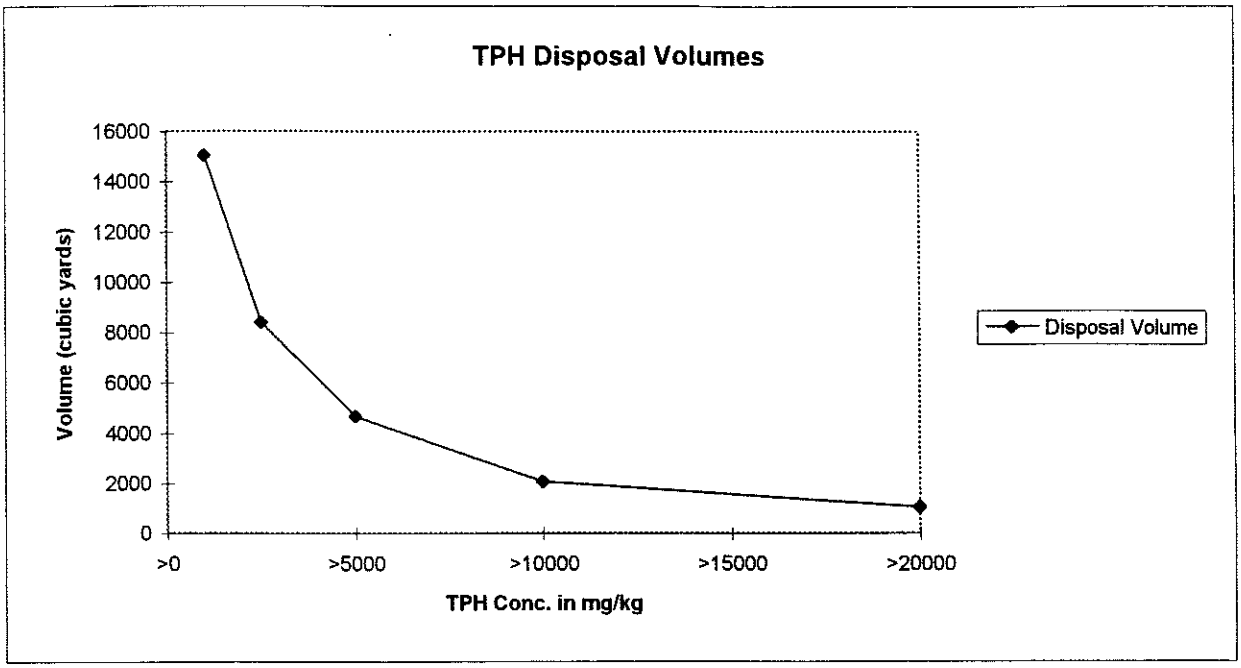
Pentachlorophenol

Conc.(mg/kg)	*Frequency*	*Cumulative %*
0-1	124	82%
1-5	16	93%
5-10	4	95%
10-20	3	97%
20-50	2	99%
50-100	0	99%
More	2	100%



DRAFT

Note: Data presented in Table 1 of this memorandum and Table 4 of the earlier August 9, 1995 technical memorandum (DOF 1995a) were used to prepare the histograms.



Disposal Volume (In-place cubic yds.)	No. Times Previous Est.	TPH (mg/kg)	Estimated Cost	No. Times Previous Est.
1042	----	>20000	$128,283	----
2075	2.0	>10000	$254,680	2.0
4669	2.3	>5000	$576,550	2.3
8420	1.8	>2500	$1,030,897	1.8
15043	1.8	>1000	$1,813,977	1.8

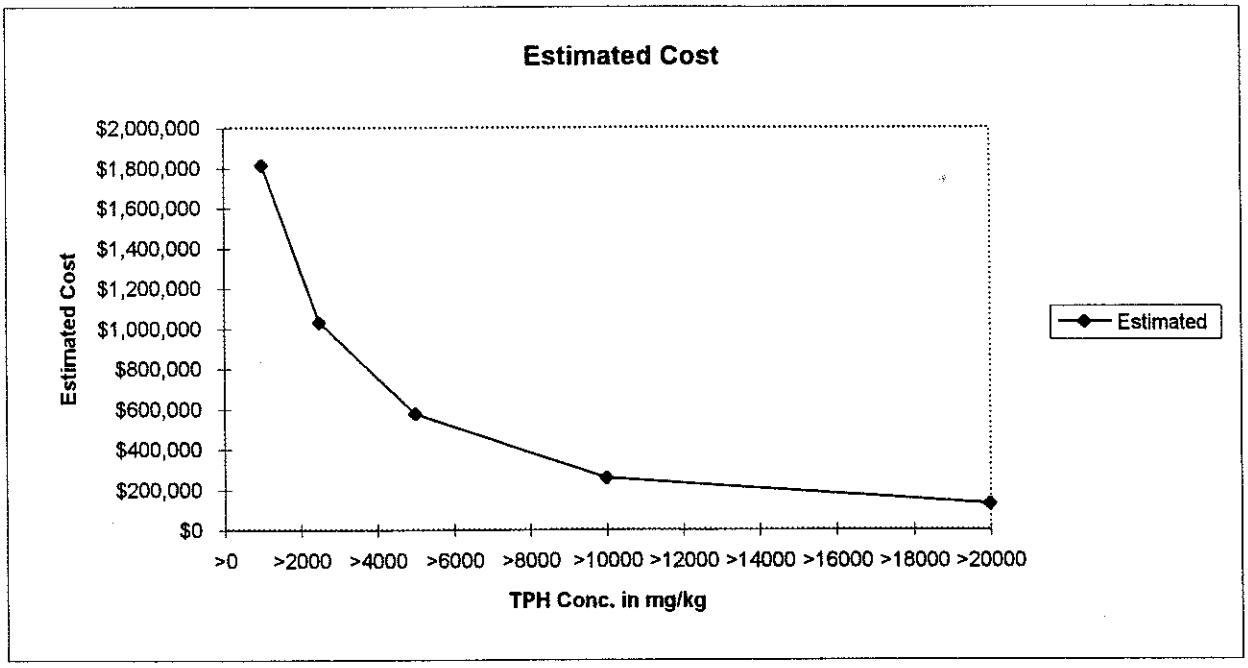
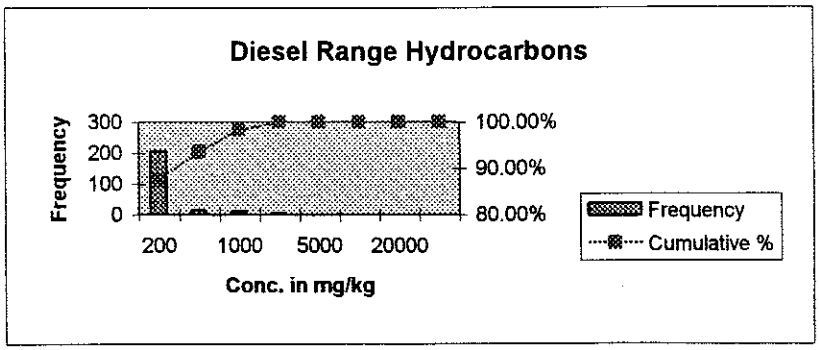


FIGURE 13 - Estimated Distribution of Post-Remediaion Sample Data

Weyerhaeuser East Site
Everett, Washington

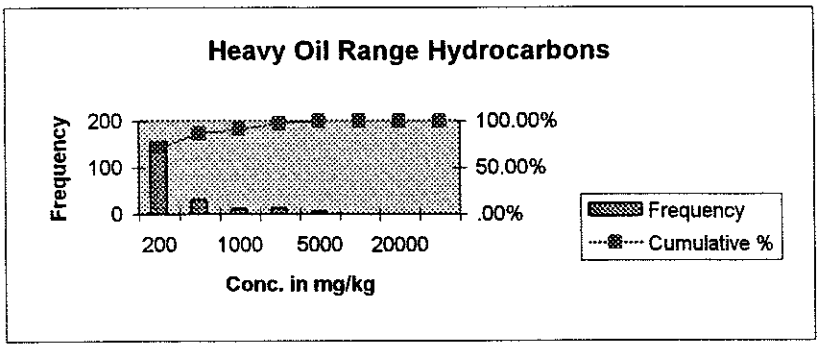
Diesel Range Hydrocarbons

Conc.(mg/kg)	*Frequency*	*Cumulative %*
0-200	206	88%
200-500	14	94%
500-1000	11	98%
1000-2500	4	100%
2500-5000	0	100%
5000-10000	0	100%
>20000	0	100%
More	0	100%



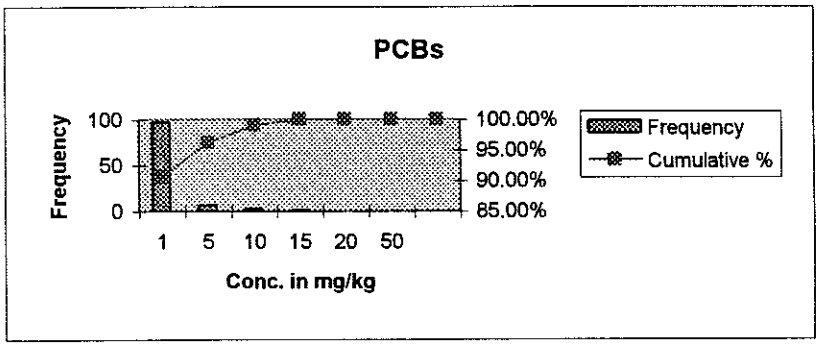
Heavy Oil Range Hydrocarbons

Conc.(mg/kg)	*Frequency*	*Cumulative %*
0-200	156	72%
200-500	32	86%
500-1000	11	91%
1000-2500	13	97%
2500-5000	6	100%
5000-10000	0	100%
>20000	0	100%
More	0	100%



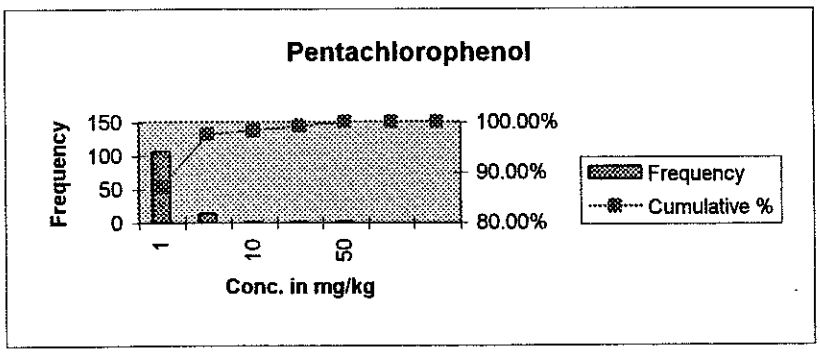
PCBs

Conc.(mg/kg)	*Frequency*	*Cumulative %*
0-1	97	91%
1-5	6	96%
5-10	3	99%
10-15	1	100%
15-20	0	100%
20-50	0	100%
More	0	100%



Pentachlorophenol

Conc.(mg/kg)	*Frequency*	*Cumulative %*
0-1	107	87%
1-5	13	98%
5-10	1	98%
10-20	1	99%
20-50	1	100%
50-100	0	100%
More	0	100%



DRAFT

Attachment A
Volume Estimates

DRAFT

Potential excavation and disposal volumes were estimated for various cleanup levels. The results of the estimates are summarized in Table 3 included with the main body of the technical memorandum.

Two general methods were used to estimate soil volumes. For relatively small areas, such as RA8-1 and RA10-2, an assumed rectangular or circular area was assumed. For larger areas, isoconcentration contour plots were prepared and the area within specified concentration ranges was estimated. Area estimates were made by printing the contours on graph paper and counting the number of boxes that fell with the isoconcentration contour lines. The number of boxes was multiplied by the area of each box to arrive at an estimate of the target area size.

Area calculations for each area summarized in Table 3 are presented below.

- **Potential Remediation Area RA3-1 (Figure 2)**

A rectangular area 45'x30' was used to estimate a base excavation area (1,350 square feet). A depth to the water table of 2-feet (based on the log of test pit A3-03D) was multiplied by the area to arrive at a base excavation volume (100 cubic yards). No TPH analyses were made in this area. It was assumed that the 100 cubic yards represented a TPH concentration of greater than 2,500 mg/kg. The base excavation volume was decreased by 25 cubic yards and increased by 25 yards to provide numbers for TPH cleanup levels greater than 5,000 mg/kg and 1,000 mg/kg, respectively.

- **Potential Remediation Area RA7-1 (Figures 1, 5 and 6)**

A rectangular area 20'x25' was used to estimate an excavation area (500 square feet). The water table was not encountered to a depth of 4.25 feet in test pit log A7-06. An excavation depth of 5-feet was used to estimate an excavation volume of approximately 93 cubic yards. This number was rounded up to 100 cubic yards. No differentiation was made for various cleanup levels because the TPH concentration was relatively high (87,000 mg/kg) and the oiling room activities were likely limited in area.

- **Potential Remediation Area RA7-2 (Figures 1, 3 and 4)**

TPH isoconcentration contours (Figure 3) were developed for TPH concentrations greater than 1,000 mg/kg, 2,500 mg/kg, and 5,000 mg/kg (the highest TPH concentration in this area was 9,000 mg/kg). The area within each concentration range was estimated as follows:

TPH Conc. Range	Excavation Area
>5000 to 10000 mg/kg	5,906 square feet
>2500 to 5000 mg/kg	8,381 square feet
>1000 to 2500 mg/kg	19,125 square feet

An excavation depth of 5-feet was assumed based on the likely presence of concrete foundations and wood decking noted in the logs of A9-05 and A9-08 (see Table 8). Disposal volumes were estimated by assuming that, on average, 2-feet of wood chips would be excavated and stockpiled.

TPH Conc. Range	Excavation Volume	Disposal Volume
>5000 to 10000 mg/kg	1,094 cubic yards	656 cubic yards
>2500 to 5000 mg/kg	1,552 cubic yards	931 cubic yards
>1000 to 2500 mg/kg	3,542 cubic yards	2,125 cubic yards

In addition to excavation for TPH containing soil, excavation for PCBs at A9-09 was accounted for in the volume estimates. A rectangular excavation area 35'x35' (1,225 square feet) and an excavation depth of 5-feet was used to estimate an excavation and disposal volume of approximately 225 cubic yards.

- **Potential Remediation Area RA8-1 (Figures 1, 5 and 6)**

A rectangular area of 45'x100' was used to estimate an excavation area (4,500 square feet). An excavation depth of 5-feet was used (based on water table depth) to estimate an excavation volume of approximately 833 cubic yards. The disposal volume was estimated by assuming that 2-feet of wood chips would be stripped and stockpiled. No differentiation was made for various cleanup levels because the source of the TPHs (chip dumper) operated in a limited in area.

- **Potential Remediation Area RA8-2 (Figures 1, 5 and 6)**

A rectangular area 55'x45' was used to estimate an excavation area (2,475 square feet). An excavation depth of 3-feet was used based on analytical data (TPH concentrations above cleanup action levels were measured in a surface sample). Using these assumptions, an excavation volume of 275 cubic yards is estimated. The disposal volume was estimated by assuming that 2-feet of wood chips would be stripped and stockpiled and that 1-feet of contaminated soil would require disposal. No differentiation was made for various cleanup levels because the TPH concentration was relatively high (87,000 mg/kg) and the small dip tank activities were likely limited in area.

- **Potential Remediation Area RA8-3 (Figures 1, 7 and 8)**

TPH isoconcentration contours (Figure 7) were developed for TPH concentrations greater than 1,000 mg/kg, 2,500 mg/kg, 5,000 mg/kg, 10,000 mg/kg and 20,000 mg/kg (the highest TPH concentration in this area was 76,000 mg/kg). The area within each concentration range was estimated as follows:

TPH Conc. Range	Excavation Area
>20,000	4,219 square feet
>10000 to 20000 mg/kg	6,188 square feet
>5000 to 10000 mg/kg	3,656 square feet
>2500 to 5000 mg/kg	7,200 square feet
>1000 to 2500 mg/kg	16,931 square feet

An excavation depth of 4-feet was assumed based on the likely depth to the water table. Disposal volumes were estimated by assuming that, on average, 1-feet of paving materials would be excavated and stockpiled.

TPH Conc. Range	Excavation Volume	Disposal Volume
>20,000 mg/kg	625 cubic yards	468 cubic yards
>10,000 to 20,000 mg/kg	917 cubic yards	688 cubic yards
>5000 to 10000 mg/kg	542 cubic yards	406 cubic yards
>2500 to 5000 mg/kg	1,067 cubic yards	800 cubic yards
>1000 to 2500 mg/kg	2,508 cubic yards	1,881 cubic yards

- **Potential Remediation Area RA8-4 (Figure 1)**

This area appears to be very limited in extent. The sample was obtained from a exposed soil surface showing evidence of staining. The available data indicates only a limited volume of soil (likely less than 5 to 10 cubic yards) would have to be removed. A somewhat larger volume of material would have to be excavated including paving which now covers the area.

- **Potential Remediation Area RA9-1 (Figures 1, 3 and 4)**

TPH isoconcentration contours (Figure 3) were developed for TPH concentrations greater than 1,000 mg/kg, 2,500 mg/kg, 5,000 mg/kg, 10,000 mg/kg and 20,000 mg/kg (the highest TPH concentration in this area was 30,900 mg/kg). The area within each concentration range was estimated as follows:

TPH Conc. Range	Excavation Area
>20,000	338 square feet
>10000 to 20000 mg/kg	1,294 square feet
>5000 to 10000 mg/kg	2,644 square feet
>2500 to 5000 mg/kg	2,756 square feet
>1000 to 2500 mg/kg	2,306 square feet

An excavation depth of 5-feet was assumed based on the likely depth to the water table. Disposal volumes were estimated by assuming that, on average, 1-feet of wood chips and other materials would be excavated and stockpiled.

TPH Conc. Range	Excavation Volume	Disposal Volume
>20,000 mg/kg	63 cubic yards	50 cubic yards
>10,000 to 20,000 mg/kg	240 cubic yards	192 cubic yards
>5000 to 10000 mg/kg	490 cubic yards	392 cubic yards
>2500 to 5000 mg/kg	510 cubic yards	408 cubic yards
>1000 to 2500 mg/kg	427 cubic yards	342 cubic yards

- **Potential Remediation Area RA10-1 (Figure 1)**

Rectangular areas of 30'x30', 30'x60', and 60'x60' were used to estimate excavation areas for TPH cleanup action levels of 1,000 mg/kg, 2,500 mg/kg, and 5,000 mg/kg, respectively. An excavation depth of 6-feet (to the water table) was used to estimate excavation volumes.

- **Potential Remediation Area RA10-2 (Figures 1, 9 and 10)**

RA10-2 is being remediated because of PCBs. It was assumed that the presence of PCBs above the cleanup level is localized to the former transformer location. An excavation area 20'x20' and an excavation depth (to the water table) of 1-feet deep was used to estimate an excavation and disposal volume of 15 cubic yards.

- **Potential Remediation Area RA10-3 (Figures 1, 9 and 10)**

TPH isoconcentration contours (Figure 9) were developed for TPH concentrations greater than 1,000 mg/kg, 2,500 mg/kg, 5,000 mg/kg, and 10,000 mg/kg (the highest TPH concentration in this area was 12,000 mg/kg). The area within each concentration range was estimated as follows:

TPH Conc. Range	Excavation Area
>10000 mg/kg	425 square feet
>5000 to 10000 mg/kg	7,150 square feet
>2500 to 5000 mg/kg	6,900 square feet
>1000 to 2500 mg/kg	7,950 square feet

An excavation depth of 2-feet was assumed based on the likely depth to the water table. Disposal volumes assumed no stripping of overburden materials.

TPH Conc. Range	Excavation and Disposal Volumes
>10,000	31 cubic yards
>5000 to 10000 mg/kg	530 cubic yards
>2500 to 5000 mg/kg	511 cubic yards
>1000 to 2500 mg/kg	588 cubic yards

- **Potential Remediation Area RA10-4 (Figures 1, 9 and 10)**

TPH isoconcentration contours (Figure 9) were developed for TPH concentrations greater than 1,000 mg/kg, 2,500 mg/kg, 5,000 mg/kg, 10,000 mg/kg and 20,000 mg/kg (the highest TPH concentration in this area was 78,000 mg/kg). The area within each concentration range was estimated as follows:

TPH Conc. Range	Excavation Area
>20000	1,000 square feet
>10000 to 20000 mg/kg	1,650 square feet
>5000 to 10000 mg/kg	4,525 square feet
>2500 to 5000 mg/kg	5,075 square feet
>1000 to 2500 mg/kg	16,700 square feet

An excavation depth of 2-feet was assumed based on the likely depth to the water table. Disposal volumes assumed no stripping of overburden materials.

TPH Conc. Range	Excavation and Disposal Volumes
>20,000 mg/kg	74 cubic yards
>10,000 to 20,000 mg/kg	122 cubic yards
>5000 to 10000 mg/kg	335 cubic yards
>2500 to 5000 mg/kg	376 cubic yards
>1000 to 2500 mg/kg	1,237 cubic yards