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EPA Superfund
Record of Decision:

ATLANTIC WOOD INDUSTRIES, INC.
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PORTSMOUTH, VA
09/29/1995

ATLANTIC WOOD INDUSTRIES, INC., SUPERFUND SITE
CITY OF PORTSMOUTH, VIRGINIA

RECORD OF DECISION

OPERABLE UNIT 1 (SOIL, SEDIMENT, DNAPL)

<IMG SRC 0395199>

PREPARED BY
THE U.S. ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER 1995

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RECORD OF DECISION
ATLANTIC WOOD INDUSTRIES, INC., SUPERFUND SITE
OPERABLE UNIT I (SOIL, SEDIMENT, DNAPL)

PART I - DECLARATION

I. SITE NAME AND LOCATION

Atlantic Wood Industries, Inc., Superfund Site
City of Portsmouth, Virginia

II. STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the remedial action selected for Operable Unit 1, which addresses soil, sediment, and Dense Non-Aqueous Phase Liquid (DNAPL) contamination at the Atlantic Wood Industries, Inc., Superfund Site, located in Portsmouth, Virginia (Site). This remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §§ 9601 et seq., and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This decision document explains the factual and legal basis for selecting the remedial action and is based on the Administrative Record for this Site. An index of documents included in the Administrative Record may be found at Appendix A of the ROD. Appendix B provides a glossary of commonly used Superfund terms.

The Virginia Department of Environmental Quality (VDEQ) has commented on the selected remedy and the State's comments have been incorporated into this ROD to the extent possible.

III. ASSESSMENT OF THE SITE

Pursuant to duly delegated authority, I hereby determine, pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606, that actual or threatened releases of hazardous substances from this Site, as discussed in Section VI (Summary of Site Risks) of this ROD, if not addressed by implementing the remedial action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

IV. DESCRIPTION OF THE SELECTED REMEDY

The Environmental Protection Agency (EPA), in consultation with VDEQ, has selected the following remedial action for the Atlantic Wood Industries, Inc., Superfund Site. This remedy addresses soil, sediment, and DNAPL contamination (Operable unit 1 or ou1) at the Site. Subsequent operable unit RODs will address potential ground water and river cleanup. As environmental conditions vary throughout the Site, the evaluation of the various cleanup alternatives for OU1 was performed for five separate Site units which are called Remedial Response Units. The selected remedy is comprised of the following major components as broken down into these Remedial Response Units:

Remedial Response Units 1 and 2 (soil/sediment):

- Excavation of an estimated 20,000 cubic yards of contaminated soil and 564 cubic yards of sediment existing above the water table (i.e., above the depth of one to ten feet) in order to achieve the cleanup levels provided in Part II, Section X, of this ROD.

- Treatment of the excavated soil and sediment, including sediments already stored on-site, using engineered land treatment (ex situ bioremediation) subject to successful treatability results; otherwise, treatment using low temperature thermal desorption. Appropriately treated materials would be backfilled to the general areas from which they were originally excavated.

Remedial Response Unit 3 (DNAPL):

- Recovery of DNAPL through the use of pumping or bailing of new and existing wells for off-site reuse or disposal.

Remedial Response Units 4 and 5 (high pH/elevated metal soil/sediment):

- Excavation of an estimated 2,370 cubic yards of contaminated soil and 250 cubic yards of sediment existing above the water table (i.e., above the depth of one to ten feet) in order to achieve the cleanup levels listed in Part II, Section X, of this ROD. Backfilling of these excavation areas with clean soil or sediment.

- Disposal of excavated soils and sediments from Remedial Response Units 4 and 5 in an off-site landfill permitted in accordance with the Resource Conservation and Recovery Act (RCRA) Subtitle C requirements;

Common Remedial Elements for all Remedial Response Units:

- Implementation of a sediment, ground water and surface water monitoring program to verify the effectiveness of the remedial action.

- Institutional controls including restrictions on title, use, and access will be placed on the Site. Restrictions on title shall prohibit the following: 1) residential development; 2) agricultural development; and 3) the use of ground water for domestic or drinking purposes.

V. STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. The remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in contaminants remaining on-site above levels that allow for unlimited use or unrestricted exposure, a review will be conducted within five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

<IMG SRC 0395199A>

Thomas C. Voltaggio Date
Director
Hazardous Waste Management Division
Region III
Environmental Protection Agency

RECORD OF DECISION
ATLANTIC WOOD INDUSTRIES, INC., SUPERFUND SITE
OPERABLE UNIT 1 (SOIL, SEDIMENT, DNAPL)

PART II - DECISION SUMMARY

I. SITE NAME, LOCATION, AND DESCRIPTION

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The Atlantic Wood Industries, Inc., Site (Site) currently occupies approximately 47.5 acres of land on the industrialized waterfront area of Portsmouth, Virginia (Figure 2-1). The States Norfolk Naval Shipyard facilities, and on the west by a Virginia Electric Power Company right-of-way. To the south of the Site is the south annex of the U.S. Norfolk Naval Shipyard and land occupied by the Portsmouth City School Board. The Site is bounded on the east by the Southern Branch of the Elizabeth River. The Site is split into eastern and western portions by the Norfolk and Portsmouth Beltline Railroad and Burtons Point Road. The eastern portion of the Site contains the currently inactive wood processing facilities, and wood storage areas. The western portion of the Site has been used for the storage of treated and untreated wood.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The original plant was constructed in 1926 by the Savannah Creosoting Company. The Site has been used for various purposes during its history including a possible coal tar refinery, creosote wood treating plant, pentachlorophenol (PCP) wood treating plant, and a storage yard for treated lumber. According to Site records, wood was never treated with chromated copper arsenate (CCA), a common wood treating chemical, although some CCA-treated wood is stored on-site. A review of aerial photographs showing the historic shoreline of the west bank of the Elizabeth River suggests that at least a portion of the Site has been elevated with filling materials. Between 1978 and 1986, a significant amount of fill material was added to the eastern boundary, and filling activity occurred south of this area from 1944 to approximately 1971 in an inlet located along the southeastern boundary of the Site.

From 1926 until 1944, the Site was operated as the Savannah Creosoting Company and was owned by the Savannah Creosoting Company, Inc., a Maryland corporation. On December 28, 1944, the name of Savannah Creosoting was changed to Atlantic Creosoting Company, Inc. On September 1, 1978, the name of the corporation was changed to Atlantic Wood Industries, Inc (AWI). Finally, on October 25, 1985, the name of corporation was changed to Atlantic Wood Assets, Inc. On June 19, 1985, a Georgia corporation named Atlantic Interim Inc. was incorporated. Its name was changed on November 21, 1985, to Atlantic Wood Industries, Inc. On November 30, 1985, the operating assets of Atlantic Wood Assets, Inc., including the wood preserving plant referred to above, were sold to Atlantic Wood Industries, Inc., the Georgia Corporation. Since that time, Atlantic Wood Industries, Inc., the Georgia Corporation, has owned and operated the plant.

The original Savannah Creosoting Company facility consisted of two of the existing four wood treatment retorts (pressurized cylinders), the existing office building, several existing maintenance and storage buildings, and the above-ground tank farm that was located adjacent to Elm Avenue. The above-ground tank farm consisted of four storage tanks, installed around 1940, and were of open-top steel construction. These tanks were originally used to store wood preserving chemicals, including creosote. In the past, two of the four tanks were used occasionally to store process water which may have contained PCP. Two of these tanks were removed in 1985, and the last two were removed by June 1986.

The four tanks west of the retorts were previously associated with a tar distillation unit that was located east of the office building. There was also a shallow concrete basin associated with the tar distillation unit. The tar distillation unit was disassembled in the 1940s. The basin was filled in and the four tanks were moved to their present location. Portions of the retaining wall around the basin are currently exposed and can be examined. Additionally, from about 1940 until October 1985, there was a concrete process water recycling basin located immediately north of the retort building. This unit was used to recover preservative from process water and until 1972 some excess process water was discharged to an area immediately south of the railroad spur that juts out into the Southern Branch of the Elizabeth River. AWI continued to use the unit to recover preservative and to recycle process water until it was removed in August 1985.

Retorts I and II, the original wood treatment units at the Site, were in use from 1926. Both retorts were primarily used for creosote treatments, but from the late 1950s through the early to mid 1960s a

PCP-related product known as creo-penta may also have been used. Retort III was constructed in 1959 and was used for creosote treatment only. PCP was first used at the Site in about 1972 in Retort I. For approximately two years, the plant operator used Retort I at times for PCP and other times for creosote treatments. In 1974, Retort IV was constructed and dedicated to PCP treatments. At that time, Retort I was used for creosote treatment only. The use of PCP as a preservative was discontinued in 1985.

Until about 1985, the plant used a concrete closed-loop recovery system located just north of the retort building. This unit was used to recover creosote preservative and process conditioning water for reuse. This system was removed in 1985, and the process then used a closed-loop recovery system located in the retort building. All wood treating operations ceased by 1992.

When the Clean Water Act was implemented in the early 1970s, the plant was required to stop discharging effluent from the oil/water separator directly into the Elizabeth River. At that time, a liquid incineration unit known as a "Liquidator" was constructed. This unit was fired with No. 6 fuel oil and incinerated excess process water that was previously discharged through the oil/water separator into the river. AWI stopped using the Liquidator unit in 1984.

From approximately 1966 until 1982, an area of the property was used as a disposal area. This area is located in the southwest corner of the property and west of Burtons Point Road. This area, termed the historical disposal area, may contain up to 740 cubic yards of general debris, steel bands, untreated and treated wood waste, and cylinder and tank clean out material, which may contain creosote and PCP.

On July 23, 1987, AWI entered into an Administrative Order by Consent (Consent Order) with EPA (Docket No. III-87-24-DC) whereby AWI would perform initial cleanup actions and perform a Remedial Investigation and Feasibility Study for the Site.

Sampling data collected during a preliminary site assessment were used to evaluate the relative hazards posed by the Site using EPA's Hazard Ranking System (HRS). EPA uses the HRS to calculate a score for hazardous waste sites based upon the presence of potential and observed hazards. If the final HRS score exceeds 28.5, the Site may be placed on the National Priorities List (NPL), making it eligible to receive Superfund monies for remedial cleanup. In 1985, an HRS score of 40.77 was calculated for the AWI Site. On February 15, 1990, the Site was listed on the NPL.

A. Initial Cleanup Actions

Based on the results of sampling taken during the Remedial Investigation at the Site, it became evident that hazardous substances associated with wood treatment had migrated into the soil surrounding the storm sewer system which is located on Elm Avenue and to the inlet sediments where this sewer discharges. The Elm Avenue storm sewer runs along the northern border of the Site. As this sewer pipeline contained small cracks, surrounding contaminants seeped into it and were transported to the Elizabeth River and its sediments. AWI, under the Consent Order with EPA, has undertaken an action to correct this problem. Under EPA oversight, AWI hired a contractor to clean and install a new liner within all affected manholes, catch basins, and sewer pipelines. The liner is made of polyethylene and various resins. This work was completed by March 25, 1995.

As part of this same action, AWI excavated approximately 660 cubic yards of contaminated sediments that existed in the intertidal drainage ditch and in the inlet that exists in the northeastern section of the Site. This work was accomplished under EPA oversight and field work was completed by May 18, 1995. The excavated sediments were stockpiled on-site in a secure storage tank and will be addressed as part of the selected alternative provided in Part II, Section X, of this Record of Decision (ROD) for Remedial Response Unit 2.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The documents which EPA used to develop, evaluate, and select a remedial alternative for the Site have been maintained at the Portsmouth Municipal Library, 601 Court Street, Portsmouth, VA 23704; Kirn Memorial Library, City Hall Avenue, Norfolk, VA 23501; Chesapeake Public Library, 200 Feeder Street, Chesapeake, VA 23320; and at the EPA Region III, Philadelphia Office.

Although many local residents, community groups, and officials are aware of work being done at the Site, community involvement has been limited. In April 1995, EPA interviewed local residents and officials to determine the community's awareness of, and concerns about, the Atlantic Wood Site. Many community members were interested in meeting with EPA and learning more about the Superfund process. Most of

those interviewed believe that frequent updates from EPA will create greater community interest and involvement in Site activities. Some of the concerns voiced during the community interviews included: a lack of knowledge about the Site and contamination; affects of contamination on the Elizabeth River and surrounding waterways; the impact of the Site on the local community; and the length of time required to conduct the cleanup.

The Feasibility Study Report, Proposed Plan, and other documents for the Atlantic Wood Industries, Inc., Site were released to the public on June 9, 1995. The notice of availability for these documents was published in the Virginian-Pilot and the Ledger-Star on June 9, 1995. A public comment period was held from June 9, 1995, to July 8, 1995. By request, the public comment period was extended until August 7, 1995. A notice announcing this extension appeared in the Virginian-Pilot and the Ledger-Star on July 12, 1995.

A public meeting was held during the public comment period on June 27, 1995. At this meeting, representatives from EPA answered questions about the Site and the remedial alternatives under consideration. Approximately 35 people, including residents from the impacted area, attended the meeting. EPA responses to the comments received during the public comment period are included in the Responsiveness Summary found at Part III of this ROD.

IV. SCOPE AND ROLE OP THE RESPONSE ACTION

The remedial action selected in this Record of Decision is intended to remediate contamination in soils and sediments, and to recover DNAPLs that are located in the subsurface. As with many Superfund sites, the problems at the Atlantic Wood Industries, Inc., Site are complex. As a result, EPA has organized the overall remedial work into Operable Units (ous). These are:

- OUI: Surface Soils, Sediments, and Dense Non-Aqueous Phase Liquid (DNAPL) located in subsoils;
- OU2: Site Ground Water;
- OU3: Impact to the River/Off-site areas (Note: this unit may be combined with OU2 Ground Water).

This ROD addresses the cleanup of OU1 only. Operable Units 2 and 3 will be handled separately. EPA has chosen this strategy for Site cleanup for two specific reasons: 1) OU1 contamination represents a continuing source of further releases of contaminants to the environment and therefore needs to be cleaned up first; 2) OU2 and OU3 require further investigation and study to determine feasible cleanup solutions.

Operable Unit 1, which this ROD addresses, is further broken down into five Remedial Response Units (RRUs) including associated areas, as described below. Figure 2-2 provides a Site plan which shows the general locations of these areas.

- RRU1: On-site soils in the former Wood Treatment East (Area 1), Wood Treatment West (Area 2), Historic Disposal (Area 3), and Wood Storage Yard (Area 4)
- RRU2: On-site sediments from the Inlet (Area 5), Storm Water Runoff Ditch (Area 6), and Western Runoff Ditch (Area 7)
- RRU3: Dense Non-Aqueous Phase Liquid located in subsurface
- RRU4: On-site sediment in Southeast Ditch (Area 8)
- RRUS: On-site soil in Waste Lime Area (Area 9)

The above designations will be used throughout this ROD to identify response units and areas that have been studied or are specifically planned for cleanup. The main difference between RRU1 and RRU2 is that RRU1 deals with soils, whereas RRU2 deals with sediments which generally have different cleanup levels than soils. These cleanup levels are provided in Part II, Section X of this ROD. RRU4 and RRU5 differ from RRU1 and RRU2 as the former units were found to contain elevated metal concentrations and high pH.

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V. SUMMARY OF SITE CHARACTERISTICS

A. General

The Site is located on the industrialized banks of the South Branch of the Elizabeth River. The Elizabeth River is the dominant aquatic habitat impacted by the Site. The river system has three branches that empty into the southern end of the Chesapeake Bay which contains highly-valued wetland areas. National Pollution Discharge Elimination System (NPDES) monitoring at the Site is performed at Outfalls 001, 002, and 003 which are shown on Figure 2-3. NPDES monitoring is a provision of the Clean Water Act for regulating pollutant discharges into navigable waters of the United States through a permitting system administered by EPA or an authorized state. AWI has obtained such a permit for the Site (Permit #VA0004189; effective 3-21-91 to 3-21-96). Outfall 003 at the Site impacts Paradise Creek which exists to the west and south of, but not immediately adjacent to, the Site. This creek empties into the South Branch of the Elizabeth River.

The closest human residences are located approximately one mile southwest of the Site in a section of Portsmouth called Cradock. Drinking water for Portsmouth residents is supplied by a pipeline operated by the City of Portsmouth; however, some residents use ground water for filling swimming pools and to water their gardens and lawns. Approximately 13 people work at the Site and 77,000 people live within a 4-mile radius of the Site. The Norfolk Naval Shipyard and its annexes, which are located within 1/2 mile of the Site, employ up to 14,000 people.

B. Surface Water Ry4rology

The Site is a relatively flat area with ground surface elevations ranging from less than one foot above mean sea level adjacent to the Southern Branch of the Elizabeth River to greater than ten feet above mean sea level near the southern property boundary west of Barton's Point Road. Stormwater runoff at the Site drains through the facility's three NPDES Outfalls (001, 002, and 003) and the Elm Avenue storm sewer. Surface water runoff from the southeast half of the property located east of Burton's Point Road flows to a collection ditch and Outfall 001, and then enters the Southern Branch of the Elizabeth River. Surface water runoff from the northeast half of the property located to the east of Barton's Point Road, and from off-site areas, drains to the South Branch of the Elizabeth River via Outfall 002 and the Elm Avenue storm sewer. Surface water runoff from the portion of the Site to the west of Burton's Point Road discharges through Outfall 003 into a ditch that flows north and eventually discharges into Paradise Creek.

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The Elizabeth River System is a tidal basin encompassing the Southern, Western, and Eastern Branches. The Lafayette River converges with the three branches forming a main stem which empties into Hampton Roads. The Southern Branch forms the eastern boundary of the Site and, in that location, flows from south to north. The Southern Branch is connected via the Dismal Swamp Canal to the Intercoastal Waterway which leads to Abetmarie Sound, and the Virginia Cut connects the Southern Branch to the Intercoastal Waterway which leads to Pamlico Sound.

The Elizabeth River has a drainage area of approximately 300 square miles which is intensely urbanized and includes portions of Norfolk, Portsmouth, Chesapeake, and Virginia Beach. There is very little topographic relief in the basin and freshwater inflow to the system is minimal, composed principally of drainage from the Dismal Swamp and stormwater runoff.

C. Hydrogeology/Geology

Based on the results from the various borings and monitoring wells drilled as part of the Remedial Investigation and prior investigations, three hydrostratigraphic units have been identified beneath the Site. These units are termed as follows:

Upper Water-Bearing Sone (Columbia Aquifer) - the uppermost soil is a brown to gray, organic-rich mixture of clayey silt and fine to medium sand, with a thickness ranging between 18 to 23 feet. This layer is continuous throughout the Site, and contains ground water under unconfined conditions; the water table is approximately 0.6 to 10 feet below grade. The Columbia Aquifer is not known to be a drinking water source.

Semi-Confining Unit (Yorktown Clay) - immediately underlying the Columbia Aquifer is a layer of gray clay, which acts as

a semi-confiningunit. This layer may be silty and may contain shell fragments. This lower semi-confining clay layer is thought to be continuous beneath the majority of the Site. The thickness (as determined by three borings) was found to range between eight and 27 feet.

Lower Water-Bearing Zone (Torktown-Bastover Aquifer) - the clay unit overlies a fine to medium to coarse grained sand layer. Based on the data collected, as well as regional geologic reports, this unit is the Yorktown-Eastover Aquifer. Ground water occurs in this unit under semi-confined to confined conditions.

Evaluation of the hydrogeology for the AWI Site was developed primarily from installation of monitoring wells at varied depths across the Site, and from stratigraphic information obtained during the soil boring program. Observations of water levels in wells installed as part of the Remedial Investigation and the existing well network, provided data relative to the position of the potentiometric surface(s), water level fluctuations, and ground water gradients across the Site. Soil boring data were utilized to characterize the lithology and geometry of the units.

An assessment of the local hydrogeologic characteristics was made possible by the evaluation of ground water data collected during the period between January 1989 and February 1990. Water levels measured at each of the wells during the various Remedial Investigation sampling events or Site visits were used to calculate ground water elevations.

Monitoring wells completed in the Columbia Aquifer indicate a range in water levels from elevations of approximately 0.18 feet to 10.07 feet above mean sea level (msl). Ground water elevation data for the shallow monitoring wells ("100"-series) screened in the upper silt, clay, and sand zone indicate a varied flow system, with several directions of ground water flow. As indicated by the ground water potentiometric contour maps presented in the Remedial Investigation Report, there are two prominent flow systems present at the Site. Within the eastern portion of the Site, ground water flow is mainly to the east, toward the Southern Branch of the Elizabeth River. Within the western portion of the Site, a ground water mound is present, such that ground water flow in this area is radial. The variation in flow directions or presence of two flow systems was attributed to: 1) the discontinuous nature of the deposits, which results in materials of varying hydraulic conductivity and interconnection, and 2) recharge of the ground water system by the introduction of water from Site drainage features. The influence of the surface configuration of the Yorktown Clay on shallow ground water flow patterns has not yet been defined, but will be further evaluated following completion of proposed additional subsurface investigation activities. Supplemental remedial investigation activities pertaining to further definition of the Yorktown Clay and shallow ground water flow characteristics are listed in Section 1.2.4.6 of the Feasibility Study Report.

Due to the presence of the ground water mound in the western portion of the Site, a wide range of ground water elevations was obtained. In general, the ground water potentiometric surface was the highest in wells MW-33 and MW-34, which are located centrally within this area. Monitoring wells along the periphery of the western Site were found to be an average of two to three feet lower than wells MW-33 and MW-34. Ground water movement in the shallow aquifer does not appear to be controlled or affected appreciably by the nearby shallow surface drainage features, since the ground water elevations are typically below the base of the nearby drainageways. Contours of the potentiometric surface in the eastern portion of the Site show that the overall direction of ground water flow across the Site is to the east. The hydraulic gradient measured during each of the sampling dates is extremely low, and ranges from 0.0059 ft/ft to 0.0068 ft/ft. In the western portion of the Site, the hydraulic gradient was found to vary between 0.010 ft/ft and 0.0094 ft/ft. Figure 2-4 provides a map depicting the potentiometric surface at the Site.

Due to the presence of only three monitoring wells completed within the lower water-bearing zone ("200"-series wells), no detailed potentiometric surface map could be developed; however, regional geologic data indicates that flow within this system would be toward the east, discharging into the South Branch of the Elizabeth River. Ground water flow patterns within the lower aquifer will be further evaluated during the proposed supplemental remedial investigation, as outlined in Section 1.2.4.6 of the Feasibility Study Report.

In situ rising- and falling-head hydraulic conductivity tests were performed at ten well locations across the Site. Horizontal hydraulic conductivities were determined only for those monitoring wells screened

within the shallow water-bearing zone (Columbia Aquifer). Horizontal hydraulic conductivity ranged from 1.3 x 10-2 cm/sec to 1.9 x 10-4 cm/sec. Average horizontal hydraulic conductivity value for the shallow zone was calculated to be 4.3 x 103 cm/sec using the Hvorslev method and 3.3 x 10-3 cm/sec using the method of Bouwer and Rice.

Based on water level measurements obtained during previous monitoring efforts, the direction and rate of ground water movement can be approximated. Ground water velocity calculations for the shallow Columbia Aquifer were based on an average hydraulic conductivity value Qf 4.3 x 10-4 cm/sec and an estimated effective porosity of 30 percent. Using a mean hydraulic gradient of 0.0062 ft/ft, an average linear velocity calculated for flow beneath the Site in the eastern area is 0.25 ft/day (91 ft/year). This calculation represents a conservatively high estimate of the rate of ground water migration of constituents dissolved in ground water.

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D. Wetlands

Five wetland areas have been identified at the Site. All the wetlands identified are in a disturbed condition and are of low functional value based upon their small size, low vegetation diversity, scattered vegetation, disturbed soils, and minimal wildlife usage. The five areas contain basically two types of wetlands. The first type is a reed grass (Phragmites australis) community and the second a saltbush (groundsel tree) community. Reed grass is an aggressive, less desirable species with little-known value to wildlife. It typically invades disturbed marshes and competes with species considered more desirable for their habitat value. Groundsel communities are considered of moderate value for the diversity and bird nesting area they add to the marsh ecosystem.

The Site is located between two large riparian/estuarine wetland habitats of high value--Chesapeake Bay, 7 km to the north, and great Dismal Swamp National Wildlife Refuge, 12 km to the south. The Elizabeth River connects these two large habitats, acting as an arian migratory route. Figure 2-3 depicts the general locations of the wetland areas and surface water Outfalls 001, 002, and 003 at the Site.

E. Extent of Contamination

The primary objective of the Remedial Investigation was to characterize the nature and extent of hazardous substances present at the Atlantic Wood Industries, Inc., site. As part of this effort, the Remedial Investigation identified and evaluated potential migration routes for contaminants and exposure pathways for human and ecological receptors.

1. Soils Quality

In general, polynuclear aromatic hydrocarbons (PAHs) and pentachlorophenol (PCP) were detected in the nine areas of the Site in surface and subsurface soils. PCP, and PAHs (which are constituents of creosote), were used in the wood treating processes at the Site. The highest levels of PAHs were detected in the wood treatment and historic disposal areas. The highest levels of PCP at the Site were detected in the historic disposal area. PAHs detected in the wood storage area are most likely associated with the wood treatment processes conducted in this area. PAHs and PCP detected in the historic disposal area are probably associated with the historical disposal activities.

Concentrations of metals were highest in the wood storage yard, where chromated copper arsenate (CCA) treated wood was stored, and along the southeastern boundary of the Site, adjacent to Navy property. Elevated levels of zinc and copper concentrations, and high pH, in the southeastern area may be related to acetylene sludge that was discharged on the surface by a pipeline that was allegedly operated by the U.S. Navy. Blasting grit and debris that the U.S. Navy may have disposed near this area may also be a possible source for the elevated metals.

Analyses for polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) were performed on 43 soil samples collected during the Site investigations. Twenty-five of the samples were collected in the vicinity of the storm sewer line and eighteen samples were collected in other areas of the Site. The samples were collected to represent worst case conditions. EPA adopted a procedure based on toxicity equivalence factors (TEFs) to estimate the potential risks posed by complex mixtures of PCDDs and PCDFs. TEFs are based on research which shows a strong structure-activity relationship between the chemical structure of a particular PCDD/PCDF congener and its ability to elicit a biological response in various i~vivo and in vitro test systems. The TEFs were used to calculate toxicity equivalent concentrations (TECs)

for the soil samples analyzed for dioxins/furans which are presented in Table 2-1.

Figure 2-5 provides maximum concentrations of total PAHs, PCP, 2,3,7,8-TCDD (TEFs), arsenic, copper, and zinc, in surface soils and their general locations. Figure 2-6 provides the concentration and location of carcinogenic PAHs in surface soils located in the western section of the Site, and Figure 2-7 provides similar data for the eastern section of the Site.

The toxicity of carcinogenic PAHs can be defined in terms of the toxicity of a specific PAH compound named benzo[a]pyrene. Benzo[a]pyrene is considered to be one of the most potent of the carcinogenic PAHs. Therefore, benzo[a]pyrene was used as a surrogate to derive the cleanup level for carcinogenic PAHs provided in Part II, Section X of this ROD. Relative potency factors are available for each carcinogenic PAH: the carcinogenic potency for each PAH was derived by assuming that the carcinogenic PAH and benzo[a]pyrene have similar dose-response curves, but takes proportionately larger concentrations of carcinogenic PAH to induce the same responses as benzo[a]pyrene. For example, benzo[a]anthracene which is another carcinogenic PAH, has a relative potency factor of 0.1; therefore, a benzola]anthracene concentration of 5 mg/Kg is equivalent to 0.5 mg benzo[a]pyrene/Kg. This concentration in terms of benzo[a]pyrene is referred to as benzo[a]pyrene equivalents (BaPEq). Relative potency factors for carcinogenic PAHs are:

PAR Constituent	Factor
Benzo[a]pyrene	1.0
Benzo[a]anthracene	0.1
Benzo[b]fluoranthene	0.1
Benzo[k]fluoranthene	0.01
Chrysene	0.001
Dibenzo[a,h]anthracene	1.0
Indeno[1,2,3-cd]pyrene	0.1

The number of BaPEq can be related to total carcinogenic PAH concentrations at this Site by generating a regression equation between the total carcinogenic PAH (cPAH) concentration and the corresponding BaPEq concentrations at each soil sample. The relationship is linear with a statistically significant correlation coefficient (r) of 0.97. The linear relationship is defined as:

$$BaPEq = 0.19 \; cPAH$$

Cleanup levels for carcinogenic PAHs can be derived in terms of BaPEq. The BaPEq concentration can easily be translated into a carcinogenic PAH concentration using the above equation. This conversion facilitates the delineation of areas that require remediation because the areas are defined by cPAH concentrations which are shown in Figures 2-6 and 2-7.

TABLE 2-1
ATLANTIC WOOD INDUSTRIES, INC.,
TOTAL EQUIVALENT 2,3,7,8-TCDD CONCENTRATIONS, :g/kg

Sample Location	Sample	Depth (ft)	Total Equivalent 2,3,7,8-TCDD Surface Soils	Total Equivalent 2,3,7,8-TCDD Subsurface Soils
Treatment	BI-S	0-0.5	0.02	--
Areas	S9-S	0-0.5	0.22	--
	S13-A	0	0.77	--
	T1-4A	0-2	0.00	--
	T1-4PD	0-2	0.00	--
	T1-4F	0-0.5	0.02	--
	7-2A	0-0.5	7.10	--
	7-11	0-0.5	8.04	--
	R-4	0-4	0.06	--
	S-25	--	0.28	--
	6-2A	0-0.5	2.05	--
	7-6A	0-0.5	2.54	--
	7-1A	0-0.5	0.75	--
	5-7A	0-0.5	1.27	--
	5-3A	0-0.5	9.31	--
	7-12A	0-0.5	6.06	--
	7-10A	0-0.5	11.64	--
	R11-A	1-2	--	0.60
	S1-A	3-4	--	0.00
	S4-A	4-6	--	0.01
	S15-A	1-2	--	0.55
	T1-A	2-4	--	0.03
	T1-3A	1-2	--	0.72
	7-9B	1.5	--	0.50
	4-5A	0-0.5	1.03	--
Old Disposal	9C	2-8	--	25.12
Area	9E	0-4	12.77	--

<IMG SRC 0395199F>
<IMG SRC 0395199G>
<IMG SRC 0395199H>

In June of 1990, after the field work for the Remedial Investigation had been completed, EPA requested that AWI collect a representative sample from each study area and conduct Toxicity Characteristic Leaching Procedure (TCLP) and analysis to ascertain whether the soils were characteristically hazardous. Based on the TCLP testing, the soils are not hazardous by characteristic. Table 2-2 provides the results for the TCLP analysis.

2. Sediment Quality

Sediment samples were collected from five locations at the Site to characterize the extent of impact on these areas from wood treating operations. The areas that were characterized include a storm-water runoff ditch in the treated wood storage area, a ditch along the western boundary of the Site, a ditch at the southeast edge of the Site which discharges into the Elizabeth River, the inlet receiving discharge from Outfall 002 and the Elm Avenue storm sewer, and the Elizabeth River.

The highest concentrations of total detected PAH were present in the inlet sediment, increasing as the samples were collected closer to the river. The PAH concentrations in the inlet ranged from 511 mg/kg to 38,437 mg/kg. The highest concentrations of PCP and chromium were detected in the storm-water runoff ditch flowing out of the CCA and PCP treated wood storage area, with concentrations ranging from 7.2 mg/kg to 12.0 mg/kg and 53 mg/kg to 54 mg/kg, respectively. The concentrations of arsenic, copper, and zinc were highest in the southeast ditch area, which is just north of the Navy property and passes through the acetylene sludge disposal area (a.k.a. waste lime area), with maximum concentrations of 364 mg/kg, 1,350 mg/kg, and 1,890 mg/kg, respectively. Analysis for metals was not performed on samples collected from the inlet. Figure 2-8 provides concentrations of total PAHs and PCP at the various sediment sampling locations.

3. DNAPL Occurrence

Dense Non-Aqueous Phase Liquid (DNAPL) can be described as heavy liquids that exist below the surface in certain areas of the Site, or can also be thought of as creosote-soaked subsoils. DNAPL exists at the Site because of past releases of chemicals used in the wood-treatment processes. Available information suggests that DNAPL has not penetrated into the Yorktown Clay zone in any significant manner and is thus predominantly confined to the Columbia aquifer which is the upper water-bearing zone. The Yorktown Clay zone is located at the bottom of the Columbia aquifer and acts as a semi-confining unit which in general prevents DNAPL contamination from spreading into the lower aquifer known as the Yorktown-Eastover aquifer.

Although predominant areas of DNAPL occurrence in the Columbia aquifer is determined, the full extent of DNAPL occurrence is not defined. The two main areas in which potentially recoverable DNAPL occurs are within the former process area of the plant (Area 1--see Figure 2-2 for area locations) and the historical disposal area (Area 3) at levels below approximately six feet.

The surface mound in the historical disposal area may indicate a likely area in which DNAPL may exist. According to the Remedial Investigation, the wells that closely encircle the historical disposal area have not had DNAPL accumulate within them, though some product presence was noted in soils located just south of the historic disposal area (in wells marked MW-30 and MW-102). No wells have been centrally installed within the historical disposal area itself, but soil samples were collected there. Based on examination of the soil sampling logs, it seems likely that sufficient DNAPL is present and would thus accumulate in wells centrally installed in the historic disposal area.

DNAPL has also accumulated in monitoring well MW-34 located in the wood storage area (Area 4), and monitoring well MW-117, located east of the former process area and near the inlet (Area 5), where apparent thicknesses of less than one foot and 1.5 feet, respectively, have been measured. These well locations are remote from the two main areas of DNAPL occurrence.

Table 2-3 provides the distribution of DNAPLs in soils at the Site based on borings taken during the Remedial Investigation. Table 2-4 provides a summary of DNAPL composition for Site monitoring well 117 (MW 117) for organic and inorganic constituents.

4. Ground Water

Only minimal information is provided on ground water quality in this ROD, as a subsequent operable unit will address the potential remediation of ground water at the Site. Further ground water quality information can be found in Section 4.3 of the Remedial Investigation Report (March 1992).

A total of 27 monitoring wells were used to generate ground water quality information for the Site. A

total of 23 wells monitor the upper-most water-bearing zone (Columbia Aquifer), while four wells are screened within the lower water-bearing zone (Yorktown-Eastover Aquifer).

<IMG SRC 0395199I>

TABLE 2-2
ATLANTIC WOOD INDUSTRIES, INC., SITE
RESULTS OF TCLP TESTING
JUNE 28, 1990

Location	Wood Storage Area	Wood Storage Area	Wood Storage Area	Wood Treating Area West	Wood Treating Area East	Wood Treating Area East	Wood Treating Area East	Acetylene Sludge Area	Historic Disposal Area
Grid Location(*)	IC	2-3	3-2	4-3	5-8	6-6	7-7	8-8	9E
Depth	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft	0-0.5 ft
Metals, ug/L									
Arsenic	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Barium	930	774	1140	2080	540	960	1510	1670	1500
Cadmium	12.3	9.73	10.1	5.00 U	5.00 U	8.31	5.00 U	7.74	5.00 U
Chromium	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Mercury	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
Lead	100 U	117	100 U	9460	100 U	282	1360	1470	1460
Selenium	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Silver	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Volatilc Organic Compounds, :g/L									
Benzene	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Carbon Tetrachloride	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Chlorobenzene	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Chloroform	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
1,2-Dichloroethane	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
1,1-Dichloroethylene	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Methyl ethyl ketone	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Tetrachloroethylene	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Trichloroethylene	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Vinyl chloride	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Semi-Volatile Organic Compounds, :g/L									
o-Cresol	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	10 U
m-Cresol	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	10 U
p-CresoL	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenxene	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dinitroluene	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	100 U	50 U	100 U	50 U	50 U	50 U	50 U	50 U	642
Pyridine	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	100 U	50 U	100 U	50 U	50 U	50 U	50 U	50 U	50 U
2,4,6-Trichlorophenol	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	10 U

Note: U indicates that the compound was not detected.
*Grid location corresponds to RI sampling grid.

TABLE 2-3
ATLANTIC WOOD INDUSTRIES, INC., SITE
DNAPL DISTRIBUTION IN SOILS
BASED ON RI/FS SOIL BORING AND WELL LOGS

BORING/ WELL	DNAPL OCCURRANCE (FT BGS)	TOP OF YORKTOWN CLAY (FT BGS)	NATURE OF DNAPL OCCURRANCE
2-E	3-6	20	Product occurs as isolated droplets; sheen
3-E	2-4	(1)	Some product saturation in noted interval
4-C	1.5-4		Product saturated coarse lenses above finer laminae
	5.5-19	19	Product saturated coarse lenses above finer laminae
5-A	0-2		Product stained zones throughout noted interval
	4-11	19	Product stained zones throughout noted interval
5-C	0-2.5	17.5	Product saturation
5-D	5.8-6	17.5	Thin product layer
5-E	2-3		Product staining
	5.5-8	19	Product staining in thin clay laminae
6-A	0-4		Product saturation
	4-8		Product saturated zones throughout
	8-10	16	Zones of product shen throughout
6-B	5-12	16	Product occurs as isolated droplets
6-D	8-9	(1)	Light product sheen
6-E	8.5-11		Product saturation
	14.5-17	17	Product saturation
7-A	2-5.5		Product saturation
	8-10	18.5	Product saturation
7-B	3.8-6.5	19.5	Product saturation
7-C	1-1.5	18.5	Product saturation
7-G	0-1		Product saturation
	2.3-3.5		Product saturation
	6-8	17	Product saturation
9-A	1.5-2		Product saturation
	5-5.5		Product saturation
	5.5-20		Zones of product staining and saturation throughout
	20.5-22	(1)	Product saturation
9-B	4-4.5		Product saturation
	6-6.5	18	Product saturation
9-C	3.5-7.5		Product saturation
	10-10.5		Product saturation
	17-18.5		Product saturation
	18.5-20		Thin sand seams with product saturation
	20-21		Product saturation
	25-25.5		Product saturation
	28-33.8	(1)	Product saturation laminae
9-D	5-15		Product saturation seams
	16-19		Product saturation
	19-22	(1)	Product saturated sand seams
9-E	0-22	(1)	Product saturated zonesand laminae throughout
9-F	1.8-6		Product saturation
	9.3-11.1		Product occurs as isolated droplets
	11.5-18		Zones of product staining and saturation throughout
	18-20	18	Product saturated sand laminae

TABLE 2-3 (cont'd)
ATLANTIC WOOD INDUSTRIES, INC., SITE
DNAPL DISTRIBUTION IN SOILS
BASED ON RI/FS SOIL BORING AND WELL LOGS

BORING/ WELL	DNAPL OCCURRANCE (FT BGS)	TOP OF YORKTOWN CLAY (FT BGS)	NATURE OF DNAPL OCCURRANCE
9-G	7.3-8		Product staining and saturation
	11-17.5	17.5	Product saturated lenses and laminae throughout
9-H	12-17.5		Clay laminae with product saturated lenses
	17.5-20	17.5	Clay with product sheen
9-I	3-5.6		Product saturation
	5.6-17.5	(1)	Product saturated lenses and laminae throughout
MW-102	15-16	17	Product saturation
MW-105	1.5	16	Product staining
MW-106	4-6		Product staining
	6-9.5	16.5	Product sheen
MW-113	7.9-8	18	Thin product saturated lens
MW-114	5-7	15	Product staining
MW-115	1-2		Product saturation
	2.4-4		Product saturation
	5-16	16	Product saturated sand lenses above clay lamination throughout
MW-116	0-4.5	13	Product saturation
MW-117	8-16	16	Product occurs as isolated droplets
MW-118	1.5-10.5	15.5	Product staining and sheen

NOTE: (1) CLAY NOT NOTED ON LOG; SANDS OR INTERBEDDED SANDS AND CLAYS OBSERVED AT BASE OF BORI

TABLE 2-4
ATLANTIC WOOD INDUSTRIES, INC., SITE
SUMMARY OF DNAPL COMPOSITION
WELL MW-117 - ORGANIC AND INORGANIC CONSTITUENTS

Parameters	Estimated Concentrations (:g/L)
Naphthalene	64000000
2-Methylnaphthalene	12000000
Acenaphthylene	1000000
Acenaphthene	17000000
Dibenzofuran	11000000
Fluorene	13000000
Phenanthrene	36000000
Anthracene	4000000
Fluoranthene	18000000
Pyrene	12000000
Benzo(a)anthracene	29000000
Chrysene	32000000
Bix(2-Ethylhexyl)phthalate	3900
Benzo(b)fluoranthene	2600000
Benzo(k)fluoranthene	2600000
Benzo(a)pyrene	1900000
Indeno (1,2,3-c,d)pyrene	3600000
Dibenzo(a,h)anthracene	140000
Benzo(g,h,i)perylene	310000
Pentachlorophenol	960000
Arsenic	1.2
Chromium	1.2
Copper	2.6
Zinc	9

In general, PCP was the most dominant acid extractable compound present in ground water. PCP was detected in seven of the 22 shallow wells. Generally, these wells are located in the area of the wood-treating plant, the former tank farm, and the historic disposal area. PCP was not detected in any of the deep wells monitoring the Site.

PAHs were detected in several of the monitoring wells at the Site. Concentrations of total PAHs were highest near the wood-treating plant and the historic disposal area. PAH concentration ranged up to 12,212 :g/l. The wells located downgradient from the wood-treating plant showed the most elevated levels of PAH in the shallow ground water zone. PAHs were not detected in any of the deep wells monitoring the Yorktown-Eastover aquifer.

Several volatile organic compounds (VOCs), including benzene, toluene, ethylbenzene, and xylenes (BTEX), and styrene were detected in 11 of the 22 shallow ground water monitoring wells. The majority of detections were found within the eastern half of the Site. VOCs were also detected in two of the deep wells.

Inorganic constituents, including arsenic, copper, and zinc, were detected in ground water samples throughout the Site area. Arsenic concentrations ranged up to 876 :g/l which exceeds the Maximum Contaminant Level (MCL) of 50 :g/l for this element. The MCL represents the maximum permissible level of a contaminant in water delivered to any user of a public water system. MCLs are established under the Safe Drinking Water Act, 42 U.S.C. §§ 300f et seq., codified at 40 C.F.R. Part 141, and are enforceable standards that are used as a reference level when analyzing sampling data. Samples taken from three other wells were found to exceed the arsenic MCL. An arsenic concentration of 12.8 :g/l was detected in a sample from one of the four deep wells monitoring the Yorktown-Eastover aquifer.

Total copper concentrations in the shallow aquifer ranged up to 1990 :g/l. The current MCL Goal (MCLG) for copper is 1300 :g/l. The MCLG is an unenforceable health goal equal to the maximum level of a contaminant which is not expected to cause any adverse health effects over a lifetime exposure and includes a margin of safety. In general, copper concentrations were found to be more elevated in those wells in the western portion of the Site. Copper (dissolved) was not detected in any of the deep wells monitoring the Yorktown-Eastover aquifer.

The concentration of zinc within the shallow aquifer is fairly consistent throughout the Site. Zinc concentrations ranged up to 9500 :g/l in the shallow aquifer and was detected in one of the four deep wells.

Based on the analytical results of PCP sampling and based on their downgradient location from the wood-treating plant, seven shallow wells were selected and sampled for the presence of dioxin/furans. Concentrations of 2,3,7,8-TCDD equivalents ranged from non-detects to 0.00054 :g/1. The current MCL for 2,3,7,8-TCDD is 0.00003 ~g/1.

5. Surface Water

Surface water was not investigated as part of the Remedial Investigation; however, NPDES monitoring is performed at Outfalls 001, 002, and 003. The Outfalls are shown on Figure 2-3. During the period from October 1985 through March 1990, the permit maximum for total phenol (1 mg/L monthly average; 2.0 mg/L daily maximum) was exceeded one time at Outfall 001 during July 1986 with a concentration of 7.65 mg/L. Likewise, the permitted monthly average for oil and grease (10.0 mg/L monthly average; 15.0 mg/L daily maximum) was exceeded three times; twice at Outfall 001 (12.5 mg/L and 12.6 mg/L during July and December 1986, respectively), and once at Outfall 003 (10.9 mg/L during December 1986). The permitted maximum oil and grease concentration was exceeded four times at Outfall 001 (17 mg/L, 20 mg/L, 35.7 mg/L, and 20.47 mg/L during July, August, December 1986 and March 1989, respectively), once at Outfall 002 (20.8 mg/L during December 1986), and once at Outfall 003 (28.4 mg/L during December 1986). The permitted maximum oil and grease concentration was exceeded in May 1989 at each Outfall and in June 1989 at Outfall 001.

In August 1986, and October 1989, rainfall samples from each of the Outfalls were collected and analyzed for all priority and non-priority pollutant extractable and volatile organics, and various metals. These parameters were not subject to permit limitations. During the August 1986 event, 2,4-Dimethylphenol, phenol, and total recoverable phenolics were detected, as well as arsenic, lead, and zinc. In October 1989, only metals were detected - arsenic, copper, lead, nickel, and zinc.

During each of the first eight months of the permit which was effective beginning March 21, 1991, one grab rainfall runoff sample was collected from each of the Outfalls, and analyzed for base neutral acids and selected metals. These parameters were not subject to permit limitations, but were performed as part of the

Virginia Toxics Monitoring Program. Pentachlorophenol, total recoverable phenolics, fluoranthene, total recoverable zinc, and ferrous iron were most of the compounds that were detected.

Annual toxicity testing was performed by Savannah Laboratories and Environmental Services, Inc., a representative of AWI. A 48-hour static bioassay was conducted using 5-day old Mysidopsis bahia (grass shrimp). Results of the bioassay showed 95% or better survival rate for all test and control groups, with the exception of the tests conducted on August 13, 1986, and October 3, 1989. On August 13, 1986, the bioassay results showed survival rates ranging from 0% (Outfall 002 discharge, 100% effluent concentration) to 100% (Outfalls 001 and 002 discharge, 6.25% effluent concentration) which indicate that the stormwater samples were moderately toxic to Mysidopsis bahia. The August 1986 results may have been due to constituents that were allowed to accumulate during the abnormally dry months in Spring and Summer of 1986 and which were washed through the Outfalls with the stormwater. The results of the October 1989 bioassay using water from Outfall 002 showed survival rates between 65% and 85%; the reason for this is not known, but it was noted in the laboratory report that the survival rate was 65% in the 25% concentration and then increased to 85% in the 100% concentration. This testing concluded that the stormwater runoff from the Site was not toxic to the MvsidoDsis bahia, and no additional toxicity testing was required by the Surface Water Control Board.

6. Air

Air was not investigated as part of the Remedial Investigation; however, previous air sampling events were conducted by EPA and Risk Service International (RSI), a representative of AWI. A total of 58 samples were collected from eleven stations. EPA identified two on-site naphthalene emission sources: the northeast drainage ditch area and the wood treatment area east. There was reasonable agreement between naphthalene measurements made by EPA and RSI for the northeast drainage area, but RSI measurements for the area adjacent to wood treatment area east were five-fold higher than the related EPA sample.

Based on EPA air sampling data, naphthalene levels at the south boundary fence were shown to be sufficiently elevated above those of Elm Avenue which is an indication of possible off-site migration. However, the RSI naphthalene air sampling data did not show similar sampling results. Considering the collected data from both EPA and RSI, it appears that there is not enough data to conclusively determine if off-site migration has occurred.

VI. SUMMARY OF SITE HEALTH RISKS

As part of the Remedial Investigation/Feasibility Study (RI/FS) process, an analysis was conducted by AWI, under the oversight of EPA in consultation with the Virginia Department of Environmental Quality (VDEQ), to identify human health and environmental risks that could exist if no action were taken at the Site. This analysis, completed in accordance with the NCP, is referred to as a baseline risk assessment. This assessment provides the basis for taking action and indicates the exposure pathways that need to be addressed by the remedial action.

In general, a baseline risk assessment is performed in four steps: (1) data collection and evaluation, (2) the exposure assessment, (3) the toxicity assessment, and (4) risk characterization. This section of the ROD will summarize the result of each of these steps.

A. Data Collection and Evaluation

The data collected and described in the previous section were evaluated for use in the baseline risk assessment. This evaluation involves reviewing the quality of the data and determining which data are appropriate to use to quantitatively estimate the risks associated with Site soil, sediment, surface water, and ground water. Note, ground water data will not be presented within this summary as a subsequent ROD will address potential ground water remediation.

Based on the soil sampling data, areas of high soil contamination exist in the Wood Treatment Area West and East, Historic Disposal Area, Wood Storage Area, and the Waste Lime Area. The analytical results from samples collected in these areas were used to estimate the soil exposure point concentrations for use in the baseline risk assessment. The exposure point concentrations are upper 95th percentile confidence limits of the arithmetic average concentrations of this data set. The values for surface and subsurface soils are presented in Tables 2-5 through 2-9. The tables are divided into the five soil areas that were evaluated in the baseline risk assessment. The table headings reference the general Site location from which the data were generated. Scientific notation, a shorthand means of expressing numerical values, is used within the tables to deal with particularly large or small numbers. For example, the value 0.000011 can

be written as 1.1E-05 or 1.1 x 10-5.

Data from sediment sampling were not quantitatively evaluated for human risk assessment purposes since exposure to sediments by human receptors is unlikely to occur at a frequency that would pose a significant risk.

Surface water was not investigated as part of the Remedial Investigation; however, NPDES monitoring was performed by AWI at Outfalls 001 through 003. Surface water was not quantitatively evaluated for human risk assessment purposes since exposure to surface water by human receptors is unlikely to occur at a frequency that would pose a significant risk.

B. Exposure Assessment

There are three basic steps involved in an exposure assessment: 1) identifying the potentially exposed populations, both current and future, 2) determining the pathways by which these populations could be exposed, and 3) quantifying the exposure. Under current Site conditions, the populations that could potentially be exposed to contaminants in soil and sediment are current on-site workers, future on-site workers, and off-site individuals on adjacent properties. Ground water users are also potentially exposed, although ground water at the Site is not expected to be used for residential consumption purposes. According to the Remedial Investigation, the City of Portsmouth requires all new residences to use city sewerage, and any residence on the city sewer system must use city water. Note, potential ground water remediation will be handled by a ROD for a subsequent operable unit, and is not addressed in this ROD.

The potential pathways for current exposure include: 1) incidental ingestion of soils (usually resulting from placing hands or objects contaminated with soil into the mouth), 2) dermal contact with the soils, and 3) inhalation (i.e. breathing) of fugitive dust.

EPA does not believe that residential development is a potential future use of the Site. The land use currently on and within the vicinity of the Site is industrial, and thus, an industrial use scenario was used in assessing risk. According to City records, the actual zoning designation at the Site is M2 - Heavy Industrial.

Table 2-5: Reasonable Maximum Exposure Point Concentrations
WOOD TREATMENT AREA EAST (AREA 1)

Contaminants	Surface Soil			Subsurface Soil	
	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust (mg/m3)		Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust via Construction Activities (mg/m3)
		via Wind Erosion	via Construction Activities		
Arsenic	36	3.6E-07	4.1 E-e6	445	5.1E-05
Copper	184	1.9E-06	2.1 E-e5	715	8.2E-05
Zinc	458	4.6E-06	5.2E-05	2,670	3.0E-04
Benzene	n/a	n/a	n/a	0.140	1.6E-08
Toluene	n/a	n/a	n/a	0.2.04	2.3E-08
Ethylbenzene	n/a	n/a	n/a	0.243	2.8E-08
Styrene	n/a	n/a	n/a	0.173	2.0E-08
Xylenes	n/a	n/a	n/a	1.005	1.1E-07
2-Methylnaphthalene	49	5.0E-07	5.6E-06	220	2.5E-05
Dibenzofuran	72	7.3E-07	8.3E-06	484	5.5E-05
Acenaphthene	114	1.2E-06	1.3E-05	707	8.1E-05
Acenaphthylene	10	1.0E-07	1.2E-06	20	2.3E-06
Anthracene	280	2.8E-06	3.2E-05	2,710	3.1E-04
Benzo(a)anthracene	167	1.7E-06	1.9E-05	391	4.5E-05
Benzo(a)pyrene	83	8.4E-07	9.5E-06	156	1.8E-05
Benzo(b)fiuoranthene	1716	1.7E-06	1.9E-05	228	2.8E-05
Benzo(g,h,i)perylene	26	2.6E-07	3.0E-06	60	6.8E-06
Benzo (k)fluoranthene	154	1.6E-06	1.8E-05	205	2.3E-05
Chrysene	2058	2.1E-06	2.3E-05	505	5.8E-05
Dibenzo(a,h)anthracene	9	8.7E-08	9.8E-07	22	2.5E-06
Fluoranthene	733	7.4E-6	8.4E-05	2,631	3.0E-04

Table 2-5: Reasonable Maximum Exposure Point Concentrations
WOOD TREATMENT AREA EAST (AREA 1)

Contaminants	Surface Soil			Subsurface Soil	
	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust (mg/m3)		Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust via Construction Activities (mg/m3)
		via Wind Erosion	via Construction Activities		
Fluorene	136	1.4E-06	1.5E-05	1,101	1.3E-04
Indeno(1,2,3-cd) pyrene	27	2.7E-07	3.0E-06	68	7.7E-06
Naphthalene	150	1.5E-06	1.7E-05	233	2.7E-05
Phenanthrene	432	4.4E-06	4.9E-05	3,766	4.3E-04
Pyrene	456	4.8E-06	5.2E-05	1,603	1.8E-04
Pentachlorophenol	10	1.1E-07	1.2E-06	53	6.1E-06
Phenol	6	5.9E-08	1.2E-06	14	1.6E-06
2,4,6-Trichlorophenol	n/a	n/a	n/a	n/a	n/a
2,4-Dimethyphenol	n/a	n/a	n/a	11	1.2E-06
2-Methylphenol	n/a	n/a	n/a	10	1.1E-06
4-Methylphenol	n/a	n/a	n/a	9	1.0E-06

Table 2-6: Reasonable Maximum Exposure Point Concentrations
WOOD TREATMENT AREA EAST (AREA 2)

Contaminants	Surface Soil			Subsurface Soil	
	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust (mg/m3)		Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust via Construction Activities (mg/m3)
		via Wind Erosion	via Construction Activities		
Arsenic	93	n/a	1.1E-05	n/a	n/a
Copper	313	n/a	3.6E-05	n/a	n/a

Table 2-6: Reasonable Maximum Exposure Point Concentrations
WOOD TREATMENT AREA EAST (AREA 2)

Contaminants	Surface Soil			Subsurface Soil	
	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust (mg/m3)		Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust via Construction Activities (mg/m3)
		via Wind Erosion	via Construction Activities		
Zinc	947	n/a	1.1E-04	1,452	1.7E-04
Benzene	n/a	n/a	n/a	n/a	0.0
Toluene	n/a	n/a	n/a	0.002	2.3E-10
Ethylbenzene	n/a	n/a	n/a	0.003	3.4E-10
Styrene	n/a	n/a	n/a	0.005	5.7E-10
Xylenes	n/a	n/a	n/a	0.030	3.4E-09
2-Methylnaphthalene	1.2	n/a	1.4E-07	359	4.1E-05
Dibenzofuran	1.9	n/a	2.2E-07	602	8.9E-05
Acenaphthene	1.8	n/a	2.1E-07	802	9.1E-05
Acenaphthylene	3.8	n/a	4.4E-07	10	1.1E-06
Anthracene	14.9	n/a	1.7E-06	434	5.0E-05
Benzo(a)anthracene	23.4	n/a	2.7E-06	182	2.1E-05
Benzo (a)pyrene	27.5	n/a	3.1E-06	57	6.5E-06
Benzo(b)fluoranthene	66.6	n/a	7.6E-06	141	1.6E-05
Benzo(g,h,i)perylene	14.9	n/a	1.7E-06	15	1.8E-06
Benzo(k)fluoranthene	66.6	n/a	7.8E-06	137	1.6E-05
Chrysene	35.8	n/a	4.1E-06	233	2.7E-05
Dibenzo(a,h)anthracene	6.0	n/a	8.8E-07	5	6.2E-07
Fluoranthene	58.1	n/a	6.8E-06	1,259	1.4E-04
Fluorene	2.8	n/a	3.0E-07	802	9.1E-05
Indeno(1,2,3-cd)pyrene	15.5	n/a	1.8E-06	16	1.8E-06
Naphthalene	1.8	n/a	2.1E-07	507	5.8E-05

Table 2-6: Reasonable Maximum Exposure Point Concentrations
WOOD TREATMENT AREA EAST (AREA 2)

Contaminants	Surface Soil			Subsurface Soil	
	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust (mg/m3)		Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust via Construction Activities (mg/m3)
		via Wind Erosion	via Construction Activities		
Phenanthrene	12.5	n/a	1.4E-06	2,359	2.7E-04
Pyrene	63.6	n/a	7.2E-06	1,057	1.2E-04
Pentachlorophenol	60.8	n/a	6.9E-06	23	2.6E-06
Phenol	n/a	n/a	n/a	2	1.9E-07
2,4,6-Trichlorophenol	n/a	n/a	n/a	n/a	n/a
2,4-Dimethyphenol	n/a	n/a	n/a	7	8.2E-07
2-Methylphenol	n/a	n/a	n/a	2	2.5E-07
4-Methylphenol	n/a	n/a	n/a	3	3.8E-07

Table 2-7: Reasonable Maximum Exposure Point Concentrations
HISTORIC DISPOSAL AREA (AREA 3)

Contaminants	Surface Soil			Subsurface Soil	
	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust (mg/m3)		Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust via Construction Activities (mg/m3)
		via Wind Erosion	via Construction Activities		
Arsenic	n/a	n/a	0.0	n/a	0.0
Copper	n/a	n/a	0.0	n/a	0.0
Zinc	577	n/a	6.6E-05	209	2.4E-05
Benzene	0.015	n/a	1.7E-09	0.009	1.0E-09

Table 2-7: Reasonable Maximum Exposure Point Concentrations
HISTORIC DISPOSAL AREA (AREA 3)

Contaminants	Surface Soil			Subsurface Soil	
	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust (mg/m3)		Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust via Construction Activities (mg/m3)
		via Wind Erosion	via Construction Activities		
Toluene	0.062	n/a	7.1E-09	0.061	7.01-09
Ethylbenzene	0.096	n/a	1.1E-08	0.047	5.4E-09
Styrene	0.052	n/a	5.9E-09	0.004	4.6E-10
Xylenes	1.4	n/a	1.6E-07	0.045	5.2E-09
2- Methylnaphthalene	390	n/a	4.4E-05	15	1.7E-06
Dibenzofuran	400	n/a	4.6E-05	14	1.6E-06
Acenaphthene	560	n/a	6.4E-05	13	1.5E-06
Acenaphthylene	42	n/a	4.8E-06	0.8	9.1E-0S
Anthracene	650	n/a	7.4E-05	7.7	8.8E-07
Benzo(a)anthracene	1804	n/a	2.1E-05	8	9.1E-07
Benzo(a)pyrene	110	n/a	1.3E-05	3.8	4.3E-07
Benzo(b)fiuoranthene	110	n/a	1.3E-05	5.8	6.8E-07
Benzo(g,h,i)perylene	28	n/a	3.0E-06	2.5	2.9E-07
Benzo(k)fluoranthene	99	n/a	1.1E-05	5.2	5.9E-07
Chrysene	190	n/a	2.2E-05	1.1	1.3E-07
Dibenzo(a,h)anthracene	10	n/a	1.1E-06	0.58	6.6E-08
Fluoranthene	890	n/a	1.0E-04	37	4.2E-06
Fluorene	490	n/a	5.6E-05	20	2.3E-06
Indeno(1,2,3-cd)pyrene	30	n/a	3.4E-00	2.9	3.3E-07
Naphthalene	610	n/a	7.0E-05	18	2.1E-06
Phenanthrene	1,400	n/a	1.6E-04	49	5.6E-06
Pyrene	560	n/a	6.4E-05	29	3.3E-06

Table 2-7: Reasonable Maximum Exposure Point Concentrations
HISTORIC DISPOSAL AREA (AREA 3)

Contaminants	Surface Soil			Subsurface Soil	
	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust (mg/m3) via Wind Erosion	Inhalation of Dust (mg/m3) via Construction Activities	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust via Construction Activities (mg/m3)
Pentachlorophenol	970	n/a	1.1E-04	43	4.9E-06
Phenol	0.46	n/a	5.2E-08	2.8	3.0E-07
2,4,6-Trichlorophenol	n/a	n/a	n/a	n/a	n/a
2,4-Dimethyphenol	n/a	n/a	n/a	2.8	3.0E-07
2-Methylphenol	n/a	n/a	n/a	2.6	3.0E-07
4-Methylphenol	n/a	n/a	n/a	2.8	3.0E-07

Table 2-8: Reasonable Maximum Exposure Point Concentrations
WOOD STORAGE AREA (AREA 4)

Contaminants	Surface Soil			Subsurface Soil	
	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust (mg/m3) via Wind Erosion	Inhalation of Dust (mg/m3) via Construction Activities	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust via Construction Activities (mg/m3)
Arsenic	183	1.8E-06	2.1E-05	34	3.9E-06
Copper	528	5.3E-06	8.0E-05	535	8.1E-05
Zinc	775	7.8E-06	8.8E-05	424	4.8E-05
Benzene	0.03	3.0E-10	3.4E-09	n/a	0.0
Toluene	0.097	9.8E-10	1.1E-08	0.004	4.3E-10
Ethylbenzene	0.08	8.1E-10	9.1E-09	n/a	0.0
Styrene	0.085	8.8E-10	9.7E-09	n/a	0.0

Table 2-8: Reasonable Maximum Exposure Point Concentrations
WOOD STORAGE AREA (AREA 4)

Contaminants	Surface Soil			Subsurface Soil	
	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust (mg/m3)		Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust via Construction Activities (mg/m3)
		via Wind Erosion	via Construction Activities		
Xylenes	0.65	6.6E-09	7.4E-08	n/a	0.0
2-Methylnaphthalene	36	3.7E-07	4.1 E-68	1	9.2E-08
Dibenzofuran	56	5.7E-07	6.4E-06	4	4.9E-07
Acenaphthene	32	3.2E-07	3.7E-06	8	9.0E-07
Acenaphthylene	2	2.3E-08	2.6E-07	2	2.5E-07
Anthracene	177	1.8E-68	2.0E-05	12	1.3E-06
Benzo(a)anthracene	70	7.1E-07	8.0E-06	45	5.2E-06
Benzo(a)pyrene	53	5.4E-07	6.0E-06	43	4.9E-06
Benzo(b)fiuoranthene	65	6.5E-07	7.4E-68	69	7.9E-06
Benzo(g,h,i)perylene	18	1.9E-07	2.1E-06	12	1.3E-06
Benzo(k)fluoranthene	68	6.8E-07	7.7E-06	69	7.9E-06
Chrysene	71	7.2E-07	8.1E-06	43	4.9E-06
Dibenzo(a,h)anthracene	6.0	6.4E-08	7.2E-07	6	6.6E-07
Fluoranthene	185	1.7E-06	1.9E-05	86	9.8E.06
Fluorene	119	1.2E-06	1.4E-05	7	8.2E-07
Indeno(1,2,3-cd)pyrene	20	2.0E-07	2.3E-06	13	1.5E-06
Naphthalene	33	3.4E-07	3.8E-06	11	1.2E-07
Phenanthrene	259	2.6E-06	3.0E-05	48	5.5E-68
Pyrene	128	1.3E-06	1.5E-05	66	7.5E-06
Pentachlorophenol	61	6.2E-07	7.0E-68	39	4.5E-68
Phenol	2	1.8E-08	2.1E-07	n/a	0.0
2,4,6-Trichlorophenol	n/a	n/a	n/a	n/a	n/a

Table 2-8: Reasonable Maximum Exposure Point Concentrations
WOOD STORAGE AREA (AREA 4)

Contaminants	Surface Soil			Subsurface Soil	
	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust (mg/m3)		Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust via Construction Activities (mg/m3)
		via Wind Erosion	via Construction Activities		
2,4-Dimethyphenol	n/a	n/a	n/a	n/a	0.0
2-Methylphenol	n/a	n/a	n/a	n/a	0.0
4-Methylphenol	n/a	n/a	n/a	n/a	0.0

Table 2-9: Reasonable Maximum Exposure Point Concentrations
WASTE LIME AREA (AREA 9)

Contaminants	Surface Soil			Subsurface Soil	
	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust (mg/m3)		Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust via Construction Activities (mg/m3)
		via Wind Erosion	via Construction Activities		
Arsenic	328	n/a	3.7E-05	43	4.9E-06
Copper	6,140	n/a	7.0E-04	1,259	1.4E-04
Zinc	12,552	n/a	1.4E-03	1,675	1.9E-04
Benzene	0.001	n/a	1.1E-10	0.004	4.6E-10
Toluene	0.003	n/a	3.4E-10	0.015	1.7E-09
Ethylbenzene	0.002	n/a	2.3E-10	0.004	4.6E-10
Styrene	0.007	n/a	8.0E-10	0.008	9.1E-10
Xylenes	0.015	n/a	1.7E-09	0.021	2.4E-09
2-Methylnaphthalene	6	n/a	6.9E-07	38	4.3E-06

Table 2-9: Reasonable Maximum Exposure Point Concentrations
WASTE LIME AREA (AREA 9)

Contaminants	Surface Soil			Subsurface Soil	
	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust (mg/m3)		Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust via Construction Activities (mg/m3)
		via Wind Erosion	via Construction Activities		
Dibenzofuran	18	n/a	2.0E-06	203	2.3E-05
Acenaphthene	29	n/a	3.4E-06	415	4.7E-05
Acenaphthylene	7	n/a	8.2E-07	1	5.7E-08
Anthracene	95	n/a	1.1E-05	741	8.4E-05
Benzo(a)anthracene	283	n/a	3.2E-05	293	3.3E-05
Benzo(a)pyrene	290	n/a	3.3E-05	2,563	2.9E-04
Benzo(b)fiuoranthene	553	n/a	6.3E-05	1,777	2.0E-04
Benzo(g,h,i)perylene	107	n/a	1.2E-05	80	9.1E-06
Benzo(k)fluoranthene	555	n/a	8.3E-05	1,777	2.0E-04
Chrysene	276	n/a	3.1E-05	2,860	3.3E-04
Dibenzo(a,h)anthracene	45	n/a	5.1E-06	394	4.5E-05
Fluoranthene	664	n/a	7.6E-05	4,096	4.7E-04
Fluorene	24	n/a	2.8E-06	311	3.5E-05
Indeno(1,2,3-cd)pyrene	132	n/a	1.5E-05	1,281	1.5E-04
Naphthalene	10	n/a	1.2E-03	49	5.6E-06
Phenanthrene	322	n/a	3.7E-05	3,453	3.9E-04
Pyrene	387	n/a	4.4E-05	4,585	5.2E-04
Pentachlorophenol	10	n/a	1.1E-06	0.95	1.1E-07
Phenol	7	n/a	8.1E-07	0.29	3.3E-08
2,4,6-Trichlorophenol	n/a	n/a	n/a	n/a	n/a
2,4-Dimethyphenol	n/a	n/a	n/a	0.25	2.9E-08
2-Methylphenol	n/a	n/a	n/a	n/a	n/a

Table 2-9: Reasonable Maximum Exposure Point Concentrations
WASTE LIME AREA (AREA 9)

Contaminants	Surface Soil			Subsurface Soil	
	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust (mg/m3) via Wind Erosion	Inhalation of Dust (mg/m3) via Construction Activities	Ingestion/ Dermal Contact (mg/kg)	Inhalation of Dust via Construction Activities (mg/m3)
4-Methylphenol	n/a	n/a	n/a	0.36	4.1E-08

Note: For all previous tables, ambient air concentrations are based on a total particulate PM10 concentration of 114 :g/m3 for construction activities, and 10.1 :g/m3 for wind erosion.

In order to quantify the potential exposure associated with each pathway, assumptions must be made with respect to the various factors used in the calculations. Table 2-10 summarizes the values used in the baseline risk assessment.

Table 2-10: Reasonable Maximum Exposure Assessment Factors

Exposure Factors		Future Construction Worker	On-site Worker	Off-site Individuals (Adults)
INGESTION EXPOSURE PATHWAY				
Ingestion Rate:				
	Soil	100 mg/day	100 mg/day	n/a
Exposure Frequency:				
	Soil	250 days/year	250 days/year	n/a
DERMAL CONTACT EXPOSURE PATHWAY				
Skin Surface Area Available for Contact:	Soil	2,000 cm2	2,000 cm2	n/a
Soil to Skin Adherence Factor		1.45 mg/cm²	1.45 mg/cm2	n/a
Exposure Frequency:				
	Soil	250 days/year	250 days/year	250 days/year
INHALATION EXPOSURE PATHWAY				
Inhalation Rate:				
	Soil Vapor	1.8 m3/hour	1.8 m3/hour	1.8 m3/hour
Exposure Time:				
	Soil Vapor	8 hour/day	8 hours/day	8 hours/day
Exposure Frequency:				
	Soil Vapor	250 days/year	250 days/year	250 days/year
EXPOSURE ASSESSMENT CONSTANTS				
Exposure Duration		0.5 years	25 years	25 years
Body Weight		70 kg	70 kg	70 kg
Averaging Time:				
	Carcinogens	70 years	70 years	70 years
	Noncarcinogens	0.5 years	25 years	25 years

C. Toxicity Assessment

The purpose of the toxicity assessment is to weigh available evidence regarding the potential for particular contaminants to cause adverse effects in exposed individuals. Where possible, the assessment provides a quantitative estimate of the relationship between the extent of exposure to a contaminant and the increased likelihood and/or severity of adverse effects.

A toxicity assessment for contaminants found at a Superfund site is generally accomplished in two steps: 1) hazard identification, and 2) dose-response assessment. Hazard identification is the process of determining whether exposure to an agent can cause an increase in the incidence of a particular adverse health effect (e.g., cancer or birth defects) and whether the adverse health effect is likely to occur in humans. It involves characterizing the nature and strength of the evidence of causation.

Dose-response evaluation is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the contaminant administered or received and the incidence of adverse health effects in the administered population. From this quantitative dose-response relationship, toxicity values (e.g., reference doses and slope factors) are derived that can be used to estimate the incidence or potential for adverse effects as a function of human exposure to the agent. These toxicity values are used in the risk characterization step to estimate the likelihood of adverse effects occurring in humans at different exposure levels. For the purpose of the risk assessment, contaminants were classified into two groups: potential carcinogens and noncarcinogens. The risks posed by these two types of compounds are assessed differently because noncarcinogens generally exhibit a threshold dose below which no adverse effects occur, while no such threshold can be proven to exist for carcinogens. As used here, the term carcinogen means any chemical for which there is sufficient evidence that exposure may result in continuing uncontrolled cell division (cancer) in humans and/or animals.
Conversely, the term noncarcinoaen means any chemical for which the carcinogenic evidence is negative or insufficient.

Slope factors have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic contaminants of concern. Slope factors, which are expressed in units of (mg/kg/day)-1, are multiplied by the estimated intake of a potential carcinogen, in mg/kg/day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the slope factor. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Slope factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). Slope factors used in the baseline risk assessment are presented in Table 2-11.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to contaminants of concern exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg/day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of contaminants of concern from human epidemiological studies or animal studies to which uncertainty factors have been applied account for the use of animal data to predict effects on humans. Reference doses used in the baseline risk assessment are presented in Table 2-11.

Table 2-11 Slope Factors and Reference Doses

	Slope Factors (mg/kg-day)-1			Reference Doses (mg/kg-day)	
Chemical	Oral	Inhalation	Class	Oral	Inhalation
Benzo(a)anthracene	1.67	0.884	B2	ND	ND
Benzo(a)pyrene	11.5	6.1	B2	ND	ND
Benzo(b)fluoranthene	1.61	0.854	B2	ND	ND
Benzo(k)fluoranthene	0.759	0.403	B2	ND	ND
Chrysene	0.051	0.027	B2	ND	ND
Dibenzo(a,h)anthracene	12.8	6.77	B2	ND	ND
Indeno(1,2,3-cd)pyrene	2.67	1.42	B2	ND	ND
Acenaphthene	ND	ND	D	0.06	0.06
Acenaphthylene	ND	ND	D	0.004	0.004
Anthracene	ND	ND	D	0.3	0.3
Benzo(g,h,i)perylene	0.253	0.134	D	0.004	0.004
Fluoroanthene	ND	ND	D	0.04	0.04
Fluorene	ND	ND	D	0.04	0.04
Naphthalene	ND	ND	D	0.004	0.004
Phenanthrene	ND	ND	D	0.004	0.004
Pyrene	0.932	0.494	D	0.03	0.03

Table 2-11 Slope Factors and Reference Doses

	Slope Factors (mg/kg-day)-1			Reference Doses (mg/kg-day)	
Chemical	Oral	Inhalation	Class	Oral	Inhalation
Pentachlorophenol	0.12	0.12	E2	0.03	0.03
Phenol	ND	ND	D	0.6	0.6
2-Methylphenol	ND	ND	C	0.05	0.05
4-Met~ylphenol	ND	ND	C	0.05	0.05
2,4-Dimethylphenol	ND	ND	-	0.02	0.02
2,4,6-Trichlorophenol	0.011	0.011	B2	ND	ND
Benzene	0.029	0.029	A	ND	ND
Toluene	ND	ND	D	0.2	0.57
Ethylbenzene	ND	ND	D	0.1	0.1
Styrene	0.03	0.03	-	0.2	0.2
Xylenes (Total)	ND	ND	D	2.0	0.4
2-Methylnaphthalene	ND	ND	-	ND	ND
Dibenzofuran	ND	ND	D	ND	ND
Arsenic	1.75	50.0	A	0.001	0.001
Chromium VI	ND	41.0	A	0.005	0.00000571
Copper	ND	ND	D	0.037	0.037
Zinc	ND	ND	D	0.2	0.2

Key: ND - Not determined

Class = EPA Weight-Of-Evidence Class for Carcinogenicity

A Human Carcinogen - sufficient evidence from epidemiological studies to support a causal association between exposure and

B Probable Human Carcinogen -

B1 ! At least limited evidence of carcinogenicity to humans from epidemiological studies

132 ! Usually a combination of sufficient evidence of carcinogenicity in animals and inadequate evidence of carcinogenicity in humans

C Possible Human Carcinogen - limited evidence of carcinogenicity in animals in the absence of human data

D Not Classified - inadequate evidence of carcinogenicity in animals

D. Human Health Effects

The health effects of the Site contaminants that are most associated with the unacceptable risk levels are summarized below. In most cases, the information in the summaries is drawn from the Public Health Statement in the Agency for Toxic Substances and Disease Registry's (ATSDR) toxicological profile for that particular chemical.

Polynuclear Aromatic Hydrocarbons (PAHs): PAHs are a group of chemicals that are formed by the incomplete burning of coal, oil, gas, garbage, tobacco, or almost any other organic substance. Natural sources include forest fires and volcanoes. Consequently, PAHs occur naturally throughout the environment in the soil and other environmental media. Reproductive effects have occurred in animals that were fed certain PAHs. Long-term ingestion of PAHs in food has resulted in adverse effects on the liver and blood in mice. Those effects may also occur in humans, but there is no experimental evidence to substantiate that adverse impacts in humans have, in fact, occurred. No information is available from human studies to determine what non-cancerous adverse health effects, if any, may result from exposure to specific levels of the individual PAHs, although inhalation and skin exposures to mixtures containing PAHs have been associated with cancer in humans. The levels and lengths of exposure to the individual PAHs that effect human health cannot be determined from the human studies available. Therefore, evaluation of non-cancer adverse health effects that may result from exposure is somewhat uncertain.

EPA classifies a small group of PAHs as B2 (probable) carcinogens. Benzo(a)pyrene is the most potent of the carcinogenic PAHs. Several PAHs, those listed as present in surface soils at the Site, have caused cancer in laboratory animals through ingestion, skin contact, and inhalation. Reports from human studies show that individuals exposed to mixtures of other compounds and PAHs by breathing or through skin contact for a long period of time can also develop cancer. Human exposure to the PAHs found in existing surface soils at the Site may result in a moderately increased risk of developing cancer if personal protective equipment is not used.

Pentachlorophenol (PCP) s The major target organs impacted by PCP for both humans and animals are the liver and the kidney. The central nervous system and the immune system also appear to be affected by PCP exposure. Absorption is predominantly through the skin and/or respiratory system, although ingestion is also possible. People are generally exposed to technical grade PCP, which usually contains such toxic impurities as polychlorinated dibenzo-p-dioxins and dibenzofurans. Animal studies with both technical and purified PCP have demonstrated that many, but not all, of the toxic effects attributed to PCP are actually due to the impurities.

EPA classifies PCP as a Class B2 (probable) carcinogen. An increased incidence of liver and spleen cancer has been shown in laboratory animals exposed to large concentrations of PCP. Workers who are exposed daily to PCP at the maximum levels detected on the Site may have a slightly increased risk of developing cancer if personal protective equipment is not used.

Arsenic: Direct skin contact with arsenic compounds can cause mild-to-severe skin irritation. Because the levels of arsenic that can cause skin irritations are not known, constant contact with the maximum detected level of arsenic at the Site may result in some skin irritation in sensitive individuals. However, workers are not likely to be in constant contact with maximum levels.

EPA has determined that arsenic is a Class A human carcinogen because enough human data are available to indicate oral and inhalation exposures do cause cancer. Dermal exposure to arsenic has been shown to cause cancer. Also, the National Toxicology Program has classified arsenic as known carcinogen through the oral and inhalation routes. Workers exposed to the highest amount of arsenic detected on-site through incidental ingestion and inhalation are at a moderately increased risk of developing cancer if personal protective equipment is not used.

E. Risk Characterization

The risk characterization process integrates the toxicity and exposure assessments into a quantitative expression of risk. For carcinogens, the exposure point concentrations and exposure factors discussed earlier are mathematically combined to generate a chronic daily intake value that is averaged over a lifetime (i.e., 70 years). This intake value is then multiplied by the toxicity value for the contaminant (i.e., the slope factor) to generate the incremental probability of an individual developing cancer over a life-time as a result of exposure to the contaminant. These probabilities are generally expressed in scientific notation (e.g., 1x10-6, otherwise expressed as 1E-6). An excess lifetime cancer risk of 1x10-6 indicates that, as a reasonable maximum estimate, an individual has a 1 in 1,000,000

chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at the Site. The generally acceptable excess cancer risk range, as defined by Section 300.430 (e) (2) (i) (A) (2) of the NCP, is between 1.0 x 10-4 to 1.0 x 10-6.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (i.e., the chronic daily intake) with the toxicity of the contaminant for a similar time period (i.e., the reference dose). The ratio of exposure to toxicity is called the hazard quotient. A Hazard Index (HI) is generated by adding the appropriate hazard quotients for contaminants to which a given population may reasonably be exposed. Any media with an HI greater than 1.0 has the potential to adversely affect health.

The baseline risk assessment estimates the reasonable maximum total lifetime cancer risks for current on-site workers to range from 4.5 x 10-3 to 5.1 x 10-4 in the evaluated areas of the Site, and 4.6 x 10-4 for future on-site workers in the Waste Lime Area of the Site. These risks exceed the acceptable risk range of 1 x 10-4 to 1 x 10-6 established in Section 300.430(e) (2)(i)(A) of the NCP. Table 2-12 summarizes the baseline risk assessment calculations for carcinogenic risk to individuals who would experience a reasonable maximum exposure to Site contaminants.

The baseline risk assessment estimates the hazard index for noncarcinogenic effects for on-site workers to be 1.22 in the historic disposal area, and 1.88, 1.04, 1.93 for future on-site workers in the wood treatment east, wood treatment west, and waste lime area of the Site respectively. These risks exceed 1.0, which is the acceptable hazard index level. Table 2-13 summarizes the hazard indices for noncarcinogenic risk to individuals who would experience a reasonable maximum exposure to Site contaminants.

Table 2-12: Summary of Carcinogenic Risks

Exposure Scenario	Exposure Media	Potential Risks by Area					Predominant Exposure Pathway
		Wood Treatment Area West	Waste Lime Area	Historic Disposal Area	Wood Storage Area	Wood Treatment Area East	
on-site workers	surface soils	5.1x10-4	4.5x10-3	1.9x10-3	8.5x10-4	1.6x10-3	Dermal Contact
	air via construction activities	2.3x10-7	1.8x10-5	4.4x10-5	3.9x10-7	9.1x10-7	Inhalation
future workers	surface & subsurface soils	2.9x10-5	4.6X10-4	2.5x10-5	1.9x10-5	6.6x10-5	Dermal Contact
off-site workers	air via wind erosion	n/a	n/a	n/a	2.8x10-5	1.1x10-6	Inhalation
	air via construction activities	2.3x10-7	1.8x10-6	4.4x10-3	3.9x10-7	9.1x10-7	Inhalation

Table 2-13: Summary of Hazard Indices (Noncarcinogenic Risks)

Exposure Scenario	Exposure Media	Hazard Indices by Area					Predominant Exposure Pathway
		Wood Treatment Area West	Waste Lime Area	Historic Disposal Area	Wood Storage Area	Wood Treatment Area East	
on-site workers	surface soils	0.09	0.57	1.22	0.29	0.40	Dermal Contact
	air via construction activities	0.029	0.260	0.003	0.031	0.055	Inhalation
future workers	surface & subsurface soils	1.04	1.93	0.76	0.28	1.88	Dermal Contact
off-site workers	air via wind erosion	n/a	n/a	n/a	0.004	0.004	Inhalation
	air via construction activities	0.029	0.260	0.003	0.031	0.055	Inhalation

VII. SUMMARY OF SITE ECOLOGICAL RISKS

A quantitative analysis of the potential environmental impacts was not performed during the Remedial Investigation of the Site. Using qualitative information, the National Oceanic and Atmospheric Administration (NOAA), through an agreement with EPA, prepared an Ecological Risk Assessment, dated April 1992, for the Site. The primary objective of this assessment was to determine whether contaminants released to the environment at the Site have impacted aquatic and terrestrial habitats. The impact of Site contaminants on the two habitats is summarized below:

Aquatic Habitats: The primary contaminants for this habitat are PAHs, PCP, and dioxin/furans, arsenic, copper, and zinc. The South Branch of the Elizabeth River, located immediately adjacent to the Site, is of particular concern since it has received contamination through direct releases of creosote to the river. Since contamination is present in soil, ground water, and sediment, there is the continued potential for Site-related contaminants to be transported to the river and other nearby areas through surface water runoff, ground water discharge, and fugitive dust from wind erosion.

Since many of the contaminants at the Site adsorb to sediments, benthic (bottom feeding or dwelling) organisms that have frequent contact with sediments will be most at risk. These include benthic fish and invertebrates as well as those species that feed on benthic prey such as blue crab, weakfish, spot, and croaker. Given the levels of contamination, many biological organisms that live near the Site may be at potential risk.

Terrestrial Habitats: The Ecological Risk Assessment found that animal, bird, and amphibian (e.g. frog) species on-site are at risk. Animal species could suffer short- and long-term effects from eating soil contaminated with PAHs, PCP, dioxin/furans, and arsenic. Concentrations of copper and zinc are high enough so that animals could suffer long-term effects from continued exposure to these substances.

Bird species could potentially suffer both short- and long-term effects from exposures to the soil contaminated with PCP, PAHs, dioxin/furans, and arsenic. No data were available at the time of the Remedial Investigation describing the toxicity of copper and zinc to bird species, so the risk associated with these substances was not evaluated.

Amphibian species could experience both short- and long-term effects from exposure to PAHs. No data were found describing the toxicity of the other contaminants to either amphibians or reptiles, so the risk to these species associated with exposure to the other chemicals will not be addressed.

Waterfowl are considered the predominant users of the areas near or on the Site. Common species are dabblers, black duck, mallard, and ruddy duck. Wading birds include great blue heron, black-crowned night heron, yellow-crowned night heron, clapper rail, snowy and great egret. Blue crab, eastern oysters, and numerous anadromous, catadromous, and estuarine fish species also occur near the Site. Muskrat, raccoon, opossum, meadow vole, marsh rabbit, and Norway rat are likely to live near or on the Site along with various reptile and amphibian species.

The contaminants of primary ecological concern at the Atlantic Wood Site are the PAHs agsociated with creosote, PCF, PCDDs and PCDFs, arsenic, copper, and zinc. Substantial data demonstrate that PAHs are persistent compounds that can accumulate to high levels in many invertebrate organisms and are toxic to most species at low concentrations. PCP and the associated chlorinated dioxins and furans also have been shown to be toxic to most biological species. Because creosote (PAHs), PCP, PCDDs, and certain metals are all known to be acutely toxic to aquatic and terrestrial species and because most of the toxicologic information available describes acute toxicity, mortality was the primary endpoint of concern in the risk assessment.

PCP's primary mode of action is the cellular uncoupling of oxidative phosphorylation (Ecobichon, 1991)1. In aquatic organisms, this leads to a reduction in the availability of energy needed for maintenance and growth, and thereby reduces their survival (Eisler, 1989)2. Adverse effects on growth, survival, and reproduction have been demonstrated in algae and macrophytes; mollusc; and fishes at 7.5 to 80 ppb; 2.5 to 100 ppb; and less than 1.0 to 68 ppb, respectively. The American oyster (Crassostrea viginica), is very sensitive to the effects of PCP, and abnormal development in 50% larvae was shown following exposure to 40 ppb PCP. Adverse effects have been demonstrated in birds fed on a 1 ppm PCP diet. Terrestrial plants and soil invertebrates were adversely affected at 0.3 ppm (Eisler 1989).

In performing the aquatic exposure assessment for the Atlantic Wood Site, uncertainties arose from two main sources. First, those uncertainties associated with the distribution, import, and fate of compounds in the environment. Second, those uncertainties associated in the estimated chemical intakes resulting from contact by a receptor with a particular medium.

Without an ecological site-specific quantitative risk assessment, toxicity to ecological receptors provided by literature values (ER-M)3 was evaluated to determine the potential need to cleanup Site sediments. These values were also used in evaluating the need to clean up Site soils since most of the Site is within the 100-year flood plain (Figure 2-9). The literature values from Long and MacDonald (1992)4 and Long and Morgan (1990)5 which were used to evaluate the potential risk to ecological receptors are presented below.

Compound	ER-M
total PAH	44.79 ppm
pentachlorophenol	0.360 ppm6
arsenic	70 ppm
copper	270 ppm
zinc	410 ppm

1 Ecobichon, D.J. 1991. Toxic effects of Pesticides. In Casarett and Doull's Toxicology. (Eds. M.O. Amdur, J. Doull, C.D. Klaassen) Pergamon Press, Inc. NY.

2 Eisler, R. 1989. Pentachlorophenol hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Fish and Wildlife Service. Biological Report No. 85(1.7), April 1989

3 The Effects Range-Median (ER-M) value for a specific contaminant is the median concentration, or 50th percentile, from a range of sediment concentrations determined by bioassessment studies to cause adverse environmental impact.

4 Long, E.R. and D.D. MacDonald. 1992. National Status and Trends Program Approach. In: Sediment Classification Methods Compendium. EPA 823-R-92-006. EPA office of Water (WH-556). Washington, D.C.

5 Long and Morgan, E.R. and L.G. Morgan. 1990. The Potential for Biological Effects of Sediment-sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memo NOS OMA 52. Seattle WA. National Oceanic and Atmospheric Administration.

6 There is no ER-M value for this compound. The value listed is the lowest among the 4 apparent effects threshold (AET) tests.

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VIII. DESCRIPTION OF ALTERNATIVE B

The Feasibility Study (FS) Report for the Site, dated April 1995, was prepared by a consultant hired by AWI. EPA, in consultation with VDEQ, reviewed the FS Report and approved it subject to certain technical reservations that can be found in the Administrative Record for the Site. In the FS Report, technologies applicable to remediating the contaminated media were screened according to their effectiveness and implementability. Those technologies remaining after the screening process were then developed into remedial alternatives. The specific remedial alternatives were developed utilizing information and data from the FS Report. An independent set of alternatives was developed as part the FS for each of the five Remedial Response Units (RRU) at the Site. The remedial alternatives were carried through a detailed analysis in the FS for the purpose of providing comparative and evaluative information on the alternatives.

Common Elements of All Alternatives:

All alternatives evaluated in the FS include monitoring of ground water and DNAPL occurrence to track the migration and persistence of the contaminants for a period of 30 years or an alternate period selected by EPA in consultation with VDEQ. If applicable, ground water monitoring for a new on-site landfill would also be required. Institutional controls, including restrictions on title, use, and access would be placed on the Site. Title restrictions prohibit residential/agricultural development and restrict the use of ground water at the Site because an industrial-use scenario was used to derive the cleanup levels. Long-term surface water monitoring would also be included in accordance with State and federal requirements to monitor the quality of surface water run-off at the Site and to monitor the potential migration of contamination from the Site. Semi-annual chemical and annual bioassay monitoring of on-site sediments would be required for a minimum period of five years to determine the effectiveness and durability of the cleanup1. Alternatives that involve on-site landfilling would also require that the Site title be modified and recorded to indicate appropriate restrictions against the disturbance or development of the impacted Site areas.

Several wetland areas were identified at the Site. Excavation and backfilling operations that would impact these areas would be conducted to be protective of wetlands.

1 This monitoring would be required for any alternatives that yield concentrations of PCP greater than 0.4 mg/kg in Site soils.

Common Elements of Excavation Alternatives:

For alternatives that involve excavation, certain impacted soils are anticipated to be located beneath portions of the wood-treating plant and associated railroad tracks. Limited demolition of surface tanks, buildings, railroad tracks, and associated piping may be required to gain access to the impacted surface soils. Any existing piping associated with the former tank storage yard along Elm Avenue would be removed. The shaded portions of Figure 2-10 provide a general estimate of the surface areas of the Site that are expected to require excavation. Table 2-14 provides a listing of the estimated physical characteristics of the five remedial response units.

Contaminated soils would be excavated to a depth where contamination is no longer present, but the excavation would generally not extend beyond the water table which varies from 1 to 10 feet below grade across the Site. Most of the excavations would be expected to occur within the top three feet of surface soils. The excavation areas would be scattered throughout the Site. Due to the shallow depth and limited size of the excavation areas, only standard construction equipment, such as an excavator or backhoe, would be required for excavating the soils or sediments.

Surface soils are not expected to contain excess amounts of moisture. Surface water run-off would be diverted away from the excavation areas, and appropriate erosion and sediment control measures would be implemented. In the event of rain or potential Site flooding during excavation, any partially excavated areas would be covered to minimize water infiltration.

Excavation can generate dust under dry and windy conditions. Measures would be taken to prevent dispersion of the materials during excavation and transportation. Controlled amounts of water would be sprayed onto the soils and tarps would be placed over the loaded trucks. If dust emission problems persist despite implementation of these dust controls, excavation would be suspended until conditions improve.

Common Elements of Treatment Alternatives:

For all alternatives that involve treatment, a bench-scale and/or pilot-scale treatability study would be required prior to implementation of the alternative to ensure that cleanup levels can be obtained given Site-specific conditions.

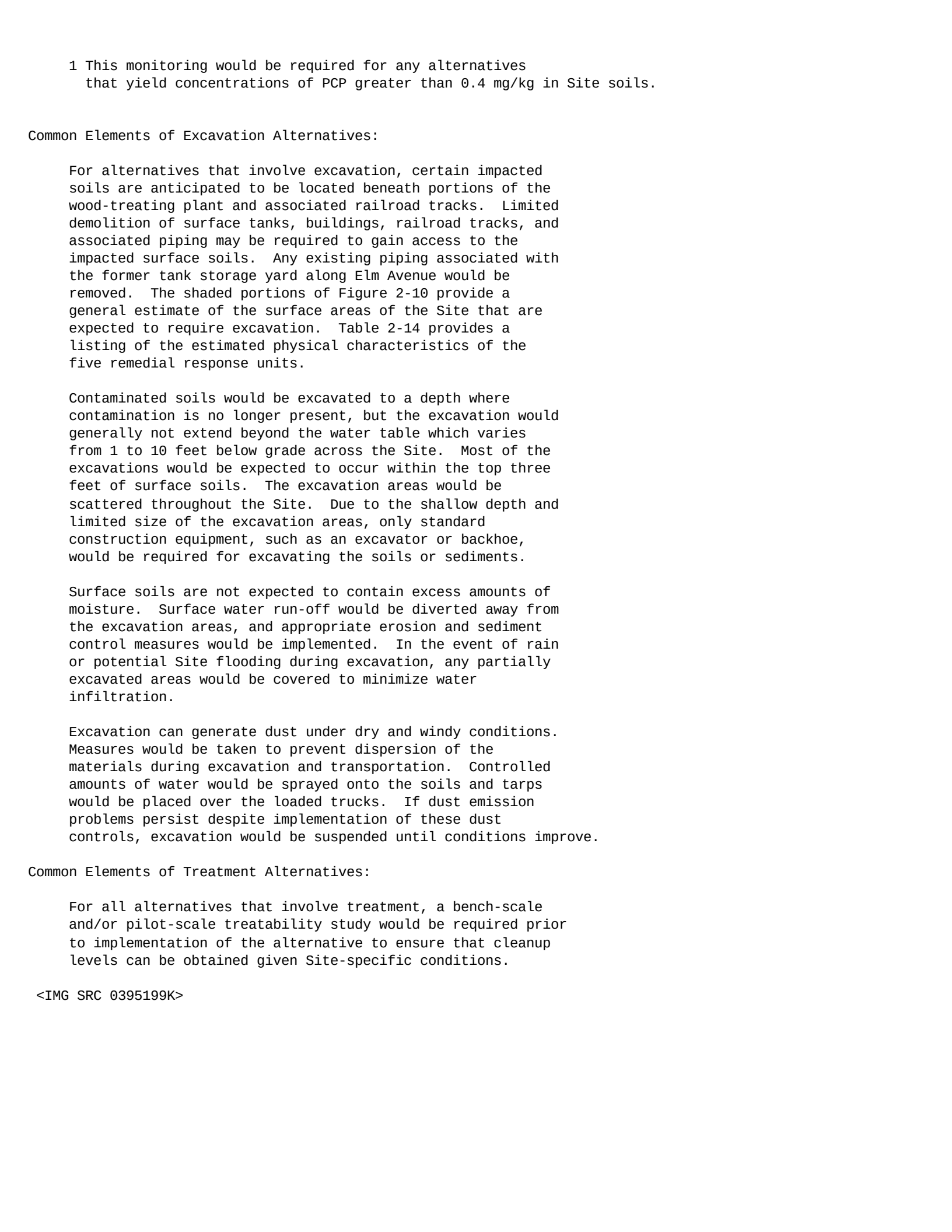

TABLE 2-14
ATLANTIC WOOD INDUSTRIES INC., SITE
PHYSICAL CHARACTERISTICS OF REMEDIAL RESPONSE UNITS

Unit	Area (sq. feet)	Depth Interval (feet)	Volume For Excavation (cu. yards)	Volume For Treatment (cu. yards)	Concenration Ranges cPAHs (mg/Kg)	PCP (mg/Kg)	Arsenic (mg/Kg)
Remedial Response Unit One (RRU1)							
Wood Treating Area East (Area 1)	224,620	0 - 1	8,320	7,980	BDL - 3,260	0.3 - 22	8 - 36
		1 - 1.4!!	3,264	3,264	4 - 6,384	0.7 - 290	4 - 445
Wood Treating Area West (Area 2)	42,710	0 - 1	1,580	1,320	BDL - 328	BDL - 120	59 - 93
		1 - 1.4!!	576	576	14 - 1,418	1.5 42	NA
Historical Disposal Area (Area 3)	28,800	0 - 1	1,070	1,070	21 - 729	25 - 970	NA
Wood Storage Area (Area 4)	107,140	0 - 1	3,965	3,435	BDL - 1,703	0.1 - 290	24 - 369
		1 - 1.3!!	1,365	1,365	BDL - 1,170	0.06-170	1 -89
	403,270		20,140	19,010			
Remedial Responses Unit Two (RRU2)							
Inlet Area (Area 5)	9,404	0 - 1.5	523	523	171-7,650	BDL	NA
Storm Water Run-off Ditch (Area 6)	750	0 - 1	25	25	26 - 80	7.2 - 12.0	109-136
Western Ditch (Area 7)	420	0 - 1	16	16	34 - 175	1.5 - 25	82 - 135
Remedial Response Unit Four (RRU4)							
Southeastern Ditch	6710	0 - 1	250	250	97 - 3,118	.42 - 5.7	31 - 364
Remedial Response Unit Five (RRU5)							
Acetylene Sludge Area	42,620	0 - 1	1580	1580	6.41 - 6110	0.130 - 21.5	4 - 495
		1 - 1.5	790	790	3.41 - 22,190	0.270 - 0.950	1 - 43

TABLE 2-14 (Cont'd)
ATLANTIC WOOD INDUSTRIES INC., SITE
PHYSICAL CHARACTERISTICS OF REMEDIAL RESPONSE UNITS

Unit		Area (sq. feet)	Depth Interval (feet)	Volume For Excavation (cu. yards)	Volume For Treatment (cu. yards)	Concenration Ranges cPAHs (mg/Kg)	PCP (mg/Kg)	Arsenic (mg/Kg)
Remedial Response Unit One (RRU3)								
Wood Treating Area	DNAPL	---	<20 !	---	---	---	---	---
Historical Disposal Area	DNAPL	---	<35 !	---	---	---	---	---
Western Area (MW-34 Area)	DNAPL	---	<6 !	---	---	---	---	---
East of Process Area	DNAPL	---	<5 !	---	---	---	---	---
Eastern Area (MW-117 Area)	DNAPL	---	<20 !	---	---	---	---	---

! - Depth estimates based on available descriptions of original boring logs only.
!! - Measured avernge depth to groundwater table.
BDL - Below detection limits.
NA - Not Analyzed.

NOTE: The alternatives described below are not numbered to directly correspond with the alternatives described in the Feasibility Study Report. Appendix C of this ROD provides a table which cross-references the alternatives identified in this ROD with those found in the Feasibility Study.

Alternative 1 - No Action

Section 300.430(e) (6) of the NCP requires that EPA consider a "No Action" alternative for every Superfund site to establish a baseline or reference point against which each of the remedial action alternatives are compared. This alternative leaves the Site undisturbed and all current and potential future risks would remain. This alternative includes long-term ground water monitoring as well as chemical and biological monitoring of sediments. Presented below are the estimated costs and implementation times of the No Action Alternative for each remedial response unit:

Alternative 1 Estimate of:	Remedial Response Unit				
	1	2	3	4	5
Capital Costs[2]	$ 0	$ 0	$ 0	$ 0	$ 0
Annual O&M Costs3	$ 27,550 to 112,900	$ 23,800	$ 27,500 to 86,600	$ 16,900	$ 27,500 to 86,600
Present Worth Costs4	$ 698,000	$ 368,000	$ 584,000	$ 260,000	$ 584,000
Time to Implement	Immediate	Immediate	Immediate	Immediate	Immediate

Alternative 2 - Excavation and On-site Landfilling of Soil/Sediment

This alternative provides for the excavation of approximately 20,000 cubic yards of soil for RRU1 and 564 cubic yards of sediment for RRU2 followed by disposal in an on-site landfill. The soils and sediments would be excavated using conventional earth-moving equipment and then transported to a new on-site landfill that would be constructed to meet the substantive requirements of a RCRA Subtitle C landfill. For purposes of determining cost and engineering estimates, this alternative assumes that soils and sediments would not require treatment prior to disposal because appropriate Land Disposal Restrictions have not yet been established for RCRA waste listings F032 and F034 wood-treating wastes. The estimated size of the landfill would be about 200' x 240' and would include a bottom liner, low-permeability cap, and would be protected from inundation or washout caused by local flooding. Clean soils would be placed

2 Estimated Capital Costs represent the present worth of all capital costs.

3 Estimated Annual Operation and Maintenance ("O&M") Costs represent the total present worth of annual costs divided by the life of the project (generally 30 years). Ranges are provided if annual costs would vary over time.

4 Estimated Present Worth Costs represent the present worth of all capital costs and the total present worth of O&M costs for a project life of 30 years. Present worth analysis is used to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year. This allows the cost of remedial action alternatives to be compared on the basis of a single figure representing the amount of money that, if invested in the base year and disbursed as needed, would be sufficient to cover all costs associated with the remedial action over its planned life. The planned life of each alternative is generally 30 years.

into the excavated areas to restore them to the original grade. This alternative only applies to RRU1 and RRU2. Estimated costs and implementation times are presented below:

Alternative 2 Estimate of:	Remedial Response Unit	
	1	2
Capital Costs	$ 2,930,000	$ 412,000
Annual O&M Costs	$ 47,100	$ 45,000

		to 132,400
Present Worth Costs	$ 3,928,000	$ 1,104,000
Time to Implement	7 months	6 months

Alternative 3 - Excavation and Off-site Landfilling of Soil/Sediment

This alternative entails the removal of soil or sediment (approximately 20,000 cubic yards for RRU1, 564 cubic yards for RRU2, 250 cubic yards for RRU4, and 2,370 cubic yards for RRUS) and transporting it to an off-site RCRA Subtitle C landfill for disposal. For purposes of determining costs and engineering estimates, it is assumed that treatment of the soil/sediment is not required prior to placing it in the off-site landfill because appropriate Land Disposal Restrictions have not yet been established for RCRA waste listings F032 and F034 wood-treating wastes. Clean soils would be placed into the excavated areas to restore them to original grades. This alternative applies to RRU1, RRU2, RRU4, and RRU5. Estimated costs and times for implementation are presented below:

Alternative 3 Estimate of	Remedial Response Unit 1	2	4	5
Capital Costs	$ 9,379,000	$ 291,000	$ 162,000	$1,403,000
Annual O&M Costs	$ 31,900 to 117,300	$ 28,000	$ 15,600	$ 31,900
Present Worth Costs	$ 9.654,000	$ 721,000	$ 402,000	$1,893,000
Time to Implement	4 months	2 months	2 months	1 year

Alternative 4 - Soil Capping

A low permeability surface cap constructed in accordance with the substantive requirements of applicable RCRA regulations would be installed to cover the impacted soil. This alternative only applies to RRU5 (soils in the waste lime area). The purpose of this cap would be to eliminate any direct contact with contaminated soil and to keep surface water from draining through the impacted soils in this area. A cap of approximately one acre in size would be required to cover the waste lime area. The capped area would then be fenced to restrict access and would no longer be available for use.

Cap construction would include grading and compacting the surface soils, placing soil to establish drainage from the area to be capped, and installing a low permeability barrier layer. The barrier layer would consist of a synthetic membrane placed on a six-inch thick layer of clayey soil. The synthetic membrane would be covered with a drainage layer, then a layer of filter fabric, and finally, a one-foot soil cover. Erosion resistant stone would be placed along the edges of the cap as a flood protection measure. Additionally, an erosion protection mat would be placed along the shoulder edge of the cap to ensure establishment of the vegetative cover. The surface of the cap areas would be seeded and mulched to establish a permanent erosion resistant vegetative cover. Estimated costs and implementation time are listed below:

Alternative 4 Estimate of:	Remedial Response Unit 5
Capital Costs	$ 383,400
Annual O&M Costs	$ 81,900
Present Worth Costs	$ 1,622,000
Time to Implement	1 year

Alternative 5 - In Situ Bioremediation of Soil

This alternative which applies to RRU1 provides for the treatment of contaminated soils in situ (in place without excavation) using bioremediation with naturally occurring microorganisms. The treatment

process would be performed in accordance with the substantive requirements of applicable Federal and State regulations. Excavation or dredgingwould not be required. Bioremediation uses microorganisms such as yeast, fungi and/or bacteria to break down hazardous substances into less toxic or nontoxic substances. Microorganisms, just like humans, eat and digest organic substances for nutrition and energy. Certain microorganisms can digest organic substances that are hazardous to humans. The organic contaminants at the Site, such as PAHs and PCP, would degrade into harmless products consisting mainly of carbon dioxide and water.

Approximately 20,000 cubic yards of soils in RRU1 would be treated in this alternative. The major elements of this alternative include the construction of a nutrient application system to promote the bioremediation process, installation of run-on/run-off controls, and periodic sampling, analysis, and inspection. In addition, an on-site water treatment plant that meets the substantive requirements of the NPDES program established pursuant to Section 402 of the Clean Water Act is planned to address possible run-off from the in situ areas due to precipitation. This alternative would only apply to RRU1. Estimated costs and implementation time are presented below:

Alternative 5 Estimate of:	Remedial Response Unit 1
Capital Costs	$ 2,369,000
Annual O&M Costs	$ 27,500 to $185,100
Present Worth Costs	$ 3,673,000
Time to Implement	10 years

Alternative 6 - Excavation and On-site Biological Slurry Treatment of Soil/sediment

This alternative involves excavation of impacted soil/sediment (approximately 20,000 cubic yards for RRU1, and 564 cubic yards for RRU2), and biologically treating the excavated soil in an on-site biological sIurry reactor. Biological slurry remediation mixes excavated soils with water in a tank to create a slurry which is then mechanically agitated. Appropriate nutrients are added and the levels of oxygen, pH, and temperature are controlled to promote the bioremediation process. Organic contaminant levels would be reduced as microorganisms would degrade the contaminants into less toxic or nontoxic substances such as carbon dioxide and water. A water treatment plant, consisting of filtration, pumps and tanks, would be constructed to handle the water from the biological slurry process and its effluent would be discharged in accordance with applicable State and Federal requirements. Access restrictions would be applied during the construction and implementation of this alternative.

Following treatment, the soil/sediment would be disposed of using one of the following options:

On-Site Landfill Option: The appropriately treated soil/sediment would be placed in a new on-site landfill constructed to meet the requirements of RCRA Subtitle D landfill. This landfill would include a bottom liner, low-permeability cap, and would be protected from local flooding. Clean soils would be placed into the excavated areas to restore them to the original grade.

Off-Site Landfill Option: The appropriately treated soil/sediment would be transported to an off-site RCRA-permitted landfill. Clean soils would be placed into the excavated areas to restore them to the original grade.

Backfilling Option: The appropriately treated soil/sediment would be placed back into the general areas from which it was excavated using conventional earth-moving equipment.

Estimated costs and implementation times are presented below:

Alternative 6 Estimate of:	On-Site landfill Option		Off-Site landfill Option		Backfilling Option	
	RRU1	RRU2	RRU1	RRU2	RRU1	RRU2
Capital Costs	$5,276,000	$ 374,000	$12,719,000	$ 588,000	$4,511,000	$ 343,000
Annual O&M Costs	$ 46,300 to 511,800	$ 42,500	$ 33,800 to 436,800	$ 30,000	$ 33,800 to 429,300	$ 30,000
Present Worth Costs	$7,747,000	$1,027,000	$14,378,000	$ 1,049,000	$5,120,000	$ 804,000
Time to Implement	3 years	1 year	3 years	1 year	3 years	1 year

Alternative 7 - Excavation and Engineered Land Treatment of Soil/sediment

This alternative involves excavation of impacted soil/sediment (approximately 20,000 cubic yards for RRU1, and 564 cubic yards for RRU2), and biologically land-treating the excavated soil/sediment in a treatment plot that would be constructed with a landfill-type liner system. On-site treatment in a plot would be in compliance with Virginia Hazardous Waste Management Regulations § 10.11, and RCRA requirements defined in 40 C.F.R. 264, Subpart L, Waste piles. Generally, engineered land treatment is a bioremediation process that is similar to biological slurry (Alternative 6) except that the method for introducing the microorganisms to the organic contaminants involves a plot system rather than a tank.

For cost estimating purposes, it was assumed that about 4,000 cubic yards of contaminated soils would be excavated at a time and placed in a 180' x 810' treatment plot. Actual specifications would be determined during the remedial design. The excavation would be repeated until all contaminated soils were treated. The soils would be tilled and aerobically treated for periods up to a year. Water and nutrients would be added to promote the bioremediation process. Excavated areas would be backfilled with clean or appropriately treated soils (i.e., soils that have been treated to achieve site-specific environmental and health-based cleanup levels). Organic contaminant levels would be reduced as microorganisms would degrade the contaminants into less toxic or nontoxic substances such as carbon dioxide and water. Site access would be restricted during the construction and implementation of this alternative.

Treated soil/sediment would be disposed of using one of the options described previously under Alternative 6. Estimated costs and implementation times are presented below:

Alternative 6 Estimate of:	On-Site landfill Option		Off-Site landfill Option		Backfilling Option	
	RRU1	RRU2	RRU1	RRU2	RRU1	RRU2
Capital Costs	$3,441,000	$ 294,000	$10,500,000	$ 527,000	$2,442,000	$ 283,000
Annual O&M Costs	$ 46,300 to 281,200	$ 30,400 to 45,400	$ 33,800 to 202,700	$ 30,000 to 45,000	$ 33,800 to 276,800	$ 30,000 to 45,000
Present Worth Costs	$4,564,000	$ 789,000	$11,701,000	$1,016,000	$3,839,000	$ 772,000
Time to Implement	4 years	2 year	4 years	2 years	6 years	2 years

Alternative 8 - Excavation and On-site Incineration of Soil/Sediment

This alternative provides for the excavation of RRU1 soils and RRU2 sediments followed by treatment in a mobile on-site incinerator, and disposal in an on-site landfill. Contaminated soil/sediment (approximately 20,000 cubic yards for RRU1 and 564 cubic yards for RRU2) would be excavated using conventional excavating equipment. Erosion and sediment control measures would be implemented during excavation. The contaminated soils would be incinerated in a mobile on-site rotary kiln incinerator outfitted with appropriate air abatement equipment and operated in accordance with the substantive requirements defined in Virginia

Hazardous Waste Management Regulations § 10.15, and RCRA requirements defined in 40 C.F.R. 264, Subpart O, Incinerators. Organic contaminants would be burned by heating the soils to a temperature of 1400° C. Waste solids would be discharged directly from the kiln, while the off-gases would be discharged to a secondary combustion unit where complete destruction of the organic contaminants would occur. Clean soils would be placed into the excavated areas to restore them to original grades.

Following incineration, the ash would be disposed of using one of the options described under Alternative 6. Estimated costs and implementation times are presented below:

Alternative 6 Estimate of:	On-Site landfill Option		Off-Site landfill Option		Backfilling Option	
	RRU1	RRU2	RRU1	RRU2	RRU1	RRU2
Capital Costs	$17,355,000	$ 589,000	$21,977,000	$ 750,000	$15,957,000	$ 580,000
Annual O&M Costs	$ 46,300 to 131,600	$ 42,500	$ 33,800 to 119,100	$ 30,000	$ 33,800 to 119,100	$ 30,000
Present Worth Costs	$18,341,000	$1,251,000	$22,771,000	$1,211,000	$18,822,000	$ 1,041,000
Time to Implement	1 year	1 year	6 months	1 year	6 months	6 months

Alternative 9 - Excavation and On-site Low Temperature Thermal Desorption of Soil/Sediment

This alternative involves the excavation of contaminated soil/sediment (approximately 20,000 cubic yards for RRU1 and 564 cubic yards for RRU2), and treating it through an on-site low temperature thermal desorption system (LTTD) operated in accordance with the substantive requirements of 40 C.F.R. 264 Subpart X, and VHWMR § 10.15, Miscellaneous Units. LTTD treats contaminated soil/sediment by heating it at relatively low temperatures (200-1000°F) so t~at contaminants with low boiling points will vaporize (turn into gas) and, consequently, separate from the soil/sediment. The vaporized contaminants are then collected and removed, typically by an air emissions treatment system. LTTD is a different treatment process than incineration. LTTD uses heat to physically separate the contaminants from the soil/sediment. These contaminants then require further treatment. Incineration uses heat to actually destroy the contaminants.

The treated soil/sediment would be disposed of using one of the options described in Alternative 6. Estimated costs and implementation times are presented below:

Alternative 6 Estimate of:	On-Site landfill Option		Off-Site landfill Option		Backfilling Option	
	RRU1	RRU2	RRU1	RRU2	RRU1	RRU2
Capital Costs	$ 7,787,000	$ 383,000	$13,058,000	$ 535,000	$ 7,018,000	$ 364,000
Annual O&M Costs	$ 46,300 to 131,600	$ 42,500	$ 33,800 to 119,100	$ 30,000	$ 33,800 to 119,100	$ 30,000
Present Worth Costs	$ 8,822,000	$1,038,000	$13,852,000	$ 996,000	$ 7,294,000	$ 825,000
Time to Implement	1.5 years	1 year	8 months	1 year	1.5 years	8 months

Alternative 10 - Excavation and Off-sits Incineration of Soil/Sediment

This alternative would involve the excavation of contaminated soil/sediment (approximately 20,000 cubic yards from RRUl and 564 cubic yards from RRU2), loading it into trucks, and hauling it to a RCRA-permitted off-site incineration facility for destruction. Clean soils would be placed into the excavated areas to restore them to original grades. Estimated costs and implementation times are presented below:

Alternative 10 Estimate of:	Remedial Response Unit 1	2
Capital Costs	$ 53,064,000	$ 1,590,000
Annual O&M Costs	$ 31,900 to 117,300	$ 30,000
Present Worth Costs	$ 53,829,000	$ 2,051,000
Time to Implement	4 months	4 months

Alternative 11 - Extracting DNAPL for Off-Site Reuse

This alternative would involve monitoring and removing DNAPL (e.g., creosote) in existing monitoring wells and would also involve the installation of several new recovery wells in areas where DNAPL has been demonstrated to significantly accumulate in wells. Permanent DNAPL recovery pumps would be used in the new recovery wells. DNAPL would be periodically bailed or pumped from existing monitoring wells in areas where DNAPL does not rapidly accumulate. Any water collected during DNAPL recovery, or any recovered DNAPL that can not be reused/recycled, will be disposed of in accordance with applicable local, state, and Federal regulations.

Prior to the actual implementation of this alternative, relative rates of DNAPL accumulation in Site wells would be measured. For costing purposes, it has been assumed that seven new recovery wells will be installed; three in the historic disposal area and four in the former process area. Additional wells may be installed if determined to be necessary by EPA.

The two main areas where potentially recoverable DNAPL exists at levels below approximately six feet are in the former process area (Area 1) and the historic disposal area (Area 3). All of the DNAPL cannot be practically removed from the subsurface. Residual DNAPL at areas in which recovery is not possible will be left behind, and will continue to dissolve in the future. Further study will be required to determine if additional cleanup measures will be needed to address ground water contamination. These additional measures would be documented in a subsequent Proposed Plan and Record of Decision. Estimated costs and implementation time are presented below:

Alternative 11 Estimate of:	Remedial Response Unit 3
Capital Costs	$ 537,850
Annual O&M Costs	$ 214,775
Present Worth Costs	$ 2,196,000
Time to Implement	10+ years

IX. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial action alternatives described above were evaluated using the following criteria, as required under the NCP, 40 C.F.R. 300.430(e)(9)(iii):

Threshold Criteria: Statutory requirements that each alternative must satisfy in order to be eligible for selection

1) Overall Protection of Human Health and the Environment.

Evaluation of the ability of each alternative to provide adequate protection of human health and the environment in the long- and short-term; description of how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2) Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Evaluation of the ability of each alternative to attain applicable or relevant and appropriate requirements under federal environmental laws and state environmental or facility siting laws or provide grounds for invoking a waiver established under CERCLA.

Primary Balancing Criteria: Technical criteria upon which the detailed analysis is primarily based.

3) Long-Term Effectiveness and Permanence

Evaluation of expected residual risk and the ability of each alternative to maintain reliable protection of human health and the environment over time after cleanup requirements have been met.

4) Short-Term Effectiveness

Evaluation of the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period.

5) Reduction of Toxicity, Mobility, or Volume through Treatment

Evaluation of the degree to which an alternative employs treatment methods to reduce the toxicity, mobility, or volume of hazardous substances at the Site.

6) Implementability

Evaluation of the technical and administrative feasibility of each alternative, including the availability of materials and services.

7) Cost

Section 121 of CERCLA, 42 U.S.C. § 9621, requires selection of a cost-effective remedy that protects human health and the environment and meets the other requirements of the statute. Alternatives are compared using present worth cost, which includes all capital costs and the operation and maintenance cost incurred over the life of the project. Capital costs include expenditures necessary to implement a remedial action (e.g., construction costs). All costs presented are estimates computed for comparison purposes only.

Modifying Criteria: Criteria considered throughout the development of the preferred remedial alternative and formally assessed after the public comment period, which may modify the preferred alternative.

8) State Acceptance

Assessment of technical and administrative issues and concerns that the State may have regarding each alternative.

9) Community Acceptance

Assessment of issues and concerns the public may have regarding each alternative based on a review of public comments received on the Administrative Record and the Proposed Plan.

A. Overall Protection of Human Health and the Environment

RRU1 (Soils) and RRU2 (Sediments) Each of the alternatives, with the exception of Alternative 1 (No Action), provide protection of human health and the environment. The greatest overall protection would be provided from alternatives that use incineration as the treatment process (Alternatives 8 and 10). The contaminant destruction efficiency of incineration is about 99.9999 percent. Among the three disposal options for the incineration ash, on-site or off-site landfilling would provide slightly greater protection than the backfill option because the ash would be in a controlled unit.

The alternatives that provide the next highest level of protection include Alternative 5 (In Situ Bioremediation), Alternative 6 (Excavation and Biological Slurry Treatment) Alternative 7 (Excavation and Engineered Land Treatment), and Alternative 9 (Excavation and On-Site LTTD). These alternatives reduce the contaminant concentrations through treatment and cause a significant reduction in the toxicity, mobility and volume of Site contamination.

Alternative 2 (Excavation and On-Site Landfilling), Alternative 3 (Excavation and Off-Site Landfilling), and Alternative 4 (Soil Capping) provide lower overall protection because these alternatives rely on effective long-term operation and maintenance and institutional controls, rather than actual treatment, to contain and isolate the contamination and prevent future exposure.

RRU3 (DNAPLs) Alternative 11 (Extracting DNAPL for Off-Site Reuse) provides for protection of human health and the environment by removing a concentrated source of contamination and thereby reducing further migration of the contamination into the ground water. Since not all of the DNAPL can be removed from the subsurface, the residual DNAPL left behind will continue to dissolve into the ground water. By reducing the amount of DNAPL present to dissolve into the ground water, the overall time required to control movement of the contamination will be reduced.

Alternative 1 (No Action) contains no provision for reducing or eliminating the migration and potential exposure to DNAPL contamination, and is not protective of human health and the environment.

RRU4 (Southeast Ditch Sediments) and RRU5 (Waste Lime Area Soils) Alternative 1 (No Action) would not provide protection of human health and the environment. Alternative 3 (Excavation and Off-Site Landfilling) provides adequate overall protection. The treatment alternatives considered for soils and sediments may not be effective for the Southeast Ditch sediments and Waste Lime Area soils because of elevated metal concentrations and high pH. Off-site landfilling provides protection by containing and isolating the contaminated soils and sediments to prevent future exposure.

Alternative 1 (No Action) will not be considered further in this analysis since it does not meet the threshold criterion of providing protection to human health and the environment.

B. Compliance with ARARs

This criterion addresses whether a remedy wiii meet all of the applicable or relevant and appropriate requirements (ARARs) of federal and state environmental laws and/or provide grounds for invoking a waiver under the NCP at 40 C.F.R. § 300.430(f)(1)(ii)(c). All alternatives that are protective of human health and the environment would be in compliance with existing federal and state ARARs.

1. Excavation/Storage ARARs For alternatives requiring excavation of soil (Alternatives 2, 3, 6, 7, 8, 9 & 10), limited demolition of surface tanks, portions of the wood-treating plant, railroad tracks, and associated piping may be necessary. Any debris contaminated with a listed hazardous waste (40 C.F.R. Part 261, Subpart D) such as F032 or F034, or debris exhibiting a characteristic of hazardous waste (40 C.F.R. 261, Subpart C) would be managed in accordance with the land disposal restrictions at 40 C.F.R. Part 268, and Part XV of the Virginia Hazardous Waste Management Regulations (VHWHR) (VR 672-10-00). Debris that does not contain or exhibit characteristics of hazardous waste would be managed in accordance with Virginia Solid Waste Management Regulations (VSWMR) (VR 672-20-10).

Excavated soil and sediment would be temporarily staged on-site in accordance with 40 C.F.R. Part 264, Subpart L, and VHWMR § 10.11, Waste Piles, prior to treatment and/or transportation to an off-site disposal facility. To the extent practicable, excavated soil and sediment would be staged in areas of existing contamination. Erosion and sediment control measures would be installed in accordance with the substantive requirements of the Virginia Erosion and Sediment Control Law (Code of Va. §§ 10.1-560 et seq.) and the Virginia Erosion and Sediment Regulations (VR 625-02-00). These measures would be sufficient to provide protection in the event of flooding in accordance with Executive Order 11988 (Flood Plain Management). When final areas of contamination are being addressed, excavated soil and sediment may need to be staged in an area where cleanup has previously occurred. In such instances, soil and sediment would be

staged in containers in accordance with 40 C.F.R. Part 264, Subpart I and VHWMR § 10.8 Use and Management of Containers , and 40 C.F.R. 268, Subpart E, Prohibitions on Storage.

Air monitoring for site-related contaminants would be performed in accordance with 40 C.F.R. Part 50, to ensure air emissions conform with the National Primary and Secondary Ambient Air Quality Standards. Fugitive dust emissions would be controlled in accordance with Virginia Air Pollution Control Law (Code of Va. § 10.1-1300 et seq.)and the Virginia Regulations for the Control and Abatement of Air Pollution (VR 120-01).

2. Soil and Sediment Treatment/Disppsal ARARs The soil and sediment at the Site are primarily contaminated with drippage from the wood treatment processes which used PCP and creosote. This drippage is a RCRA-listed hazardous waste (F032 or F034) and, therefore, any excavated soil and sediment containing this waste is also regulated as a hazardous waste. The Hazardous and Solid Waste Amendments of 1984 prohibited the land disposal of untreated hazardous wastes. EPA has promulgated regulations (40 C.F.R. Part 268) that establish the constituent concentrations that can be present in the waste in order to allow for land disposal. However, for F032 and F034 wastes, such concentrations have not yet been set. Therefore, untreated soil and sediment can currently be disposed of in a hazardous waste landfill that is permitted in accordance with RCRA Subtitle C. Alternatives 2 and 3 would comply with this requirement.

An EPA and VDEQ interpretation of the RCRA regulations, referred to as the "Contained-In Policy" states that any mixture of environmental media (e.g., ground water, soil, sediment) and a RCRA listed hazardous waste (e.g., F032, F034) is not a solid waste itself, but must be managed as if it were a hazardous waste. Consistent with this approach, the Agency further interprets the RCRA Subtitle C regulations to mean that environmental media contaminated with listed hazardous waste must be managed as if it were hazardous waste until the media no longer contains the listed hazardous waste (i.e., until decontaminated). Related to making a determination as to when contaminated media no longer contains listed hazardous waste, a site-specific risk assessment approach has been used that addresses the public health and environmental impacts of hazardous constituents remaining in the treated media. Media treated so that the concentration of hazardous constituents is below a level which would result in an unacceptable risk to human health and the environment would not contain hazardous waste and, therefore, will no longer be required to be managed as if it were a hazardous waste (EPA OSWER Directive 9347.3-05FS). For alternatives that require treatment of soil and sediment (Alternatives 5 through 10), the treatment processes would be expected to achieve the cleanup levels set forth in Part II, Section X of this ROD. These cleanup levels have been derived from site-specific information and would be protective of human health and the environment. Therefore, soil and sediment treated to these cleanup levels would no longer have to be managed as hazardous waste. The treated soil and sediment could be backfilled on-site or disposed in a landfill (either on- or off-site) permitted in accordance with RCRA Subtitle D.

Any off-site disposal of hazardous substances would comply with CERCLA § 121(d)(3) which prohibits the disposal of Superfund Site waste at a facility not in compliance with §§3004 and 3005 of RCRA, 40 C.F.R. § 300.440.

3. Other ARARs Alternative 4 does not involve excavation; therefore, the RCRA regulations are not applicable, but are considered relevant and appropriate, for the design of the surface cap.

Under Alternatives 2, 3, 6, 7, 8, 9, and 10, any transportation of hazardous waste from the Site would be performed in accordance with Part VII of VHWMR, and Virginia Regulations Governing the Transport of Hazardous Materials (VR 672-30-1), and RCRA requirements defined in 40 C.F.R. Parts 262 and 263, and 49 C.F.R. Parts 107, and 171-179.

For Alternatives 8 and 9, the on-site treatment units would be equipped with air pollution control equipment that can meet federal and Virginia air emission standards and eliminate any unacceptable risks to human health of the environment. Air emissions would be in compliance with National Ambient Air Quality Standards (NAAQS) (40 C.F.R. Part 50), National Emissions Standards for Hazardous Air Pollutants (NESHAP) (40 C.F.R. Part 61), and Virginia Regulations for Control and Abatement of Air Pollution (VR 120-01).

For Alternative 6, the water from the biological slurry process would be treated on-site and discharged in accordance with the substantive requirements of the Virginia State Water Control Law (Code of Va., §§ 62.1-44.2 et seq.) and the Virginia Pollution Discharge Elimination System regulations (VPDES) (VR 680-14-01). Also, the on-site treatment of soils and sediments in tanks would be in compliance with VHWMR § 10.9, and RCRA requirements defined in 40 C.F.R. 264, Subpart J, Tank Systems.

For Alternative 7, on-site treatment in a plot would be in compliance with Virginia Hazardous Waste

Management Regulations § 10.11, and RCRA requirements defined in 40 C.F.R. 264, Subpart L, Waste Piles.

For Alternative 10, soil and sediment would be transported to an off-site incinerator in compliance with RCRA regulations for incinerators (40 C.F.R. 264, Part o).

For Alternative 11, any water collected during the DNAPL recovery or any recovered DNAPL that can not be reused or recycled would be managed as a hazardous waste and transported off-site for treatment and/or disposal at a permitted RCRA Subtitle C facility.

Chemical and biological monitoring would be required under all alternatives to monitor the impact of surface water run-off from the Site and evaluate the effectiveness of the cleanup5. The monitoring requirements would be developed in accordance with Virginia State Water Control Law (Code of Virginia §§ 62.1-44.2 et seq.), VPDES regulations (VR 680-14-01), and 40 C.F.R. Part 141, Subparts C and E.

Other ARARs that are associated with various alternatives include the Chesapeake Bay Preservation Area Designation and Management Regulations (VR 173-02-01), Virginia Water Protection Permit Regulations (VR 680-15-01), the Coastal Zone Management Act (40 C.F.R. 930), and Virginia Wetlands Regulations (VR 450-1-0051).

5 his monitoring would be required for any alternatives that yield concentrations of PCP greater than 0.4 mg/kg in Site soils.

C. Long-Term Effectiveness and Permanence

RRU1 (Soils) For those alternatives where the impacted soil would be excavated and treated, the long-term effectiveness would be very high. The Site soils and sediments would be required to achieve the Site cleanup levels. Alternatives 6, 7, and 9 involve non-incineration forms of treatment. Alternatives 8, and 10 include incineration which is the most effective technology for destroying the contaminants.

Alternative 5 (In Situ Bioremediation) could potentially reduce concentrations of contaminants to below cleanup levels and, thus, could provide long-term protection of on-site workers and the environment. However, significant residual concentrations of contaminants would remain on-site for the longest period of time when compared to all the other alternatives except No Action.

For those alternatives that solely involve landfill disposal of the untreated soil (Alternatives 2 and 3), long-term effectiveness would rely on effective and continuing operation and maintenance of the landfill.

RRU3 (DNAPLs) Because the total volume of DNAPL beneath the site will be reduced as a result of implementing Alternative 11, the amount of time over which DNAPL dissolution occurs will decrease. Overall ground water quality should begin to improve in terms of chemical loading, as less DNAPL will be available for dissolution.

RRU4 (Southeast Ditch Sediments) and RRU5 (Waste Lime Area Soils) Alternative 3 (Excavation and Off-Site Landfilling) would provide long-term effectiveness by requiring disposal at a RCRA-permitted off-site landfill facility. The long-term effectiveness would rely on effective and continuing operation and maintenance of the landfill facility. Alternative 4 (Surface Capping) was also considered for the Waste Lime Area and would be effective over the long term provided that the integrity of the cap is maintained.

D. Short-Term Effectiveness

RRU1 (Soils) and RRU2 (Sediments) Alternative 4 (In Situ Bioremediation) would result in the least short-term risks to workers because soil would not be excavated. The other alternatives, except No Action, all have potential for some short-term risk because excavation of impacted soil/sediment is required. However, in all cases, short-term risks would be minimized by conducting operations in accordance with acceptable health and safety procedures. The overall potential short-term exposure risks to on-site workers would be minimal.

Alternatives 6 and 7 provide a similar level of short-term effectiveness in that cleanup may take three to six years to complete. Cleanup under Alternatives 8, 9, and 10 would be accomplished in approximately 16 months. Additional short-term risks may be associated with those alternatives that call for off-site transportation of untreated soil, such as Alternative 10 (Excavation and Off-Site Incineration) and Alternative 3 (Excavation and Off-Site Landfilling) due to the risk resulting from a spill or accident during transportation.

RRU3 (DNAPLs) Alternative 11 has the potential to increase the risk to on-site workers during implementation due to worker interaction with impacted materials; however, these risks would be minimized by use of proper health and safety procedures. There may also be a slight risk of exposure to residents along the transportation route in the event of a spill or accidental release. Every effort would be made to identify measures that would minimize the chance of an accident or spill. In addition, contingency plans for responding to such an event would be developed.

RRU4 (Southeast Ditch Sediments) and RRU5 (Waste Lime Area Soils) Alternative 3 requires the excavation of impacted sediments. The excavation process would potentially increase exposures to workers; however, in all cases, risks would be minimized by conducting operations in accordance with acceptable health and safety procedures. In addition to excavation, Alternative 3 requires the transportation of tuntreated soil/sediment to a landfill facility. The potential risk resulting from a spill or accident during transportation is minimal. The soil/sediment could be readily contained if such an incident were to occur.

Alternative 4 (Surface Capping) of the Waste Lime Area would result in the least short-term risks because soil would not be excavated.

E. Reduction of Toxicity, Mobility, or Volume through Treatment

RRU1 (Soils) and RRU2 (Sediments) Alternatives 2 and 3 would significantly reduce the mobility of the contaminants on-site; however, this reduction is not achieved through treatment and would not likely result in a permanent reduction of the toxicity and volume of contaminants except for the natural biodegradation over time. Alternative 5 (In Situ Bioremediation) would eventually reduce the toxicity, mobility, and volume of contaminants through biological treatment of the impacted soils.

Among the alternatives that provide treatment, Alternatives $ and 10 would achieve the greatest reduction (over 99.9999 percent) of contaminant concentrations. The percent reduction expected from LTTD (Alternative 9) is in excess of 95 percent for both carcinogenic PAHs and PCP. The percent reduction expected from the Biological Slurry Treatment (Alternative 6) and Engineered Land Treatment (Alternative 7) range from 85 percent to 95 percent within the projected time frame.

RRU3 (DNAPLs) Alternative 11 will reduce the toxicity and mobility of DNAPL at the Site by reducing the level of saturation in the soil and by removing a portion of the mobile DNAPL in the impacted areas. The volume of mobile DNAPL remaining in the subsurface will be reduced, leaving less to be eventually dissolved.

RRU4 (Southeast Ditch Sediments) and RRU5 (Waste Lime Area Soils) Alternative 3 does not provide treatment of the impacted material; thus, there would not be any reduction of toxicity or volume of the contaminants. This alternative does contribute to reducing the mobility of the contaminants in the soil by placing the soil/sediment in a secure off-site landfill. Alternative 4 (Soil Capping) for the Waste Lime Area does not provide for treatment, but would reduce the mobility of contaminants by limiting surface water infiltration into the impacted area.

F. Implementability

RRU1 (Soils) and RRU2 (Sediments) Alternatives 2 and 3 can be readily implemented. Conventional earth-moving equipment would be used for the excavation activities and construction of the on-site landfill in Alternative 2. Excavated material would be transported to an off-site landfill under Alternative 3.

Alternative 5 (In Situ Bioremediation) would require minimal excavation and construction compared with the other alternatives. Equipment and materials which would be required to implement this alternative are readily obtainable. However, because of the shallow ground water table and hydraulic gradient at the Site, a significant engineering effort is warranted to design an effective treatment system.

The treatment alternatives (5, 6, 7, 8, 9, and 10) would require bench-scale and/or pilot-scale studies, as appropriate, prior to full-scale implementation. Alternative 6 (Biological Slurry Treatment) would involve extensive materials handling. The backfilling and off-site landfilling disposal option for treated soil/sediment would be relatively easy to implement. The on-site landfilling disposal option would require additional construction activity, but could also be readily implemented.

RRU3 (DNAPLs) Alternative 11 would also be easily implemented because the equipment and materials are readily available and adequately demonstrated for similar applications.

RRU4 (Southeast Ditch Sediments) and RRU5 (Waste Lime Area Soils) Technically, Alternative 3 is easily implementable. The excavation and landfill techniques are commonly practiced and could be implemented in a relatively short period of time. Surface capping (Alternative 4) of the Waste Lime Area could also be easily implemented. Earth-moving equipment is readily available and the area of the Site to be capped may be easily accessed.

G. Cost: Effectiveness

RRU1, 2, 4, and 5 (DNAPL) The costs of the alternatives for RRU1, 2, 4, and 5 are shown in the table below. (Note: For convenience, costs for the selected alternatives are shown in bolded print in the table below.)

Present Worth Cost for Soil/Sediment Remedial Response Units

Alternative	1	2	4	5
Alternative 1	$698,000	$366,000	$260,000	$584,000
Alternative 2	$3,928,000	$1,104,000	n/a	n/a
Alternative 3	$9,654,000	$721,000	$402,000	$1,893,000
Alternative 4	n/a	n/a	n/a	$1,622,000
Alternative 5	$3,673,000	n/a	n/a	n/a
Alternative 6 with On-Site Landfill	$7,747,000	$1,027,000	n/a	n/a
Alternative 6 with Off-Site Landfill	$14,378,000	$1,049,000	n/a	n/a
Alternative 6 with Backfilling	$6,120,000	$804,000	n/a	n/a
Alternative 7 with On-Site landfill	$4,564,000	$789,000	n/a	n/a
Alternative 7 with Off-Site Landfill	$11,701,000	$1,016,000	n/a	n/a
Alternative 7 with Backfilling	$3,839,000	$772,000	n/a	n/a
Alternative 8 with On-Site landfill	$18,341,000	$1,251,000	n/a	n/a
Alternative 8 with Off-Site Landfill	$22,771,000	$1 211,000	n/a	n/a
Alternative 8 with Backfilling	$16,822,000	$1,041,000	n/a	n/a
Alternative 9 with On-Site Landfill	$8,822,000	$1,036,000	n/a	n/a
Alternative 9 with Off-Site Landfill	$13,852,000	$996,000	n/a	n/a
Alternative 9 with Backfilling	$7,294,000	$825,000	n/a	n/a
Alternative 10	$53,829,000	$2,051,000	n/a	n/a

RRU3 (DNAPL) The No Action alternative present worth cost is $584,000. Alternative 11 (Extracting DNAPL for

Off-site Reuse) has a present worth cost of $2,196,000.

H. State Acceptance

VDEQ has had the opportunity to review and comment on all the documents in the Administrative Record and has had the opportunity to comment on the draft ROD. The Commonwealth has not concurred with this ROD; however, the Commonwealth's comments have been incorporated into this ROD.

I. Community Acceptance

The community has not indicated objections to the alternatives selected in this Record of Decision. Atlantic Wood Industries, Inc., has, however, stated opposition to some components of the chosen alternatives. Oral and written comments on the remedial alternatives evaluated by EPA for implementation at the Site are included in Part III of this ROD.

X. SELECTED REMEDY AND PERFORMANCE STANDARDS

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives presented in the Proposed Remedial Action Plan using the nine criteria, and public comments, EPA has selected Alternative 7 (Engineered Land Treatment) with a contingency of Alternative 9 (Low Temperature Thermal Desorption) as the remedy for RRU1 (soil) and RRU2 (sediment); Alternative 11 (DNAPL Extraction for Off-Site Use) for RRU3; and Alternative 3 (Off-Site Landfilling) for RRU4 (Southeast Ditch Sediments) and RRU5 (Waste Lime Area). The major components of the remedy include:

- Excavation of an estimated 20,000 cubic yards of soil (RRUl) and 564 cubic yards of sediment (RRU2)6, treatment of soil/sediment biologically using the engineered land treatment process in order to achieve the cleanup levels in Table 2-15 of this ROD, and backfilling of appropriately treated soil/sediment on-site;

- A contingency treatment process using on-site low temperature thermal desorption if treatability studies conducted during the remedial design indicate that biological treatment will not be effective in achieving the Site cleanup levels listed in Table 2-15 of this ROD;

- Excavation of an estimated 250 cubic yards of sediment (RRU4) and 2,370 cubic yards of soil (RRUS) in order to achieve the cleanup levels in Table 2-15 of this ROD, and disposal off-site in a RCRA-permitted Subtitle C landfill;

- Recovery of DNAPL from new and existing wells for off-site reuse or disposal;

- Monitoring and institutional controls.

Table 2-15 immediately below sets forth the clean-up levels for RRU1, RRU2, RRU4, and RRUS.

6 The majority of contaminated sediment from the inlet portion of RRU2 have already Been removed ag Dart of a ram0val action conducted at the Site in May of 1995. The excavated sediment is being stored on-site awaiting treatment during the remedial action. Therefore, the amount of sediment to actually excavate during the remedial action should be lower.

Table 2-15: Performance Standards: Soil and Sediment Cleanup Levels7
(ppm)

Soils by Area:	BaPEq8	Total PAH	PCP	Arsenic	Copper	Zinc	Dioxin/ Furans
RRU1-Area 1 Wood Treating East	11	100	3	150	390	410	0.001
RRU1-Area 2 Wood Treating West	10	100	2	76	390	410	0.001
RRU1-Area 3 Historic Disposal	8	100	3	150	390	410	0.001
RRU1-Area 4 Wood Storage Yard	8	100	3	131	390	410	0.001
RRU5-Area 9 Waste Lime Area	8	100	3	150	390	410	0.001
Sediments by Area: RRU2-Arees 5, 6, 7 RRU4-Area 8 (All Sediment arees)	n/a	25	0.4	85	390	270	0.001

The specific elements of the remedy and the associated performance standards are presented below.

A. Treatability Study/Contingent Trigger

1. An on-site pilot-scale treatability study using engineered land treatment shall be conducted in general accordance with EPA/540/R-93/519a, August 1993, Guide for Conductina Treatability Studies Under CERCLA: Biodegradation Remedy Selection.

2. A detailed Treatability Study Work Plan to test the effectiveness of the engineered land treatment methods shall be approved by SPA prior to commencing the study. The Work Plan shall include, at a minimum, a study description, testing goals, sampling and analysis methods, quality assurance/control methods, treatment level derivations that support achieving the Table 2-15 cleanup levels for respective Site areas, and an expeditious schedule for the study.

7 Cleanup concentrations are arithmetic means. Compliance will be determined in accordance with Section X.B.8 of this ROD. Cleanup levels are based on the more conservative of the 1 x 10-5 target risk level for human health, or ecological literature values adjusted to accommodate site-specific characteristics.

8 BaPEq stands for benzo[a]pyrene equivalents. Benzo[a]pyrene is a specific compound in PAH and is used as a surrogate to define PAH cleanup.

3. Pilot-scale studies performed shall clearly demonstrate the technical feasibility of engineered land treatment in achieving the cleanup levels listed in Table 2-15 within a reasonable period of time (i.e. approximately 12 months per lift).9 If EPA determines that the pilot-scale studies demonstrate the technical feasibility of engineered land treatment, this technology shall be implemented in accordance with Section X.C.

4. If EPA determines that engineered land treatment is not technically feasible based on the pilot-scale studies, low temperature thermal desorption shall be triggered as the treatment technology to be implemented for RRU1 and RRU2 in accordance with Section X.D.

B. Soil/Sediment Excavation and Backfill

1. All soil/sediment in the unsaturated zone above the water table (which varies from 1 to 10 feet below grade) that require treatment or disposal in order to achieve the cleanup levels in Table 2-15, shall be excavated. To the extent practicable, excavation shall be performed when the water table is at the seasonally low elevation. The volume of soil to be excavated is estimated to be 20,000 yd3 for RRU1 and 2,370 yd3 for RRUS. The volume of sediments to be excavated is estimated to be 564 yd3 for RRU2 and 250 yd5 for RRU4. The full extent of excavation shall be finalized during the remedial design.

2. Surface tanks, buildings, railroad tracks, and associated piping shall be demolished as necessary to

remediate contaminated soils beneath the wood-treating plant and associated railroad. Any existing piping associated with the former tank storage yard along Elm Avenue shall be removed as necessary during excavation. The demolition plans shall be finalized during the remedial design and will require approval by EPA.

9 The sediment cleanup level for PCP (0.4 ppm) shown in Table 2-15 is not expected to be achievable through the use of engineered land treatment; therefore, excavated areas shall be backfilled with clean sediments. However, the Table 2-15 soil cleanup levels for PCP and other contaminants are expected to be achievable at the Site; therefore, sediments treated to achieve the soil cleanup levels shall be backfilled at the Site as soils.

3. Excavation activities shall be conducted in a manner that minimizes damage to the ecosystem and surrounding wetlands in accordance with Executive Order 11990 on Wetlands Protection (40 C.F.R. Part 6, Appendix A), Chesapeake Bay Preservation Area Designation and Management Regulations (VR 173-02-01), Virginia Water Protection Permit Regulations (VR 680-15-01), and Virginia Wetlands Regulations (VR 450-01- 0051). To the extent practicable, wildlife present in the areas to be excavated shall be moved to comparable natural areas prior to commencement of excavation activities. Any impacts to wetlands shall be mitigated in accordance with applicable regulations and EPA approved methods.

4. Air monitoring for site-related contaminants shall be performed in accordance with 40 C.F.R. Part 50, to ensure air emissions conform with the National Primary and Secondary ambient Air Quality Standards. Fugitive dust emissions shall be controlled in accordance with Virginia Air Pollution Control Law (Code of Va. § 10.1-1300 et seq.) and the Virginia Regulations for the Control and Abatement of Air Pollution (VR 120-01). Measures shall be taken to prevent dispersion of the materials during excavation and transportation. Controlled amounts of water shall be sprayed onto the soils and tarps shall be placed over the loaded trucks. If dust emission problems persist, excavation shall be suspended until conditions improve.

5. Erosion and sediment control measures shall be installed in accordance with the substantive requirements of the Virginia Erosion and Sediment Control Law (Code of Va. §§ 10.1-560 et seq.) and the Virginia Erosion and Sediment Regulations (VR 625-02-00). To the extent possible, these measures shall be sufficient to provide protection in the event of flooding in accordance with Executive Order 11988 (Flood Plain Management). An erosion and sediment control plan shall be prepared and submitted to EPA and the locality for review. Surface water run-off shall be diverted away from the excavation areas, and appropriate erosion and sediment control measures shall be implemented. In the event of rain or potential Site flooding during excavation, appropriate measures shall be taken to prevent contaminant migration. Stormwater runoff from the Site that discharges to surface water shall be in compliance with the stormwater requirements included in VPDES regulations (VR 680-14-01).

6. All equipment used during excavation of contaminated soil shall be decontaminated before entering uncontaminated areas. The design and specifications for the decontamination facilities shall be approved by EPA as part of the remedial design. Any discharge of water generated from Site decontamination activities shall be in compliance with Virginia State Water Control Law, Code of Virginia §§ 62.1-44.2 et seq., and VPDES regulations (VR 680-14-01).

7. Excavated areas shall be backfilled with appropriately treated soil/sediment or clean fill and revegetated.

8. Sampling and analysis of soil and sediment shall be performed prior to excavation to delineate the complete extent of contamination for excavation purposes. Sampling and analysis shall also be performed after excavation, and after backfilling, to confirm that cleanup levels set forth in Table 2-15 have been achieved. Methods for determining compliance with the cleanup levels shall be finalized and approved by EPA during the remedial design and will be based upon EPA 230/02-89-042, February 1989, Methods for Evaluating the Attainment 9f CleaDup Standards, Vol 1: Soils and Solid Media.

9. Excavated soil and sediment shall be temporarily staged on-site in accordance with 40 C.F.R. Part 264, Subpart L, and VR § 10.11, Waste Piles, or alternate methods approved by EPA in consultation with VDEQ, prior to treatment and/or transportation to an off-site disposal facility. To the extent practicable, excavated soil and sediment shall be staged in areas of existing contamination. If soil and sediment will be staged in a clean area, the waste material and soil shall be temporarily staged in containers in accordance with RCRA regulations contained in 40 C.F.R. Part 268, Subpart E, or alternate methods approved by EPA in consultation with VDEQ; containers shall be in compliance with 40 C.F.R. Part 264, Subpart I and VHWMR § 10.8, Use and Management of Containers.

10. Any debris contaminated with a listed hazardous waste (40 C.F.R. Part 261, Subpart D) such as F032 or F034, or debris exhibiting a characteristic of hazardous waste (40 C.F.R. 261, Subpart c) shall be managed An accordance with the federal land disposal restrictions (40 C.F.R. Part 268). Debris that does not contain or exhibit characteristics of hazardous waste shall be managed in accordance with VSWMR (VR 672-20-10).

C. Engineered Land Treatment of Soil/Sediment

1. Engineered land treatment for RRU1 and RRU2 shall be implemented if EPA determines that this technology can be utilized to achieve the cleanup levels in Table 2-15 based on the pilot-scale treatability studies required in Section X.A. On-site treatment in a plot would be in compliance with Virginia Hazardous Waste Management Regulations § 10.11, and RCRA requirements defined in 40 C.F.R. 264, Subpart L, Waste Piles.

2. The engineered land treatment system shall be designed and constructed in general accordance with EPA/600/R-93/164, August 1993, Bioremediation Using the Land Treatment concept, in order to achieve the cleanup levels listed in Table 2-15. The system design requires EPA approval prior to commencing implementation.

3. Run-on and run-off controls shall be installed to prevent over-saturation of the treatment beds and to prevent migration of contaminants.

4. The treatment unit soil/sediment shall be monitored routinely to determine the rate of degradation of the contaminants. The appropriately treated materials shall be backfilled to the general areas from which they were excavated.

5. Any air emissions from any on-site treatment system shall comply with Virginia Air Pollution Control Law, Code of Virginia §§ 10.1-1300 et. seq.; the Virginia Department of Air Pollution Control Regulations for the Control and Abatement of Air Pollution (VR 120-01); and the federal Clean Air Act, 42 U.S.C. § 7401 et seq.; and 40 C.F.R. Part 50.

D. Contingent Treatment Technology for RRU1 and RRU2: Low Temperature Thermal Desorption of Soil/Sediment

1. Low temperature thermal desorption shall be used to treat the soil/sediment in RRU1 and RRU2 if EPA determines that engineered land treatment cannot be implemented to achieve the cleanup levels in Table 2-15 based on the pilot-scale treatability study required in Section X.A.

2. A treatability study for low temperature thermal desorption shall be conducted in general accordance with EPA/540/R-92/074A, September 1992, Guide for Conducting Treatability Studies Under CERCLA: Thermal Desorption Remedy Selection. A detailed Treatability Study Work Plan to test the effectiveness of low temperature thermal desorption shall be approved by EPA prior to commencing the study. The Work Plan shall include, at a minimum, a study description, testing goals, sampling and analysis methods, quality assurance/control methods, treatment level derivations that support achieving the Table 2-15 cleanup levels for respective Site areas, and an expeditious schedule for the study.

3. If EPA determines, based on treatability studies, that low temperature thermal desorption cannot achieve the cleanup levels listed in Table 2-15, the soils and sediments in RRU1 and RRU2 shall be disposed of in accordance with Section X.E. If low temperature thermal desorption can achieve the cleanup levels listed in Table 2-15, proceed with Section X.D.4.

4. Low temperature thermal desorption shall be used to treat excavated soil/sediment in order to achieve the cleanup levels in Table 2-15.

5. Air emissions shall be in compliance with National Ambient Air Quality Standards (NAAQS) (40 C.F.R. Part 50), National Emissions Standards for Hazardous Air Pollutants (NESHAP) (40 C.F.R. Part 61), and Virginia Regulations for Control and Abatement of Air Pollution (VR 120-01). On-site treatment units shall be equipped with air pollution control equipment that can meet federal and Virginia air emission standards and eliminate any unacceptable risks to human health of the environment.

6. 40 C.F.R. Part 264, Subpart X, and VHWMR § 10.15, Miscellaneous Units, regulate the use of miscellaneous units for storing and/or treating hazardous wastes during the cleanup.

E. Soil/Sediment Disposal

1. Soil and sediment excavated for off-site disposal (RRU4 and RRU5) shall be sent to a permitted RCRA Subtitle C facility. Excavated areas shall be backfilled with clean fill in order to restore original grades. Off-site disposal shall comply with all applicable statutes and regulations including, but not limited to, CERCLA § 121(d)(3) which prohibits the disposal of Superfund Site waste at a facility not in compliance with §§ 3004 and 3005 of RCRA, 40 C.F.R. § 300.440.

2. Transportation of hazardous waste from the Site shall be performed in accordance with Part VII of VHWMR, and Virginia Regulations Governing the Transport of Hazardous Materials (VR 672-30-1), and RCRA requirements defined in 40 C.F.R. Parts 262 and 263, and 49 C.F.R. Parts 107, and 171-179.

F. DNAPL Recovery

1. During the remedial design phase, relative rates of DNAPL accumulation shall be measured at the Site to determine the appropriate location and number of additional wells and the most effective DRAPL removal method as approved by EPA. An estimated number of eight existing and seven new wells shall be utilized for DNAPL recovery. Additional new, and/or existing, wells shall also be installed if determined to be required by EPA.

2. DNAPL shall be recovered to the extent practicable and reused or recycled in accordance with all applicable local, state, and Federal requirements.

3. Any water collected during DNAPL recovery or any recovered DNAPL that can not be reused or recycled shall be managed as a hazardous waste and transported off-site for treatment and/or disposal at a permitted RCRA Subtitle C facility.

G. Site Monitoring

1. Ground water monitoring shall begin upon the initiation of DNAPL recovery and shall continue until a final ground water remedy is implemented in accordance with a subsequent ROD. Ground water and DNAPL beneath the Site shall be monitored for PAHs, PCP, arsenic, and DNAPL thickness on a quarterly basis. Wells shall also be sampled and analyzed for the full EPA Contract LaD Program Target Analyte List and Target Compound List, and for dioxins/furans on an annual basis. The appropriate number and location of wells to be sampled, the duration of sampling, and the parameters and methods for analysis shall be approved by EPA during the remedial design phase.

2. Long-term surface water monitoring shall be performed in accordance with State and federal requirements to monitor the quality of surface water run-off at the Site and to monitor for the potential migration of contamination from the Site. The monitoring requirements shall be developed in accordance with Virginia State Water Control Law (Code of Virginia §§ 62.1-44.2 et seq.), VPDES regulations (VR 680- 14-01), and 40 C.F.R. Part 141, Subparts C and E.

3. Chemical and biological monitoring of sediments shall be required if post-remedial concentrations of PCP are greater than 0.4 mg/kg in Site soils. Semi-annual chemical and annual bioassay monitoring of on-site sediments shall be required for a minimum period of five years from the time of remedial construction completion to determine the effectiveness and durability of the cleanup. Sediments shall be analyzed for PCP, total PAH, arsenic, copper, zinc, total organic carbon, grain size, pH and soil type.

H. Miscellaneous Performance Standards/Institutional Controls

1. As soon as practicable, institutional controls, including restrictions on title, use, and access will be placed on the site. Restrictions on title shall prohibit the following: 1) residential development; 2) agricultural development; and 3) the use of ground water for domestic or drinking purposes.

2. Appropriate measures shall be taken during any field activities to prevent exposure to off-site individuals and/or pedestrians. Security fencing shall be installed to prevent unauthorized access in areas set for ongoing remedial activities.

XI. STATUTORY DETERMINATIONS

This remedy satisfies the remedy selection requirements of CERCLA and the NCP. The remedy is expected to be protective of human health and the environment, complies with ARARs, is cost-effective, utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and meets the preference for treatment as a principal element of the remedy. The following is a discussion of how the

selected remedial action addresses these statutory requirements.

A. Overall Protection of Human Health and the Environment

The selected remedy will provide adequate protection of human health and the environment through the removal of soil and sediments contaminated with PAHs, PCP, arsenic, copper, zinc, and dioxin/furan, and the recovery of DNAPL in the subsurface. These actions will reduce the carcinogenic risk to within the acceptable EPA risk range of 1 x 10-4 to 1 x 10-6 and achieve a Hazard Index of less than one for noncarcinogenic risks.

No unacceptable short-term risks or cross-media impacts are anticipated by implementation of the selected remedy.

B. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Under Section 121(d) of CERCLA, 42 U.S.C. § 9621(d), and EPA guidance, remedial actions at Superfund sites must attain legally applicable or relevant and appropriate Federal and state environmental standards, requirements, criteria, and limitations (collectively referred to as ARARs). Applicable requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under Federal or state law that specifically address hazardous material found at the Site,
the remedial action to be implemented at the Site, the location of the Site, or other circumstances at the Site. Relevant and appropriate requirements are those which, while not applicable to the Site, nevertheless address problems or situations sufficiently similar to those encountered at the Site that their use is well suited to that Site.

The selected remedy will comply with all ARARs. The site-specific ARARs and the To Be Considered (TBC) criteria for the selected remedies are presented below.

1. Chemical Specific ARARs

! Off-site disposal will comply with RCRA regulations and standards for owners and operators of hazardous waste treatment, storage and disposal facilities, 40 C.F.R. Part 264, VHWMR (VR 672-10-1); VSWMR (VR 672-20-10); RCRA land disposal regulations, 40 C.F.R. Part 268, Subpart C and D, and §§ 15.3 and 15.4 of VHWMR (VR 672-10-1).

! Any debris contaminated with a listed hazardous waste (40 C.F.R. Part 261, Subpart D) such as F032 or F034, or debris exhibiting a characteristic of hazardous waste (40 C.F.R. 261, Subpart c) shall be managed in accordance with the RCRA land disposal regulations (40 C.F.R. Part 268 and VHWHR Part XV). Debris that does not contain or exhibit characteristics of hazardous waste shall be managed in accordance with VSWHR (VR 672-20-10).

2. Action-Specific ARARs

! Any off-site disposal of hazardous substances will comply with CERCLA § 121(d)(3) which prohibits the disposal of Superfund site waste at a facility not in compliance with §§ 3004 and 3005 of RCRA, 40 C.F.R. § 300.440.

! 40 C.F.R. Parts 262, 263, and 268, 49 C.F.R. Parts 107, 171-179, Part VII of VHWMR (VR 672-10-1), and the Virginia Regulations Governing the Transportation of Hazardous Materials (VR 672-30-1) regulate the off-site transportation of solid and hazardous wastes in the Commonwealth of Virginia.

! 40 C.F.R. Part 268, Subpart E, Prohibitions on Storage, and VHWMR Part XV, provide land disposal restrictions for hazardous waste.

! Virginia Solid Waste Management Regulations (VSWHR 672-20-10) regulate the management of solid waste management facilities in the Commonwealth of Virginia.

! 40 C.F.R Part 261, and VHWMR Part III provide for the identification and listing of hazardous waste.

! 40 C.F.R. Part 264, Subpart I, and VHWMR § 10.8, Use and Management of Containers regulates the use and management of containers of hazardous wastes during the cleanup.

! 40 C.F.R. Part 264, Subpart J, and VHWMR § 10.9, Tanks, regulate the use of tanks for storing and/or

treating hazardous wastes during the cleanup.

! 40 C.F.R. Part 264, Subpart L, and VHWMR § 10.11, Waste Piles, regulate the use of waste piles for storing and/or treating hazardous wastes during the cleanup.

! 40 C.F.R. Part 264, Subpart X, and VHWMR § 10.15, Miscellaneous Units, regulates the use of miscellaneous units for storing and/or treating hazardous wastes during the cleanup.

! Any land-disturbing activities associated with the selected remedy will comply with the Virginia Erosion and Sediment Control Law, Code of Virginia §§ 10.1-560 et seq., and Virginia Erosion and Sediment Control Regulations (VR 625-02-00) to prevent erosion and transport of sediments in surface water runoff during earth moving activities.

! The excavation associated with the selected remedy shall cause no violation of NAAQS due to fugitive dust generated during construction activities as set forth in 40 C.F.R. § 50.6 and 40 CFR) 52.21(j) and VR 120-04-0101 of the Virginia Regulations for the Control and Abatement of Air Pollution.

! 40 C.F.R. Part 50, Appendix G establish protocols for air monitoring to be conducted during the cleanup.

! Air emissions shall be in compliance with National Ambient Air Quality Standards (NAAQS) (40 C.F.R. Part 50), National Emissions Standards for Hazardous Air Pollutants (NESHAP) (40 C.F.R. Part 61), and Virginia Regulations for Control and Abatement of Air Pollution (VR 120-01).

! The Site monitoring requirements shall be developed in accordance with Virginia State Water Control Law (Code of Virginia §§ 62.1-44.2 et seq.), VPDES regulations (VR 680-14-01), and 40 C.F.R. Part 141, Subparts C and E.

! Virginia Stormwater Management Regulations (VR 215-02-00) require that all land-disturbing activities be in compliance with local stormwater management 9rograms.

! The federal National Pollutant Discharge Elimination System (NPDES) under the Clean Water Act 33 U.S.C. §§ 1251 et seq., and the Virginia Pollution Discharge Elimination System (VPDES) under the Virginia Water Control law, Code of VA § 62.1-44.2 et seq., establish discharge limitations for point source discharges to surface water based on designated use of the receiving stream. NPDES requirements set forth in 40 C.F.R. Part 122, 129, and 131 and VPDES requirements set forth in VR 680-14-00 and 680-21-00 shall be met.

3. Location-Specific ARARs

! The Fish and Wildlife Coordination Act (16 U.S.C. 661-667e) coordinates Federal, State, public and private organizations in protecting fish, wildlife and their habitats. The Migratory Bird Treaty Act (16 U.S.C. 701-708) is an international treaty protecting migratory birds.

! The Endangered Species Act of 1973 (16 U.S.C. § 1651 et. seq.,), the Virginia Board of Game and Inland Fisheries (Code of Virginia §§ 29.1-100 et seq.), and Virginia Endangered Species Act, Code of Virginia §§ 29.1-563, provide a means for conserving various species of fish, wildlife, and plants that are threatened with extinction. These ARARs will be applicable if EPA determines that endangered species are present or will be affected by the remedial actionA

! Executive Order 11988, Floodplain Management (42 U.S.C. 4001); the National Flood Insurance Act of 1968; the Flood Disaster Act of 1973; and Procedures for Implementing the Requirements of the Council on Environmental Quality on the National Environmental Policy Act. These provisions regulate cleanup activities that take place in a floodplain.

! Coastal Zone Management Act (16 U.S.C. §§ 1451 et. seq., 40 C.F.R. Part 930); the Coastal Management Plan for the City of Portsmouth; and the National oceanic and Atmospheric Administration (NOAA) Regulations on Federal Consistency With Approved State Coastal Zone Management Programs. These provisions regulate cleanup activities that take place in a coastal area.

! Virginia's Chesapeake Bay Preservation Act (Code of Va,. § 10.1-2100 et seq) and Chesapeake Bay Preservation Area Designation and Management Regulations (VR 173-02-01) regulate cleanup activities that take place in resource management and/or research protected areas as designated in the Chesapeake Bay Preservation Act.

! Excavation activities in wetland areas shall be conducted in accordance with Executive Order 11990 on Wetlands Protection (40 C.F.R. Part 6, Appendix A), and Virginia Wetlands Regulations (VR 450-01-0051), and the Virginia Water Protection Permit Regulations (VR 680-15-01).

4. Criteria, Advisories, or Guidance To Be Considered (TBCs)

! Contained-in Policy (EPA OSWER Directire 9347.3-05FS) states that environmental media mixed with a RCRA listed hazardous waste must, upon collection, be managed as if it were a hazardous waste until it no longer contains the listed hazardous waste.

! Methods for Evaluating the Attainment of Cleanup Standards - Volume 1 (Soils add Solid Media), EPA 230/02-89-042, provides statistical methods to confirm compliance with soil/solid media clean-up levels.

! Guide for Conducting Treatability Studies Under CERCLA: Biodegradation Remedy Selection, EPA/540/R-93/519a, August 1993, provides guidance for the on-site pilot-scale treatability study using engineered land treatment.

! Guide for Conducting Treatability Studies Under CERCLA: Thermal Desorption Remedy Selection, EPA/540/R-92/074A, September 1992, provides guidance for a treatability study using low temperature thermal desorption

! Bioremediation Using the Land Treatment Concept, EPA/600/R-93/164, August 1993, provides guidance on designing the engineered land treatment system.

C. Cost Effectiveness

EPA has determined that the selected remedy is cost-effective in that it mitigates the risks posed by the contaminants associated with the Site, meets all other requirements of CERCLA, and affords overall effectiveness proportionate to the cost. Based on the Feasibility Study Report, the total estimated present worth cost of the selected remedy is $9,102,000 and is summarized in the table below.

Total Estimated Costs of Selected Alternatives

	RRU1	RRU2	RRU3	RRU4	RRU5	TOTALS10
Capital Costs	$2,442,000	$283.000	$537,850	$162.000	$1,403,000	$4,827,850
Annual O&M Costs	$33,800 to $276,800	$30,000 to $45,000	$214,775	$15,600	$31,900	$326,075 to $584,075
Present Worth Costs	$3,839,000	$772.000	$2,196,000	$402,000	$1,893,000	$9,102,000

D. Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner at the Site. Soils and sediments from RRU1 and RRU2 will be treated by either engineered land treatment or by low temperature thermal desorption processes. Soils and sediments from RRU4 and RRU5 can not be treated similarly due to the presence of elevated metals, organics, and high pH. Soils and sediments from RRU4 and RRU5 will be sent off-site for disposals therefore, this portion of the remedy does not employ a permanent solution. DNAPLs will be extracted from new and existing recovery wells and will be re-used or disposed of off-site.

E. Preference for Treatment as a Principal Element

In keeping with the statutory preference for treatment as a principle element of the remedy, the selected remedy utilizes treatment as a principal element for RRU1 and RRU2. The soil and sediment from RRU1 and RRU2 account for an estimated 87% of the total soil/sediment requiring remediation at the Site. The remaining soil/sediment will be disposed of off-site. Site soil and sediment will be treated to the extent necessary to meet the cleanup levels provided in Table 2-15 of this ROD.

10 Total estimated costs assume that engineered land treatment will be the treatment technology implemented for soil/sediment in RRU1 and RRU2. Total estimated costs are $12.6M if low temperature thermal desorption is the required technology to be implemented.

XII. DOCUMENTATION OF SIGNIFICANT CHANGES

No significant changes from the Proposed Remedial Action Plan appear in this Record of Decision.

RECORD OF DECISION
ATLANTIC WOOD INDUSTRIES, INC., SUPERFUND SITE

PART III- RESPONSIVENESS SUMMARY

Comments raised during the public comment period on the Proposed Plan for the Atlantic Wood Industries, Inc., Superfund Site (Site) are summarized in this Responsiveness Summary. The comment period was initially held from June 9, 1995, to July 8, 1995, to address the Proposed Plan. Upon request, the public comment period was extended to August 7, 1995.

Oral comments were presented at the Proposed Plan Public Meeting held on June 27, 1995. These comments and EPA's responses are presented in Section I of this Responsiveness Summary. A transcript of the first public meeting has been included in the Administrative Record for the Site.

EPA received three letters from concerned parties on the cleanup alternatives or other aspects of Site activity during the public comment period. One letter was from a citizen. The other two letters contained comments submitted by potentially responsible parties. The comments presented in these letters and EPA's responses are found in Section II of the Responsiveness Summary. These letters have been included in the Administrative Record for the Site.

I. ORAL COMMENTS FROM JUNE 27, 1995, PUBLIC MEETING

1. A community member asked how Alternative 6 and Alternative 7 in the Proposed Plan are different.

EPA RESPONSE: Both Alternative 6 and Alternative 7 are bioremediation technologies which involve excavating contaminated soils and sediments and mixing in water and nutrients to enhance the break down of the contaminants. However, Alternative 6 would involve placing excavated soils and sediments into an on-site tank, and Alternative 7 involves placing the soil and sediments into an on-site treatment plot.

2. A community member asked if the proposed excavation of soils and sediments would change the present surface characteristics of the Site and induce mosquito breeding grounds.

SPA RESPONSE: The surface of the Site will not be changed as a result of excavation; therefore, new mosquito breeding areas will not be created. Any areas that are excavated will be backfilled with clean or treated soil.

3. A community member asked who will pay for the cost of the clean-up actions.

EPA RESPONSE: EPA will negotiate with the responsible parties to pay for the costs of the cleanup. If EPA is unsuccessful in coming to an agreement with the responsible parties, then EPA can unilaterally order these parties to do the work or use money from the Superfund trust to pay for the cleanup. If money is used from the trust fund, EPA will continue to pursue the PRPs to recover the money spent on the cleanup.

4. A resident asked why the Site continued to operate until 1992 if it was placed on the National Priorities List in 1990.

EPA RESPONSE: The placing of a site on the National Priorities List (NPL) does not necessarily mean that its operations must stop. The Site was placed on the National Priorities List in 1990 because of contamination problems resulting from past operational practices.

5. A resident asked how sediments were prevented from entering the river during the removal action.

EPA RESPONSE: EPA required that necessary precautions be taken during excavation of sediments from the inlet to minimize the transport of sediments to the river. These precautions involved the use of silt-curtains, booms, and the removal of sediments from the inlet only during low tide conditions.

6. A local resident commented that well water in the community is often used to water yards and gardens and fill swimming pools. The resident asked how Site contamination has affected the ground water in these wells.

EPA RESPONSE: Additional investigation will be conducted under Operable Unit 2 of the Site to characterize the impact of contamination on the ground water in the area. Residents who live in the immediate Site area and use well water for domestic purposes should contact EPA so that a determination can be made as to the potential impact of the Site on the well water.

7. A community member asked if any controls were going to be implemented to prevent rodents from migrating from the Site during clean-up work.

EP& RESPONSE: EPA has not seen any indications that rodents will present a problem to the surrounding neighborhood during the cleanup, but this issue may be considered during the remedial design.

8. A community member asked how dust from the trucks hauling contaminated material off-site would be controlled.

EPA RESPONSE: EPA will ensure that all necessary safety precautions and regulations are followed during the hauling of contaminated wastes off-site. Materials being transported from the Site by truck will be covered with tarps. In addition, the truck drivers will have proper training for the transportation of hazardous material.

9. A community member asked if EPA's goal for bioremediation is to achieve the minimum permissible exposure level.

EPA RESPONSE: EPA's clean-up levels are designed to be protective of human health and the environment. The cleanup levels are based on the more conservative of the human health or environmental risk factors for the Site. The specific clean-up levels for Site contaminants are provided in Table 2-15 of this ROD.

10. A community member commented that, although there are bans on fishing in the Elizabeth River, people continue to crab and fish. The community member asked if river contamination would be addressed as part of this Site.

EPA RESPONSE: Because there are many industries located on the Elizabeth River, the source of contamination and how best to address it are difficult to determine. This ROD addresses the cleanup of Operable Unit 1 (OU1) only. Subsequent OUs will be handled separately. EPA has chosen this strategy for Site cleanup for two specific reasons: 1) OU1 contamination represents a continuing source of further releases of contaminants to the environment and therefore needs to be cleaned up first; 2) subsequent OUs require further investigation and study to determine feasible cleanup solutions. If cleanup actions are required as a result of Site-related contamination, those actions will be documented in a subsequent ROD.

11. A resident asked about the time frame for initiating cleanup activities.

EPA RESPONSE: EPA will attempt to negotiate an agreement with the potentially responsible parties for implementation of the cleanup. This can take six to eight months, sometimes longer. Upon completion of this negotiation process, the design phase begins. As part of the design, treatability studies will be performed to ensure that biological treatment can work effectively at the Site. The design phase usually requires 15 to 20 months. Actual on-site cleanup action will begin following EPA approval of the design standards and specifications.

12. A resident asked why EPA sought the community's comments before selecting a final clean-up method.

EPA RESPONSE: EPA is required by law to solicit public input before selecting a remedy at a Superfund site. EPA relies on public input to ensure that the cleanup meets the needs and concerns of the local community.

13. A community member asked who was paying for the studies and investigations that have been completed to date and who will Day for the eventual clean-up work.

EPA RESPONSE: Atlantic Wood Industries, Inc. (AWI), has conducted all of the investigations and studies at the Site under oversight from EPA and the Virginia Department of Environmental Quality. EPA anticipates negotiating a consent decree with the potentially responsible parties (PRPs) for the AWI Superfund Site who

under the terms of such decree, would pay for Site cleanup. If a decree is not successfully negotiated, EPA has the option of ordering one or more of the PRPs to perform Site cleanup or EPA may use Superfund monies to pay for Site cleanup and thereafter seek reimbursement of cleanup costs from the PRPs.

14. A Community member asked if drums buried on-site will be removed.

EPA RESPONSE: This ROD requires excavation of contaminated materials in the area known as the historic disposal area where drums may have been buried. Excavation is required to the depth of the water table, and if drums are found, they will be removed and disposed of properly.

15. A community member asked EPA to identify the responsible parties for Site contamination.

EPA RESPONSE: At this time, EPA has not made a legal determination as to which parties are responsible for Site contamination. What EPA has done, however, is to inform those parties who are potentially responsible for contamination at the AWI Site of their potential liability. The parties who have been so informed by EPA are Atlantic Wood Industries, Inc., and the U.S. Norfolk Naval Shipyard.

16. A resident commented that many people in the community expressed an interest in the public meeting but could not attend because they only received a few days notice in the mail.

EPA RESPONSE: EPA mailed a fact sheet to the community and placed a public notice announcing the public meeting in the Virginian-Pilot & Ledger-Star on June 9, 1995. EPA is available to schedule a teleconference or availability session with any community members who could not attend the meeting. In the future, EPA will attempt to provide the community with earlier notice of Site meetings and activities.

A community member asked if Site contamination impacting Paradise Creek will be addressed.

EPA RESPONSE: This ROD does not address Paradise Creek. If investigations under subsequent Operable Units for the Site determine that the Creek is contaminated by Site-related contamination, appropriate cleanup actions would be documented in a subsequent ROD.

A resident asked if EPA could place a copy of the Administrative Record in the Cradock Library.

EPA RESPONSE: EPA has been told there is not adequate space at the Cradock Library for the Administrative Record. However, EPA will attempt to have either a hard copy or a microfilm version placed there as soon as possible.

A community member asked if Alternative 7 in the Proposed Plan would be constructed on-site.

EPA RESPONSE: Alternative 7, which involves excavation and engineered land treatment of soils, would be conducted on-site. Excavated soils will be placed in treatment plots at the Site and tilled to promote biological degradation of the contaminants. Nutrient will be added as appropriate to enhance the biological process.

20. A community member asked if EPA knew the volume of DNAPLs present beneath the surface of the Site.

EPA RESPONSE: Areas have been identified where DNAPLs are known or suspected to exist. This information is sufficient to identify the need for action to remove DNAPL contamination, however, an accurate estimate of the total volume could not be made.

21. A community member asked if EPA is going to monitor the effectiveness of the clean-up actions.

EPA RESPONSE: EPA will oversee implementation of the cleanup actions required in this ROD. In addition, EPA will continue to oversee investigation activities for subsequent operable units at the Site. After actual cleanup begins, a formal review of the Site is required by law in five years to ensure that the cleanup remains protective of human health and the environment.

22. A community member asked if creosote was still used in industry today.

EPA RESPONSE: Creosote is still used in industry today. When stored, handled, and disposed of properly, creosote can be put to beneficial use. Health and environmental hazards arise when creosote is used, stored, or disposed of improperly.

23. A community member asked if EPA will inform the community of the results of the treatability studies prior to beginning actual clean-up work.

EPA RESPONSE: EPA plans to issue fact sheets during the design of the cleanup remedy to update the community on the progress of treatability studies and other work. In addition, EPA plans to hold another public meeting prior to beginning the actual cleanup action at the Site.

24. A resident asked if Atlantic Wood has future industrial plans for this Site once it is cleaned up.

EPA RESPONSE: Currently, the Site is used for storage and shipping purposes. Atlantic Wood has not identified any future plans for the Site to EPA following its cleanup. Note, however, that this ROD requires that the Site title be modified to show restrictions to prevent: 1) residential development; 2) agricultural development, and 3) the use of ground water for domestic or drinking purposes.

25. A community member asked if there have been studies, other than plant and animal studies, on the contaminants at this Site.

EPA RESPONSE: Table 2-11 (Slope Factors and Reference Doses) in this ROD indicates the nature of the evidence that EPA has relied upon in evaluating the health hazards associated with chemicals found at the Site. The column labeled "Class" refers to this evidence and is explained in the notes at the end of the table.

26. A community member asked what creo-penta was and where the wood that is on-site is coming from.

EPA RESPONSE: Creo-penta is a mixture of creosote and pentachlorophenol, the two elements commonly used during wood treating operations at the Site. The wood that is currently stored on-site is being treated and shipped from another facility. No active wood treatment is occurring at the Site at this time.

II. WRITTEN COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

Comments from Atlantic Wood Industries, Inc.

1. The company states that U.S. EPA's primary stated objective to "eliminate the potential for human or ecological exposure to soils or sediments that contain contaminants" (emphasis added) is inconsistent with CERCLA and the NCP. Rather, the objective should be to reduce the potential for adverse human or ecological exposures to the constituents of interest at the Site, as "adverse" is defined by the NCP.

EPA RESPON8E: The NCP at §300.430(a) states "The purpose of the remedy selection process is to implement remedies that eliminate, reduce, or control risks to human health and the environment." This ROD is consistent with that requirement.

2. The company contends that the RI/FS soil data for the Site more closely reflects a lognormal distribution than a normal distribution, prior to and after remediation. The company believes that a geometric mean is the statistic that best describes this distribution and that EPA should concur with what is statistically appropriate and sound scientific practice.

EPA RESPONSE: EPA agrees that the distribution of data prior to remediation most often tends to be lognormal and that the appropriate statistic to measure the central tendency of a lognormal data set is the geometric mean. Following remediation, however, the objective of sampling is not simply to determine the

central tendency of the data set. Rather, the objective is also to ensure that contamination "hot spots," which could pose an unacceptable risk to human health and the environment, do not exist. By using a geometric mean to evaluate the success of the cleanup, areas with contaminant concentrations several orders of magnitude above the cleanup level could remain. The use of the arithmetic mean, on the other hand, avoids this problem and ensures that the cleanup is truly protective.

EPA expresses cleanup levels in terms of average concentrations, as provided in "Methods for Evaluating the Attainment of Cleanup Standards" (EPA 230/02-89-042) and other similar statistical guidance documents. The average concentration in post-remedial samples must be less than or equal to these goals for the cleanup to be judged acceptable.

For physiological and biochemical reasons, EPA's model of toxic effects (including cancer) requires that exposures and risk be based on arithmetic rather than geometric means ("Risk Assessment Guidance for Superfund", IA, EPA/540/1-89/002). For this reason, EPA also sets cleanup levels based on arithmetic rather than geometric means. For data that are lognormally distributed, special methods are used to calculate the unbiased arithmetic mean.

It would be possible to convert the arithmetic mean cleanup levels to equivalent geometric means. However, these geometric means would be substantially lower (and would describe exactly the same set of post-remedial conditions). Furthermore, in order to calculate residual risk the geometric means would have to be converted back to arithmetic means, a pointless and unnecessary exercise.

3. The company contends that the cleanup levels in Table 2-15 of this ROD are not appropriate for use as goals for the biological treatment itself since achievement of the cleanup levels will be determined as the statistical average concentration throughout the remediated area.

EPA RESPONSE: In general, two basic approaches can be used to determine if required cleanup levels are achieved for treated soils (or sediments) at a site. In the first method, statistically representative sampling of the site soils is conducted prior to excavation to determine the areas where the cleanup levels are exceeded. These soils are excavated and treated. As the soils exit the treatment unit, samples are collected and analyzed to determine if the cleanup levels have been achieved. If the cleanup levels have been achieved, the treated soils are backfilled and no further sampling is required. Otherwise, the soil is returned to the treatment unit for further treatment and the process is repeated. This is a conservative approach that generally guarantees that cleanup levels have been achieved. This method may, however, result in more soil being treated than needed to achieve the required cleanup level.

The second method relies on statistical calculations based on the initial distribution of contaminants to project interim concentrations that can be used as a basis for identifying what soils need to be excavated and what treatment must be achieved in order to attain the cleanup levels. With this approach, the cleanup levels do not need to be used to determine which soils should be excavated or to determine when treatment is completed and backfilling can occur. However, statistically representative sampling will be needed in remediated areas after backfilling to determine if the cleanup levels have been achieved. This method may reduce the amount of soil that is treated, but the risk that some areas may have to be excavated and treated again is greater.

The company's comment reflects a desire to use the second approach. EPA agrees that this approach can be used, however, the company would be responsible for establishing the excavation and treatment levels at its own risk. EPA's main interest under the second approach would be in evaluating the sampling plan used and analytical results generated following backfilling to ensure that the cleanup levels have been achieved.

4. The company states that the exposure model used in the Ecological Risk Assessment prepared for the Site does not

consider the home range of a species and, therefore, results in an overestimation of the low dose exposures. The company further contends that the exposure model incorrectly assumes that the plants and animals consumed by ecological receptors (e.g., other animals and birds) will bioaccumulate contaminants to levels equal to those found in the contaminated soil and sediment.

EPA RESPONSE: The purpose of the Ecological Risk Assessment was to conduct a screening of ecological risk to determine if further consideration is warranted. Conservative assumptions are used so that if a decision is made based upon the screening that no further consideration is needed, EPA can be confident that this determination is appropriate. EPA agrees that if a site-specific quantitative ecological risk assessment were to be conducted for the Site, factors such as home range and bioconcentration factors should be considered in the exposure mode.

The company contends that any contribution from the Site to the Elizabeth River is the result of historical discharges and/or infiltration and not from stormwater run-off. The company contends that outfall grab samples and bioassays conducted since 1985 confirm that the Site has not significantly impacted aquatic life.

EPA RESPONSE: While the outfall samplingdata summarized by the company may show compliance with the State discharge permit requirements, this data does not confirm the company's statement that stormwater run-off from the Site is not contributing contamination to the Elizabeth River. In all instances where the PCP data reported was above the analytical detection level (24 of 42 samples), all the concentrations exceeded either the acute or marine chronic water quality standard for PCP. In the remaining instances, the analytical detection limit exceeds the chronic water quality standard (and the acute in five samples) so the data is inconclusive.

The discharge limit in the permit allows for a dilution factor of 50 to be applied to the outfall data to estimate the river concentration. By using this dilution factor, the resulting river PCP concentrations do not exceed the acute water quality standard and only exceed the chronic standard in one sample from 1986. In addition, the bioassay results have shown instances were the Site run-off has been toxic.

The outfall data and the associated water quality standards do not apply to sediments and do not characterize the mass of existing contamination within the sediments. Therefore, the outfall data does not address risk from exposure to these contaminated sediments. Site outfall data show that PCP was still entering the river (1993 levels at 370 and 330 :g/L) two years after treatment with PCP ceased at the Site. With PCP's affinity for soil (log K. of 5.86), PCP would be expected to concentrate in sediment and not remain in the water. Sediment data presented in the Ecological Risk Assessment show a gradient of decreasing levels of PCP with increasing distance from the Site.

A much more detailed study would be required to determine if the concentrations of contaminants leaving the Site through stormwater run-off or other means are significantly impacting aquatic life in the Elizabeth River.

6. The company contends that EPA's PCP soil cleanup level of 3 mg/kg is more stringent than levels established in many states (eight state cleanup levels were cited) and other EPA Records of Decision (two were cited).

EPA RESPONSE: The Commonwealth of Virginia has not established soil cleanup levels and the soil cleanup levels established by other states do not apply to this Site. Even if these state cleanup levels were considered relevant, they would not have direct application to the Site. The PCP cleanup level for the Site is based not only on potential risk from direct exposure to soil, but is also based on the potential risk from exposure to sediments since Site soil can erode and migrate to nearby drainageways and the river. Because aquatic organisms are more sensitive to PCP in sediment than terrestrial organisms may be to PCP in

soil, the soil cleanup level was biased low in order to protect the aquatic organisms as well.

The determination of cleanup levels at Superfund sites is highly dependant on site-specific factors. Therefore, the cleanup levels derived for one site cannot be applied to another.

7. The company contends that EPA's concern about potential flooding of the Site fails to take into account the hydrology of the Elizabeth River and the fact that past floods have not been erosional-type floods.

EPA RESPONSE: Site-specific studies to indicate whether erosion occurs during heavy precipitation or during flood events have not been conducted. However, drainageways on the Site, the inlet to the river, and the river in the vicinity of the Site all have elevated levels of Site-related contaminants. While this contamination could have resulted solely from surface and ground water migration, transport of soil with surface water run-off almost always occurs to some extent.

8. The company contends that EPA did not consider the use of engineering controls that could be used to mitigate the potential for adverse erosional activities at the Site.

EPA RESPONSE: Engineering controls can be used to reduce the transport of soil through erosion; however, as with any engineering control, these measures would have to be properly designed and constructed, and permanently maintained to eliminate this transport pathway. EPA did not increase the PCP cleanup level and allow the use of engineering controls to prevent the transport of soil because the long-term effectiveness and permanence of the remedy would be difficult to achieve under these circumstances.

9. The company contends that recent plant studies indicate that uptake of PCP is not significant, PCP accumulated in plants in readily metabolized, and bioaccumulation in animal eating plants is minimal. Therefore, the company does not believe that biomonitoring of the Site is necessary.

EPA RESPONSE: PCP readily breaks down in the environment by chemical, microbial, and photochemical processes. PCP is most toxic, yet rapidly metabolized, in aquatic environments at elevated temperatures and reduced pH. A review of the related literature, however, indicates that although bioaccumulation may not be significant (it does bioconcentrate, depending upon pH), PeP at low level exposure is still toxic to plants, and causes uncoupling oxidative phosphorylation in mitochondria1. Studies indicate that root growth in terrestrial plants is adversely affected at 0.3 mg/kg PCP. PCP applied at the rate of 1.0 g/m^2 to beech forest soils reduced populations of soil organisms, and at a rate of 5.0 g/m^2, PCP reduced most of the soil microflora and invertebrates. Little data is available on the toxic effects of PCP on terrestrial wildlife. However, PCP has been shown to cause adverse sublethal effects in birds fed dietary levels as low as one mg/kg.

The related Canadian study[2] indicates that lettuce (Lactuca sativa) seed germination and root elongation tests were used to assess the toxicity of PCP in soils. Seed germination tests measure toxicity associated with soils directly, while root elongation tests evaluate the indirect effects of water soluble constituents that may be present in Site samples. The no observable effects concentration for seedling emergence in Lactuca sativa was calculated as 7 mg/kg dry soil, and the mean no observable effects concentration for root elongation was calculated as 0.25 mg/kg dry soil.

The remedy selected in this ROD requires that Site soils be remediated to achieve the cleanup level of 3 mg/kg for PCP. However, other data, such as the apparent effects threshold3 concentration of 0.4 mg/kg suggest that the 3 mg/kg cleanup level may not be conservative enough. Absent a site-specific quantitative risk assessment to clearly define the most appropriate ecological cleanup level, chemical and biological monitoring of sediments shall be conducted at the Site if post-remedial soil concentrations of PCP are greater than 0.4 mg/kg. 10. The company recommends that EPA use 25 mg/kg as the cleanup level as recommended by the recent comprehensive Canadian study[2] because of the industrial nature of the Site.

1 Eisler, R. 1989 Pentachlorophenol Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review. U.S. Fish and Wildlife Service Biological Report 10. 72 pp.

2 National Contaminated Site Remediation Program. Draft Report, September 1994. Canadian Soil Quality Criteria for Contaminated Sites. Ecological and Human Health Effects: Pentachlorophenol.

3 Preliminary Literature Review of the Aquatic Transport, Fate, and Effects of Creosote; and Recommendations for Chemical and Biological Studies. Tech Memo 88-4. Seattle, Washington: National Oceanic and Atmospheric Administration

EPA RESPONSE: The Canadian Soil Quality Criteria document referenced in the comment supports a soil cleanup concentration of 25 mg/kg at industrial/commercial sites where a ground water check is not necessary (i.e., where ground water is not used as a drinking source or if ground water will not discharge to surface water). Contaminated ground water at the Site discharges to the Elizabeth River and contaminated soils are a likely source of contamination to the aquifer. According to the soil quality document, a soil clean-up concentration of 1.4 mg/kg is recommended for the protection of drinking water and 0.12 mg/kg is recommended for the protection of aquatic life. The threshold effects concentrations for soils in agricultural, or residential/parkland uses (calculated to be protective of ecological resources) is 3 mg/kg.

11. The company contends that EPA should eliminate the requirement for backfilling of treated material and allow a decision on management of the treated soil to be made during the remedial design based upon the treatability study results.

EPA RESPONSE: The purpose of the treatability study to be conducted during the remedial design is to establish whether engineered land treatment can be used to effectively achieve the cleanup levels established for the Site in Table 2-15 of this ROD. If successful implementation of this technology cannot be demonstrated, low temperature thermal desorption will be used to treat appropriate Site soils and sediments. If engineered land treatment can be successfully implemented at the Site, backfilling provides the most cost-effective disposal option for treated soils. The possibility exists that the treatability study results for engineered land treatment may be positive, but for some reason, the full-scale implementation may fail to produce appropriate results for a particular treatment plot. Under these circumstances, EPA will need to review the specific facts available at that time and make a determination as to the appropriate action.

12. The company contends that the Corrective Action Management Unit (CAMU) regulations in 40 C.F.R. § 264.552 are ARARs for the Site and, therefore, excavation, staging, treatment, containment, and/or disposal of soils can occur at the Site without triggering current or future RCRA Land Disposal Restrictions.

EPA RESPONSE: Excavation, staging, treatment, and disposal of soils at the Site, as required in the selected remedy, will not trigger RCRA Land Disposal Restrictions. Therefore, the CAMU Rule does not need to be considered.

Although the use of a CAMU as an ARAR may relieve a site from meeting specific federal LDR requirements and/or needing a RCRA permit, the CAMU does not relieve a site from providing many other protective measures. The preamble of the CAMU Rule (58 FR 8659) states, "EPA does not intend for this rule to replace existing state and federal requirements, guidelines, and standards that define the necessary level of protectiveness for remedies and the factors to be considered in selecting site-specific remedies."

AWI has stated that placing remediation wastes into or within a CAMU does not constitute land disposal. This is only correct in that the LDRs do not apply. The CAMU rule revised the LDR Land Disposal definition at 40 CFR § 268.2 to state "except in a corrective action management unit". The CAMU rule did not change the base RCRA definition of "Disposal" at 40 CFR 260.10. It should be clear from the CAMU regulations at 40 CFR § 264.552 that include ground water monitoring, closure and potential post-closure requirements, that using a CAMU does not avoid the need for protective measures. Also as is stated in the regulation at 40 CFR § 264.552 (h), "The designation of a CAMU does not change EPA's existing authority to address clean-up levels, media-specific points of compliance to be applied to remediation at a facility or other remedy selection decisions", which clearly indicates that a CAMU designation does not relieve the facility/site from these site-specific decisions.

Even if a CAMU is designated as an ARAR for remediation actions at the Site, such designation may not substantially change the remediation design requirements or clean-up levels. The designation of a CAMU may also require long term environmental controls at the Site that may not be needed if a CAMU designation is not applied.

13. The company contends that the RCRA minimum technical

requirements for waste piles and surface impoundments should not apply to staging and treating soils at the Site. The company further contends that even if these requirements did apply, the RCRA Corrective Action Management Unit concept and/or the Temporary Unit concept should be used to waive these requirements.

EPA RESPONSE: As identified in this ROD, EPA had determined that the RCRA regulations for waste piles (40 C.F.R. Part 264, Subpart L) are ARARs for soil staged in waste piles at the Site; and RCRA regulations for containers (40 C.F.R. Part 264, Subpart I) are ARARs for soil staged in containers. EPA does not consider RCRA regulations for surface impoundments to be ARARs for the land treatment process. EPA believes the waste pile and container regulations are appropriate for the cleanup activities to be performed at the Site and does not consider it appropriate to attempt to waive these requirements by applying the CAMU Rule.

14. The company contends that the remedial alternatives development, screening, and detailed analysis performed in the Feasibility Study for the Site did not assume that RCRA Land Disposal Restrictions or RCRA Minimum Technical Requirements would apply. Therefore, the company believes that if these requirements do apply, the basis for making a remedy selection will be flawed.

EPA RESPONSE: Treatment standards for RCRA listed wastes F032 and F034 have not been established under the RCRA Land Disposal Restrictions. Therefore, the application of Land Disposal Restrictions to the alternatives evaluated in the Feasibility Study would not have changed the analysis. As for the RCRA Minimum Technical Requirements, consideration of the specific RCRA requirements for waste piles, containers, and land treatment do not alter the discussion and analysis provided in the Feasibility Study needed to make a remedy selection.

15. The company contends that several non-treatment alternatives were either screened out or not rated as highly as treatment alternatives because of CERCLA's statutory preference for treatment. The company further contends that, in light of the general movement away from the preference for treatment, EPA should reconsider the use of the surface capping and on-site landfill alternatives for all Site soils and sediments.

EPA RESPONSE: EPA believes that an appropriate range of treatment and non-treatment alternatives were evaluated in the Feasibility Study and the Proposed Remedial Action Plan. EPA, in fact, selected non-treatment alternatives for two of the remedial response units being addressed under this ROD. The reasons for not selecting a non-treatment remedy for the RRU1 and RRU2 soils is based on the limitations of the Site itself and cost-effectiveness, not simply a preference for treatment. Even without a statutory preference for treatment, the remedy selected in this ROD would likely have been the same due to cost effectiveness. Estimates in the FS Report provided that the costs to excavate and on-site landfill ($3.928M RRU1) were higher than the costs to excavate, land treat, and backfill ($3.839M RRU1).

16. The company does not believe that EPA should select a contingency alternative for use if the primary alternative fails. Specifically, the company contends that low temperature thermal desorption is not well-demonstrated for use with coal tar creosote and pentachlorophenol constituents or with fine-grained soils such as those at the Site. The company believes that a focused Feasibility Study should be required in the event that the treatability studies for engineered land treatment fail.

EPA RESPONSE: The Feasibility Study Report provided an evaluation of the all alternatives that could potentially remediate Site soil and sediment. The report contained sufficient information on the contingency alternative, low temperature thermal desorption (LTTD), for EPA to determine that this technology would be an appropriate alternative should engineered land treatment fail to perform adequately. LTTD has been proposed for use at several other Region III wood-treating sites including Saunders Supply, Rentokil, and Southern Maryland Wood. Successful LTTD treatability studies have already been performed at Saunders and Rentokil.

EPA has used a contingency alternative for several reasons. EPA hopes to promote the use of innovative technologies, such as engineered land treatment, which appears to be the most appropriate remedy. If the provision for a contingency was eliminated, LTTD would be the selected remedy--not engineered land treatment. LTTD is considered to be a more reliable technology than engineered land treatment; however, LTTD is not as cost effective. Also, selecting a contingent alternative now has the effect of reducing the amount time needed before actual cleanup work can begin.

17. The company contends that neither CERCLA nor the NCP requires that existing, usable structures be demolished in order to access soils beneath the structures. The company recommends that structures which have an intended future use be allowed to remain and that decisions regarding the need for potential demolition activities should be finalized during the Remedial Design process.

EPA RESPONSE: The company has not provided EPA with its specific plans for buildings and tanks at the Site. The process area buildings and tanks have been idle since 1992. Substantial soil contamination may be present beneath some of the process buildings and tanks. Unless a compelling reason is provided by the company, EPA recommends that above ground structures at the Site be removed to the greatest extent possible to facilitate soil remediation. EPA willmake a final decision regarding the demolition activities during the remedial design process.

18. The company recommends that EPA clarify that excavation activities will not extend below the water table.

EPA RESPONSE: This ROD specifies that the vertical limit of excavation is the water table and, to the extent practicable, that excavation should occur when the water table is at the seasonally low elevation. EPA recommends, however, that if significant pockets of contaminated soils are encountered below the water table during excavation, and if field conditions permit, excavation of these materials should be performed to lower the burden of residual contamination to ground water.

19. The company questioned the purpose of inclusion of technical details in the Proposed Plan. The company recommends that this ROD not include technical details regarding the remedial action and that these details be developed during the Remedial Design process for the Site.

EPA RESPONSE: The specific performance standards for the selected remedy are listed in Part II, Section X of this ROD. These standards provide the requirements that must be met in implementing the remedy, but do not include the design details for implementation. EPA agrees that the detailed standards and specifications for implementing the remedy are best determined during the remedial design process. Details found in the other portions of this ROD are provided for estimating or evaluative purposes.

20. The company has requested that all of the documents, including correspondence, draft reports, and status reports, that were exchanged between the company and EPA be incorporated into the Administrative Record for the Site because they are important to the selection of the appropriate remedy, cleanup goals, and statistical methods for the Site.

EPA RESPONSE: Appendix A provides the current index to the Administrative Record. The documents in the Administrative Record are those upon which EPA has relied in making the remedy selection decision documented in this ROD. To the extent appropriate, the requested documents have been added to the Administrative Record.

COMMENTS FROM THE US DEPARTMENT OF THE NAVY ON THE FEASIBILITY STUDY (FS) REPORT.

21. The Navy questioned whether there was, in general, detection of either copper napthenate or zinc napthenate in any media analyzed.

EPA RESPONSE: The AWI Remedial Investigation (RI) Report, March 1992, provides concentrations of zinc and copper for Site soil, sediment, and ground water. Concentrations of specific compounds for these metals

do not appear to be included. Note also that AWI maintains that copper napthenate and zinc napthenate were not used at the Portsmouth facility.

22. The Navy questions where CCA-treated wood at the Site came from, where it was stored and for how long, how soon after it was treated elsewhere did it arrive at the Site, and what type of protection from the elements did it receive.

EPA RESPONSE: According to AWI, CCA-treated wood came from several off-site facilities beginning in 1970. The wood was shipped by rail or truck to the AWI Portsmouth Site. Wood that was shipped by rail would have at least 10-days of drying/standing time before storage at the Site. Wood shipped by truck would have had at least several days of drying/standing time before storage at the Site. CCA-treated wood was stored in the western section of the Site. The RI/FS reports provide additional information regarding the storage areas used for treated wood.

23. The Navy questioned whether the process water managed prior to the early 1970s was conveyed via copper and/or galvanized piping.

EPA RESPONSE: According to AWI, copper piping was not used for process water. Steel piping was mainly used in addition to a small amount of galvanized piping.

24. The Navy contends there is not evidence to support EPA's statement that inorganic concentrations in the Waste Lime Area may be related to the acetylene sludge generated by the Navy. The Navy further questions how this "contamination" could have migrated upgradient, let alone to the Wood Storage Area. The Navy contends that the locations of the highest detections of arsenic, copper and zinc in the Acetylene Sludge Area (495 mg/kg, 9780 mg/kg and 20,400 mg/kg respectively) do not correspond to suspected lime (acetylene production byproduct) discharge locations. The Navy indicates that aerial photographs from 1949, 1958, 1964, and 1972 suggest the discharge point may have been several hundred feet east.

EPA RESPONSE: The Remedial Investigation Report provides data on the concentrations of contaminants in Site soils. Statistically on a Site wide basis, the highest surface soil concentrations of metals, specifically zinc and copper, occur in the area designated in the EPA Proposed Remedial Action Plan (June 1995) as the Waste Lime Area (Area 9) of the AWI Site. Concentrations of zinc in this area range from 87 to 20,400 mg/kg. Concentrations of copper in this area range from 78 to 9,780 mg/kg. South of this area, and on the south side of the fence which divides the AWI property from the Norfolk Naval Shipyard's annex, is the Navy's Site 9 (Waste Lime Pit). Comparing these AWI Site concentrations with data provided in the Final Remedial Investigation/Risk Assessment/Feasibility Study (RI/RA/FS) Report, Norfolk Naval Shipyard, March 1995. for the Navy's Site 9, reveals a correlation of elevated metals among the properties that when combined with historical information suggests that the Navy may have caused contamination on the AWI property.

The Navy's RI/RA/FS Report lists concentrations of metals in Site 9. Concentrations of zinc in Site 9 range from 3,770 to 28,500 mg/kg. Concentrations of copper in Site 9 range from 931 to 6,470 mg/kg. These levels correspond with levels found at the AWI Site. The Navy RI/RA/FS Report states that "ballast stones, silty sand, Black Beauty (trade name for abrasive blasting material used at NNSY), and other mixed debris were used to construct the berm". This berm surrounds the Navy's waste lime pit at Site 9. Section 4.5 of the AWI RI Report states that zinc was present in a sample from the acetylene waste sludge, sand blasting grit, and in the red ballast stones collected on AWI property.

A letter dated July 23, 1951, from C. H. Slingluff, Vice-President for Atlantic Creosoting Company, Inc., to Commander Van Liew, Public Works Officer for the Norfolk Naval Shipyard (NNSY) stated that for several years NNSY discharged acetylene waste into the creek that separated the AWI Site from NNSY and requested that NNSY review and correct the problem. A reply letter from Commander Van Liew, dated August 16, 1951, stated NNSY was "considering several proposals for a more adequate disposal of sludge from the Acetylene Plantm. This correspondence confirms past NNSY disposal practices and the possibility that contamination of AWI's property may have been in part caused by NNSY. Also, aerial photographs from 1944,

1949, and 1952 analyzed by the EPA's Environmental Monitoring Systems Laboratory, suggest that a light-toned material appears to radiate from a possible pipeline that may be associated with the Navy's acetylene production. This material eventually accumulated within the inlet.

EPA recognizes that it was not unusual in the past for an industrial facility such as NNSY to combine sludge, blasting grit, and other waste materials. If the blasting grit was of the spent varioty, which is likely, it would not be unusual for that grit to contain inorganic contaminants from the paint or metal blasting operations. This could partly explain the source for elevated metals on both sides of the fence. The preceding information coupled with AWI's assertions that it has never used zinc, copper, or arsenic in its operations provided the justification that EPA needed to consider the Navy as a potentially responsible party.

Regarding contaminant migration issues, EPA has not made any determinations with respect to off-site contributions of contamination existing in the AWI Site Wood Storage Area located on the western portion of the Site. However, EPA has contemplated that localized migration of contaminants in the AWI Site Waste Lime Area could have occurred even if it appears to currently be upgradient. As operations at both the AWI Site and NNSY date at least back to the early part of this century, and due to much of the impacted area being fill, it is possible that contaminants could have been inadvertently spread to currently upgradient areas.

25. The Navy questioned what the ecological cleanup levels for the Site were and from where they were derived.

EPA RESPONSE: The ecological cleanup levels for the Site are:

Ecological Cleanup Levels (ppm); AW1 Site

	BaPEq	total PAH	PCP	arsenic	copper	zinc	dioxin/ furans
Soil	n/a	100	3.0	150	3.0	410	0.001
Sediment	n/a	25	0.4	85	390	270	0.001

The Site is mostly located on the floodplain of the Elizabeth River in the ecologically sensitive Chesapeake Bay Drainage area. Because of the potential for Site soils to erode and migrate into drainageways and the river, EPA factored in potential risks associated with sediment for the purposes of determining ecological risk and cleanup levels.

The cleanup levels listed above were developed during the RI/FS for the Site. These levels generally originate from effect range-median (ER-M) values provided by Long and Morgan (1990) as referenced in the Ecoloaical Risk Assessment for Atlantic Wood Industries. APril 1992. which is a report prepared by NOAA providing a qualitative risk assessment for the Site. During the RI/FS, these values were adjusted to accommodate site-specific characteristics.

26. The Navy questioned how alternatives could be considered to eliminate exposure to soil in the Feasibility Study when inorganic compounds are naturally occurring and will be present in background concentrations.

EPA RESPONSE: The zero value applied to "an alternative that would eliminate exposure to soil" as stated in the FS Report did not mean that a concentration of "0" would be achieved. These alternatives with the zero value would involve capping or replacement of contaminated soils with clean soil--not treated soils, as would be the case with bioremediation and backfill. Application of a zero value would therefore be appropriate.

The background values from literature of metals were considered during the RI/FS. Table 4-2 of the RI Report provides the related ranges of concentrations. As the background values are generally below the cleanup levels selected for the Site, they are not considered to be a factor.

27. The Navy questioned on what data the copper and zinc geometric mean concentrations presented in the Feasibility Study were based and how they were derived.

EPA RESPONSE: The tables in Section 4 of the RI Report provide the basis for the concentrations. This

information was derived from sampling and analysis conducted at the Site.

28. The Navy stated that the assumption in the Feasibility Study that soils in the Waste Lime Area cannot be treated biologically eliminates other feasible options, as may be learned during the remedial design. The Navy further states that only the sludge itself, due to its high pH, may not be easily bioremediated. The Navy contends that the inclusion of the contaminated media (soil) originating from AWI with that which has been alleged to have originated from the Norfolk Naval Shipyard may prohibit or preclude EPA from taking the most appropriate remedial action for the soil.

EPA RESPONSE: Based on the available RI/FS information, biologically treatment does not appear to be a feasible alternative for the Waste Lime Area. However, if new information becomes available to indicate that treatment of these soils is possible, EPA would be willing to consider this information.

29. The Navy question why cleanup levels presented in the Feasibility Study for the Acetylene Sludge Area do not correlate with the Remedial Action objectives presented in Table 2-6 of the Feasibility Study.

EPA RESPONSE: A discrepancy does exist between the two tables. Table 2-5 provides cleanup levels that were derived on the basis of protectiveness of human health. Table 2-6 provides objectives that were intended to consider protectiveness to human health as well as the environment; however, the objectives are not totally consistent. In any event, the cleanup levels provided in this ROD will govern during the remedial design and action.

30. The Navy contends that EPA eliminated a numher of alternatives in the Feasibility Study due to cost (4A, B, and C; 5A, B and C, 6 and 7) and/or lack of vendor interest (5A, B and C) when they may, in fact be feasible if combined with other RRUs. The Navy further contends that the Feasibility Study does not take into consideration consolidation and/or treatment of like wastes to realize any economy or efficiency.

EPA RESPONSE: Similarities between the various response units was considered during the development of the Feasibility Study and during the evaluations conducted by EPA for the purposes of proposing and selecting remedies. For example, this ROD provides for land treatment for both Remedial Response Units 1 and 2. EPA does recognize that further consolidations could have been presented in the Feasibility Study. EPA determined, however, that sufficient information was contained in the Feasibility Study for EPA, in consultation with the Virginia Department of Environmental Quality, to make remedial decisions.

31. The Navy questioned whether EPA has been able to demonstrate if there has been or is likely to be migration of constituents from the soil to the groundwater.

EPA RESPONSE: A Multimed model was performed in an effort to derive soil concentrations that would be protective of ground water. Based on this model, there appears to be a potential for migration of constituents to ground water at the Site. For example, Table 7-1 of the Final Report Interim Soil Cleanup Goals, AWI, March 1992, which is the report providing the Multimed model results, provides arsenic concentrations for soils ranging from 0.181 to 6.24 mg/kg which would be protective of ground water and the Elizabeth River. These concentrations are generally more conservative than the levels existing at the Site.

Also, existing ground water data does show elevated levels of Site contaminants in various monitoring wells. Additional data may be collected during a supplementary investigation planned for the Site.

32. The Navy noted that Fig. 2-6 of the Feasibility Study indicates only two soil sample locations with arsenic detection. The Navy questioned if this was because these were the only two analyzed for inorganic compounds. If so, the Navy questioned if this is a sufficient number to assert

the "maximum concentration of 93 mg/Kg" is valid for the entire area.

EPA RESPONSE: Only two locations were sampled in the Waste Lime Area for arsenic. The focus of the Remedial Investigation was not on inorganic contaminants as the facility allegedly never used inorganics in their processes. Also, it was apparent from Site investigations and plant history that the significant contamination would have been caused by creosote and pentachlorophenol operations. Absent additional data, which may become available through supplementary investigations, EPA believes that the use of data from the two sample locations is valid.

33. The Navy states that for EPA to achieve a 10-5 cumulative risk, soils in the Acetylene Sludge Area only need to be treated for PCP contamination since elimination of PCP exposure yields cleanup levels well below the EPA acceptable risk range of 10-4 to 10-6. The Navy questions why there is the need then to consider arsenic as a Potential Contaminant of Concern since it appears cleanup in this area is driven by PCP and/or cPAHs with arsenic remediation a benefit.

BPA RESPONSE: Both the arithmetic average for arsenic in this area of 155 mg/kg and its 95% Upper Confidence Limit of 376 mg/kg exceed the area cleanup level of 150 mg/kg for arsenic. Note that the governing cleanup level is derived for both human health and ecological risk. Even if remediation of arsenic was not needed for human health purposes in this area, the ecological cleanup level of 150 mg/kg does necessitate a need for arsenic remediation.

OTHER COMMENTS

34. A written comment from a citizen recommended the use of the most cost effective methods for Site cleanup. The citizen believes that the problems are overstated--as long as the contamination is not washed into streams or aquifers.

EPA RESPONSE: EPA considered cost effectiveness as one of the balancing criteria in the selection of Site remedies. Also, the selected remedies will eliminate source contamination and will thereby reduce the potential of contaminating streams and aquifers.

ATLANTIC WOOD INDUSTRIES
ADMINISTRATIVE RECORD FILE *
INDEX OF DOCUMENTS

I. SITE IDENTIFICATION

1. Report: Final Preliminary Assessment for Atlantic Wood Industries, Inc., prepared by NUS Corporation, 6/8/83. P. 100001-100027.

2. Report: Site Inspection of Atlantic Wood Industries, Inc., prepared by NUS Corporation, 3/28/86. P. 100028-100229.

* Administrative Record File available 10/22/93, updated 10/17/94, 12/06/94, 1/31/95, 2/16/95, 3/23/95, 6/9/95, 8/10/95, and / / .

II. REMEDIAL ENFORCEMENT PLANNING

1. Administrative Order by Consent, In The Matter Of: Atlantic Wood Industries, Inc. (a Georgia corporation), Portsmouth, Virginia, Respondent, U.S. EPA Docket No. III-87-24-DC, 7/23/87. P. 200001-200044.

2. First Amendment to the Administrative Order by Consent In The Matter Of: Atlantic Wood Industries, Inc., Superfund Site, Portsmouth, Virginia, Respondent, Docket No. III-87-24-DC, 8/5/94. P. 200045-200063.

3. Letter to Mr. Jeffrey A. Smigel, Atlantic Wood Industries, Inc., from Mr. Bruce P. Smith and Mr Stephen R. Wassersug, U.S. EPA, re: Notification of potentially responsible party status and scope of response activities for the site, 6/30/86. P. 200064-200068.

4. Letter to Mr. James K. Strickland, Norfolk Naval Ship Yard, from Mr. David Iacono, U.S. EPA, re: General notice of potential liability for the site, 5/18/94. P. 200069-200076.

III. REMEDIAL RESPONSE PLANNING

1. Report: Remedial Investigation/Feasibility Study Work Plan for the Atlantic Wood Industries, Inc. Site in Portsmouth, Virginia, prepared by Environmental Strategies Corporation, 3/1/88. P. 300001-300116.

2. Report: Supplemental Remedial Investigation Work Plan, Atlantic Wood Industries, Inc. Portsmouth Virginia Site, prepared by Keystone Environmental Resources, Inc., 9/91. P. 300117-300158.

3. Report: Remedial Investigation Report of Atlantic Wood Industries, Inc., Portsmouth, Virginia, Volume I, prepared by Keystone Environmental Resources, Inc., 3/92. P. 300159-300563.

4. Report: Ecological Risk Assessment for Atlantic Wood Industries, prepared by National Oceanic and Atmospheric Administration (NOAA) and E.V.S. Consultants, Inc., 4/92. P. 300564-300617.

5. Memorandum to Mr. Abraham Ferdas, U.S. EPA, from Mr. Vance A. Evans, U.S. EPA, re: Determination that a release at the site could present a threat to public health or the welfare of the environment, 9/9/93. P. 300618-300621.

6. Report: Public Health Assessment for Atlantic Wood Industries Inc., Portsmouth, Portsmouth County, Virginia, prepared by U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, 2/15/94. P. 300622-300678.

7. Memorandum to Mr. Drew Lausch, II, U.S. EPA, from Mr. Roy L. Smith, U.S. EPA, re: Certification of human health risk assessment for the site, 2/27/92. P. 300679-300679.

8. Memorandum to Mr. David Iacono, U.S. EPA, from Mr. Roy L. Smith, U.S. EPA, re: Performance of Monte Carlo analysis to determine if proposed soil clean-up levels are consistent with risk reduction goals, 1/6/95. P. 300680-300682. The analysis is attached.

9. Report: Feasibility Study Report for Atlantic Wood Industries, Inc., Portsmouth, Virginia Site, prepared by Groundwater Technology, Inc., 4/95. P. 300683-301293.

10. Letter to Mr. Jeffrey A. Smigel, Atlantic Wood Industries, Inc., from Mr. David J. Iacono, U.S. EPA, re: EPA's approval, with technical reservations, of the April 1995 Feasibility Study Report, 6/8/95. P. 301294-301300. The technical reservations of the Feasibility Study are attached.

11. Proposed Plan, Atlantic Wood Industries Inc., 6/95. P. 301301-301333.

12. Report: Remedial Investigation Report of Atlantic Wood Industries, Inc., Portsmouth, Virginia Site, Volume IT, prepared by Keystone Environmental Resources, Inc., 1/92. P. 301334-301958.

13. Report: Remedial Investigation Report of Atlantic Wood Industries, Inc., Portsmouth, Virginia Site, Volume III, prepared by Keystone Environmental Resources, Inc., 1/92. P. 301959-302563.

14. Letter to Mr. Timothy A. Longe, Virginia Department of Environmental Quality, from Mr. David Iacono, U.S. EPA, re: Request for applicable or relevant and appropriate requirements (ARARs) for the Atlantic Wood Industries, Inc. Site, 1/26/95. P. 302564-302565.

15. Letter to Mr. David Iacono, U.S. EPA, from Mr. Paul L. Spaulding, Virginia Department of Environmental Quality, re: Notification that the Virginia ARARs were previously provided to EPA in the February 1994, Feasibility Study, 3/2/95. P. 302566-302566.

16. Letter to Mr. David Iacono, U.S. EPA, from Mr. Ross F. Worsham, Atlantic Wood, Inc., re: Request for a 30-day extension of the public comment period for the Proposed Remedial Action Plan, 6/22/95. P. 302567-302567.

17. Memorandum to Mr. David Iacono, U.S. EPA, from Mr. Roy L. Smith, U.S. EPA, re: Documentation of EPA's reasoning in determining the acceptability of post-remedial human health risks, 7/26/95. P. 302568-302582.

18. Letter to Mr. Harry S. Harbold, U.S. EPA, from Mr. Robert J. Anderson, Keystone Environmental Resources, Inc., re: Response to regulatory comments on the May 2, 1990, draft Remedial Investigation Report, 6/29/90. P. The comments of the EPA, Virginia Department of Environmental Quality, and the National Oceanic and Atmospheric Administration (NOAA) are attached.

19. Letter to Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., from Mr. Drew Lausch, U.S. EPA, re: Transmittal of regulatory comments on the draft Remedial Investigation Report and disapproval of the report, 6/21/91. P. The following are attached:

    a) comments on the Remedial Investigation Report;

    b) a list of environmental areas of concern;

    c) the scope of additional remedial investigation work required at the site;

    d) a set of calculations and methodology for estimating shower air concentrations and inhalation exposures at the site.

20. Letter to Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., from Mr. Drew Lausch, U.S. EPA, re: EPA's approval of Atlantic Wood Industry, Inc.'s request for time extensions for the submittal of the revised Remedial Investigation Report and additional remedial investigation tasks, 7/23/91. P.

21. Letter to Mr. Drew Lausch, U.S. EPA, from Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., re: Notification that Atlantic Wood Industry, Inc. is ceasing operations at its Portsmouth, Virginia plant, 8/2/91. P.

22. Letter to Mr. Drew Lausch, U.S. EPA, from Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., re: Notification that Atlantic Wood Industry, Inc. agrees to perform additionaltasks related to the remedial investigation as requested by EPA, and that the tasks will be defined in an addendum to the work plan, 8/23/91. P.

23. Letter to Mr. Drew Lausch, U.S. EPA, from Ms. Diane E. McCausland, Keystone Environmental Resources, Inc., re: Transmittal of the Supplemental Remedial Investigation Work Plan, 9/20/91. P.

24. Letter to Mr. Drew Lausch, U.S. EPA, from Ms. Diane E. McCausland, Keystone Environmental Resources, Inc., re: Transmittal of the draft Interim Soil Clean Up Goals Report, 10/22/91. P.

25. Letter to Ms. Diane E. McCausland, Keystone Environmental Resources, Inc., from Mr. Drew Lausch, U.S. EPA, re: Discussion of preparation of the draft Feasibility Study Report, 11/8/91. P. A summary of the findings from a request for technical assistance support and a copy of a journal of applied technologies for remediation are attached.

Letter to Mr. Ross F. Worsham, Atlantic Wood Industry, Inc., from Mr. Drew Lausch, U.S. EPA, re: Transmittal of regulatory comments concerning the revised Remedial Investigation Report, 12/12/91. P. The comments and a table of ambient marine water quality criteria are attached.

27. Letter to Mr. Ross F. Worsham, Atlantic Wood Industry, Inc., from Mr. Drew Lausch, U.S. EPA, re: Comments concerning the Interim Clean Up Goals Report, 12/23/91. P. A list of references is attached.

28. Letter to Mr. Drew Lausch, U.S. EPA, from Ms. Diane E. McCausland, Keystone Environmental Resources, Inc., re: Transmittal of the Remedial Investigation Report and a response to specific EPA comments in a letter, dated December 16, 1991, 1/14/92. P.

29. Letter to Mr. Drew Lausch, U.S. EPA, from Ms. Diane E. McCausland, Keystone Environmental Resources, Inc., re: Transmittal of the Risk-Based Soil Clean Up Levels Study, 3/3/92. P. A title page to the report is attached.

30. Letter to Mr. Ross F. Worsham, Atlantic Wood Industry, Inc., from Mr. Drew Lausch, U.S. EPA, re: Notification that some regulatory comments concerning the second and third revisions of the Remedial Investigation Report still need to be addressed, 3/12/92. P. A summary of Keystone Environmental Resources, Inc.'s responses to regulatory comments and a list of regulatory comments that still need to be addressed are attached.

31. Letter to Mr. Ross F. Worsham, Atlantic Wood Industry, Inc., from Mr. Drew Lausch, U.S. EPA, re: Request for a revised schedule for submission of the Feasibility Study, 3/12/92. P.

32. Letter to Mr. Drew Lausch, U.S. EPA, from Ms. Diane E. McCausland, Keystone Environmental Resources, Inc., re: Transmittal of the final Interim Soil Clean Up Goals Report, 3/13/92. P. The report is attached.

33. Letter to Mr. Drew Lausch, U.S. EPA, from Ms. Diane E. McCausland, Keystone Environmental Resources, Inc., re: Transmittal of a schedule for the Feasibility Study, 3/19/92. P.

34. Letter to Mr. Drew Lausch, U.S. EPA, from Ms. Diane E. McCausland, Keystone Environmental Resources, Inc., re: Transmittal of revised pages for the Remedial Investigation Report and specific responses to EPA's additional comments, 3/23/92. P.

35. Letter to Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., from Ms. Kimberly A. Hummel, U.S. EPA, re: EPA's displeasure with the progress of the Feasibility Study and the required removal action at the site, and transmittal of a set of deadlines to complete this work, 4/5/92. P.

36. Letter to Mr. Ross F. Worsham, Atlantic Wood Industry, Inc., from Mr. Drew Lausch, U.S. EPA, re: Transmittal of the final Ecological Risk Assessment, 4/13/92. P. The title page to the report is attached.

37. Letter to Mr. Ross F. Worsham, Atlantic Wood Industry, Inc., from Mr. Drew Lausch, U.S. EPA, re: Final approval of the Remedial Investigation Report, 4/16/92. P.

38. Letter to Ms. Kimberly A. Hummel, U.S. EPA, from Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., re: Response to EPA's letter of April 5, 1992, concerning Atlantic Wood Industry, Inc.'s compliance with established time schedules, 4/16/92. P.

39. Letter to Ms. Kimberly A. Hummel, U.S. EPA, from Ms. Diane E. McCausland, Keystone Environmental Resources, Inc., re: Transmittal of an outline for the Feasibility Study, 4/29/92. P. The outline is attached.

40. Memorandum to Mr. Robert Davis, Biological Technical Assistance Group (BTAG), from Mr. Peter Knight, NOAA, re: Review and comments on the Feasibility Study, 6/23/92. P.

41. Memorandum to Mr. Robert Davis, BTAG, from Mr. Peter Knight, NOAA, re: Additional comments concerning the Feasibility Study, 7/9/92. P.

42. Letter to Ms. Kimberly Hummel, U.S. EPA, from Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., re: Transmittal of responses to regulatory comments to the Feasibility Study and a rationale for Atlantic Wood Industry, Inc.'s approach to the Feasibility Study, 11/22/93. P. The comments are attached.

43. Letter to Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., from Ms. Kimberly Hummel, U.S. EPA, re: EPA's disapproval of the Feasibility Study, 11/23/93. P. The regulatory comments on the Feasibility Study and EPA Region III's risk-based concentration table are attached.

44. Letter to Mr. David J. Iacono, U.S. EPA, from Mr. D. Randolph Grubbs, Gannett Fleming, Inc., re: Transmittal of notes summarizing a December 17, 1993, meeting with representatives of Atlantic Wood Industry, Inc., EPA, and the Virginia Department of Environmental Quality, 12/29/93. P. The notes and a list of attendees to the meeting are attached.

45. Letter to Mr. David J. Iacono, U.S. EPA, from Ms. Diane E. McCausland, Chester Environmental, re: Summary of a December 17/ 1993 meeting between the representatives of Atlantic Wood Industry, Inc., EPA, and the Virginia Department of Environmental Quality, 1/3/94. P.

46. Letter to Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., from Mr. David J. Iacono, U.S. EPA, re: Notification that EPA may impose previously stipulated penalties on Atlantic Wood Industry, Inc. for the late submission of the Feasibility Study, 1/25/94. P.

47. Letter to Mr. David J. Iacono, U.S. EPA, from Ms. Diane E. McCausland, Chester Environmental, re: Transmittal of a response to regulatory comments concerning the Feasibility Study Report, 2/16/94. P. The responses are attached.

48. Letter to Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., from Mr. David J. Iacono, U.S. EPA, re: EPA's disapproval of the revised Feasibility Study, 5/13/94. P. The regulatory comments on the Feasibility Study are attached.

49. Letter to Mr. David J. Iacono, U.S. EPA, from Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., re: Initiation of dispute resolution procedures with regard to EPA's disapproval of the Feasibility Study and a request for the extension of the period of dispute resolution, 5/24/94. P.

50. Letter to Mr. David J. Iacono, U.S. EPA, from Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., re: Transmittal of responses to regulatory comments concerning the Feasibility Study, 6/3/94. P. The responses are attached.

51. Letter to Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., from Mr. David J. Iacono, U.S. EPA, re: Notification that EPA will expand the period for the dispute resolution, 6/16/94. P.

52. Letter to Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., from Mr. David J. Iacono, U.S. EPA, re: Notification of an August 8, 1994, deadline to re-submit the Feasibility Study, conditions for the resubmission, and transmittal of the regulatory comments to Atlantic Wood Industry, Inc.'s June 3, 1994, responses, 7/8/94. P. The comments are attached.

53. Letter to Mr. David J. Iacono, U.S. EPA, from Mr. David L. King and Mr. Anthony Collins, Chester Environmental, re: Response to regulatory comments of July 8, 1994, and the rationale for Chester Environmental's disagreement with the regulatory agencies concerning ecological issues, 8/24/94. P.

54. Letter to Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., from Mr. David J. Iacono, U.S. EPA, re: Transmittal of EPA's comments concerning the Feasibility Study and notification of a March 6, 1995 deadline for submission of the revised and final Feasibility Study along with guidelines for that submittal, 2/3/95. P.

55. Letter to Mr. David J. Iacono, U.S. EPA, from Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., re: Notification that Atlantic Wood Industry, Inc. is initiating dispute resolution regarding EPA's February 3, 1995, disapproval of the Feasibility Study, 2/17/95. P.

56. Letter to Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., from Ms. Kathryn A. Hodgkiss, U.S. EPA, re: Transmittal of EPA's decision resolving ecological issues brought up in the dispute resolution process and notification that the deadline for submission of the Feasibility Study is extended to March 20, 1995, 3/3/95. P.

57. Letter to Ms. Kathryn A. Hodgkiss, U.S. EPA, from Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., re: Atlantic wood Industry, Inc.'s response to EPA's resolution of the disputed ecological issues, 3/9/95. P. A limited review of clean-up levels from the Record of Decision (ROD) database, and a report on sediment quality and the sedimentation process are attached.

58. Letter to Mr. David J. Iacono, U.S. EPA, from Mr. David L. King, Groundwater Technology, Inc., re: Transmittal of responses to EPA's February 3, 1995, comments on the Feasibility Study, 3/17/95. P. The comments are attached.

59. Letter to Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., from Ms. Kathryn A. Hodgkiss, U.S. EPA, re: Notification that EPA will extend the deadline for submission of the Feasibility Study to April 3, 1995, and EPA's rationale in developing clean-up goals, 3/29/95. P.

60. Letter to Mr. David J. Iacono, U.S. EPA, from Mr. Thomas D. Modena, Virginia Department of Environmental Quality, re: Review and comments for the Proposed Remedial Action Plan, 5/23/95. P.

61. Letter to Mr. David J. Iacono, U.S. EPA, from P. A. Rakowski, Department of the Navy, re: Transmittal of comments concerning the Proposed Remedial Action Plan, 8/4/95. P. The comments are attached.

62. Letter to Mr. David J. Iacono, U.S. EPA, from Mr. Jeffrey Smigel, Atlantic Wood Industries, Inc., re: Transmittal of Atlantic Wood Industry, Inc.'s comments concerning the Proposed Remedial Action Plan, 8/7/95. P. The comments are attached.

63. Letter to Mr. David J. Iacono, U.S. EPA, from Mr. David L. King, Groundwater Technology, Inc., re: Transmittal of Atlantic Wood Industry, Inc.'s response to EPA's technical reservation concerning the Feasibility Study, 8/7/95. P. The response is attached.

IV. REMOVAL RESPONSE PROJECTS

1. Report: Erosion and Sediment Control Plan, prepared by Chester Environmental, 9/94. P. 400001-400019.

2. Report: Health and Safety Plan, Storm Drain Sealing/Lining and Sediment Response Action, Portsmouth, Virginia, prepared by Chester Environmental, 10/94. P. 400020-400131.

3. Report: Response Action Plan, Elm Avenue Storm Drain Portsmouth, Virginia Site, prepared by Chester Environmental, 10/94. P. 400132-400168.

4. Report: Alternatives Screening Document for Sediment Response Action, Portsmouth, Virginia Site, prepared by Chester Environmental, 9/94. P. 400169-400208.

5. Letter to Mr. Jeffrey A. Smigel, Atlantic Wood Industries, from Mr. David J. Iacono, U.S. EPA, re: EPA comments on the Alternative Screening Document for Sediment Response Action and conditional acceptance of the Erosion and Sediment Control Plan, 10/27/94. P. 400209-400214. Comments of the Virginia Superfund Remedial Program on the Sediment Response Action Plan are attached.

6. Report: Sediment Response Action Plan, Portsmouth, Virginia Site, prepared by Chester Environmental, 1/95. P. 400215-400250.

7. Report: Site Activities Report/Response Action Plan for Elm Avenue Storm Drain, prepared by Groundwater Technology, Inc., 4/95. P.

V. COMMUNITY INVOLVEMENT/CONGRESSIONAL CORRESPONDENCE/IMAGERY

1. Final Community Relations Plan, Atlantic Wood Industries Site, Portsmouth, Virginia, 2/18/88. P. 500001-500026.

2. U.S. EPA Quick Reference Fact Sheet: Superfund Technical Assistance Grants, 9/93. P. 500027-500032.

3. Letter to Mr. Chuck Anderson, Chesapeake Public Library, from Ms. Lisa M. Brown, U.S. EPA, re: Information on the Technical Assistance Grants, 2/10/95. P. 500033-500033.

4. Letter to Mr. Dean Burgess, Portsmouth Municipal Library, from Ms. Lisa M. Brown, U.S. EPA, re: Information on the Technical Assistance Grants, 2/10/95. P. 500034-500034.

5. Letter to Mr. Jerry Drye, Kirn Memorial Library, from Ms. Lisa M. Brown, U.S. EPA, re: Information on the Technical Assistance Grants, 2/10/95. P. 500035-500035.

6. EPA Public Information Sheet, re: Establishment of an (800) number for information on Superfund sites, (undated). P. 500036-500036.

7. U.S. EPA Public Notice, re: The availability of the Administrative Record, The Virginian-Pilot and The Ledger Star, 2/5/95. P. 500037-500037.

8. U.S. EPA Fact Sheet, re: Removal action to begin at the site, 3/95. P. 500038-500041.

9. U.S. EPA Fact sheet, re: EPA's release of the Proposed Plan for the Atlantic Wood Industries, Inc. Site, 6/95. P. 500042-500047.

10. Transcript of public meeting, Atlantic Wood Industries, Inc. Site, 6/27/95. P. 500048-500110.

11. U.S. EPA Public Notice, re: EPA extension of the comment period for the site, The Virginian-Pilot and The Ledger Star, 7/12/95. P. 500111-500111.

APPENDIX B
GLOSSARY

Administrative Order on Consent (AOC) - A legal agreement signed by EPA and an individual, business, or other entity through which the violator agrees to pay for correction of violations, take the required corrective or cleanup actions, or refrain from an activity. It describes the actions to be taken, may be subject to a comment period, applies to civil actions, and can be enforced in court.

Administrative Record - EPA's official compilation of documents, data, reports, and other information supporting selection of a response action. The record is placed in the information repository to allow public access to the material.

Anadromous - Fish that migrate from the sea up a river to spawn.

Aquatic - Living or growing in the water.

Aquifer - An underground geologic formation, or group of formations, containing useable amounts of ground water that can supply wells and springs.

ARARS - Applicable, Relevant and Appropriate Requirements:

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

Relevant and Appropriate requirements are those same standards mentioned above that while not "applicable" at the CERCLA site, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site.

Background - The average concentration of a contaminant in the Site area either naturally occurring or from external sources unrelated from the Site.

Bioremediation, or Biological Treatment - Generally refers to the breakdown of organic compounds (contaminants) by micro-organisms.

Carcinogenic - The ability to cause cancer.

Catadromous - Fish that migrate down a river to the sea to spawn. The opposite of anadromous.

CERCLA - See SUPERFUND below.

Creosote - A dark oily liquid having a penetrating tarry odor, obtained by the distillation of wood tar and commonly used as a wood-treating preservative.

Dense Non-Aqueous Phase Liquid (DNAPLs) - Chemical compounds that are heavier than water in their pure form. DNAPL can be described as a heavy liquid that exists in certain areas below the ground at a site and can also be thought of as creosote-soaked subsoils.

Feasibility Study - See RI/FS.

Ground water - Water found beneath the earth's surface that fills pores between soil, sand, and gravel particles to the point of saturation. Groundwater often flows more slowly than surface water. When it occurs in sufficient quantity, groundwater can be used as a water supply.

Hazard Index (HI) - The HI is the measurement expressing the overall potential for non-carcinogenic effects posed by contaminants. An HI greater than 1 is characterized as presenting an unacceptable non-carcinogenic risk.

Information Repository - A location where documents and data related to the Superfund project are placed by EPA to allow access to the material by the public.

In situ Bioremediation - The process of enhancing the microbial degradation of contaminants in subsurface soil and water without excavation of the contaminated soil. Nutrients and microorganisms may be added to stimulate biodegradation.

Low Temperature Thermal Desorption (LTTD) - Contaminated soils/sediments are heated at low temperatures to volatilize water and organic contaminants. A carrier gas or vacuum system transports volatilized water and organics to a gas treatment system. The contaminants are not destroyed, rather they are physically separated from the soils and concentrated in a vapor treatment system before being disposed of.

MCL - The Maximum Contaminant Level or MCL is the maximum permissible level of a contaminant in water which is delivered to any user of a public water system.

Micrograms per liter (:g/l) - Parts per Billion. For example, 5 ppb would be 5 parts in 1 billion parts. For liquids (groundwater and surface water) ppb is based on volume. Example: 5 tablespoons of a contaminant in a billion tablespoons (3,906,250 gallons) of water.

National Oil and Hazardous Substances Pollution Contingency plan (NCP) - The federal regulation that guides determination of the sites to be corrected under the Superfund program and the program to prevent or control spills into surface waters or other portions of the environment.

National Pollutant Discharge Elimination System (NPDRS) - A provision of the Clean Water Act which prohibits discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, or (where delegated) a tribal government on an Indian reservation.

National Priorities List {NPL) - EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund. A site must be on the NPL to receive money from the Trust Fund for remedial action. The list is based primarily on the score a site receives from the Hazard Ranking System. EPA is required to update the NPL at least once a year.

Organic Compounds - Animal or plant-produced substances containing mainly carbon, hydrogen, and oxygen. PAHs, pentachlorophenol, and dioxins are all organic compounds. Some organic compounds can cause cancer.

Pentachlorophenol (PCP) - An organic compound commonly used as a wood preservative.

Polynuclear Aromatic Hydrocarbons (PAR) - A class of organic compounds originating from creosote and commonly used as a wood preservative.

ppb - Parts per billion. For example, five parts per billion is a fractional representation of five parts in one billion parts. For solids, ppb is a fraction based on weight, for example five pounds of a contaminant in a billion pounds (500,000 tons) of soil. For liquids ppb is based on volume, for example five tablespoons of a contaminant in a billion tablespoons (3,906,250 gallons) of water.

ppm - Parts per Million. One ppm is a fractional representation of one part in one million parts.

RCRA (Resource Conservation and Recovery Act) - A statute at 42 U.S.C. §§ 6901 et. seq. under which EPA regulates the management of hazardous waste.

Record of Decision (ROD) - A legal decision document that describes the remedial actions selected for a Superfund site, why certain remedial action(s) were chosen as opposed to others, how much they will cost, and how the public's comments about the Proposed Plan were incorporated into the final decisional document.

Recovery Well - A well used to extract contaminated ground water or product from an aquifer for subsequent treatment or disposal.

Remedial Investigation and Feasibility Study (RI/PS) - An in-depth study designed to gather the data necessary to determine the nature and extent of contamination at a Superfund site; establish criteria for cleaning up the site; identify preliminary alternatives for remedial actions; and support the technical and cost analyses of the alternatives. The remedial investigation is usually done with the feasibility study. Together they are usually referred to as the "RI/FS".

Risk Assessment (RA) - The qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific pollutants.

Scientific Notation - In dealing with particularly large or small numbers, scientists and engineers have developed a "short hand" means of expressing numerical values. For example: 1,000,000 can be written as 1 x 106 and 1/1,000,000 can be written as 1 x 10-6.

SUPERFUND (Comprehensive Environmental Response, Compensation. and Liability Act) - The program operated under the legislative authority of CERCLA and SARA that funds and carries out the EPA solid waste emergency and long-term removal remedial activities. These activities include establishing the National Priorities List, investigating sites for inclusion on the list, determining their priority level on the list, and conducting and/or supervising the ultimately determined cleanup and other remedial activities.

Surface Water - All water naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, estuaries, etc.) and all spring wells, or other collectors which are directly influenced by surface water.

Terrestrial - Growing or living on the ground.

APPENDIX C

CROSS REFERENCE BETWEEN PROPOSED PLAN ALTERNATIVE NUMBERS AND FEASIBILITY STUDY REPORT ALTERNATIVE NUMBERS FOR REMEDIAL RESPONSE UNITS 1 THROUGH 5

Proposed Plan Alternative Number	Feasibility Study Report Alternative Number				
	RRU 1	RRU 2	RRU 3	RRU 4	RRU 5
1: No Action	1	1	1	1	1
2: Excavation and On-Site Landfilling	11	9	n/a	n/a	n/a
3: Excavation and Off-Site Landfill	12	10	n/a	7	8
4: Soil Capping	n/a	n/a	n/a	n/a	3
5: In Situ Bioremediation	4	n/a	n/a	n/a	n/a
6: Excavation and On-Site Biological Slurry Treatment of Soil/Sediment	5A (for On-Site Landfill) 5B (for Off-Site Landfill) 5C (for Backfill)	3A (for On-Site Landfill) 3B (for Off-Site Landfill) 3C (for Backfill)	n/a	n/a	n/a
7: Excavation and Engineering Land Treatment of Soil/Sediment	7A (for On-Site Landfill) 7B (for Off-Site Landfill) 7C (for Backfill)	3A (for On-Site Landfill) 3B (for Off-Site Landfill) 3C (for Backfill)	n/a	n/a	n/a
8: Excavation and On-Site Incineration of Soil/Sediment	8A (for On-Site Landfill) 8B (for Off-Site Landfill) 8C (for Backfill)	3A (for On-Site Landfill) 3B (for Off-Site Landfill) 3C (for Backfill)	n/a	n/a	n/a
9: Excavation and On-Site Low Temperature Thermal Desorption of Soil/Sediment	9A (for On-Site Landfill) 9B (for Off-Site Landfill) 9C (for Backfill)	3A (for On-Site Landfill) 3B (for Off-Site Landfill) 3C (for Backfill)	n/a	n/a	n/a
10: Excavation and Off-Site Incineration of Soil/Sediment	10	8	n/a	n/a	n/a
11: Extracting DNAPL for Reuse	n/a	n/a	4	n/a	n/a