United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R03-93/168
June 1993
PB94-963912

EPA

Superfund Record of Decision:

Rentokil Virginia Wood Preserving, VA

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R03-93/168	2	3. Recipient's Accession No.

4. Title and Subtitle
SUPERFUND RECORD OF DECISION
Rentokil Virginia Wood Preserving Division, VA
First Remedial Action - Final

5. Report Date 06/22/93

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

10. Project Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

13. Type of Report & Period Covered
800/800

14.

15. Supplementary Notes
PB94-963912

16. Abstract (Limit: 200 words)

The Rentokil Virginia Wood Preserving Division site is a former wood treating facility located in Henrico County, Virginia. Land use in the area is mixed light industrial, commercial, and low density residential. In addition, site features include woodlands, wetland areas, a floodplain, Talley's Pond, and an unnamed tributary referred to as North Run Creek. Residents living just north of the site use the municipal water supply system to obtain their drinking water. From 1957 to 1990, onsite wood treatment operations used products such as PCP, fuel oil, chromium zinc arsenate, copper chromated arsenate (CCA), fire retardant, creosote, and xylenes. Wastes from the early wood treatment operations reportedly were discharged to the blowdown sump, which is an open earthen pit used for the discharge of waste processing fluids, located to the north of the treatment cylinders. In 1963, the State required that the pit be cleared, cleaned, and replaced with the concrete holding pond due to fish kills in Talley's Pond. In 1976 or 1977, approximately 1,100 to 1,400 pounds of CCA, that was allowed to precipitate in a process tank before it was rendered unusable, was disposed of in a pit located along the north fence line of the site. When soil was excavated during the removal of one of three production wells, a black substance, assumed to be creosote,

(See Attached Page)

17. Document Analysis a. Descriptors
Record of Decision - Rentokil Virginia Wood Preserving Division, VA
First Remedial Action - Final
Contaminated Media: soil, sediment, debris, sludge, gw, sw
Key Contaminants: VOCs (benzene, toluene, xylenes), other organics (dioxin, PAHs, phenols), metals (arsenic, chromium)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 102
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

Abstract (Continued)

was observed seeping into the wall of the excavation at a depth of approximately five feet. In 1987, the contents of the covered holding lagoon were transported to offsite treatment and disposal facilities. Because clean closure of the lagoon was not attempted, and the cover was not replaced, the lagoon re-filled with water. As a result, a hazardous K001 sludge, containing creosote and/or PCP, remains at the bottom of the lagoon due to the treatment of wastewater from the wood preserving processes. Throughout site operations, treated wood was stored in open areas onsite and was allowed to drip onto the ground, contaminating the soil. In 1987, sampling during the RI indicated elevated levels of arsenic, chromium, copper, and zinc in the sediment and surface water of North Run Creek. In 1989, the owners of Talley's Pond dredged the sediment and sludge that had accumulated at the bottom of the pond, placed them around the pond, and seeded the area. In 1990, when onsite operations ceased, a cover was placed over the drip pad to shield it from precipitation, and a roof was constructed over the concrete holding pond. In 1991, all of the wood treatment equipment was removed offsite, and a layer of clean gravel was placed over the entire surface of the site. In 1992, EPA required Rentokil to design and construct sediment control structures to prevent additional migration of sediment containing metals from the site into the North Run Creek, and to provide site security by posting the area with warning signs and maintaining the existing fencing. In addition, the CCA disposal areas were covered with heavy duty plastic sheeting anchored with a gravel covering to minimize the continued migration of contaminated sediment. This ROD addresses the contamination in several site areas, including the area of the former blowdown sump, the drip pad, the unlined pond, the CCA Disposal Area, the Fill Area, the perched and saprolite units, the three wetland areas, North Run Creek, and the remaining structures onsite. The primary contaminants of concern affecting the soil, sediment, debris, sludge, ground water, and surface water are VOCs, including benzene, toluene, and xylenes; other organics, including dioxin, PAHs, and phenols; and metals, including arsenic and chromium.

The selected remedial action for this site includes demolishing, decontaminating, and disposing of existing structures offsite; excavating and incinerating offsite approximately 70 yd^3 of K001 sediment and sludge, with prior onsite treatment using dechlorination, if the level of dioxins/furans would cause a violation of the incinerator's RCRA permit; extracting and treating surface water in the unlined pond onsite using carbon adsorption, with onsite discharge of residuals to North Run Creek and closure of the pond; dewatering, excavating, and consolidating approximately 7,200 yd^3 of surface soil from the three wetland areas to the area to be capped; treating the pond water in an onsite water treatment system, prior to discharge to North Run Creek; re-vegetating the excavated wetland areas; constructing a slurry wall, which includes a dewatering system around the cap; treating contaminated ground water onsite using carbon adsorption, with precipitation of metals, if necessary, with onsite discharge of the treated water to North Run Creek; regenerating the spent carbon offsite, with offsite disposal of sludge generated during the treatment process in an approved facility; excavating and treating onsite approximately 5,150 yd^3 of the soil removed during installation of the dewatering system and slurry wall, along with soil located in the CCA Disposal Area and Fill Area, and the DNAPL-contaminated soil using low temperature thermal desorption to remove PCP and carcinogenic PAHs; treating onsite the remaining soil which exceeds the arsenic cleanup level using chemical fixation; disposing of and capping the treated soil onsite, with disposal of any treated soil which does not meet the established cleanup levels in an offsite RCRA facility; disposing of excavated drums from the Fill Area offsite; excavating and disposing of sediment in North Run Creek onsite; excavating, treating, and disposing of sediment in and around Talley's Pond offsite; providing for a contingency remedy to treat onsite the K001 waste from the unlined pond using dechlorination, if the level of dioxins/furans exceed the level which the incinerator is permitted to accept; monitoring ground water; and implementing institutional controls, including ground water and land use restrictions. The estimated present worth cost for this remedial action is $10,907,000, which includes an estimated annual O&M cost of $72,200 for 30 years. The estimated present worth cost for the contingency remedy is $1,499,500.

Abstract (Continued)

PERFORMANCE STANDARDS OR GOALS:

Chemical-specific cleanup goals for the site are based on a human health risk of 10^{-6}, and include arsenic 33 mg/kg; PAHs 48 mg/kg; and PCP 48 mg/kg.

RECORD OF DECISION
RENTOKIL/VIRGINIA WOOD PRESERVING

DECLARATION

SITE NAME AND LOCATION

Rentokil/Virginia Wood Preserving
Richmond, Virginia

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Rentokil/Virginia Wood Preserving Site (the Site) in Richmond, Virginia which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for this Site. Information supporting the remedial action decision is contained in the Administrative Record for the Site.

The Virginia Department of Environmental Quality concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

This remedy will address all of the media impacted by the contamination at the Site. It is not warranted at this time to divide the Site into smaller components called operable units to address individual media. Based on the information derived through the Remedial Investigation, the CCA Disposal Area, Fill Area, and the dense nonaqueous phase liquids (DNAPLs) pose principal threats to human health. Since wastes will be left in place, long-term monitoring of the ground water must be performed.

The selected remedy includes the following major components:

- Demolition, decontamination, and offsite disposal of the existing structures.

- Excavation, dechlorination treatment (if necessary), and offsite incineration of K001 waste from the unlined pond. Removal and onsite carbon adsorption treatment of surface water in the unlined pond.

- Construction of a RCRA Subtitle C cap.

- Excavation and onsite disposal of surface soil beyond extent of cap.

- Excavation, low temperature thermal desorption (LTTD) and fixation treatment, and onsite disposal of CCA Disposal Area, Fill Area, and the DNAPL soil within 25 feet of concrete drip pad, unlined pond, and former blowdown sump.

- Offsite disposal of drums excavated from the Fill Area.

- Construction of a slurry wall.

- Construction of a dewatering system within the cap/slurry wall; onsite carbon adsorption treatment of ground water.

- Excavation and onsite disposal of sediments in the oxbow of North Run Creek. Sampling of sediments in Talley's Pond and those sediments previously dredged by the owner with excavation, treatment, and offsite disposal if sediments exceed cleanup levels.

- Institutional controls to prohibit residential development of Site and use of the ground water at the Site.

- Long-term ground water monitoring.

DECLARATION OF 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. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable, and it satisfies the statutory preference for a remedy that employs treatments that reduce toxicity, mobility, or volume as their principal element.

Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted (no less often than every) five years after initiation of remedial action to ensure that human health and the environment are being protected by the selected remedy.

for Stanley L. Laskowski
Acting Regional Administrator
Region III

6-22-93
Date

DECISION SUMMARY for the RECORD OF DECISION

RENTOKIL, INC.

A. Site Name, Location, and Description

The Rentokil Inc. Site (the Site) is located at 3000 Peyton Street at the intersection of Peyton Street and Ackley Avenue in Henrico County, near Richmond, Virginia (see Figure 1 - Regional Location Map). The Site is a former wood treating facility which ceased operating in January 1990. The land immediately surrounding the Site is mostly open space/woodlands. Nearby development is comprised of light industrial, commercial, and low density residential as shown at Figure 2 (Site Location Map). The Site and surrounding land are presently zoned for light and general industry.

As shown at Figure 3, there are three wetland areas which receive runoff from the Site: the area immediately north of the Site which is within the flood plain of an unnamed tributary to North Run (Area A); the area at the southeastern corner of the Site (Area B); and the area immediately south of the Site which is across Peyton Street (Area C). The unnamed tributary north of the Site is referred to as North Run Creek. Wetlands B and C are presently connected by two 18" culverts under Peyton Avenue. Surface runoff discharges from the Site through a ditch to Wetland B, where it is retained and discharges to Wetland C when flow is high. A ditch along the north side of Peyton Avenue also collects runoff from the Site. This runoff flows through the west culvert to Wetland C.

Ditches have been artificially cut into Wetland C approximately 60 feet south of the outlet of each culvert. This was done in association with the reconstruction of Peyton Street. A ditch parallel to the south side of Peyton Avenue carries runoff from Wetland C to the east and ultimately to a 24" culvert under Ackley Avenue. Because the invert of the 24" culvert is about 2 feet above the flow line of the south ditch and the normal elevation of Wetland C, Site-related runoff waters are retained within Wetland C.

The Site is comprised of the land occupied by the Rentokil (Virginia Wood Preserving) facility as well as those portions of land contiguous to the northcentral boundary and the southeastern corner of the facility (Figure 4). The center of the Site is highest in elevation. The surface runoff from the southern portion of the Site flows toward Wetland B while the surface runoff from the northern portion of the Site flows toward North Run Creek, an intermittent stream. North Run Creek flows into Talley's Pond approximately one mile southeast of the Site and then flows approximately 0.7 miles more to North Run. North Run

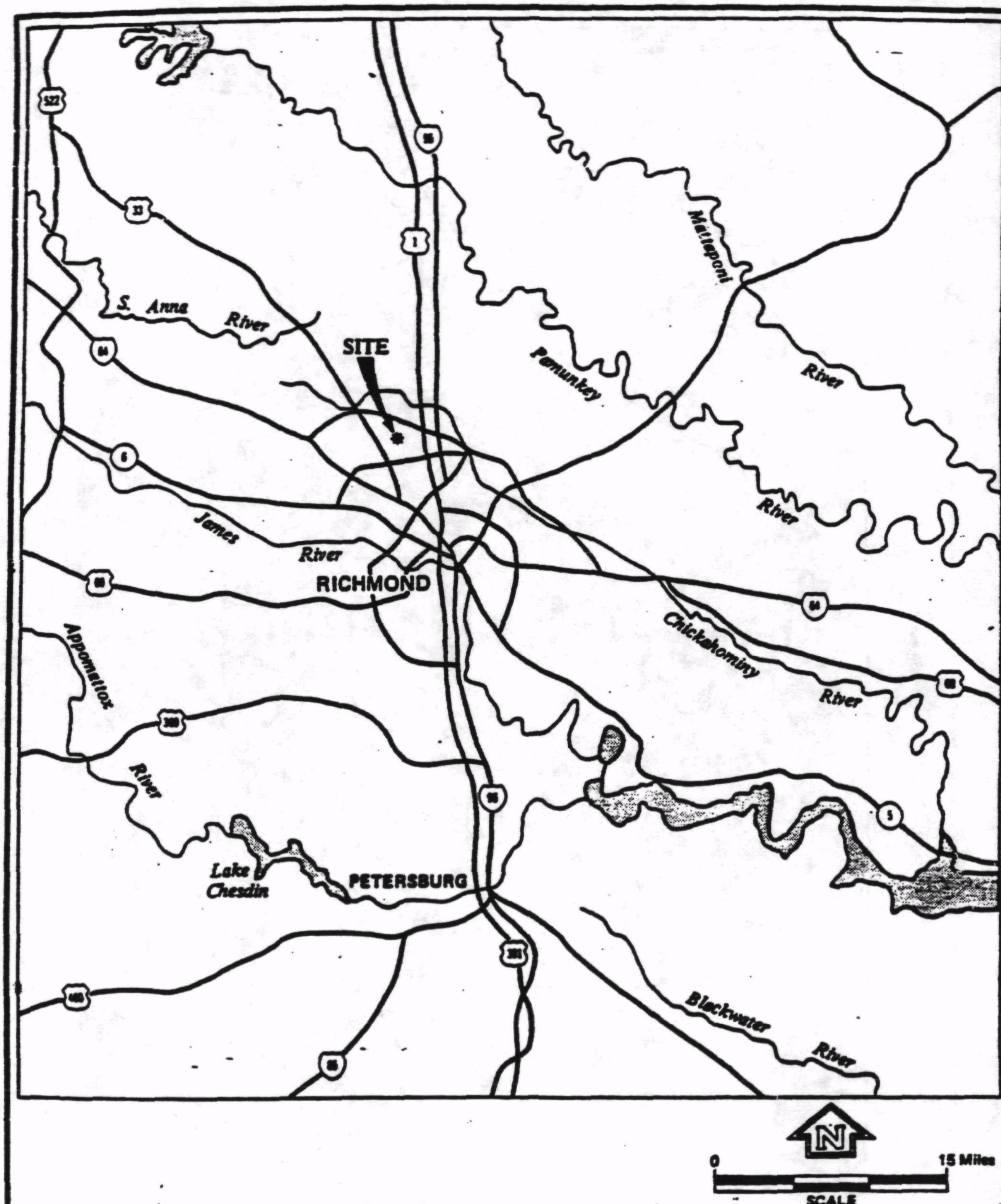


FIGURE 1
REGIONAL LOCATION MAP

BASE MAP SOURCE: 7½' Quads: Yellow Tavern, Va., 1981; Glen Allen, Va., 1981.

0 2000 Feet
SCALE

FIGURE 2
SITE LOCATION MAP
VIRGINIA WOOD PRESERVING SITE

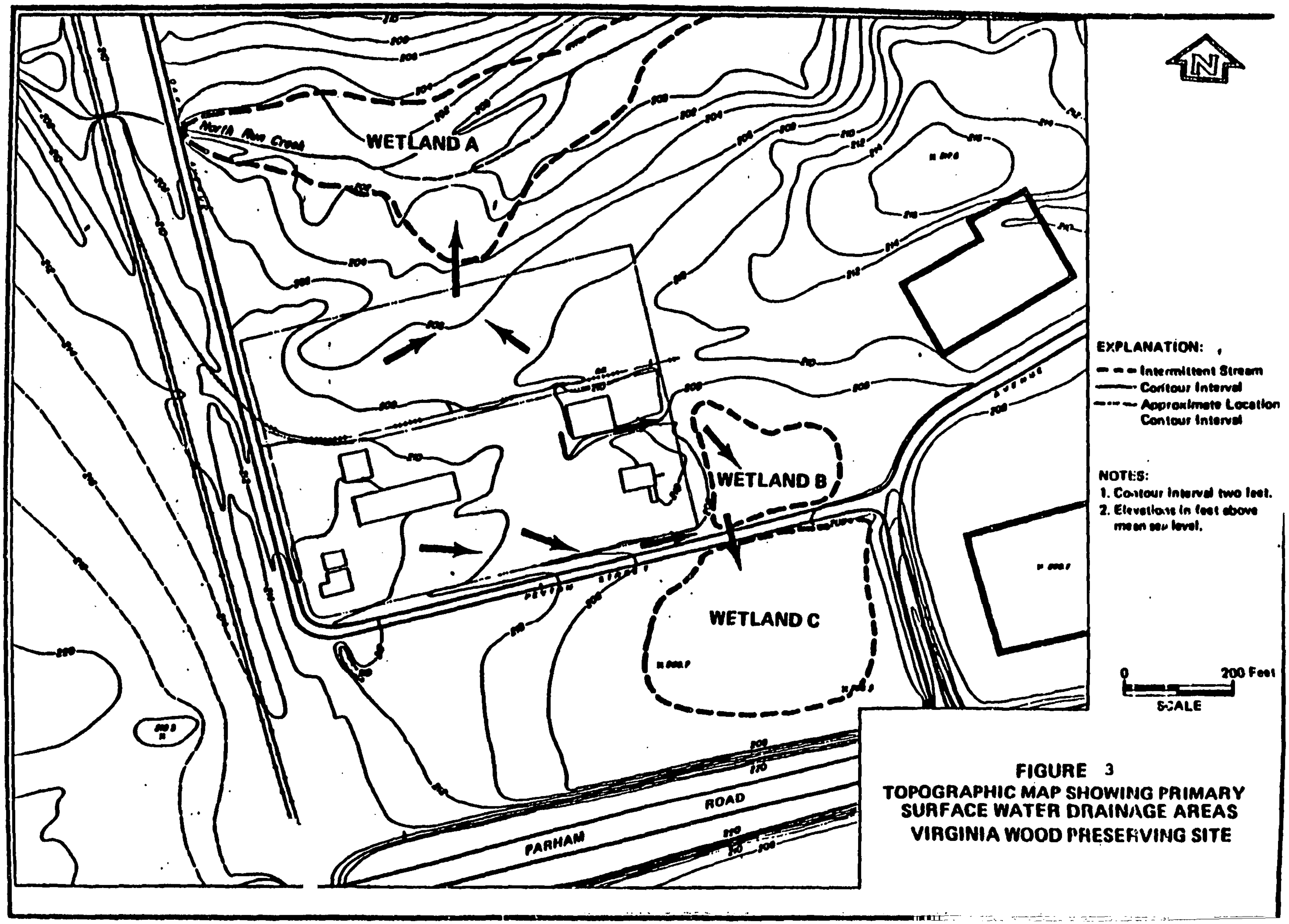


FIGURE 3
TOPOGRAPHIC MAP SHOWING PRIMARY SURFACE WATER DRAINAGE AREAS
VIRGINIA WOOD PRESERVING SITE

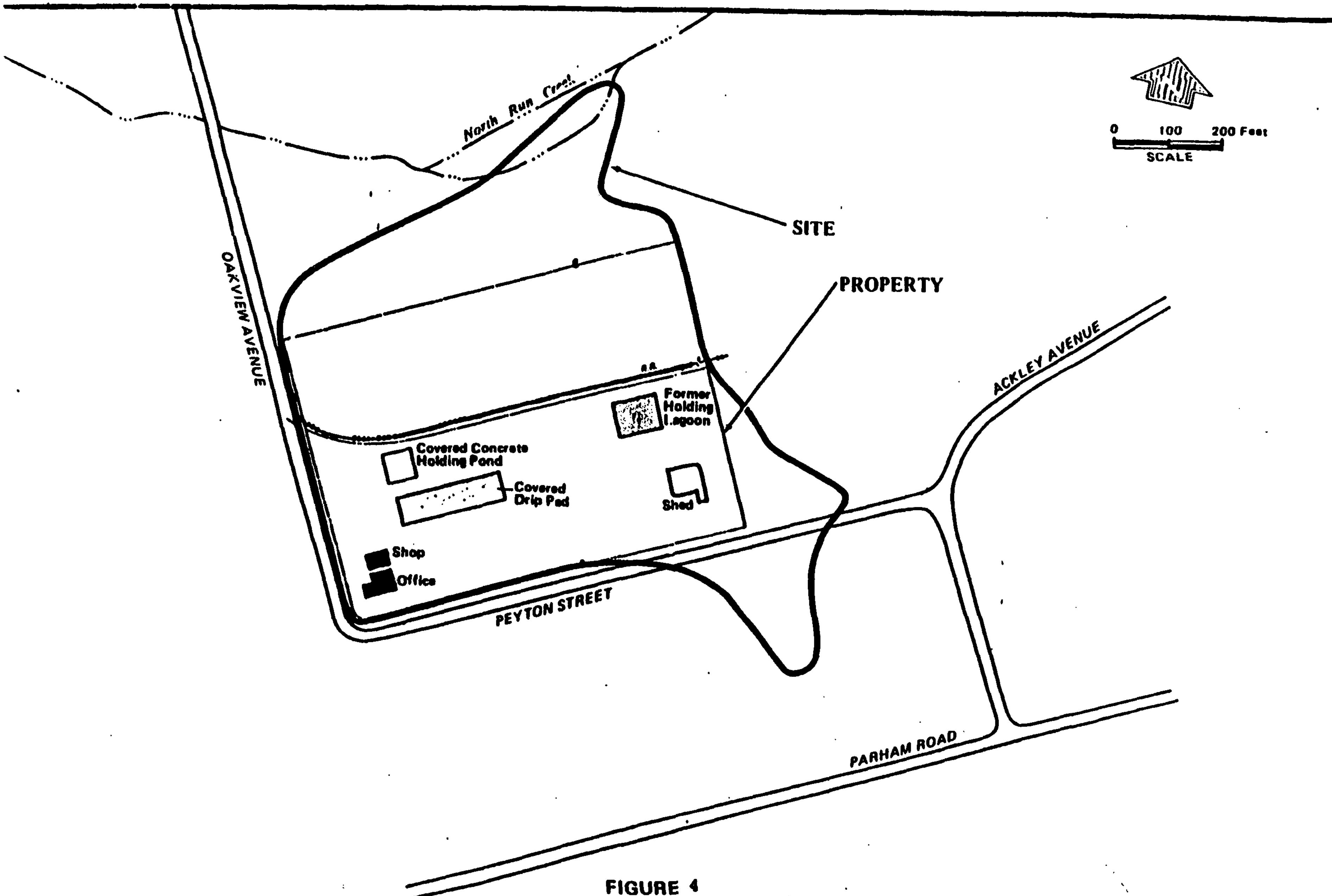


FIGURE 4
EXISTING STRUCTURES MAP
VIRGINIA WOOD PRESERVING PROPERTY, FACILITY, AND SITE

flows approximately 2.7 miles downstream to Upham Creek, which in turn flows into the Chickahominy River after approximately another 2.5 miles.

The geology at the Site consists of the following features: a top layer of sediments, a hardpan, a layer of saprolite, and bedrock as shown on the representative cross-section at Figure 5. The surface sediments consist of clayey silts and fine sands from 0 to 7 feet thick. The hardpan consists of silty to sandy clay which varies from 1 to 10 feet thick in the vicinity of the Site. The hardpan is 3 to 5 feet thick in the center of the Site, and thins to less than 1 foot between the northern property boundary and North Run Creek. The saprolite layer underlying the hardpan consists of disintegrated granite residuum from 4.5 to 15 feet thick in the vicinity of the Site. The bedrock is granite with limited fracturing.

The Henrico County Health Department reported that there are 92 home wells within a 1-kilometer radius of the Site. Depths of these wells reportedly range from 10 to 215 feet, with 20 to 40 foot deep wells being the most prevalent. Residents of Wakefield Road, Mayfair Avenue, and Oakview Avenue, to the north of the Site, are served by the municipal water supply system.

B. Site History and Enforcement Activities

Wood treatment operations at the Site were initiated in 1957 and continued until January 1990. The methods and the chemicals used at the Site have changed over the years. Products used at the Site include pentachlorophenol (PCP) in a solution with either mineral spirits or No. 2 fuel oil, chromium zinc arsenate (CZA), copper chromated arsenate (CCA), fire retardant (FR), creosote, and xylene (Figure 6). The fire retardant is believed to have been a water-based solution of ammonium phosphate or ammonium sulfate. The fire retardant solution may also have contained ammonium thiocyanate as a corrosion-inhibiting additive.

Over the years, all of the wood treating facilities installed on the Site have been taken out of service and most have been removed. Figure 7 shows the original buildings and equipment as well as the additions between 1963 and 1980.

Wastes from the early wood treatment operations were reportedly discharged to the blowdown sump north of the treatment cylinders. The blowdown sump was an open earthen pit used for the discharge of waste processing fluids from 1957 to 1963. In 1963, under the direction of the Virginia State Water Control Board, the pit was cleared, cleaned, and replaced with the concrete holding pond. The Virginia State Water Control Board requested these changes because of fish kills in Talley's Pond on

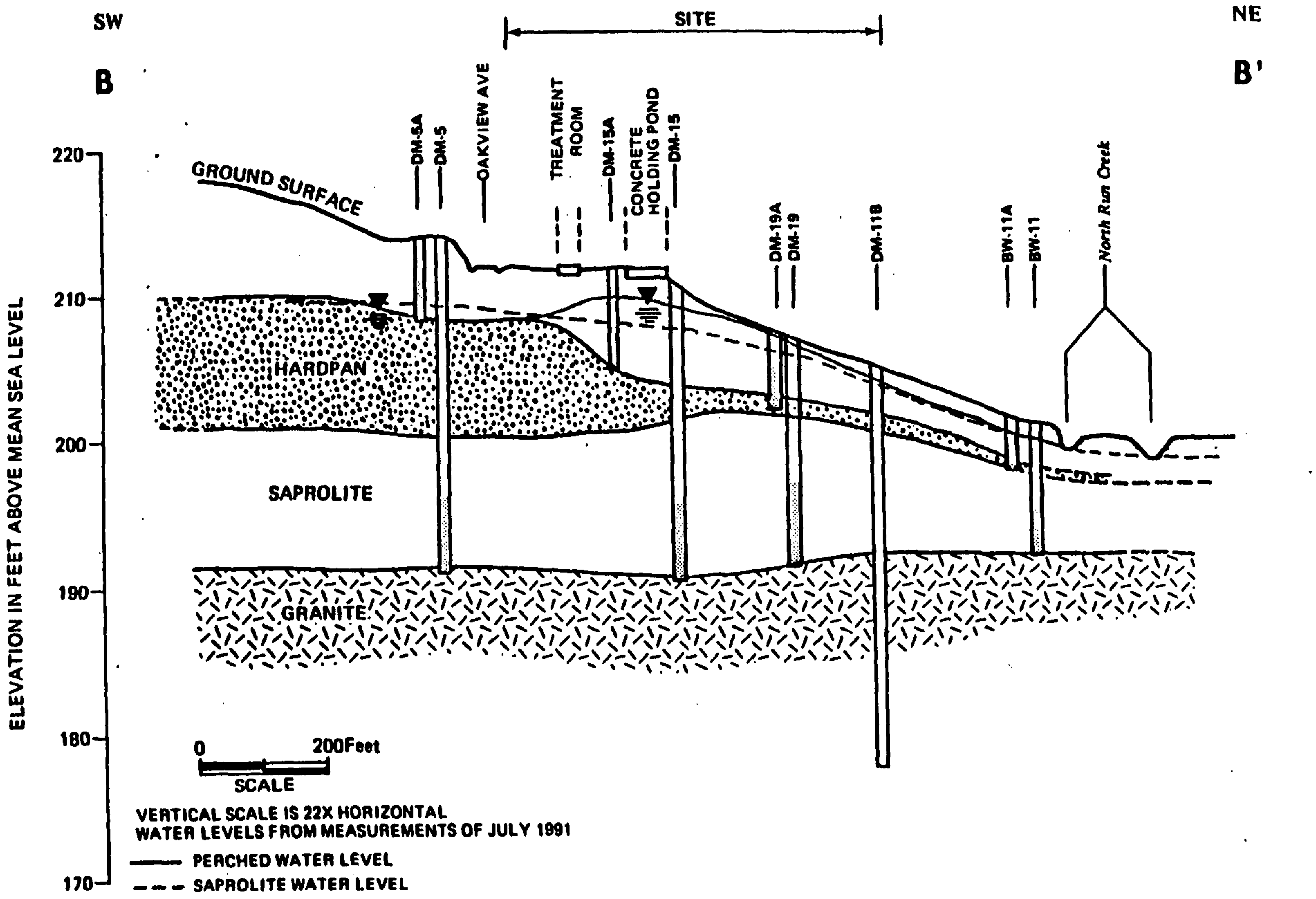
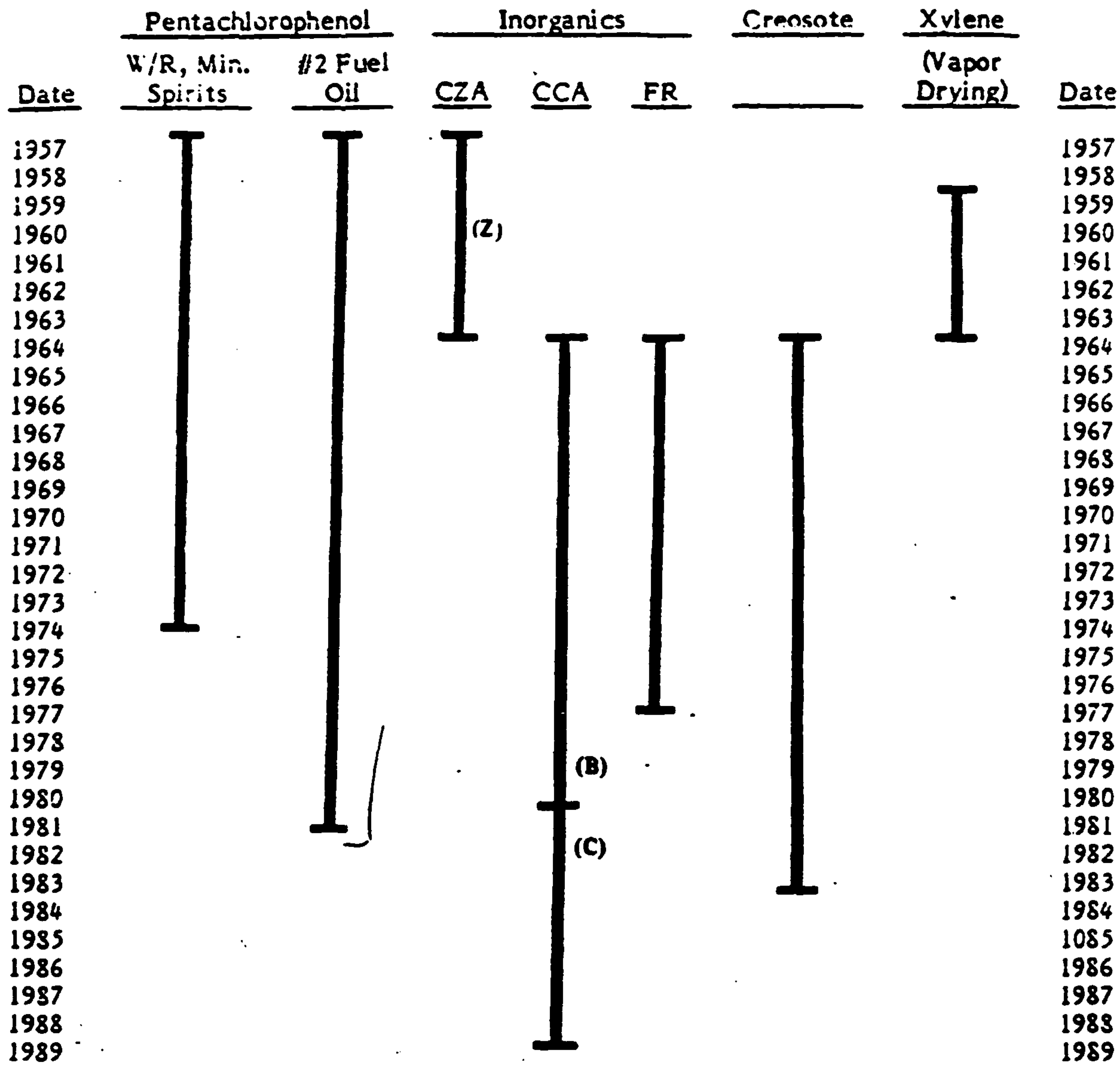


FIGURE 5
GENERALIZED CROSS SECTION FROM SOUTHWEST TO NORTHEAST
ACROSS THE VIRGINIA WOOD PRESERVING SITE

Dames & Moore



KEY:

	% CuO	% CrO_3	% As_2O_5
(B) = CCA Type B:	19.6	35.3	45.1
(C) = CCA Type C:	18.5	47.5	34.0

	% ZnO	% CrO_3	% As_2O_5
(Z) = Boliden Salts:	9.4	7.5	40.7

Source: Summary of Operational History of Virginia Wood Facility Preserving Facility September 1989.

FIGURE 6

Products Reportedly Used at Virginia Wood Preserving Facility

FIGURE 6

FIGURE 7
HISTORICAL FACILITIES MAP
VIRGINIA WOOD PRESERVING SITE

SOURCE: Bennett & Williams, 1986

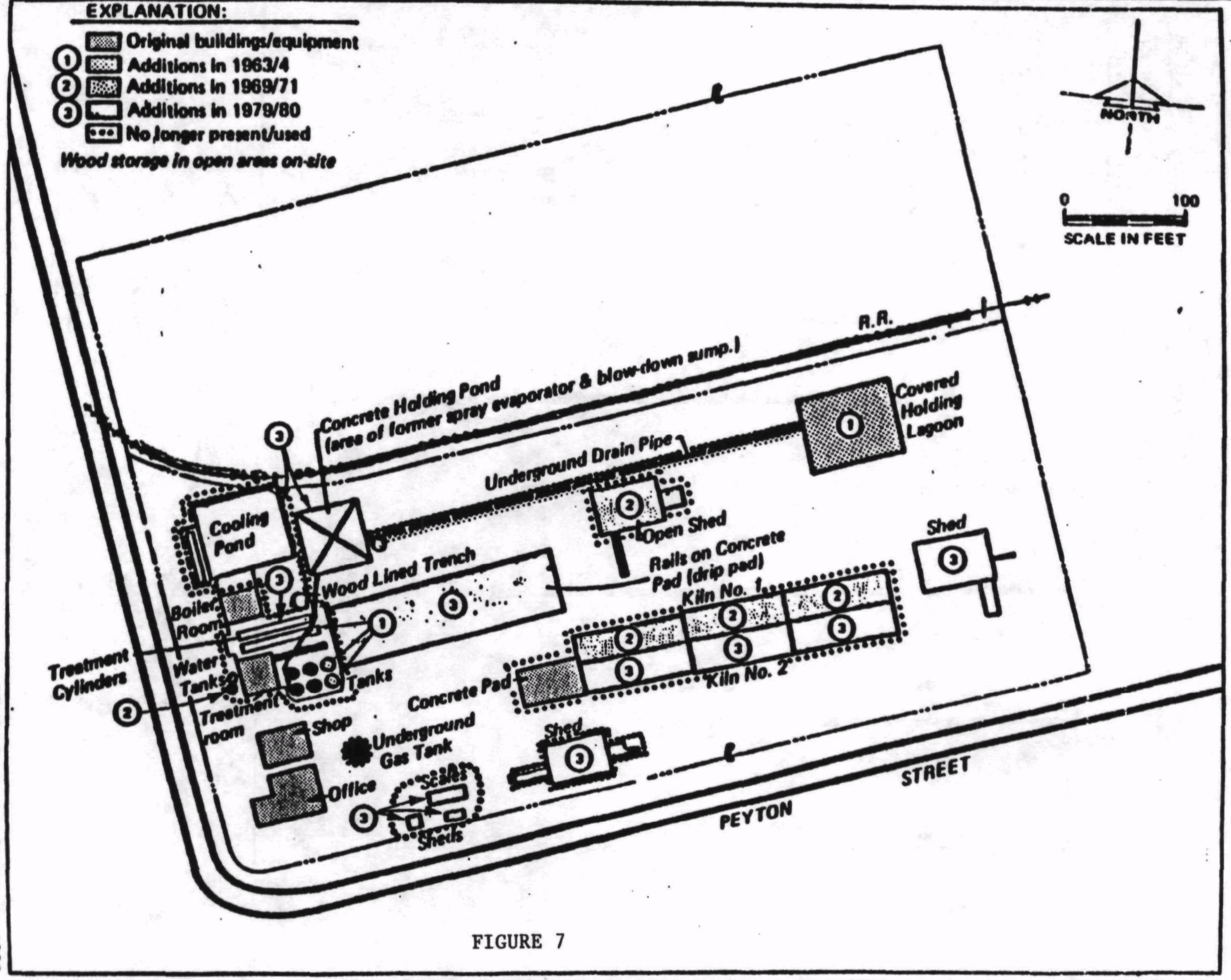


FIGURE 7

January 2, 1962 and on two previous occasions. Both the blowdown sump and the concrete holding pond were linked to the covered holding lagoon by an underground drain pipe. In 1974, the underground drain pipe was closed and abandoned in-place because a new water treatment/preservative recovery system was installed which continuously recycled the wastewater.

In 1976 or 1977, a batch of CCA precipitated in a process tank before it was used and was rendered unusable. The precipitation was reportedly caused by a reduction of the chromium from the hexavalent state to the trivalent state. This batch of approximately 1,100 to 1,400 pounds of CCA was disposed of in a pit (with alternating 6-inch layers of lime) located along the north fence line in the northeast quadrant of the Site.

An area on the southeastern corner of the wood treating facility property, next to Wetland B, was at one time filled with materials from the Site. Some of the materials placed in this area include wood scraps (some of which may have been treated) and metal bands. In addition, crushed, heavily weathered drums were observed during soil boring in the area.

Three production wells and five monitoring wells were previously constructed on the Site but were not double-cased through the hardpan layer. These wells were abandoned to prevent continued potential cross-contamination between the perched ground water unit and the saprolite ground water unit. The production wells consisted of two steel-cased wells (one 4-inch well and one 6-inch well) installed into the bedrock and one 36-inch cement-lined well. The soil excavated during removal of the 36-inch well had a noticeable creosote odor. Also, a black substance (assumed to be creosote) was observed seeping into the wall of the excavation at a depth of approximately 5 feet.

In 1987, the contents of the covered holding lagoon were transported to offsite treatment/disposal facilities. No soil or water samples were collected at that time. Clean closure of the lagoon in accordance with the Virginia Hazardous Waste Management Regulations (VHWMR) was not attempted and the cover was not replaced, allowing the lagoon to fill up with water again. The sludge currently at the bottom of the pond is considered to be a listed hazardous waste under the Resource Conservation and Recovery Act (RCRA) with the designation K001. See VHWMR Appendix 3.1 and 40 C.F.R. § 261.32. K001 waste is defined as the bottom sediment sludge from the treatment of wastewaters from wood preserving processes utilizing creosote and/or PCP.

Throughout the operational history of the Site, treated wood was stored in nearly all open areas on-Site. A concrete drip pad directly adjacent to the treatment cylinders was not installed until 1979/1980. Because of the contamination resulting from the previous practice of allowing the treated wood to drip onto the ground, the soil at the Site contains F032, F034, and F035 RCRA listed hazardous waste, as defined at 40 C.F.R. § 261.31. F032 waste is defined as drippage from wood treating operations utilizing PCP. F034 waste is defined as drippage from wood treating operations utilizing creosote. F035 waste is defined as drippage from wood treating operations utilizing solutions containing arsenic.

In 1989, the owners of Talley's pond dredged the sediments which were acculumating at the bottom of the pond. The owners placed the dredged sediments around the pond and seeded the area.

After ceasing wood treatment operations in 1990, a polyvinyl chloride (PVC) cover was placed over the drip pad to shield it from precipitation and a roof was constructed over the concrete holding pond. In the spring of 1991, all of the wood treatment equipment was removed from the Site. The above ground storage tanks and treatment cylinders were dismantled and disposed of by a hazardous waste contractor. A layer of clean compacted clay was placed over the area where the cylinders were located. In addition, a roof was built over the former tank farm area and a layer of clean gravel was placed over the entire surface of the Site.

EPA proposed that the Site be listed on the National Priorities List (NPL) in January 1987. The Site was placed on the NPL in March 1989. Rentokil, Inc. and EPA signed an Administrative Order By Consent in December 1987 to conduct a Remedial Investigation/Feasibility Study (RI/FS) to identify the types, quantities and locations of contaminants and to develop ways of addressing Site contamination. Field work for the first phase of the RI was conducted from May to August 1989. The field work for the second phase of the RI was conducted in June and July 1991.

Sampling during the RI indicated elevated levels of arsenic, chromium, copper, and zinc in the sediment and surface water of North Run Creek. The sampling results indicated levels of arsenic which exceeded the chronic fresh water quality criteria for the protection of aquatic life and the Safe Drinking Water Act Maximum Contaminant Level (MCL).

In March 1992, EPA and Virginia Properties, Inc. (a wholly owned subsidiary of Rentokil, Inc.) entered into an Administrative Order by Consent for Removal Action (Order). The purpose of the Order was to design and construct sediment control structures to prevent additional migration of sediment containing arsenic, chromium, copper, and zinc from the Site into North Run Creek. The Order also required Virginia Properties, Inc. to provide Site security by posting the area with warning signs and maintaining the existing fencing. The sediment control structures consist of a berm and a sediment trap located between the fence line and North Run Creek. These structures were completed by June 22, 1992. Also, the CCA disposal area was covered with heavy duty plastic sheeting anchored with a gravel covering to minimize the continued migration of contaminated sediment.

C. Highlights of Community Participation

The RI/FS Report and the Proposed Plan for the Rentokil Site were released to the public for comment on January 8, 1993 in accordance with the requirements of Sections 113(k), 117(a), and 121(f) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, 42 U.S.C. § 9613(k), 9617(a), and 9621(f). These documents were made available to the public in the administrative record maintained at the EPA Docket Room in Region 3 and at the Henrico County Municipal Reference and Law Library in the County Government Complex, Parham Road at Hungary Spring Road. The notice of availability for these two documents was published in the Richmond Times-Dispatch on January 8, 1993. A public comment period on the documents was held from January 8, 1993 through March 10, 1993.

In addition, a public meeting was held by EPA and the Virginia Department of Waste Management on January 20, 1993 in accordance with Section 117(a)(2) of CERCLA, 42 U.S.C. Section 9617(a)(2). At this meeting, representatives from EPA presented the findings on the contamination problems at the Site and the remedial alternatives under consideration. A response to the comments received during the public comment period is included in the Responsiveness Summary, which is part of this ROD. This decision document presents the selected remedial action for the Rentokil, Inc. Site in Henrico County, Virginia, chosen in accordance with CERCLA, as amended by SARA and, to the extent practicable, the National Contingency Plan. The decision for this Site is based on the Administrative Record.

D. Scope and Role of Response Action

The selected remedy addresses the media impacted by the contamination at the Site including: surface and subsurface soil, dense non-aqueous phase liquids (DNAPLs) in the soil in the area of the former blowdown sump, the drip pad, and the unlined pond, the CCA Disposal Area, the Fill Area, the ground water in the perched unit and the ground water in the saprolite unit, the surface water in the unlined pond, the sediments in the unlined pond, the sediments in the three wetland areas, the sediments in North Run Creek, the sediments in and around Talley's pond, and the remaining structures on the Site. The principal threats at the Site include the DNAPL soil, CCA Disposal Area, Fill Area, and the surface water and K001 waste in the unlined pond. EPA has determined that it is not warranted to split the Site remediation into operable units to address individual media.

E. Summary of Site Characteristics

The RI field activities and analytical program were designed to define the extent of contamination in the soil, sediments, surface water, and ground water on and around the wood treatment facility, identify migration pathways, and provide data to support a feasibility study of potential remedial actions. The following tasks were completed at the Site:

- Topographic mapping;
- Surface soil sampling;
- Subsurface soil boring and sampling;
- Ground water well installation and sampling;
- Aquifer testing;
- Surface water and sediment sampling from surface water bodies and wetland areas; and
- Biota sampling in selected locations of surface water bodies.

A summary of the results from the RI sampling program is provided below.

Surface Soil

The primary inorganic contaminants detected in the Site surface soil include arsenic, chromium, and copper. Concentrations of arsenic were detected across most of the wood treatment facility property as well as in the wetland areas located to the north and southeast. Arsenic detections ranged from 1 to 10,400 milligrams per kilogram (mg/kg) as shown at Figure 8. Chromium detections ranged from 3.1 to 3,890 mg/kg. Copper detections ranged from 3 to 2,880 mg/kg.

The primary organic contaminants detected at the Site include PCP, PAHs, and dioxins/furans. Concentrations of these contaminants mimic the distribution of arsenic throughout the surface of the wood treatment facility as well as in the wetland areas located to the north and the southeast. PCP detections ranged from below the detection limit to 540,000 micrograms per kilogram (μg/kg) as shown at Figure 9. Polynuclear Aromatic Hydrocarbons (PAHs) are constitutents of creosote which are contaminants of concern at the Site. Carcinogenic PAHs

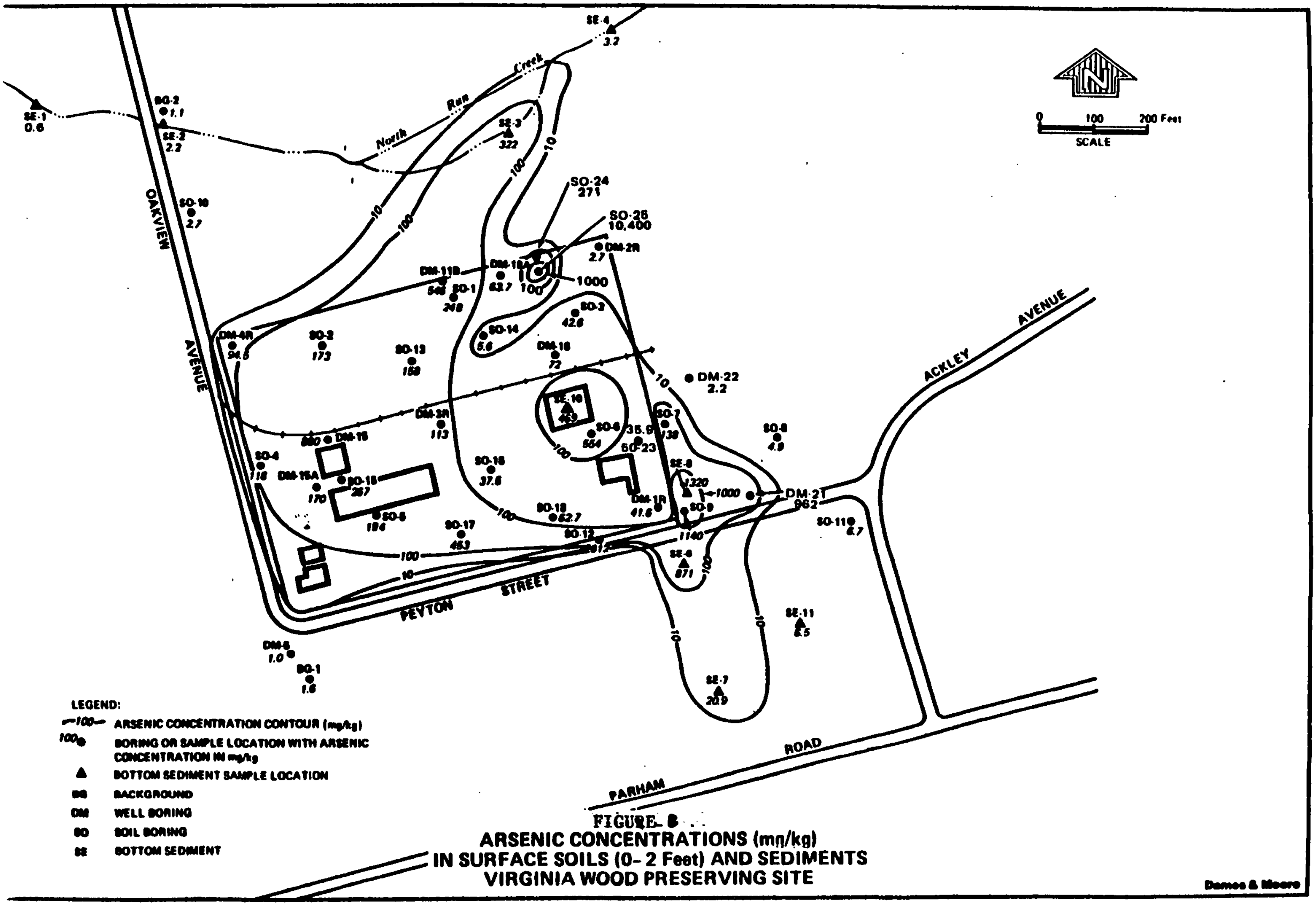


FIGURE 8
ARSENIC CONCENTRATIONS (mg/kg)
IN SURFACE SOILS (0- 2 Feet) AND SEDIMENTS
VIRGINIA WOOD PRESERVING SITE

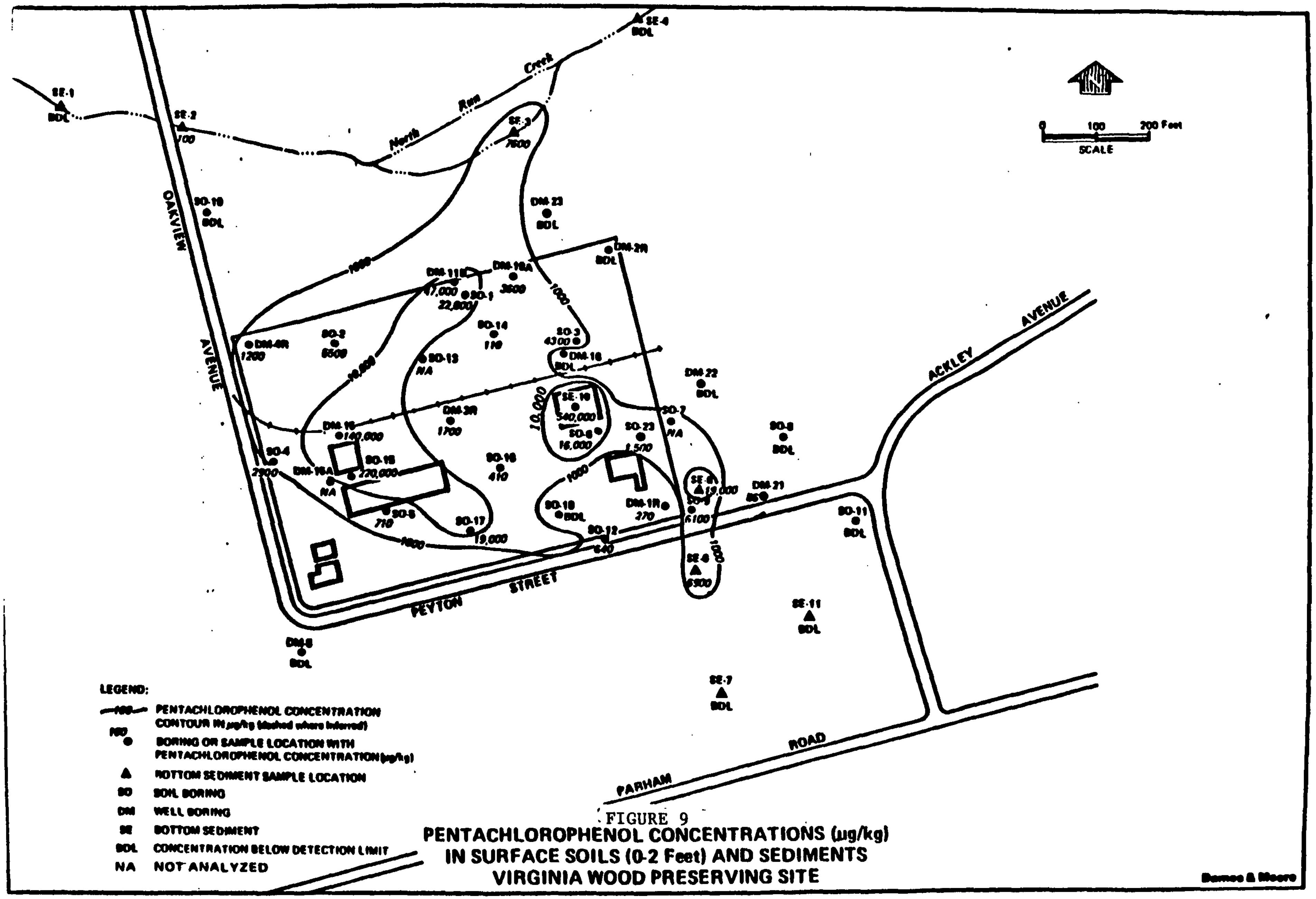


FIGURE 9
PENTACHLOROPHENOL CONCENTRATIONS (µg/kg)
IN SURFACE SOILS (0-2 Feet) AND SEDIMENTS
VIRGINIA WOOD PRESERVING SITE

detections ranged from below the detection limit to 454,900 μg/kg as shown at Figure 10. Dioxins and furans were detected at total concentrations up to 2,978 μg/kg and 1,077 μg/kg, respectively. Because of the existence of many different isomers of dioxins and furans, EPA uses the Toxicity Equivalency Factor (TEF) to compare the differing isomers to the most toxic isomers, 2,3,7,8 tetrachlorodibenzodioxin (TCDD) and tetrachlorodibenzofuran (TCDF). The dioxin and furan detections ranged from 0.013 to 10.37 μg/kg TEF.

No soil samples were taken beneath the concrete pads in the wood treating area.

<u>Subsurface Soil</u>

Two areas of non-aqueous phase liquids (DNAPLs)/creosote or PCP product have been approximated based on physical observations during the Remedial Investigation (RI), the investigation prior to the RI, and the abandonment of previous wells. These two areas, as shown on Figure 11, are primarily related to the former treatment area and the unlined pond. The existence of DNAPLs/product has only been documented qualitatively and is based on visual observation of oily smears on excavated well casings, oily material on the flexidip (a piece of equipment used to measure DNAPLs), stained soils, or product which bubbled to the surface during excavation activities. Based on these observations, the DNAPL/product appears limited to the soils above the hardpan with the exception of the Saprolite soils in monitoring well DM-15.

At the top of the hardpan layer, arsenic detections ranged from below the detection limit to 345 mg/kg while chromium detections ranged from 4 to 252 mg/kg. The highest detections of organic contaminants at the top of the hardpan layer were associated with three of the previously indicated source areas: the treatment area, unlined pond, and the fill material. PCP detections ranged from below the detection limit to 100,000 μg/kg. Carcinogenic PAHs detections ranged from below the detection limit to 254,600 μg/kg. Dioxin and furan detections ranged from 0.001 to 0.194 μg/kg TEF. Dense non-aqueous phase liquids (DNAPLs) were observed in soil at the top of the hardpan in the former treatment area and in the area of the unlined pond.

Below the hardpan layer, arsenic detections ranged from below the detection limit to 13.3 mg/kg, while chromium detections ranged from 1.5 to 18.6 mg/kg. PCP detections range from below the detection limit to 20,000 μg/kg in the saprolite soil and from below the detection limit to 82,000 μg/kg at the top of the bedrock. Carcinogenic PAHs range from below the detection limit to 8,110 μg/kg in the saprolite soil and from below detection limit to 62,830 μg/kg at the top of the bedrock. The only known location of DNAPL beneath the hardpan layer is at

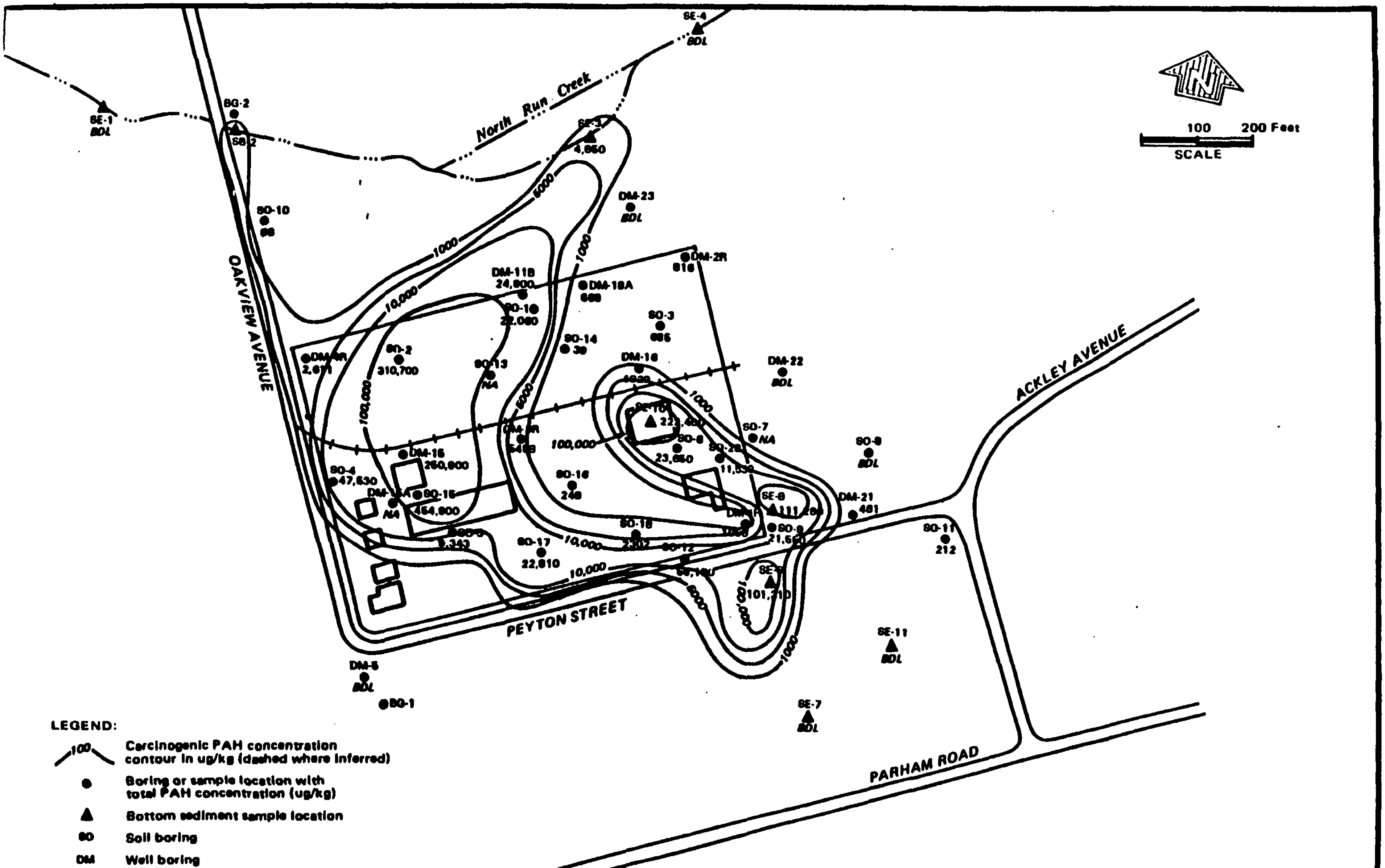


FIGURE 10

CARCINOGENIC PAH CONCENTRATION (ug/kg) IN SURFACE SOILS (0-2 FEET) AND SEDIMENTS VIRGINIA WOOD PRESERVING SITE

Dames & Moore

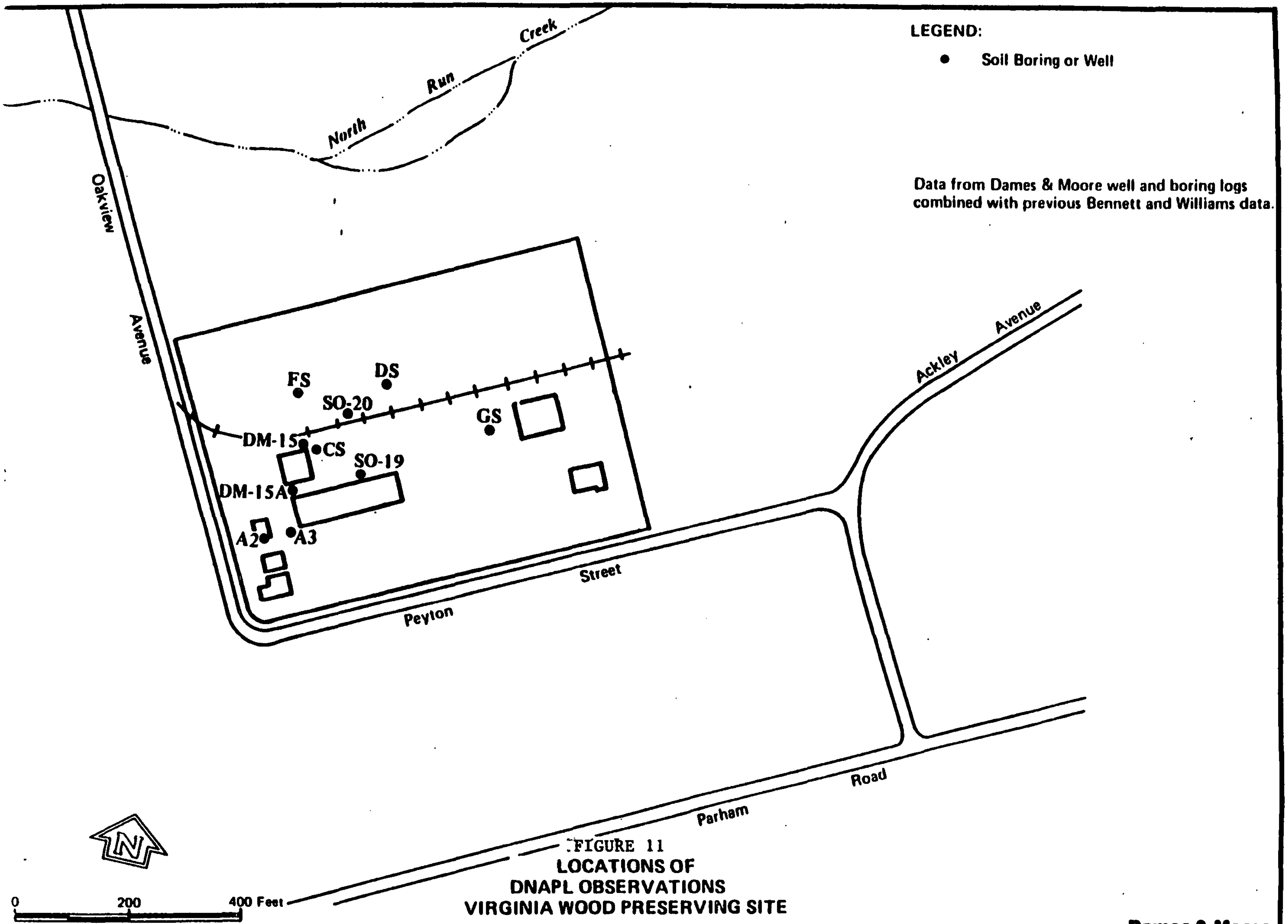


FIGURE 11
LOCATIONS OF
DNAPL OBSERVATIONS
VIRGINIA WOOD PRESERVING SITE

Dames & Moore

monitoring well DM-15, which is adjacent to the area of the former blowdown sump. Several inches of free product were observed in this monitoring well.

Ground Water

The uppermost ground water unit is the perched ground water. Immediately below the perched ground water is the hardpan; below the hardpan is the saprolite ground water unit; below the saprolite ground water unit is the bedrock. Since the hardpan is not continuous in the general area of the Site, the perched ground water and the saprolite ground water are considered as one aquifer. The aquifer has the characteristics of a Class IIA aquifer (currently used for drinking water within the Classification Review Area) since it is used as a source of drinking water.

The primary inorganic contaminants detected in the ground water at the Site include arsenic, chromium, and zinc. In the perched ground water unit, the arsenic detections ranged from below the detection limit to 868 micrograms per liter ($\mu g/l$), chromium detections ranged from below the detection limit to 51.8 $\mu g/l$, and zinc detections ranged from 23.5 to 537 $\mu g/l$. The Maximum Contaminant Levels (MCLs) for arsenic and chromium are 50 $\mu g/l$ and 100 $\mu g/l$, respectively. As shown at Figure 12, the overall distribution of dissolved arsenic in the perched ground water unit indicates the presence of two plumes: one centered in the treatment area, and the other centered over the fill material and the unlined pond. The distribution of dissolved zinc does not correspond to the arsenic plumes. Rather, the distribution of dissolved zinc appears sporadic, with no definable plume apparent.

The primary organic contaminants detected in the ground water at the Site are PCP and PAHs. The PCP detections in the perched ground water unit ranged from below the detection limit to 790 $\mu g/l$ and carcinogenic PAHs detections ranged from below the detection limit to 2,348 $\mu g/l$. The MCL for PCP is 1 $\mu g/l$. The PAH with the most stringent MCL is benzo(a)anthracene at 0.1 $\mu g/l$. As shown at Figure 13, the overall distribution of PCP is a plume centered in the treatment area and a smaller plume centered in the area of the unlined pond. As shown at Figure 14, the overall distribution of total PAHs is a plume centered in the area of the treatment area.

In the saprolite ground water unit, arsenic was detected in five samples, at a maximum concentration of 5.6 $\mu g/l$ and chromium was detected in two samples, at a maximum concentration of 13.2 $\mu g/l$.

The overall distribution of organic contaminants in the saprolite ground water unit is very similar to that in the

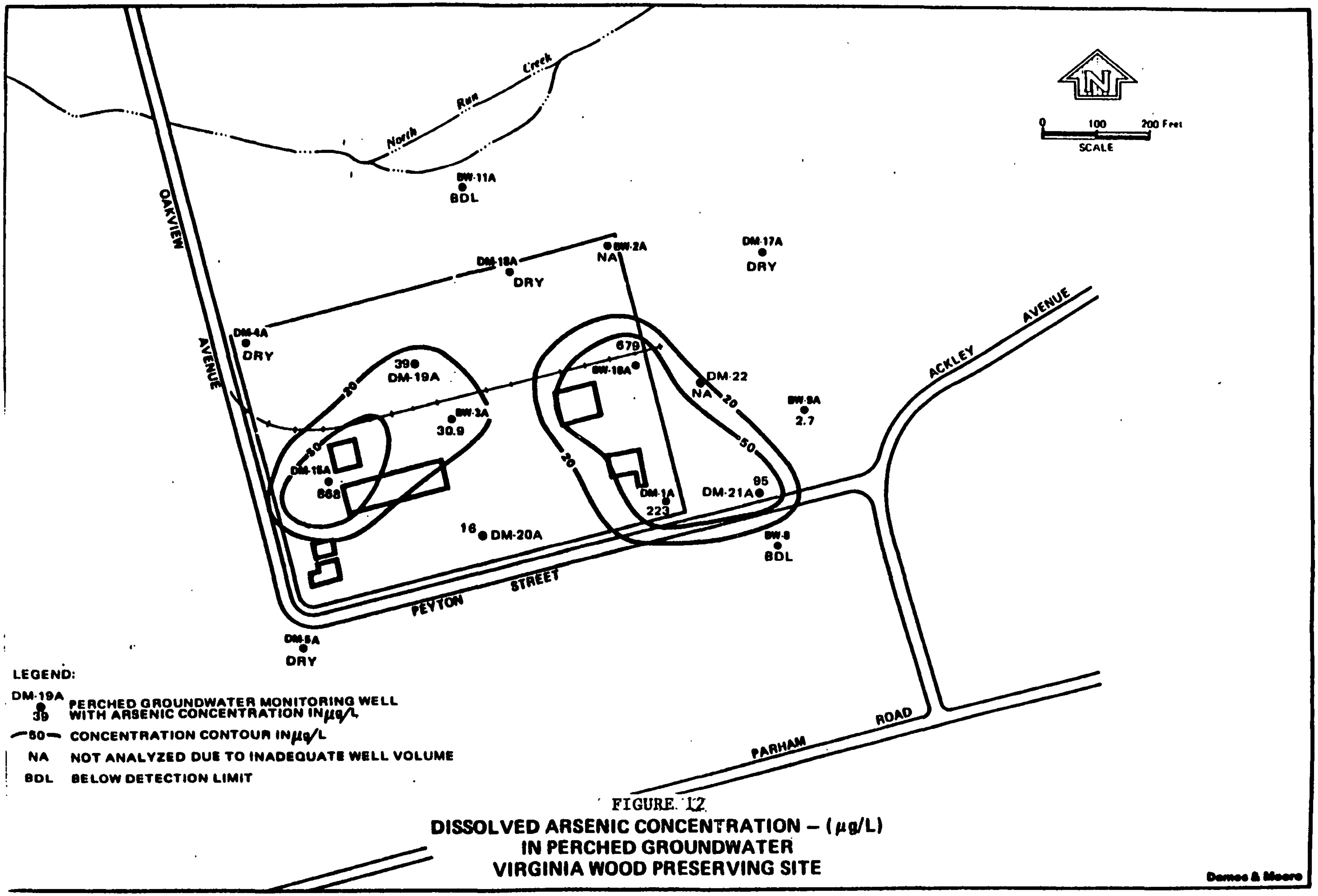


FIGURE 12
**DISSOLVED ARSENIC CONCENTRATION – (µg/L)
IN PERCHED GROUNDWATER
VIRGINIA WOOD PRESERVING SITE**

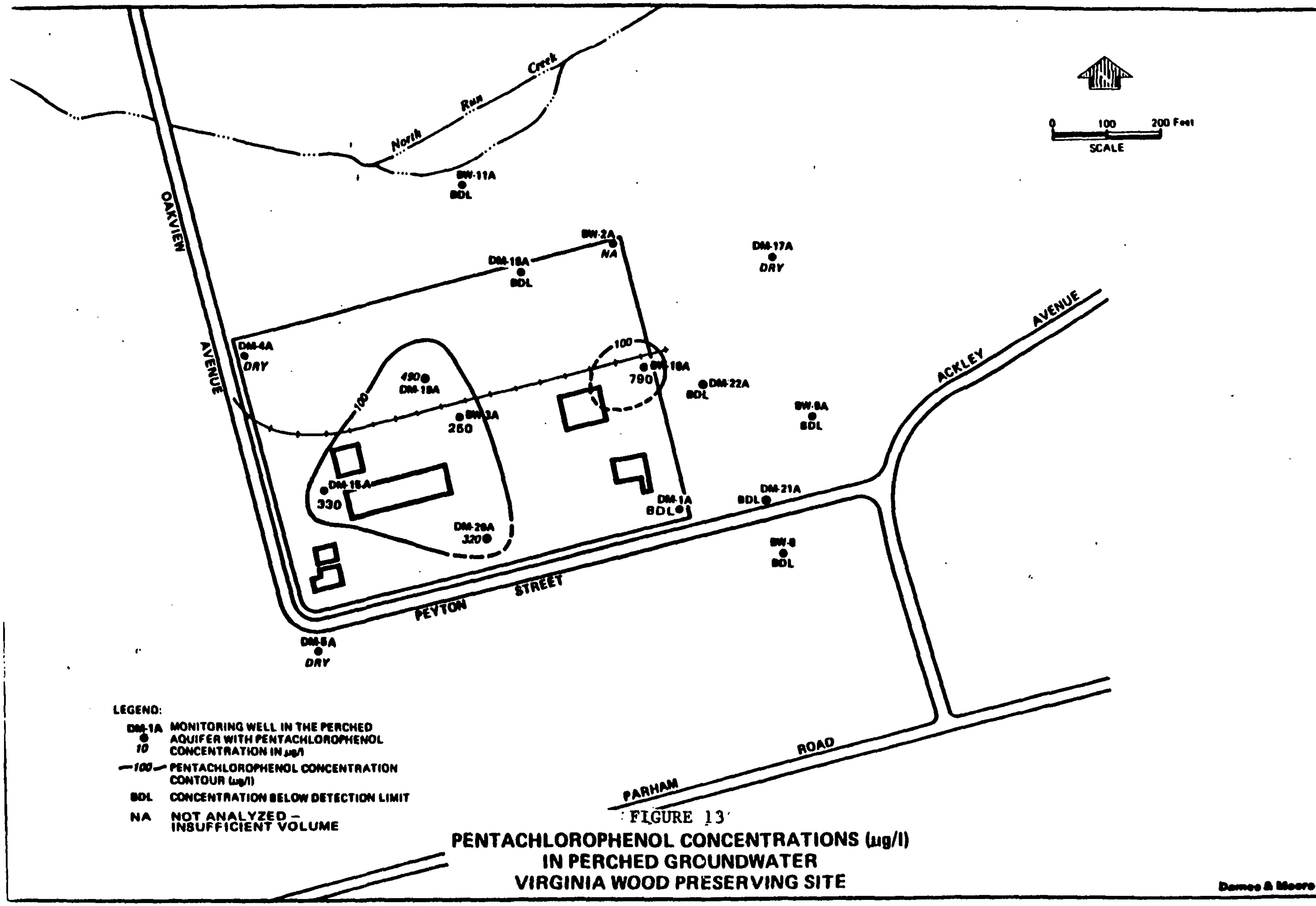


FIGURE 13

PENTACHLOROPHENOL CONCENTRATIONS (µg/l) IN PERCHED GROUNDWATER VIRGINIA WOOD PRESERVING SITE

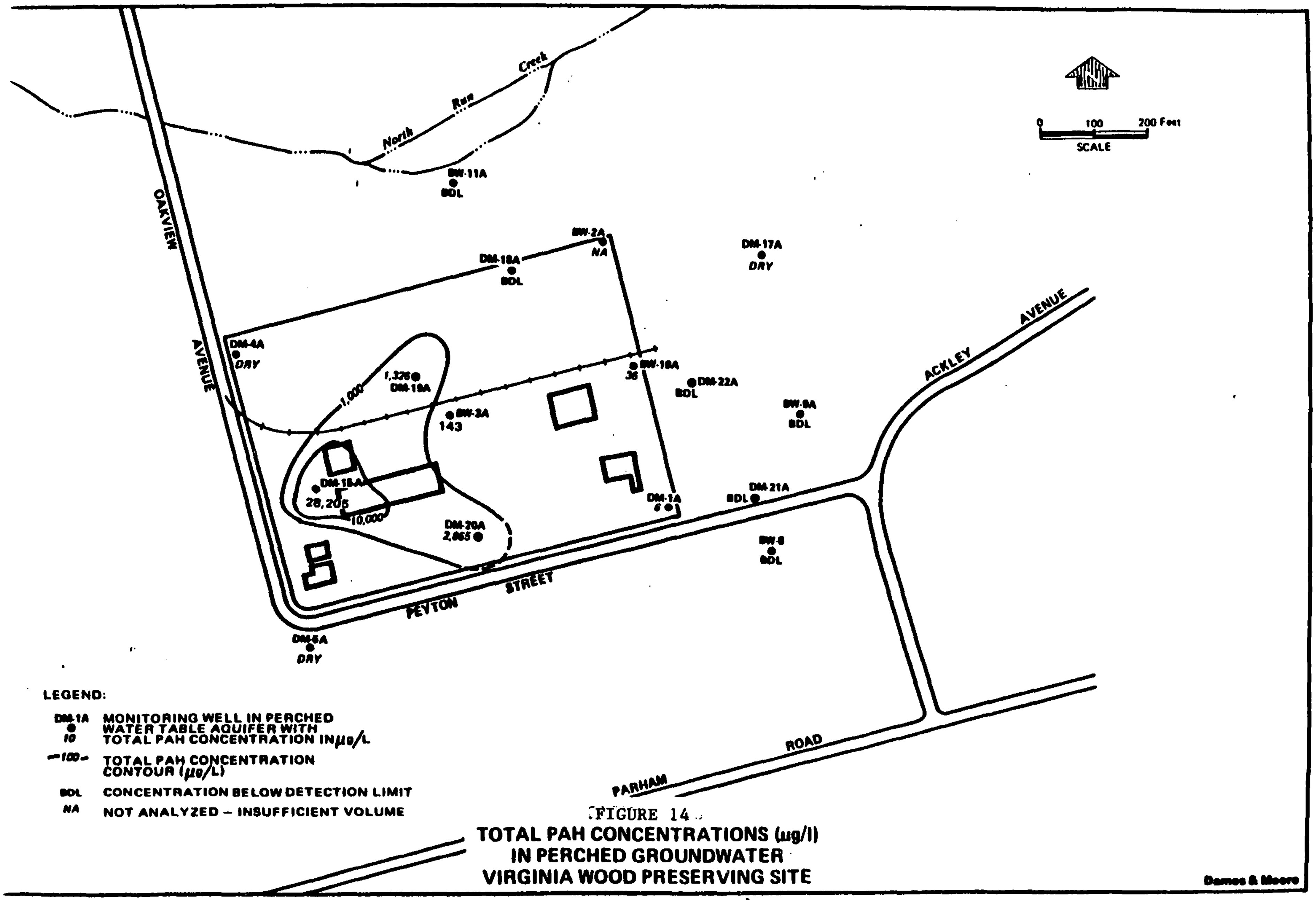


FIGURE 14
TOTAL PAH CONCENTRATIONS (μg/l) IN PERCHED GROUNDWATER VIRGINIA WOOD PRESERVING SITE

perched ground water unit. The principal plume is centered in the treatment area, with a second smaller plume centered in the area of the unlined pond. PCP detections ranged from below the detection limit to 2,500 μg/l and carcinogenic PAHs detections ranged from below the detection limit to 172 μg/l.

Surface Water and Sediment

Surface water and sediment samples were taken from a total of 16 locations including the wetland areas, North Run Creek, Talley's pond, and North Run. The results of sediment analysis indicate that deposition of sediment containing Site-related organic and inorganic contaminants is occurring in North Run Creek, principally into the oxbow just north of the Site. Arsenic detections in stream sediments ranged from 0.6 mg/kg in the background sample to 322 mg/kg at SW-3, the sampling location closest to the Site. Chromium detections in stream sediments ranged from below the detection limit to 618 mg/kg. PCP detections in stream sediments ranged from below the detection limit to 7,600 μg/kg while carcinogenic PAHs detections ranged from below the detection limit to 4,850 μg/kg.

Regarding surface water, arsenic analyses ranged from 9.9 to 1,640 μg/l in unfiltered surface water samples and from 7.4 to 633 μg/l in filtered surface water samples, with the highest values corresponding to Station SW-3. Arsenic was detected in Talley's pond at 59.6 μg/l in an unfiltered sample. Chromium detections ranged from 5.6 to 66 μg/l in unfiltered surface water samples at the three locations closest to and downstream of the Site.

As stated previously, a berm and sediment trap was constructed on June 22, 1992 in response to the above results from Phases 1 and 2 of the RI sampling events. Subsequently, additional surface water and sediment analyses were performed on December 10, 1992. Regarding surface water, arsenic analyses ranged from 4.6 μg/l in the background location to 22.4 μg/l at SW-3, and chromium analyses ranged from below the detection limit at SW-3 to 11.0 μg/l in the background location. Arsenic was detected in Talley's pond at 15.2 μg/l.

F. Summary of Site Risks

As part of the RI/FS process, a Baseline Risk Assessment was prepared for the Site to characterize, in the absence of remedial action (i.e., the "no action" alternative), the current and potential threats to human health and the environment that may be posed by contaminants migrating in ground water or surface water, released to the air, leaching through the soil, remaining in the soil, or bioaccumulating in the food chain at the Site. A glossary of the key risk terms from the Baseline Risk Assessment used in the ROD is provided at the end of this Decision Summary.

Based on the Baseline Risk Assessment discussed below, actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Human Health Risks

Contaminants of Concern

The initial step of the Baseline Risk Assessment was to compile a list of key indicator contaminants, those which represent the highest potential risk to human health. The following contaminants of concern were judged to represent the major potential health risks at the Site:

arsenic	benzoic acid
chromium	2,4-dimethylphenol
copper	2-methylphenol
zinc	4-methylphenol
benzene	pentachlorophenol
ethylbenzene	phenol
styrene	PAHs
toluene	dioxins
xylenes	furans

Of these contaminants, arsenic, chromium, benzene, styrene, pentachlorophenol, some of the PAHs, dioxins, and furans are known to cause cancer in humans and/or laboratory animals and thus are classified as carcinogens.

EPA has classified arsenic as a Group A Human Carcinogen, based on extensive evidence of human carcinogenicity through inhalation and ingestion exposure. Regarding noncarcinogenic effects, arsenic compounds have been shown to produce acute and chronic toxic effects, including irreversible systemic damage at high doses. EPA has also listed hexavalent chromium as a Group A Human Carcinogen via inhalation only, based on positive animal studies and positive epidemiological studies. Regarding noncarcinogenic effects, hexavalent chromium is a respiratory tract irritant following inhalation and occupational exposure to chromium compounds by inhalation has resulted in changes in the kidney and liver. EPA has classified copper as a Group D Carcinogen--not classified. Regarding noncarcinogenic effects, copper has toxic effects at high dose levels including gastrointestinal disturbances, hemolytic anemia, and liver damage.

EPA has classified PCP as a Group B2 Probable Human Carcinogen because there is sufficient evidence of carcinogenicity in animals but insufficient data in humans. There are a wide range of noncarcinogenic effects associated with PCP, including hepatic toxicity, kidney toxicity, and central and peripheral nervous system toxicity.

EPA has classified TCDD-dioxin as a Group B2 Probable Human Carcinogen because there is sufficient evidence of carcinogenicity in animals but insufficient data in humans. There are four major noncarcinogenic effects associated with exposure to TCDD: chloracne, the wasting syndrome, hepatoxicity, and immunotoxicity.

Exposure Assessment

The goal of the exposure assessment is to determine the type and magnitude of human exposure to the contaminants present at, and migrating from, the Site. The exposure assessment was conducted to estimate the Site risks if remedial action is not taken.

To determine if human and environmental exposure to the contaminants of concern might occur in the absence of remedial action, an exposure pathway analysis was performed. An exposure pathway has four necessary elements: 1) a source and mechanism of chemical release; 2) an environmental transport medium; 3) a human or environmental exposure point; and 4) a feasible human or environmental exposure route at the exposure point. The potential for completion of exposure pathways at the Site is described in the following sections.

Transport Pathways

For any particular site, there may be a variety of potential exposure routes, with either simple or complex pathways. The simple pathways are of primary significance at the Site. Such simple exposure routes for humans generally include consumption of ground water, bathing with ground water, inhalation of volatile contaminants in ground water during showering, consumption of surface water, bathing with or playing in surface water, ingestion of soil, dermal exposure to soil, and inhalation of fugitive dust emissions. The ingestion pathways are the most important at the Site, based on Site constituents and contaminant distribution. Complex exposure routes are significantly less important at the Site than simple pathways because the primary contaminants have not been shown to bioaccumulate. Furthermore, sampling data indicate that only minimal offsite migration of contaminants has occurred in any environmental media to date.

The transport pathways evaluated at the Site include ground water, soils, sediments, and runoff water. Based on the results of the sampling performed as part of the RI, the five primary areas of contamination associated with the Site are as follows:

- Surface soils throughout the Site;
- Sediments in the unlined pond;
- DNAPL soils;
- Ground water plumes centered around the treatment area and the unlined pond; and
- Sediments in North Run Creek and Wetlands A, B, and C.

The contaminants of greatest concern with respect to potential exposure are those in the surface soils which are distributed throughout the Site. Currently, exposure to sediments at the bottom of the unlined pond is unlikely. However, if the property is developed, future residents could potentially be exposed. The DNAPL soils, CCA Disposal Area, and Fill Area are principal threats according to EPA guidance. Exposure to ground water does not currently occur but must be considered for future use according to EPA requirements. Exposure to the sediments and surface water in the wetlands and North Run Creek may potentially take place when children wade or play in these areas. Also, continued flow of runoff may move the sediments further downstream. It should be noted that sampling downstream of the oxbow of North Run Creek indicates that the levels of contamination in the sediments and surface water decrease rapidly away from the Site.

Exposure Scenarios

The Baseline Risk Assessment developed for the Site incorporates a hybrid of EPA methodologies from the Superfund Health Evaluation Manual (EPA/540/1-86/060) and the Risk Assessment Guidance for Superfund (EPA/540/1-89/002) included in the Administrative Record File. As part of this assessment, the exposure point concentrations, or estimates of the chemical concentrations that will be contacted over time, were determined by the arithematic mean of the detected constitutents selected for evaluation rather than the upper 95th percentile upper confidence limit required by the Risk Assessment Guidance for Superfund. The future use scenario utilized for the Site is light industrial. Three scenarios, encompassing the likeliest potential exposure pathways, have been evaluated in the Baseline Risk Assessment. They are:

- Scenario 1: Worker exposure to soil contaminants;
- Scenario 2: Exposure to surface water contaminants; and

• Scenario 3: Hypothetical ground water usage exposure.

Scenario 1 addresses surface soil related exposures that could occur to adult workers under the light industrial outdoor exposure scenario. Since the soils are contaminated with metals and relatively nonvolatile organic compounds, the worker exposure scenario addresses exposure from ingestion and dermal adsorption of contaminants in soil, and inhalation of soil contaminants entrained in airborne particulates. The key variables in the worker exposure scenario include a soil ingestion rate of 100 mg/day, an exposure frequency of 250 days/year, an exposure duration of 30 years in a 70-year lifetime, an exposure time of 8 hours/day, and an inhalation rate of 2.1 m^3/day.

Scenario 2 addresses surface water related exposures that could occur if children were to periodically wade or play in North Run Creek downstream of the Site. In this scenario, two exposure pathways (ingestion and dermal adsorption of contaminants in surface water) have been evaluated for children aged 5 to 15. Key variables in the surface water exposure scenario are an exposure time of 1 hour per day, an exposure frequency of 100 days per year, an exposure duration of 10 years, and an ingestion rate of 2 liters per year or 0.02 liters per day.

Scenario 3 addresses potential ground water exposures that could occur as a result of future use of ground water from the Site. The exposure pathways evaluated are ingestion of ground water and dermal absorption during showering. Key variables in the ground water usage scenario are a water ingestion rate of 2.0 liters/day, an exposure frequency of 365 days/year, an exposure duration of 30 years, and an exposure time while showering of 0.25 hours per day.

Exposure Point Concentrations

Data gathered during the RI are adequate to predict potential exposure concentrations if the Site has reached steady-state conditions (i.e., when the rate of transport of contaminants is stable and in equilibrium with the environment). In the absence of an established trend in historical data indicating the contrary, the Site was considered to have reached steady-state conditions.

Although the Risk Assessment Guidance for Superfund indicates that the upper 95% confidence limit on the arithmetic averages of contaminant concentrations are to be used to estimate exposures, the arithmetic mean of the detected contaminants was utilized because the Baseline Risk Assessment was initiated prior to finalization of the guidance document. Also, even though average concentrations were used in the Baseline Risk Assessment, rather than the more conservative levels dictated by EPA guidance, an unacceptable risk was calculated for the Site.

The exposure point concentrations are those of the contaminants in shallow soil, ground water and surface water. Exposure from ingestion of ground water is calculated only to characterize the potential risk from contaminants there. The ground water itself is not used at the Site, but EPA guidance requires that an assessment be performed based on the possibility that the ground water could be used as a water supply in the future. It appears that hydraulic communication has occurred (and may still be occurring) at the Site between the perched ground water unit and the saprolite ground water unit. In addition, installation of the initial monitoring wells could have contributed to the movement of contamination since they were not double-cased through the intervening hardpan layer. Also, the hardpan layer is absent in some areas of the Site and thins out in the vicinity of North Run Creek.

Therefore, two exposure estimates were made for the future use scenario, one for ground water from the perched ground water unit and one for ground water from the saprolite ground water unit. In addition, a third exposure for the use of the bedrock ground water was performed in order to ascertain whether contaminants from the Site had migrated there.

Toxicity Assessment

The purpose of the toxicity assessment is to compile toxicity and carcinogenicity data for the chemicals of concern and to provide an estimate of the relationship between the extent of exposure to a contaminant and the likelihood and/or severity of adverse effects. The toxicity assessment was performed in two steps - hazard identification and dose-response relationship. Hazard identification is a qualitative description of the potential toxic properties of the chemicals of concern present at the Site. The dose-response evaluation is a process that results in a quantitative estimate or index of toxicity for each contaminant at the Site. For carcinogens, the index is the cancer potency factor and for non-carcinogens, it is the Reference Dose.

Cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, 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 CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely.

Cancer potency 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.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals 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 chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

Risk Characterization

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., $1x10^{-6}$ or 1E-6). An excess lifetime cancer risk of $1x10^{-6}$ indicates that, as a plausible upper bound, an individual has a one in one million 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 a site. EPA considers excess lifetime cancer risks in the range of 10^{-4} to 10^{-6} to be acceptable. Table 1 identifies Site media that exceed this range.

In the absence of remedial action, the Site soils present a total excess lifetime cancer risk of 4.7×10^{-3} for the average case exposure from incidential ingestion, inhalation, and dermal absorption. In other words, without remedial action, approximately five additional people per one thousand have an increased chance of developing cancer as a result of exposure to the soil at the Site.

The excess lifetime cancer risk from oral and dermal exposure to the average concentrations of contaminants in perched ground water is 9.5×10^{-2}. In other words, if no remedial action is taken, approximately one additional person per ten people has a chance of contracting cancer as a result of exposure to the perched ground water. The majority of this risk is due primarily to the ingestion of PAHs in the contaminated perched ground water. The excess lifetime cancer risk determined from ingestion and dermal absorption of average contaminant concentrations in the saprolite ground water is 1.9×10^{-2}. In other words, if no remedial action is taken, approximately 2

TABLE 1

Site Media Posing Unacceptable
Carcinogenic Risks

Media		Carcinogenic Risk
Soil		
Incidental Ingestion		6.5×10^{-4}
Dermal Absorption		4.0×10^{-3}
	Total:	4.7×10^{-3}
Perched Ground Water		
Ingestion		8.9×10^{-2}
Dermal Absorption		5.7×10^{-3}
	Total:	9.5×10^{-2}
Saprolite Ground Water		
Ingestion		1.8×10^{-2}
Dermal Absorption		1.3×10^{-3}
	Total:	1.9×10^{-2}

additional people per hundred have a chance of contracting cancer as a result of exposure to the saprolite ground water. The majority of this risk is due primarily to the ingestion of PCP and dioxins in the contaminated saprolite ground water.

Potential concern for non-carcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). The Hazard Index (HI) is calculated by adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed. The HI provides a reference point to gauge the potential significance of multiple contaminant exposures within a single medium or across media.

To determine the human health effects from the non-carcinogenic contaminants, EPA uses the HI. Any media with a cumulative HI equal to or greater than 1.0 is considered to pose a potential risk to human health. The Site media which have an HI equal to or greater than 1.0 are listed at Table 2.

With an HI of 4.5, arsenic, chromium, PCP and one of the PAHs would pose a human health risk through the incidential ingestion, inhalation, and dermal absorption of the Site soils.

With a total HI of 53.3, arsenic and one of the PAHs pose human health risks through ingestion and dermal absorption of the perched ground water. With a total HI of 37.9, one of the PAHs also poses human health risks through ingestion and dermal absorption of saprolite ground water.

The human health risks (both cancerous and noncancerous) from exposure to perched and saprolite ground water provide a reference point for evaluating future ground water risks; it does not represent actual present day exposures since the ground water contamination is confined to the area beneath the Site and no one is utilizing the contaminated portions of either aquifer as a source of domestic water. Although the perched and saprolite ground water units have the characteristics of a Class IIA aquifer, domestic use of the ground water from these units is not likely to occur since a public water source is already available.

Significant Sources of Uncertainty

The general limitations inherent in the risk assessment process as well as the uncertainty related to some of the major assumptions in this assessment include:

1. The assumption that the contaminants at the Site have reached steady-state conditions.

TABLE 2

Site Media Posing Unacceptable
Hazard Indices

Media		Hazard Index
Soil		
Incidental Ingestion		1.7
Dermal Absorption		1.4
Inhalation		1.4
	Total:	4.5
Perched Ground Water		
Ingestion		47.3
Dermal Absorption		6.0
	Total:	53.3
Saprolite Ground Water		
Ingestion		29.3
Dermal Absorption		8.6
	Total:	37.9

2. The uncertainties in the exposure assessment including the current and future land uses and identification of possible exposure pathways, parameter value uncertainty, and determination of exposure point concentration.

3. The uncertainties in the toxicity values that are used to estimate potential risk and toxic hazard.

Environmental Risks

An environmental assessment was performed to determine if contaminants related to the Site are present in nearby surface waters and sediments in available concentrations sufficient to cause adverse ecological impacts. The contaminants evaluated include: arsenic, chromium, copper, dioxins, furans, PAHs, PCP, and zinc.

No State parks, cooperative public hunting areas, unperturbed forest or critical habitats exist in the vicinity of the Site. However, North Run Creek, Wetlands A, B and C, and Talley's Pond are areas in which surface water and sediments show evidence of Site-related contaminants. The results of the Phase I RI surface water sampling and analysis indicate the presence of inorganic contaminants within North Run Creek and within Wetlands B and C. Concentrations of total (unfiltered) arsenic, copper, iron, and zinc within the wetland areas exceed chronic Federal and Virginia ambient water quality criteria (AWQC) for freshwater life. Within North Run Creek, the copper AWQC was slightly exceeded at all stations (including the background station); the arsenic AWQC was exceeded at the two stations located just downstream from the Site; and the zinc AWQC (Virginia) was exceeded at most locations (including the background station). The Phase I data also demonstrate the presence of PCP in the surface water collected from Wetlands B and C. These detections were within the AWQC value of 13 $\mu g/l$.

The Phase II RI data (North Run Creek only) indicate that the arsenic AWQC (chronic and acute) was exceeded only at the station just north of the Site (SW-3) and the copper AWQC was exceeded at SW-3 and SW-5.

Although potential impacts from surface water to organisms is indicated by comparison to AWQCs, the chronic and acute aquatic toxicity testing conducted during the Phase II RI indicates that there is no significant impact to aquatic organisms in North Run Creek.

Regarding sediments, the Phase I RI data indicate that arsenic concentrations are elevated at stations SE-3 (the same station in North Run Creek where SW-3 was taken), SE-6 (Wetland C), and SE-8 (Wetland B); chromium concentrations are elevated at stations SE-6 and SE-8; and copper is elevated at station SE-8.

PCP and PAHs were also detected in the sediments at stations SE-3, SE-6, and SE-8. All of these stations are in areas of deposition in either North Run Creek, Wetland B, or Wetland C where accumulation of contaminants is expected to occur. The Phase II RI data indicate that arsenic, chromium, and copper are present at elevated concentrations in sediments of North Run Creek at SE-3, and that arsenic concentrations are slightly elevated at SE-13 (Talley's Pond).

Concentrations of inorganic and organic contaminants detected in the wetland areas and inorganic contaminants detected in North Run Creek indicate the potential for impact to organisms. Observations made of the wetland areas directly adjacent to the Site indicate the presence of stressed flora and a general absence of fauna or signs of fauna. These areas correspond to detections of elevated concentrations of site-related contaminants, which have apparently contributed to the degradation of flora and fauna. Observations of the Wetland A, adjacent to North Run Creek, showed no signs of stress and signs of fauna were generally abundant.

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

G. Description of Alternatives

In accordance with the National Oil and Hazardous Substances Contingency Plan (NCP), 40 C.F.R. Section 300.430(e)(9), remedial response actions were identified and screened for effectiveness, implementability, and cost during the FS to meet remedial action objectives at the Site. The technologies that passed the screening were assembled to form remedial alternatives. The alternatives were then evaluated using the nine criteria required by 40 C.F.R. Section 300.430(e)(9). The FS evaluated a variety of technologies used in the development of alternatives for addressing soil at the Site, ground water in both the perched and the saprolite units, sediments in the unlined pond, sediments in Wetlands A, B, and C, and the remaining structures on the Site. The technologies and the approaches contained in the alternatives listed below have been determined to be the most applicable for this Site. The descriptions of Alternatives 1 through 5 reflect the descriptions in the FS. Alternative 6 was developed after receipt of the final FS. The capital costs, the Operation and Maintenance (O&M) costs, present worth costs, and months to implement for each of the alternatives listed below are estimates based on present information.

Common Elements

Ground Water Monitoring. All of the alternatives include a 5-year review pursuant to Section 121(c) of CERCLA and thirty years of ground water monitoring. Ground water monitoring will be used to evaluate the protectiveness of each remedial action because contamination will be left in place. EPA will determine the appropriate number and location of the monitoring wells during the design phase. The monitoring will include, but not be limited to, the requirements of Section 10.5.H of the Virginia Hazardous Waste Management Regulations (VHWMR), VR 672-10-1. The ground water monitoring will be performed for at least thirty years, in accordance with the VHWMR. The monitoring will test for arsenic, chromium, copper, zinc, PAHs, and PCP since these were the primary contaminants detected in the ground water during the RI sampling.

Except for Alternative 1 ("No Action"), each remedial alternative for the Site includes the following elements:

Institutional Controls. Institutional controls, including deed restrictions and restrictions on the use of the ground water, will be implemented. The deed restrictions will prohibit residential development of the Site in order to prevent exposure to contaminated soil. The deed restrictions are required since none of the alternatives developed include complete remediation of the contaminated Site soils. The restrictions on the use of the ground water at the Site will prevent exposure to the contaminated ground water.

Closure of Unlined Pond. Closure and post closure of the unlined pond will be in accordance with Section 10.10.I of the VHWMR, surface impoundments closure and post closure requirements. Since the K001 waste is a RCRA listed waste, it must be disposed of in a Subtitle C facility. Because of the previous removal of sediments from the unlined pond, it is not known at what level, if any, dioxins may exist. If there are high concentrations of dioxins/furans in the K001 waste, they will be chemically dechlorinated onsite prior to offsite treatment and disposal.

Existing Structures. Site remediation will require demolition and removal of all existing structures on the Site, including the concrete drip pad, holding pond, shop, office and shed. It is anticipated at this time that only the concrete drip pad and holding pond will require decontamination by high pressure steam cleaning prior to disposal in an approved landfill.

Alternative 1: NO ACTION

Capital Cost:	*$ 000*
Annual O&M Cost:	*$ 11,000*
Present Worth:	*$169,000*

The NCP, 40 C.F.R. Part 300, which regulates Superfund response actions, requires that a "no action" alternative be evaluated at every NPL site in order to establish a baseline for comparison. Under this alternative, EPA would take no further action at the Site to prevent exposure to the contaminated media or to reduce risks at the Site. Monitoring of the contaminated ground water would be implemented.

Alternative 2: CAP WITH SLURRY WALL

Capital Cost:	*$ 9,740,000*
Annual O&M Cost:	*$ 17,000*
Present Worth:	*$10,001,000*

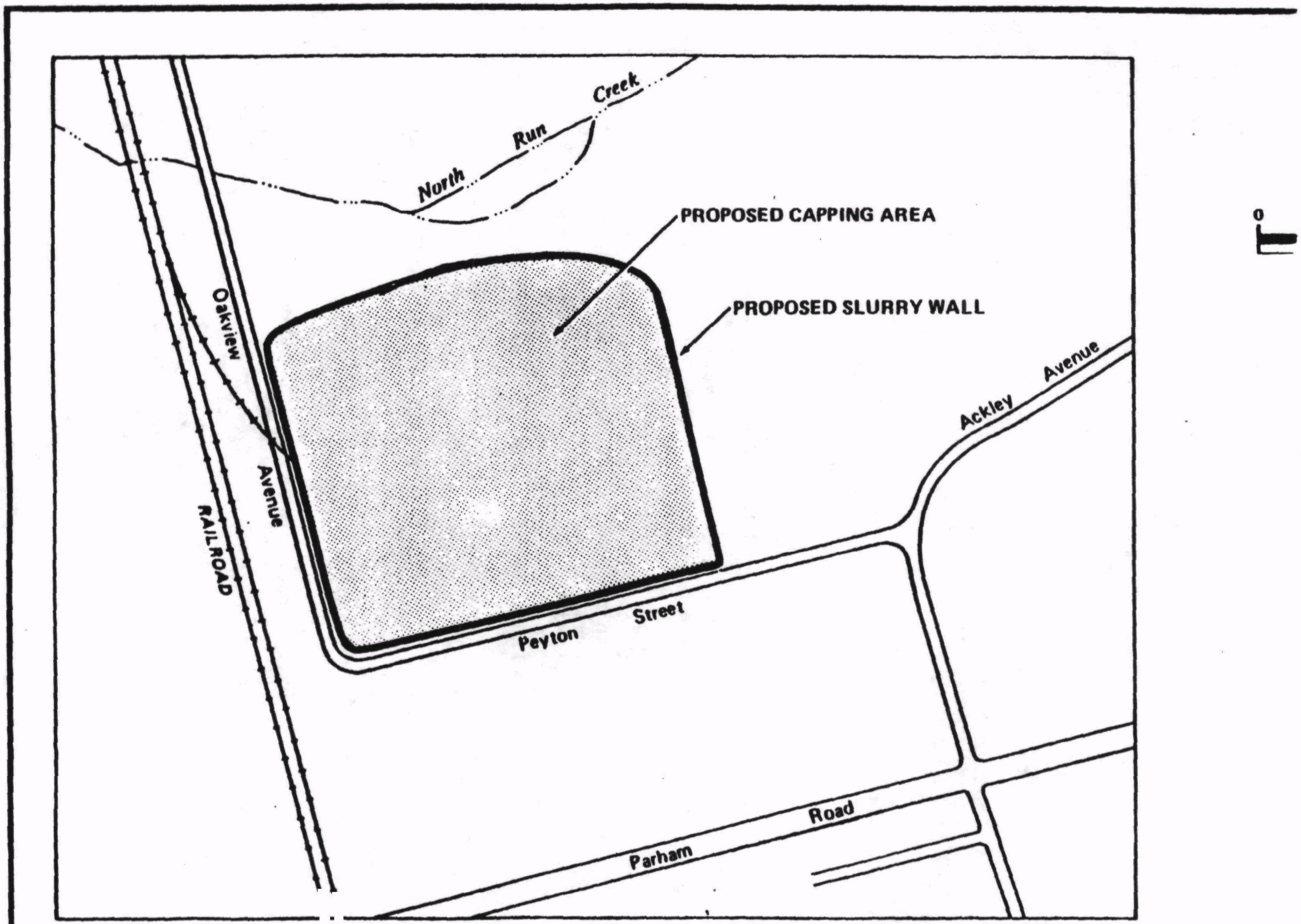
Alternative 2 consists of the construction of an approximately 11.5 acre RCRA Subtitle C capping system over the Site and a slurry wall around the perimeter of the cap (Figure 15). The costs above reflect the installation of a rigid cap. However, the capping system could be either rigid (such as concrete or asphalt) or non-rigid (such as clay or membrane). In either case, the cap would be designed to meet the landfill closure requirements as provided at Part 10 of the VHWMR. Prior to the construction of the cap, approximately 70 cubic yards of K001 waste would be excavated and treated in an offsite incinerator. The K001 waste would be chemically dechlorinated onsite if the level of dioxins/furans present in the sediment prevent treatment in an offsite incinerator. Approximately 7,200 cubic yards of soil located off of the wood treating facility property containing concentrations of arsenic, PAHs, or PCP which exceed the Site-specific cleanup levels would be excavated and disposed of offsite. The Site-specific health based cleanup levels developed for the Site are: 5.1 mg/kg for total carcinogenic PAHs, 48 mg/kg for PCP, and 33 mg/kg for arsenic.

The time required to implement this alternative is estimated at approximately 8 to 12 months.

Alternative 3: LOW TEMPERATURE THERMAL DESORPTION

Capital Cost:	*$18,176,000*
Annual O&M Cost:	*$ 62,000*
Present Worth:	*$19,129,000*

Alternative 3 consists of: (1) excavation of approximately 22,700 cubic yards of surface soil (the top two feet) which exceed the cleanup level for PAHs and PCP; (2) excavation of approximately 8,600 cubic yards of subsurface soil contaminated with DNAPLs; (3) onsite treatment of PCP and PAHs by Low Temperature Thermal Desorption (LTTD), (4) fixation of the LTTD-treated soils and the 13,700 cubic yards of surface soil which exceed the cleanup level for arsenic; (5) onsite disposal of the soil which meets the cleanup levels; and (6) passive


North Run Creek
PROPOSED CAPPING AREA
PROPOSED SLURRY WALL
Oakview Avenue
RAILROAD
Ackley Avenue
Peyton Street
Parham Road

FGEND:

Fi 15

collection and onsite carbon adsorption treatment of contaminated ground water. The Site-specific health based cleanup levels developed for the Site are: 5.1 mg/kg for total carcinogenic PAHs, 48 mg/kg for PCP, and 33 mg/kg for arsenic. These cleanup levels equate to a 10^{-6} risk to human health.

After demolition and removal of the existing structures, gravels that have been spread over the contaminated soil will be collected by screening and washed before excavating the contaminated soil. The excavated soil would be transported to the LTTD system located on the Site. Once in the LTTD unit, the contaminated soil would be heated to 300 to 800° F, causing the organics in the soil to volatilize into the air stream. The organics vaporized in the LTTD system, including PCP and the PAHs, would be removed with a carbon adsorption system. The carbon would be regenerated at an offsite facility. The LTTD system would contain air pollution control equipment enabling it to meet federal and Virginia air emission requirements and eliminating any unacceptable risks to human health or the environment. Treatability studies of the LTTD system would have to be performed during the remedial design phase to determine the contaminant removal levels as well as to maximize the operating parameters.

The LTTD-treated soil and remaining surface soil exceeding the health-based cleanup level of 33 mg/kg of arsenic will be treated by means of chemical fixation. The chemical fixation process is a series of chemical reactions involving various combinations of chemical reagents with a waste material to form a chemically stable solid. Because a reagent would be added to the soil during the fixation process, the volume of treated soil would typically increase by an estimated 20 to 30 percent. Treatability studies of the chemical fixation system would have to be performed during the remedial design phase to determine the contaminant removal levels as well as to maximize the operating parameters.

The passive ground water collection system would consist of approximately 3,000 feet of interceptor trench generally constructed along the downgradient edge of the contaminated ground water, in the former wood treating area, and in the area of the unlined pond. The trench would be installed atop the bedrock, which ranges in depth from 12 to 27 feet. Ground water would be treated with a carbon adsorption system to meet the discharge requirements for discharge to North Run Creek. The carbon would be regenerated in an offsite facility. Precipitation treatment may also be required to remove any remaining metals from the ground water. If so, any sludges produced in the treatment of the ground water would be disposed of at an offsite facility. Treatability studies of the carbon adsorption system would have to be performed during the remedial design phase to determine the contaminant removal levels, whether metals precipitation is required and to maximize the operating parameters. The 70 cubic yards of K001 waste will be excavated from the unlined pond and treated in an offsite incinerator. The K001 waste would be chemically dechlorinated onsite if the level of dioxins/furans present in the sediment prevent their disposal in an offsite incinerator.

The costs for Alternative 3 stated above reflect backfilling of the treated soil onsite and covering the backfilled soil with six inches of clean soil. If, however, ARARs do not allow backfilling of treated soil onsite, the soil would have to be treated to meet the level for disposal in an offsite landfill.

The time required to implement this alternative is estimated at approximately two years.

Alternative 4: INCINERATION

Capital Cost:	*$26,443,000*
Annual O&M Cost:	*$ 62,000*
Present Worth:	*$27,396,000*

Alternative 4 consists of: (1) excavation of approximately 22,700 cubic yards of the top two feet of surface soil which exceeds the cleanup level for PAHs and PCP; (2) excavation of approximately 8,600 cubic yards of subsurface soil contaminated with DNAPLs; (3) onsite treatment of PCP and PAHs by incineration; (4) fixation of the incinerator ash and the 13,700 cubic yards of surface soil (top two feet) which exceed the cleanup level for arsenic; and (5) passive collection and carbon adsorption treatment of the contaminated ground water. The Site-specific health based cleanup levels developed for the Site are: 5.1 mg/kg for total carcinogenic PAHs, 48 kg/kg for PCP, and 33 mg/kg for arsenic. These cleanup levels equate to a 10^{-6} risk to human health.

After demolition and removal of the existing structures, gravels that have been spread over the contaminated soil should be collected by screening and washed before excavating the contaminated soil. The excavated soil would be transported to the incinerator located on the Site. The incinerator would be required to achieve at least 99.99 percent destruction and removal efficiency (DRE) for the organic contaminants in the soil and to meet other pertinent RCRA incineration standards at 40 C.F.R. 264, Subpart O. The incinerator would include a stack, a mechanical system to feed the contaminated materials into the refractory-lined kiln, a secondary combustion chamber or afterburner to maximize combustion efficiency, and an air pollution control system such as a Venturi scrubber or a baghouse filter to remove particulates (and acid gases, if present) from the exhaust gases. A test burn would be required during the remedial design phase to confirm that the incinerator is capable of meeting the DRE for the organic contaminants in the soil.

The incinerator ash and remaining surface soil exceeding the health-based cleanup level of 33 mg/kg for arsenic would then be treated by means of chemical fixation. The chemical fixation process is a series of chemical reactions involving various combinations of chemical reagents with a waste material to form a chemically stable solid. Because a reagent would be added to the soil during the fixation process, the volume of treated soil would typically increase by an estimated 20 to 30 percent. Treatability studies of the chemical fixation system would have to be performed during the remedial design phase to determine the contaminant removal levels as well as to maximize the operating parameters.

The passive ground water collection system would consist of approximately 3,000 feet of interceptor trench generally constructed along the downgradient edge of the contaminated ground water, in the former wood treating area, and in the area of the unlined pond. The trench would be installed atop the bedrock, which ranges in depth from 12 to 27 feet. Ground water would be treated with a carbon adsorption system to meet the discharge requirements for discharge to North Run Creek. The carbon would be regenerated in an offsite facility. Precipitation treatment may also be required to remove any remaining metals from the ground water. If so, any sludges produced in the treatment of the ground water would be disposed of at an offsite facility. Treatability studies of the carbon adsorption system would have to be performed during the remedial design phase to determine the contaminant removal levels, whether precipitation of metals is required and to maximize the operating parameters.

The K001 waste would be excavated, chemically dechlorinated onsite if high concentrations of dioxins/furans are detected, and incinerated onsite. After incineration, the K001 waste would be disposed of at an offsite facility.

The costs for Alternative 4 stated above reflect backfilling of treated soil and incinerator ash onsite and covering with six inches of clean soil. If, however, ARARs do not allow backfilling of treated soil onsite, the soil would have to be treated to meet the level for disposal in an offsite landfill.

The time required to implement this alternative is estimated at approximately three years.

Alternative 5: **SOLVENT EXTRACTION**

Capital Cost:	*$22,376,000*
Annual O&M Cost:	*$ 62,000*
Present Worth:	*$23,329,000*

Alternative 5 consists of: (1) excavation of approximately 22,700 cubic yards of surface soil (top two feet) exceeding the cleanup level for PAHs and PCP; (2) excavation of approximately 8,600 cubic yards of subsurface soil contaminated with DNAPLs; (3) onsite removal of PCP and PAHs by solvent extraction; (4) fixation of the solvent extracted-treated soil and the 13,700 cubic yards of surface soil (top two feet) exceeding the cleanup level for arsenic; and (5) passive collection and onsite carbon adsorption treatment of contaminated ground water. The Site-specific health based cleanup levels developed for the Site are: 5.1 mg/kg for total carcinogenic PAHs, 48 kg/kg for PCP, and 33 mg/kg for arsenic. These cleanup levels equate to a 10^{-6} risk to human health.

The oily residue generated from the solvent extraction process will be treated by chemical dechlorination to remove the expected high levels of dioxins/furans and then incinerated offsite.

The passive ground water collection system would consist of approximately 3,000 feet of interceptor trench constructed generally along the downgradient edge of the contaminated ground water, in the former wood treating area, and in the area of the unlined pond. The trench would be installed atop the bedrock, which ranges in depth from 12 to 27 feet. Ground water would be treated to meet the discharge requirements for discharge to North Run Creek. Any sludges produced in the treatment of the ground water would be disposed of at an offsite facility.

The K001 waste would be excavated and treated in an offsite incinerator. The K001 waste would be chemically dechlorinated onsite if the level of dioxins/furans present in the sediment prevents their treatment in an offsite incinerator.

The costs for Alternative 5 stated above reflect backfilling of treated soil onsite beneath a six inch cover of clean soil. If, however, ARARs do not allow backfilling of treated soil onsite, the soil would have to be treated to meet the level for disposal in an offsite landfill.

The time required to implement this alternative is estimated at approximately two years.

Alternative 6: OFFSITE DISPOSAL AND CAP

Capital Cost: *$21,663,000*
Annual O&M Cost: *$ 62,000*
Present Worth: *$22,616,000*

Alternative 6 consists of: (1) excavation of approximately 22,700 cubic yards of surface soil (top two feet) exceeding the cleanup level for PAHs and PCP; (2) excavation of approximately 8,600 cubic yards of subsurface soil contaminated with DNAPLs; (3) offsite disposal of the excavated soil in an approved landfill; (4) backfilling the excavated area with clean fill; (5) construction of an approximately 11.5 acre two-foot thick soil cover over the entire Site; and (6) collection and onsite carbon adsorption treatment of contaminated ground water. The Site-specific health based cleanup levels developed for the Site are: 5.1 mg/kg for total carcinogenic PAHs, 48 mg/kg for PCP, and 33 mg/kg for arsenic. These cleanup levels equate to a 10^{-6} risk to human health.

The soil cover would consist of one foot of clean fill and one foot of top soil. The surface of the soil cover would be vegetated.

The ground water collection system would consist of approximately 3,000 feet of interceptor trench constructed generally along the downgradient edge of the contaminated ground water, in the former wood treating area, and in the area of the unlined pond. The trench would be installed atop the bedrock, which ranges in depth from 12 to 27 feet. Ground water would be treated to meet the discharge requirements for discharge to North Run Creek. Any sludges produced in the treatment of the ground water would be disposed of at an offsite facility.

The K001 waste would be excavated and treated in an offsite incinerator. The K001 waste would be chemically dechlorinated onsite if the level of dioxins/furans present in the sediment prevent their treatment in an offsite incinerator.

The time required to implement this alternative is estimated at approximately 12 months.

The costs developed for all of the above alternatives are estimates. The annual Operation and Maintenance (O&M) costs include the cost of annual sampling of four of the existing monitoring wells for 30 years. The costs developed in the FS include analysis of ground water samples for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals.

H. Summary of Comparative Analysis of Alternatives

All of the six remedial action alternatives described above were assessed in accordance with the nine evaluation criteria as set forth in the NCP at 40 C.F.R. Section 300.430(e)(9). These nine criteria are categorized below into three groups: threshold criteria, primary balancing criteria, and modifying criteria.

THRESHOLD CRITERIA

1. Overall protection of human health and the environment; and
2. Compliance with applicable or relevant and appropriate requirements (ARARs).

PRIMARY BALANCING CRITERIA

3. Long-term effectiveness and permanence;
4. Reduction of toxicity, mobility, or volume through treatment;
5. Short-term effectiveness;
6. Implementability; and
7. Cost.

MODIFYING CRITERIA

8. State acceptance; and
9. Community acceptance.

These evaluation criteria relate directly to requirements in Section 121 of CERCLA, 42 U.S.C. Section 9621, which determine the overall feasibility and acceptability of the remedy.

Threshold criteria must be satisfied in order for a remedy to be eligible for selection. Primary balancing criteria are used to weigh major trade-offs between remedies. State and community acceptance are modifying criteria formally taken into account after public comment is received on the Proposed Plan. A summary of the relative performance of the alternatives with respect to each of the nine criteria follows. This summary provides the basis for determining which alternative provides the "best balance" of tradeoffs with respect to the nine evaluation criteria.

1. Overall Protection of Human Health and the Environment

A primary requirement of CERCLA is that the selected remedial action be protective of human health and the environment. A remedy is protective if it reduces current and potential risks to acceptable levels within the established risk range posed by each exposure pathway at the Site.

Alternatives 3, 4, 5 and 6 are equally the most protective of human health and the environment. These alternatives achieve this protection by either treatment or removal of most of the contamination at the Site and implementing institutional controls. Alternative 2 provides adequate protection of human health and the environment by controlling the risks posed by the exposure pathways through construction of a capping system and slurry wall and implementing institutional controls.

Alternatives 2-6 all include demolition, decontamination, and offsite disposal of the existing structures, excavation, treatment, and offsite disposal of the K001 waste, and closure of the unlined pond. Alternatives 3, 4, and 5 also include excavation and treatment of the top two feet of Site soils and DNAPL soils as well as collection and treatment of the ground water. Under Alternatives 3, 4, and 5 the soil would be treated to health-based levels and disposed of onsite. Under Alternative 6, the excavated soil would be disposed of untreated in an approved offsite landfill and replaced with two feet of clean soil to prevent surface exposure to the remaining contaminants. Under Alternatives 3, 4, 5, and 6 the ground water would be treated to the substantive requirements equivalent to those of a Virginia Pollution Discharge Elimination System (VPDES) permit and the effluent discharged to North Run Creek. Treatment and proper disposal of these contaminated media would further reduce the risks at the Site associated with direct contact.

Alternative 1 accomplishes none of the above. Because contaminant levels already exceed health-based levels, Alternative 1 would not be protective of human health or the environment. Since protection of human health and the environment is a threshold criteria for any Superfund action, this alternative cannot be selected and thus will not be evaluated any further with regard to the other evaluation criteria.

2. Compliance with ARARs

This criterion addresses whether a remedy will meet all of the Applicable or Relevant and Appropriate Requirements (ARARs) of other environmental statutes and/or provide grounds for invoking a waiver under the NCP at 40 C.F.R. Section 300.430(f)(1)(ii)(C).

Under all of the alternatives, decontamination and disposal of the existing structures would comply with state and federal regulations, particularly Part VIII of the Virginia Solid Waste Management Regulations (VSWMR) and those portions of 40 C.F.R. Part 268 dealing with contaminated/inorganic solid debris.

Under all of the alternatives, the final treatment of K001 waste will be by incineration. Since no offsite incinerators are presently permitted to accept waste containing dioxins/furans, the K001 waste will be treated onsite using chemical dechlorination if it contains dioxins/furans. Closure and post closure of the unlined pond will be in accordance with Section 10.10.I of the VHWMR.

Alternatives 2 through 6 would meet all of the respective ARARs of Federal and Virginia law (see Table 3). Although the Site soils contain F032, F034, and F035 listed RCRA waste (drippage from wood treatment processes which utilize PCP, creosote, or arsenic solutions, respectively), Land Disposal Restrictions (see 40 C.F.R. Part 268) have not been developed yet. Therefore, Alternatives 3, 4, and 5 will comply with Land Disposal Restrictions and Virginia disposal ARARs through excavation, treatment to health-based levels, and onsite disposal of the Site soils. Temporary storage and treatment of contaminated media and/or debris must be in accordance with VHWMR, Section 10.8, Use and Management of Containers, Section 10.9, Tanks, and Section 10.11, Waste Piles. Treatment standards for media which fail the Toxicity Characteristic Leaching Procedure (TCLP) for PCP are presently scheduled to be issued by EPA by June 1993. Treatment standards for soil contaminated with wood treating preservatives are presently scheduled to be issued by EPA by March 1994. Offsite disposal of untreated soil under Alternative 6 would have to be performed prior to implementation of the treatment standards in order to avoid the prohibition on land disposal. Dredging of sediments in North Run Creek or Wetlands A, B, or C would be in compliance with the substantive requirements of a Virginia Water Protection permit, VR 680-15-02.

Capping the soils in-place under Alternative 2 would not trigger Land Disposal Restrictions. However, since the cap cannot be extended all the way into the contaminated portions of Wetlands A, B, or C and the soils in these areas contain RCRA listed wastes (F032, F034, and F035), the contaminated soil in these areas must be either disposed of in a RCRA Subtitle C landfill prior to promulgation of a prohibition on land disposal or treated in accordance with the treatment standards. Under Alternative 6, all of the soil would have to be excavated and disposed of in a RCRA Subtitle C landfill prior to the prohibition on land disposal because none of the soil would be treated under this alternative.

Work within the wetlands under Alternatives 2 through 6 would be in compliance with the Virginia Wetlands Act, Code of Va. §§ 62.1-13.1 - 13.2, and Virginia's Chesapeake Bay Preservation Act, Code of Va. § 10.1-2100 et seq., including the Chesapeake Bay Preservation Area Designation and Management Regulations (CBPA Regulations), VR 173-02-01.

The discharge of treated ground water and any process waters to North Run Creek would have to comply with the substantive

TABLE 3

ARARs

ACTION-SPECIFIC

Standards, Requirements, Criteria, or Limitations	Citation	Description	Applicable/ Relevant and Appropriate	Discussion
Resource Conservation and Recovery Act (RCRA) Regulations	40 C.F.R. Part 268	Land Disposal Restrictions for offsite disposal of debris.	yes/no	Alternatives 2-6.
Clean Water Act (CWA) Regulations	40 C.F.R. Section 122.44	Ambient Water Quality Standards for discharge of ground water treatment system effluent to North Run Creek.	yes/no	Alternatives 3, 4, 5, and 6.
CWA	40 C.F.R. Part 230, 33 C.F.R. Parts 320, 323, and 330	Discharge of fill material into wetlands.	no/yes	Alternatives 2-6.
Virginia Water Quality Standards	Virginia Regulation (VR) 680-21-01	State Water Quality Standards for surface water serve as a source for the establishment of discharge limits of ground water treatment system to North Run Creek.	yes/no	Alternatives 3, 4, 5, and 6.

TABLE 3

ARARs

ACTION-SPECIFIC

Virginia Pollutant Discharge Elimination System (VPDES) Program	VR 680-14-01	Effluent limitations are established on a case-by-case basis.	yes/no	Alternatives 3, 4, 5, and 6.
Virginia Toxics Monitoring Regulation VR 680-14-2.5	Toxics Management Regulation Section 2	Requirements for effluent discharge and receiving stream monitoring.	yes/no	Alternatives 3, 4, 5, and 6.
Virginia Erosion and Sediment Control Law	Virginia Code Sections 10.1-560 et seq.	Methods to control erosion and sedimentation.	yes/no	Alternatives 2-6.
Virginia Hazardous Waste Management Regulations (VHWMR) VR 672-10-1	VHWMR Part 3	Hazardous Waste determination requirements.	yes/no	Alternatives 3, 4, and 5. Since chromium cleanup value not established, treated soil will undergo TCLP to determine if RCRA characteristic waste due to chromium.
VHWMR	VHWMR Section 10.5.H	Ground water monitoring requirements.	no/yes	Alternatives 1-6.
VHWMR	VHWMR Part 10	Onsite stockpiling or staging of soil and other contaminated material.	yes/no	Alternatives 3, 4, 5, and 6.

TABLE 3

ARARs

ACTION-SPECIFIC

VHWMR	VHWMR Parts 3 and 10	Treatment, storage, and disposal of spent carbon.	yes/no	Alternatives 3, 4, 5, and 6 from ground water treatment system. Alternative 3 from LTTD air emission treatment system.
VHWMR	VHWMR Part 7	Transportation of K001 waste, treated soil and sediments, and spent carbon to an offsite facility.	yes/no	Alternatives 2-6 for K001 waste and sediments from North Run Creek and, possibly, Talley's Pond. Alternatives 3, 4, and 5 for soil which does not meet Site-specific cleanup values. Alternative 2 for soil beyond extent of cap. Alternative 6 for all soil. Alternatives 3, 4, 5, and 6 for spent carbon.
VHWMR	VHWMR Part 3	Treated soil and sediments must meet standards in order to no longer be managed as a hazardous waste.	yes/no	Alternatives 3, 4, and 5 for treated soil.

TABLE 3

ARARs

ACTION-SPECIFIC

VHWMR	VHWMR Part 3	Hazardous Waste determination requirements.	yes/no	Alternatives 3, 4, and 5. Since chromium cleanup value not established, treated soil will undergo TCLP to determine if RCRA characteristic waste due to chromium.
VHWMR	VHWMR Section 10.10.I	Closure and post closure requirements for surface impoundments.	yes/no	Alternatives 2-6.
VHWMR	VHWMR Section 10.13.I	Surface impoundments closure and post closure requirements.	yes/no	Alternative 2.
Virginia Solid Waste Management Regulations (VSWMR) VR 672-20-10	VSWMR Part 8	Treated soil and sediments must meet requirements prior to disposal in a solid waste landfill in Virginia.	yes/no	Alternatives 3, 4, and 5 for soil which does not meet Site-specific cleanup values. Alternative 2 for soil beyond extent of cap. Alternative 6 for all soil.
Virginia Regulations for Control and Abatement of Air Pollution	VR 120-01-01	All air emissions from Site activities must meet air regulations.	yes/no	Alternatives 2-6.

TABLE 3

ARARs

CHEMICAL-SPECIFIC

Standards, Requirements, Criteria, or Limitations	Citation	Description	Applicable/ Relevant and Appropriate	Discussion
Safe Drinking Water Act (SDWA) Regulations	40 C.F.R. Section 141.11	Maximum Contaminant Level for discharge of ground water treatment system to North Run Creek.	yes/no	Alternatives 3, 4, 5, and 6.
Virginia Water Quality Standards	Virginia Regulations 680-21-03.2	Site specific limits for discharge of treatment system effluent to North Run Creek.	yes/no	Alternatives 3, 4, 5, and 6.

TABLE 3

ARARs

LOCATION-SPECIFIC

Standards, Requirements, Criteria, or Limitations	Citation	Description	Applicable/ Relevant and Appropriate	Discussion
Executive Order 11990 (Wetlands Protection)	40 C.F.R. Part 6 (Appendix A)	Wetland protection and restoration.	yes/no	Alternatives 2-6.
Virginia Water Protection Permit	VR 680-15-02	Regulates dredging, filling, and excavation activities impacting wetlands.	yes/no	Alternatives 2-6.
Chesapeake Bay Preservation Area Designation and Management Regulations	VR 173-02-01	Limitations on wetland activities having an impact on water quality.	yes/no	Alternatives 2-6.

requirements equivalent to those of a VPDES permit in accordance with Virginia Regulations at (VR) 680-14-01.

All of the alternatives would also comply with Section 10.5.H of the Virginia Hazardous Waste Management Regulations (VHWMR) by instituting long-term monitoring of the ground water both upgradient and downgradient of the Site.

3. Long-Term Effectiveness and Permanence

This evaluation criterion addresses the long-term protection of human health and the environment once remedial action cleanup goals have been achieved, and focuses on residual risks that will remain after completion of the remedial action.

All of the alternatives provide equal long-term effectiveness and permanence regarding existing structures, K001 waste, and closure of the unlined pond.

Alternatives 3, 4, 5, and 6 provide the greatest degree of long-term effectiveness and permanence regarding soils and ground water because they provide for either treatment or offsite disposal of the surface and DNAPL soils as well as treatment of ground water. Under Alternatives 3, 4, and 5, the surface soils and the DNAPL soils would be excavated and treated to health-based levels prior to onsite disposal. The treated soils would then be covered with six inches of clean soil. Under Alternative 6, the surface and DNAPL soils would be excavated and properly disposed of in a RCRA Subtitle C landfill. Under all four of these alternatives, the contaminated ground water would be collected, treated to meet requirements equivalent to those of a VPDES permit and discharged to North Run Creek. Institutional controls would be implemented under each of these four alternatives to prohibit the use of the ground water at the Site and to preclude residential development of the Site. These Alternatives offer the most long-term effectiveness and permanence because they remove hazardous substances from the Site.

For Alternative 2, the risks posed by soil contaminants through the potential exposure pathways would be eliminated only as long as the cap and slurry wall were properly maintained. Alternative 2 therefore offers the least long-term effectiveness and permanence. Because the contaminant sources (soil and ground water) are contained and not treated or removed, long-term threats posed by remedy failure would remain. Ground water within the boundaries of the Site would not be treated. However, this would pose little risk to human health at the Site. The ground water within the Site would not be used for domestic purposes since institutional controls would be implemented as part of the remedy, prohibiting use of ground water onsite and precluding residential development of the Site.

4. <u>Reduction of Toxicity, Mobility, or Volume through Treatment</u>

This evaluation criterion addresses the degree to which a technology or remedial alternative reduces the toxicity, mobility, or volume of a hazardous substance. Although Section 121 (b) of CERCLA, 42 U.S.C. Section 9621(b), establishes a preference for remedial actions that permanently and significantly reduce the toxicity, mobility, or volume of hazardous substances, EPA expects to use a combination of treatment and engineering controls to achieve protection of human health and the environment, as set forth in the NCP at 40 C.F.R. Section 300.430(a)(iii). EPA's expectations are that treatment should be utilized whenever principal threats occur and that containment will be considered for wastes that pose a relatively low long-term threat or where treatment is impracticable.

Based on published data, it is anticipated that Alternatives 3, 4, and 5 would all reduce the toxicity of the contaminants in the surface soil, DNAPL soil and ground water by removing and/or destroying the organic contaminants. However, for all of these alternatives, the actual effectiveness of the different technologies would have to be confirmed by treatability testing performed during the design phase.

All of the alternatives equally reduce the toxicity, mobility, or volume of K001 waste and existing water in the unlined pond. In all of the alternatives, the K001 waste would be excavated, dechlorinated if it contains excessive levels of dioxins/furans, and incinerated. The only difference between the alternatives is that the incineration would take place onsite under Alternative 4 and offsite under the other alternatives. The treatment of the surface water in the pond would be the same under all of the alternatives.

In Alternative 3, the LTTD treatment process would remove the organic contaminants (PCP and PAHs) from the surface and DNAPL soils. Once removed from the soil, the organics would be captured onto carbon adsorption beds. The beds would then be regenerated offsite, destroying the organic contaminants. The LTTD-treated soil and remaining surface soil exceeding the cleanup level for arsenic would then be treated to immobilize inorganic contaminants. The organic contaminants in the ground water would be substantially removed through the carbon adsorption water treatment process. The organic contaminants would be captured during this process and destroyed offsite in the regeneration process. If inorganics exceed the substantive requirements of a VPDES permit, additional treatment would be required to meet these requirements.

In Alternative 4, the incineration treatment process would destroy all of the organic contaminants and volatilize the inorganic contaminants from the surface and DNAPL soils. The incinerator ash and the remaining surface soil which exceeds the cleanup level for arsenic would be treated to immobilize the inorganic contaminants in the soil. The organic contaminants in the ground water would be substantially removed through the carbon adsorption water treatment process. The organic contaminants would be captured during this process and destroyed offsite in the regeneration process. If inorganics exceed the substantive requirements of a VPDES permit, additional treatment would be required to meet these requirements.

In Alternative 5, the solvent extraction treatment process would remove the organic contaminants from the surface and DNAPL soils into the solvent used in the process. The organics would then be removed from the solvent and dechlorinated onsite to treat the dioxins/furans. Following dechlorination, the organics would be destroyed in an offsite incineration treatment process. The solvent extraction-treated soil and remaining surface soil which exceeds the cleanup level for arsenic would then be treated to immobilize the inorganic contaminants in the soil. The organic contaminants in the ground water would be substantially removed through the carbon adsorption water treatment process. The organic contaminants would be captured during this process and destroyed offsite in the regeneration process. If inorganics exceed the substantive requirements of a VPDES permit, additional treatment would be required to meet these requirements.

In Alternative 6, the only reduction of toxicity, mobility, or volume through treatment would occur in the treatment of the contaminated ground water. The organic contaminants in the ground water would be substantially removed through the carbon adsorption water treatment process. The organic contaminants would be captured during this process and destroyed offsite in the regeneration process. If inorganics exceed the substantive requirements of a VPDES permit, additional treatment would be required to meet these requirements. Under this alternative there would be no treatment of the surface or DNAPL soils.

In Alternative 2 there would be no reduction of toxicity, mobility or volume of the contaminated soils or ground water through treatment because none of these media are treated. In Alternative 2, surface soil, DNAPL soil, and ground water is remediated by constructing a capping system and slurry wall.

5. Short-Term Effectiveness

This evaluation criterion addresses the period of time needed to achieve protection of human health and the environment, and any adverse impacts that may be posed during the construction and implementation period of a remedy, until cleanup goals are achieved. The time for completion of the remedial actions for each of the alternatives listed below does not include the time for long-term ground water monitoring, which will be required for all of the remaining alternatives. All of the timeframes listed below are estimates.

All of the alternatives would be equal in short-term effectiveness regarding the demolition, decontamination, and offsite disposal of the existing structures, washing the existing gravel cover, and the treatment of the surface water in the unlined pond. The water from decontaminating the existing structures and washing the existing gravel cover will be collected. This collected water, as well as the surface water in the unlined pond, will be treated in the onsite water treatment system and discharged to North Run Creek. Alternatives 2, 3, 5, and 6 would all be equal in short-term effectiveness regarding the excavation, dechlorination, and offsite disposal of the K001 waste, because the incineration of this waste occurs in an offsite incinerator. The incineration of the K001 waste under Alternative 4 would occur in an onsite incinerator.

Remedial action would be implemented in the shortest amount of time under Alternative 2, approximately one year, and would present the fewest short-term effects. During construction of the approximately 11.5 acre cap and excavation for the slurry wall and the approximately 7,200 cubic yards of surface soil in the wetland areas, there would be a temporary increase in dust production, noise disturbance, and truck traffic at the Site. However, as the alternative with the least amount of excavation, the soils would remain relatively undisturbed. Clean soil would have to be brought into the Site to fill in the excavated areas. Grading of the Site would result in minimal soil disturbance.

Alternative 3 would take approximately 2 years to implement. The amount of soil excavation required (approximately 36,400 cubic yards of surface soil and approximately 8,600 cubic yards of DNAPL soil) would be much more extensive than Alternative 2. As such, the amounts of dust production, noise disturbance, and truck traffic would also be significantly increased. However, dust-suppression techniques would substantially control any dust generated during the remedial action, protecting the workers at the Site and residents in the area of the Site. The LTTD system would be equiped with air pollution control equipment, allowing it to meet federal and Virginia air emission standards and eliminating any unacceptable risks to human health or the environment.

Alternative 4 would take approximately 3 years to implement. The amount of soil to be excavated would be the same as that under Alternative 3. As such, dust-suppression techniques would be required to control any dust that would be generated during the remedial action to protect the workers at the Site and the residents in the area of the Site. The incinerator would be required to achieve at least 99.99 percent destruction and removal efficiency (DRE) for the organic contaminants in the soil and meet other pertinent RCRA incineration standards at 40 C.F.R. Part 264, Subpart O. The incinerator would include a stack, a secondary combustion chamber or afterburner to maximize combustion efficiency, and an air pollution control system such as a Venturi scrubber or a baghouse filter to remove particulates (and acid gases, if present) from the exhaust gases.

Alternative 5 would take approximately 2 years to implement. The amount of soil to be excavated would be the same as that under Alternative 3. Dust-suppression techniques would be required to control any dust that would be generated during the remedial action, protecting workers at the Site and residents in the area of the Site. The solvent extraction process would not require any air pollution control equipment because no air emissions would be generated.

Alternative 6 would take approximately 1 year to implement. The amount of soil to be excavated would be the same as that under Alternative 3. Dust-suppression techniques would control dust generated during the remedial action, thereby protecting workers at the Site and residents in the area of the Site. Since all excavated soil would be disposed offsite, an equal amount of soil would be required to fill in the excavated area. This would entail significantly more truck traffic in the area of the Site, both in the offsite disposal of the contaminated soil and the delivery of clean soil to be placed in the excavated areas.

6. <u>Implementability</u>

This evaluation criterion addresses the technical and administrative feasibility of each remedy, including the availability of materials and services needed to implement the chosen remedy.

The excavation, dechlorination treatment, and offsite disposal of K001 waste would be identical under all alternatives. In all cases, the K001 waste would be incinerated (onsite under Alternative 4 and offsite under the remaining alternatives) and disposed of offsite. The removal and treatment of the surface water in the unlined pond would also be the same under all of the alternatives.

Alternative 2 could be easily implemented. Capping and slurry wall construction have been used at many hazardous waste sites. Construction of the slurry wall at the Site would be compounded compared to standard slurry wall construction because of the addition of a synthetic liner. The liner would be required because the impermeability of bentonite may significantly decrease when it is exposed to high concentrations of creosote, water-soluble salts (copper, chromium, arsenic), or fire retardant salts (borates, phosphates, and ammonia). Long-term maintenance and repairs of the cap and ground water monitoring would be required to assure the integrity of this alternative. Although the cap could be easily extended or repaired, if needed, it would preclude direct soil treatment unless it were removed. The excavation and offsite disposal of the surface soil in the wetlands would have to be completed prior to the enactment of Land Disposal Restrictions for F032, F034, and F035 RCRA listed wastes. If not, these excavated soils would have to be treated prior to disposal in an offsite facility.

Operation of either the LTTD and fixation systems under Alternative 3 or the incineration and fixation systems under Alternative 4 could be readily achieved once treatability tests are completed and the systems' operating parameters are established. The ability of LTTD to meet the cleanup goals for PCP and PAHs needs to be confirmed in treatability tests. Incineration is a highly reliable technology for organics treatment; trial burns would still be undertaken to ensure the cleanup levels could be met within air emission requirements. The handling, treatment, and disposal of the approximately 45,000 cubic yards of contaminated soils would require a design plan sequencing remedial activities to facilitate efficient removal. Varying volumes or concentrations of contaminants in soils could be easily handled. In addition, treatment of ground water is routinely performed at many Superfund Sites. The carbon adsorption ground water treatment system contemplated under both of these alternatives would also require treatability tests to assure the effluent limits would be met prior to discharge to North Run Creek. The disposal of residuals in Alternatives 3 and 4 can be implemented since the availability of such facilities is adequate. The spent carbon would require regeneration at an offsite facility.

Excavation and offsite disposal of untreated surface and DNAPL soils under Alternative 6 would be easily implemented as long as the disposal is completed prior to the prohibition on land disposal for F032, F034, and F035 RCRA listed wastes. After the prohibition, these soils cannot be land disposed if they do not meet treatment standards. The carbon adsorption ground water treatment system could be easily implemented even though treatability tests would be required to assure the effluent limits would be met prior to discharge to North Run Creek. The spent carbon would require regeneration at an offsite facility. The handling, treatment, and disposal of the approximately 45,000 cubic yards of contaminated soils would require a design plan sequencing remedial activities to facilitate an efficient removal.

The solvent extraction treatment system under Alternative 5 would be the most difficult alternative to implement. Material handling problems have been reported for full scale implementation of solvent extraction at other locations. The ability of the solvent extraction process to meet the cleanup goals for PCP and PAHs needs to be confirmed in treatability tests. The carbon adsorption ground water treatment system under this alternative would also require treatability tests to assure the effluent limits would be met prior to discharge to North Run Creek. The disposal of residuals can be implemented since the availability of such facilities is adequate. The spent carbon would require regeneration at an offsite facility.

7. Cost

Section 121 of CERCLA, 42 U.S.C. Section 9621, requires selection of a cost-effective remedy that protects human health and the environment and meets the other requirements of the statute. The alternatives are compared with respect to present worth cost, which includes all capital costs and the operation and maintenance cost incurred over the life of the project. Capital costs include those expenditures necessary to implement a remedial action, including construction costs. All of the costs indicated below are estimates.

Alternative 2 has the lowest present worth cost, $10,001,000. Of the alternatives that include treatment of the contaminated soil and ground water, Alternative 3, has the lowest present worth cost, $19,129,000 followed by Alternative 6 at $22,616,000 and Alternative 5 at a present worth cost of $23,329,000. Alternative 4 has the highest present worth cost of all of the alternatives, $27,396,000. The present worth costs for Alternatives 2 and 6 include the cost of offsite disposal of untreated soil in a RCRA Subtitle C facility. If the prohibition on land disposal becomes effective prior to the completion of the offsite disposal, the present worth costs of these two alternatives would increase accordingly.

8. State Acceptance

The Virginia Department of Environmental Quality (VDEQ) served as the lead agency for the Commonwealth of Virginia. VDEQ has reviewed the remedial alternatives under consideration for the Rentokil, Inc. Site and has provided EPA with technical and administrative requirements for the Commonwealth of Virginia. VDEQ agrees with the analysis of alternatives presented in this ROD and concurs with EPA's selected remedy discussed below.

9. Community Acceptance

On January 20, 1993, a public meeting was held at the Henrico County Goverment Complex, Parham Road at Hungary Spring Road, in Richmond, Virginia to discuss EPA's preferred alternative as described in the Proposed Plan. A public comment period for the Proposed Plan was held from January 8, 1993, through March 8, 1993. The comment period was extended by request. Comments received during the public meeting and the public comment period are discussed in the Responsiveness Summary attached to this ROD.

I. Selected Remedy

EPA has selected a combination of Alternatives 2 and 3 to remediate the contamination at the Site. Based on the RI/FS findings and the nine criteria listed in Section H of this Decision Summary, the combination of Alternatives 2 and 3 represents the best balance among the evaluation criteria. Specifically, the selected remedy includes:

(1) Existing Structures

Demolition, decontamination, and offsite disposal of the existing structures at the Site.

(2) Unlined Pond

Excavation and offsite incineration of approximately 70 cubic yards of K001 waste (including onsite dechlorination if the level of dioxins/furans in the waste would cause a violation of the incinerator's RCRA permit if incinerated without prior treatment).

Removal and onsite carbon adsorption treatment of the surface water in the unlined pond with discharge to North Run Creek; and closure of the unlined pond.

(3) Soil

Movement of Site surface soils (0-2 feet--approximately 7,200 cubic yards) which lie outside the area to be capped, and which exceed any Site-specific cleanup level, to the area of the Site to be capped (generally these soils occur in Wetlands A, B, and C).

Excavation and onsite low temperature thermal desorption (LTTD) treatment to remove PCP and carcinogenic PAHs (to the Site-specific cleanup levels of 48 mg/kg and 5.1 mg/kg, respectively) from soils removed during installation of the dewatering system and slurry cutoff wall, and the soil located at the following Site "hot spots": CCA Disposal Area; Fill Area; and DNAPL-contaminated soils between the surface and the hardpan which occur within 25 feet of the concrete drip pad, the unlined pond, and the former blowdown sump (a total of approximately 5,150 cubic yards of soil).

Chemical fixation of all LTTD treated soil which exceeds the arsenic cleanup level of 33 mg/kg.

Onsite disposal of all treated soils prior to construction of the cap (offsite disposal, in accordance with Subtitle C of RCRA, if any cleanup goal is not met after treatment).

Offsite disposal of all drums excavated from the Fill Area.

Dewatering of contaminated soil in Wetlands A, B, and C prior to excavation, and treatment of the water in the onsite water treatment system prior to discharge to North Run Creek. The discharge of treated water will meet the substantive requirements of a VPDES permit. Planting of excavated wetlands with wetland vegetation as approved by EPA. Mitigation of wetland loss due to capping with creation of wetlands of equal or better value, consistent with the Location Specific ARARs listed at page 66 of this ROD, and as approved by EPA.

(4) Containment

Construction of a RCRA Subtitle C cap over the Site where the surface soil exceeds the Site-specific cleanup levels stated above as far into the wetlands as possible.

Construction of a slurry wall around the perimeter of the cap. Construction of a dewatering system inside of cap/slurry wall to produce an intragradient condition with onsite treatment of ground water by carbon adsorption and, if necessary, precipitation of metals; discharge of treated ground water to North Run Creek;

(5) North Run Creek and Talley's Pond

Excavation and onsite disposal of sediments in the oxbow of North Run Creek north of the Site.

Sampling of sediments in Talley's Pond and sediments previously dredged by the owner of the Pond. Excavation, treatment, and offsite disposal of the sediments in or previously dredged from Talley's Pond which exceed the Site-specific cleanup goals.

(6) Institutional Controls

Implement institutional controls to prohibit residential development of the Site and use of the ground water at the Site.

(7) Ground Water Monitoring

Long-term ground water monitoring (at least 30 years).

Performance Standards

The selected remedy addresses all of the contaminated media at the Site. By instituting all of these components, the Site risks will be reduced to within the EPA acceptable risk range. The performance standards for the major components of the selected remedy include the following:

(1) Existing Structures

- To reduce the risk to human health and the environment via the exposure pathways attributed to the existing structures on the Site, the concrete drip pad, holding pond, shop, office, and shed will be demolished, cleaned of any residual soil, decontaminated, and disposed of in accordance with Part VIII of the VSWMR and as approved by EPA. Decontamination and disposal must also meet the requirements of 40 C.F.R. Part 268. Waste water generated during the decontamination will be collected, treated and discharged to North Run Creek. The discharge of treated water will meet the substantive requirements of a VPDES permit.

(2) Unlined Pond

- To reduce the risk to human health and the environment via the exposure pathways attributed to the unlined pond, surface water in the pond will be removed, treated, and discharged to North Run Creek. Closure and post closure of the unlined pond will be performed in accordance with the VHWMR. The discharge of treated water from the unlined pond will meet the substantive requirements of a VPDES permit.

- To reduce the risk to human health and the environment via the exposure pathways attributed to the K001 waste, approximately 70 cubic yards of K001 waste will be excavated from the unlined pond and incinerated (the Best Demonstrated Available Technology for K001 waste) at an offsite facility approved by EPA and operating in accordance with, among other things, 40 C.F.R. Part 264, Subpart O. If the level of dioxins/furans in the K001 waste exceeds the level which the incinerator is permitted to accept, the K001 waste will be dechlorinated onsite to bring the level of dioxins/furans down to a level at or below that specified in the incinerator's permit prior to shipment.

(3) Soil

- To reduce the risk to human health and the environment via the exposure pathways attributed to the surface soil in areas beyond the extent of the cap that exceed the cleanup levels of 5.1 mg/kg carcinogenic PAHs, 48 mg/kg PCP, or 33 mg/kg arsenic, approximately 7,200 cubic yards of soil will be moved to the area to be capped prior to construction of the cap.

• To reduce the risk to human health and the environment via the exposure pathways attributed to the "hot spots" at the Site, approximately 5,150 cubic yards of soil will be excavated, treated, and disposed onsite prior to construction of the cap. The "hot spots" are defined as the CCA Disposal Area, the Fill Area, and DNAPL-contaminated soil between the surface and the hardpan within 25 feet of the concrete drip pad, the unlined lagoon, and the former blowdown sump. All excavated soil exceeding the cleanup levels of 5.1 mg/kg carcinogenic PAHs and/or 48 mg/kg PCP will be treated by the low temperature thermal desorption (LTTD) process to a level at or below the cleanup levels. All excavated soil exceeding the cleanup level of 33 mg/kg arsenic will be treated by the fixation process to meet the cleanup level. The organics vaporized in the LTTD system, including PCP and the PAHs, will be removed with a carbon adsorption system. The carbon will be regenerated at an offsite facility approved by EPA. The LTTD system will be equipped with air pollution control equipment, enabling it to meet federal and Virginia air emission standards and eliminate any unacceptable risks to human health or the environment. All of the soil treated to the cleanup levels will be backfilled onsite. All soils which, after treatment, do not meet the cleanup levels for carcinogenic PAHs, PCP, and/or arsenic will be disposed of offsite in a RCRA Hazardous Waste Management (Subtitle C) facility approved by EPA. Excavated wetlands will be restored to the appropriate contours and revegetated with a diverse community of indigenous species as approved by EPA.

(4) Containment

• To reduce the risk to human health and the environment via the exposure pathways attributed to the surface soil at the Site, a cap will be constructed over a portion of the Site which meets the requirements of RCRA Subtitle C, and regulations promulgated thereunder, particularly the closure requirements at 40 C.F.R. Part 264, Subpart N. The cap will be approximately 11.5 acres in size. The cap is not expected to cover all of the contaminated portions of Wetlands A, B, and C. All surface soil presently lying within the area to be capped which exceeds any cleanup level for the Site will not be capped until it has undergone treatment as provided in (3), above. The loss of wetlands through capping will be mitigated by the creation of wetlands of equal or better value. All wetland restoration and monitoring must be approved of by EPA.

• To reduce the risk to human health and the environment via the exposure pathways attributed to the migration of ground water from the Site, a slurry wall will be constructed around the perimeter of the cap and a dewatering system will be constructed within the slurry wall to create an intragradient condition. The dewatering system will consist of two vertical caissons constructed to the bedrock with horizontal laterals installed on top of the hardpan and on top of the bedrock. Construction techniques will be implemented to prevent the migration of ground water or DNAPLs along the caissons through the hardpan. The horizontal laterals will be installed with clean washed gravel or gravel packs. The ground water collected in the horizontal laterals will be treated via carbon adsorption and, if necessary, precipitation of metals, prior to discharge to North Run Creek. The ground water will be treated to comply with the substantive requirements equivalent to those of a Virginia Pollution Discharge Elimination System (VPDES) permit for discharge to North Run Creek. The carbon from the carbon adsorption will be regenerated at an offsite facility approved by EPA. All sludges generated will be disposed of at an offsite facility approved by EPA.

(5) North Run Creek and Talley's Pond

• To reduce the risk to human health and the environment via the exposure pathways attributed to sediments in the oxbow of North Run Creek north of the Site, sediments exceeding the cleanup levels of 5.1 mg/kg carcinogenic PAHs, 48 mg/kg PCP, and/or 33 mg/kg arsenic will be moved to the area of the Site to be capped.

• To ascertain that the remedy is protective of human health and the environment, the sediments in Talley's Pond and the sediments that were previously dredged by the owner of Talley's Pond will be sampled to determine whether they exceed any cleanup levels for the Site. If the sediments exceed a cleanup level(s), the sediments will be excavated, treated, and disposed of at an offsite facility approved by EPA.

(6) Institutional Controls

• To restrict access to the soil at the Site, institutional controls to prohibit residential development on the Site will be implemented. The institutional controls will prevent exposure to the untreated soil at the Site as well as prevent residential exposure to treated soils which meet the cleanup levels established for the future light industrial use scenario for the Site.

• To restrict access to the contaminated ground water under the Site, institutional controls prohibiting use of the ground water will be implemented.

(7) Ground Water Monitoring

• To determine if MCLs are being met at the boundary of the Site, long-term ground water monitoring will be performed for thirty years. The ground water monitoring will include sampling for arsenic, chromium, copper, zinc, PAHs, and PCP. The appropriate number and location of the monitoring wells will be determined during the design phase.

EPA may modify or refine the selected remedy during the remedial design and construction. Such modifications or refinements, if any, would generally reflect results of the engineering design process. The estimated present worth cost of the selected remedy is $10,907,000. The present worth cost is comprised of a capital cost of $9,797,400 and an annual operation and maintenance cost of $72,200. Details of the costs for the selected remedy are shown in Table 4.

J. Statutory Determinations

EPA's primary responsibility at Superfund sites is to select remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA, 42 U.S.C. Section 9621, establishes several other statutory requirements and preferences. These specify that, when complete, the selected remedial action for a site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws, unless a statutory waiver is justified. The selected remedy must also be cost-effective and utilize permanent treatment technologies or resource recovery technologies to the maximum extent practicable. The statute also contains a preference for remedies that employ treatment as a principal element. The following sections discuss how the selected remedy for the Site meets these statutory requirements.

Protection of Human Health and the Environment

In order to meet the remedial objectives outlined in the FS, the risks associated with exposure to the contamination at the Site must fall within the acceptable risk range for carcinogens (10^{-4} to 10^{-6}) and the Hazard Indices for non-carcinogens must be less than 1. Implementation of the selected remedy will ensure that Site risks fall within EPA's acceptable risk range.

The selected remedy protects human health and the environment by:

1. Eliminating direct contact with contaminants in surface soils (0-2 feet) beyond the extent of the area to be capped by moving these wastes into the area to be capped;

2. Eliminating the principal threats from the DNAPL soil, CCA Disposal Area, and the Fill Area by excavating, treating, and properly disposing of these wastes;

3. Reducing contaminant levels in the existing structures through removal of residual soil, decontamination and offsite disposal;

4. Eliminating direct contact with the unlined pond by: treating and discharging the surface water to North Run Creek; excavating, treating, and disposing of the K001 waste; and closure and post closure care of the pond; and

5. Eliminating direct contact with contaminants in the ground water by: constructing a slurry wall and dewatering system; collecting, treating, and discharging ground water in accordance with the substantive requirements of a VPDES permit; and Implementing institutional controls to prohibit use of the ground water at the Site.

Of all of the alternatives evaluated, the selected remedy provides the best protection of human health without significant adverse impact on the environment. No unacceptable short-term effects or cross-media impacts would be caused by implementing this remedy.

<u>Compliance with Applicable or Relevant and Appropriate Requirements</u>

The selected remedy will comply with all Applicable or Relevant and Appropriate Requirements (ARARs) as depicted in Table 3.

Action-Specific ARARs:

- All debris will be cleaned of any residual soil and those portions determined to require decontamination will be handled in accordance with Part VIII of the VSWMR and 40 C.F.R. Part 268. The debris is considered a "special waste" under Part VIII of VSWMR. Disposal of the debris will occur at an offsite facility approved of by EPA.

• Storage of the K001 wastes must conform with Sections 10.8 and 10.9 of the VHWMR.

• Closure of the unlined pond will be implemented in accordance with the surface impoundments closure and post closure requirements at Section 10.10.I of the VHWMR.

• The DNAPL, CCA Disposal Area, and Fill Area soils will be treated by the LTTD and fixation processes, as appropriate, prior to disposal onsite under the cap. The surface soil located beyond the extent of the cap will be excavated and disposed of onsite. Storage of soils containing hazardous wastes in a waste pile must conform with Section 10.11 of the VHWMR. All soil which cannot be treated to the health-based levels developed for this Site must be disposed of in accordance with Section 121(d)(3) of CERCLA and Subtitle C of RCRA. Transportation to a RCRA-permitted treatment and/or disposal facility must conform with RCRA regulations at 40 C.F.R. Parts 262 and 263, the Department of Transportation regulations at 49 C.F.R., and Part 7 of the VHWMR.

• Substantive requirements of the Virginia Erosion and Sediment Control Law will be achieved. The Henrico County Code--Chapter 9, Erosion and Sediment Control Ordinance--constitutes Virginia's requirements for erosion and sediment control.

• Substantive requirements of the VPDES program must be complied with for the discharge of treated water.

• All air emissions from Site activities must conform with the Virginia Regulations for Control and Abatement of Air Pollution provided at VR 120-01-01.

Location-Specific ARARs:

• All excavation in North Run Creek or Wetlands A, B, or C or the placement of soil in Wetlands A, B, or C will take place in accordance with: Section 404 of the Clean Water Act, 33 U.S.C. § 1344; 33 C.F.R. Section 323; 40 C.F.R. Part 6, Appendix A; Executive Orders 11988 and 11990; the Virginia State Water Control Law (Code of Virginia §§ 62.1-44.2 et seq.); the Virginia Chesapeake Bay Preservation Act (Code of Virginia §§ 10.1-2100 et seq.); and Virginia Water Protection Permit (VR 680-15-02). The Chesapeake Bay Preservation Area Designation and Management Regulations (VR 173-02-01) are the implementing regulations for Virginia's Chesapeake Bay Preservation Act. Henrico County ordinance contains the local requirements for compliance with Virginia's Chesapeake Bay Preservation Act.

Cost-Effectiveness

The selected remedy is cost-effective because it mitigates the risks posed by the Site contamination within a reasonable period of time. Section 300.430(f)(1)(ii)(D) of the NCP requires EPA to evaluate cost-effectiveness by first determining if the alternative satisfies the threshold criteria: protection of human health and the environment and compliance with ARARs. The effectiveness of the alternative is then determined by evaluating the following three of the five balancing criteria: long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, and short-term effectiveness. The selected remedy meets these criteria and is cost-effective because the costs are proportional to its overall effectiveness. The estimated present worth cost for the selected remedy is $10,907,000. A breakdown of the present worth costs for the selected remedy is provided at Table 4.

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

Despite treating a smaller volume of contaminated soil than that included under Alternatives 3, 4, and 5, EPA has determined that the selected remedy satisfies the statutory preference for treatment as a principal element and represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for remediation of the Site. This is accomplished by treating the ground water at the Site, as well as the principal threats associated with DNAPL-contaminated soil in the perched unit; the CCA Disposal Area; the Fill Area; the surface water and K001 waste in the unlined pond to EPA acceptable risk levels. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, and cost, while also considering the statutory preference for treatment as a principal element and considering state and community acceptance.

Regarding long-term effectiveness and permanence, the selected remedy is equal to Alternatives 3, 4, 5, and 6. None of the alternatives evaluated include treating all of the contaminated soil at the Site because it would entail excavation of the entire Site down to the bedrock. Alternatives 3, 4, 5, and 6 have a higher degree of permanence by treating or removing a larger volume of contaminated soil as opposed to constructing a cap over the Site. However, the dewatering system included in the selected remedy offers a higher degree of long-term effectiveness regarding ground water. The dewatering system will

TABLE 4

Present Worth Cost
Selected Remedy

Existing Structures	
Demolition, Decontamination & Disposal	126,000
Unlined Pond	
Remove & Treat Surface Water	126,000
Remove Sediments	1,000
Offsite Incineration of Sediments	133,000
Dechlorination of Sediments (if necessary)	97,000
Site Preparation	38,000
Excavate and Backfill Surface Soil (7,200 cubic yards)	87,300
LTTD and Fixation (5,150 cubic yards/6,695 tons)	
Mobilization	750,000
Treatability Study	35,000
Excavation	41,000
Silt Fence/Dust Control	13,000
Load & Haul to LTTD Unit	30,500
LTTD Treatment	837,000
Load & Haul to Fixation Unit	30,500
Fixation Treatment	569,000
Backfill	21,700
Cap and Slurry Wall	3,391,000
Caisson and Ground Water Collection	
Mobilization/Demobilization	100,000
Installation of 2 Caissons	550,000
Grouting	60,000
Install 4" Collection Laterals	160,000
Pumps, Fittings, and Process Control Unit	10,000
Install 2" PVC Piping	30,000
Holding Tank, 7,000 gal.	6,000
Install Concrete Pad for Tank	12,000
Ground Water Treatment	243,000
Construction Subtotal	7,498,000
Contingency	1,499,500
Health & Safety Plan and Equipment	149,900
Total Construction	9,147,400
Design, Engineering & Construction Management	650,000
Total Capital Cost	9,797,400
Annual Operation & Maintenance	72,200
Present Worth Operation & Maintenance	1,109,600
Total Present Worth Cost	10,907,000

induce an inward movement of ground water within the cap and slurry wall. Any failure of the cap or slurry wall would be readily detected because a larger volume of ground water would flow into the dewatering system and be captured and treated. On the other hand, failure of the collection trenches included in Alternatives 3, 4, 5, and 6 would not be detected by the monitoring wells until contaminants had already breached the collection trenches. Alternative 2, on the other hand, only includes removal of the surface soil located beyond the cap and treatment of the surface water and K001 waste in the unlined pond.

Regarding reduction of toxicity, mobility, or volume through treatment, Alternatives 3, 4, and 5 include treatment of approximately 45,000 cubic yards of soil compared to approximately 5,150 cubic yards under the selected remedy. Under Alternatives 3, 4, and 5, surface soils (0-2 feet) would be treated that are not treated under the selected alternative. However, under the selected alternative, these soils would be contained by the cap. Additionally, scientists currently theorize that by dewatering the soil within the cap and slurry wall, those DNAPLs remaining in the soil may mobilize and be collected in the laterals of the dewatering system, after which they would be treated and discharged to North Run Creek. Thus, the selected remedy would reduce the toxicity and volume of the DNAPLs in addition to treating the wastes listed above. Approximately 70 cubic yards of K001 waste is the only reduction of toxicity, mobility, or volume accomplished under Alternative 2.

Regarding short-term effectiveness, the selected remedy is second only to Alternative 2. The selected remedy includes excavation of more soil than that under Alternative 2 but less than that included under Alternatives 3, 4, 5, and 6. Thus, the short-term impacts associated with dust, noise, and truck traffic would be less than that from Alternatives 3, 4, 5, and 6 but more than Alternative 2. Also, the selected remedy is anticipated to take 18 months to complete, six months more than Alternatives 2 and 6 and six months less than Alternatives 3, 4, and 5.

Regarding implementability, the selected remedy is second to Alternative 2. Alternative 2 is the most implementable alternative. Construction of a cap and slurry wall has been performed at many Superfund sites, as has excavation and offsite disposal of contaminated soil. The selected remedy is more easily implemented than Alternatives 3, 4, 5, and 6. The selected remedy would require treatability studies identical to Alternatives 3, 4, and 5 to determe whether LTTD and fixation would meet the cleanup goals determined for the Site. However, the selected remedy would be more easily implemented because it would not involve excavating such a large volume of soil.

Regarding cost, the selected remedy has the second lowest present worth cost, $10,907,000. Alternative 2, at $10,001,000, has the lowest present worth cost. With a present worth cost of $19,129,000, Alternative 3 has a present worth cost $8,222,000 more than the selected remedy.

In summary, the selected remedy was chosen to remediate the Site because it is protective of human health and the environment, complies with all ARARs, and is cost-effective. In addition, this remedy satisfies the statutory preference for a remedy that employs treatment that reduces toxicity, mobility, or volume as a principal element.

Alternatives 3 and 4 are equal to the selected remedy regarding protectiveness of human health and the environment, compliance with ARARs, high degree of long-term effectiveness and permanence, reduction of toxicity, mobility or volume through treatment, and ease of implementation. However, these alternatives are not as cost-effective as the selected remedy.

Although Alternative 6 meets all ARARs and has as much long-term effectiveness and permanence as the selected remedy, it does not reduce the toxicity, mobility or volume through treatment, and may not be as implementable because the soil must be completely excavated and disposed of offsite prior to the enactment of the Land Disposal Restrictions. Alternative 6 also has a higher present worth cost than the selected remedy and does not fulfill the statutory mandate to utilize treatment technologies to the maximum extent practicable and the preference for treatment as a principal element.

Alternative 2 meets all ARARs, has the least short-term effects, is the most easily implementable alternative, and, at $10,001,000, has the lowest present worth cost of all of the alternatives. However, Alternative 2 does not reduce the toxicity, mobility or volume through treatment. In addition, Alternative 2 does not fulfill the statutory mandate to utilize treatment technologies to the maximum extent practicable and the preference for treatment as a principal element.

Alternative 5 meets all ARARs, reduces the toxicity, mobility or volume through treatment, and has as much long-term effectiveness and permanence as Alternative 3. However, Alternative 5 may not be as implementable as Alternative 3 because of the difficulties encountered in previous attempts with this treatment process and has a present worth cost that is $12,422,000 more than the selected alternative.

The Virginia Department of Environmental Quality has concurred with the selected remedy.

Preference for Treatment as a Principal Element

The selected remedy satisfies the statutory preference for treatment as a principal element. The PCP, PAHs, and arsenic contamination in the soil and ground water constitute the major human health risks associated with the Site. The selected alternative would remediate the principal threats at the Site including DNAPL soil, surface water and K001 waste in the unlined pond, CCA Disposal Area, and Fill Area. The low temperature thermal desorption treatment system will effectively remove the PCP and PAHs from the soil by heating it to 400^0 F to 800^0 F. The exhaust will then be treated by air pollution control equipment to remove any entrained particulate material, enabling the system to meet federal and Virginia emission standards. Next, the air will be directed into a condenser where the PCP and PAHs will be condensed for subsequent treatment in an onsite carbon adsorption unit. The K001 sediments will be incinerated offsite. If the K001 contains high levels of dioxins/furans, it will be treated onsite with a dechlorination process prior to shipment to an incinerator. Collected ground water, and that recovered during excavation and dewatering of soils, as well as water from the unlined pond, will be treated by the carbon adsorption process. Finally, the debris will be decontaminated, where necessary, prior to disposal.

K. Documentation of Significant Changes

The Proposed Plan was released for public comment on January 8, 1993. The Proposed Plan identified Alternative 3--onsite LTTD and fixation treatment of subsurface soil contaminated with DNAPLs and all surface soil; installation of collection trenches; and onsite treatment of ground water--as the preferred alternative. One of the other alternatives (Alternative 2) presented in the Proposed Plan and the RI/FS included construction of a RCRA Subtitle C cap and slurry wall. All of the alternatives evaluated in the FS resulted in hazardous substances remaining onsite because of the depth of the contamination (up to 27 feet) and the nature of the contamination (DNAPLs). The original preference for Alternative 3 was based in part on the statutory preference for a remedy that employs treatments that reduce toxicity, mobility, or volume as their principal element and the need to treat the ground water at the Site. During the public comment period, however, a proposal was received which suggested addition of a dewatering system within the cap and slurry wall, with onsite treatment of the ground water ("Alternative 7"). The commenter stated that the dewatering system would be effective in collecting DNAPLs once the area within the cap and slurry wall is dewatered.

EPA, in consultation with the VDEQ, decided that the dewatering proposal would be more protective of human health and the environment regarding ground water and that the cap and slurry wall were necessary in order to make the dewatering system effective. Any breach of the collection trenches under Alternative 3 would result in contaminanted ground water leaving the Site while a breach of the selected alternative's cap and slurry wall would result only in additional ground water entering this area which would be collected in the dewatering system and treated.

Alternative 3 did not include mitigation or restoration of impacted wetland areas. Alternative 3 also did not include remediation of DNAPLs below the hardpan. The dewatering system presented in the selected alternative should be capable of mobilizing and collecting the DNAPLs there.

Neither Alternative 2 nor the subsequently proposed Alternative 7 address excavation and treatment of the CCA Disposal Area, the Fill Area, or DNAPLs in the area above the hardpan. The CCA Disposal Area and Fill Area were not specifically referenced in the Proposed Plan since they would have been remediated as part of the surface soil. Construction of a RCRA Subtitle C cap precludes the necessity of treating all surface soil. The selected remedy remediates the CCA Disposal Area and Fill Area through treatment and disposal. Excavation and treatment of the DNAPLs above the hardpan is also retained in the selected remedy. However, the area of DNAPLs to be excavated has been explicitly defined as the area within 25 feet of the concrete drip pad, unlined pond, and the former blowdown sump. These areas have been retained because they contain the largest amount of DNAPLs, based on the documentation in the RI. Overall, while the selected alternative treats a smaller volume of soils as compared to Alternative 3, all soils are nevertheless remediated, at about half the cost of Alternative 3.

Finally, the selected remedy includes the movement (without treatment or disposal) of untreated surface soil and sediments from the oxbow of North Run Creek into the area to be capped, while Alternative 3 included onsite treatment and disposal of soil and sediments lying outside the area to be capped.

GLOSSARY

Administrative Record: An official compilation of documents, data, reports, and other information that is considered important to the status of and decisions made relative to a Superfund Site. The record is placed in the information repository to allow public access to the material.

Applicable or Relevant and Appropriate Requirements (ARARs): The federal and state requirements that a selected remedy must attain. These requirements may vary among sites and alternatives.

Carcinogens: Substances which can or may cause cancer.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The Act created a Trust Fund, known as Superfund, to investigate and clean up abandoned or uncontrolled hazardous waste sites.

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

National Priorities List: EPA's list of the nation's top priority hazardous waste sites that are eligible to receive federal money for response under Superfund.

Operable Unit (OU): A portion of a Superfund site that has been conceptually separated from the rest of the site to allow for easier management.

Record of Decision (ROD): A legal document that describes the interim or final remedial action selected for a Superfund site, why the remedial actions were chosen and others not, how much they cost, and how the public responded.

Remedial Investigation/Feasibility Study (RI/FS): A two-part study of a hazardous waste site that supports the selection of a remedial action for a site. The first part, the RI, identifies the nature and extent of contamination of the site. The second part, the FS, identifies and evaluates alternatives for addressing the contamination.

Resource Conservation and Recovery Act (RCRA): A federal law enacted in 1976 and amended in 1980 and 1984 designed to control hazardous waste from the generation of the waste to its ultimate treatment, storage, and disposal.

Risk Assessment: A means of estimating the amount of harm which a Superfund Site could cause to human health and the environment. The objectives of a risk assessment are (1) to help determine the need for action by estimating the harm if the site is not cleaned up, (2) to help determine the levels of chemicals that can remain on the site and still protect human health and the environment, and (3) to provide a basis for comparing different cleanup methods.

Rentokil, Inc. (Virginia Wood Preserving) Superfund Site
Richmond, Henrico County, Virginia

Responsiveness Summary
May 1993

This Responsiveness Summary documents public concerns and comments expressed during the public comment period. The summary also provides EPA's response to those comments. The information is organized as follows:

- Overview
- Background on Community Involvement
- Summary of Comments and EPA Responses from:
  - (1) The Public Meeting
  - (2) Citizens
  - (3) Local Municipality
  - (4) Potentially Responsible Parties

I. OVERVIEW

The public comment period for the Rentokil, Inc. Site began on January 8, 1993. Although the comment period was initially scheduled to end on February 8, 1993, it was extended until March 10, 1993, as requested. To facilitate commenting, EPA held a public meeting on January 20, 1993, in the Board of Supervisors Room at the Henrico County Government Complex, Parham Road at Hungary Spring Road.

At the meeting, EPA discussed the Remedial Investigation (RI), including the Risk Assessment (RA), and the Feasibility Study (FS) reports performed for the Site. EPA also presented the Proposed Plan for eliminating and/or mitigating the public health and environmental threats posed by the contamination detected in environmental media at the Site. EPA explained that the preferred remedy includes the following: demolition, decontamination, and offsite disposal of the existing structures; removal and onsite carbon adsorption treatment of surface water in the unlined pond; excavation, dechlorination treatment, and offsite disposal of the K001 sediments from the unlined pond; excavation, low temperature thermal desorption and fixation treatment, and onsite disposal of the contaminated surface and DNAPL soil; collection and onsite carbon adsorption treatment of ground water; long-term groundwater monitoring; and institutional controls. Although the selected remedy was not one of the alternatives presented to the public for comment, the components of the selected remedy were presented in Alternatives 2 and 3 of the Proposed Plan.

The January 20, 1993, public meeting also provided the opportunity for the public to ask questions and express opinions and concerns. Residents questioned the current health risks, and the extent to which these risks will be lessened by remediation. Virginia Properties, Inc. and Henrico County prefer a modified remedy which was submitted during the public comment period as part of the comments from Virginia Properties, Inc.

II. BACKGROUND ON COMMUNITY INVOLVEMENT

During May and June 1985, several articles were published in local newspapers concerning contamination at the Site and extension of the municipal water lines. Public concern over possible water contamination at that time was very high. After public water was supplied to residents northeast of the Site, media coverage diminished and their immediate concerns about the Site were alleviated. Community interviews were conducted in July and August 1989 for the Community Relations Plan. Residents near the Site indicated during the interviews that they were moderately interested in the activities at the Site and wanted to be kept informed. The interviews also revealed that the community prefers to learn of Site activities through informal mailings. Due to the fact that many residents are elderly, public meetings were determined not to be the ideal communication method.

The Henrico County Director of Public Health and the County Supervisor have been informing residents on a one-to-one basis of Site activities and recommend that this method continue to be utilized as it has proven successful.

The local citizen environmental groups contacted in July 1989 had no involvement with the Site. Some groups contacted were unaware of the Site, while others felt the Site required no further attention.

The Virginia Department of Environmental Quality currently has the lead on community relations activities for the Site. Community Updates are sent to citizens on the mailing list four times per year, or as significant developments occur. A Community Relations Plan was drafted in April 1991, and an Information Repository has been established at the Henrico County Municipal Reference and Law Library.

The major concerns expressed during the remedial planning activities are as follows:

- Residents want information concerning EPA activities (past, present, and future) conducted at the site;

- Effects of creosote, pentachlorophenol, chrome, copper, and arsenic on children, adults, and animals;
- The quality of water supply;
- Air pollutants and their associated health impacts;
- Effects of media coverage on real estate values;
- The length of time for cleanup to be completed;
- Health and liability risks associated with Talley's Pond; and
- Hazards of substances released into the air during remediation.

III. SUMMARY OF PUBLIC MEETING COMMENTS AND EPA RESPONSES

Questions and comments presented at the January 20, 1993, public meeting are summarized briefly in this section and are grouped according to subject. The EPA response follows each of the questions or comments presented.

A. Technical Comments/Concerns Regarding Remedial Alternatives:

At the conclusion of the presentation of the EPA preferred remedy, Virginia Properties, Inc. was permitted to show a video entitled "Virginia Properties-The Right Alternatives" which presented the company's comments on the Proposed Plan. Major comments made in the video are summarized below, followed by the EPA response.

1. Virginia Properties, Inc. stated that the concentrations of contaminants below the hardpan are insignificant.

EPA Response: As determined in the Risk Assessment performed by Dames & Moore, ingestion of ground water from below the hardpan constitutes a human health risk of 1.9×10^{-2}. This significantly exceeds the EPA acceptable risk range of 10^{-4} to 10^{-6}. In addition, DNAPLs (which are classified as principal threats) have been detected below the hardpan in the area of monitoring well DM-15.

2. Virginia Properties, Inc. stated that Alternatives 1, 2, and 3 (Alternatives 3, 4, and 5 as presented in the FS and Proposed Plan) have little value because they either take too long to complete, create further environmental risk, have not been proven to be completely effective, or are unsightly processes.

EPA Response: Alternatives 3, 4, and 5 are estimated to take approximately two years to complete, while Alternative 2 is estimated to take one year to complete. Since EPA has a preference for treatment, the additional one year of time implementing Alternatives 3, 4, or 5 is outweighed by the fact that contaminants levels would be substantially reduced in comparison to leaving the contaminants in place under Alternative 2. Alternatives 3, 4, and 5 all encompass excavation and treatment of a large volume of soil. As such, dust suppression techniques would be implemented to limit the amount of fugitive dust from excavation. In addition, the treatment processes would include air pollution control equipment so that the exhaust would not pose any unacceptable risks. The incineration treatment process has been shown to effectively treat the contaminants at the Site. Based on past treatability studies, the LTTD treatment process should effectively treat the contaminants. It is not known at this time whether solvent extraction can effectively treat the contaminants in the soil matrix. Regarding "unsightliness", EPA evaluates alternatives based on the Nine Point Criteria in the NCP. The Nine Point Criteria do not encompass "unsightliness."

3. Virginia Properties, Inc. described Alternative 3 as low temperature incineration.

EPA Response: The treatment process proposed in Alternative 3 is low temperature thermal desorption (LTTD), not low temperature incineration. Incineration is a treatment process which destroys contaminants while operating at temperatures starting at 1700° F. LTTD is an innovative treatment technology that treats soil contaminated with hazardous substances by heating the soil to relatively low temperatures (200-1000° F) so that contaminants with low boiling points will vaporize (turn into gas) and, consequently, separate from the soil. The vaporized contaminants are collected and treated. The preferred remedy for the Site included offsite incineration treatment of the collected contaminants.

4. Virginia Properties, Inc. expressed concern that a test period is required for Alternatives 3, 4, and 5 to evaluate the effectiveness of the processes, and possible chemical reactions.

EPA Response: Treatability studies are required in order to properly design any treatment system. EPA prefers that treatability studies be performed during the RI/FS phase. Since the treatability studies were not performed previously, they must be performed during the design phase for the Site.

5. Virginia Properties, Inc. stated that the pumping operation in Alternative 3 may require 30 or more years, due to the very slow movement of groundwater.

EPA Response: It is not known how long it would take to achieve remediation of the ground water at the Site. EPA used a thirty year period for costing purposes. It is possible that ground water would require treatment much longer than thirty years.

6. Virginia Properties, Inc. expressed concern that Alternatives 3, 4, and 5 would require large scale excavation, which adds to the environmental risk through the release of potentially harmful substances into the atmosphere.

EPA Response: Almost all of the contaminants at the Site are semi-volatile organic contaminants or metals. These types of contaminants do not volatilize very easily. In addition, dust suppression techniques would be utilized during all excavation at the Site.

7. Virginia Properties, Inc. warned that Alternative 4 poses a further risk to the environment because contaminants may be released into the atmosphere as byproducts of burning.

EPA Response: The incineration process included in Alternative 4 would include the necessary air pollution control equipment to meet the Federal and Virginia air emission standards. In addition, a test burn would be conducted during the design phase to determine the effectiveness of incineration on the destruction of the contaminants at the Site as well as monitoring for products of incomplete combustion.

8. Virginia Properties, Inc. stated that the no-action alternative (Alternative 1) is not in anyone's interest, as the harmful substances would eventually contaminate the groundwater and surrounding areas.

EPA Response: EPA agrees that Alternative 1 is not protective of human health and the environment and should not be selected for the Site.

9. Virginia Properties, Inc. recommended that Alternative 2 be selected to remediate the Site since it takes best advantage of the geologic characteristics of the Site, minimizes all environmental risks posed to the off-Site soil, water, and ecology, makes a permanent chamber to contain the constituents, and there is no risk of additional infiltration to off-Site areas.

EPA Response: EPA agrees that a slurry wall constructed to the bedrock and a RCRA Subtitle C cap could effectively contain the contaminants at the Site, thus minimizing risks associated with the Site. However, the slurry wall and cap must always be maintained to assure protectiveness of the remedy. In addition, Alternative 2 includes treatment of only the K001 waste in the unlined pond. The NCP states a preference for treatment, especially for any principal threats associated with a site. None of the principal threats associated with the Site-DNAPL soil, CCA Disposal Area, and Fill Area-would be treated under Alternative 2.

10. Virginia Properties, Inc. stated that Alternative 2 requires a small amount of excavation, posing minimal risk of air emissions during remediation, and requires no test period because the technologies are well understood.

EPA Response: EPA agrees that the amount of excavation under Alternative 2 is much less than that under Alternatives 3, 4, and 5. However, as stated previously, all excavation at the Site would be performed using dust suppression techniques to minimize fugitive dust emissions. Although treatability studies would not be required under Alternative 2, tests must be performed during the design phase to determine whether the slurry wall would require a liner and to determine the appropriate composition of the liner because of the ability of creosote to penetrate slurry walls.

11. Virginia Properties, Inc. prefers Alternative 2 because it provides for the reuse and aesthetic rehabilitation of the property through the placement of topsoil, grass, and new structures above the cap.

EPA Response: Although EPA Region 3 knows of Superfund sites which have been converted to open space/recreation areas after the construction of a cap, it is not aware of any Superfund sites which were developed with light industrial/commercial structures on top of a cap. In addition, Alternatives 3, 4, and 5 include placement of six inches of topsoil on top of the treated soil. These three alternatives include institutional controls which prohibit only residential development of the Site after remediation since the soil cleanup levels were determined based on light industrial/commercial exposures.

B. Public Comments

1. The owner of Talley's Pond asked what will be done for North Run Creek and Talley's Pond.

EPA Response: Arsenic has been detected in North Run Creek and Talley's Pond but the highest levels of arsenic have been restricted to the oxbow of North Run Creek, just north of the Site. The selected remedy includes removal of the sediments in the oxbow of North Run Creek, just north of the Site. Also, Talley's Pond will be re-sampled and the dredged sediments from the pond will be sampled as part of the selected remedy.

2. The owner of Talley's Pond stated that, within the last three years, swans and Canadian geese that were brought onto their

property died.

EPA Response: According to the owner of Talley's Pond, wildlife which were born at the pond thrive better than those which were brought there. Since wildlife which were born at the pond have had far greater exposures to whatever contaminants are/were present, it is not clear that Site related contaminants are responsible for the poor health of the wildlife. In addition, it is impossible to determine the health of the wildlife prior to their being brought to the pond.

3. The owner of Talley's Pond stated that tests on bluegills taken from the pond showed the fish were contaminated.

EPA Response: As part of the RI, ten bluegill specimens were caught and sampled for total metals analyses. Metal contaminants associated with the Site are arsenic, chromium, and copper, all of which were sampled and were below the detection limits. However, organic analyses were not performed on the fish. Based on this information, the selected remedy includes an additional round of sampling of fish from the pond to determine if they are safe to ingest.

4. The owner of Talley's Pond indicated that her husband dredged the pond sediments in January 1989 and spread the dredged sediments on the property. She expressed concern about friends and passersby walking around the property while feeding ducks and possibly being exposed to Site-related contaminants.

EPA Response: The first phase of the RI was performed from May to August 1989. Samples were not taken of the dredged sediments because EPA was unaware that sediments from Talley's Pond were dredged and placed on the property prior to the RI. Based on this information, the selected remedy includes sampling of the dredged sediments. If the sediments exceed the Site-specific cleanup levels, they will be excavated and disposed of offsite. The excavated areas will be replaced with topsoil and seeded.

IV. SUMMARY OF CITIZENS' WRITTEN COMMENTS AND EPA RESPONSES

1. One commenter stated that there is no such thing as a permanent capping/containment system and that Alternative 2 does not fix the problem but leaves the mess where it is where it will eventually start to leak.

EPA Response: Installation of a cap and slurry wall can be effective in controlling contamination at a site. However, both the slurry wall and the cap will need to be maintained to assure protectiveness of human health and the environment. It is conceivable that the containment system will eventually start to leak. However, the selected remedy provides for a dewatering system within the cap and slurry wall. If the containment system under the selected remedy should start to leak, water would be drawn into the capped area and then be collected and treated. By treating the most highly contaminated soil at the Site, the selected remedy further limits the chance for any uncontrolled release of contamination at the Site.

2. One commenter stated that it appears the LTTD treatment system would provide for adequate air pollution safeguards.

EPA Response: Air emissions would be tested during the treatability studies to determine what air pollution control equipment is necessary to meet Federal and Virginia air emission requirements.

3. One commenter asked that steps be taken to ensure total containment of pollutants on the Site while the cleanup takes place.

EPA Response: An Erosion and Sediment Control Plan will be developed during the remedial design phase. Implementation of the Erosion and Sediment Control Plan during remedial action will control runon and runoff of surface water at the Site and minimize impacts from sediment transport from the Site. During the remedial action, dust control measures will be utilized to minimize the amount of fugitive dust caused by earth-moving operations. EPA will continue to assess conditions at the Site as the remediation process continues to ensure human health and the environment are protected.

4. The owner of Talley's Pond inquired as to the safety of her and her family since the pond is on their property. She also asked what are their responsibilities to the public which visit the pond.

EPA Response: Without sampling results, EPA cannot determine whether anyone would be at risk from exposure to the dredged sediments. Since the sediments have been planted with grass seed, the possibility of exposure to fugitive dust is greatly reduced. The selected remedy includes sampling the dredged sediments to determine if they pose unacceptable risks to human health and the environment. Until the sampling results are known, it is suggested that children not be allowed to play in that area.

5. The owner of Talley's Pond stated that, should they ever decide to dredge the pond again, they would be dealing with contaminated soil.

EPA Response: The sediments in Talley's Pond have been sampled. The results of the sampling have indicated some metals contamination associated with contaminants from the Site. The levels have decreased from the first to the second round of sampling. EPA believes the reduction is due to the construction of the sediment trap and berm in June 1992. However, EPA has included additional sampling of the pond as part of the selected remedy because the highest level of contaminants in the pond sediments may not be detected at the previous sampling location. Also, the previous sampling did not include testing for organic contaminants. If the sampling results indicate that the sediments pose unacceptable risks to human health or the environment, they will be excavated and disposed of offsite.

V. SUMMARY OF LOCAL MUNICIPALITY COMMENTS AND EPA RESPONSES

1. The County of Henrico researched literature on the Low Temperature Thermal Desorption Process, and found no evidence of the technology having been used at a wood preserving operation. They are concerned that this is the first time LTTD would be used on this type of facility and that contaminants may breach either the LTTD treatment process or, during periods of heavy rains or flooding, the ground water collection trenches.

EPA Response: LTTD is an innovative treatment process which has been selected in 14 Records of Decision as of May 1991 (including two Records of Decision for wood treating facilities). In addition, performance data indicate that LTTD is capable of removing PCP and PAHs from soil. Verification sampling plans will be developed during the design phase to determine if the LTTD process is treating the contaminated soil to the established cleanup levels. The potential for ground water to breach the collection trenches exists primarily when the trenches become clogged with silt over time. The remedy selected by EPA includes slurry walls and a dewatering system to contain the contaminated ground water rather than the proposed collection trenches.

2. The County of Henrico is concerned that the offsite transportation of soils and sludge in Alternative 3 would mean an increased risk of transportation-related accidents involving hazardous materials at an intersection on Parham Road that has no traffic light.

EPA Response: K001 waste and material from the Fill Area (including drums) are the only hazardous substances selected for offsite disposal, with the possibility that the dredged sediments and present sediments from Talley's Pond could also be disposed of offsite if they pose unacceptable risks to human health or the environment. In addition, debris from the demolition of the remaining structures will be disposed of offsite. However, the debris will be decontaminated, as needed, prior to transportation. As part of the remedial action workplan, details for transportation of the wastes offsite will be developed which will take into account the amount of traffic on Parham Road and the fact that no traffic light exists.

3. The County of Henrico stated that Alternative 3 does not detail the method of treatment of contaminated soils found off the Rentokil property outside of the containment area.

EPA Response: On page 3 of the Proposed Plan, EPA defined the "Site" as comprising the land occupied by the Rentokil (Virginia Wood Preserving) facility as well as those portions of land contiguous to the northcentral boundary and the southeastern corner of the facility. The preferred remedy included excavation, treatment and onsite disposal of the surface soil from the Site, including areas contiguous to the Rentokil facility, which exceeded the cleanup levels. The selected remedy includes excavation and onsite disposal of the contaminated surface soil located beyond the extent of the cap.

4. The County of Henrico expressed doubt that Alternative 3 would be completed in the estimated two years, given the chronology of EPA's involvement at the Site. The County questions whether this two year estimate contains sufficient time to pretest the LTTD Process.

EPA Response: The Feasibility Study (FS) for the Site was conducted by Dames & Moore under contract to Rentokil, Inc. The timeframes for all alternatives included in the Proposed Plan are those developed by Dames & Moore, with the only exception being the timeframe for Alternative 6 which was developed by EPA. The timeframes included in the Proposed Plan for all alternatives are the estimated time required to construct the remedial action, and do not include the time required to negotiate with the potentially responsible parties to perform the work or the time required to conduct the remedial design, including the treatability studies.

5. The County of Henrico strongly recommends careful consideration of Alternative 7 as a better solution than Alternatives 2 or 3.

EPA Response: Virginia Properties, Inc. submitted comments which suggested the addition of dewatering the area within the cap and slurry wall area as a new Alternative 7. EPA believes the addition of the dewatering concept in concert with the construction of a cap and slurry wall offers more protection from contaminated ground water than the collection trenches included in Alternative 3. Therefore, the remedy selected by EPA includes a cap, slurry wall, and dewatering system. However, in accordance with the preference for treatment presented in CERCLA and the NCP, EPA has also selected treatment of the principal threats associated with the Site-surface water and K001 waste in the unlined pond, the CCA Disposal Area, Fill Area, and the DNAPL soil in the areas of the treatment pad, unlined pond, and the former blowdown sump.

6. The County of Henrico insists on the following, regardless of the cleanup alternative selected:

> -That testing be reinstituted at the test wells surrounding the Rentokil Site before the remedial cleanup plan is instituted, during the containment process, and upon completion of the containment process in order to demonstrate the effectiveness of the containment.
>
> -That the Workplan require that all contractors develop a traffic plan with and approved by the County of Henrico's Department of Public Works, Division of Police and the Division of Fire for the removal of hazardous waste material from the site.
>
> -That a copy of the Health and Safety Plan identified in the contamination remediation process be filed with the County's Division of Fire.
>
> -That the remediation process meet all of the County's erosion and sediment control regulations.
>
> -Should EPA enter into negotiations with the owners of the Rentokil Site, the county would like to be notified in a timely manner so we may have input into the process.

EPA Response: Long-term ground water monitoring is part of the selected remedy. EPA will determine the number and location of the monitoring wells during design. EPA agrees that a baseline of ground water data should be established by sampling the monitoring wells prior to the start of the remedial action. However, it is not necessary to perform sampling in excess of that contained in the monitoring plan.

It would be beneficial if the County of Henrico's Department of Public Works, Division of Police, and the Division of Fire were to list their applicable concerns regarding the transport of hazardous waste from the Site prior to the development of the remedial action workplan so that this document may be able to address these concerns.

A copy of the Health and Safety Plan for the Site will be filed with the County of Henrico's Division of Fire.

An Erosion and Sediment Control Plan will be completed as part of the remedial design. The Erosion and Sediment Control Plan will meet the requirements of the Virginia Erosion and Sediment Control Law which indicates the applicable regulations of the county are to be addressed.

EPA will issue Special Notice Letters to potentially responsible parties at the Site, offering them the opportunity to perform the remedial design and remedial action. EPA will notify the County of Henrico after these letters have been issued.

7. The County of Henrico expressed concern over the possibility of reuse of the Site.

EPA Response: Although EPA Region 3 knows of Superfund sites which have been converted to open space/recreation areas after the construction of a cap, it is not aware of any Superfund sites which were developed with light industrial/commercial structures on top of a cap.

VI. SUMMARY OF POTENTIALLY RESPONSIBLE PARTIES COMMENTS AND EPA RESPONSES

1. Richmond Land Corporation stated that remedial cleanup goals established for offsite areas should not contain the same reduction factors such as limited exposure frequency, limited ingestion rate, and low fraction ingested from contaminant source because there is a large portion of contamination remaining in off-Site areas.

EPA Response: The Site is comprised of the wood treating facility property occupied by Rentokil, Inc. and the areas of land contiguous to the northcentral boundary and the southeastern corner of the facility. The definition of Site is based on the soil sampling results of the Remedial Investigation. The only off-Site areas which have levels of contamination of concern would be the sediments in North Run Creek and, possibly, the sediments in Talley's Pond. The cleanup levels determined for the Site are the same for those areas on the wood treating facility property as well as those areas comprising the Site which are located beyond the wood treating facility property. The Site-specific health based cleanup levels developed for the Site are: 5.1 mg/kg for total carcinogenic PAHs, 48 mg/kg for PCP, and 33 mg/kg for arsenic.

2. The Richmond Land Corporation stated that the risk assessment does not adequately address the potential elevated risk hazards associated with on-site workers and the community during periods of excavation and remediation.

EPA Response: During the remedial action, dust-suppression techniques will substantially control any dust generated to protect workers at the Site and nearby residents.

3. The Richmond Land Corporation stated that the cost of remediation does not include indirect costs due to the devaluation of both the on-site property and the surrounding

property, the cost of damage to the underlying ground water, and the cost of restricted future land use.

EPA Response: According to the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, OSWER Directive 9355.3-01, the purpose of the cost evaluation criteria is to evaluate the capital and operation and maintenance (O&M) costs of each alternative. Capital costs consist of direct (construction) and indirect (nonconstruction and overhead) costs while O&M costs are post-construction costs necessary to ensure the continued effectiveness of a remedial action. Indirect costs may include engineering expenses, license or permit costs, startup and shakedown costs, and contingency allowances. The costs associated with the devaluation of property, damage to underlying ground water, and restricted future land use are not factors in this evaluation and, are not specifically evaluated when selecting a remedy.

4. Richmond Land Corporation believes Alternative 2, the cap and slurry wall, is not appropriate to remediate the Site and that the remedy for the Site must address reduction of toxicity and/or volume to facilitate long-term risk reduction and eliminate impacts to surrounding properties.

EPA Response: The selected remedy includes treatment to reduce toxicity and volume of the contamination at the Site as well as containment to prevent further migration and exposure to contaminants. Contaminated surface soil beyond the extent of the cap will be excavated and backfilled onsite prior to construction of the cap and the principal threats associated with the Site (DNAPL, CCA Disposal Area, and Fill Area) will be excavated, treated to health based levels, and disposed of onsite prior to construction of the cap. Ground water will be removed with a dewatering system, treated, and discharged to North Run Creek.

5. Richmond Land Corporation believes the estimates of the extent of soil and ground water remediation required have been based on inadequate data.

EPA Response: EPA believes a sufficient number of soil and ground water samples were taken from monitoring wells constructed to characterize the nature of contamination at the Site. Additional sampling of both soil and ground water will occur during the remedial design to more accurately define the extent of Site contamination.

6. Richmond Land Corporation states that the Remedial Action Plan does not identify steps that will be taken to ensure that cleanup levels are met and that the areas proposed for excavation to the hardpan are identified but the basis for the horizontal and vertical extent is not established.

EPA Response: To ensure that cleanup levels are being met during treatment, a verification sampling plan will be developed during the remedial design. The areas selected for excavation to the hardpan include 25 feet around the treatment pad, unlined pond, and the former blowdown sump.

7. Richmond Land Corporation believes the selected alternative does not adequately address off-property impacts, including an area of 200 ppm PAHs to the east of the property line.

EPA Response: The selected alternative referred to in this comment is actually Alternative 3, which was identified as the EPA preferred remedy in the Proposed Plan but was not selected in the ROD. EPA does not believe the contaminant level at this sample point poses an unacceptable risk to human health. The sample result mentioned in the comment is for total PAHs. The carcinogenic PAH fraction for this sample is 34 mg/kg. The carcinogenic PAHs cleanup level (10^{-6} human health risk) for ingestion of soil is 5.1 mg/kg. This cleanup level was developed for surface soil (top two feet) where it is most likely soil ingestion will occur. The sample point indicated in the comment is at the hardpan, about five feet from the surface. Also, most of the material in the area of this sample will be removed during the excavation of the Fill Area and the construction of the slurry wall.

8. Richmond Land Corporation stated that restoration of wetlands is not evaluated.

EPA Response: Alternatives 2 through 6 all include excavation of the top two feet of soil in the three wetland areas. Therefore, the cost of restoring the wetlands would be almost the same for all of these alternatives (Alternative 2 and the selected remedy would be somewhat less since the cap will extend beyond the northern property boundary). Although not included in the Proposed Plan, the selected remedy includes revegetating all dredged wetlands and replacing all capped wetlands, subject to approval by EPA.

9. Richmond Land Corporation stated that no treatability studies have been conducted.

EPA Response: EPA would prefer that treatability studies be conducted during the RI/FS. Since treatability studies were not performed during the RI/FS, they must be performed during the remedial design. Performance data generated in other studies indicate that the LTTD system will be capable of meeting the cleanup levels of 5.1 mg/kg for carcinogenic PAHs and 48 mg/kg for PCP. Based on the performance data, EPA does not believe a fallback remedy is warranted.

10. Richmond Land Corporation stated that the ground water

treatment system description is not adequate to evaluate costs.

EPA Response: The selected remedy includes a cap and slurry wall to minimize ground water flow through the area beneath the Site. The dewatering system in the selected remedy will only treat the ground water within the cap and slurry wall.

11. Richmond Land Corporation has concerns regarding the waste remaining on and off site under Virginia Properties' proposed Alternative 7. Also, it would like to know what the land use restrictions will be for Alternatives 2 and 7 and how the land use restrictions will differ if a rigid versus non-rigid cap is constructed.

EPA Response: The principal threats will be addressed by excavating, treating, and disposing onsite the CCA Disposal Area, Fill Area, soil to hardpan in the treatment pad, unlined pond, and former blowdown sump areas. The surface soil beyond the extent of the cap will also be excavated and disposed onsite. Land use restrictions for all alternatives will be implemented to prohibit use of the ground water at the Site and residential development of the Site. EPA will decide during the remedial design whether to construct a rigid or non-rigid cap. The effect of the cap type on land use restrictions will be considered during the evaluation.

12. The comments from Virginia Properties, Inc. propose a new remedial alternative for the Site, Alternative 7, which is actually a modification of Alternative 2. Specifically, the proposed alternative includes a dewatering system in addition to the remedial actions of Alternative 2. The purpose of the dewatering system is to produce an intragradient condition within the cap and slurry wall.

EPA Response: The dewatering system proposed by Virginia Properties, Inc. may mobilize the DNAPL in the soil after the area within the cap and slurry wall is completely dewatered, thus increasing the possibility of capturing DNAPL in the horizontal collectors. The remedy selected in the ROD combines the containment of Alternative 2, the LTTD and fixation treatment of Alternative 3 (but for a smaller volume of soil), and the dewatering system proposed by Virginia Properties, Inc. The selected remedy includes treatment of the soil to the hardpan in the area within 25 feet of the treatment pad, unlined pond, and former blowdown sump, as well as the CCA Disposal and Fill Areas to address the principal threats associated with the Site, to conform with the expectations of the NCP, and to meet the statutory preference for treatment. Although the proposal submitted by Virginia Properties, Inc. is superior to Alternative 2, it was not selected because it does not address the source areas associated with the CCA Disposal and Fill Areas. In addition, EPA selected excavation and treatment of the areas defined previously to assure reduction of the toxicity and volume of the highest levels of DNAPL at the Site.

13. Virginia Properties, Inc. stated that EPA should use cleanup levels which meet a 10^{-5} human health risk in final remedy selection because failure to do so result is a "propagation of conservativeness".

EPA Response: Quantitative risk assessments are performed to determine whether threats to human health exist due to environmental contamination. The quantitative evaluation of risk requires that many assumptions be made regarding exposure as well as inherent toxicity. In order to satisfy this obligation and to ensure that human health is protected, EPA employs admittedly conservative assumptions when calculating risk. The need to make conservative assumptions arises from the uncertainties associated with several parameters related to the assessment of risk, including (but not limited to) observed adverse health effects and subsequent toxicity criteria, derived from exposed laboratory animals for application to the human population and the variation in the general human population. However, this conservative approach does not represent a worst-case scenario, but rather, a reasonable maximum exposure (RME). The intent of the RME is to produce a conservative estimate that is still within the range of possible exposures. At the same time, such methodology ensures that EPA is able to meet its ultimate responsibility of protecting the health of sensitive subpopulations such as young children, the elderly, pregnant women, and the chronically ill.

14. Regarding long-term effectiveness and permanence, Virginia Properties, Inc. states that EPA failed to address in the Proposed Plan the degree of uncertainty that the LTTD treatment system will be able to meet the cleanup levels for PAHs and PCP.

EPA Response: LTTD is an innovative treatment system which, as of May 1991, has been selected as the treatment technology for remediation of a total of 14 Superfund sites, including two wood treating Superfund sites. Performance data from previous tests indicate LTTD is capable of removing PCP and PAHs from soil. Treatability tests will be performed during remedial design to ascertain optimal operating parameters. Verification sampling plans will be developed during the design phase to determine if the LTTD process is treating the contaminated soil to the established cleanup levels.

15. Regarding reduction of toxicity, mobility, or volume through treatment, Virginia Properties, Inc. states that its proposed Alternative 7 will achieve reductions in the toxicity, volume and mobility of Site contaminants greater than those estimated for Alternative 3.

EPA Response: The EPA evaluation criteria examine the reduction of toxicity, mobility, or volume through treatment for each alternative. Containment does not reduce toxicity, mobility, or volume through treatment because there is no treatment. In the alternative proposed by Virginia Properties, Inc., only the ground water recovered in the dewatering system is treated. As such, the alternative proposed by Virginia Properties, Inc. achieves much less of a reduction in toxicity, mobility, or volume through treatment as compared to Alternative 3. The alternative selected in the ROD combines the containment provisions of Alternative 2, the dewatering system proposed by Virginia Properties, Inc. and the treatment technologies of Alternative 3. Therefore, the selected alternative achieves a greater reduction of toxicity, mobility, or volume through treatment than does the alternative proposed by Virginia Properties, Inc.

In addition, it is not known whether the horizontal drains will effectively remove DNAPL from the soil. It is only theorized at this time that, after the area within the cap and slurry wall is dewatered, the DNAPL present will mobilize. This method of dewatering an aquifer has not been utilized previously for DNAPL removal. Thus, treatment of these wastes is not assured.

16. Regarding short-term effectiveness, Virginia Properties, Inc. states that EPA did not fully consider in the Proposed Plan the risks associated with implementation of LTTD or the other treatment alternatives considered.

EPA Response: The performance of LTTD at other sites indicates there is little cause for concern over the effectiveness of this form of treatment. Potential impacts associated with staging of excavated soil and fugitive dust will be minimized through implementation of dust-suppression techniques.

17. Regarding implementability, Virginia Properties, Inc. states that implementation of its proposed Alternative 7 will not create problems of administrative feasibility while LTTD poses both technical and administrative feasibility problems.

EPA Response: By excavating a much smaller volume of soil, the space limitations of the Site could be easily overcome with a site implementation plan to coordinate all work at the Site during remedial action.

Disposal of untreated surface soil in the area under the cap is the same as the disposal of surface soil in the selected remedy. Under the selected remedy, the treated soil would also be disposed onsite prior to construction of the cap. Under Virginia Properties' alternative, the excavated soil would either be disposed of in an offsite RCRA-permitted facility or in the area to be capped. Offsite disposal of the untreated soil would have to be accomplished prior to the soon-to-be enacted Land Disposal Restrictions for F032, F034, and F035 RCRA listed wastes.

18. Regarding cost, Virginia Properties, Inc. states that, if treated soil must be transported and disposed offsite under Alternative 3, the cost of the remedy would be $37,100,000. They also state that Alternative 3 does not meet the NCP's mandate to select a remedy that is cost-effective.

EPA Response: The present worth cost of the selected remedy has been estimated by EPA at $10,907,000, which is within 10% of the alternative proposed by Virginia Properties, Inc. The selected remedy ranks higher than the alternative proposed by Virginia Properties, Inc. in long-term effectiveness and permanence and reduction of toxicity, mobility, or volume through treatment. As such, the selected remedy is more cost-effective than that proposed by Virginia Properties, Inc.

19. Virginia Properties, Inc. questions whether the preferred alternative will comply with state and federal applicable or relevant and appropriate requirements (ARARs), specifically the VSWMR prohibition against onsite disposal of treated soil, and the federal Land Disposal Restrictions (LDRs).

EPA Response: Regarding the VSWMR, EPA has acknowledged that, in general, the VSWMR are ARARs. However, the newly issued provision cited by Virginia Properties would appear to result in a statewide prohibition of land disposal of hazardous substances. Under Section 121(d) of CERCLA, such a provision cannot be an ARAR unless three conditions are met:

- The State requirement is of general applicability and was adopted by formal means:

- The State requirement was adopted on the basis of hydrologic, geologic, or other relevant considerations and was not adopted for the purpose of precluding on-site remedial actions or other land disposal for reasons unrelated to protection of human health and the environment; and

- The State arranges for, and assures payment of the incremental costs of, utilizing a facility for hazardous waste disposal.

Assuming that the first two conditions have been met (there is nothing in the administrative record to demonstrate that they have), there is no indication that the Commonwealth of Virginia intends to satisfy the last condition. Thus, EPA has determined that the provision cited by Virginia Properties is not an ARAR. This determination is reinforced by the fact that the

Commonwealth has not documented or identified the provision as an ARAR, as required by the NCP.

The federal LDRs will only be applicable if RCRA hazardous wastes, restricted from land disposal pursuant to 40 C.F.R. Part 268, are to be disposed of at the Site. Currently, there are no LDRs in place for listed RCRA hazardous wastes at the Site. The only wastes at the Site which could potentially trigger LDRs would be wastes exhibiting a characteristic defined in 40 C.F.R. Part 261, Subpart C. The only wastes to be disposed of at the Site are the LTTD-treated soils. All LTTD-treated soils will be subjected to a chemical fixation process prior to onsite disposal. Chemical fixation should render the soils chemically stable and, in such a state, the soils would not exihibit the toxicity characteristic for arsenic or chromium. The chemical fixation process has proven successful at other Superfund sites in the Region, notably the C&R Battery Site in Virginia. Therefore, these soils should not trigger the LDRs. Non-LTTD-treated surface soils to be removed from beyond the area to be capped, and then buried beneath the cap, are not "disposed," because they are being consolidated within the same area of contamination. Thus, these soils are not subject to the LDRs.

20. Virginia Properties, Inc. submitted additional comments (after the close of the public comment period) in a letter dated May 24, 1993 in which it voices the opinion that implementation of LTTD treatment in the selected remedy will result in uncontrollable and unquantifiable costs and unnecessary delays. Additionally, Virginia Properties, Inc. states that overall protection of human health and the environment does not require both treatment of soil to a 1×10^{-6} health based level and construction of a cap and slurry wall containment system; rather, they feel treatment to a 1×10^{-4} health based level in conjunction with the cap and slurry wall containment system would be sufficient for protection of human health and the environment.

<u>EPA Response</u>: Treatability studies are required in order to properly design any treatment system. Since treatability studies were not performed by Virginia Properties, Inc. during the RI/FS phase, they will be conducted during the design phase. The purpose of the treatability study is to determine the proper design and operating parameters of the treatment system to optimize removal of contaminants while minimizing costs.

Although treatability studies were not performed on the Site soil, EPA believes LTTD will be able to meet the cleanup levels established in the ROD. LTTD is an innovative treatment system which, as of May 1991, has been selected as the treatment technology for remediation of a total of 14 Superfund sites, including two wood treating Superfund sites. In addition, LTTD has been evaluated in the Superfund Innovative Technology Evaluation (SITE) Program using the X*Trax Model 200 Thermal Desorption System manufactured by Chemical Waste Management, Inc. and the Low Temperature Thermal Treatment (LT^3) System manufactured by Roy F. Weston, Inc. The demonstration of the X*Trax Model 200 Thermal Desorption System, conducted in May 1992, included treatment of 215 tons of soil and sediment contaminated with polychlorinated biphenyls (PCBs) from the Re-Solve Superfund Site in North Dartmouth, MA. PCBs are very difficult to remove from soil and sediment, very much like PCP and PAHs. PCB concentrations in the contaminated soil ranged from 181 to 515 milligrams per kilogram (mg/kg). PCB concentrations in all treated soil samples were less than 1.0 mg/kg and the average concentration was 0.25 mg/kg. The average removal efficiency was 99.9%. This information is published in a SITE Demonstration Bulletin, EPA540/MR-93/502, February 1993.

The exact concentration level of treated soil cannot be determined without treatability studies. However, based on results such as the above, EPA believes LTTD will be able to meet the cleanup levels established in the ROD.

Virginia Properties, Inc. states in its comments that the Site-specific cleanup levels should be based on a 1×10^{-4} risk level because it is within the EPA allowable risk range, would lessen the need for testing and study, and that the soil will be placed in a the cap and slurry wall containment system which is protective of human health and the environment.

EPA's allowable risk range is 10^{-4} to 10^{-6}, with 10^{-6} being the point of departure. According to the Preamble to the NCP,

> "EPA intends that there be a preference for setting remediation goals at the more protective end of the range, other things being equal. Contrary to assertions of some commenters, EPA does not believe that this preference will be so strong as to preclude appropriate site-specific factors."

The above was utilized in determining the cleanup levels for the Rentokil, Inc. Site in that the cleanup levels determined for PCP and PAHs at the Site are established at the 10^{-6} risk level while the cleanup level for arsenic is established at the 10^{-5} risk level because the 10^{-6} cleanup level is actually lower than the Site-specific background level of arsenic.

In the remedy selection process, EPA must evaluate alternatives with respect to the nine point criteria listed in the NCP as well as meeting the statutory requirements of CERCLA section 121.

Both the selected remedy and the remedy propounded by

Virginia Properties, Inc. meet the "threshold criteria" of overall protection of human health and the environment and compliance with ARARs. EPA has determined, based upon consideration of information contained in the administrative record, that the selected remedy strikes the best balance among the five "primary balancing criteria": long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. The following is a synopsis of EPA's evaluation of the selected remedy and the remedy propounded by Virginia Properties, Inc. with respect to the five primary balancing criteria:

The selected remedy achieves more in terms of long-term effectiveness and permanence because the residual risk (if the containment system should fail) is lower than the remedy proposed by Virginia Properties, Inc. because a much higher volume of contaminated soil at the Site is treated;

The selected remedy achieves more in terms of reduction of toxicity, mobility or volume through treatment because, by utilizing the 1×10^{-6} risk level, a much higher volume of contaminated soil at the Site will be treated in comparison to the remedy proposed by Virginia Properties, Inc. plus, a much greater amount of contaminants will be removed in the selected remedy;

The remedy proposed by Virginia Properties, Inc. has greater short-term effectiveness because the remedial action objectives would be achieved more quickly than under the selected remedy;

LTTD treatment is implementable, as has been demonstrated at other sites;

Both alternatives are nearly equal in cost, the selected remedy costing less than 10% more. Although reducing or eliminating treatability testing of the LTTD treatment technology would serve to reduce the cost of remediation of the Site, this would be outweighed by the savings gained by determining the optimum design and operating parameters of the treatment system. It should be noted that most Superfund sites require treatability studies.

In the opinion of EPA, Virginia Properties, Inc. has disregarded two of the nine remedy evaluation criteria listed in the NCP, namely, reduction of toxicity, mobility, or volume through treatment and long-term effectiveness and permanence. EPA must consider all nine criteria when selecting remedies for Superfund sites.

Section 121 of CERCLA contains a mandate to utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. By treating the wastes with LTTD to the 1×10^{-6} risk level, the selected remedy will permanently reduce the volume of hazardous substances remaining at the Site. Because the cap and slurry wall system will have to contain less hazardous waste, compared to the remedy proposed by Virginia Properties, Inc., the selected remedy is likely to achieve more in terms of long-term effectiveness and permanence, at only slightly higher cost (less than 10%).

COMMUNITY RELATIONS ACTIVITIES AT RENTOKIL SITE

ACTIVITY	DATE
(Community Update mailings - four times per year)	
Proposed to NPL	1/87
Notice to Residents of Environmental Concerns	2/27/87
Meeting with County Officials	7/12/89
Community Interviews for CRP	7/8/89
Information Repository established	7/89
Site Visit to prepare for CRP	8/24/93
VDWM assumes Lead role	11/89
Community Relations Plan Draft	7/90
Mailing List established	8/90
Meeting with County Officials	1/14/91
Community Relations Plan Final	4/91
Meeting with County Officials	11/21/91
News Release, Removal Action	3/9/93
Public Meeting Citizen Advisory mailed	12/92
Public Notice of Proposed Plan, public meeting	1/8/93
Public Comment Period begins	1/8/93
News Release on Proposed Plan	1/8/93

Second Public Notice of Public meeting	1/18/93
Invitations distributed to residents	1/19/93
County Briefing Proposed Plan Public Meeting	1/20/93
Public Notice of Extension of comment Period	2/8/93
Comment Period ends	3/10/93