United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R03-91/134
June 1991

EPA

# Superfund Record of Decision:

## First Piedmont Quarry 719, VA

50272-101

| REPORT DOCUMENTATION PAGE | 1. REPORT NO. EPA/ROD/R03-91/134 | 2. | 3. Recipient's Accession No. |
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| 4. Title and Subtitle<br>SUPERFUND RECORD OF DECISION<br>First Piedmont Quarry 719, VA<br>First Remedial Action - Final | | | 5. Report Date<br>06/28/91<br>6. |
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15. Supplementary Notes

16. Abstract (Limit: 200 words)


The 4-acre First Piedmont Quarry Route 719 site is an inactive industrial and agricultural landfill located north of the city of Danville in Pittsylvania County, Virginia. Land in the area consists of open space and woodlands, with residential areas located to the south. The estimated 1,893 people living within 2 miles of the site obtain drinking water from wells or springs. Two small ponds and a wetlands area are located onsite. In addition, the landfill is a ground water discharge area for an underlying aquifer draining through the wetlands to Lawless Creek, which runs 1,400 feet northwest of the quarry. The site originally operated as a quarry for crushed stone. From 1970 to 1972, industrial and agricultural wastes were landfilled in the 2-acre quarry area of the site. Wastes include hundreds of buried drums; tires; scrap rubber; approximately 15,000 gallons of a mixture of MS-20 (a floor degreaser containing PCE), water, carbon black, and detergent; off-specification batch materials containing trace amounts of lead oxide; soil; tobacco scraps; and wood. The landfill contains approximately 65,000 cubic yards of industrial and agricultural wastes and 3,000 cubic yards of soil. Two additional waste areas, the Carbon Black Pile and the Waste Pile, have been identified onsite near the western


(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - First Piedmont Quarry 719, VA
First Remedial Action - Final
Contaminated Media: soil, sediment, debris, gw, sw
Key Contaminants: metals (antimony, arsenic, barium, lead, zinc)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

| 18. Availability Statement | 19. Security Class (This Report)<br>None | 21. No. of Pages<br>64 |
|---|---|---|
| | 20. Security Class (This Page)<br>None | 22. Price |

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

Abstract (Continued)

edge of the landfill. The Carbon Black Pile contains 100 cubic yards of a tire reinforcement additive and contaminated soil, and the Waste Pile contains 10 cubic yards of steel and nylon cords, glass, waste rubber strips, and contaminated soil. In 1972, the State ordered waste disposal operations to cease as a result of a fire on the landfill. This Record of Decision (ROD) provides a final remedy for all site media including the landfill material, leachate, the Carbon Black Pile and Waste Pile, and the contaminated Northern Drainage soil and sediment. The contaminants of concern are metals including antimony, arsenic, lead, barium, and zinc.

The selected remedial action for this site includes excavating and disposing offsite 1,080 tons of waste from the Carbon Black and Waste Piles along with the contaminated soil and sediment from the Northern drainage areas; performing a TCLP of excavated material to determine if it is RCRA characteristic waste, and if so, solidifying and stabilizing the excavated material prior to offsite disposal; filling the excavated Carbon Black and Waste Pile areas with clean soil; disposing of 30-40 drums from the surface of the landfill at a RCRA Subtitle C treatment facility; decontaminating and disposing of surface debris at an approved landfill; constructing a RCRA-cap and an associated leachate collection system over the 2-acre landfill area; covering the cap with 6 inches of soil and contouring soil to promote run-off, and revegetating the area; constructing run-off control berms in the Northern Drainage areas to lessen landfill cap run-offs; pretreating leachate, if necessary, prior to transporting to a Publicly Owned Treatment Works (POTW), or constructing an onsite treatment system with onsite discharge to surface water if the POTW will not accept the leachate; draining the north and south ponds, and transporting and discharging pond water offsite to a POTW; monitoring ground water and conducting bioassays to assess the effectiveness of the removal of the Carbon Black Pile and Waste Pile on the reduction of contaminant levels in the Southern Drainage; and implementing institutional controls including deed restrictions, and site access restrictions such as fencing. The estimated present worth cost for this remedial action is $2,154,000, which includes an annual O&M cost of $66,200.

<u>PERFORMANCE STANDARDS OR GOALS</u>: No applicable.

## RECORD OF DECISION
## FIRST PIEDMONT ROCK QUARRY/ROUTE 719

## DECLARATION

### SITE NAME AND LOCATION

First Piedmont Rock Quarry/Route 719 Site
Danville, Virginia

### STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the First Piedmont Rock Quarry site (the Site) in Danville, 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. The information supporting this remedial action decision is contained in the Administrative Record for this Site.

The Virginia Department of Waste Management concurs with the selected remedy.

### ASSESSMENT OF THE SITE

Pursuant to duly delegated authority, I hereby determine, pursuant to Section 106 of CERCLA, 42 U.S.C. Section 9606, that actual or threatened releases of hazardous substances from this Site, as discussed in "Summary of Site Risks," 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 split the Site into smaller components called operable units to address individual media. Based on the information derived through the Remedial Investigation, the Site does not pose any principal threats to human health. Since wastes will be left in place, long-term monitoring of the ground water must be performed. The ground water monitoring must encompass the full range of RCRA Subtitle C requirements because of the disposal of tetrachloroethylene, a listed RCRA hazardous waste, into the landfill.

The selected remedy includes the following major components:

- Excavation and offsite disposal of the Carbon Black, Waste Pile and the Northern Drainage soils and sediments.
- A RCRA Subtitle C cap on the landfill.
- Collection of leachate with treatment at a POTW.
- Washing and offsite disposal of surface debris.
- Ground water monitoring.
- Institutional controls.

**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 treatment that reduce toxicity, mobility, or volume as their principal element.

Because this remedy will result in hazardous substances remaining onsite, a review will be conducted no less often than each five years after initiation of remedial action to ensure that human health and the environment are being protected by the remedial action being implemented.

Edwin B. Erickson
Regional Administrator
Region III

6/28/91
Date

**DECISION SUMMARY for the RECORD of DECISION**

**FIRST PIEDMONT ROCK QUARRY/ROUTE 719 SITE**

## 1. Site Name, Location, and Description

The First Piedmont Rock Quarry Superfund site (the Site) is located along Route 719 in Pittsylvania County, Virginia near the intersection with Route 360. It is approximately six miles north of the city of Danville (see Figure 1).

The Site is an abandoned rock quarry located on a topographically high ridge. The quarrying operation left a cut into the rock outcrop bounded on three sides by the quarry highwalls. The fourth side of the cut is open and slopes to the west.

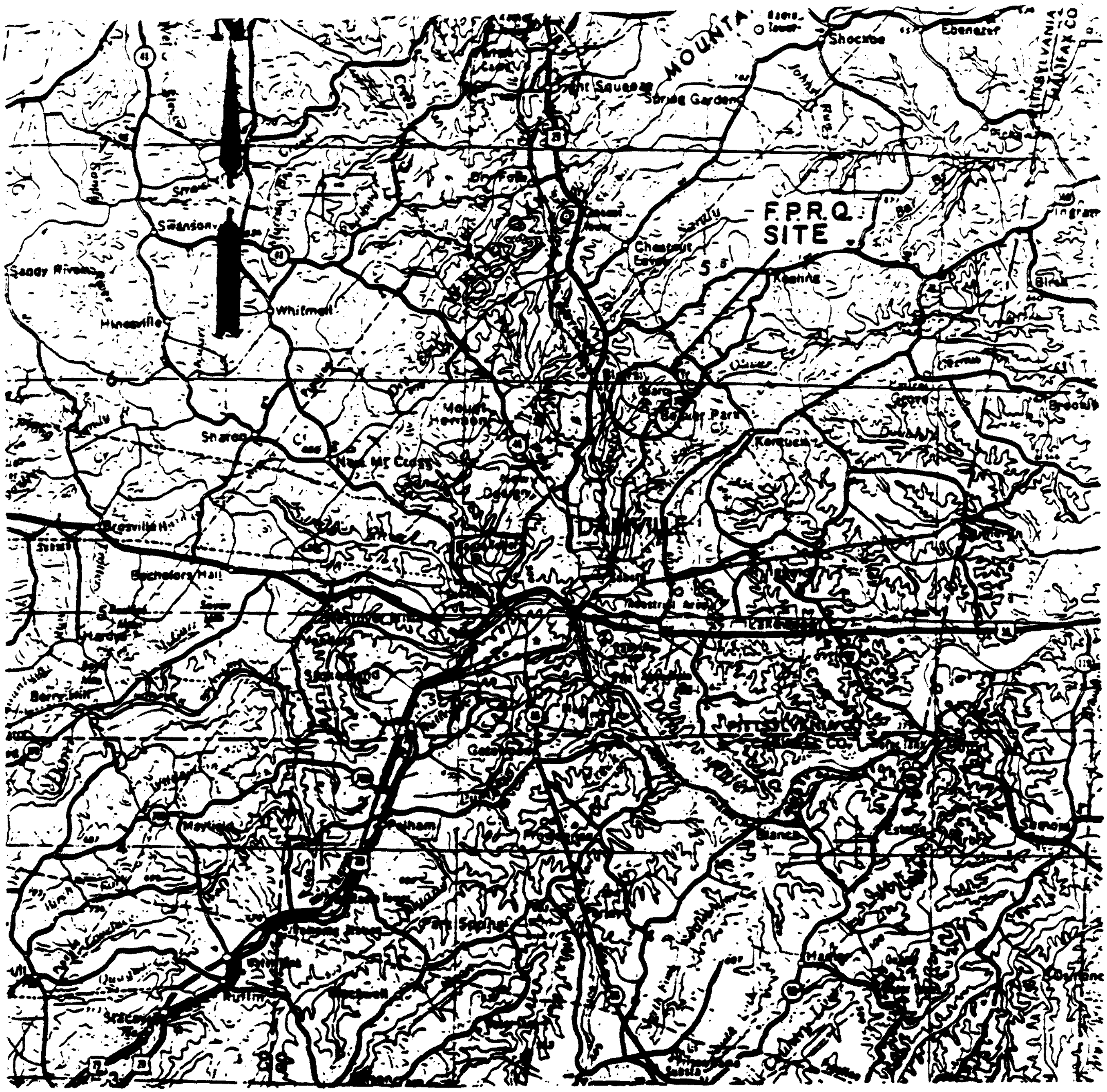
The majority of the land use in the immediate Site vicinity is open space/woodlands. Directly across Route 719 and south of the Site is a residential area, the Beaver Park community. The closest home is approximately 150 feet from the Site. All the homes in Beaver Park obtain residential water from either wells or springs. Approximately 455 people live within one mile of the Site; approximately 1,893 people live within a two-mile radius of the Site.

The Site is located within the Piedmont Physiographic Province in southern Virginia. In general, the physiography of this region consists of rounded uplands dissected by numerous streams. The land surface in the immediate vicinity of the Site slopes gently westward at a grade of 0 to 8 percent. Local relief between the uplands and valleys in the vicinity of the Site is about 100 feet.

The regional geology of the area generally consists of weathered residuum and saprolite overlying Precambrian metamorphic rocks. Field investigation of outcrops at and near the Site indicate that the bedrock is moderately fractured. Four major fracture trends were observed in the outcrops (Figure 2). Most fractures are near vertical with little parting displacement. Regional data indicate that the shallow bedrock is fractured, but the occurrence of fractures decreases with depth. Fractures probably do not occur at depths much greater than 50 to 100 feet.

Most of the soils in the area are moderately to well-drained clay to sandy loams. The soils range from silty sands to silty clays. Soils are well developed on flat slopes and thin, poorly developed on steep slopes. The soils have little sorptive capacity, with the highest value found in the northern drainage.

Pittsylvania County has a temperate climate. The mean daily temperature varies from $40^{0}$ F in January to $77^{0}$ F in July.




BASE MAP: U.S.G.S.
GREENSBORO, N.C.
1° x 2°

CONTOUR INTERVAL - 50 Ft.

**REGIONAL SITE LOCATION**

| | PROJECT TITLE: | PROJECT No. 4112-88-950 | FIGURE: 1 |
|---|---|---|---|
| Westinghouse Environmental And Geotechnical Services, Inc. | FPRQ / ROUTE 719 SITE DANVILLE, VA | CHECKED BY: | SCALE: 1:250,000 |
| | | DRAWN BY: | DATE: |

Precipitation averages 43.48 inches per year and is relatively evenly distributed.

Ground water occurrence in the Piedmont Province is principally limited to a depth of less than 150 feet; most ground water is found within 30 feet of the surface. Most of the ground water within each ground water basin discharges to the surface at low points in the topography. The seeps and springs upgradient of the landfill and south of the Beaver Park community are ground water discharge points. The landfill is also a ground water discharge area for local ground water. The majority of the ground water at the Site discharges as leachate along the western edge of the landfill into the north pond and then into the northern drainage. Surface water data and observations indicate that most of the ground water discharged from the north pond re-infiltrates or is lost to the atmosphere via evapo-transpiration.

Drainage from the area is to Lawless Creek, which lies approximately 1400 feet to the northwest of the quarry. Lawless Creek is a tributary of Fall Creek, which is a tributary of the Dan River.

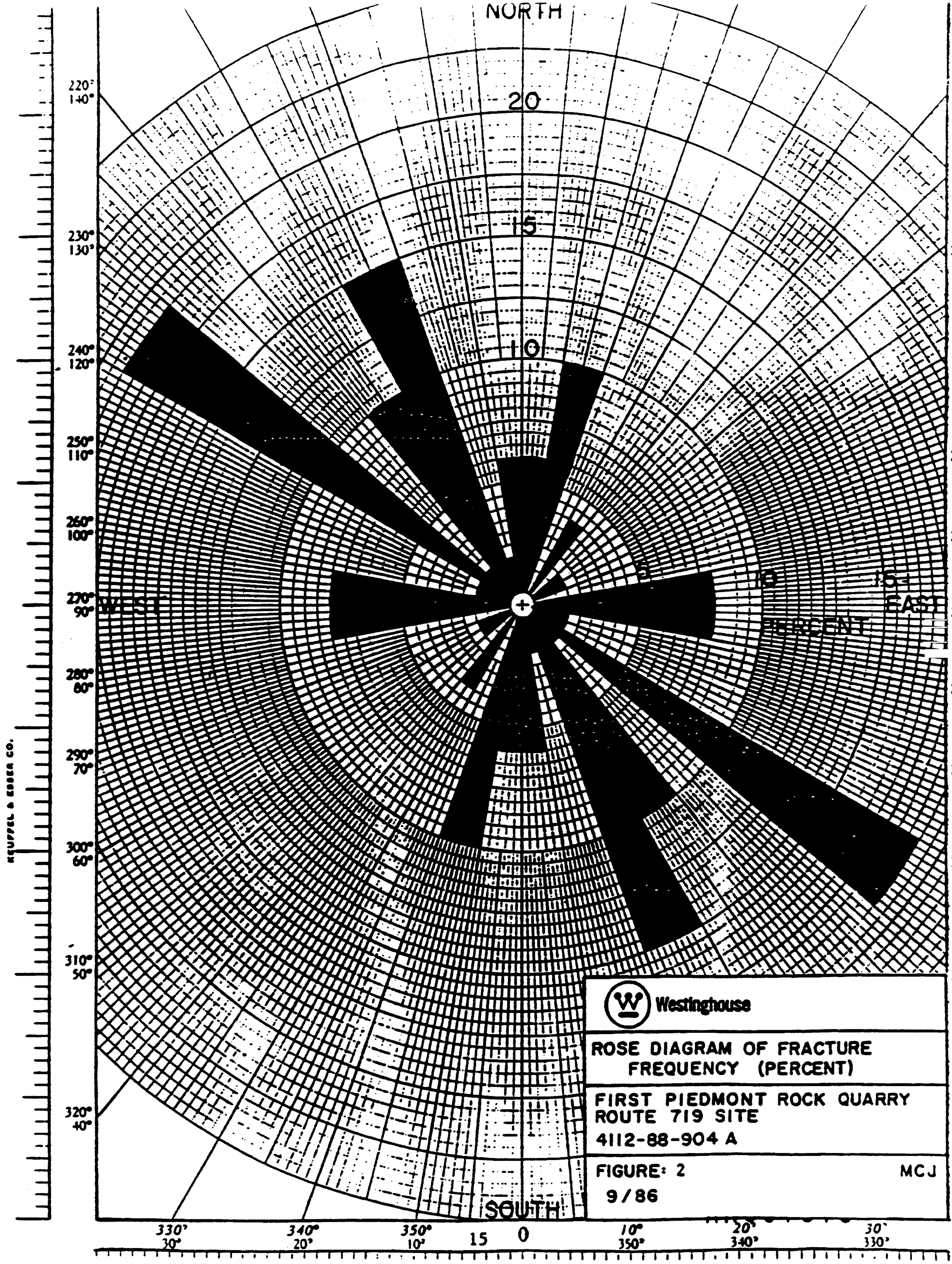
As depicted in Figure 3, two small ponded areas/wetlands are located within the landfill. The landfill is drained by two areas denoted on Figure 3 as "Southern Drainage" and "Northern Drainage". Both drainageways flow toward Lawless Creek; neither discharges directly into the creek. The Northern Drainage contains three wetland areas: a small cattail stand and a small phragmites stand in the upper reaches and a larger cattail marsh located in the bottom land hardwoods along Lawless Creek. Other than these wetlands, there are no significant habitat, agricultural land, historic or landmark sites directly or potentially affected. There are no endangered species or critical habitats within close proximity to the Site.

There are approximately thirty to forty drums remaining on the surface of the landfill.

## 2. <u>Site History and Enforcement Activities</u>

The Site was initially operated as a quarry for crushed stone. The four-acre property which comprises the Site consists of the abandoned quarry and the adjacent land. The Site was leased by the First Piedmont Corporation to be used as a landfill for industrial and agricultural waste from April 1, 1970 to April 1, 1975. Wastes were disposed in the landfill from April, 1970 to July, 1972, at which point the Virginia Health Department ordered waste disposal operations to cease due to a fire on the landfill.

The landfilling operations were restricted almost exclusively to the two-acre quarry area. The quarry was not filled in a systematic fashion; no cells or segregated disposal areas were used for specific wastes. Hundreds of drums were buried in the landfill in random fashion with other solid waste. Upon arrival at the Site, wastes were generally dumped at the highwall along the eastern edge




Westinghouse

ROSE DIAGRAM OF FRACTURE FREQUENCY (PERCENT)

FIRST PIEDMONT ROCK QUARRY
ROUTE 719 SITE
4112-88-904 A

FIGURE: 2 MCJ
9/86

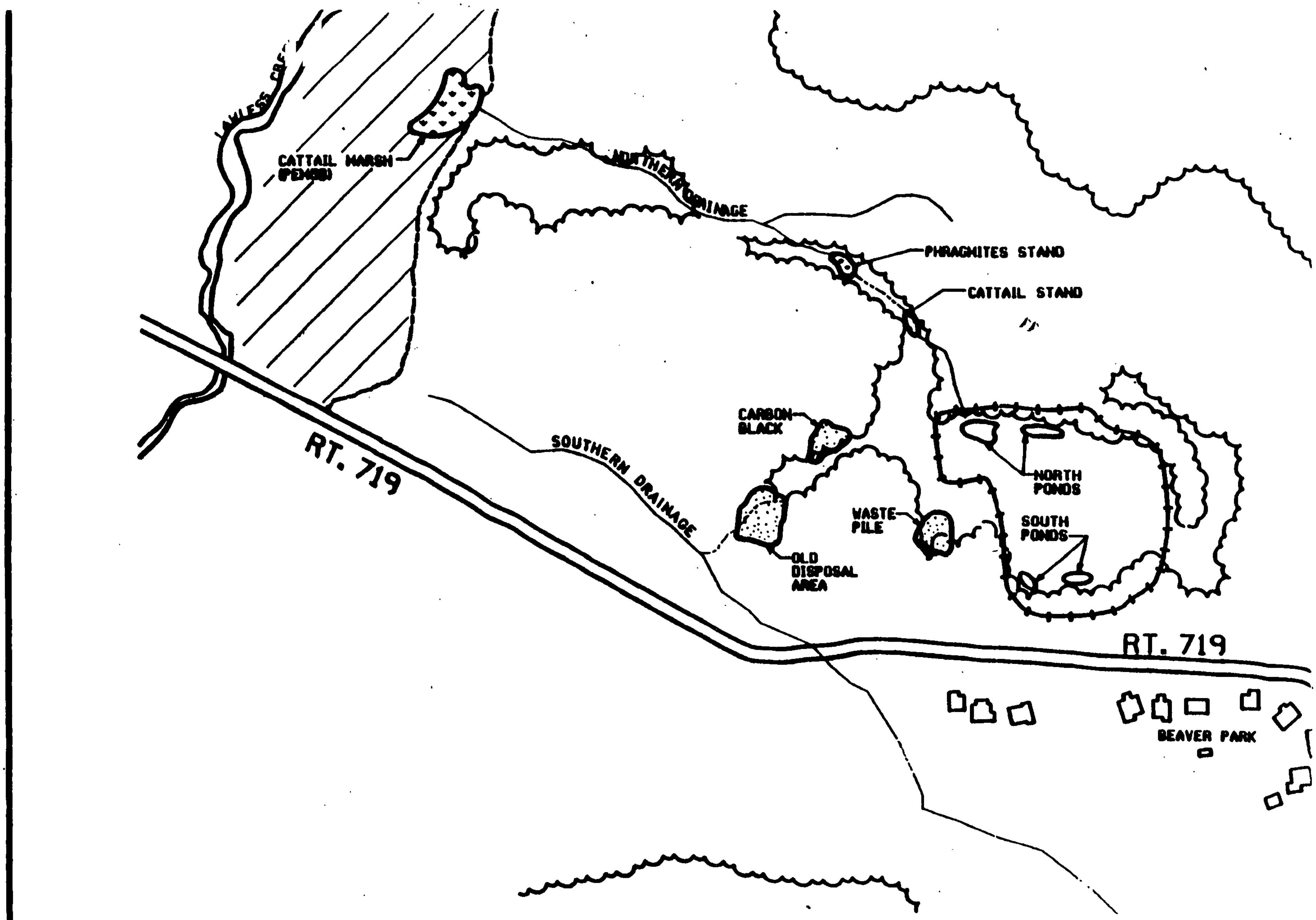

CATTAIL MARSH
NORTHERN DRAINAGE
PHRAGMITES STAND
CATTAIL STAND
CARBON BLACK
SOUTHERN DRAINAGE
RT. 719
WASTE PILE
OLD DISPOSAL AREA
NORTH PONDS
SOUTH PONDS
RT. 719
BEAVER PARK

FIGURE 3

of the landfill, where the quarry is approximately 35 feet deep, and pushed down with a bulldozer. Wastes were not covered at the end of each day.

The landfill contains approximately 65,000 cubic yards of industrial and agricultural waste and approximately 3,000 cubic yards of soil used as a cover when the landfilling was stopped. The industrial wastes were generated by The Goodyear Tire and Rubber Company and Corning Glass Works; the agricultural wastes were generated by Southern Processors, Inc. The wastes from Goodyear consisted of tires, general plant refuse, scrap rubber, rubber buildup and approximately 15,000 gallons of a mixture of residual MS-20 (a floor degreaser), water, carbon black and detergent. The MS-20 contained ten percent by volume of tetrachloroethylene which is a listed hazardous waste under the Resource, Conservation and Recovery Act as amended, 42 U.S.C. 6901 et seq. (RCRA). The wastes from Corning Glass Works consisted of paper, glass, cardboard and off-specification batch materials which contained trace amounts of lead oxide. The wastes from Southern Processors, a tobacco processing company, consisted of soil removed from tobacco leaves, tobacco scrap, paper and wood.

Separate and apart from the landfill are two other areas of waste disposal on the Site associated with the landfilling operation. These two areas are denoted as the "Carbon Black Pile" and the "Waste Pile" on Figure 3. The Carbon Black Pile consists of approximately 100 cubic yards of carbon black (a reinforcement additive used in tire manufacturing that is comprised almost entirely of carbon) and contaminated soils. Zinc oxide bags were reportedly observed in the pile during the construction of access roads for the Remedial Investigation. The Carbon Black Pile is approximately 150 feet from the most western edge of the landfill. The Waste Pile contains approximately 10 cubic yards of waste material consisting of steel and nylon cords, some glass, waste rubber strips and contaminated soils. The Waste Pile is located about 75 feet from the western edge of the landfill.

Another disposal area not associated with the landfilling operations is located about 100 feet southwest of the Carbon Black Pile. This area, denoted as the "Old Disposal Area" on Figure 3, contains miscellaneous refuse including bottles, cans and metal debris. Based on visual observations of this material, disposal in this area is estimated to have occurred 20 to 30 years prior to the landfilling operation and, as such, is not within the scope of this Record of Decision.

In a letter dated June 1, 1981, the Goodyear Tire and Rubber Company notified the First Piedmont Corporation that some of the wastes deposited at the First Piedmont Rock Quarry landfill were hazardous. The First Piedmont Corporation filed a "Notification of Hazardous Waste Site" form with EPA on June 5, 1981, listing solvents as one of the wastes disposed of at the landfill. The EPA Field Investigation Team subcontractor sampled the media in the landfill vicinity in July, 1983 to provide data in order for EPA to determine whether the landfill should be proposed for listing on the National Priorities List (NPL). Based on the results of this sampling, a Hazard Ranking Score (HRS) of 37.85 was calculated in 1985 for the Site. Based on comments received by EPA, the HRS was rescored to 30.16. The Site was listed on the NPL on July 21, 1987, pursuant to Section 105 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA).

Pursuant to Section 122(e) of CERCLA, EPA sent Special Notice Letters on May 6, 1986 to initiate negotiations with the First Piedmont Corporation, Corning Glass Works, and The Goodyear Tire and Rubber Company (the Potentially Responsible Parties or PRPs) to perform a Remedial Investigation/ Feasibility Study (RI/FS) for the Site. On December 31, 1987, EPA signed an Administrative Order by Consent (Docket No. III-88-13-DC) with the PRPs to undertake performance of the RI/FS for the Site. In February, 1988, Westinghouse Environmental and Geotechnical Services, Inc. was contracted by the PRPs to perform the RI/FS.

## 3. Community Participation

The RI/FS and Proposed Plan for the First Piedmont Rock Quarry site were released to the public in April, 1991. These documents were made available to the public in both the administrative record and an informational repository maintained at the EPA Docket Room in Region 3 and at the Pittsylvania County Library in Chatham, Virginia. The notice of availability for these documents was published in the Danville Register-Bee and the Pittsylvania County Star-Tribune. The purpose of the notice was to announce the beginning of a 30-day public comment period on the Proposed Plan for the Site. The public comment period was held from April 10, 1991, through May 9, 1991.

In accordance with Section 117(a)(2) of CERCLA, a public meeting was held on April 16, 1991 at the Bethel Baptist Church on Route 360 in Danville, Virginia. At this meeting, representatives from EPA and the Virginia Department of Waste Management answered questions about problems at the Site and the remedial alternatives under consideration. The majority of the comments at the public meeting were related to the extent of the groundwater contamination and whether Site contamination would affect residential wells. A response to comments received during this period is included in the Responsiveness Summary, which is part of this Record of Decision.

## 4. Scope and Role of Operable Unit or Response Action Within Site Strategy

The selected remedy will address all of the media impacted by the low-level contamination at the Site; that is, the landfill material, leachate, the Carbon Black Pile, the Waste Pile, the Northern Drainage soils and sediments and the drums and debris on the surface of the landfill. The Site does not appear to pose any principal threats. EPA has determined that it is not warranted to split the site remediation into separate operable units to address individual media.

## 5. Summary of Site Characteristics

The RI field activities and analytical program were designed to define the extent of environmental media contamination, identify contaminant migration pathways, and provide data to support an FS of potential remedial actions. Samples from the leachate seeps, surface soils, subsurface soils, surface waters, sediments, bioassays, shallow and deep ground water, and residential wells were analyzed to characterize the quality of these media. Sampling locations are depicted in Figures 4, 5, and 6.

The following discussion summarizes the results from the RI sampling program. Figures 7, 8, and 11, which are referenced below, contain the results of the RI sampling data for the four main Site contaminants: arsenic, barium,lead, and zinc.

### Leachate

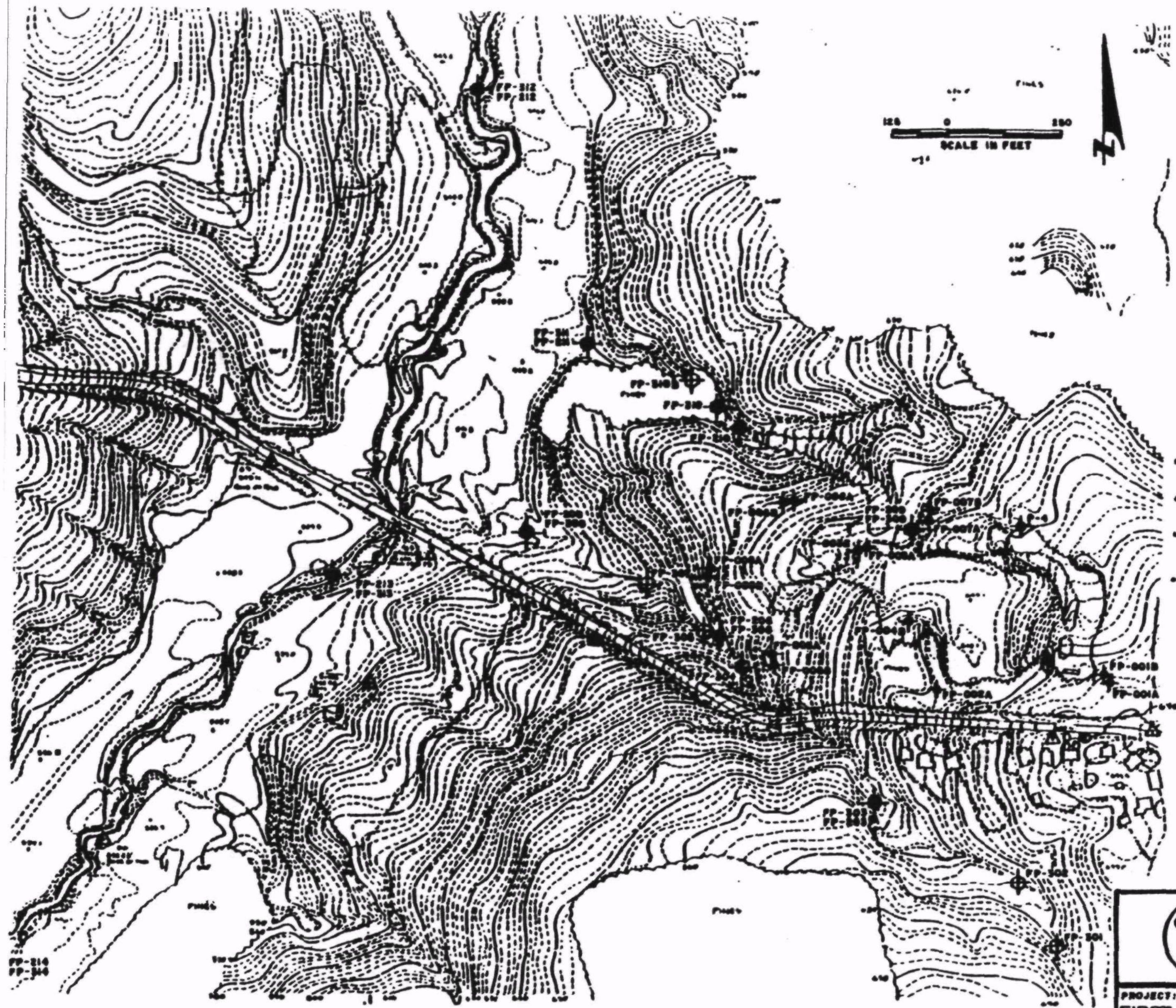
The ground water flowing through the wastes in the landfill surfaces as leachate along the western edge of the quarry. The leachate discharges to the north pond and eventually to the Northern Drainage. Sampling results indicate that contamination from the landfill contents migrates to the north pond and Northern Drainage via the transport and deposition of sediments in the leachate. In general, the highest concentrations of contaminants detected in the Northern Drainage were in the samples closest to the quarry; levels decreased with distance from the quarry area. The contaminants of concern found in the leachate are arsenic, lead (both of which are carcinogens), antimony, and barium.

### Surface Water

Surface water samples were collected from the south pond, north pond, Southern Drainage, Northern Drainage, and Lawless Creek. Figure 7 denotes the sampling locations as well as the concentration of the major Site contaminants in surface water. These sampling areas are discussed below.

### South Pond

The sampling data of the water in the south pond indicate that this water has not been adversely affected by the landfill. A very low level of 20 micrograms/liter (μg/L) of zinc was the only significant heavy metal contaminant detected in the south pond. The zinc concentration detected was below the background level for surface water zinc concentrations.




EXPLANATION

- PIEZOMETER
- MONITOR WELL: A- SHALLOW WELL
  B- DEEP WELL
- SURFACE WATER AND SEDIMENT SAMPLING S
- SURFACE WATER FLOW MEASUREMENT STATIO

NOTES:
LOCATIONS FP-203A, FP-303A, FP-207, FP-307, FP-210 AND FP-310 WERE SAMPLED DURING THE SECOND ROUND ONLY.

TOPOGRAPHY PRODUCED FROM AERIAL PHOTOGRAPHY JANUARY 24, 1989.

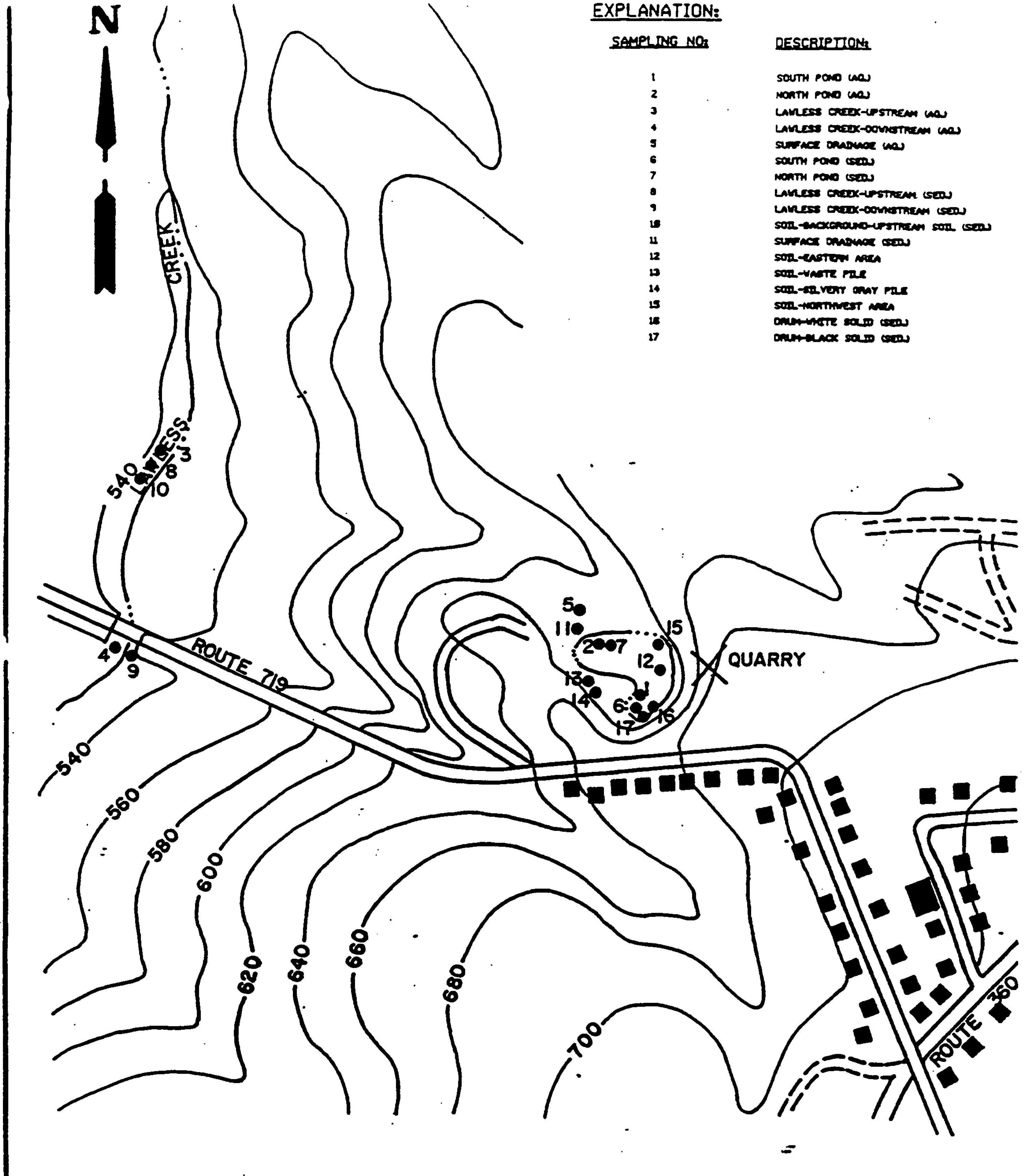
CONTOUR INTERVAL = 2 Ft.

Westinghouse Environment
and Geotechnical Services,
RICHMOND, VIRGINIA

| PROJECT: | | | TITLE: | |
|---|---|---|---|---|
| FIRST PIEDMONT ROCK QUARRY ROUTE 719 SITE DANVILLE, VA. | | | MONITORING/SAMPLING AND STUDY AREA TOP | |
| JOB NO. 1079-89-103 | DRAWN BY: | CHECKED BY: | SCALE: 1" = 250' | DATE: |

AR301312

FIGURE 5

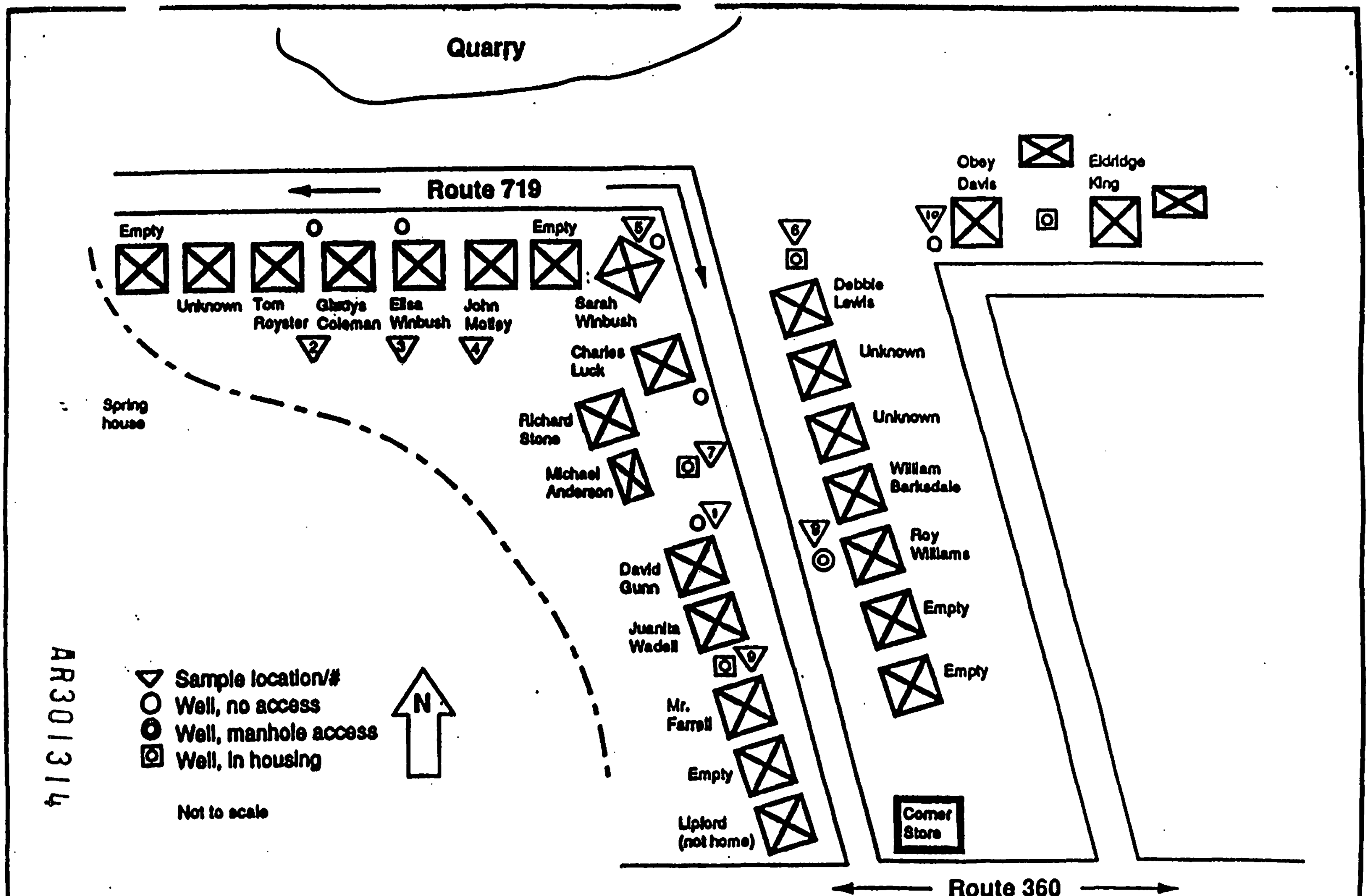



EXPLANATION:

| SAMPLING NO: | DESCRIPTION: |
|---|---|
| 1 | SOUTH POND (AQ.) |
| 2 | NORTH POND (AQ.) |
| 3 | LAWLESS CREEK-UPSTREAM (AQ.) |
| 4 | LAWLESS CREEK-DOWNSTREAM (AQ.) |
| 5 | SURFACE DRAINAGE (AQ.) |
| 6 | SOUTH POND (SED.) |
| 7 | NORTH POND (SED.) |
| 8 | LAWLESS CREEK-UPSTREAM (SED.) |
| 9 | LAWLESS CREEK-DOWNSTREAM (SED.) |
| 10 | SOIL-BACKGROUND-UPSTREAM SOIL (SED.) |
| 11 | SURFACE DRAINAGE (SED.) |
| 12 | SOIL-EASTERN AREA |
| 13 | SOIL-WASTE PILE |
| 14 | SOIL-SILVERY GRAY PILE |
| 15 | SOIL-NORTHWEST AREA |
| 16 | DRUM-WHITE SOLID (SED.) |
| 17 | DRUM-BLACK SOLID (SED.) |

HISTORICAL SITE SAMPLING LOCATIONS

| PROJECT | Westinghouse | SCALE: N. T. S |
|---|---|---|
| FIRST PIEDMONT ROCK QUARRY<br>DANVILLE, VA. | | JOB NO: 4112-88-904 F<br>FIG. NO: 4 |




AR301314

PRIVATE WELL SAMPLING LOCATION MAP

| PROJECT | | SCALE: N.T.S. |
| --- | --- | --- |
| FIRST PIEDMONT ROCK QUARRY<br>ROUTE 719 SITE<br>DANVILLE, VA. | Westinghouse | JOB NO: 4112-88-904D |
| | | FIG NO: 6 |

North Pond

In the north pond, concentrations of arsenic, barium, cadmium, lead, and zinc were detected in concentrations (58, 8420, 8, 21, and 219, µg/L, respectively) which are slightly above the Site background levels.

Northern Drainage

The Northern Drainage receives flow from the leachate which accumulates in the north pond. In the upper Northern Drainage, which is closest to the landfill, arsenic, barium, iron, lead, manganese, and zinc were detected at concentrations (13.7, 5600, 59,800, 4.1, 1540, and 48.1 µg/L, respectively) which are above background levels. The concentrations of these contaminants rapidly decrease downstream from the landfill. In fact, where the Northern Drainage meets the Lawless Creek floodplain, only very low levels of barium, lead, and zinc (109, 2.4, and 32.8 µg/L, respectively) were detected.

Southern Drainage

Zinc and cadmium were detected in the Southern Drainage at the maximum level of 111,000 µg/L and 18.2 µg/L, respectively. The source of these high levels of zinc and cadmium is considered to be the Carbon Black Pile because: the pile is located upgradient of the Southern Drainage; the concentrations of zinc were higher downgradient of the Pile than upgradient of the Pile; and the reported sighting of empty zinc oxide bags during the construction of access roads during the RI. Infiltration of precipitation and surface water into the Carbon Black Pile may mobilize high levels of zinc from the pile. The water then moves downgradient in the shallow subsurface soil and discharges to the surface water in the Southern Drainage. Sampling data indicates that the zinc concentrations were inversely proportional to flow; in other words, the lower the flow the higher the zinc concentrations. This indicates that the zinc levels are not due to surface water runoff but to shallow subsurface flow. The highest zinc levels were detected when there was no surface water runoff flow except at a very small seep in the lower Southern Drainage. The Southern Drainage also receives surface water runoff from the Waste Pile.

Lawless Creek

As shown on Figure 7, three stations were sampled along Lawless Creek: FP-312 (the background station), which is approximately 900 feet north (upstream) of the bridge at Route 719; FP-313, which is approximately 200 feet below the bridge at Route 719; and FP-314, which is approximately 1300 feet south of the bridge. At FP-313, barium, iron, manganese, and zinc were detected at concentrations (20.5, 647, 79, and 26.5 µg/L, respectively) which are above the background concentrations detected at FP-312. At FP-314, iron, manganese, and zinc were detected at concentrations (604, 57.7, and

16.3 µg/L, respectively) which are above the background concentrations detected at FP-312.

**Soils**

Figure 8 depicts the level of the four major Site contaminants in soil. Landfill soil samples have concentrations of arsenic, barium, cadmium, chromium, lead, nickel, vanadium, and zinc above Site background levels with barium, lead, and zinc found in the highest concentrations.

The Waste Pile soil samples generally show concentrations of arsenic, barium, cadmium, lead, and zinc at levels exceeding background with barium, lead, and zinc found in the highest concentrations. The concentrations range from twice the background level for arsenic to ten times the background concentration for lead. The Extraction Procedure (EP) Toxicity tests showed detectable levels of barium and lead but only at concentrations below the EP toxicity criteria. The Toxicity Characteristic Leaching Procedure (TCLP) test has not been performed on this material.

The Carbon Black Pile soil samples have concentrations of arsenic, barium, cadmium, lead, and zinc above background levels. Lead concentrations were about twice the background level while zinc was detected at concentrations ten times the background level.

**Ground Water**

The shallow and deep ground water flow in the Site vicinity is to the west, toward Lawless Creek, as shown in Figures 9 and 10. Ground water at the Site occurs mostly in the bedrock, except in areas of thicker overburden or ground water discharge areas such as Lawless Creek and the Southern and Northern Drainages. Most of the ground water is contained in the bedrock. It is locally controlled by bedrock fractures. The shallow bedrock is probably sufficiently fractured so that it acts as a nearly homogenous aquifer. Potential contaminant transport via the ground water system is not a significant process at the Site because the landfill occurs in an area of upward shallow ground water flow. However, the ground water chemistry data indicate that the landfill does have some effect on the chemistry of the shallow ground water downgradient of the Site. This effect is manifested mainly as a change in major ion chemistry with only some trace metals detected at levels slightly above background. As depicted in Figure 11, zinc was detected in monitoring wells FP-006B, FP-008A, and FP-008B at levels (504, 2050, and 213 µg/L, respectively) which exceed the background level of 61.3 µg/L. The ground water sample from monitoring well FP-008A had the only level of lead (28.8 µg/L), which exceeds the proposed action level of 15 µg/L.

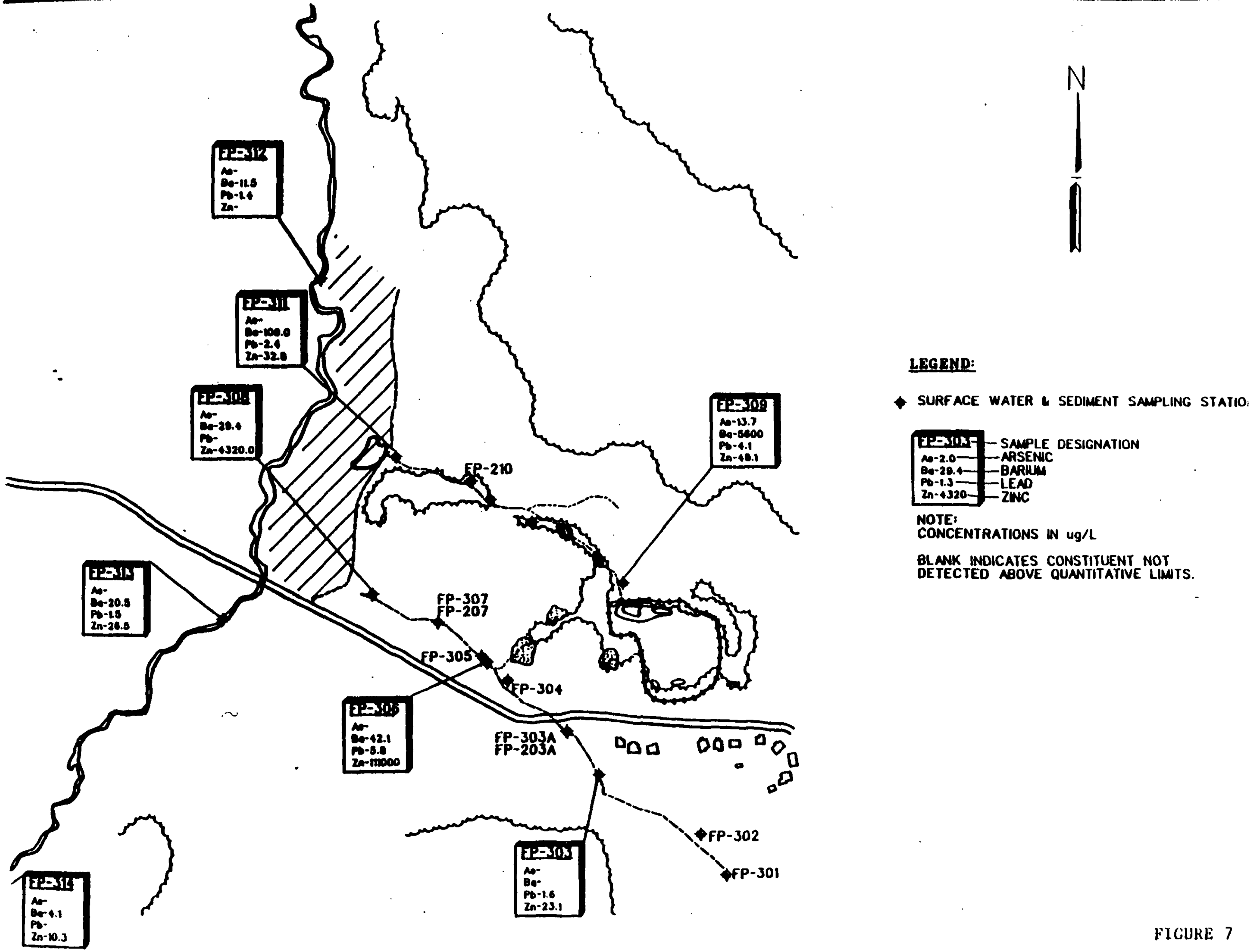



FIGURE 7

TOTAL CONCENTRATIONS FOR SELECTED METALS IN SURFACE WATER

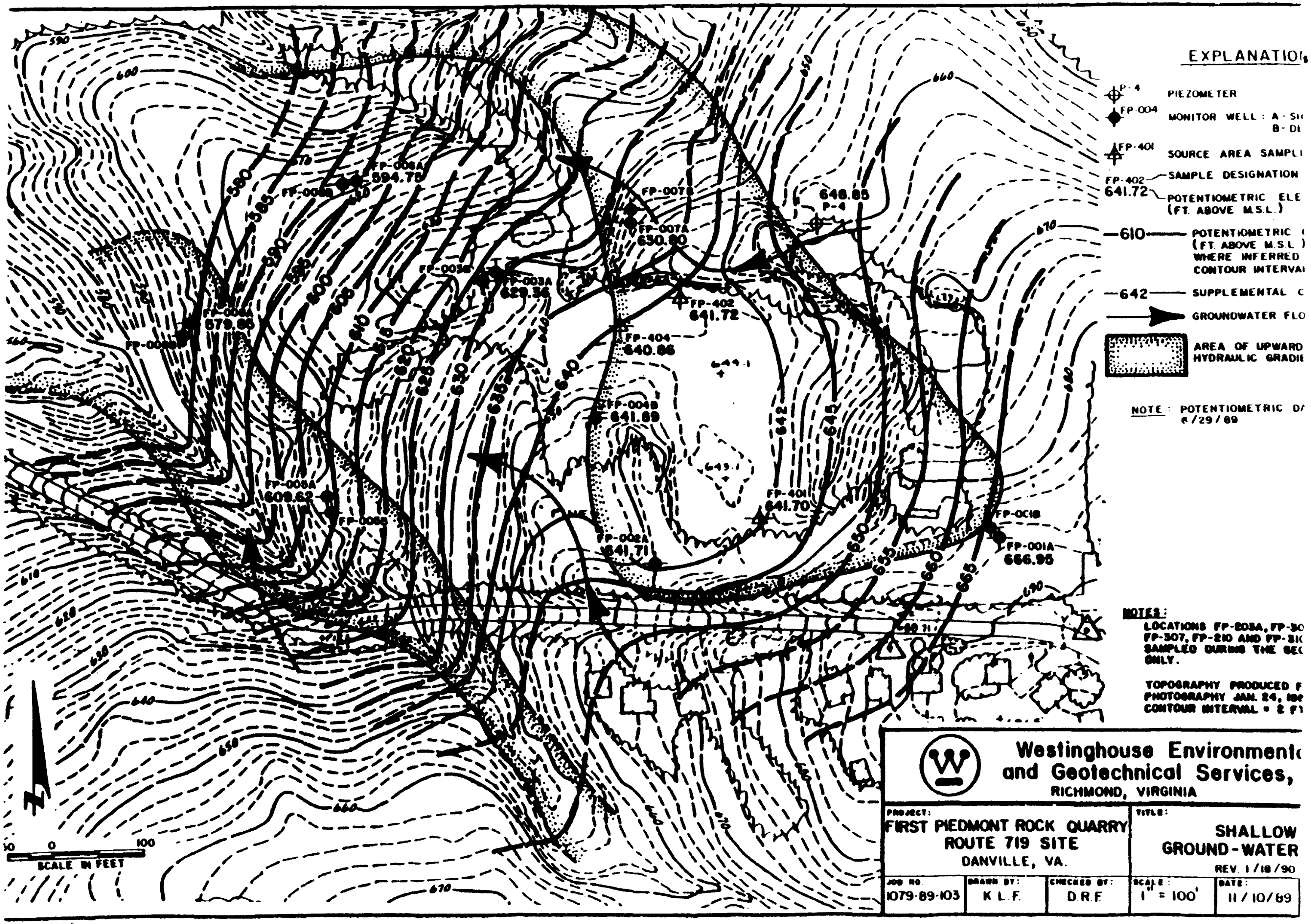

EXPLANATIO
P-4 PIEZOMETER
FP-004 MONITOR WELL : A - SH
B - DE
FP-401 SOURCE AREA SAMPL
FP-402 SAMPLE DESIGNATION
641.72 POTENTIOMETRIC ELE
(FT. ABOVE M.S.L.)
610 POTENTIOMETRIC (
(FT. ABOVE M.S.L.)
WHERE INFERRED
CONTOUR INTERVA
642 SUPPLEMENTAL C
GROUNDWATER FLO
AREA OF UPWARD
HYDRAULIC GRADIE
NOTE : POTENTIOMETRIC DA
6/29/89
NOTES:
LOCATIONS FP-203A, FP-30
FP-307, FP-210 AND FP-31
SAMPLED DURING THE SEC
ONLY.
TOPOGRAPHY PRODUCED F
PHOTOGRAPHY JAN. 24, 19
CONTOUR INTERVAL = 2 FT
FP-003A
594.75
FP-007B
FP-007A
630.80
648.85
P-4
FP-003B
FP-003A
629.36
FP-402
641.72
FP-004A
579.85
FP-404
640.86
FP-004B
641.89
FP-005A
609.62
FP-401
641.70
FP-002A
641.71
FP-001B
FP-001A
666.95
580
585
590
595
600
605
610
615
620
625
630
635
640
642
645
650
655
660
665
SCALE IN FEET
50 0 100
Westinghouse Environment
and Geotechnical Services,
RICHMOND, VIRGINIA
PROJECT:
FIRST PIEDMONT ROCK QUARRY
ROUTE 719 SITE
DANVILLE, VA.
TITLE:
SHALLOW
GROUND-WATER
REV. 1/18/90
JOB NO.
1079-89-103
DRAWN BY:
K.L.F.
CHECKED BY:
D.R.F.
SCALE:
1" = 100'
DATE:
11/10/89

FIGURE 9

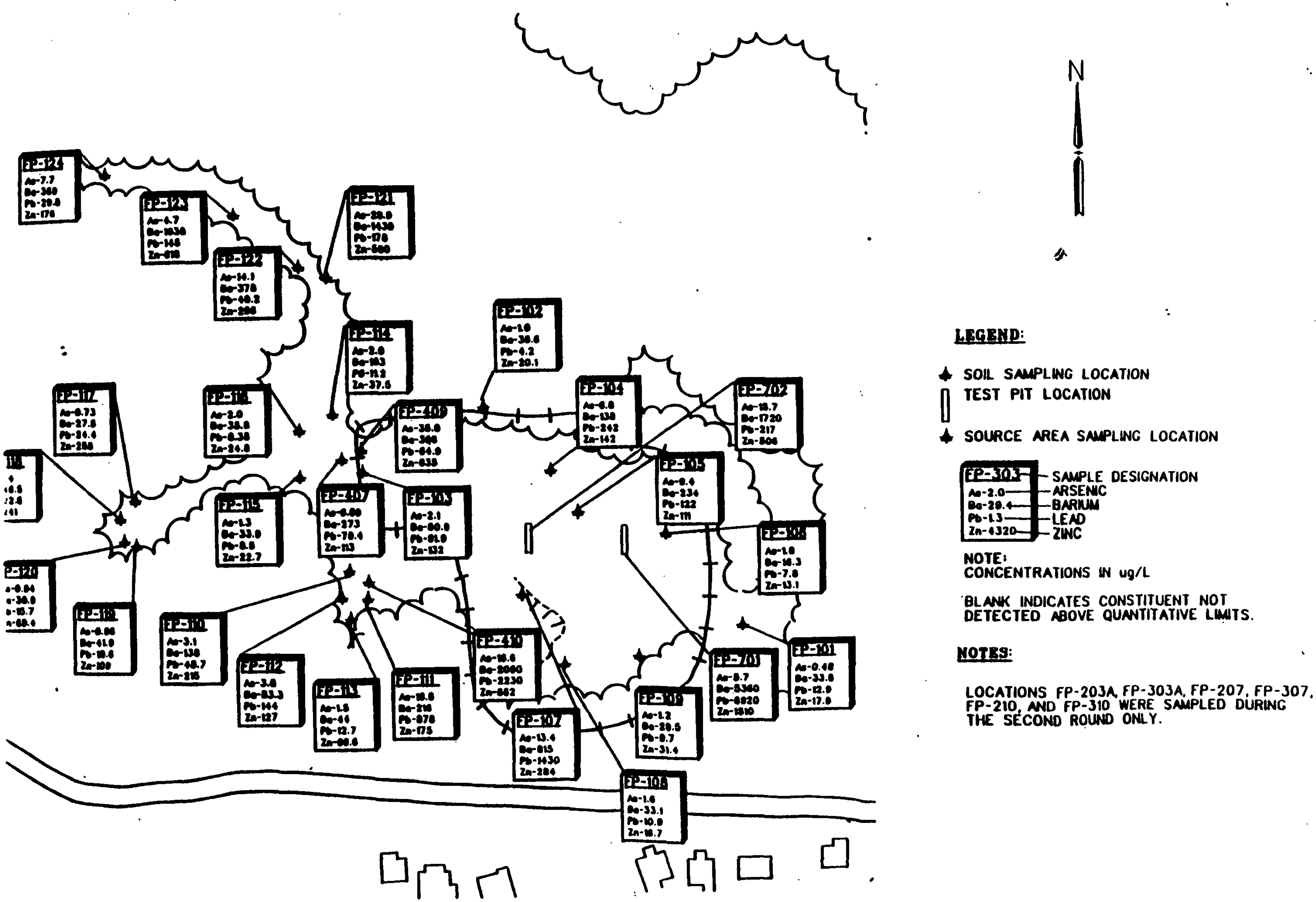
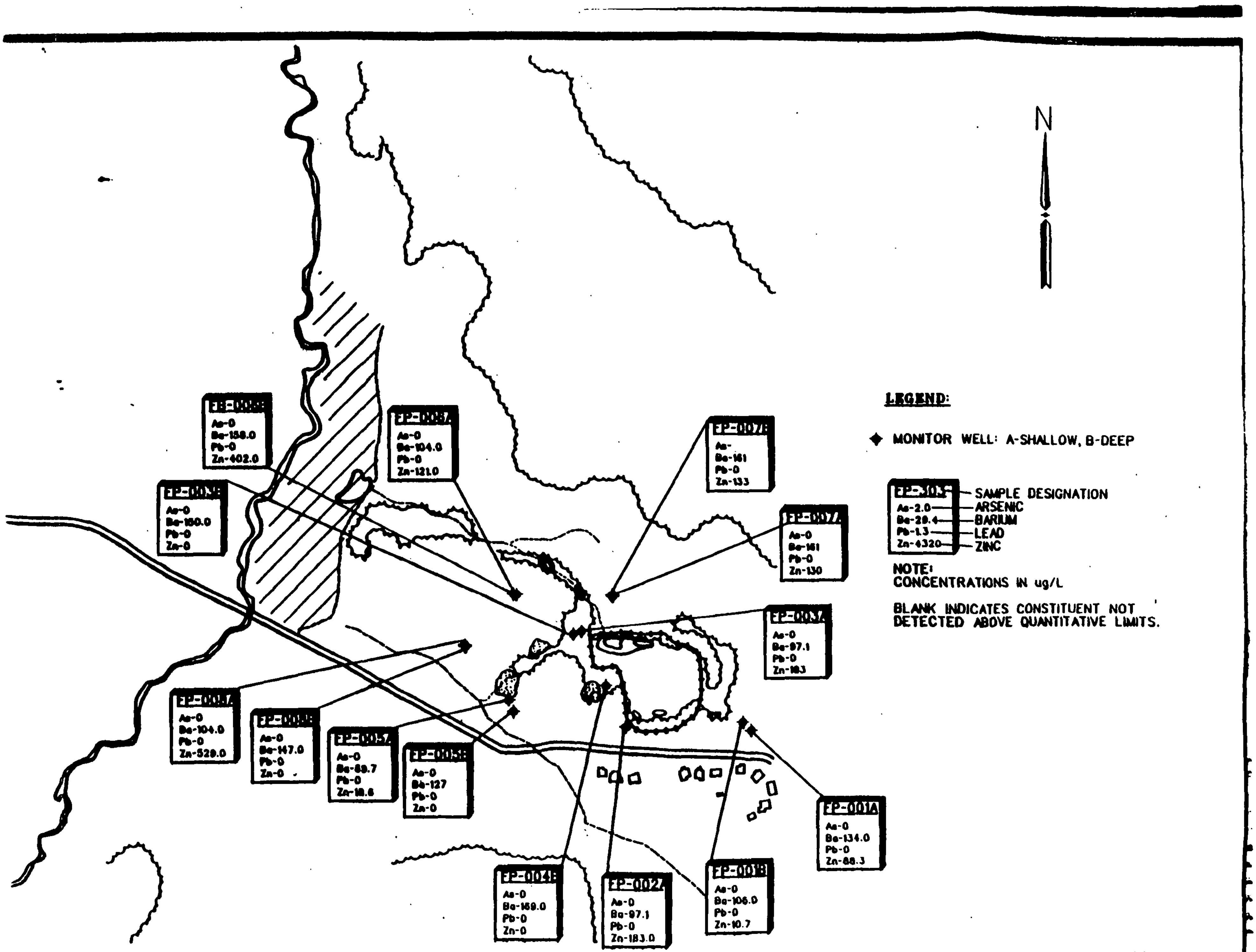


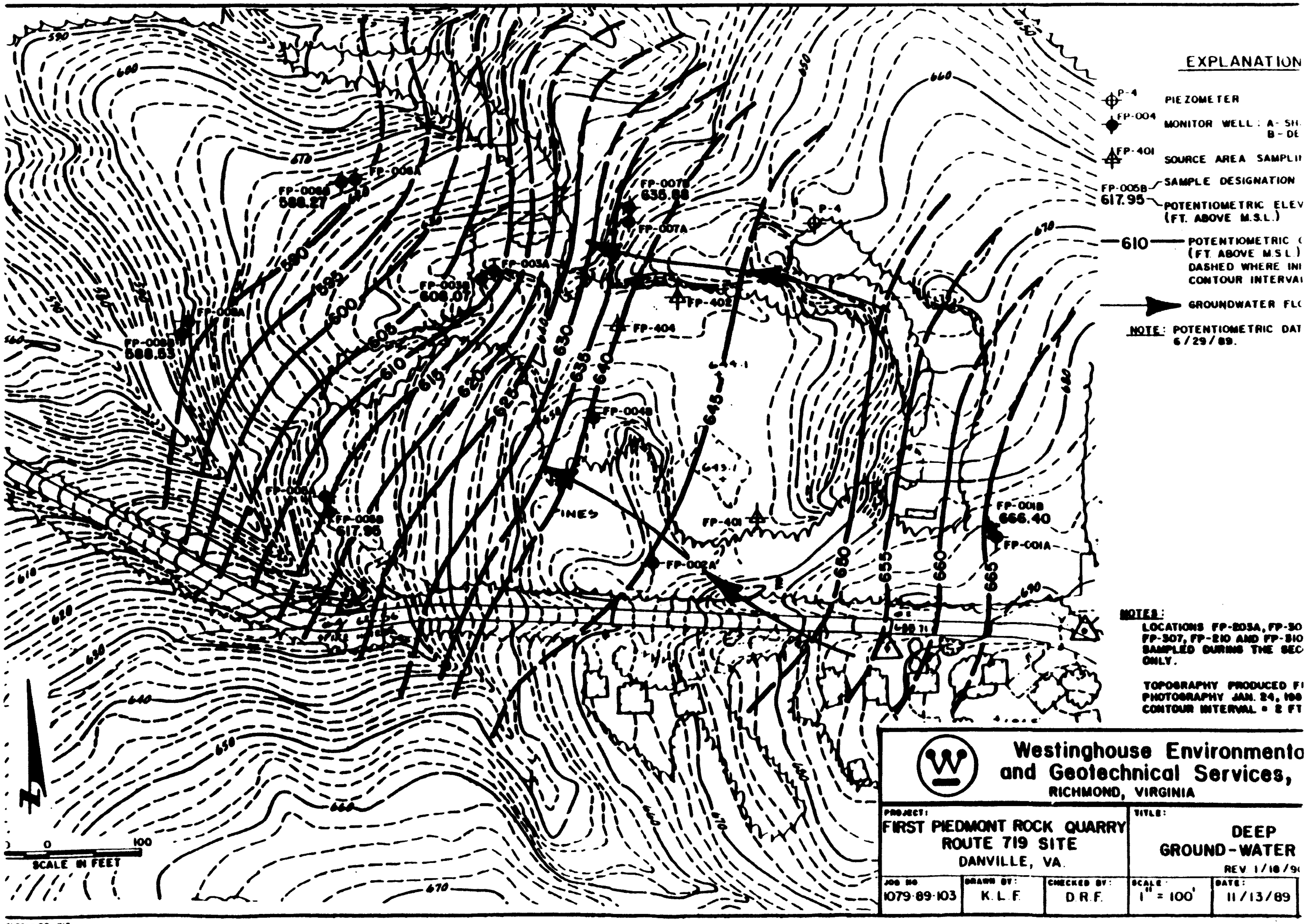

FIGURE 8

SELECTED METAL CONCENTRATIONS IN SOIL AND SOURCE MATERIAL: 1" = 100'-0"



N
As-0
Ba-158.0
Pb-0
Zn-402.0
As-0
Ba-104.0
Pb-0
Zn-121.0
As-0
Ba-150.0
Pb-0
Zn-0
FP-007B
As-
Ba-161
Pb-0
Zn-133
As-0
Ba-161
Pb-0
Zn-130
As-0
Ba-97.1
Pb-0
Zn-183
As-0
Ba-104.0
Pb-0
Zn-520.0
As-0
Ba-147.0
Pb-0
Zn-0
As-0
Ba-89.7
Pb-0
Zn-18.6
As-0
Ba-127
Pb-0
Zn-0
FP-004B
As-0
Ba-169.0
Pb-0
Zn-0
FP-002A
As-0
Ba-97.1
Pb-0
Zn-183.0
FP-001B
As-0
Ba-106.0
Pb-0
Zn-10.7
FP-001A
As-0
Ba-134.0
Pb-0
Zn-88.3
LEGEND:
MONITOR WELL: A-SHALLOW, B-DEEP
As-2.0
Ba-28.4
Pb-1.3
Zn-4320
SAMPLE DESIGNATION
ARSENIC
BARIUM
LEAD
ZINC
NOTE:
CONCENTRATIONS IN ug/L
BLANK INDICATES CONSTITUENT NOT DETECTED ABOVE QUANTITATIVE LIMITS.


FIGURE 11



EXPLANATION
P-4 PIEZOMETER
FP-004 MONITOR WELL: A- SH
B- DE
FP-401 SOURCE AREA SAMPLI
FP-005B SAMPLE DESIGNATION
617.95 POTENTIOMETRIC ELEV
(FT. ABOVE M.S.L.)
610 POTENTIOMETRIC
(FT. ABOVE M.S.L.)
DASHED WHERE INI
CONTOUR INTERVAI
GROUNDWATER FL
NOTE: POTENTIOMETRIC DAT
6/29/89.
NOTES:
LOCATIONS FP-203A, FP-30
FP-307, FP-210 AND FP-310
SAMPLED DURING THE SEC
ONLY.
TOPOGRAPHY PRODUCED F
PHOTOGRAPHY JAN. 24, 19
CONTOUR INTERVAL = 2 FT
FP-006B
588.27
FP-006A
FP-007B
636.86
FP-007A
FP-003A
FP-003B
606.07
FP-008A
FP-008B
588.53
FP-402
FP-404
FP-004B
FP-005A
FP-005B
617.95
FP-002A
FP-401
FP-001B
666.40
FP-001A
P-4
590
595
600
605
610
615
620
625
630
635
640
645
650
655
660
665
0
100
SCALE IN FEET
Westinghouse Environmental
and Geotechnical Services,
RICHMOND, VIRGINIA
PROJECT:
FIRST PIEDMONT ROCK QUARRY
ROUTE 719 SITE
DANVILLE, VA.
TITLE:
DEEP
GROUND-WATER
REV 1/18/90
JOB NO
1079-89-103
DRAWN BY:
K.L.F.
CHECKED BY:
D.R.F.
SCALE:
1" = 100'
DATE:
11/13/89


FIGURE 10

## Residential Wells

As depicted in Figure 6, EPA sampled the residential water sources of ten homes in the Beaver Park community near the Site to determine if the contamination from the Site was affecting the drinking water of the residents. Only two of the ten residential wells sampled had levels above drinking water standards. One well had a detection of 466 µg/l of iron, above the Secondary Drinking Water criterion for iron of 300 µg/l. The other well had a detection of 333 µg/l of iron and 65.1 µg/l of manganese, above the Secondary Drinking Water criteria for iron and manganese of 300 µg/l and 50 µg/l, respectively. Because none of the major Site contaminants were detected in the residential water, these results confirm that the Site contamination has not affected any residential wells in the Site vicinity.

## Air

Contaminants may be transported from the Site via the air as a result of volatization or adsorption onto fugitive dust generated at the Site. However, the few volatile compounds detected during the sampling were found in a small area at low concentrations. Therefore, air transport of contaminants is insignificant, as most of the landfill is covered by soil and most of the contaminants detected are non-volatile.

## Drums

Solid samples were collected from the contents of two of the drums on the surface of the landfill. Low concentrations of chromium, copper, and lead and higher concentrations of cadmium and zinc were detected in one drum. Low concentrations of cadmium, chromium, lead, nickel, selenium and vanadium and higher concentrations of copper and zinc were detected in the other drum sampled.

## 6. 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. Figure 12 provides a glossary of the key risk terms from the Baseline Risk Assessment that are used in this section of the ROD.

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.

## FIGURE 12
## KEY RISK TERMS

**Carcinogen:** A substance that increases the incidence of cancer in humans.

**Chronic Daily Intake (CDI):** The average amount of a chemical in contact with an individual on a daily basis over a substantial portion of a lifetime.

**Chronic Exposure:** A persistent, recurring, or long-term exposure. Chronic exposure may result in health effects (such as cancer) that are delayed in onset, occurring long after exposure ceased.

**Chronic Reference Dose (RfD):** An estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime. Chronic RfDs are specifically developed to be protective for long-term exposure to a compound (as a Superfund program guideline, seven years to lifetime.

**Exposure:** The opportunity to receive a dose through direct contact with a chemical or medium containing a chemical.

**Exposure Assessment:** The process of describing, for a population at risk, the amounts of chemicals to which individuals are exposed, or the distribution of exposures within a population, or the average exposure of an entire population.

**Hazard Index (HI):** The sum of more than one hazard quotient for multiple substances and/or multiple exposure pathways. The HI is calculated separately for chronic, subchronic, and shorter-duration exposures.

**Hazard Quotient:** The ratio of a single substance exposure level over a specified time period (e.g., subchronic) to a reference dose for that substance derived from a similar exposure period.

**Risk:** The nature and probability of occurrence of an unwanted, adverse effect on human life or health, or on the environment.

**Risk Assessment:** The characterization of the potential adverse effect on human life or health, or on the environment. According to the National Research Council's Committee on the Institutional Means for Assessment of Health Risk, human health risk assessment includes: description on the potential adverse health effects based on an evaluation of results of epidemiologic, clinical, toxicologic, and environmental research; extrapolation from those results to predict the types and estimate the extent of health effect in humans under given conditions of exposure; judgements as to the number and characteristics of persons exposed at various intensities and durations; summary judgements on the existence and overall magnitude of the public-health program; and characterization of the uncertainties inherent in the process of inferring risk.

**Slope Factor:** The statistical 95% upper confidence limit on the slope of the dose response relationship at low doses for a carcinogen. Values can range from about 0.0001 to about 100,000, in units of lifetime risk per unit dose (mg/kg-day). The larger the value, the more potent is the carcinogen, i.e., a smaller dose is sufficient to increase the risk of cancer.

**Weight-of-Evidence Classification:** An EPA classification system for characterizing the extent to which the available data indicate that an agent is a human carcinogen. Recently, EPA has developed weight-of-evidence classification systems for some other kinds of toxic effects, such as developmental effects.

**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 14 indicator contaminants were judged to represent the major potential health risks at the Site:

| | |
|---|---|
| antimony | lead |
| arsenic | manganese |
| barium | mercury |
| benzene | nickel |
| bis(2EH)phthalate | selenium |
| cadmium | vanadium |
| copper | zinc |

Of these contaminants, only arsenic, benzene, bis(2EH)phthalate, cadmium, lead and nickel are known to cause cancer in humans or laboratory animals and thus are classified as carcinogens. Although known to be disposed of in the landfill, sampling results have not detected any levels of tetrachloroethylene that exceed health-based standards.

**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 include consumption of ground water, bathing in ground water, consumption of surface water, bathing or play 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, metals, do not bioaccumulate to the extent that many organics do and they are not relatively mobile in the environment. Furthermore, sampling data indicate that only minimal off-site migration of contaminants has occurred in any environmental media to date.

Four transport pathways were evaluated for the Site: ground water; air; soil; and surface water. Although ground water and air are potential migration pathways, the RI data indicate that the potential extent of off-Site impacts via the ground water and air pathways is limited. No significant levels of contamination were detected in the ground water downgradient of the Site. The private wells located in Beaver Park are upgradient of the landfill. Potential exposure via the air pathway is minimal because the transport of contaminants through the air is insignificant.

There is minimal potential for soil transport from the Site. However, there is potential for erosion of sediment from the Site, which would transport adsorbed contaminants from the Site to surface water drainage in both the Northern and Southern Drainages. Sampling data from both drainages indicate limited movement of contaminants close to the landfill in these drainages.

The surface water migration pathways include the Northern and Southern Drainages. Discharge from the north pond and from leachate seeps enters the Northern Drainage while the Southern Drainage receives discharge from the Waste Pile and the Carbon Black Pile.

Potential Exposure Points

The potential exposure level experienced by the receptor population will be a function of the concentration of the contaminants at the exposure point and the duration of exposure. Potential human exposure to contaminants could be by five exposure routes: direct exposure to source material, or direct exposure to ground water, surface water, soil, and air.

Since it is not possible to rule out future uses of the Site, it is appropriate to consider the possibility of residential development of the land adjacent to the landfill. Under the no-action alternative, such development could result in drinking water wells in the leachate and direct contact of children and adults to Site contaminant sources such as drums, seeps, landfill pond water, carbon black, and the waste pile. The potential points of exposure to Site contaminants, assuming residential development, are shown below:

- Direct ingestion of leachate;
- Direct contact or incidental ingestion of source material by children during play and by adults during gardening;
- Incidental ingestion of surface water from the north and south ponds by children during play;
- Ingestion of downgradient ground water;

- Incidental ingestion of water or sediments from the Northern or Southern Drainage by children during play;
- Use of Lawless Creek as a source of potable water by residents;
- Incidental ingestion of quarry soil by children during play and by adults during gardening;
- Incidental ingestion of soil in Northern Drainage or Southern Drainage by children during play and by adults during gardening;
- Inhalation of particulate matter.

The potential points of exposure described above are based on a series of general assumptions as well as on specific assumptions for the different scenarios. These assumptions are derived from the following EPA guidance documents:

1) Superfund Public Health Evaluation Manual;
2) Supplemental Risk Assessment Guidance for the Superfund Program, Draft Final;
3) Exposure Factors Handbook;
4) Risk Assessment Guidance for Superfund Volume 1, Human Health Evaluation Manual (Part A).

The following assumptions, taken from the above guidance documents, have been used in the Baseline Risk Assessment for the Site:

- adults weigh 70 kg, adolescents weigh 36 kg, and children weigh 20 kg;

- lifetime drinking water exposures are based on individuals living an entire lifetime of 70 years, with 10 years childhood exposure, 5 years adolescent exposure, and 55 years adult exposure;

- lifetime exposures are based on individuals living an entire lifetime of 70 years at the Site;

- concentrations of indicator chemicals below the detectable limit were assumed to be one-half the detection limit if at least one sample had detectable concentrations;

- if all samples of an indicator chemical had below detectable concentrations, that chemical was assumed not to be present in the sample;

- for the average case exposure, calculations are based on the arithmetic mean concentrations of indicator chemicals;

- bioavailability of metals in ingested soil and sediments is assumed to be 50 percent for the average case calculations;

The health criteria for comparison of exposures were obtained from the EPA Superfund Public Health Evaluation Manual, personal correspondence from EPA regional representatives or from the EPA

Integrated Risk Information System (IRIS). The health criteria utilized in the risk assessment are shown on Table 1.

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.

The maximum and average concentrations of the fourteen indicator contaminants were derived for each of the affected media. The average concentrations are the arithmetic means of sample concentrations. The maximum concentrations are the lesser of the upper 95 percent confidence interval or the maximum observed value. Figure 13 depicts the maximum and average concentrations of ground water and surface water for the indicator contaminants.

Toxicity Assessment

The risks estimated in the Baseline Risk Assessment are potential risks, based on the assumption that the Site is developed or used in the future such that there will be some degree of exposure.

Cancer potency factors (CPFs) were developed by EPA's Carcinogenic Assessment Group to estimate 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 a conservative estimate of the risks an exposure to a chemical for which a CPF has been developed. Use of this approach makes underestimation of the actual cancer risk highly unlikely. CPFs are derived from the results of human epidemiological studies or chronic animal studies from which human factors are estimated based on animal-to-human extrapolation and by applying uncertainty factors which would not underestimate the potential for adverse effects to occur.

Reference doses (RfDs) were developed by EPA to indicate the potential for adverse health effects from exposure to chemicals exhibiting non-carcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals, that is not likely to be without an appreciable risk of adverse health effects. 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

TABLE 1

TOXICITY CONSTANTS

| Indicator Chemical | ORAL Reference Dose | ORAL Cancer Potency Factor | INHALATION Reference Dose | INHALATION Cancer Potency Factor |
|---|---|---|---|---|
| Antimony | 4e-4 | NA | 4e-4 | NA |
| Barium | 5e-2 | NA | 1.4e-4 | NA |
| Cadmium | 5e-4 | NA | 5e-4 | 6.1e0 |
| Copper | 3.7e-2 | NA | 1e-2 | NA |
| Lead | 1.4e-4 | NA | 4.3e-4 | NA |
| Manganese | 5e-1 | NA | 5e-1 | NA |
| Mercury | 2e-3 | NA | 5.1e-5 | NA |
| Nickel | 2e-2 | NA | 2e-2 | 1.19e0 |
| Selenium | 2e-3 | NA | 1e-3 | NA |
| Vanadium | 9e-3 | NA | 9e-3 | NA |
| Zinc | 2e-1 | NA | 1e-2 | NA |
| Arsenic | NA | 1.75e | NA | 5e+1 |
| Benzene | NA | 2.9e-2 | NA | 2.9e-2 |
| Bis(2eh) Phthalate | 2e-2 | 1.4e-2 | 2e-2 | NA |

FIGURE 13

| Indicator Chemical | Ground Water (Concentrations in ug/1) | | Surface Water | |
|---|---|---|---|---|
| | **Average** | **Maximum** | **Average** | **Maximum** |
| Antimony | 1.117 | 1.317 | 1.717 | 2.59 |
| Arsenic | BDL | BDL | 17.16 | 30.56 |
| Barium | 120.9 | 139.4 | 1646 | 2786 |
| Benzene | BDL | BDL | BDL | BDL |
| Bis (2-EH) phthalate | 7.5 | 9.306 | BDL | BDL |
| Cadmium | BDL | BDL | 23.22 | 41.11 |
| Copper | 4.867 | 6.73 | 14.21 | 19.85 |
| Lead | BDL | BDL | 3.932 | 6.36 |
| Manganese | 595.6 | 1245 | 901.7 | 1312 |
| Mercury | BDL | BDL | BDL | BDL |
| Nickel | BDL | BDL | 20.07 | 25.11 |
| Selenium | BDL | BDL | BDL | BDL |
| Vanadium | BDL | BDL | BDL | BDL |
| Zinc | 140.0 | 223.3 | 15546 | 29619 |

RfDs will not underestimate the potential for adverse non-carcinogenic effects to occur.

The Baseline Risk Assessment is based on a series of conservative assumptions that, taken together, provide a significant margin of safety for estimating potential risk from the Site. These assumptions include the following:

- The Site will be developed for residential purposes in the future.

- Children play, or adults garden, daily or every other day for nine months of the year.

- Children play, or adults garden, in source areas or in known contaminated areas of the Site.

- Exposed individuals have an average lifespan of 70 years.

- Contaminated soil concentrations do not account for the presence of clean soil placed over the contaminated material.

- Individuals will be maximally exposed to contaminants; that children and adults are exposed to source material or to quarry soil; that children play in the Northern and/or Southern Drainages every day that they play outside; and that exposure is always to contaminated environmental media.

Based on the exposure assumptions, exposure scenarios, sampling data, and health criteria, the human health risks were calculated for the maximum and average case exposures. However, only the average case exposure levels were utilized by EPA in determining whether remedial action would be warranted for any of the media. These risk scenarios are depicted in the Baseline Risk Assessment.

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.

The excess lifetime cancer risk determined under the average case exposure is $6.46 \times 10^{-3}$ from the ingestion of quarry leachate due to arsenic contamination. In other words, if no remedial action is taken, six additional people per one thousand have a chance of contracting cancer as a result of exposure to the arsenic if, in the future, the quarry leachate is used as a residential water source.

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 for gauging 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 greater than 1.0 is considered to pose a risk to human health. With HIs of 3.39, 11.66, and 193.88, respectively, antimony, barium, and lead also pose human health risks through ingestion of quarry leachate.

The Baseline Risk Assessment identified lead as a contaminant which represents a risk to human health assuming incidental ingestion of soil by children playing in source material because it has an HI of 1.58. The exposure to lead by children playing in quarry soil equates to a HI of 1.39.

The Site media which exceed the EPA acceptable risk range of $10^{-4}$ to $10^{-6}$ or have an HI equal to or greater than 1.0 are summarized on Table 2.

**Environmental Risks**

Habitat areas influenced by surface water or animals that might come into contact with contaminated surface water or soils within the Site itself have the highest potential to be adversely affected. Although an intensive ecological risk assessment was not conducted, an indication of potential risk to wildlife and the environment can be assessed from toxicity testing (bioassays) and the human health risk assessment. Because there is the potential for contamination of surface water in the immediate vicinity of the landfill, samples of surface water and sediments were collected along the Northern Drainage and Lawless Creek for aquatic toxicity testing. The samples collected underwent the following tests:

- Four 7-day chronic toxicity tests, using Ceriodaphnia and fathead minnows, were conducted on the surface water samples. Three of the tests were undiluted samples and one contained a full set of serial dilutions.

- Four 7-day chronic toxicity tests, using Ceriodaphnia, were conducted on the sediment elutriate. All of these tests were full serial dilutions.

The test results indicate that the surface water in the Northern Drainage and in Lawless Creek were not acutely toxic to the test organisms. However, surface water from the upper reaches of the Northern Drainage did result in significant decreases in growth among fathead minnows and reproduction among Ceriodaphnia at concentrations above 30 percent dilution.

TABLE 2

MEDIA OF CONCERN

| Medium | Contaminant | HI | Cancer Risk |
|---|---|---|---|
| Quarry Leachate | Antimony | 3.39 | NA |
| | Barium | 11.66 | NA |
| | Lead | 193.88 | NA |
| | Arsenic | NA | 6.46e-3 |
| Source Material | Lead | 1.58 | NA |
| Quarry Soil | Lead | 1.39 | NA |

Significant Sources of Uncertainty

Discussion of general limitations inherent in the risk assessment process as well as the uncertainty related to some of the major assumptions made in this assessment are included below:

1. The Baseline Risk Assessment is based upon the data collected during the RI and uses RI results of limited sampling to represent environmental concentrations over large areas. This extrapolation contributes to the uncertainty of the risk assessment.

2. The Carbon Black Pile is considered to be the source of the zinc found in the Southern Drainage. If the levels of zinc are not significantly reduced after remediation of the Carbon Black Pile, the source of the zinc may have to be investigated further.

3. Environmental risks are assumed to occur in the Southern Drainage because the levels of zinc greatly exceed the Virginia water quality standard. However, the extent of the toxicity is not known because toxicity tests were not performed on the water or sediments since this contamination was identified late in the RI.

## 7. Description of Alternatives

In accordance with 40 C.F.R. § 300.430, remedial response actions were identified and screened for effectiveness, implementability, and cost during the FS to meet the remedial action objectives at the Site. The technologies that passed the screening were assembled to form remedial alternatives. The developed alternatives were then evaluated and compared to nine criteria required by the National Oil and Hazardous Substances Contingency Plan, 40 C.F.R. Part 300 (NCP). The FS evaluated a variety of technologies used in the development of alternatives for addressing the landfill wastes, the Carbon Black Pile, the Waste Pile, the Northern Drainage soils and sediments, and the landfill leachate. The technologies and approaches contained in the alternatives listed below have been determined to be the most applicable for this Site. The description of the alternatives reflect the descriptions in the FS.

**Common Elements**

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

**Ground Water Monitoring.** Ground water monitoring will be used to evaluate the protectiveness of the remedial action because waste will be left in place. Exact monitoring points will be determined during the remedial design phase and will be in accordance with the requirements of the Virginia Hazardous Waste Management Regulations (VHWMR), Section 10.5. The ground water monitoring will be performed for at least thirty years in accordance with the VHWMR. Because tetrachloroethylene was disposed of in the landfill, the monitoring must comprise the full priority pollutant list. When it is demonstrated that only a limited number of contaminants are detected over a period of time, a request can be made to limit the monitoring to those contaminants.

**Institutional Controls.** Institutional controls, including fencing and a deed restriction will prevent access to the Site and prohibit future development of the Site.

**Leachate Treatment.** Leachate will be treated until the contaminant levels meet a $10^{-6}$ risk level and an HI less than 1. At present, the length of time required for treatment of leachate is not known, however, a longer treatment period is anticipated for Alternatives 7 and 8 in which the ground water flow through the landfill will be reduced than for Alternatives 3 through 6 in which the ground water flow is not reduced. In order to evaluate the alternatives on the same basis, the present worth costs developed in the FS for Alternatives 3 through 9 include 30 years of leachate collection and treatment.

**Alternative 1- No Action**

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 risk at the Site.

**Alternative 2- Institutional Controls**

| | |
|---|---|
| Capital Cost: | $44,200 |
| Annual O&M Cost: | $15,690 |
| Present Worth: | $285,400 |
| Months to Implement: | 4 |

Alternative 2 consists of the implementation of institutional controls and long-term ground water monitoring. The institutional controls include complete fencing of the Site to restrict access and a deed restriction to prohibit future development of the Site.

**Alternative 3- Excavation and Off-Site Disposal of Non-Landfill Wastes, Landfill Cap, and Leachate Treatment.**

| | |
|---|---|
| **Capital Cost:** | **$1,258,000** |
| **Annual O&M Cost:** | **$56,110** |
| **Present Worth:** | **$2,120,500** |
| **Months to Implement:** | **6 - 8** |

The major features of Alternative 3 include implementation of the institutional controls as described in Alternative 2, excavation and off-site disposal of the estimated 800 cubic yards from the Carbon Black Pile, Waste Pile, and the Northern Drainage soils and sediments; off-site disposal of the surface drums and debris; installation of a RCRA Subtitle C cap over the landfill;

construction of a passive leachate treatment unit; and long-term ground water monitoring.

After the material from the Carbon Black Pile, Waste Pile, and the Northern Drainage is excavated and removed, the effectiveness of this action on the zinc level in the Southern Drainage surface water and zinc mobility in drainage sediments would be assessed. The excavated areas will be backfilled with clean soil, contoured to promote run-off, and planted with vegetation to control erosion. Run-off control berms will be constructed in the Northern Drainage. The berms will act as retention structures to reduce peak run-off flows from the quarry cap and minimize erosion in the Northern Drainage. The surface drums would be disposed of at an approved off-Site hazardous waste facility in accordance with the VHWMR.

To facilitate the landfill cap construction, the water in the north and south ponds will be pumped to tanker trucks for transport to a Publicly Owned Treatment Works (POTW) for treatment and discharge. The water must be tested to determine if it meets the pretreatment requirements of the POTW. The cap will include a passive leachate treatment system which will consist of a tee-shaped trench system constructed at the head of the Northern Drainage. The top of the tee will act as an interceptor trench with the stem of the tee constituting the treatment area with filter zones and adsorptive/ion exchange zones.

**<u>Alternative 4</u>- Excavation, Treatment and On-Site Disposal of Non-Landfill Wastes, Landfill Cap, and Leachate Treatment.**

| | |
|---|---|
| Capital Cost: | $1,173,000 |
| Annual O&M Cost: | $56,110 |
| Present Worth: | $2,035,000 |
| Months to Implement: | 6 - 8 |

The major features of this alternative include implementation of the institutional controls as described in Alternative 2; excavation, stabilization/solidification treatment (if required) and on-site disposal of the Carbon Black Pile, Waste Pile, and the Northern Drainage soils and sediments; off-site disposal of the landfill surface drums and debris; installation of a RCRA Subtitle C cap over the landfill; construction of a passive leachate treatment unit; and long-term monitoring.

This alternative is identical to Alternative 3 with one additional element. Prior to disposal, the excavated material, soils, and sediments from the Carbon Black Pile, Waste Pile, and the Northern Drainage will be tested utilizing the Toxicity Characteristic Leaching Procedure (TCLP) to determine if they are RCRA characteristic wastes. If such wastes are determined to be RCRA characteristic, they will be treated with the stabilization/solidification process and disposed of on-Site in the landfill prior to capping the landfill. If the wastes are determined not to be

RCRA characteristic, they will be disposed of in an off-Site solid waste landfill, as described in Alternative 3.

**<u>Alternative 5</u>- Excavation, Treatment and either On-Site or Off-Site Disposal of Non-Landfill Wastes, Landfill Cap, and Leachate Treatment at a POTW**

| | |
|---|---|
| Capital Cost: | $1,136,000 |
| Annual O&M Cost: | $66,200 |
| Present Worth: | $2,154,000 |
| Months to Implement: | 6 - 8 |

The major features of this alternative include implementation of the institutional controls as described in Alternative 2; excavation, stabilization/solidification treatment (if required) and either on-Site or off-Site disposal of the Carbon Black Pile, Waste Pile, and the Northern Drainage soils and sediments; off-Site disposal of the landfill surface drums and debris; installation of a RCRA Subtitle C cap over the landfill; collection of leachate with treatment at a POTW; and long-term monitoring.

The elements of this alternative are identical to Alternative 4 except one: the landfill leachate would be collected and transported to a POTW for off-Site treatment and disposal rather than treated on-Site in the passive treatment system constructed under the cap as in Alternative 4. It is estimated that 3,000 gallons of landfill leachate would be generated on a average daily basis. To maximize leachate collection, the collection system would be constructed under the landfill cap. If, during operation, this collection system does not collect all of the leachate, a second collection trench would be constructed outside of the landfill cap.

**<u>Alternative 6</u>- Excavation, Treatment and either On-Site or Off- Site Disposal of Non-Landfill Wastes, Landfill Cap, and On-Site Leachate Treatment**

| | |
|---|---|
| Capital Cost: | $1,211,000 |
| Annual O&M Cost: | $73,270 |
| Present Worth: | $2,340,000 |
| Months to Implement: | 10-12 |

The major features of this alternative include implementation of the institutional controls as described in Alternative 2; excavation, stabilization/solidification treatment (if required) and either on-Site or off-Site disposal of the Carbon Black Pile, Waste Pile, and the Northern Drainage soils and sediments; off-Site disposal of the landfill surface drums and debris; installation of a RCRA Subtitle C cap over the landfill; collection of landfill leachate with on-Site treatment; and long-term monitoring.

The elements of this alternative are identical to Alternative 5 except one: the landfill leachate would be treated on-Site in a wastewater treatment plant and discharged to Lawless Creek. The discharge to Lawless Creek must meet the Virginia Pollution

Discharge Elimination System (VPDES) effluent discharge limits as established by the Virginia State Water Control Board (VSWCB). Bench-scale tests of the leachate treatment system would be required during the design phase.

<u>Alternative 7</u>- **Excavation, Treatment and either On-Site or Off-Site Disposal of Non-Landfill Wastes, Landfill Cap, Construction of Slurry Walls, and Leachate Treatment either On-Site or at POTW**

| | |
|---|---|
| Capital Cost: | $1,282,000 |
| Annual O&M Cost: | $39,450 |
| Present Worth: | $1,889,000 |
| Months to Implement: | 8 |

The major features of this alternative include implementation of the institutional controls as described in Alternative 2; excavation, stabilization/solidification treatment (if required), and either on-Site or off-Site disposal of the Carbon Black Pile, Waste Pile, and the Northern Drainage soils and sediments; off-Site disposal of the landfill surface drums and debris; installation of a RCRA Subtitle C cap over the landfill; construction of slurry walls around the inside perimeter of the quarry highwall; leachate collection with treatment either on-Site or at a POTW; and long-term monitoring.

The elements of this alternative combine the leachate treatment options of Alternatives 5 and 6 and are identical to the other elements of these two alternatives except one: slurry walls would be constructed around the inside perimeter of the quarry highwall in order to prevent the horizontal flow of ground water into the landfill, thus reducing the total amount of leachate flowing from the landfill. However, leachate production cannot be completely eliminated by the slurry walls because ground water enters the bottom of the landfill due to the fractured bedrock and flows upward through the landfill.

<u>Alternative 8</u>- **Excavation, Treatment and either On-Site or Off-Site Disposal of Non-Landfill Wastes, Consolidation of Landfill Waste including a Liner and an Underdrain System, Landfill Cap, and Leachate Treatment either On-Site or at POTW**

| | |
|---|---|
| **Capital Cost:** | **$4,015,633** |
| **Annual O&M Cost:** | **$28,150** |
| **Present Worth:** | **$4,450,000** |
| **Months to Implement:** | **8** |

**The major features of this alternative include implementation of the institutional controls as described in Alternative 2; excavation, stabilization/solidification treatment (if required); and either on-Site or off-Site disposal of the Carbon Black Pile, Waste Pile, and the Northern Drainage soils and sediments; off-Site disposal of the landfill surface drums and debris; excavation and consolidation of all of the landfill wastes onto a liner and underdrain system in the**

quarry area; installation of a RCRA Subtitle C cap over the landfill; leachate collection with treatment either at a POTW or at an on-Site treatment plant; and long-term monitoring.

The elements of this alternative are identical to Alternative 7 except one: prior to installing the landfill cap, the landfill wastes would be excavated, consolidated, and placed on top of a liner in the quarry area to remove the wastes from the ground water, thus reducing the production of leachate from the landfill.

<u>Alternative 9</u>- **Excavation, Treatment and either On-Site or Off-Site Disposal of Non-Landfill Wastes, In-Situ Stabilization of Landfill Wastes, and Landfill Cap**

| | |
|---|---|
| Capital Cost: | $4,573,000 |
| Annual O&M Cost: | $23,750 |
| Present Worth: | $4,940,000 |
| Months to Implement: | 6 - 8 |

The major features of this alternative include implementation of the institutional controls as described in Alternative 2; excavation, stabilization/solidification treatment (if required), and either on-Site or off-Site disposal of the Carbon Black Pile, Waste Pile and the Northern Drainage soils and sediments; in-situ stabilization or solidification of the landfill wastes; installation of a RCRA Subtitle C cap; and long-term monitoring. Prior to implementation of this alternative, treatability tests would have to be performed in order to determine the proper stabilization/solidification reagents.

The elements of this alternative are identical to Alternatives 3 through 8 except that most of the landfill contents would be stabilized or solidified in place. The 3,000 cubic yards of soil cover and the 65,000 cubic yards of landfill wastes would be stabilized or solidified in place, thereby reducing the solubility of the metallic contaminants (metals) and producing a waste which is of low permeability and leachability such that leachate production, and the need to collect or treat leachate, is eliminated. The buried drums and tires would not be stabilized or solidified because the drill mechanism cannot penetrate and properly blend them. Therefore, the drums and tires would be excavated and disposed of off-Site at a hazardous waste facility in accordance with the VHWMR.

## 8. <u>Summary of Comparative Analysis of Alternatives</u>

The nine 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. § 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 1 and 2 accomplish none of the above. Because contaminants are migrating and contaminant levels already exceed health-based levels, Alternatives 1 and 2 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, these two alternatives cannot be selected and thus will not be evaluated any further with regard to the nine criteria.

The selected alternative, Alternative 5, is protective of human health and the environment because it would reduce the risks associated with direct contact of the Site contaminants to within the EPA acceptable risk range by excavation of and, if required, stabilization/solidification treatment of the non-landfill wastes; off-Site disposal of the non-landfill wastes, surface drums and surface debris; installation of a RCRA Subtitle C cap over the landfill; and collection and treatment of leachate. Alternative 9 is the most protective of human health and the environment because it entails treating all of the contamination at the Site, including the landfill wastes which would eliminate the production of leachate. Alternatives 3, 4, 6, 7, and 8 would provide adequate protection of human health and the environment by eliminating, controlling or reducing Site-related risks through a combination of treatment, engineering controls, and institutional controls. The slurry walls installed under Alternative 7 and the consolidation of the landfill wastes in Alternative 8 do not provide any additional protection because their purpose is to reduce, but not eliminate, leachate production, thus leachate treatment would still be required.

2. Compliance with ARARs

This criterion addresses whether or not 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.300.430(f)(1)(ii)(c).

All alternatives will meet the respective ARARs of Federal and State laws. Prior to disposal in an off-Site solid waste facility in accordance with the VSWMR, the non-landfill wastes will undergo a TCLP to determine if they are RCRA characteristic wastes. If such wastes are determined to be characteristic, they will be treated by stabilization/solidification. The cap construction in Alternatives 3 through 9 will meet the action-specific ARARs, including a RCRA Subtitle C cap and the full range of monitoring for thirty years because tetrachloroethylene was disposed into the landfill.

Although the landfill contains RCRA-regulated wastes (tetrachloroethylene), the RCRA Land Disposal Restrictions (LDRs) are not applicable requirements to Alternatives 3 through 9. Alternatives 3 through 7 do not provide for treatment or placement of the landfill wastes. Although Alternative 8 includes the excavation and placement of landfill wastes, the LDRs are not applicable requirements because the wastes are consolidated in the same Area of Contamination and the wastes are not treated. The LDRs are not applicable to Alternative 9 because the wastes are treated in place and no placement of treated waste occurs.

In all alternatives, the water from the north and south ponds will be tested prior to discharge to the POTW to assure compliance with the pretreatment requirements of the POTW. In Alternative 5, and, possibly Alternatives 7 and 8, the leachate will also have to be tested for compliance with the pretreatment requirements of the POTW. Any water to be discharged which does not meet the pretreatment requirements must be pretreated on-Site to meet these requirements. Alternative 6, and, possibly Alternatives 7 and 8, will to meet the VPDES effluent discharge requirements established by the VSWCB. The residuals of any on-Site treatment will be disposed of in a hazardous waste facility because the water was in contact with the landfill wastes.

The loss of the wetland areas of the north and south ponds and the small stands of cattail and phragmites in the Northern Drainage will be mitigated by replacement with plantings of additional wetland species in the berms along the Northern Drainage.

3. Long-Term Effectiveness and Permanence

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

The selected alternative, Alternative 5, would reduce the risk posed by the contaminated media. Even though the landfill contents would not be treated, the risk of exposure would be reduced to the EPA acceptable risk range by installing a RCRA Subtitle C cap and implementing institutional controls to prohibit development of the Site. Because Alternative 9 incorporates solidification/ stabilization treatment of the landfill wastes, it does not require long-term management of waste on-Site. As such, Alternative 9 would have a greater degree of permanence than Alternatives 3 through 8 where the landfill wastes are left in-place without any treatment. Bench scale testing would be required to confirm the effectiveness of Alternative 9's treatment system. Alternatives 3 through 9 all provide for the off-site disposal of the surface drums and debris as well as the excavation and disposal of the Carbon Black Pile, Waste Pile, and the Northern Drainage soils and sediments, thus they are all equal with respect to the lack of residual risk from contaminated materials.

Alternative 5, with collection and discharge to a POTW, has a greater degree of permanence than Alternatives 3 and 4, which rely on passive treatment systems on-Site. Alternative 5 would also allow the natural flow of ground water through the landfill contents in order to continue the flushing of contaminants from the landfill, which should decrease the total period in which contaminated leachate is produced and requires treatment. By reducing the time needed for leachate treatment, Alternative 5 offers a higher degree of long-term effectiveness than Alternatives 7 and 8 which reduce, but not eliminate, the flow of ground water through the landfill. The on-Site leachate treatment system of Alternative 6 and, possibly, Alternatives 7 and 8 (if on-Site treatment is utilized) have the least long-term effectiveness. Since the treatment system would be on a remote unmanned location, a malfunction could go undetected and cause a release of inadequately treated water to the environment.

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. § 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.

Alternative 5 is in conformance with these expectations since the low-level risks associated with the landfill wastes will be contained and the non-landfill wastes, surface drums and landfill leachate will be treated.

Alternatives 4 through 9 provide for treatment of the Carbon Black Pile, Waste Pile, and the Northern Drainage soils and sediments should such material be determined to be RCRA characteristic wastes. Such treatment would be solidification/stabilization, which reduces toxicity and mobility, but increases volume. Because the contaminants of concern in these areas are metals, this treatment should effectively render the wastes non-characteristic by binding the contaminants. If these wastes are determined to be RCRA characteristic, Alternative 3 would not reduce the mobility of the contaminants because it does not provide for any treatment of the wastes. Alternatives 3 through 9 all address the toxicity and mobility of surface debris by providing for the off-site disposal of the surface drums in an approved RCRA facility.

Alternative 9 would markedly reduce the volume of leachate by immobilizing the landfill wastes in the solidification/stabilization process, thus eliminating the need to treat leachate. Alternative 8 would reduce the leachate volume to a greater extent than Alternatives 3 through 7 by raising the landfill wastes above the ground water and placing the wastes on a liner. Alternative 7 would also reduce the amount of leachate produced, although to a lesser extent than Alternative 8, via use of slurry walls around the landfill. Alternatives 3 through 8 all reduce the mobility and toxicity of leachate by collecting and treating the leachate.

5. <u>Short-Term Effectiveness</u>

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.

Alternatives 3 through 9 provide for the excavation of the Carbon Black Pile, Waste Pile and the Northern Drainage soils and sediments; thus, these alternatives are equal in terms of the associated short-term impacts. Environmental impacts will be minimized by installing erosion and sedimentation controls such as runoff control berms in the Northern Drainage and siltation fencing as needed.

Alternatives 3 through 6 have the least potential to adversely affect the community or Site workers during remedial activities because these alternatives do not involve any disruptive activities on the landfill wastes except for the removal of the surface drums and debris. Conversely, the implementation of Alternatives 7, 8, and 9 require the excavation of landfill waste. Alternative 7 includes the excavation of approximately 1,500 cubic yards of landfill waste to install a slurry wall around the quarry perimeter. Excavation could uncover and bring to the surface potentially contaminated materials that could pose a health risk to the Site workers. Also, a water management system will be required to collect potentially contaminated run-off and sediment from the excavation zone to prevent release to the environment. Alternative 8, which provides for the excavation of 68,000 cubic yards of material, would require an extensive run-off and sediment management system and would be far more disruptive than the excavation associated with Alternative 7. In addition, it would be very difficult to move this large quantity of waste because of the quarry highwall and the surrounding steep slopes. The augering and mixing action of the solidification/stabilization treatment under Alternative 9 would be less disruptive than the excavation associated with Alternatives 7 and 8. However, because the equipment cannot penetrate and mix the buried drums and tires, these items must be excavated prior to initiating the treatment process. Such excavation would be complicated to perform due to the difficulty in determining the location of drums and tires below the surface of the landfill and conducting work on the unstable landfill surface.

Alternative 5 would have the fewest short-term effects of all the alternatives with regard to leachate. Discharging to an existing treatment plant would result in proper leachate treatment in the shortest amount of time. The passive treatment system of Alternatives 3 and 4 and the on-Site treatment plant of Alternative 6 would necessitate a start-up time until leachate was being properly treated. These plants then would allow the discharge of partially treated leachate until such time as when they were fully operational and meeting discharge limits.

6. Implementability

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

Alternative 5 would be the most technically feasible to implement because it entails discharge to an existing wastewater treatment plant. The leachate would be properly treated by meeting the pretreatment requirements of the POTW.

Alternatives 3 through 9 all provide for the excavation and disposal of the non-landfill wastes as well as installation of a RCRA Subtitle C cap over the landfill. These activities could be implemented easily, using readily available materials and equipment such as front-end loaders and roll-off boxes or tarpaulined dump trucks. Cap construction is a known technology. The confined nature of the landfill, however, with the quarry walls on three sides, may present implementation difficulties which would have to be taken into account during the design phase. Alternative 8 would be complex to implement because of the difficulty of determining appropriate engineering controls to prevent or minimize the production of contaminated water and sediment which would occur from precipitation falling onto the open face of the landfill during the excavation of the landfill contents. Alternative 9 would be the most difficult alternative to implement because the buried drums and tires would have to be excavated prior to the blending of the columns to prevent jamming the drill rig.

Alternative 3 could not be implemented if the non-landfill wastes are determined to be RCRA characteristic wastes because these wastes would then have to be treated prior to disposal.

7. Cost

CERCLA 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 the present worth cost, which includes all capital costs and the operation and maintenance costs incurred over the life of the project. Capital costs include those expenditures necessary to implement a remedial action, including the construction cost.

The present worth costs developed in the FS for comparing the alternatives included 30 years of leachate collection and treatment. At present, the length of time required for treatment is not known, however, a longer treatment period is anticipated for Alternatives 7 and 8 in which the ground water flow is reduced.

Of Alternatives 3 through 9, Alternative 7 has the lowest present worth cost. However, because it includes the installation of cut-off walls to reduce the amount of leachate produced, Alternative 7 will incur higher treatment costs than Alternatives 3 through 6. In other words, leachate will have to be treated for a longer period of time in Alternative 7 than for Alternatives 3 through 6. Alternatives 8 and 9 are the most costly with present worth costs of $4,450,000 and $4,940,000, respectively. The difference in cost among Alternatives 3 through 6 is minimal; costs range from $2,035,000 to $2,340,000. The cost of the selected alternative, Alternative 5, is $2,154,000. A breakdown of the costs of the selected alternative is provided in Table 3.

TABLE 3

Alternative 5

Capital Cost Summary

| | |
|---|---|
| Institutional Control | $ 44,200 |
| Remove and treat carbon black, waste pile and northern drainage soil and assess removal action | $ 210,020 |
| Cap Construction | $ 745,107 |
| Testing and Design Cost | $ 113,426 |
| Leachate Collection System | $ 23,700 |
| TOTAL CAPITAL COST | $ 1,136,453 |

8. State Acceptance

The Commonwealth of Virginia has concurred with the remedy selected in this Record of Decision.

9. Community Acceptance

On April 16, 1991, a public meeting was held at the Bethel Baptist Church on Route 360 in Danville, Virginia to discuss EPA's preferred alternative as described in the Proposed Plan. A public comment period for the Proposed Plan was held from April 10, 1991, through May 9, 1991. Comments received during the public meeting and the public comment period are discussed in the Responsiveness Summary attached to this ROD.

**9. Selected Remedy**

EPA has selected Alternative 5 with some modifications (as indicated below) to remediate the contamination at the Site. Based on the findings in the RI/FS and the nine criteria listed in Section 8 of this Decision Summary, Alternative 5 represents the best balance among the evaluation criteria.

**Performance Standards**

The remedy selected addresses all of the contaminated media at the Site and consists primarily of excavation and off-Site disposal of the non-landfill wastes, off-Site disposal of the surface drums and debris, installation of a RCRA Subtitle C cap over the landfill, and collection and treatment of leachate. By instituting all of these components, the Site risks (exposure to leachate, source material, and quarry soil) would be reduced to within the EPA acceptable risk range. The major components of this alternative include the following:

- To reduce the risks to human health and the environment attributed to the source material, approximately 1080 tons of material from the Carbon Black Pile, Waste Pile, and the Northern Drainage soils and sediments shall be excavated and disposed of off-Site. The Carbon Black Pile and the Waste Pile shall be excavated down to the bedrock. To determine if the soils and sediments from these three areas are RCRA characteristic wastes, a TCLP shall be performed on these materials prior to disposal. If it is determined through the TCLP that the soils and sediments are characteristic wastes, they shall be solidified/stabilized prior to disposal. EPA will determine the specific treatment during the design phase. Disposal shall be in a solid waste landfill in accordance with the VSWMR. All excavated areas shall be filled with clean soil, contoured to promote run-off, and planted with vegetation to control erosion. Run-off control berms shall be constructed in the Northern Drainage to lessen peak run-off flows from the landfill cap and shall be planted with wetland-type vegetation to mitigate the loss of the Site wetland areas. In addition, the effectiveness of the removal of the Carbon Black and Waste Piles on the reduction of the zinc levels in the Southern Drainage shall be assessed, including sampling and bioassays.

• To reduce the risk to human health attributed to the source material, the drums on the landfill surface shall be disposed of in a RCRA Subtitle C treatment facility because tetrachloroethylene, a RCRA listed waste, was placed in the drums. It is estimated that there are approximately thirty to forty drums on the surface of the landfill and along the quarry highwall. To help maintain the integrity of the landfill cap, the surface debris shall be decontaminated and then disposed of in a landfill approved by the Virginia Department of Waste Management.

• To reduce the risks to human health attributed to the quarry soil, a RCRA Subtitle C cap shall be constructed over the landfill area, which is approximately 2 acres in size. The north and south ponds shall be drained and the water transported to a POTW for treatment and discharge. Prior to discharge, the water shall be analyzed to determine if it meets the pretreatment requirements of the POTW. Clean fill shall be placed onto the existing surface of the landfill before constructing the cap to fill in the north and south ponds and to establish the requisite slopes for the cap. A 6-inch layer of topsoil shall be placed on top of the cap and vegetated to control erosion. As part of the cap construction, a leachate collection system shall be installed under the cap to effectively capture all of the leachate generated through the landfill. If, during operation, EPA determines that this collection system does not capture all of the leachate, another collection trench shall be constructed outside of the landfill cap.

• To reduce the risk to human health attributed to the leachate, the leachate shall be transported to a POTW for treatment. The leachate shall be analyzed prior to transport to the POTW to determine whether the leachate meets the pretreatment requirements of the POTW or whether pretreatment is required. EPA, in consultation with the POTW, will determine if pretreatment is needed and whether it may be conducted at an on-site facility or at an industrial user's facility. If a POTW does not agree to accept the leachate or if the leachate cannot be pretreated to meet the pretreatment requirements of the POTW, a treatment system shall be constructed on-Site to treat the leachate, with discharge to Lawless Creek. On-site treatment of leachate shall meet the VPDES effluent discharge limits set by the VSWCB. Collection and treatment of leachate shall continue until the contaminant levels meet a $10^{-6}$ risk level and an HI less than 1.

• To ascertain that the remedy is protective of human health and the environment, long-term post-closure ground water monitoring shall be performed. Ground water monitoring, including the full list of priority pollutants specified in TCL/TAL, shall be conducted after the cap is constructed. The ground water monitoring shall be performed for thirty years or as long as leachate is collected and treated, whichever is longer. EPA will determine the appropriate number and location of monitoring wells during the design phase. If continued monitoring over a period of time indicates the existence of only a limited number of contaminants, a request may be made to limit the monitoring to those specific contaminants.

• To restrict access and development of the Site, institutional controls shall be implemented, including fencing of the Site and implementing deed restrictions to prohibit residential development of the Site.

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 $2,154,000. Details of the costs for the selected remedy are shown in Tables 4 through 8.

## 10. 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. 9621, establishes several other statutory requirements and preferences. These specify that, when complete, the selected remedial action for this 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 and non-carcinogens. Removal of the Carbon Black Pile, Waste Pile and the Northern Drainage soils and sediments, capping the landfill, and leachate collection will assure the Site risks fall within this range. The selected remedy protects human health and the environment by:

1. Reducing contaminant levels in the Carbon Black Pile, Waste Pile and the Northern Drainage soils and sediments

TABLE 4

Alternative 5

Capital Cost

Institutional Controls

Material and Labor Cost

| | | |
|---|---|---|
| Survey fence line | 3000 Ft. @ $1.00 /Ft. | $ 3,000 |
| Prepare Plat | | 500 |
| Galv. Fence 6 Ft. high | 3000 Ft. @ $13.40/Ft. | 40,200 |
| File Deed Restriction | | 500 |
| | Total | $44,200 |

TABLE 5

Capital Cost

EXCAVATE CARBON BLACK, WASTE PILE AND NORTHERN DRAINAGE SOILS

CARBON COST

| | | |
|---|---|---|
| Site Supervisor | 80 hrs. @ $75/hr. | $ 6,000 |
| Equipment Operator | 100 hrs. @ $42/hr. | 4,200 |
| Technician | 100 hrs. @ $32/hr. | 3,200 |
| Project Manager | 16 hrs. @ $100/hr. | 1,600 |
| Project Manager | 32 hrs. @ $75/hr. | 2,400 |
| Secretarial | 4 hrs. @ $30/hr. | 120 |
| Expenses | | 3,600 |
| | Subtotal | $21,120 |

EQUIPMENT AND MATERIAL

| | | |
|---|---|---|
| Mixer | 10 days @ $200/day | $ 2,000 |
| Dump Truck | 10 days @ $300/day | 3,000 |
| Track Excavator | 10 days @ $300/day | 3,000 |
| Pressure Washer | 10 days @ $75/week | 750 |
| Wind Meter | 2 week @ $50/day | 100 |
| Water Tanker | 2 week @ $350/wk | 700 |
| Level D Equipment | 10 days @ $45/day | 450 |
| X-Met Analyzer | Training | 450 |
| X-Met Analyzer | Rental | 1,400 |
| Trailer | 2 week @ $150/wk | 300 |
| Delivery & Removal | | 500 |
| Telephone | | 50 |
| Power | | 100 |
| Toilet | | 50 |
| 40' X 100' X 6 ML Polyethylene @ $140/roll X 4 | | 560 |
| Geotextile Silt Fence 1000 Ft. @ $1.35/LF | | 1,350 |
| Seeding 1000 SY @ $1.16/SY | | 1,160 |
| Mulch 1000 SY @ $180/1000 SY | | 180 |
| | Subtotal | $14,900 |

| | | |
|---|---|---|
| Treatability Testing | | $17,500 |
| 8 Samples Total Zinc @ $50/ea. | | 400 |
| 6 Samples TCLP Metals @ $350/ea. | | 2,100 |
| Treatment 1080 Tons @ $50/ton | | 54,000 |
| | Subtotal | $74,000 |
| ASSESSMENT OF REMOVAL ACTION | | $100,000 |
| TOTAL | | $210,020 |

TABLE 6

ALTERNATIVES 5

CAPITAL COSTS

CAP CONSTRUCTION

MATERIALS AND LABOR

| | | | | |
|---|---|---|---|---|
| Clear Light Trees | 2 acres | @ | $2,150/acre | $ 4,300 |
| Grub Stumps | 2 acres | @ | $1,025/acre | 2,050 |
| Clearing (debris and trash) | 2 areas | @ | $2,100/acre | 4,200 |
| Dewater Ponds Pump | 2 days | @ | $ 100/day | 200 |
| Tank Truck Rental | 2 days | @ | $ 320/day | 640 |
| Disposal Cost POTW | 25,000 gal | @ | $1.5/1000 gal | 37 |
| Fill For Quarry | 15,000 cy | @ | $ 7.00/yd | 105,000 |
| Haul Fill 5 Miles | 15,000 cy | @ | $ 2.79/5 miles | 41,850 |
| Compact Fill | 15,000 cy | @ | $ 6.25/cy | 93,750 |
| Clay, Select Fill | 8,000 cy | @ | $10.85/cy | 86,800 |
| Haul Fill 5 Miles | 8,000 cy | @ | $ 2.79/cy | 22,320 |
| Bentonite | 800 cy | @ | $ 6.75/cy | 5,400 |
| Spread Bentonite | 800 cy | @ | $ 3.25/cy | 2,600 |
| Compact | 8,800 cy | @ | $ 6.25/cy | 55,000 |
| Drainage Layer | 2,000 cy | @ | $10.85/cy | 21,700 |
| Haul 5 Miles | 2,000 cy | @ | $ 2.79/cy | 5,580 |
| Topsoil | 2,000 cy | @ | $14.70/cy | 29,400 |
| Haul 5 Miles | 2,000 cy | @ | $ 2.79/cy | 5,580 |
| Grass Seeding | 15,000 sy | @ | $ 1.16/sy | 17,400 |
| Mulch | 15,000 sy | @ | $ 1.80/1000 sy | 2,700 |
| | | | Subtotal | $506,507 |

EQUIPMENT RENTAL, HEALTH AND SAFETY, MANAGEMENT AND EXPENSES

| | | | | |
|---|---|---|---|---|
| Pressure Washer | 4 months | @ | $ 400/mo | $ 1,600 |
| Trailers | 4 months | @ | $ 300/mo | 1,200 |
| Delivery and Removal | | | | 1,000 |
| Telephone | 4 months | @ | $ 100/mo | 400 |
| Power | 4 months | @ | $ 150/mo | 600 |
| Toilets | 4 months | @ | $ 200/mo | 800 |
| Water Tanker | 4 months | @ | $1,700/mo | 6,800 |
| Health and Safety | 120 days | @ | $ 900/day | 108,000 |
| Level D | 120 days | @ | $ 45/day | 5,400 |
| Site Supervisor | 120 days | @ | $ 600/day | 72,000 |
| Secretary | 120 days | @ | $ 240/day | 28,800 |
| Expenses | 120 days | @ | $ 100/day | 12,000 |
| | | | Subtotal | $238,600 |

Materials, Labor and Equipment TOTAL

TABLE 7

ALTERNATIVE 5

Capital Cost

Leachate Collection

| | | |
|---|---|---|
| Excavate Trench | 30 cy rock @ $75/cy | $ 2,250 |
| Geotextile | 60 sy @ $3/sy | 180 |
| Stone | 70 cy @ $20/cy | 1,400 |
| Sump Pumps | | 500 |
| Piping | 100 ft @ $7.50/ft | 750 |
| Storage Tank | 10,000 gallon | 6,000 |
| Containment | | 2,500 |
| Design | | 2,700 |
| Installation | | 7,420 |
| | TOTAL | $23,700 |

TABLE 8

ALTERNATIVE 5

O & M COST

| | |
|---|---|
| Cost same as Alternative 3 less treatment system | $20,750 |
| LEACHATE COLLECT AND HAUL | |
| Haul 170 trips @ $125 ea. | 21,250 |
| Discharge fee $1.5/1000 gallon | 1,500 |
| Testing annual | 1,700 |
| Monthly monitoring 12 x 250 | 3,000 |
| Labor 4 hrs x 180 x $25/hr. | 18,000 |
| Subtotal | $45,450 |
| O & M COST | $66,200 |

by excavating, treating (if required), and disposing of these wastes in an approved off-site facility;

2. Eliminating direct contact with the landfill wastes by constructing a RCRA Subtitle C cap over the landfill, meeting the RCRA landfill closure requirements, and implementing deed restrictions to prohibit residential development of the Site. Landfill closure will also reduce the likelihood of contaminant migration; and

3. Reducing the contaminant levels in the landfill leachate by collecting the leachate and treating it at a POTW. It is not known at this time how long the leachate will remain contaminated.

Of all of the alternatives evaluated, Alternative 5 provides the best protection to human health without significant adverse impact to the environment. No unacceptable short-term risks 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 9.

**Chemical-Specific ARARs:** The selected remedy will achieve compliance with chemical specific ARARs related to the non-landfill wastes. Specifically, the Carbon Black Pile, Waste Pile and the Northern Drainage soils and sediments would undergo a TCLP test to determine if they are RCRA characteristic wastes in accordance with 40 C.F.R. Part 261.

**Action-Specific ARARs:** If the non-landfill wastes are determined to be RCRA characteristic wastes, they will be treated (either solidified or stabilized) prior to disposal. The surface drums will be sent to a RCRA facility for disposal. The surface debris will be decontaminated on-Site and sent to a solid waste landfill in accordance with the VSWMR. Transportation to a RCRA-permitted treatment/disposal facility would conform with RCRA regulations at 40 C.F.R. Parts 262 and 263, the Department of Transportation regulations of Title 49 of the U.S. Code and Part VII of the VSWMR. Capping of the landfill with a RCRA Subtitle C cap will conform with the requirements set forth at 40 C.F.R. Part 264 and Part 10 of the VSWMR. The substantive requirements of the Virginia Erosion and Sediment Control Law will be achieved. The landfill leachate will be treated at a POTW if it meets the pretreatment requirements.

**Location-Specific ARARs:** To mitigate the loss of wetlands that will be filled in or excavated as part of the remedial action, plantings of wetland vegetation will be made in the newly constructed berms in the Northern Drainage.

**Other Criteria, Advisories or Guidance To Be Considered:** None

TABLE 9

ACTION-SPECIFIC ARARs

| Standards, Requirements, Criteria, or Limitations | Citation | Description | Applicable/ Relevant and Appropriate | Discussion |
|---|---|---|---|---|
| Solid Waste Management Act (SWMA) | 40 C.F.R. Section 261 | Hazardous Waste determination requirements | yes/no | Alternatives 4-9. Non-landfill wastes will undergo TCLP to determine if RCRA characteristic waste. |
| SWMA | 40 C.F.R. Section 268 (Subpart D) | Land Disposal Restrictions for off-site disposal of non-landfill wastes, if RCRA characteristic waste. | yes/no | Alternative 3. Alternatives 5-9. |
| SWMA | 40 C.F.R. Section 268 (Subpart D) | Land Disposal Restrictions for on-site disposal of non-landfill wastes, if RCRA characteristic waste. | yes/no | Alternatives 4-9. |
| SWMA | 40 C.F.R. Section 268 (Subpart D) | Land Disposal Restrictions for on-site consolidation of landfill wastes. | no/yes | Alternative 8. |

TABLE 9 (continued)

ACTION-SPECIFIC ARARs

| Standards, Requirements, Criteria, or Limitations | Citation | Description | Applicable/ Relevant and Appropriate | Discussion |
|---|---|---|---|---|
| Clean Water Act (CWA) | 40 C.F.R. Section 122.44(a) | Discharge of treatment system effluent to Lawless Creek. | yes/no | Alternatives 6-9. Best available technology economically achievable and best conventional pollution control technology required to control toxic and nonconventional pollutants and conventional pollutants, respectively. |
| CWA | 40 C.F.R. Sections 125.100, 125.104, 122.41(i), 136.1-136.4 | Discharge of treatment system effluent to Lawless Creek. | yes/no | Alternatives 6-9. Best Management Practice Program to prevent release of toxic constituents to surface waters. |
| CWA | 40 C.F.R. Part 230, 33 C.F.R. Parts 320, and 330 | Discharge of fill material into wetlands. | no/yes | Alternatives 3-9. |

TABLE 9 (continued)

ACTION-SPECIFIC ARARs

| Standards, Requirements, Criteria, or Limitations | Citation | Description | Applicable/ Relevant and Appropriate | Discussion |
|---|---|---|---|---|
| CWA | 40 C.F.R. Section 122.44 | Ambient Water Quality Standards for discharge of treatment system effluent into Lawless Creek. | yes/no | Alternatives 6-9. |
| Virginia Water Quality Standards | Virginia Regulation 680-21-00 | State Water Quality Standards for discharge of treatment system effluent to Lawless Creek. | yes/no | Alternatives 6-9. |
| Virginia Erosion and Sedimentation Control Law | VA Code Sections 10.1-560 *et seq.* | | yes/no | |
| Virginia Hazardous Waste Management Regulation (VHWMR) | VHWMR Section 10.5 | Ground water monitoring requirements for closure. | yes/no | Alternatives 2-9. |
| VHWMR | VHWMR Section 10.6 | Closure and post closure requirements for hazardous waste facilities. | yes/no | Alternatives 2-9. |

TABLE 9 (continued)

ACTION-SPECIFIC ARARs

| Standards, Requirements, Criteria, or Limitations | Citation | Description | Applicable/ Relevant and Appropriate | Discussion |
|---|---|---|---|---|
| VHWMR | VHWMR Section 10.13.K | Landfill closure requirements. | yes/no | Alternatives 2-9. |

TABLE 9 (continued)

CHEMICAL-SPECIFIC ARARs

| Standards, Requirements, Criteria, or Limitations | Citation | Description | Applicable/ Relevant and Appropriate | Discussion |
|---|---|---|---|---|
| Safe Drinking Water Act | 40 C.F.R. Section 141.11 | Maximum Contaminant Levels for discharge of treatment system effluent to Lawless Creek. | yes/no | Alternatives 3-9. |
| Virginia Water Quality Standards | Virginia Regulations 680-21-00 | Site specific limits for discharge of treatment system effluent to Lawless Creek. | yes/no | Alternatives 3-9. |

TABLE 9 (continued)

LOCATION-SPECIFIC ARARs

| 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 | Alternatvies 3-9. |
| Clean Water Act | 40 C.F.R. Part 230, 33 C.F.R. Parts 320, and 330 | Discharge of fill material into wetlands. | no/yes | Alternatives 3-9. |

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)(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 $2,154,000.

Utilization of Permanent Solutions and Alternative Treatment (or resource recovery) Technologies to the Maximum Extent Practicable (MEP).

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for remediation of the Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the selected remedy, Alternative 5, as modified, 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.

Alternative 5 was selected because it offers a higher degree of long-term effectiveness, implementability, and short-term effectiveness than the other alternatives. The strategy for remediating the leachate is to allow the natural flow of ground water through the landfill contents with collection and treatment of leachate. By maintaining the natural flow conditions, it is projected that the leachate will meet health-based levels in a shorter period of time than reducing the flow as in Alternatives 7 and 8. Utilizing a POTW offers more long-term effectiveness for the treatment of leachate than the on-Site treatment plants contained in Alternatives 3, 4, and 6 and, possibly, 7 and 8. Alternative 5 was selected over Alternatives 3, 4 and 6 because the use of a POTW to treat the leachate has greater reliability than a small on-Site treatment system since the POTW would have close monitoring of the plant operations while the on-Site plant would be unmanned in a remote area. In addition, utilizing an existing POTW would eliminate the need for a start-up period for the treatment of leachate.

Although Alternative 9 would be more protective and have greater long-term effectiveness than the other alternatives, it was not selected because it may not be implementable. The in-situ stabilization/solidification of the landfill contents in Alternative 9 would require the excavation of all of the buried drums and tires which, at best, would be very difficult to locate. It would also be difficult to perform this removal work on the surface of the landfill.

Alternative 8, and, to a lesser extent, Alternative 7 would have short-term effects from the excavation of the landfill material, Alternative 7 in placing the slurry walls around the landfill and Alternative 8 in consolidating all of the landfill material onto a liner. Alternative 9 would also have short-term effects from the excavation of the buried drums and tires, although to a lesser extent than Alternatives 7 and 8.

The Virginia Department of Waste Management has concurred with the selected remedy. The Proposed Plan for the Site was released for public comment on April 10, 1991. The Proposed Plan identified Alternative 5 as the preferred remedy. As a result of public comment, EPA decided to modify the preferred remedy described in the Proposed Plan to include the option of leachate pretreatment at an industrial user's facility prior to discharge to the POTW. The Proposed Plan included only pretreatment in an on-site treatment plant. This change allows a choice between either the on-site plant or an existing industrial user's facility. If a determination is made that pretreatment is required, EPA, in consultation with the POTW, will determine during the design phase how and where to pretreat.

Preference for Treatment as a Principal Element.

The selected remedy satisfies, in part, the statutory preference for treatment as a principal element. The major human health risk associated with the Site is from ingestion of landfill leachate. The selected remedy reduces the levels of arsenic, antimony, barium and lead in the leachate by using the POTW to remove these contaminants in the treatment process. Also, if the Carbon Black Pile, Waste Pile or the soils and sediments of the Northern Drainage are determined to be RCRA characteristic wastes, they will be treated by either solidification or stabilization so that they no longer constitute characteristic wastes.

## 11. Documentation of Significant Changes

The Proposed Plan, which identified Alternative 5 as EPA's preferred alternative for the Site, was released for public comment on April 10, 1991. EPA reviewed all written and verbal comments submitted during the public comment period and determined that no significant change to the remedy identified in the Proposed Plan was necessary.