United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R03-90/098
September 1990

EPA

Superfund Record of Decision:

Sand, Gravel and Stone, MD

50272-101

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SUPERFUND RECORD OF DECISION
Sand, Gravel and Stone, MD
Second Remedial Action

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Washington, D.C. 20460

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14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The 200-acre Sand, Gravel and Stone site is a former sand and gravel quarry three miles west of the town of Elkton, in Cecil County, Maryland, along a tributary to Mill Creek. Surface water in Mill Creek eventually flows to the Elk River and the Chesapeake Bay. Beginning in 1969, hazardous materials were disposed of onsite. In 1974, a pool of chemical waste burned in a onsite fire, the cause of which has yet to be determined. Subsequently, 200,000 gallons of this liquid waste was removed to an offsite landfill and the remaining drums and sludge were buried onsite in two excavated pits (eastern and western). The site has been separated into three operable units (OU). A 1985 Record of Decision (ROD) addressed OU1, the remediation of shallow ground water contamination near the eastern excavated pit, source control (i.e., removal of buried drums), and site access restrictions. This ROD focuses on OU2, the threat posed by soil and ground water contamination migrating from the eastern portion of the site, including remediation of ground water contamination in the lower aquifers if needed, and evaluation of contaminant sources near the western excavation pit. Soil sampling analyses and geophysical studies now show that there are no unacceptable risks associated with soil in the western area of the site. A future ROD will address OU3, the contaminated soil,

(See Attached Page)

17. Document Analysis a. Descriptors
Record of Decision - Sand, Gravel and Stone, MD
Second Remedial Action
Contaminated Medium: gw
Key Contaminants: VOCs (benzene, toluene), metals

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 77
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse*

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

Abstract (Continued)

source control, final site closure, and post-closure operation and maintenance activities. The primary contaminants of concern affecting the ground water are VOCs, including benzene and toluene; and metals.

The selected remedial action for this site includes onsite and offsite ground water monitoring. If this monitoring data demonstrate that remediation is required, ground water may be treated either onsite, or offsite at point of use, and bottled water will be supplied to affected residences and businesses. The onsite treatment system installed as a result of the first remedial action would be expanded and modified, as necessary, to treat the ground water in the lower aquifer. Treatment measures may utilize granular activated carbon, air stripping, ion exchange, or any combination of these techniques. The estimated present worth cost of this remedial action ranges from $702,000 to $7,125,000, depending on the extent and nature of treatment required, and an annual O&M cost ranging from $102,000 to $625,900 for 30 years.

PERFORMANCE STANDARDS OR GOALS: Action levels that will trigger the implementation of onsite and/or offsite ground water treatment include concentrations of chemicals of concern in excess of MCLs, a cumulative carcinogenic risk in excess of 10^{-4}, or a non-carcinogenic hazard index greater than 1.0.

U.S. ENVIRONMENTAL PROTECTION AGENCY - REGION III
SUPERFUND PROGRAM

RECORD OF DECISION

MARYLAND SAND, GRAVEL AND STONE SITE
OPERABLE UNIT TWO
ELKTON, MARYLAND

SEPTEMBER 1990

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I. DECLARATION FOR THE RECORD OF DECISION

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Maryland Sand, Gravel & Stone Site
Elkton, Maryland
Operable Unit Two

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Operable Unit Two at the Maryland Sand, Gravel and Stone Site ("Site") in Elkton, Maryland, chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. This decision is based on the Administrative Record for the Site.

The State of Maryland 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. § 9606, that actual or threatened releases of hazardous substances from the Site, as discussed in "Summary of Site Risks" in Section 6.0, if not addressed by implementing the response action selected in this Record of Decision may present an imminent and substantial endangerment to the public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

This operable unit is the second of three operable units for this Site. Operable Unit One dealt with shallow groundwater contamination in the Eastern Excavated Area of the Site. The remedy for Operable Unit One called for treatment of the contaminated groundwater in a treatment plant that will be built on the Site. It also provided for source control (i.e., removal of buried drums) and access restrictions (i.e., a fence was constructed around the Eastern Excavated Area). Operable Unit Two, which is the subject of this Record of Decision deals with groundwater contamination in the lower aquifers and an evaluation of contaminant sources in the Western Excavated Area. Operable Unit Three will address contaminated soils, closure, and post-closure operation and maintenance activities.

The remedy for Operable Unit Two was selected after a careful evaluation of the overall conditions at the Site. The soil and groundwater in the uppermost aquifer in the Eastern Excavated Area of the Site are highly contaminated with a variety

of organic and inorganic compounds. The soil and groundwater in this area will continue to act as a source until this source is removed or controlled, either as part of Operable Unit One or Operable Unit Three.

The remedy selected for Operable Unit Two addresses the threat posed by the existing soil and groundwater contamination in the eastern portion of the Site. Although to date, the migration of contamination from the uppermost aquifer appears to be limited, the selected remedy will put in place a system to monitor and treat contaminated groundwater that does migrate into the deeper aquifers or offsite.

The major components of the selected remedy are:

- o Onsite and offsite groundwater monitoring
- o Onsite and/or offsite point-of-use treatment if determined necessary based on groundwater monitoring data.

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 satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Until a decision is made with respect to the contaminated soils under Operable Unit Three, hazardous substances will remain onsite above health-based levels. A review will therefore be conducted within five years after commencement of remedial action in accordance with Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), to ensure that the remedy selected for this operable unit continues to provide adequate protection of human health and the environment.

SEP 28 1990

Edwin B. Erickson
Regional Administrator
Region III

Date

1.0 SITE LOCATION AND DESCRIPTION

1.1 SITE LOCATION

The Maryland Sand, Gravel and Stone Site (MSGS site or Site) is located in Cecil County, Maryland at 75°53'54" longitude and 30°36'53" latitude on the U.S. Geological Survey (USGS) Northeast, Maryland 7.5 minute quadrangle map. Consisting of about 200 acres, the Site is located north of Maryland Route 40 along a tributary to Mill Creek and about 3 miles west of Elkton (Figure 1). It is situated within the western portion of a triangle formed by Marley Road to the northwest, Nottingham Road to the northeast, and Maryland Route 40 (Pulaski Highway) to the south (Figure 2).

1.1 - Site Description

The Site was previously operated as a sand and gravel quarry. Quarrying operations removed materials from two areas: the Eastern Excavated Area and the Western Excavated Area.

About three acres of the Site in the Eastern Excavated Area reportedly were used for the disposal of waste processing water, still bottoms, sludge, and drums of solid and semisolid waste between 1969 and 1974. Three pits in the Eastern Excavated Area were used as surface impoundments where about 700,000 gallons of waste were dumped.

Within a 1 mile radius of the Site there are approximately 150 units housing about 570 residents. Elkton, a town of 6,468 residents, is located approximately 3 miles to the east of the Site. The town of North East, located approximately 1.8 miles west-southwest of the Site, has a population of 1,469.

The geology of the MSGS Site consists of fluvial Potomac Group Sediments that overlie fractured metamorphic bedrock. The sediments are sand, gravel, silt and clay. The sediments exhibit marked lateral variations. There do appear, however, to be several laterally consistent strata across much of the Site. These include an upper sand unit (primarily restricted to the Eastern Excavated Area), a middle and a lower sand unit, a zone of weathered bedrock (saprolite) and bedrock.

The middle and lower sand units currently are used as a source of drinking water and these units have therefore been classified as a Class II (a) aquifer. The general direction of groundwater flow from the Site is south or south-southwest.

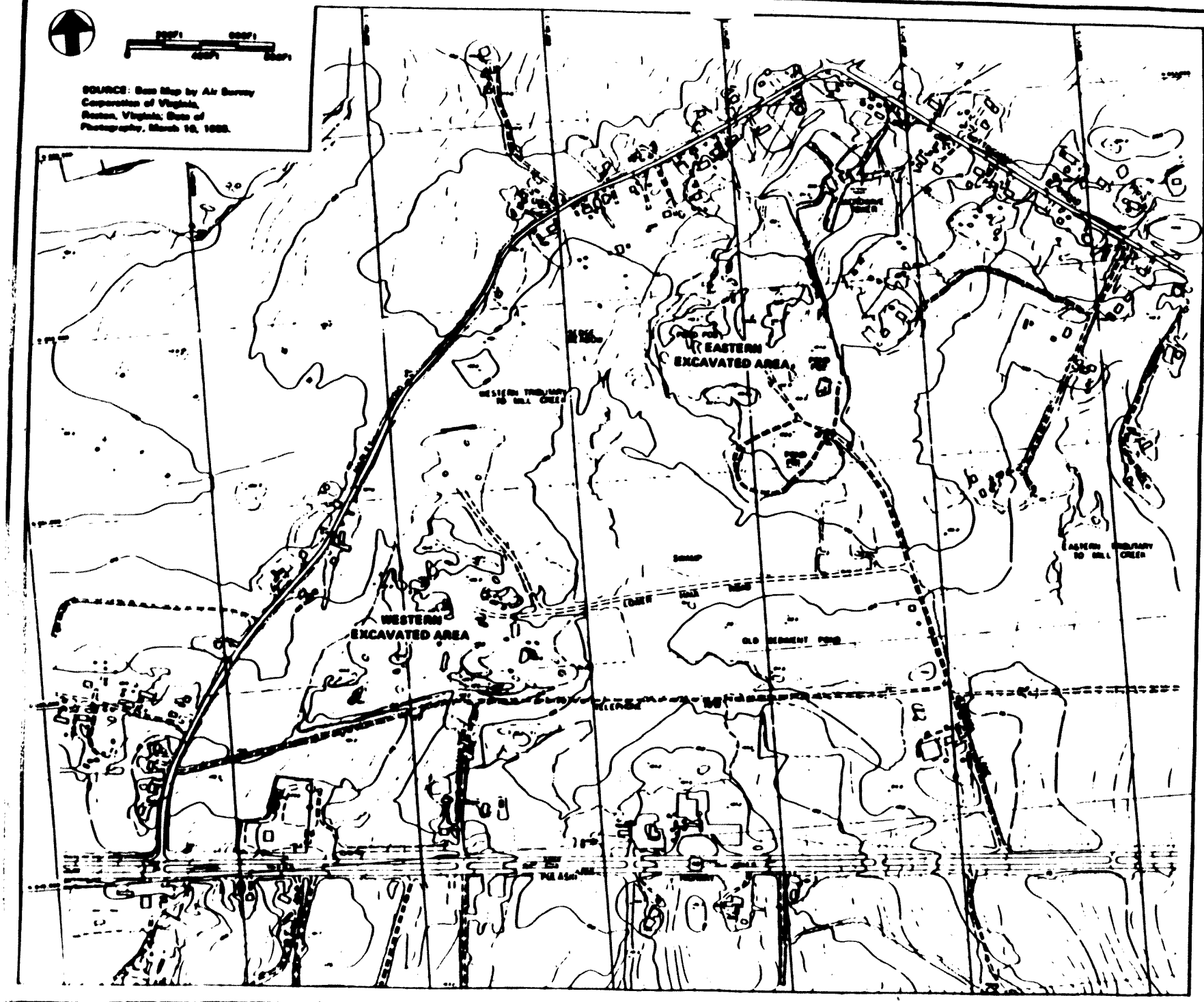
There are a number of seeps and springs on the Site. Surface waters from the Site are collected by two intermittent streams; the western and eastern tributaries of Mill Creek. The tributaries merge at the southeastern corner of the Site. Mill Creek flows southeastward from the site, turns eastward and then becomes a tributary of Elk Creek. Elk Creek drains into Elk

Source: Topographic Map of Cecil County, Maryland Geological Survey, 1977

0 2000 Feet

FIGURE 1
VICINITY MAP

Dames &



SITE MAP

Figure 2

River and subsequently into the Chesapeake Bay. Recreational use of the surface water for fishing occurs in both Elk Creek and Elk River.

2.0 SITE HISTORY AND ENFORCEMENT ACTIONS

Quarrying operations at the Site were conducted by the Maryland Sand, Gravel and Stone Company. Hazardous materials were disposed of on the Site between 1969 and 1974.

In April 1974, a fire occurred onsite during which a pool of chemical waste burned at high intensity before it was extinguished. The cause of the fire was not determined.

Two hundred thousand gallons of liquid waste were removed from the Site in 1974, and taken to the Kin Buc Landfill in Edison, New Jersey. The drums and sludges that remained following the removal of the liquid waste were buried onsite in excavated pits (refer to Section 4.0 for current status of buried drums).

In July 1979, EPA conducted an initial site investigation. Additional investigations were conducted by EPA in February 1982. EPA proposed the Site for inclusion on the National Priorities List (NPL) in December 1982, and it was added to the list in September 1984.

EPA initiated remedial investigation (RI) activities in June 1984. The Phase I Remedial Investigation/Feasibility Study (RI/FS), conducted by EPA, was completed in September 1985.

On September 30, 1985, EPA issued a Record of Decision (ROD) for Operable Unit One at the Site. (refer to Section 4.0 for a discussion of the scope and role of the three operable units associated with this Site.) In April 1988, forty-one potentially responsible parties (PRPs) entered into a Consent Decree with EPA to implement the remedy identified in the ROD for Operable Unit One. In October 1989, the United States filed an action against five non-settlors seeking recovery of response costs.

On January 16, 1986, sixteen PRPs entered into a Consent Order with EPA to perform the RI/FS for Operable Unit Two.[1] Work on the Phase Two RI/FS began in November 1985 and was completed in May 1990. (Note, hereinafter the terms Operable Unit and Phase will be used interchangeably. That is, the Phase II RI/FS corresponds to the RI/FS for Operable Unit two, etc.)

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[1]. Since January 16, 1986, there have been two amendments to the Consent Order pursuant to which parties were added or dropped as respondents. The Consent Order ended up with seventeen respondents (Docket No. III-86-2-DC Amended Caption and Amended Caption No. 2).

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI/FS and Proposed Plan for Operable Unit Two at the Maryland Sand, Gravel and Stone Site were released to the public on May 15, 1990. The documents were made available to the public in both the administrative record and an information repository maintained at the EPA Docket Room in Region III and at the Cecil County Public Library. The Notice of availability of these two documents was published in the Cecil Whig Newspaper on May 15, 1990. The Proposed Plan and administrative record were made available to the public in accordance with Sections 113 and 117 of CERCLA, 42 U.S.C. § 9613 and 9617 and 40 C.F.R. § 300.430(f), 55 Fed. Reg. 8850, March 8, 1990.

The public comment period was originally scheduled to run from May 15, 1990, to June 15, 1990. However, upon request of some of the PRPs associated with this Site, the comment period was extended to July 15, 1990, in accordance with 40 C.F.R. § 300.430(f)(3)(C), 55 Fed. Reg. 8851, March 8, 1990.

A public meeting was held on June 5, 1990, at 7:00 p.m. in the Cecil County Public Library. At this meeting a representative from EPA discussed conditions at the Site, summarized the remedial alternatives under consideration and presented EPA's proposed plan for dealing with Operable Unit Two. Following this presentation, representatives from EPA and the Maryland Department of the Environment answered questions about the Site and the alternatives under consideration. A response to the comments received during the public comment period, including those received during the public meeting, is included in the Responsiveness Summary that is part of this ROD. This decision document presents the selected remedial action for Operable Unit Two at the Maryland Sand, Gravel and Stone Site in Elkton, Maryland. The remedy selected was chosen in accordance with CERCLA, 42 U.S.C. § 9601 et. seq., and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The decision for this operable unit is based on the administrative record.

4.0 SCOPE AND ROLE OF OPERABLE UNITS

As with many Superfund sites, the problems at the Maryland Sand, Gravel and Stone Site are complex. As a result, EPA has divided the work into three operable units. The scope of each of the operable units can be summarized as follows:

Operable Unit One - shallow groundwater contamination in the Eastern Excavated Area, source control, access restrictions

Operable Unit Two - groundwater contamination in the lower aquifers and evaluation of contaminant sources in the Western Excavated Area

Operable Unit Three - soils, source control, final site closure, and post closure operation and maintenance activities.

EPA has already selected the clean-up remedy for Operable Unit One (refer to September 30, 1985, ROD). The remedy provided for the removal of buried material (drums and/or cement mixer barrels) and offsite disposal of hazardous materials at an approved RCRA facility. The remedy called for a fence to be constructed around the most heavily contaminated portions of the Eastern Excavated Area. It also provided for the installation of shallow groundwater interceptor trenches downgradient from the waste sources to collect the contaminated groundwater and leachate for treatment at a treatment plant to be built on the Site.

Portions of the Operable Unit One remedial action have already been completed. The fence has been installed. Drum removal work is currently underway, and the treatability study to determine the location and type of groundwater collection and treatment systems is also ongoing.

This ROD addresses Operable Unit Two at the Site. It addresses groundwater contamination in the lower aquifers and the evaluation of potential contaminant sources in the Western Excavated Area.

Operable Unit Three will address contaminated soils, closure and post closure activities.

5.0 SITE CHARACTERIZATION

5.1 WESTERN EXCAVATED AREA

One of the objectives of the remedial investigation for Operable Unit Two, was to investigate the possibility of a contamination source in the Western Excavated Area. Several tasks in the remedial investigation were aimed at providing the information necessary to make a determination as to whether waste disposal had occurred in the Western Excavated Area.

A geophysical study was conducted in the Western Excavated Area as well as in the Old Sedimentation Pond. The study did not encounter evidence of buried metallic waste or other indications of contaminant sources in either of these areas.

Analysis of soil samples (0 to 3ft) and shallow borings (0 to 8ft) taken from the Western Excavated Area also did not reveal evidence of a contamination source in the Western Excavated Area.

Based on a review of the results of geophysical studies, surface soil sampling and shallow boring analysis conducted in the Western Excavated Area, it does not appear that waste disposal occurred in this area. The Risk Assessment summarized in Section 6.0 concluded that there were no unacceptable risks associated with the Western Excavated Area. Therefore, no further investigation nor remedial activity is proposed to deal with surface contamination in this area.

Remedial activities associated with groundwater, both on- and off-site, including the Western Excavated Area, are discussed below. Note, however, that wells in the Western Excavated Area sampled during the Phase II remedial investigation did not evidence contamination.

5.2 GROUNDWATER

As noted previously, the geology of the MSGS Site consists of fluvial Potomac Group Sediments that overlie fractured metamorphic bedrock. The sediments are sand, gravel, silt and clay. The sediments exhibit marked lateral variations. However, there do appear to be several laterally consistent strata. These include an upper, middle, and lower sand unit, a zone of weathered bedrock (saprolite) and bedrock. Figure 3 provides a representative cross-section of the Site showing the relationship and relative thickness of the various units. Figure 4 shows the location of the cross section with respect to the Site.

The upper sand unit appears to be restricted to the Eastern Excavated Area. The highest concentration of contaminants was found in the groundwater associated with this unit due to the disposal of wastes immediately above and within this unit. Contamination in the upper sand unit was characterized in the Phase I remedial investigation and confirmed in the Phase II remedial investigation.

The following constituents have been detected in concentrations exceeding the maximum contaminant level (MCL) in the upper sand unit: benzene, xylene, 1,2-dichloroethane, vinyl chloride, toluene, 1,1,1-trichloroethane, and cadmium. An order of magnitude increase in the concentrations of volatile organics in the upper sand monitoring wells was noted between 1985 and 1987 for wells south of Pond 1.

The upper sand unit appears to be perched on a layer of silt and clay. Groundwater moves from the upper sand unit into the middle sand unit by way of surface seeps, leakage through the confining layer, or possibly by movement thorough undetected gaps in the confining layer. The Phase I Remedial Investigation identified three areas of surface seeps, one associated with each of the three ponds located in the Eastern Excavated Area. Groundwater in the upper sand unit flows toward these seeps located west, southwest and southeast of the Eastern Excavated Area.

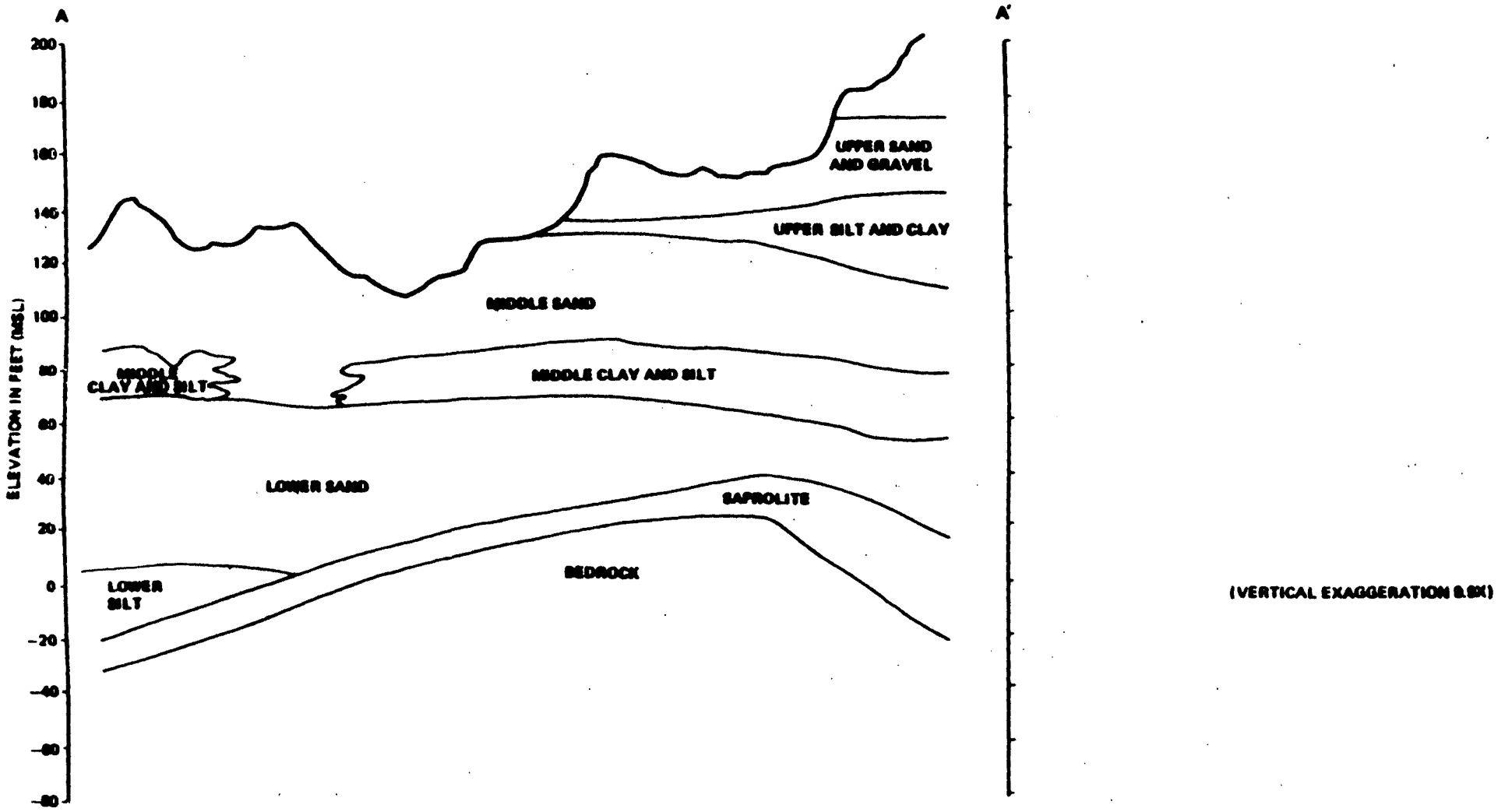


Figure 3

CROSS SECTION A–A' SHOWING GROUNDWATER UNITS

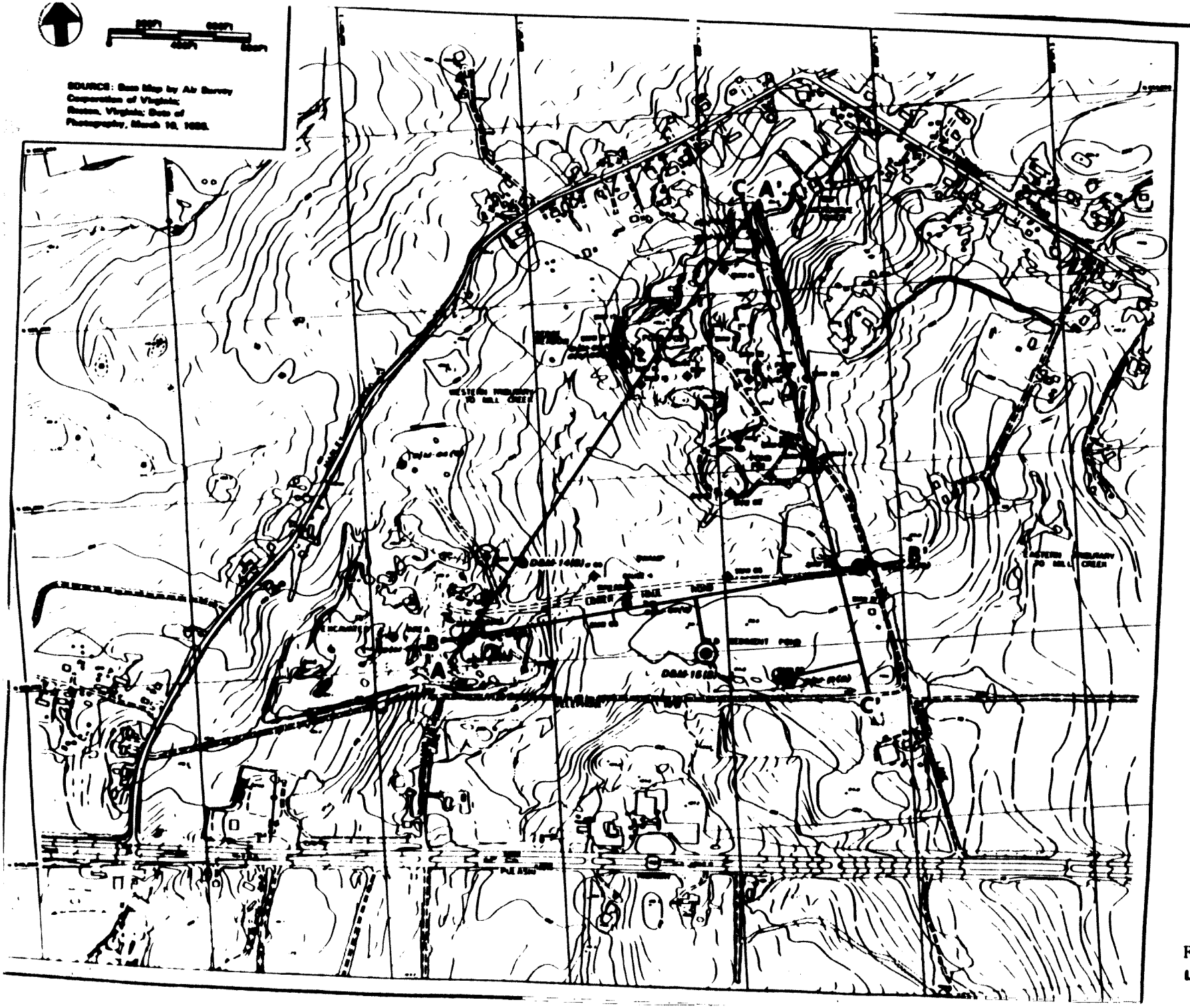


Figure 4
LOCATION OF CROSS-SECTIO

The water table aquifer in the middle sand unit south of the Eastern Excavated Area and along the valley of the western tributary to Mill Creek is underlain by a separate silt and clay layer. Groundwater moves downward from the middle sand unit by leakage through this confining bed, and through gaps in the confining bed. Gaps in the confining layer were observed at wells SMW-10 and D&M 14. The location of on-site monitoring wells is shown on Figure 5. The direction of groundwater flow in the middle sand unit is generally southward.

Contaminant levels in the middle sand groundwater unit generally were considerably lower than in the upper sand unit. However, elevated levels of contamination were detected in middle sand well DMW-7 which is located immediately downgradient of the Eastern Excavated Area. Twelve organic compounds were detected in the well. Five of these were detected in concentrations at or exceeding MCL's. They include: vinyl chloride, benzene, trichloroethene, 1,1-dichloroethene, and 1,1,1-trichloroethane. There was a significant increase in both the number and concentration of contaminants found in this well between 1985 and 1988. This increase likely represents migration of contaminants into the groundwater in the area of DMW-7. No elevated levels of metals were found in the middle sand wells. A summary of the occurrence of analytes associated with groundwater from the middle sand unit is provided in Table 1.

Few contaminants were found in the lower sand and bedrock aquifer. Low levels of several metals and organic compounds were detected, but they were found at concentrations that do not present a concern at this time. Tables 2 and 3 provide summaries of the occurrence of analytes in groundwater from the lower sand and bedrock units respectively.

As previously noted, Operable Unit Two deals with only a portion of the Site. The primary exposure pathway associated with this operable unit involves the potential exposure to contaminated groundwater by existing or future off-site groundwater users.

Analytical data for groundwater samples collected from off-site wells during the Phase II remedial investigation detected metals and a few volatile organic compounds. Data from the Phase I and Phase II remedial investigation do not indicate that contaminants from the Site have reached the off-site wells tested. However, the potential for future off-site migration of contamination does exist.

The general direction of groundwater flow from the Site is south or south-southwest. Estimated groundwater velocities are shown in Table 4. The estimated velocities as well as the calculated travel times shown on this table vary greatly as a result of the heterogeneous nature of the sediments associated with the Site. The calculated travel times are order of magnitude estimates at best; actual groundwater velocities could

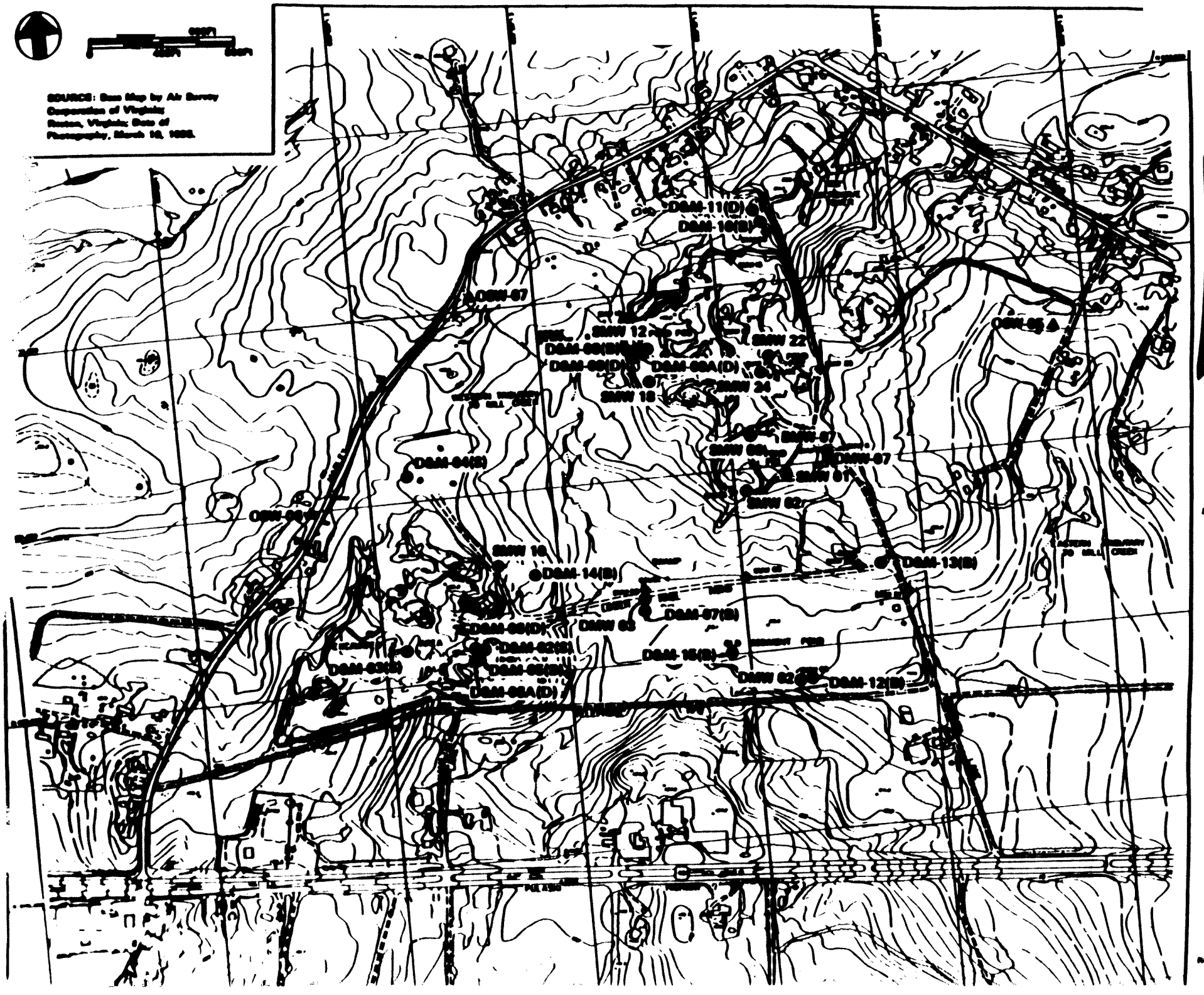


Figure 5
LOCATION OF ON-SITE MONITORING WELLS AND RESIDENTIAL WELLS SAMPLED NEAR THE SITE

TABLE 1

Summary of the Occurrence of Analytes Associated With Groundwater From the Middle Sand Unit in the Western and Eastern Excavated Areas (Means Calculated as the Average of the Detected Concentrations)

Middle Sand wells (a)

Analyte	SWM-10 (WEA)			DWM-07 (EEA)						DWM-02 (WEA)	DWM-03 (WEA)		DWM-04 (EEA)		
	05	07	08	05	DWM-07(b) 08	DWM-07EE(c) 08	DWM-07(d) 08	DWM-07EE(e) 08	Assessment (f) Concentration 08	07	07	08	07	Mean (g)	Max
Volatiles (ug/l)															
Chloromethane															
Bromomethane															
Vinyl Chloride															
Chloroethane															
Methylene Chloride					3 J		4 J		3.5		6 J			0.7	6
Acetone		2 BJ	2 BJ		34	20 DJ	34	34 D	34		6 J			0.7	6
1,1-Dichloroethene			12		5	11 DJ	5 B	15 BDJ	(e)		6 J			0.8	6
1,1-Dichloroethane					130						5 J			4.3	34
1,2-Dichloroethane					51	120 D	88	69 D	109	9 J			2 BJ	(i)	
Chloroform					2 J	51 D	46	45 D	45.5					1.0	12
1,1,1-TCA	20 J			14 J			2 J		2					100.0	100
Trichloroethene				11 J	600 E	600 D	990 E	690 D	745					45.5	45.5
Benzene					13	13 DJ	13	12 DJ	13					2.0	2.0
2-Hexanone					4 J	6 DJ	4 BJ	21 BDJ	(e)					17.2	20
Tetrachloroethene														370.0	745
Toluene			41		7	7 DJ	8		7.5	2 J				13.0	13
Semivolatiles (ug/l)							11	14 DJ	9.5					(i)	
														0.2	2
bis(2-ethylhexyl)phthalate	NA	NA	5 J	20 B										7.5	7.5
N-nitrosodiphenylamine	NA	NA			2 J	NA	NA	NA	1		NA		3 J	23.2	41
Di-n-butyl phthalate	NA	NA	7 J	NA						10 J					
Diethylphthalate		NA		10 B						8 J				3.0	10
Butylbenzylphthalate		NA		10 B						NA				1.5	8
Bis(2-ethylhexyl)hexanedioic acid		NA	NA	13 J	NA	NA	NA	NA			NA	NA	NA	7.0	7
2-Butoxyethol		NA		42 J						NA				0.8	8
Metals (ug/l)														0.8	8
														0.8	8
Aluminum														6.5	13
Arsenic	NA	23 V	97 [JPW	NA	307 P	406 P	NA	307	307	43 U	20 U	27 UPW	20 U	21.0	42
Barium	7.5 U	1.4 UW	1.5 [JP	7.5 U	5.7 [JP	1.6 [JP		1.5	1.5	1.5 U	4.6 UW	0.06 UW	2.1 W	69	307
Beryllium	NA	9.6 V	20 [JP		0.8 [JP	9.8 [JP		7.4	7.4	3.0 V	8.1 V W	11 [JP	24 V	2.1	4.6
Calcium	4.2 U	1 U	0.37 [JP	4.2 U	25400 P	0.78 [JP		0.75	0.75	1.0 U	1 U	0.29 UP	1 U	13.3	20
Chromium	NA	2000 V	6100 P		28 P	27400 P		26400	26400	3430 WE	6900	3360 [JP	22900	0.03	2.1
Cobalt	10 J	4 U	8.1 UP	17.2 U	6.8 [JP	19 P		26	26	5.0 U	5.5 V	8.1 UP		10200	26400
Copper	NA	3.4 V	11 [JP		9.8 [JP	2.4 UP		4	4	5.0 U	5.5 V	2.4 UP	4 U	17	90
Iron	17.2 U	7 U	12 [JP		67 [JP	10 [JP		13	13	20 U	7 U	9.4 UP	4.7 V	6.6	11
Lead	NA	3 UE	260 P	50 U	2.2 UE	943 P		81	81	0.2 U	10 VE	5 UP	7 U	7.3	12
Magnesium	50 U	5.7	4.1 [JP		800 [JP	4.1 [JP		3.2	3.2	2.5 U	2 U	2.2 UE	3 UE	35	260
Manganese	NA	337 V	656 [JP		5.6 [JPE	731 [JP		769	769	1040 V	1300 V	760 [JP	2 U	7.5	25
Potassium	82	9 V	60 P		1770 UP	7.7 [JEP		6.7	6.7	13 V	4.6 V	4.6 [JP	1030 V	943	1030
Sodium	NA	1600 U	3620 [JP		7640 P	1770 UP		885	885	2080 U	3350 V	1770 UP	14 V	21	63
Thallium	NA	1050 WE	5570 PE		1.9 UE	2930 [JP		5065	5065	4060 V	4000 VE	2220 [JP	5490	2430	5490
Vanadium	NA	2.8 V	1.9 UE		28 [JP	1.9 UE		1.8	1.8	2.2 U	1.2 V	1.9 UE	3940 WE	3000	5570
Zinc	NA	1 U	3.2 UP		16 [JP	25 [JP		20.5	20.5	4.2 V	2.3 V	3.2 UP	0.8 U	1.2	2.8
	NA	100 E	453 P-NE			94 EP		55	55	63 E	47 E	37 P-N	1.4 V	5.4	20.5
													13 WE	140	453

See notes on next page

TABLE 1 (con't)

(a) Notes regarding data entries
1. Blank spaces - analyte not detected
2. "J" flag - estimated concentration for compound that meets the mass spectra identification criteria but the detected concentration is less than the sample quantitation limit but greater than zero
3. "B" flag - analyte detected in method blank.
4. "D" flag - analyte detected in sample after sample dilution.
5. "E" flag for organics - response was greater than full scale, indicating requirement for sample dilution.
6. "E" flag for inorganics - reported value is estimated because of the presence of interference
7. "P" flag - ICP used for Aluminum, Antimony, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Magnesium, Manganese, Nickel, Potassium, Silver, Sodium, Vanadium and Zinc
8. "F" flag - furnace AA, used for Arsenic, Lead, Selenium and Thallium.
9. "CV" flag - manual Cold Vapor AA, used for Mercury
10. "W" flag - spike sample recovery is not within control limits.
11. "U" or "[]" flag - value greater than or equal to the Instrument Detection Limit (IDL) but less than the Contract Required Detection Limit (CRDL).
12. "*" flag - duplicate analyses are not within control limits.
13. "R" flag - rejected value
14. NA - not analyzed
15. "U" flag for inorganics - undetected. The number associated with the "U" flag is the detection limit, which must be tracked for inorganics because inorganics are naturally occurring.
16. "89," "87," and "88" - samples collected in 1989, 1987, and 1988, respectively.
17. "EEA," "EIA," and "GSA" - Eastern Excavated Area, Eastern Excavated Area, and General Site Area, respectively.
(b) The first sample of two that were collected from well GWM-07 in 1988
(c) The reanalysis of the first 1988 sample from well GWM-07, as required because the chromatographic response for 1,1,1-TCA was greater than full scale.
(d) The second sample of two that were collected from well GWM-07 in 1988.
(e) The reanalysis of the second 1988 sample from well GWM-07, as required because the chromatographic response for 1,1,1-TCA was greater than full scale.
(f) "Assessment Concentration" - the 1988 analyte concentrations representative of well GWM-07 and used as input for the statistical summary for the middle sand water-bearing unit. See text for further discussion
(g) means are arithmetic. If an organic analyte was not detected above the detection limit, a value of zero was assumed for nonindicator chemicals. For organic indicator chemicals, the mean concentration is the average of the detected concentrations. If an inorganic analyte was not detected above the detection limit, a value of one-half of the detection limit was assumed
(h) minimum detected concentrations for organics are assumed to be zero if at least one sample exhibited a non-detectable concentration. Minimum detected concentrations for inorganics are assumed to be equal to one-half of the minimum detection limit reported for the analyte
(i) method blank was contaminated by this analyte. Analyte concentration in the groundwater sample was less than five times (5x) the detection limit for this analyte; therefore, the analyte is considered to be a laboratory artifact
(j) method blank was contaminated by this analyte. Analyte concentration in the groundwater sample was less than or equal to the detection limit for this analyte; therefore, the analyte is considered to be a laboratory artifact

TABLE 2

Summary of the Occurrence of Analytes Associated With Groundwater From the Lower Sand Unit in the Western and Eastern Excavated Areas (Means Calculated as the Average of the Detected Concentrations)

Analyte	Lower Sand Wells (a)										Statistical Summary				
	DMW-03 (CSA)			DMW-06 (EEA)	D&M-06 (b) (WEA)	D&M-06A (WEA)	D&M-09(b) (EEA)	D&M-09A (EEA)	D&M-11 (EEA)		Mean (c)	Max.	Min (c)	No. of Samples	No. of Positive Results
	05	07	08	05	07	08	07	08	07	08 (c)					
Volatiles (ug/l)															
Methylene Chloride		1 J	6 B		2 J	1 J	3 BJ		29 B		2 9	29	0	10	1
Acetone	129 J		4 BJ		10 B	25					12 9	129	0	10	1
Chloroform				4 9				2 J	2 J		3	4 9	0	10	3
Benzene						4 J			2 J		3	4	0	10	2
2-Hexanone	244 B										0	0	0	10	0
Toluene	9 42	10			120	5	42	20	6	6	25	120	0	10	6
Chlorobenzene	16 4										1 6	16 4	0	10	1
1,4-Dioxane	7 8	NA	NA	NA	NA	NA	NA	NA	NA	NA	7 8	7 8	7 8	1	1
5-mc-3-Heptanone	20 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	20 1	20 1	20 1	1	1
Tetrahydrofuran	16 2	NA	NA	NA	NA	NA	NA	NA	NA	NA	16 2	16 2	16 2	1	1
Semivolatiles (ug/l)															
Bis(2-ethylhexyl)phthalate		NA		NA	NA	33	NA	10	NA	32	12 75	33	0	4	2
Diethylphthalate	10 B	NA			NA		NA		NA		0	0	0	6	0
Di-n-butylphthalate	10 B	NA			NA		NA		NA		0	0	0	6	0
Butylbenzylphthalate	10 B	NA			NA		NA		NA		0	0	0	6	0
Tetradecane	17 J	NA	NA		NA	NA	NA	NA	NA	NA	0 5	17	0	2	1
Bis(2-ethylhexyl) ester,nonanedioacid	0 7 J	NA	NA		NA	NA	NA	NA	NA	NA	4 3	8 7	0	2	1
Metals (ug/l)															
Aluminum	NA	74 V	391 PN	NA	362	183 JP	144 V	319 P	20 U	125 JPN	184	391	10	6	5
Arsenic	7 5 U	1 4 U	0 86 UP	7 5 U	4 7 V	1 9 JP	14	1 6 UP	3 4 V	1 2 JP	1 9	3 8	0 43	6	3
Barium	NA	69 VE	74 JP	NA	879 E	9 3 JP	2120 E	41 JP	89 V	22 JP	91	89	9 3	6	6
Beryllium	4 2 U	1 U	0 29 UP	4 2 U	1 U	0 29 UP	1 2 V	0 29 UP	1 U	0 85 JP	0 8	2 1	0 15	8	1
Calcium	NA	20500	17700 P	NA	197000	9180 P	514000	16100 P	11600	4500 JPE	13300	20500	4500	6	6
Chromium	0 6 U	4 U	0 1 UP	55 J	94	0 1 UP	4 U	0 1 UP	4 U	0 1 UP	9 9	55	2	8	1
Cobalt	NA	7 6 V	10 JP	NA	6 3 V	3 5 JP	0 1 V	2 4 UP	10 VE	7 2 JP	5 8	10	1 2	6	5
Copper	17 2 U	16 V	9 8 JP	22	16 V	23 JP	15 V	10 JP	7 6 V	20 JP	15 6	23	7 6	8	7
Iron	NA	433	1320 P	NA	3 7 V	211 P	3 U	152 P	8 3 V	635 P	460	1320	8 3	6	6
Lead	50 U	2 U	2 2 UP	50 U	126	9 3 +P	221	0 91 UP+P	2 U	22 P	10 6	25	0 43	8	2
Magnesium	NA	2000 VE	1690 JP	NA	936 VE	1060 JP	1730 VE	551 JP	836 VE	646 JP	1140	2000	551	6	6
Manganese	44	78	50 P	12 9 U	4 8 V	42 P	4 8 V	0 30 UP	26 E	23 PE	30	78	0 15	8	6
Potassium	NA	3900 VE	10000 P	NA	200000 E	16500 P	79700 E	23200 P	27900	3670 JP	14200	27900	3670	6	6
Sodium	NA	11000 E	8700 PE	NA	90900 E	14900 P	47400 E	13900 P	10200	4590 JP	10600	14900	4590	6	6
Thallium	NA	0 8 U	1 9 UP	NA	1 4 V	2 0 UP	0 8 U	2 0 UP	0 8 U	1 9 UP	0 7	1 0	0 4	7	1
Vanadium	NA	3 9 V	7 6 JP	NA	6 8 V	3 2 UP	7 5 V	11 JP	3 3 V	3 2 UP	4 8	11	1 6	6	4
Zinc	NA	42	162 P+N	NA	8 4 V	152 NP	13 V	19 JNP	12 VE	75 P+N	77	162	12	6	6

T. 2 (con't)

(a) Notes regarding data entries:
1 Blank space = analyte not detected
2 "J" flag = estimated concentration for compound that meets the mass spectra identification criteria but the detected concentration is less than the sample quantitation limit but greater than zero
3 "B" flag = analyte detected in method blank.
4 "D" flag = analyte detected in sample after sample dilution.
5 "E" flag for organics = response was greater than full scale, indicating requirement for sample dilution
6 "E" flag for inorganics = reported value is estimated because of the presence of interference.
7 "P" flag = ICP, used for Aluminum, Antimony, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Magnesium, Manganese, Nickel, Potassium, Silver, Sodium, Vanadium, and Zinc
8 "F" flag = furnace AA, used for Arsenic, Lead, Selenium, and Thallium
9 "CV" flag = manual Cold Vapor AA, used for Mercury
10 "N" flag = spike sample recovery is not within control limits.
11 "U" or "[]" flag = value greater than or equal to the Instrument Detection Limit (IDL) but less than the Contract Required Detection Limit (CRDL)
12 "*" flag = duplicate analyses are not within control limits
13 "R" flag = rejected value
14 NA = not analyzed
15 "U" flag for inorganics = undetected. The number associated with the "U" flag is the detection limit, which must be tracked for inorganics because inorganics are naturally occurring
16 "85", "87", and "88" = samples collected in 1985, 1987, and 1988, respectively
17 "WIA," "EIA," and "GSA" = Western Excavated Area, Eastern Excavated Area, and General Site Area, respectively
(b) Inorganics results for this well not used to derive the statistical summary due to well construction problems and probable impact on inorganics chemistry
(c) The analytical results (1988) for semivolatiles are presented, but were not used to derive the statistical summary because the holding time was exceeded for semivolatiles.
(d) Means are arithmetic. If an organic analyte was not detected above the detection limit, a value of zero was assumed for nonindicator chemicals; for organic indicator chemicals, the mean concentration is the average of the detected concentrations. If an inorganic analyte was not detected above the detection limit, a value of one-half of the detection limit was assumed
(e) Minimum detected concentrations for organics are assumed to be zero if at least one sample exhibited a non-detectable concentration. Minimum detected concentrations for inorganics are assumed to be equal to one-half of the minimum detection limit reported for the analyte.

TABLE 3

Summary of the Occurrence of Analytes Associated With Groundwater From the Bedrock in the Western and Eastern Excavated Areas (Means Calculated as the Average of the Detected Concentrations)

Bedrock wells (a)

Analyte	DBR-02 (CSA) 05	DBR-02 (CSA) 07	DBR-02 (CSA) 08	DBR-07 (EEA) 05	DBR-07 (EEA) 08 (b)	DBR-05 (WEA) 07	DBR-05 (WEA) 08	DBR-07 (CSA) 07	DBR-07 (CSA) 08 (b)	DBR-08 (EEA) 07	DBR-10 (EEA) 07	DBR-10 (EEA) 08	DBR-12 (CSA) 07	DBR-12 (CSA) 08	DBR-13 (CSA) 07	DBR-13 (CSA) 08	DBR-14 (WEA) 08	DBR-15 (CSA) 08	Mean (c)
Volatiles (ug/l)																			
Methylene Chloride			1 J	5 1 B						2 BJ	1 BJ				10 B	2 BJ	2 BJ		(c)
Acetone		14 B				6 BJ					11 B	6 BJ	8 BJ		25	8 BJ			(c)
1,1-Dichloroethane										4 J									4
Benzene										1 J	3 J		5 B				2 BJ	3 BJ	(c)
2-Hexanone	11 7 B																		9
Tetrachloroethene									1 J										1
Toluene		53			2 J			26	20	62	100	3 J	88	4 J	120	3		1 J	30 5
Xylenes															1 J				0 1
Carbon Disulfide	NA	NA		NA	2 1	NA		NA		NA	NA		NA		NA				2 1
Semivolatiles (ug/l)																			
Bis(2-ethylhexyl)phthalate	NA	24				NA	59	NA	13 J	NA	NA	5 J	NA	4 J	NA	19 J	22	46	17 4
Di-n-octyl phthalate	NA			20 B		NA		NA		NA	NA		NA		NA	15 J		3 J	1 8
Di-n-butyl phthalate	NA	NA		NA	3 J	NA		NA		NA	NA		NA		NA				3
Phenol	NA	NA		NA		NA		NA		NA	NA		NA		NA		2 J	3 J	3 5
Metals (ug/l)																			
Aluminum	NA	20 U	350 PW	NA	27 UPW	20 U	27 UPW	20 U	27 UPW	20 U	20 U	27 UP	20 U	27 UPW	61 V	27 UP	1410 P	72 [JP	150
Arsenic	7 5 U	1 4 UN	0 86 UP	7 5 U	2 4 [JF	1 4 U	2 3 [JF	1 4 U	0 86 UP	1 8 VN	1 4 U	1 6 [JF	1 4 U	1 3 [JF	1 4 UN	1 3 [JF	1 3 [JF	0 86 UP	1 4
Barium	NA	21 V	55 [JP	NA	36 [JP	349	386 P	91 VE	31 [JP	173 V	56 VE	94 [JP	71 V	121 [JP	54 V	44 [JP	219 P	98 [JP	125
Beryllium	4 2 U	1 U	0 29 UP	4 2 U	0 71 [JP	1 1 V	0 41 [JP	1 U	0 29 UP	1 U	1 U	0 31 [JP	1 U	0 29 UP	1 U	0 29 UP	0 29 UP	0 48 [JP	0 6
Calcium	NA	43000 V	53400 P	NA	30500 [JPE	132000	144000 P	136000	28900 [JPE	112000	45300 V	137000 P	157000	139000 P	107000	81400 P	160000 P	124000 P	99000
Chromium	10 J	4 U	0 1 UP	8 6 U	0 1 UP	4 U	0 1 UP	4 U	0 1 UP	4 U	4 U	0 1 UP	4 U	0 1 UP	4 U	0 1 UP	0 1 UP	0 1 UP	4
Cobalt	NA	9 6 V	15 [JP	NA	6 [JP	10 V	3 6 [JP	6 1 V	2 4 UP	2 U	5 6 V	2 4 UP	4 1 V	2 4 UP	2 U	2 4 UP	2 4 UP	2 4 UP	4 4
Copper	17 2 U	7 U	12 [JP	17 2 U	20 [JP	10 V	11 [JP	8 8 V	30 P	7 U	8 4 V	5 4 UP	9 8 V	5 4 UP	7 U	5 4 UP	14 [JP	9 8 [JP	10
Iron	NA	7540 E	8800 P	NA	5570 P	3330	2420 P	678	129 P	462 E	3 U	982 P*N	218	3700 P	135 E	7340 P*N	6400 P	6040 P	4259
Lead	50 U	2 U	19 F	50 U	2 3 UP	4 7 V	2 2 UP	2 U	4 6 [JF	3 V	2 U	2 2 UP	2 U	2 2 UP	3 3 V	2 2 UP	20 F	2 2 UP	7 8
Magnesium	NA	11250 V	15400 [JP	NA	12330 [JP	79000 E	76600 P	49400 VE	10010 [JP	20400 V	995 VE	30330 [JP	20700 VE	24400 [JP	24600 V	33000 [JP	35600 [JP	33230 [JP	34440
Manganese	89	80	81 P	40	51 PE	199	203 P	114	18 PE	229	3 V	27 P	25	92 P	2 3 V	72 P	110 EP	65 EP	97
Potassium	NA	26900 V	11000 P	NA	11770 UP	80200	85330 P	58600 E	11770 UP	98000	76200 E	104000 P	42000 V	11770 UP	260000	11770 UP	68610 P	140000 P	73770
Sodium	NA	23000 E	21400 PE	NA	40230 [JP	136000 E	104000 P	126000 E	24110 [JP	122000 E	33400 E	144000 P	97900 E	67400 [JP	98100 E	70410 P	99000 P	123000 P	83093
Thallium	NA	0 8 U	1 0 UP	NA	1 0 UP	0 8 U	1 0 UP	0 8 U	1 0 UP	0 8 U	0 8 U	1 0 UPN	0 8 U	1 0 UP	4 4 V	1 0 UPN	1 0 UP	1 0 UP	0 8
Vanadium	NA	1 8 V	24 [JP	NA	3 3 UP	3 9 V	3 3 UP	2 4 V	3 3 UP	1 U	3 V	3 3 UP	2 4 V	3 3 UP	1 U	3 3 UP	3 3 UP	3 3 UP	3 5
Zinc	NA	147 E	209 P*NE	NA	117 P*N	16 VE	99 P*N	24	101 P*N	11 VE	6 2 V	8 9 [JP	7 8 VE	9 5 [JP*N	15 VE	70 P	169 EP	102 EP	88

TABLE 3 (con't)

(a) Notes regarding data entries:
1. Blank space = analyte not detected
2. "J" flag = estimated concentration for compound that meets the mass spectra identification criteria but the detected concentration is less than the sample quantitation limit but greater than zero.
3. "B" flag = analyte detected in method blank.
4. "D" flag = analyte detected in sample after sample dilution.
5. "E" flag for organics = response was greater than full scale, indicating requirement for sample dilution.
6. "E" flag for inorganics = reported value is estimated because of the presence of interference.
7. "P" flag = ICP, used for Aluminum, Antimony, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Magnesium, Manganese, Nickel, Potassium, Silver, Sodium, Vanadium, and Zinc.
8. "F" flag = Furnace AA, used for Arsenic, Lead, Selenium, and Thallium
9. "CV" flag = manual Cold Vapor AA, used for mercury
10. "N" flag = spike sample recovery is not within control limits.
11. "W" or "[]" flag = value greater than or equal to the Instrument Detection Limit (IDL) but less than the Contract Required Detection Limit (CRDL).
12. "*" flag = duplicate analyses are not within control limits.
13. "R" flag = rejected value
14. NA = not analyzed
15. "U" flag for inorganics = undetected. The number associated with the "U" flag is the detection limit, which must be tracked for inorganics because inorganics are naturally occurring.
16. "85," "87" and "88" = samples collected in 1985, 1987, and 1988, respectively
17. "WEA," "EEA," and "GSA" = Western Excavated Area, Eastern Excavated Area, and General Site Area, respectively.

(b) The analytical results (1988) for semivolatiles are presented, but were not used to derive the statistical summary because the holding time was exceeded for semivolatiles

(c) means are arithmetic. If an organic analyte was not detected above the detection limit, a value of zero was assumed for nonindicator chemicals. For organic indicator chemicals, the mean concentration is the average of the detected concentrations. If an inorganic analyte was not detected above the detection limit, a value of one-half of the detection limit was assumed

(d) minimum detected concentrations for organics are assumed to be zero if at least one sample exhibited a non-detectable concentration. minimum detected concentrations for inorganics are assumed to be equal to one-half of the minimum detection limit reported for the analyte

(e) method blank was contaminated by this analyte. Analyte concentration in the groundwater sample was less than five times (5X) the detection limit for this analyte; therefore, the analyte is considered to be a laboratory artifact

TABLE 4

Representative Groundwater Velocity Calculations and Resulting Travel Time to the MSGS Southern Boundary

Well #	Distance dl (ft)	Change in Head dh (ft)	Hydraulic Conductivity K (ft/d)	Effective Porosity (a) P	Velocity (b) V (ft/d)	Distance to Boundary D (ft)	Approximate Travel Time to Boundary, t (yr) (c)
LOWER SAND							
DMW-03	1,600	18	2.90E-01	0.33	9.89E-03	550	152.4
D&M-06A	800	9	6.04E+01	0.33	2.06E+00	320	0.4
D&M-09	1,600	18	6.66E-02	0.33	2.27E-03	1,875	2,262.5
MIDDLE SAND (e)							
DMW-07	1330	12	5.73E-02	0.26	1.99E-03	1500	2,066.7
D&M-02	950	3.7	5.73E-02	0.26	8.58E-04	300	957.6
D&M-03	2130	14	5.73E-02	0.26	1.45E-03	500	945.7
D&M-04	1290	10	5.73E-02	0.26	1.71E-03	1700	2,726.2
SMW-10	1470	12	5.73E-02	0.26	1.80E-03	900	1,370.6
BEDROCK (LOW ESTIMATE OF POROSITY)							
D&M-05	1,600	14	2.23E-02	0.01	1.95E-02	300	42.1
D&M-07	1,600	14	2.74E+01	0.01	2.40E+01	525	0.1
D&M-08	1,600	14	1.12E-02	0.01	9.82E-03	1,875	523.0
D&M-10	2,500	17	2.27E-03	0.01	1.54E-03	2,700	4,797.0
D&M-12	1,600	14	3.40E-02	0.01	2.98E-02	100	9.2
Pond 03 to D&M-07	1,600	14	2.74E+01	0.01	2.40E+01	1,600	0.2 (d)
BEDROCK (HIGH ESTIMATE OF POROSITY)							
D&M-05	1,600	14	2.23E-02	0.26	7.50E-04	300	1,095.2
D&M-07	1,600	14	2.74E+01	0.26	9.22E-01	525	1.6
D&M-08	1,600	14	1.12E-02	0.26	3.78E-04	1,875	13,598.1
D&M-10	2,500	17	2.27E-03	0.26	5.93E-05	2,700	124,723.0
D&M-12	1,600	14	3.40E-02	0.26	1.14E-03	100	239.4
Pond 03 to D&M-07	1,600	14	2.74E+01	0.26	9.22E-01	1,600	4.8 (d)

(a) Effective porosity taken from Mercer, et al., 1982.

(b) V = Kdh/Pdl

(c) t = D/V(365)

(d) Approximate time for groundwater to travel from the bedrock beneath Pond 03 to D&M-07 assuming the hydrologic conditions at D&M-07 are continuous across the site.

(e) Hydraulic conductivity was measured only in D&M-02. This value was used for all middle sand calculations.

be several orders of magnitude greater than the calculated velocities shown.

6.0 SUMMARY OF SITE RISKS

An Endangerment Assessment was prepared to assess the potential human health effects that may result from exposure to Site releases in the absence of remediation. The portions of the Site specifically addressed by the Endangerment Assessment are the soils, surface water, and sediments in the Western Excavated Area and groundwater associated with the three water bearing zones (the middle sand, lower sand and bedrock units) present in both the Western and Eastern Excavated Area.

Contaminants in the surface water and groundwater comprising the perched aquifer (i.e., the upper sand unit) in the Eastern Excavated Area were not evaluated in the Phase II Endangerment Assessment because those media were addressed in the Phase I Endangerment Assessment. Soils and sediments associated primarily with the Eastern Excavated Area also are not addressed in the Phase II Endangerment Assessment, as they will be the subject of a future focused feasibility study (Operable Unit 3).

Indicator chemicals (i.e., chemicals observed at the site which are most likely to pose a threat to public health and the environment) for the MSGS Site are summarized below. Chemicals selected only for specific media have the applicable media in parentheses following the chemical. All other chemicals are applicable to all media.

* Benzene
* Bis(2-ethylhexyl) phthalate (BEHP) (sediment)
* Di-n-butlyl phthalate
* Carbon Disulfide
* Chloroform
* 1,1-Dichloroethane
* 1,1-Dichloroethene
* 1,2-Dichloroethene
* 1,4-Dioxane
* Phenol
* Tetrachloroethene
* Toluene
* 1,1,1-Trichloroethane
* Trichloroethene
* Vinyl chloride
* Cadmium (soil)
* Lead (groundwater)
* Mercury (soil)

Exposure pathways were evaluated for two scenarios, current and future use. The current-use scenario considered the existing land use patterns of the area and evaluated the completeness of potential exposure pathways based on the current land use information. For the future-use scenario, the exposure pathways were altered to reflect the effects of possible future changes. Potential exposure to the indicator chemicals was evaluated for both scenarios for the following media:

* Middle sand unit groundwater
* Lower sand unit groundwater
* Bedrock groundwater
* Surface soil

* Subsurface soil
* Surface water
* Sediment
* Aquatic life
* Air

Tables 5 and 6 summarize the current-use and future-use pathways, respectively.

Because the western portion of the Site is open and residential areas are adjacent to the Site, public access is possible. Therefore, a potentially complete pathway under the current-use scenario was defined as dermal and incidental ingestion by exposure to the sediment in the Western Excavated Area. A potential future-use scenario for the Site includes possible residential development up to the southern boundary. This scenario reflects public access to sediment and could result in additional groundwater supply wells that withdraw water from the middle sand unit, lower sand unit, and/or bedrock. Potential future exposure routes related to exposure through groundwater include ingestion, dermal absorption during bathing, and inhalation of vapors during water usage (e.g., showering).

Exposure doses and risks were calculated under conservative most-probable and worst-case conditions. Risks calculated in this manner represent the upper bound of the probability of contracting cancer from a lifetime of exposure. This means that the true risk of contracting cancer is probably less and may be zero. Probabilities are expressed in scientific notation. For example, 1.0 E-6 is the same as 1×10^{-6} and equates to a one in a million chance of contracting cancer. Similarly, 1.0^{-4} represents a one in ten thousand chance of contracting cancer.

Quantitative estimates of potential risks for the complete pathways (i.e., direct contact with sediment and soil for the current-use scenario and exposure to sediment, soil and groundwater for the future-use scenario) are summarized below.

Sediment Exposure Pathway

Table 7 summarizes most-probable and worst-case risks for exposure to sediment under both the current and future-use scenarios. Risks under both scenarios are below EPA's target risk range (10^{-4} to 10^{-6}) and indicate no unacceptable carcinogenic risks related to exposure to sediment from the Western Excavated Area under either the current or future-use scenario.

Soil Exposure Pathway

Table 8 summarizes the most probable and worst case risks for exposure to soil under both the current and future-use scenarios. Neither inorganic cadmium nor mercury compounds are carcinogenic through oral exposure. Therefore, neither cadmium

TABLE 5

Evaluation of Exposure Pathways--Current Use

Media	Potential Source	Transport Media/ Release Mechanism	Exposure Point/ Exposure Population	Potential Exposure Route	Pathway Complete
Middle Sand Unit	Yes[a]	Groundwater flow/leaching	No	NA	No
Lower Sand Unit	Yes[a]	Groundwater flow/leaching	No	NA	No
Bedrock	Yes[a]	Groundwater flow/leaching	No	NA	No
Surface Soil (WEA)[b]	Yes	Direct contact	Yes	Incidental ingestion	Yes
Subsurface Soil (WEA)	Yes	Direct contact	Yes	Incidental ingestion	Yes
Surface Water (WEA)	No	NA	NA	NA	No
Sediment (WEA)	Yes[c]	Direct contact	Site/humans	Dermal contact/ incidental ingestion	Yes
Aquatic Life (WEA)	No	NA	NA	NA	No
Air (WEA)	No	NA	NA	NA	No

[a] The potential source is the near-surface contamination confirmed at the Eastern Excavated Area.

[b] Western Excavated Area.

[c] The principal source appears to be runoff from the Eastern Excavated Area.

TABLE 6

Evaluation of Exposure Pathways--Future Use

Media	Potential Source	Transport Media/ Release Mechanism	Exposure Point/ Exposure Population	Potential Exposure Route	Pathway Complete
·lle Sand	Yes[a]	Groundwater flow/leaching	Offsite/humans	Ingestion/inhalation/ dermal contact	Yes
·er Sand	Yes[a]	Groundwater flow/leaching	Offsite/humans	Ingestion/inhalation/ dermal contact	Yes
drock	Yes[a]	Groundwater flow/leaching	Offsite/humans	Ingestion/inhalation dermal contact	Yes
ırface Soil WEA)[b]	Yes	Direct contact	Onsite/humans	Incidental ingestion/ inhalation	Yes
ubsurface Soil WEA)	Yes	Direct contact	Onsite/humans	Incidental ingestion/ inhalation	Yes
ırface Water WEA)	No	NA	NA	NA	No
ediment WEA)	Yes[c]	Direct contact	Site/humans	Dermal contact/ incidental ingestion	Yes
Aquatic Life WEA)	No	NA	NA	NA	No
Air	No	NA	NA	NA	No

The potential source is the near-surface contamination confirmed at the Eastern Excavated Area.

Western Excavated Area.

The principal source appears to be runoff from the Eastern Excavated Area.

Table 7

Calculation of Most Probable and Worst Case

Upper Bound Total Incremental Risk from Potential Carcinogens

Current and Future Use - Sediment

Operative Pathway	Applicable Indicator Chemical	Current Use Chemical-Specific Risk Most Probable	Current Use Chemical-Specific Risk Worst Case	Future Use Chemical-Specific Risk Most Probable	Future Use Chemical-Specific Risk Worst Case
Sediment	Benzene	3.07 E-13	1.65 E-11	3.31 E-12	1.07 E-09
	Chloroform	9.94 E-13	4.22 E-11	2.45 E-11	1.96 E-09
	Tetrachloroethene	2.09 E-12	7.60 E-11	9.08 E-12	6.99 E-09
	Bis(2-ethylhexyl) phthalate	7.56 E-12	1.76 E-10	3.28 E-11	1.62 E-08
	TOTAL RISK	1.10 E-11	3.11 E-10	6.97 E-11	2.63 E-08

Table 8

Summary of Most Probable and Worst Case
Upper Bound Total Incremental Risk from Potential Carcinogens
Current and Future Use - Soil

Operative Pathway	Applicable Indicator Chemical	Current Use Chemical-Specific Risk Most Probable	Current Use Chemical-Specific Risk Worst Case	Future Use Chemical-Specific Risk Most Probable	Future Use Chemical-Specific Risk Worst Case
Soil	Cadmium	--a	--a	3.15 E-09	9.03 E-07
	Mercury	--a	--a	--b	--b
	Total Future Use Site Risks Resulting from Exposure to Soil:			3.15 E-09	9.03 E-07

a) No carcinogenic risks, because inorganic cadmium and mercury compounds are not carcinogenic by the oral exposure route.

b) No carcinogenic risks, because mercury is not carcinogenic via the inhalation exposure route.

nor mercury pose carcinogenic risks under the current-use soil exposure scenario. Carcinogenic risks under the future-use scenario are at acceptable levels, and remediation of soils in the Western Excavated Area of the Site is not warranted.

Groundwater Exposure Pathway

Table 9 summarizes the most probable and worst case risks for exposure to groundwater under the future-use scenario. The following are the most probable and worst case carcinogenic risks for the middle sand, lower sand and bedrock units summarized from that table.

Water Bearing Unit	Most Probable Potential Risk	Worst Case Potential Risk
Middle Sand	1.48×10^{-2}	2.51×10^{-2}
Lower Sand	3.66×10^{-5}	9.20×10^{-5}
Bedrock	2.99×10^{-6}	3.79×10^{-6}

The upper limit of the target risk range is exceeded for the middle sand unit only. For this unit, for both the most-probable and worst-case scenarios, the principal chemicals driving the risk are: chloroform; 1,1-dichloroethene; tetrachloroethene; trichloroethene; and vinyl chloride. These chemicals were detected in the middle sand unit only at well DMW-07, located in the Eastern Excavated Area. Vinyl chloride, for which a single concentration of 6 ppb was detected, was observed in well D&M-03 in 1987. However, a more recent analysis (1988) of well D&M-03 did not detect vinyl chloride. Therefore, the area of the MSGS Site where the middle sand unit poses human health risks is in the vicinity of well DMW-07. This is consistent with the documented contaminant source in the upper sand unit in the area, and the flow of ground water into the middle sand unit.

Table 10 summarizes the hazard index calculated under both most-probable and worst-case conditions for exposure to groundwater under the future-use scenario. The hazard index is the ratio of the estimated dose received by exposed individuals to the reference dose. The reference dose is a chronic dose believed to be without effect in human populations. Thus, a hazard index of less than 1.0 (estimated dose is less than reference dose) suggests that harmful effects are unlikely; a hazard index greater than 1.0 suggests that safety is no longer certain.

Table 9

Summary of Most Probable Upper Bound and Worst Case
Total Incremental Risk from Potential Carcinogens
Future Use - Groundwater*

Case Aquifer/Chemical Specific Risk	Most Probable Chemical-Specific Risk**	Worst Chemical-
Middle sand unit		
Chloroform	1.16E-04	2.53E-04
1,1-Dichloroethene	1.40E-02	2.39E-02
Tetrachloroethene	2.25E-05	2.84E-05
Trichloroethene	2.12E-05	3.46E-05
Vinyl chloride	6.01E-04	9.15E-04
TOTAL AQUIFER RISK	**1.48E-02**	**2.51E-02**
Lower Sand Unit		
Benzene	1.16E-05	2.49E-05
Chloroform	2.04E-05	6.15E-05
1,4-Dioxane	4.60E-06	5.55E-06
TOTAL AQUIFER RISK	**3.66E-05**	**9.20E-05**
Bedrock		
Tetrachloroethene	2.99E-06	3.79E-06
TOTAL AQUIFER RISK	**2.99E-06**	**3.79E-06**

*Includes oral, dermal and inhalation exposures
**Means calculated as average of the detected concentration

Table 10

Summary of Noncarcinogenic
Chronic Hazard Index
Future Use - Groundwater

Aquifer/Chemical	Most Probable Scenario		Worst Case Scenario	
	Oral and Dermal	Inhalation	Oral and Dermal	Inhalation
Middle Sand Unit				
Chloroform	6.13E-02		1.30E-01	
1,1-Dichloroethane	2.03E-02	2.64E-02	1.29E-02	4.95E-02
1,1-Dichloroethene	6.50E-01		7.83E-01	
1,2-Dichloroethene(a)				
Tetrachloroethene	4.03E-02		4.85E-02	
Toluene	6.53E-03	1.24E-03	8.80E-03	4.10E-03
1,1,1-Trichloroethane	2.26E-01	1.01E-01	3.06E-01	3.73E-01
Trichloroethene(a)				
Vinyl chloride(a)				
Di-n-butyl phthalate	4.24E-03		6.27E-03	
L d	1.64E-01		5.45E-01	
S of Hazard Indices	1.17E+00	1.29E-01	1.85E+00	4.27E-01
Lower Sand Unit				
Benzene(a)				
Chloroform	1.62E-02		3.17E-02	
1,4-Dioxane(a)				
Toluene	4.47E-03	1.33E-03	2.58E-02	1.20E-02
Lead	2.31E-01		5.45E-01	
Sum of Hazard Indices	2.52E-01	1.33E-03	6.03E-01	1.20E-02
Bedrock				
Carbon disulfide	6.58E-04		1.29E-03	
1,1-Dichloroethane	1.78E-03	2.32E-03	2.15E-03	4.35E-03
Tetrachloroethene	5.36E-03		6.46E-03	
Toluene	7.07E-03	2.11E-03	2.58E-02	1.20E-02
Di-n-butlyl phthalate	1.82E-03		2.70E-03	
Phenol	5.30E-03	1.93E-04	8.08E-03	3.75E-02
Lead	1.70E-01		6.32E-01	
Sum of Hazard Indices	1.92E-01	4.62E-03	6.78E-01	5.38E-02

(a) Chemical for which non carcinogenic AIC data are unavailable in the Superfund Public Health Evaluation Database.

The following are the most probable and worst case hazard indices for the middle sand, lower sand, and bedrock units summarized from Table 10.

Water Bearing Unit	Most Probable Hazard Index	Worst Case Hazard Index
Middle Sand	1.3	2.28
Lower Sand	0.25	0.62
Bedrock	0.20	0.72

Each of these hazard indices are the sum of the hazard indices developed for the oral, dermal and inhalation exposure routes.

The hazard index exceeds 1.0 for the middle sand unit under both the most probable and worst case scenarios. This finding is consistent with the findings of the carcinogenic risk evaluation, which indicated that unacceptable health risks may be posed by the middle sand unit.

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

7.0 DESCRIPTION OF ALTERNATIVES

The following section describes remedial action alternatives that were evaluated for this operable unit in accordance with the NCP (See 40 C.F.R. § 300.430, 55 Fed. Reg. 8846, March 8, 1990). It is important to remember that the scope of Operable Unit Two included analysis of groundwater contamination in the lower aquifers (i.e., middle sand, lower sand and bedrock units) and evaluation of contaminant sources in the Western Excavated Area. Since the remedial investigation concluded that there was no evidence of waste disposal in the Western Excavated Area, the following alternatives deal only with remediation of groundwater in the lower aquifers. Remedial alternatives for surface water and groundwater in the upper sand unit were evaluated in the Phase I Remedial Investigation/ Feasibility Study. Soils and sediments, primarily associated with the Eastern Excavated Area, will be addressed in a future focused Feasibility Study (Operable Unit Three).

In developing and evaluating remedial alternatives for the lower aquifers, it is important to keep the overall problems

associated with this Site in perspective. As summarized in the Phase I Record of Decision, the soil and groundwater in the upper sand unit in the Eastern Excavated Area of the Site are highly contaminated with a variety of organic and inorganic compounds. The soil and groundwater in this area will continue to act as a source of contamination until it is removed or controlled. The threat posed by this contamination is that it will migrate down into the lower aquifers, and eventually offsite. This would present an unacceptable risk to individuals using this groundwater. Residents downgradient from the Site currently use the middle sand and lower sand units as a water supply source.

Since it is impossible to predict with any certainty the time required to reduce contamination in the upper sand unit to acceptable levels, the alternatives developed to deal with contamination in the lower aquifers focus on ways to monitor and react to contamination over an extended period of time.

A total of six alternatives were evaluated to deal with current and potential future contamination in the lower aquifers. They are summarized as follows:

7.1 ALTERNATIVE 1 - NO ACTION

The reason for evaluating a no action alternative is to provide a basis for comparison of existing conditions with other proposed remedial alternatives.

Since no remedial measures would be taken under this alternative, risk to the environment and public health would only be influenced by the present hydrology and geology and the implementation of the Phase I ROD. With groundwater treatment instituted under the Phase I remedy, the concentrations of compounds in leachate generated from the upper sand unit should decrease. Compounds already in the upper and middle sand units could continue to migrate and leach/seep into the middle and lower sand units until the upper sand unit is remediated. Thus, with the passage of time, the risk associated with the lower water bearing units at the Site may increase before decreasing.

Contaminants have been detected in the middle sand unit above acceptable levels. The no action alternative would not provide for the reduction of pollutant levels in the onsite groundwater. This would result in violation of the Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs) established under the Safe Drinking Water Act (40 C.F.R. Parts 141 and 143). Further, no action would allow the continued migration of onsite contamination into deeper portions of the aquifers and eventually offsite. This would allow additional human exposure to contaminants associated with this Site. The no action alternative would result in no direct capital or operation and maintenance (O&M) expenditures.

7.2 ALTERNATIVE 2 - ONSITE GROUNDWATER MONITORING

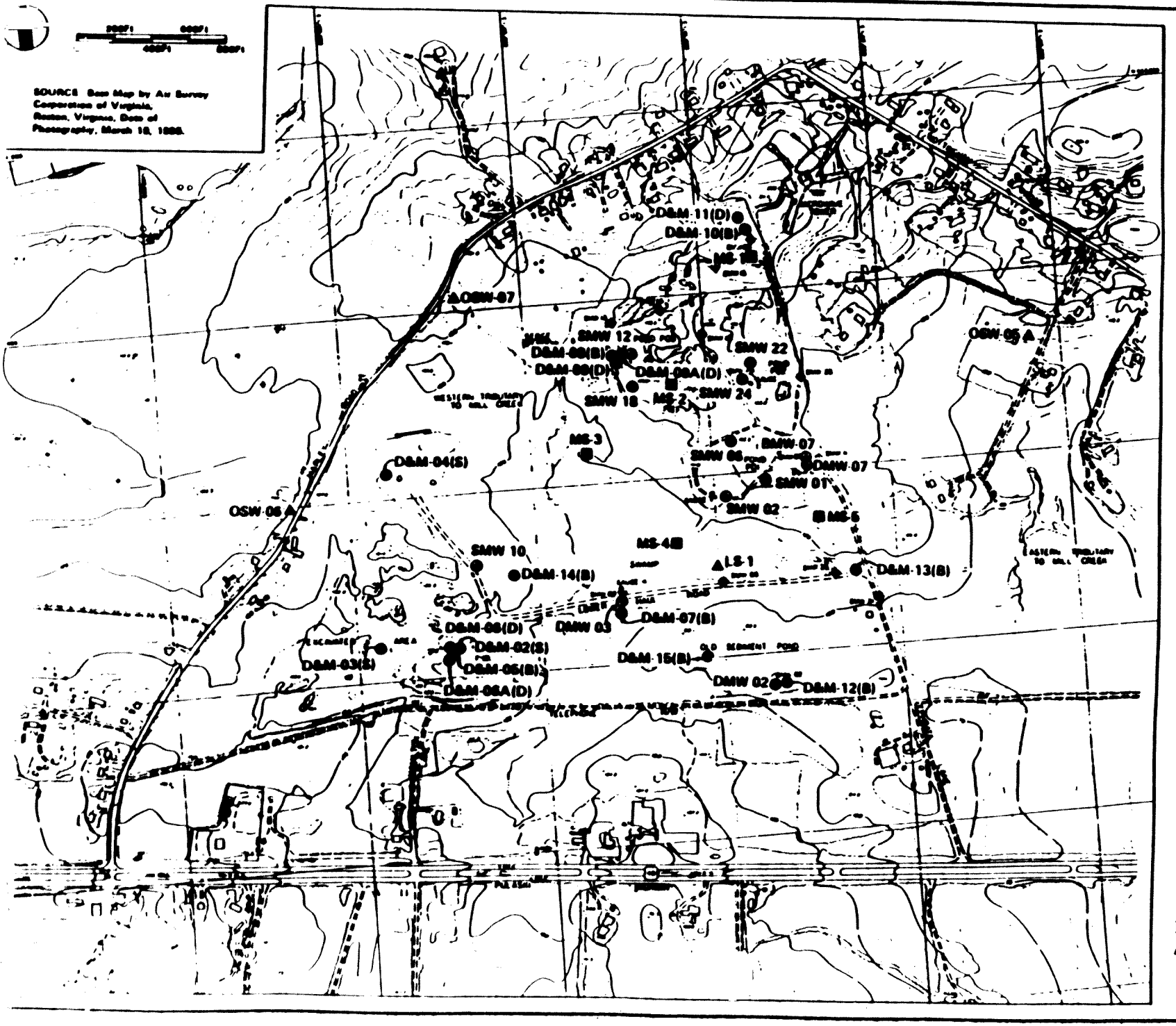
Alternative 2 consists of onsite groundwater monitoring. Wells to be monitored include six new wells and eleven existing wells (refer to Figure 6). These wells are located upgradient and downgradient of the area where wastes were disposed and provide for monitoring of the middle sand, lower sand and bedrock units. No monitoring in the upper sand unit is provided since it will be closely monitored during implementation of the Phase I ROD.

Quarterly samples would be taken from the middle and lower sand unit wells and analyzed for Target Compound List (TCL) volatiles. These wells would be sampled annually for Target Analyte List (TAL) metals. Bedrock wells would be sampled annually and tested for volatile organic compounds (VOCs) and metals. The sampling program would continue until two years after start up of the Phase I treatment system (currently projected for mid-1993), or approximately four years of monitoring. At that time, VOC sampling of the middle and lower sand units would be reduced to semiannually, until a total of five years has elapsed and the monitoring program is reevaluated. If further monitoring beyond the five years is deemed necessary, or if expansion of the program is warranted based on monitoring results, revisions to the monitoring program will be developed and implemented.

This alternative, as with no action, would not result in compliance with Federal ARARs (MCL's and non-zero MCLGs) associated with drinking water. Concentrations of contaminants in excess of established MCLs have been documented onsite in the middle sand unit. Monitoring alone would do nothing to reduce contaminant levels, although it would provide a means to measure the changes in groundwater conditions due to attenuation, dilution, or the Phase I treatment system.

Federal Resource Conservation and Recovery Act (RCRA) requirements contained in 40 C.F.R. § 264.90-264.101 pertaining to groundwater monitoring were determined to be relevant and appropriate, and would be complied with during the implementation of this alternative. In addition, Maryland's well construction requirements (MD. Code Ann.§ 26.04.04)) and OSHA requirements for workers at remedial action sites 29 C.F.R. Part 1910 would be achieved.

Capital costs for this alternative are estimated to be $114,000 with annual O&M costs of approximately $92,400. The net present worth of this alternative at a discount rate of 10% for 30 years is $614,000.



LEGEND:

- Well installed during Phase II
  - (S) Shallow well
  - (D) Deep well
  - (B) Bedrock well
- Well installed during Phase I
  - SMW Shallow well
  - DMW Deep well
  - BMW Bedrock well
- Offsite Well (OSW)
- New Monitoring Well in Middle Sand
- New Monitoring Well in Lower Sand (LS)

WELLS TO BE MONITORED

Middle Sand:
MS-1, MS-2, MS-3, MS-4, MS-5, DMW-07, SMW-03, SMW-08, SMW-10, SMW-25

Lower Sand:
LS-1, DMW-03, D&M-08A, D&M-11

Bedrock:
D&M-05, D&M-10, D&M-12

Figure 6
APPROXIMATE LOCATION OF ONSITE MONITORING WELLS (ALTERNATIVES 2, 3, AND 4)

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7.3 ALTERNATIVE 3 - ONSITE AND OFFSITE GROUNDWATER MONITORING

Alternative 3 consists of onsite and offsite groundwater monitoring. The onsite monitoring portion of this alternative is identical in scope to the onsite monitoring program described for Alternative 2. The offsite monitoring program would encompass four wells serving both residential and commercial users.

The proposed offsite monitoring well locations are shown on Figure 7. The wells were selected to maximize the likelihood of detection of contamination from the Site. Most of the locations are south of the Site, in the direction of groundwater flow. A large volume groundwater user is included in the monitoring plan to account for the possibility that contamination might preferentially be drawn to this location. Access and permission to sample will have to be obtained for each well from the property owner prior to sampling.

Offsite monitoring would be conducted on an annual basis, with samples being analyzed for TCL VOC's and TAL metals. As with the onsite program, the monitoring schedule and number of offsite wells monitored may be expanded as necessary to provide information on plume migration. The scope of the monitoring program would be reviewed at least every five years, in compliance with Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), and continued as necessary.

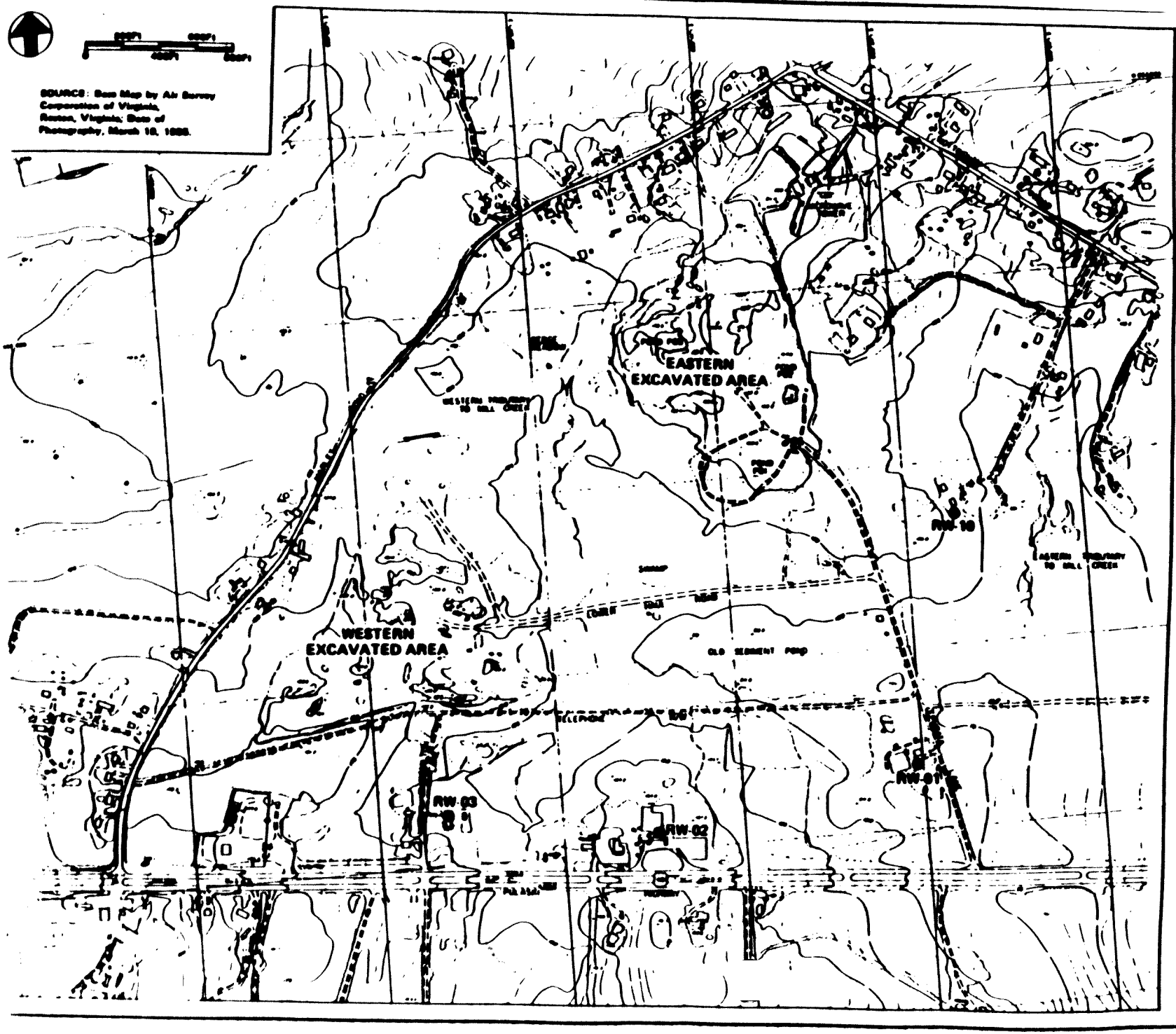
This alternative would not result in compliance with Federal ARARs (MCLs and non-zero MCLGs) associated with drinking water. Monitoring alone would do nothing to reduce contaminant levels although it would provide information about the condition of groundwater both on and off-site.

Federal RCRA requirements contained in 40 C.F.R. § 264.90-264.101 pertaining to groundwater monitoring were determined to be relevant and appropriate, and would be complied with during the implementation of this alternative. In addition, Maryland's well construction requirements (MD Code Ann. § 26.04.04) and OSHA requirements for workers at remedial action sites (29 C.F.R. Part 1910) would be followed.

This alternative consists of monitoring 17 onsite and four offsite wells chosen to provide representative samples from the middle sand, lower sand, and bedrock units. Capital costs for the alternative are estimated to be $114,000 with annual O&M costs of approximately $101,800. The net present worth of this alternative at a discount rate of 10% for 30 years is $702,400.

7.4 ALTERNATIVE 4 - ONSITE AND OFFSITE GROUNDWATER MONITORING WITH DEFERRED OFFSITE TREATMENT

Alternative 4 involves the use of onsite and offsite monitoring as described for Alternatives 2 and 3. In addition, if indicated by offsite monitoring data, offsite point-of-use



KEY:

- ● Offsite Monitoring Well; for Description See Table 3-1.

Figure 7
LOCATION OF OFFSITE MONITORING WELLS

treatment would be implemented. For offsite wells, detection of any of the contaminants of concern during a particular monitoring period would require immediate resampling of the affected well. Concurrently, bottled water for drinking purposes would be made available to the affected residence or business. As noted under Alternative 3, the scope of the monitoring program would be evaluated and adjusted as necessary in order to provide information on plume migration.

Action levels that would "trigger" the implementation of offsite groundwater treatment include MCLs for those contaminants for which these criteria exist, a cumulative carcinogenic risk in excess of 10^{-4} or a hazard index greater than 1.0. The cumulative risk and hazard index estimates shall include all detected contaminants. The existence of any of the above three conditions would trigger treatment.

If any of the contaminants of concern are detected at levels above these action levels following confirmation sampling employing statistical analysis, then point-of-use treatment systems would be installed at the affected wells. The type of system would depend on the analytes found during monitoring. Highly soluble organics not amenable to granular activated carbon adsorption would require a small scale point-of-use air stripper. If other organics are confirmed, an activated carbon unit would be utilized either with or without the air stripper. An ion-exchange system would be provided for metals removal. The ion exchange system may be used in series with the granular activated carbon filter and/or the air stripper. The exact nature and configuration of the point-of-use treatment systems would be based on the contaminants found in a particular well. These systems would be maintained in proper working order (e.g., replacement of carbon filters) throughout their useful life.

This alternative would result in compliance with the MCLs and the non-zero MCLGs established under the Safe Drinking Water Act at the point of use. If offsite detection of analytes were limited to a small area, this alternative would be protective of groundwater users in that area without requiring construction of a complete large-scale treatment system.

The overall objective of the point-of-use treatment systems would be to reduce the concentration of contaminants to acceptable levels (i.e., 10^{-6} carcinogenic risk and a Hazard Index ≤ 1.0). In addition, the point-of-use treatment systems would result in compliance with MCLs and non-zero MCLGs established under the Safe Drinking Water Act.

In addition to the ARARs identified under Alternative 3 pertaining to the monitoring aspects of this alternative, the following requirements pertaining to the treatment aspect of this alternative would be achieved.

The State of Maryland's requirements pertaining to air pollution control would be complied with during the implementation of this alternative. Also, any waste product (e.g., spent residential carbon filter cartridges) determined to be hazardous would be transported in accordance with Department of Transportation regulations, 49 C.F.R. Part 107 and 49 C.F.R. § 171.1 through 172.558, and disposed of in accordance with the waste disposal requirements of 40 C.F.R. Part 261, including the land disposal restrictions, 40 C.F.R. Part 268.

Costs for this alternative would vary, depending upon the number and type of point-of-use treatment systems installed. A range of costs have been developed based on best-case (no treatment units necessary) and worst-case (all three treatment technologies required for all residences and businesses within the affected area during the first year). It is important to note that these costs are order-of-magnitude estimates and are to be used for comparison purposes only. Actual costs may differ due to development in the area or a larger affected population.

The costs for the best-case situation would be the same as those identified for the onsite and offsite groundwater monitoring alternative (Alternative 3). These costs consist of capital costs amounting to $114,000 and annual O&M costs of $101,800, that result in an estimated net present worth of $702,400.

The worst-case estimate is based on the installation of point-of-use water treatment systems in 25 residences and three businesses. This case would have capital costs of $556,400, O&M costs of $167,000 per year, and a net present worth of $1,763,700. Monitoring for all units would continue on an annual basis for 30 years. As with the previous alternatives, the scope and schedule for monitoring would be reevaluated at least every 5 years in accordance with Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), and continue as necessary.

7.5 ALTERNATIVE 5 - ONSITE GROUNDWATER MONITORING WITH DEFERRED ONSITE TREATMENT

Alternative 5 involves the onsite groundwater monitoring program described in Alternative 2 coupled with onsite pumping and treatment of contaminated groundwater. The action levels that which would "trigger" the implementation of onsite groundwater treatment are, as described previously, MCLs, a cumulative carcinogenic risk of 10^{-4} or a hazard index greater than 1.0. If groundwater treatment is determined to be required, it would involve use of the Phase I treatment system. The decision process for implementing onsite groundwater treatment is shown in the lower portion of Figure 8.

Implementation of this alternative must be coordinated with the Phase I remedy. It is important to remember that the contaminated soil and groundwater in the upper sand aquifer in

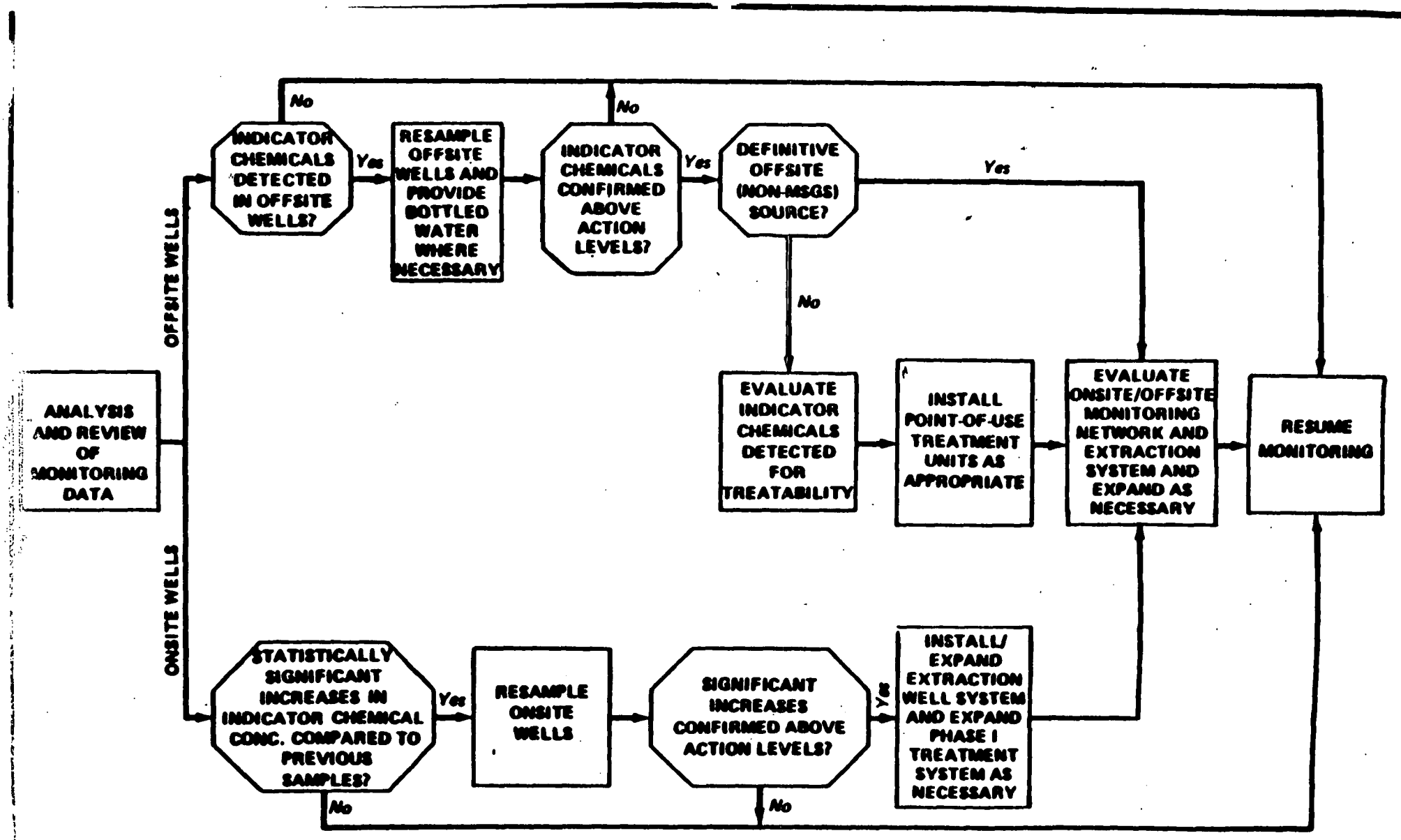


FIGURE 8

DECISION PROCESS FOR IMPLEMENTING ONSITE AND/OR OFFSITE WATER TREATMENT
(ALTERNATIVES 5 AND 6)

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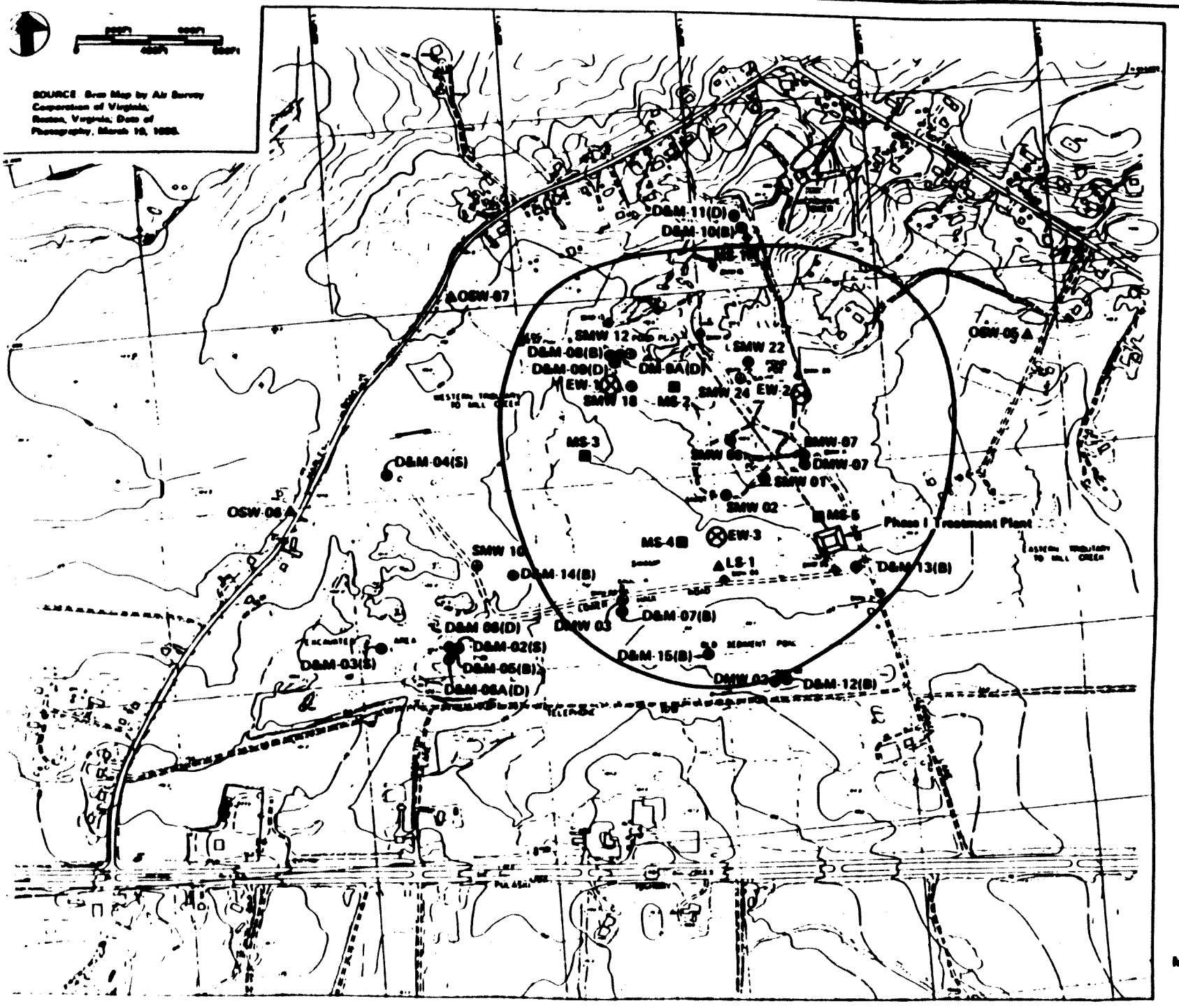
the Eastern Excavated Area will continue to act as a source of contamination until it is removed or controlled. Thus the groundwater treatment portion of this alternative could have negative impacts on the groundwater quality within the lower aquifers if it were implemented without regard to contaminant sources in the upper sand unit. Lowering of the hydraulic head by pumping from the middle sand unit could accelerate the rate of downward migration of contamination from near-surface groundwater.

Information concerning the design and performance of the Phase I groundwater treatment system must be taken into account during the design and implementation of this alternative. For example, information concerning the effect which Phase I treatment in the upper sand unit has on groundwater quality in the underlying middle sand, lower sand and bedrock units would affect the design of this system. Also, the method of disposal (gravity outfall line to discharge point south of the Old Sedimentation Pond or discharge into the on-site ponds) of treated effluent from the Phase I treatment system may reduce or increase recharge to the unconfined portion of the middle sand unit along the western tributary of Mill Creek and in the Sedge Meadow Area. This would impact design alternatives for extracting groundwater from the units underlying the upper sand unit.

The proposed groundwater collection system associated with this alternative provides for the installation of three extraction wells. The tentative location of these extraction wells is shown on Figure 9. The proposed location of these wells coincide with the three seep areas that have been identified as the most likely path for migration of contaminants from the upper to the middle sand unit. The actual number and location of the extraction wells will be determined during design.

Initially, these extraction wells would be pumped at a rate only large enough to prevent contaminant migration through the middle sand unit away from the seep areas. This would be done in an effort to contain contamination to a discrete on-site area. Full-scale remediation of the lower water bearing units (e.g., pumping these wells at higher rates) would be delayed until the Phase I remedial system in the upper sand unit has operated long enough to reduce the potential for further contaminant migration. The initial production rate from the three middle sand extraction wells is estimated at approximately 10 gallons per minute. This rate will depend on local conditions at the well locations.

The on-site Phase I (upper sand) treatment facility would be expanded and modified as necessary to treat the groundwater from the lower water bearing units. It is expected that if contamination is confirmed in the lower water bearing unit it will likely contain the same type of contaminants found in the upper sand unit. Thus, expansion of the Phase I treatment system will provide an efficient means of providing treatment for this groundwater.



LEGEND:

- ● Well installed during Phase II
  - (S) Shallow well
  - (D) Deep well
  - (B) Bedrock well
- ● Well installed during Phase I
  - SMW Shallow well
  - DMW Deep well
  - BMW Bedrock well
- ▲ Offsite well (OSW)
- — — Piping
- ⊗ Extraction Well (EW)
- ■ New Monitoring Well in Middle Sand (MS)
- ▲ New Monitoring Well in Lower Sand (LS)
- —— Estimated Extent of Groundwater Capture Area of Extraction Wells From Model

See Figure 3-1 for list of wells to be monitored.

Figure 9
APPROXIMATE LOCATION OF ONSITE MONITORING AND EXTRACTION WELLS (ALTERNATIVES 5 AND 6)

The scale-up of the Phase I system to accommodate the increase in flow should not affect the overall technical feasibility of the system. The flow increase would be approximately 10 gallons per minute or 14,400 gallons per day. This will result in the approximate doubling of the capacity of the Phase I treatment system.

As noted in the September 30, 1985, ROD for Operable Unit One, the objective of the Phase I (and now the Phase II) treatment system is to reduce organic compound and heavy metal concentrations in the groundwater to an acceptable risk level (10^{-6}) or meet standards determined by the Agency.

In addition, an objective of the Phase II treatment system is to reduce the non-carcinogenic risk associated with potential exposure to groundwater in the lower aquifers to acceptable levels (i.e., Hazard Index ≤ 1).

The remedial action objectives for this alternative include achievement of MCLs and non-zero MCLGs at the point of compliance. The "point of compliance," or point at which compliance with the remedial action objectives will be measured, will include all wells placed in the plume of contamination. The time required to achieve the remedial action objectives cannot be determined with any accuracy, and was not estimated.

As discussed under Alternative 2, federal requirements pertaining to groundwater monitoring, state well construction requirements and OSHA requirements for workers at remedial action sites would be complied with during the implementation of this alternative.

In addition, the following requirements pertaining to the treatment aspects of this alternative have been determined to be applicable or relevant and appropriate and would be complied with during remedy implementation. The provisions of the National Pollutant Discharge Elimination System 40 C.F.R. Parts 122-124, and the State of Maryland's requirements pertaining to direct discharges, MD Code Ann. § 26.08.01 through 26.08.04, would be applicable to the discharge of treated groundwater.

Effluent limitations would be based upon state water quality standards and federal ambient water quality criteria. The state water quality standards would be used for those compounds specifically addressed by the standards. Ambient water quality criteria would be used to develop effluent limitations for compounds not specifically addressed by the standards. Discharges of treated effluent would be to a tributary of Elk Creek which is designated as a freshwater stream. The designated uses of Elk Creek and its tributaries include water contact recreation, protection of aquatic life and public water supply. Therefore, the water quality criteria for water and fish

ingestion and both acute and chronic aquatic impacts would be relevant and appropriate criteria to be used in the development of discharge limitations.

The treatment facility would comply with the State of Maryland's requirements pertaining to tank standards and generators of hazardous waste (MD. Code Ann. § 26.13.05.06 and 26.13.03).

Air releases resulting from onsite treatment would be in compliance with the applicable provisions of Maryland's requirements pertaining to toxic air pollutants (MD Code Ann. § 26.11.15). In addition, the State's requirements pertaining to testing, recordkeeping, odors and permits associated with the air pollution control aspects of this alternative have been determined to be relevant and appropriate. Citations to the particular provisions of these requirements are summarized in Table 7 which is located in Section 7.6 of this ROD. Since the Site is located in an attainment area, the provisions of the above state requirements were determined to be applicable or relevant and appropriate rather than those contained in OSWER Directive 9355.0-25, entitled, "Control of Air Emissions from Superfund Air Strippers at Superfund Groundwater Sites."

Waste products (e.g., sludge, spent carbon) resulting from the treatment of groundwater would be managed in accordance with the applicable provisions of RCRA at 40 C.F.R. Part 261, including land disposal restrictions at 40 C.F.R. Part 268. Listed hazardous wastes were disposed of at this site, and these constituents are now "contained in" the groundwater being treated. Thus the cited requirements are applicable because they relate to the treatment and disposal of wastes containing hazardous wastes.

Transportation of waste materials offsite would be carried out in compliance with the applicable provisions of U.S. DOT regulations, 49 C.F.R. Part 107 and 49 C.F.R. § 171.1 through 172.558.

EPA's policy set forth in 40 C.F.R. Part 6, Subpart A, pertaining to the protection of wetlands would also be applicable to the groundwater treatment aspects of this alternative, but only in the event that groundwater extraction actually results in an adverse effect on wetlands. In such case, actions to minimize the adverse effect or recreate lost wetlands would be taken.

Costs for the first phase of this alternative would be identical to those developed for Alternative 2-Onsite Groundwater Monitoring. This monitoring would have a capital cost of $114,000, an annual O&M cost of $92,400, and a net present worth of $614,100.

Costs for treatment were based on the change in flow capacity that would be required for the Phase I treatment system

to accommodate groundwater extracted from the middle sand unit. The Phase I system would require approximately twice the current design capacity. The cost of this increase has been estimated as 50 percent of the capital and O&M costs presented in the Phase I FS. The total worst-case cost of this alternative, assuming both onsite monitoring and treatment, would involve a capital cost of $1,151,100, annual O&M costs of $550,900, resulting in a net present worth of $6,063,400.

7.6 Alternative 6 - ONSITE AND OFFSITE GROUNDWATER MONITORING WITH DEFERRED ONSITE AND OFFSITE TREATMENT

Alternative 6 involves the use of onsite and offsite monitoring as described in Alternatives 2 and 3. In addition, if indicated by monitoring data, onsite and/or offsite point-of-use treatment would be provided. Immediate onsite treatment for containment purposes (if necessary) would involve pumping and treatment of groundwater from the middle sand unit using wells located in the seeps, as described in Alternative 5. If further onsite treatment is deemed necessary, a more extensive extraction system would be designed. Offsite treatment (if necessary) would involve point-of-use treatment systems and the decision mechanism discussed under Alternative 4.

The decision process for implementing onsite and/or offsite point-of-use water treatment is shown on Figure 8. An initial decision to install either onsite or offsite point-of-use water treatment would be based on the results of a statistical analysis of the respective monitoring information. Detection and confirmation of indicator chemicals at statistically significant concentrations above action levels in offsite wells would result in installation of appropriate point-of-use treatment units at the affected locations. Action levels that "trigger" the implementation of onsite and/or offsite groundwater treatment include MCLs for those contaminants for which these criteria exist, a cumulative carcinogenic risk in excess of 10^{-4}, or a hazard index greater than 1.0. The cumulative risk and hazard index estimates shall include all detected contaminants. The existence of any of the above three conditions would trigger treatment.

The network of onsite and offsite monitoring wells would be evaluated for possible expansion in view of the location and water-bearing unit of the affected well(s) and the concentration(s) of indicator chemicals detected. Changes would be made to the network (as necessary) prior to the resumption of monitoring. In addition, both monitoring networks would be reevaluated especially in terms of scope and schedule every five years, in accordance with Section 121(c) of CERCLA, 42 U.S.C. § 9621(c).

Federal and State ARARs and remedial action objectives associated with the various components of this alternative have been discussed previously under Alternatives 4 and 5, and are summarized in Table 11.

Costs for this alternative would vary depending upon whether onsite and offsite treatment are found to be necessary, and the extent to which treatment must be provided at either of these locations. A range of costs has been developed based on best-case (no treatment units necessary) and three worst-case (onsite treatment, offsite treatment, or both) situations.

The costs for the best-case situation would be the same as those developed for the onsite and offsite groundwater monitoring alternative (Alternative 3).

The cost estimate for implementation of offsite treatment on a worst-case basis is based on a maximum of 25 residences and three businesses requiring point-of-use treatment. Costs for this situation are the same as those developed for Alternative 4.

Costs for onsite treatment for containment purposes have been estimated from a scale-up of the Phase I treatment system as discussed under Alternative 5. The costs for this scenario are based on containment in the middle sand unit. If a more extensive groundwater extraction system, or pumping of the lower sand or bedrock aquifers is determined to be necessary, additional costs would be incurred.

A final worst-case scenario would involve installation of both onsite and offsite treatment as described above. The costs associated with the various scenarios developed for this alternative are summarized below.

	Capital Cost	Annual O & M Cost	Net Present Worth
Onsite and Offsite Monitoring	$ 114,000	$101,800	$ 702,000
Offsite Treatment	442,300	65,600	1,062,000
Onsite Treatment	1,037,200	458,500	5,449,000
Both Onsite and Offsite Treatment with Monitoring	1,593,500	625,900	7,125,000

8.0 SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

The following nine criteria, as set forth in the NCP, 40 C.F.R. § 300.430(e), 55 Fed. Reg. 8848, March 8, 1990, were used in the evaluation of the remedial action alternatives for Operable Unit Two at the Maryland Sand, Gravel and Stone Site:

Threshold Criteria

1) Overall protection of human health and the environment; and

Table 11

Maryland Sand Gravel and Stone Site
Operable Unit 2
Summary of Major ARARs

Action - Specific ARARs

I) Hazardous Waste

Waste Disposal Requirements for Treatment Residues 40 C.F.R. Part 261, including land disposal restrictions 40 C.F.R. Part 268 [applicable]

Corrective action program requirements in 40 C.F.R. Subpart F, § 264.90-264.101 that address groundwater monitoring [relevant and appropriate]

State of Maryland requirements contained in MD Code Ann. § 26.13.05.10 regarding tank standards; § 26.13.05.06 governing the methodology of groundwater monitoring; and § 26.13.03 regarding generators [relevant and appropriate]

II) Water

National Pollutant Discharge Elimination System (NPDES) requirements contained in 40 C.F.R. Parts 122 through 124* [Applicable]

State of Maryland requirements contained in MD Code Ann. § 26.08.01 pertaining to general requirements associated with water pollution control, § 26.08.02 pertaining to water quality standards, § 26.08.03 pertaining to discharge limitations, and § 26.08.04 pertaining to discharge permits* [applicable]

III) Air

State of Maryland requirements contained in MD Code Ann. § 26.11.15 pertaining to toxic air pollutants* [applicable]

State of Maryland requirements contained in MD Code Ann. § 26.18.01, subsections .04 and .05 pertaining to testing, monitoring and records; § 26.11.06 subsections .08 and .09 pertaining to nuisances and odors; and § 26.18.02*, subsections .01 to .03 pertaining to permits and approvals [relevant and appropriate]

Table 11

(continued)

IV) OSHA

Occupational Safety and Health Administration (OSHA) requirements for workers at remedial action sites 29 C.F.R. Part 1910 [applicable]

V) Transportation

U.S. Department of Transportation (DOT) Regulations, 49 C.F.R. Part 107, and 40 C.F.R. § 171.1 through 172.558 [applicable]

VI) Well Construction

State of Maryland requirements contained in MD Code Ann. § 26.04.04 subsections .04 and .06 pertaining to application and issuance on well permits*; subsection .07 pertaining to construction standards; and subsection .11 pertaining to abandonment. [applicable]

Chemical-Specific ARARs

Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs) contained in 40 C.F.R. Parts 141 and 143 [relevant and appropriate]

Federal Ambient Water Quality Criteria [relevant and appropriate]

Location-Specific ARARs

Wetlands

EPA's policy set forth in 40 C.F.R. Part 6, Subpart A, for carrying out the provisions of Executive Order 11990 (Protection of Wetlands). [applicable]

* The substantive requirements of these sections will be complied with. However, in accordance with Section 121(e) of CERCLA, 42 U.S.C. § 9621(e), permits are not required for onsite activities.

	2)	Compliance with applicable or relevant and appropriate requirements.
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/support agency acceptance; and
	9)	Community acceptance.

A brief description of each of these criteria is provided in Table 12.

Of the six alternatives developed for this Operable Unit, three fail to satisfy the threshold criteria identified above. Alternative 1 (No Action), Alternative 2 (Onsite Groundwater Monitoring), and Alternative 3 (Onsite and Offsite Groundwater Monitoring) would not be protective of human health and the environment. These alternatives would do nothing to reduce contaminant levels that currently exceed MCLs in at least one well in the middle sand unit. These alternatives would not be considered protective of human health and the environment since they would allow the further migration of onsite contamination into deeper portions of the aquifer and eventually offsite. This would allow additional human exposure to contaminants associated with this Site.

Since Alternatives 1, 2, and 3 failed to satisfy the threshold criteria they will not be discussed further in this section. The remainder of the section will deal with the evaluation of Alternatives 4, 5 and 6 with respect to the nine evaluation criteria.

Overall Protection of Human Health and the Environment - Alternative 6 provides the best overall protection of human health and the environment. Alternative 6 (Onsite and Offsite Monitoring with Deferred Onsite and Offsite Treatment) offers advantages over Alternative 5 (Onsite Monitoring with Deferred Onsite Treatment). By providing for offsite monitoring and offsite treatment, Alternative 6 contains a mechanism for monitoring pollutant levels offsite and provides a means to treat contaminated groundwater that has moved offsite at the point of use.

Alternative 6 also offers advantages over Alternative 4 (Onsite and Offsite Monitoring with Deferred Offsite Treatment) by providing for the control of contaminants onsite. This

Table 12

NINE EVALUATION CRITERIA

Overall Protection of Human Health and the Environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

Compliance with ARARs addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes and/or provides grounds for invoking a waiver.

Long-Term Effectiveness and Permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been achieved.

Reduction of Toxicity, Mobility or Volume refers to the anticipated performance of the treatment technologies a remedy may employ.

Short-Term Effectiveness addresses the period of time needed to achieve protection, and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

Cost includes estimated capital, operation and maintenance, and net present worth costs.

State Acceptance indicates whether, based on its review of the RI/FS and Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.

Community Acceptance refers to the comments and/or concerns expressed by interested persons during the public comment period.

provides a mechanism for removing contaminants before they have an opportunity to move offsite and present risks to additional water users.

Compliance With ARARS - Alternative 6 will comply with all Federal and State ARARs associated with groundwater monitoring, and onsite and offsite treatment. These are summarized in Table 11. Alternative 5 will comply with Federal and State ARARs associated with onsite monitoring and onsite treatment, and Alternative 4 would comply with requirements pertaining to monitoring and offsite treatment.

Long-Term Effectiveness and Permanence - The long-term effectiveness of both the onsite and offsite treatment systems should remain high throughout their period of operation. By providing both on- and offsite treatment, Alternative 6 offers advantages over both Alternatives 4 and 5. Onsite treatment will provide for source control, while offsite treatment at affected wells will ensure that risks associated with contaminants which do migrate offsite are effectively controlled.

Alternative 5, while providing for onsite treatment, does not provide a mechanism that will address offsite contamination if it occurs. Although Alternative 4 does provide for offsite treatment, the overall effectiveness of this alternative is limited by not providing for onsite control/reduction of contaminants.

Reduction in Toxicity, Mobility or Volume - Alternative 6 provides the greatest reduction in the toxicity, mobility or volume of contaminants associated with this Site. The onsite treatment aspect of this alternative will likely have the greatest impact in reducing the mobility of the contaminants. Both the onsite and the offsite treatment systems will be effective in treating the groundwater, and thus reducing toxicity. Since Alternative 6 employs both on and offsite treatment, the degree of reduction in toxicity and/or mobility of contaminants would be greater than either Alternative 4 or Alternative 5.

Short-Term Effectiveness - Alternatives 4 and 6, which include provisions for offsite monitoring and point-of-use treatment, provide the highest degree of short-term effectiveness. The decision process for both these alternatives provides for supplying bottled water to affected well owners immediately after contamination from the Site has been detected. Since no contamination has as yet been detected in offsite wells, this provides for an expeditious means of reducing risks from contaminated groundwater.

Alternative 5, which provides for onsite treatment, would not provide adequate short-term effectiveness since years of pumping and treating contaminated groundwater may be required in order to reduce risks to acceptable levels.

Implementability - The groundwater monitoring aspects of all three alternatives would be carried out using proven technologies and widely practiced techniques.

Offsite treatment which would be provided under Alternatives 4 and 6 would be accomplished using components (i.e., air strippers, carbon adsorption, and ion exchange units) that have been used extensively in business and industry for a variety of water treatment needs. Thus, a system that is properly designed for the contaminants detected should function reliably over its expected useful life.

The design of the onsite treatment system, which would be provided under Alternatives 5 and 6, will be based on the results of treatability studies. Once again, a properly designed system should be capable of treating the groundwater in order to achieve the remedial action objectives established for this site.

As mentioned previously, the implementation of onsite groundwater treatment for this operable unit must be done in concert with the treatment provided under Operable Unit One. Otherwise, contaminants may be drawn into the middle sand unit from the more heavily contaminated upper sand unit.

Cost - The capital, annual operation and maintenance, and present worth costs for all six alternatives evaluated in the feasibility study are summarized in Table 13.

State Acceptance - The State of Maryland concurs with EPA's selection of Alternative 6 as described in Section 9.0 of this ROD.

Community Acceptance - Comments received during the public comment period concerning the various alternatives are summarized in the Responsiveness Summary which is a part of this ROD.

9.0 THE SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, the detailed evaluation of the alternatives, and public comments, EPA has determined, and the State of Maryland has concurred that Alternative 6 is the most appropriate remedy for the Site. Alternative 6 involves the use of an onsite and offsite monitoring program. In addition, if indicated by monitoring data, onsite treatment and/or offsite point-of-use treatment would be provided.

TABLE 13

Summary of Costs Associated with Remedial Alternatives

Maryland Sand, Gravel & Stone Site

Operable Unit Two

Alternative	Cost (thousands of dollars) Capital	O&M	NPW(a)
1-No Action	0	0	0
2-Onsite Groundwater Monitoring	114	92	614
3-Onsite and Offsite Groundwater Monitoring	114	102	702
4-Onsite and Offsite Groundwater Monitoring with Deferred Offsite Point-of-Use Treatment	114(d) 556(e)	102(d) 167(e)	702(d) 1,764(e)
5-Onsite Groundwater Monitoring with Deferred Onsite Groundwater Treatment	114(b) 1,151(c)	92(b) 551(c)	614(b) 6,063(c)
6-Onsite and Offsite Groundwater Monitoring with Deferred Offsite and Onsite Treatment	114(b) (d) 556(b) (e) 1,151(c) (d) 1,594(c) (e)	102(b) (d) 167(b) (e) 560(c) (d) 626(c) (e)	702(b) (d) 1,764(b) (e) 6,063(c) (d) 7,125(c) (e)

(a) Net present worth; evaluated at a 10% discount rate for 30 years
(b) If onsite treatment is not necessary
(c) If onsite treatment is necessary
(d) If offsite treatment is not necessary
(e) If offsite treatment is necessary

Based on comments received during the public comment period, EPA has modified the action level that would "trigger" the implementation of offsite treatment from that described in the Section 7.6. As explained in Section 11.0, EPA has determined that the action level for offsite treatment should include a criterion for requiring action based on 10^{-5} rather than 10^{-4} carcinogenic risk as described in Section 7.6.

Thus, action levels that would "trigger" the implementation of offsite treatment have been defined as MCLs for those contaminants for which these criteria exist, or a cumulative carcinogenic risk in excess of 10^{-5}, or a hazard index greater than 1.0.

Action levels that would "trigger" the implementation of onsite treatment have been defined as MCLs for those contaminants for which these criteria exist, or a cumulative carcinogenic risk in excess of 10^{-4}, or a hazard index greater than 1.0.

The cumulative risk and hazard index estimates shall include all detected contaminants. The confirmed existence of any of the above three conditions in either onsite or offsite wells would trigger treatment in that location.

For offsite wells, detection of any of the contaminants of concern during a particular monitoring period would require immediate resampling of the affected well. Concurrently, bottled water for drinking purposes would be made available to the affected residence or business.

Following initial detection of contaminants at concentrations in excess of either the onsite or offsite action levels, confirmation sampling would take place. This second round of sampling would employ statistical analysis to confirm the presence of contaminants at levels above the action levels. Once it is confirmed that the action level has been exceeded, a remedial action plan will be developed to provide treatment for the nature and extent of the confirmed contamination.

The objective of this alternative is to reduce the contaminant concentration in the lower aquifers, both on and offsite, to an acceptable risk level (i.e., carcinogenic risk 10^{-6} and Hazard Index $\leq$ 1.0). In addition, an objective of the selected alternative is the achievement of MCLs and non-zero MCLGs at the point of compliance. The point of compliance will be measured at all wells placed in the plume of contamination. The time required to achieve the remedial action objectives cannot be determined with any accuracy, and was not estimated. It will be influenced by a number of factors, including the effectiveness of the Phase I (upper sand) treatment system.

A more detailed description of the selected alternative is provided in Section 7.6. It should be recognized that the action levels for onsite and offsite treatment are those described in

this section as opposed to Section 7.6. It should also be recognized that minor changes to the selected alternative may be made during design (e.g., location or number of wells). These changes in general will reflect the usual modifications resulting from the engineering process.

10.0 STATUTORY DETERMINATIONS

EPA's primary responsibility at Superfund sites is to undertake 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 each site must comply with applicable or relevant and appropriate environmental standards established under federal and state environmental laws unless a statutory waiver is granted. The selected remedy also must be cost-effective and utilize treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that permanently and significantly reduce the volume, toxicity or mobility of hazardous wastes. The following sections discuss how the selected remedy for this Site meets these statutory requirements.

Protection of Human Health and the Environment - The selected remedy protects human health and the environment by controlling exposure to contaminated groundwater associated with the Site. Detection of constituents above the action levels in groundwater onsite would trigger implementation of onsite groundwater treatment. This will provide a mechanism for controlling the migration of contaminants, as well as reducing the level of contamination. If contamination is detected in residential wells offsite, point-of-use treatment systems will provide the means for controlling individual exposure to contaminated groundwater. Together, the onsite and offsite monitoring program, coupled with deferred onsite and/or offsite treatment, will be protective of human health and the environment. There are no significant short-term threats associated with the selected remedy. In addition, no adverse cross media impacts are expected from implementation of this remedy.

Attainment of Applicable or Relevant and Appropriate Requirements The selected remedy will attain all location, action and chemical-specific applicable or relevant and appropriate requirements for the Site. The major federal and state ARARs pertaining to the selected alternative are summarized in Table 11.

Cost Effectiveness - EPA believes and the State concurs that the selected remedy is cost effective in mitigating the risk posed by the contaminants associated with this operable unit. The staged approach to monitoring, and both on and offsite treatment,

represents a cost-effective approach to addressing current and future risks associated with this portion of the Site.

Utilization of Permanent Solutions Employing Alternative Technologies to the Maximum Extent Practicable - The selected remedy is the most appropriate solution for this operable unit and represents the maximum extent to which permanent solutions and treatment can be practicably utilized.

Preference for Treatment - This preference is satisfied since treatment is a principal element of the chosen alternative.

11.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The alternatives developed in the Feasibility Study (and as described in Section 7.0), were based on action levels which included a criterion of 10^{-4} for carcinogenic risk. The alternatives employed this criterion for both on and offsite wells.

When EPA issued the Proposed Plan to the public for comment, EPA proposed revising the carcinogenic risk criterion to 10^{-5} for both on-and offsite wells.

In response to comments received during the public comment period, EPA has modified the selected remedy from that described in the Proposed Plan. The selected remedy will employ a carcinogenic trigger criterion of 10^{-4} onsite, and 10^{-5} in offsite wells.

The onsite trigger mechanism has been revised to 10^{-4} in response to comments relating to the cost/benefit of providing onsite treatment based on 10^{-5} carcinogenic risk. Other considerations included the fact that there are no onsite users of groundwater, and that some degree of attenuation would be expected to occur as groundwater moves across the Site. EPA continues to believe, however, that the offsite trigger must remain at 10^{-5} to be protective of human health and the environment.

Maryland Sand Gravel & Stone
Responsiveness Summary

The following discussion summarizes the comments raised during the public comment period for the Proposed Plan for Operable Unit Two at the Maryland Sand, Gravel and Stone Site. This responsiveness summary is divided into two sections. The first section describes the comments received at the public meeting that was held to present the Proposed Plan. The second section summarizes the written comments received during the public comment period.

I) Public Meeting Comments

On June 5, 1990, EPA held a public information meeting to present the Agency's proposed remedial plan for Operable Unit Two at the Site. Approximately 45 people attended the meeting, which took place from 7:00 to 8:30 p.m. at the Cecil County Public Library. Attending the meeting were representatives from the community, local officials, businesses, news media, the Maryland Department of the Environment and EPA.

Representatives from EPA and the Maryland Department of the Environment made a presentation that addressed: the history of the Site, the current conditions at the Site, an explanation of the Superfund process, a description of the remedial alternatives that had been developed for Operable Unit Two, and EPA's proposed alternative for Operable Unit Two.

Following the presentation, there was a question and answer session. During this session, the majority of the questions were requests to clarify or explain in greater detail certain aspects of the conditions at the Site. For example, questions focused on identifying the nature and extent of contamination found at the Site, the rate at which groundwater moved under the Site, and other activities taking place on the Site (e.g., drum removal). Representatives from EPA and the Maryland Department of the Environment responded to each of these points.

One commentor suggested that it might be less costly to provide area residents with a centralized water system instead of cleaning up the contaminated groundwater. While EPA agrees that it may be less costly to provide a centralized water supply, this would do nothing about remedying the contamination that exists at the Site. EPA's preference for Alternative 6 was not based on cost alone, but on the nine evaluation criteria in the NCP, 55 Fed. Reg. 8848, March 8, 1990, to be codified at 40 C.F.R. § 300.430(e)(9)(iii).

II) Written Comments

This section of the responsiveness summary addresses the written comments received during the 60-day public comment period. Only one set of written comments was received during the comment period. The comments are described below.

By letter dated July 13, 1990, the Settling Parties under the Consent Decree for the Phase I Record of Decision ("Settling Parties") at the Site objected to EPA's revision to the risk based action level described in the Phase II Feasibility Study. The Settling Parties stated that the revisions to the risk based action level has raised other technical issues relating to how the action levels would be calculated, the method for determining when the action levels have been reached, and what actions will be taken if it is determined that the action levels have been reached. The Settling Parties identified numerous technical issues that they believe should be addressed by EPA before a response action is selected.

The Settling Parties expressed a concern that improperly installed monitoring wells may have caused contamination of the lower aquifers. They objected to several of the applicable or relevant and appropriate criteria (ARARs) that EPA identified during the development of the Feasibility Study. The Settling Parties also stated their belief that EPA's selection of Alternative 6 was arbitrary and capricious, and identified Alternative 5 as the preferred alternative for dealing with the conditions associated with Operable Unit Two.

The following discussion summarizes the main points raised by the Settling Parties in their July 13, 1990, letter and explains how EPA has responded, or will respond, to these concerns.

Revision to Risk Based Action Levels

The Settling Parties raised a number of issues relating to EPA's decision to revise the carcinogenic risk based action level that would require either onsite or offsite treatment from 10^{-4} to 10^{-5}. The Settling Parties' comments included a summary of some of the exchanges that went into the development of the risk based action level that was ultimately included in the Feasibility Study. This summary notes that there was significant disagreement throughout the development of the Feasibility Study as to the appropriate terms of the risk based action level (or "trigger mechanism").

Although EPA directed the Settling Parties to incorporate a 10^{-4} trigger mechanism into the Final Feasibility Study, EPA reconsidered its position with respect to the trigger mechanism, and on May 15, 1990, issued a Proposed Plan for Operable Unit Two that included a risk based action level for both onsite and offsite remediation of 10^{-5}. In their comments to the Proposed

Plan the Settling Parties objected to EPA's proposal to revise the risk based action levels for a variety of reasons. The Settling Parties' objections, and EPA's response to these objections are summarized below.

1) The Settling Parties argued that EPA's revision to the risk-based action level violated procedural requirements. The Settling Parties believe they should have been afforded the opportunity to exercise the dispute resolution provisions of the Consent Order under which they prepared the RI/FS for Operable Unit Two. They believed that EPA's failure to disapprove the Feasibility Study, which would have allowed them to invoke the dispute resolution provisions of the Order (assuming the Respondents did not agree to incorporate the revised trigger mechanism) violated the procedural requirements relating to the Consent Order.

   EPA Response - The Settling Parties had already raised this same point earlier and by letter dated May 30, 1990, EPA responded to the Settling Parties' request to invoke the dispute resolution provisions of the Order. In essence, the conditions under which dispute resolution could be invoked did not present themselves since EPA did not notify the Settling Parties of a deficiency in the Feasibility Study. EPA had no obligation to disapprove the Final Feasibility Study or to issue a notice of deficiency. Rather, in an effort to keep the project moving forward, EPA modified the trigger mechanism contained in the Feasibility Study, and incorporated the modified trigger in the Proposed Plan. As explained to the Settling Parties at a meeting on June 28, 1990, (during the public comment period) one of the primary functions of issuing a Proposed Plan is to solicit comments from all interested parties on all aspects of the proposed alternative. Thus, EPA has not violated any of the procedural requirements of the Order, and the Settling Parties have been afforded the required opportunity to comment on the revised risk based trigger mechanism.

2) The Settling Parties commented that EPA had acted in an arbitrary and capricious manner by identifying a risk-based action level of 10^{-5}, when language in the Proposed Plan stated "Remedial action is generally warranted at a site when the calculated carcinogenic risk level exceeds 10^{-4}".

   EPA Response - The statement that remedial action is generally warranted when carcinogenic risks exceeds 10^{-4} was included in the Proposed Plan as a means of identifying the upper limit of EPA's acceptable risk range. The National Oil and Hazardous Substances Contingency Plan (NCP), 55 Fed. Reg. 8848, March 8, 1990, to be codified at 40 C.F.R. § 300.430(e)(2)(i)(A)(2), identifies the acceptable exposure levels (risk range) as 10^{-4} to 10^{-6}. However, it also specifies that EPA shall use the lower end of this risk

range (i.e., 10^{-6}) as the "point of departure". Thus EPA's proposal to initiate remedial action that will reduce the threat to public health when the risks are below the upper end of the risk range (i.e., 10^{-4}) is entirely consistent with the NCP. EPA strongly believes its actions are consistent with CERCLA and the NCP and are not arbitrary and capricious.

3) The Settling Parties commented that the quantitation limits of several of the contaminants of concern at the Site support a 10^{-4} risk based action level. The Settling Parties have cited a memorandum dated July 26, 1989, from Roy L. Smith, Ph.D., an EPA toxicologist, which states in part:

> "To summarize our discussions last week on triggers, I agreed that using a combined 10^{-6} risk level as a trigger (as opposed to a clean-up goal) was too restrictive for this site. The reason for this is that two contaminants of concern, 1,1-DCE and vinyl chloride, are not detectable at the 10^{-6} level. To initiate offsite and onsite groundwater cleanup, a combined risk of 10^{-4} or hazard index of 1 is justifiable."

The Settling Parties' position is that EPA's own toxicologist has acknowledged that a remedial action trigger of 10^{-4} is justifiable, and that a trigger of 10^{-6} is not justifiable because certain contaminants of concern are not detectable at the 10^{-6} level.

EPA Response - As noted in the Proposed Plan, several contaminants of concern at the Site cannot be quantified at concentrations less than those equal to a risk of 10^{-4}. On the other hand, the majority of contaminants found at the Site can be quantified at concentrations that would be equivalent to a risk of less than or equal to 10^{-6}. EPA's identification of 10^{-5} as an action level was consistent with trying to minimize the risk of exposure to chemicals from the Site. Thus, although the July 26, 1989, memorandum cited above states that a 10^{-4} level is "justifiable", this does not foreclose the Agency from finding that a 10^{-5} level was necessary because of its obligation to protect public health. In addition, the Settling Parties, as well as the public at large, were informed of, and given an opportunity to comment on, the proposed change in the Proposed Plan.

EPA acknowledged in the Proposed Plan that not all contaminants could be quantified down to the 10^{-5} risk level, so as to not create a false impression for the general public. While EPA established 10^{-5} as both the onsite and offsite trigger mechanism in the Proposed Plan, EPA recognized and wanted to make sure that the general public understood that certain contaminants could not be

quantified at that level. As mentioned previously, the majority of the contaminants found at the Site can be quantified down to the 10^{-5} level. Thus, although it would have been EPA's desire to quantify all contaminants of concern at the 10^{-5} level, analytical limitations preclude this from being possible for some contaminants at this time.

4) The Settling Parties commented that EPA failed to assess cost effectiveness, as required by CERCLA, when it revised the risk based trigger in the Proposed Plan.

EPA Response - As noted in the Settling Parties' comments, the Feasibility Study did include cost estimates for each of the response alternatives. These cost estimates were based on a number of assumptions, and it would be unreasonable to think that the cost estimates in the Feasibility Study could cover every conceivable future scenario. In fact, the costs in the Feasibility Study for onsite treatment are based on the limited pumping and treatment of groundwater from the middle sand unit, where contamination was found in the area of DMW-7. Obviously, additional costs would be incurred if it were determined that contamination had migrated further into the lower aquifers.

EPA's revision to the risk based trigger would not affect the overall ranking of the alternatives with respect to cost, though it would have an impact on the time at which the remedial action would have to be implemented, and thus on the overall cost of the remedy. Thus, although the trigger criteria will have an effect on when the remedial action must begin, the main factor driving the overall project costs is whether contaminants from the upper sand unit migrate into the lower aquifers.

In summary, EPA did consider cost when evaluating the six alternatives developed in the Feasibility Study, and EPA's selection of Alternative 6 was based on its belief that the alternative achieves the best balance among the nine evaluation criteria. The revision to the risk based trigger did not change the overall ranking of the six alternatives with respect to the selection criteria.

5) The Settling Parties commented that EPA's proposed revision to the risk based trigger would increase the total cost of the preferred alternative by $16 to $23 million dollars.

EPA Response - The Settling Parties calculation of additional costs that would be incurred as a result of EPA's revision to the risk based action level is grossly overestimated. The $16 to $23 million figure is based on a straight-line scale-up of a relatively small system and does not take into account the economies of scale associated with either the construction or operation of a larger system.

Furthermore, the cost figures the Settling Parties cite assume that groundwater from both the lower sand and the bedrock aquifers would require treatment immediately, and that this treatment would continue for 30 years. Based on the data in the remedial investigation, treatment of groundwater in the lower sand and bedrock aquifers would not currently be required under either the 10^{-4} or 10^{-5} trigger mechanism. Thus, treatment of these lower aquifers would be required only if additional contamination were to migrate into these units. (Note that although the values summarized in the Proposed Plan suggest that the risk in the lower sand unit presently exceeds 1×10^{-5}, this is the result of an extremely conservative averaging technique employed in the risk assessment. EPA would employ a less conservative approach in calculating the values to be used in its determination of the trigger mechanism.)

6) The Settling Parties commented that it is not cost effective to spend $16 to $23 million to treat groundwater that meets "acceptable exposure standards" (i.e. within EPA's acceptable risk range of 10^{-4} to 10^{-6}), and that this expenditure is excessive when compared to the minimal benefit that would be achieved.

EPA Response - The response to the previous question addressed EPA's position with respect to the accuracy of the Settling Parties' cost estimate. The response to comment #2 in this section addressed EPA's mandate to employ 10^{-6} as a point of departure in determining acceptable risks. Nevertheless, EPA has reconsidered its position with respect to the onsite trigger mechanism in view of the cost/benefit argument presented by the Settling Parties.

Although EPA does not agree with the magnitude of the cost estimates developed by Settling Parties, additional costs would be incurred as a result of implementing treatment in an aquifer when the risk was at 10^{-5} as opposed to the 10^{-4} level. Since there are no users of onsite groundwater, and some degree of attenuation would be expected to occur as groundwater moves across the Site, EPA believes that the establishment of 10^{-4} as the onsite trigger will result in a remedy that is protective of human health and the environment. The offsite trigger, however, must remain at 10^{-5} to also be protective of human health and the environment.

7) The Settling Parties commented that a risk based action level of 10^{-5} cannot be substantively supported because background concentrations of organics and inorganics at the Site exceed 10^{-5}.

EPA Response - There were a number of technical and logical errors employed by the Settling Parties' consultant in arriving at the conclusion that background carcinogenic risk in the area of the Site exceeds 10^{-5}. This resulted in an

erroneously high value for the risk associated with background wells. For example, filtered and unfiltered lead data were combined improperly resulting in high estimates of carcinogenic risk due to lead. Methylene chloride is not a contaminant of concern at the Site, and therefore should not have been included in the background risk assessment. The presence of high concentrations of insoluble bis(2-ethylhexyl)phthalate (BEHP) suggests that the organic samples were unfiltered. BEHP is unlikely to migrate in groundwater, so its presence is probably an artifact of sampling or analysis.

More importantly, the concept of overall background risk is really not an issue. In general, remedial actions do not require any particular contaminant to be cleaned up below background concentrations, but this determination is made on a chemical by chemical basis for the particular compounds found at a site. Therefore, the concept of a "background risk" from all chemicals combined is not germane to the remedial decision.

8) The Settling Parties commented that a provision of the NCP, 55 Fed. Reg. 8848, March 8, 1990, to be codified at 40 C.F.R. § 300.430(e)(2)(i)(D), establishes a presumption that cleanup levels more stringent than 10^{-5} are not required unless cumulative risks at the site exceed 10^{-4}.

EPA Response - EPA disagrees with the Settling Parties interpretation of the cited provision of the NCP. That provision provides direction for dealing with sites like the Maryland Sand, Gravel and Stone Site where multiple contaminants are involved. The provision directs EPA to ensure that risks at such sites are maintained within the acceptable risk range of 10^{-4} to 10^{-6}, again making specific reference to the use of 10^{-6} risk level as the point of departure. Thus, EPA maintains that its action to limit risk to values below the upper end (10^{-4}) of the acceptable risk range are not inconsistent with the NCP.

9) The Settling Parties commented that EPA cannot support a risk based action level of 10^{-5} for the Site when based on information developed by the Settling Parties' consultant, the risk level associated with drinking water in the Baltimore, Maryland and Denver, Colorado water supplies currently exceeds 10^{-5}.

As previously explained, EPA's action in establishing risk based action levels for the Site are based on the NCP. There is no provision in the NCP that provides for a comparison of risk in public drinking water supplies.

As a point of explanation, however, the cancer risk from the two public drinking water supplies cited by the Settling Parties, as well as many other urban water supplies, are

elevated as a result of risk associated with exposure to lead and trihalomethanes. The EPA Office of Drinking Water is aware of these risks, but allows them because: 1) Lead leaches into water from pipes in the distribution system, which are very costly to replace; and, 2) Trihalomethanes are unavoidable by-products of disinfection, the benefit of which is judged to outweigh the risk.

10) The Settling Parties commented that they have been unable to locate any other CERCLA sites where EPA had selected a remedy with action levels as stringent as 10^{-5}, and referred to an article by Travis, Richer et al. (Risk and Regulation, Chemtech, August 1987) which concluded, based on a survey of several Federal Agencies, that "for small populations impacts, regulatory action was never taken for individual risk levels less than 10^{-4}."

EPA Response - The action levels for the Site were based on the conditions and chemicals associated with the Site. EPA developed them in accordance with the provisions of the NCP, which does not include requirements for comparisons to other sites, nor to surveys conducted by private parties.

Technical Issues

The Settling Parties have raised a number of technical issues that they believe must be addressed by EPA prior to remedy selection. In general, the majority of the issues raised in this category are technical concerns which are so specific that they are dealt with properly during the remedial design phase rather than as part of remedy selection. Specific responses to the concerns raised by the Settling Parties are summarized below:

1) The Settling Parties commented that several technical issues had to be resolved prior to the selection of the Phase II remedy because of concerns related to the implementation of the Phase I Remedy.

EPA Response - While it is correct that implementation of the Phase II onsite groundwater treatment system must be done in concert with the treatment provided under Operable Unit One, there is nothing that would prevent implementation of the Phase I groundwater treatment system prior to implementation (if determined to be necessary) of the Phase II Treatment System. The Settling Parties who are party to the Consent Decree for Operable Unit One have an obligation to implement the Phase I remedy, notwithstanding a decision on Operable Unit Two.

2) The Settling Parties commented that the assumptions and methodologies used in the Endangerment Assessment for the Site are overly conservative when compared to other Endangerment Assessments prepared for other Superfund sites.

EPA Response - The Endangerment Assessment, which we note as being prepared by the Settling Parties' contractor, contained assumptions and methodologies that were acceptable to EPA. The change in the trigger mechanism which the Settling Parties claim caused them to "reevaluate" the assumptions and methodologies employed by their own contractor, does not in EPA's view, warrant the development of a new Endangerment Assessment for the Site.

Similarly, the Settling Parties' comparison of the Endangerment Assessment methodology employed at the Site to those employed at other Superfund sites does not warrant revising the existing Endangerment Assessment. The assumptions and methodologies that were employed by the Settling Parties' contractor are still acceptable to EPA for the purpose of remedy selection.

3) The Settling Parties commented that certain aspects of the Endangerment Assessment prepared for the Site are inconsistent with current EPA guidance.

EPA Response - The Phase II Endangerment Assessment was prepared in accordance with the then-current EPA guidance. As noted during our meeting with representatives of the Settling Parties on June 28, 1990, EPA agrees that future risk calculations should be done in accordance with Risk Assessment Guidance for Superfund (RAGS) and the Exposure Factors Handbook. The assumptions and the methodologies in these documents can be used to calculate the risks for determining whether the trigger mechanism has been exceeded during the course of Remedial Design/Remedial Action (RD/RA). EPA does not believe it is necessary, or appropriate, to stop the process at this point for the sake of incorporating a revised Endangerment Assessment into the Remedial Investigation.

4) The Settling Parties raised a number of concerns relating to the specific methodology that would be employed in determining when the risk based action level has been exceeded. They commented that in order to fully assess the impact, including the economic repercussions of the risk based action level, EPA must address each each of these concerns prior to remedy selection.

EPA Response - EPA does not believe that these concerns need to be addressed prior to remedy selection. These concerns relate to remedy implementation, rather than to remedy selection. While the procedures used to determine whether the action level has been exceeded, will have an effect on overall project costs, determinations on each of these points will not undermine the overall cost-effectiveness analysis contained in the Feasibility Study. Final decisions on many of the points raised by the Settling Parties in this area will be made during the development of

the remedial design work plan. However, the following discussion summarizes EPA's current view on several of these points:

Statistical Approach - EPA agrees that a statistical approach should be employed to determine whether action levels have been exceeded. The guidance contained in Statistical Analysis of Ground-Water Monitoring at RCRA Facilities (U.S. EPA, April 1989) may be used in developing this approach.

Identification of Compliance Wells - EPA agrees that the selection of compliance wells can be deferred pending collection of additional data and selection of a statistical approach to groundwater monitoring. The data the Settling Parties presented regarding the construction of some of the onsite wells, suggests that proposed wells should be evaluated prior to making a determination to use a particular well as a compliance point. Furthermore, the statistical approach chosen to evaluate whether the risk based action level has been exceeded will have an effect on the number of monitoring wells needed in each water bearing zone.

Dilution/Attenuation - The Settling Parties have suggested utilizing dilution/attenuation factors for several calculations involved in the determination as to whether the risk based action level has been exceeded. Presumably this recommendation relates to their preference for selection of Alternative 5 which only employs onsite monitoring and treatment. In EPA's view there is no need to employ dilution/attenuation factors in the implementation of Alternative 6 since it employs direct measurements at specific compliance points. Further, given the complex hydrology, it is uncertain if accurate dilution/attenuation factors could be developed for the Site.

Confirmatory Sampling - EPA agrees that confirmation sampling should be employed prior to implementing remedial action. The procedures for evaluating the analytical results from both the initial and the confirmation sampling will be developed in the RD/RA work plan.

5) The Settling Parties commented that an additional decision point should be incorporated into the process for determining when to implement groundwater treatment for Operable Unit Two at the Site. They believe that triggering the action level should lead to a secondary decision. That decision being to evaluate whether the particular contaminants that resulted in the action level being exceded are less than either: (1) the concentrations identified as acceptable cleanup levels at other Superfund sites; or, (2) concentrations that are achievable using best demonstrated available technology ("BDAT").

EPA Response - Clean-up levels are established on a site specific basis, and change according to our knowledge of the effects that particular contaminants have on human health and the environment. It would be entirely inappropriate to base a decision as to whether remedial action was required at the Maryland Sand, Gravel and Stone Site on a clean-up level established at a different site.

With regard to the second proposal, the Settling Parties have not cited a single specific example whereby BDAT technology could not achieve the 10^{-6} clean-up goal established for the Site. At this point, EPA is not aware of any situation where use of BDAT would preclude achievement of the 10^{-6} clean-up goal for the contaminants found at this Site.

6) The Settling Parties commented that the groundwater contamination discovered in the middle sand, lower sand, and bedrock units may be the result of improperly installed monitoring wells. The Settling Parties believe that the contaminants discovered in these lower aquifers are simply artifacts of improper well installation in the immediate vicinity of the monitoring wells and are not indicative of the true characteristics of water quality beneath the entire Site. The Settling Parties commented that the scope and nature of the required remediation may need to be directed to ameliorate only the effects of the monitoring well installation, as opposed to remediation of large areas of the lower aquifers at the Site.

EPA Response - The Settling Parties have presented information that indicates discrepancies between the records documenting the construction of some of the monitoring wells installed during the Phase I Remedial Investigation and in recent field observations. The information presented is insufficient to allow EPA to conclude that the contaminants found in the lower aquifers were artifacts of well construction. However, if during the implementation of the selected alternative, it is determined that the contamination is in fact limited in scope, as suggested by the Settling Parties, then the remedial action would be designed to deal with only that localized contamination rather than remediation of the entire aquifer. It should be noted, as in the case of DMW-7, that it may be necessary to install additional monitoring wells in order to ascertain the localized extent of contamination detected in any of the proposed monitoring wells.

7) The Settling Parties disagreed with EPA's determination concerning applicable or relevant and appropriate requirements (ARARs) that must be complied with during implementation of the selected alternative. In particular, the Settling Parties asserted that such requirements that would apply only during the course of the clean-up are not appli-

cable or relevant and appropriate. The Settling Parties commented that based upon Section 121(d)(2)(A) of CERCLA, 42 U.S.C. § 9621(d)(2)(A), ARARs are supposed to be substantive standards that apply "with respect to any hazardous substance, pollutant or contaminant that will remain onsite . . . at the completion of the Remedial Action".

EPA Response - The Settling Parties have raised this issue previously, and by letter dated October 30, 1989, EPA summarized our position as to why it was necessary to comply with ARARs during the implementation of the remedy. The NCP was finalized following the issuance of our October 30, 1989 letter, and it contains a specific provision requiring compliance with ARARs during the course of RD/RA (See 55 Fed. Reg. 8852, March 8, 1990, to be codified at 40 C.F.R. § 300.435(b)(2).

8) The Settling Parties do not believe that the RCRA land disposal restrictions under 40 C.F.R. Part 268 are applicable or relevant and appropriate to the Phase II remedy at the Site because the treatment of contaminated groundwater and the subsequent recharge of such treated water to groundwater does not constitute the "placement of hazardous waste into land disposal units" as required for the land disposal requirements to apply.

EPA Response - EPA's "contained in" RCRA policy triggers the requirement to handle and treat the contaminated groundwater from the Site as a hazardous waste. Contaminated groundwater that has been treated to remove hazardous constituents to below health based levels is no longer considered a hazardous waste, and therefore, discharge of such treated water to a recharge point would not constitute "placement" of a hazardous waste under the land disposal restrictions. Treatment residues resulting from the groundwater treatment process will "contain" hazardous constituents and the land disposal restrictions will apply to their disposal.

9) The Settling Parties commented that because the Site did not receive wastes after July 26, 1982, See 40 C.F.R. § 264.90(a)(2), the only RCRA corrective action provision that is "arguably applicable or appropriate is 40 C.F.R. § 264.101, which allows for onsite remedial measures to be decided on a case-by-case basis".

EPA Response - By letter dated March 2, 1990, EPA identified the ARAR's associated with the remedial action for Operable Unit Two. This listing included the identification of the corrective action program requirements in 40 C.F.R. § 264.90 - .101 as being relevant and appropriate to the remedial action. These requirements were cited as relevant and appropriate, rather than applicable, primarily because

of the date the wastes were disposed of at the Site. EPA continues to believe that these requirements are relevant and appropriate for the selected remedy.

10) The Settling Parties commented that the requirements of the National Pollutant Discharge Elimination System ("NPDES") regulations, 40 C.F.R. Parts 122-124, are only applicable or appropriate to regulate direct discharges from a point source to surface waters of the United States. Thus, the NPDES regulations should only be applicable to the extent that there is a discharge from the groundwater treatment facility into Mill Creek.

EPA Response - EPA agrees that these requirements would only be applicable to a direct discharge to Mill Creek.

11) The Settling Parties stated that Maximum Contaminant Levels ("MCL's") should be the "initial clean-up goals" for groundwater that is to be used for drinking water. They further stated that when restoration of the groundwater to MCL standards is not practicable, alternative achievable concentration limits or background levels should be the designated clean-up standard.

EPA Response - As noted in the Record of Decision, the overall clean-up goal, once remedial action has been triggered, is to reduce the risks associated with the groundwater to acceptable levels (i.e. 10^{-6} carcinogenic risk and Hazard Index <1.0). Clean-up goals for individual compounds include MCL's and non-zero Maximum Contaminant Level Goals (MCLG's) for those compound for which these criteria exist. If it is determined that these goals are not achievable, EPA may establish alternative clean-up standards.

12) The Settling Parties commented that they did not believe that Maryland requirements regarding tank standards, groundwater monitoring and generators (Md. Code Ann. § 26.13.05.10, 26.13.03 and 26.13.05.06), are applicable or relevant and appropriate. They stated that since Maryland does not recognize EPA's "contained in" policy, the groundwater which is the subject of the Phase II Feasibility Study, is not a hazardous waste under Maryland's regulatory scheme and thus these regulations are not applicable or appropriate to the contemplated remedy.

EPA Response - As noted in the State of Maryland's September 10, 1990, letter from Kathy M. Kinsey, Assistant Attorney General to EPA, the State agrees that its position with respect to EPA's "contained in" policy results in the determination that these requirements are not applicable.

However, as outlined in their letter, the State has determined that these requirements are relevant and appropriate.

As noted in EPA's March 2, 1990, letter to Dr. Paul Krueger, EPA's position is that these requirements are, at a minimum, relevant and appropriate and compliance with these requirements must be achieved.

13) The Settling Parties commented that they do not believe that Maryland's toxic water criteria and discharge regulations (Md. Code Ann. § § 26.08.01, 26.08.02, and 26.08.04) should be applicable or relevant and appropriate because these regulations are primarily oriented towards surface waters, as opposed to groundwater which is the subject of the Phase II activities. The Settling Parties also commented that since these regulations did not become effective until after the Feasibility Study was completed, neither the Settling Parties nor EPA anticipated incorporation of these standards into the Feasibility Study.

EPA Response - Like the Federal NPDES regulations, the cited State requirements apply to that portion of the remedy relating to discharge of treated groundwater. These regulations are applicable due to the fact that there is a discharge involved with the selected remedy. The fact that groundwater, rather than surface water is being treated has little bearing on the applicability of these requirements.

With regard to the timing issue, EPA identified these requirements as being applicable prior to the issuance of this ROD. The NCP, 55 Fed. Reg. 8757, March 8, 1990, to be codified at 40 C.F.R. § 300.430(f)(1)(ii)(B), expressly provides for compliance with all modified or newly promulgated ARARs in effect prior to the time the ROD is signed.

Preferred Alternative

The Settling Parties commented that EPA's preference for Remedial Alternative 6, is arbitrary and capricious because Alternative 5 meets all the criteria that EPA uses to evaluate alternatives and is less costly than Alternative 6. Thus, Alternative 5 is the most cost-effective remedy for Phase II.

EPA Response - As more fully explained in Section 8.0 of this ROD, EPA's selection of Alternative 6 was based on an analysis of the alternatives developed for this operable unit against the nine evaluation criteria identified in the NCP.

EPA believes that Alternative 6 offers distinct advantages over Alternative 5. While it is true that Alternative 6 will be slightly more complicated to implement, since it involves the cooperation of offsite parties, this disadvantage is far outweighed by the fact that Alternative 6 puts in place a mechanism to deal with contamination that is found in offsite wells. For a relatively small amount of additional cost, Alternative 6 provide a means to monitor offsite wells. Costs associated with offsite treatment would be incurred only if contamination is actually detected in offsite wells. While we recognize that offsite contamination has not been detected to date, EPA believes that the additional investment for offsite monitoring (and treatment, if required) is justified when compared to the overall protection of human health and the environment that this alternative offers over Alternative 5.

In summary, EPA's selection of Alternative 6 was based on the nine evaluation criteria identified in the NCP. Thus EPA's selection of Alternative 6 is not arbitrary an capricious.

State of Maryland

DEPARTMENT OF THE ENVIRONMENT
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William Donald Schaefer
Governor

Martin W. Walsh, Jr.
Secretary

September 26, 1990

Mr. Thomas C. Voltaggio
Acting Division Director (3HW00)
Hazardous Waste Management Division
U.S. Environmental Protection Agency
Region III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

Dear Mr. Voltaggio:

The Hazardous and Solid Waste Management Administration (HSWMA) has completed its review of the Record of Decision for Operable Unit II at the Maryland Sand Gravel and Stone Site. HSWMA concurs with EPAs selected remedy, Alternative Six which requires onsite and off-site groundwater monitoring with deferred off-site and onsite treatment, if necessary.

We also concur with EPAs modification to one action level in the selected remedy which would "trigger" implementation of pumping and treatment operations. We understand that this modification has resulted in a cumulative carcinogenic risk of 10^{-4} for onsite locations and 10^{-5} for off-site locations.

In addition to concurring with the selected remedy for Operable Unit II, we request that EPA expedite the implementation of the Focussed Feasibility Study (FFS) for Operable Unit III. The continued presence of the sludge and contaminated soils will have an impact on the selected remedies for Operable Units I and II until they are removed.

We look forward to continuing our cooperative relationship with EPA on this project as we implement remediation at this site.

Sincerely,

Ronald Nelson, Director
Hazardous and Solid Waste
Management Administration

RN:klj

cc: Dr. Virgina Bailey
Mr. Harold L. Dye, Jr.