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January 1995

EPA Superfund Record of Decision:

Coakley Landfill, Management of Migration (O.U.2), NH 9/30/1994

DECLARATION FOR THE RECORD OF DECISION

Coakley Landfill
North Hampton, New Hampshire

STATEMENT OF PURPOSE

This decision document sets forth the selected remedy for Operable Unit-2 Management of Migration, for the Coakley Landfill Site in North Hampton, New Hampshire. The selected remedy was developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, and to the extent practicable, the National Oil and Hazardous Substances Contingency Plan (NCP), 40 CFR Part 300 et seq., as amended. The Region I Administrator has been delegated the authority to approve this Record of Decision.

The State of New Hampshire has concurred on the selected remedy.

STATEMENT OF BASIS

This decision is based on the Administrative Record which has been developed in accordance with Section 113 (k) of CERCLA and which is available for public review at the North Hampton Public Library in North Hampton, New Hampshire and at the Region I Waste Management Division Records Center in Boston, Massachusetts. The Administrative Record Index (Appendix E to the ROD) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based.

ASSESSMENT OF THE SITE

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

DESCRIPTION OF THE SELECTED REMEDY

This ROD sets forth the selected remedy for the second operable unit (OU-2) at the Coakley Landfill Site, which addresses management of migration to meet off site cleanup levels for the groundwater from the landfill. A first ROD addressed the source control remedy. The source control operable unit one consists of a multi-task remedy which included capping the landfill and extraction and treatment of the landfill groundwater and gases.

The remedial measures included in the remedy will restore the aquifer to drinking water quality by allowing natural attenuation of the contaminated groundwater, and will eliminate threats posed by the future ingestion of the contaminated groundwater by implementing controls restricting the use of the groundwater.

The major components of the selected remedy include:

- institutional controls (such as deed restrictions) to prevent use of contaminated groundwater;

- natural attenuation for the contaminated groundwater plume; and

- groundwater monitoring.

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate for this remedial action and is cost-effective. The overall remedy satisfies the statutory preference for remedies that utilize treatment as a principal element to reduce the toxicity, mobility, or volume of hazardous substances. In addition, this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

As this remedy will result in hazardous substances remaining on site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

SEP 30 1994

Date

John P. DeVillars
Regional Administrator
EPA - Region I

RECORD OF DECISION
COAKLEY LANDFILL SITE
OPERABLE UNIT 2
MANAGEMENT OF MIGRATION

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ROD DECISION SUMMARY

September 1994

I. SITE NAME, LOCATION AND DESCRIPTION

A. General Description

The Coakley Landfill Site (the Site) is situated on approximately 100 acres located within the Towns of Greenland and North Hampton, Rockingham County, New Hampshire (Appendix A, Figure 1). The actual landfill area covers approximately 27 acres of this property. The Site located about 400 to 800 feet west of Lafayette Road (U.S.Route 1), directly south of Breakfast Hill Road, and about 2.5 miles northeast of the center of the Town of North Hampton. Vehicles access the Site through an entrance gate located on Breakfast Hill Road, approximately 600 feet northwest of the intersection of Lafayette and Breakfast Hill Roads. The Greenland-Rye town line forms a major portion of the eastern boundary of the Site. A more detailed Site map is shown on Appendix A, Figure 2. There is a more complete description of the Site in the Remedial Investigation and Feasibility Study (RI/FS) in Volume 1, Section 1, Pages 1-3 to 1-9.

Breakfast Hill Road forms the northern boundary of the Site. Privately owned properties border the Site to the west and north and include both farmland and undeveloped woodlands and wetlands. Properties abutting east and south of the Site are generally commercial or residential. The Rye Landfill, which was closed in 1987, abuts the Site directly to the northeast. The Lafayette Terrace housing development is directly southeast of the Site. The Granite Post Green Mobile Home Park lies approximately 500 feet to the south of the Site, west of Lafayette Terrace. The Boston & Maine Railroad, which runs north-south, forms the western border of the southern half of the Site.

The landfill is situated within the southernmost portion of the Site, almost completely within the Town of North Hampton. The Coakley Landfill covers approximately 27 acres, constituting the major portion of the southern section of the Site. Generally rectangular in shape, with an average width of approximately 900 feet and an average length of approximately 1,300 feet, the landfill extends to the western, southern, and eastern boundaries in the south direction.

The landfill forms a hill rising approximately 10 to 60 feet above the surrounding area. At its highest point the elevation is about 137 feet above mean sea level. Ground surface in the landfill area originally sloped gently westward. The landfill now forms a prominent raised plateau in that area, with a generally flat upper surface. The landfill has moderately steep slopes along its western, eastern, and southern sides, and a gentle slope along the northern side.

Fine, sandy soil and a crushed aggregate of variable thickness covers most of the landfill, and vegetative cover is intermittent and sparse. Along the top of the northern and western slopes, some incinerator residue is visible in banks where wind and water action apparently removed the sand cover. A drainage ditch bounds the southern and western sides of the landfill, channeling surface water runoff into a wetland area situated immediately to the north-northwest of the landfill. The wetland area generally extends from the northwest corner of the landfill area, along both sides of the B&M Railroad, to a point approximately 500 feet south of Breakfast Hill Road, The margins of the wetlands adjacent to the landfill have been partially filled with rock removed from the quarry and some native sand and gravel. Wetlands west of the railroad track drain both north and south. The landfill is located on a subregional drainage divide and contributes runoff in a generally radial pattern into the watersheds of four nearby streams west of the Site: Little River, Berry's Brook, North Brook, and Bailey Brook (Appendix A, Figure 2).

Natural resources in the area include the agricultural lands, woodlands, and wetlands which surround the Site. Surface water bodies feed the wetland area. The groundwater is available in aquifers formed by water saturated portions of sand and gravel deposits and in fractured bedrock. Sand and gravel deposits are found throughout the Site. Some bedrock outcrops were mined for crushed aggregate in a quarry operation. It is reasonable to expect that wetland and stream areas receive some hunting and fishing activity. This is considered minor recreational use. There is also occasional use of all-terrain recreational vehicles on and around the Site.

B. Geologic Characteristics

Portions of the landfill lie directly on fractured bedrock of the Rye Formation or on an undetermined thickness of unconsolidated sediments of the Pleistocene age. Bedrock consists of deformed igneous and metamorphic metasediments of the Precambrian to Ordovician Age intruded locally by pegmitites of the Hillsboro plutonic series.

On site drilling and geophysical work indicated the bedrock surface is irregular and appears to form a northeast/southwest ridge beneath the landfill.

Surficial geology in the Site vicinity varies from ice contact sand and gravel deposit on the easterly side of the landfill to marine sandy silt on the westerly side. Ice contact deposits also appear to overlie the marine sediments on the northeastern side of the landfill.

The overburden materials on site vary in thickness from three feet to almost fifty feet and grade from highly permeable sands and gravels to stiff, low permeability sandy silt.

C. Hydrogeological Characteristics

The generalized groundwater hydraulics of the Coakley Landfill Site are presented in Appendix A, Figure 3. Both the direction and magnitude of the hydraulic gradients appears to be similar in the overburden and bedrock units. In addition, the data suggest that the overburden is recharging bedrock over the topographic high area east of the Coakley Landfill, and that bedrock is discharging into the overburden in the wetlands area.

The primary directions of groundwater flow from the Coakley Landfill are southwest, west and northwest toward the wetlands. In the wetlands, an east to west groundwater divide directly west of the landfill causes groundwater to flow south toward North Road and presumably north toward Breakfast Hill Road. Residential and commercial pumping, occurring prior to the installation of public water supplies, altered the natural hydraulic system. EPA considers this pumping to be the primary reason for contaminant migration south, east, and northeast of the landfill.

Overburden groundwater flow appears to be radial from the Coakley Landfill and vertically downward into the bedrock aquifer. Surface drainage is also multidirectional since the landfill is near the headwaters of Berry's Brook to the north and the Little River to the south. Flow within the bedrock aquifer is a function of interconnected fractures and is affected locally by hydraulic gradients induced by bedrock water well usage within the area. At least one major fracture system positioned in a south/southeast direction has been documented to interconnect with the Coakley Landfill. This is located in the south/southwest boundary where substantial recharge to the bedrock aquifer may be occurring.

Groundwater recharge from the overburden to the bedrock aquifer occurs where overburden water levels are higher in elevation than those in bedrock and fine grained materials do not prohibit this recharge. The bedrock recharges to the wetlands west of the landfill. Direct leachate discharge to the bedrock may take place beneath parts of the landfill, since the refuse is in direct contact with bedrock in areas where rock quarrying had previously occurred.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Land Use

In approximately 1965 sand and gravel operations began on the Coakley property, which had previously consisted of wooded areas and open fields as evidenced by aerial photographs. These operations continued into the late 1970s.

Permitting for a landfill began in 1971 when the New Hampshire Department of Public Health granted the Town of North Hampton a permit to operate a landfill on the Coakley Site. Early in 1972, Coakley Landfill, Inc. and the Towns of North Hampton and the City of Portsmouth entered into an agreement which prohibited the dumping of shop and ordnance waste from Pease Air Force Base, located in Newington, NH, as well as demolished buildings, junk autos, machinery, and large tree stumps or butts.

Landfill operations began in 1972, with the southern portion of the Site used for refuse from the municipalities of Portsmouth, North Hampton, Newington, and New Castle, along with Pease Air Force Base. Coincident with landfill operations, rock quarrying was conducted at the Site from approximately 1973 through 1977. Much of the refuse disposed of at Coakley Landfill was placed in open (some liquid-filled) trenches created by rock quarrying sand and gravel mining.

In 1978 and 1979 oil-soaked debris from accidents in Portsmouth and Newington, was placed in what is known as the Oily Debris Area in the northern section of the Coakley Site (Appendix A, Figure 2). The precise volume of this material is unknown.

In 1981, the State of New Hampshire granted the Town of North Hampton permission to dispose of pesticide waste containers at the Coakley Landfill Site.

The City of Portsmouth began operating a refuse-to-energy plant on leased property at Pease Air Force Base in 1982. From July 1982 through July 1985, Pease Air Force Base and the municipalities of Rye, North Hampton, Portsmouth, New Castle, and Derry began transporting their refuse to this plant for incineration. After that time, the Coakley Landfill generally accepted only incinerator residue from the new plant. In March 1983, the Bureau of Solid Waste Management ordered an end to the disposal of unburned residue at the Coakley Landfill.

Prior to incineration, the New Hampshire Waste Management Division estimated that approximately 120 tons per day were disposed of at the landfill. The daily weight of incinerator residue was estimated to be approximately 90 tons. A more detailed description of the Site history can be found in the RI/FS Volume 1, Section 1 at pages 1-9 through 1-14.

B. Response History

In 1979, the New Hampshire Waste Management Division received a complaint concerning leachate breakouts in the area. A subsequent investigation by the Bureau of Solid Waste Management resulted in the discovery of allegedly empty drums with markings indicative of cyanide waste.

A second complaint was received in early 1983 by the New Hampshire Water Supply and Pollution Control Commission (WSPCC) regarding the water quality from a domestic drinking water well. Testing revealed the presence of five different VOCs.

A subsequent confirmatory sampling beyond these initial wells detected VOC contamination to the south, southeast,and northeast of the Coakley Landfill. As a result, the Town of North Hampton extended public water to Lafayette Terrace in 1983 and to Birch and North Roads in 1986. Prior to this time, commercial and residential water supply came from private wells.

Also in 1983, the Rye Water district completed a water main extension along Washington Road from the Corner of Lafayette Road and along Dow Lane. This extension brought the public water supply into the area due east and southeast of the Rye Landfill. The WSPCC submitted proposals to the U.S. Environmental Protection Agency (EPA) in May and October of 1983 recommending that the Coakley Site be included on the National Priority List (NPL). In December 1983, the Coakley Landfill was listed on the NPL, and ranked as No. 689.

In July 1985, after additional investigation conducted by the EPA and the WSPCC, the Coakley Landfill ceased operations.

A cooperative agreement was signed with the State of New Hampshire on August 12, 1985 to conduct a Remedial Investigation/Feasibility Study (RI/FS). The contractor, Roy F. Weston, Inc., completed the RI and the FS which were released for public comment on October 31, 1988 and March 2, 1990, respectively. The Proposed Plan which contains EPA's preferred alternative was released with the FS.

The Record of Decision (ROD) for Source Control (Operable Unit 1) was signed by the EPA Regional Administrator in June 1990. The Source Control remedy called for:

1. Consolidation of sediments in the wetlands;
2. Consolidation of solid waste;
3. Capping of the landfill;
4. Collection and treatment of landfill gases;
5. Groundwater extraction and treatment;
6. Long-term environmental monitoring; and
7. Institutional controls where possible.

An Explanation of Significant Difference (ESD) was issued by the EPA Regional Administrator in March 1991, to make clarifications to the remedy set forth in the ROD. The ESD required the cap design to include a composite liner and treatment of the off gases from the air stripper.

The RI/FS for the Management of Migration (Operable Unit 2) was performed by an EPA contractor, CDM - Federal Programs, as a fund lead project. The project began in September 1990. The RI/FS was completed on May 23, 1994. The Proposed Plan which contains EPA's preferred alternative was released with the RI/FS.

C. Enforcement History

The State of New Hampshire began discussions concerning the Site with Coakley, the owner, and with the municipalities as early as December, 1983. Information request letters were sent by EPA to these parties in September and October, 1987. Additional information request letters were sent to approximately 300 parties during 1988.

On February 2, 1990, EPA notified approximately 59 parties who either owned or operated the facility, generated wastes that were shipped to the facility, arranged for the disposal of wastes at the facility, or transported wastes to the facility of their potential liability with respect to the Site. The PRPs formed a steering committee and initial communication took place with EPA. On March 14, 1990 EPA met with the potential responsible parties (PRPs) to discuss their potential liability at the Site.

Soon after the PRPs were noticed the City of Portsmouth, the Town of North Hampton and the Town of Newington notified the EPA of their suspicions that additional parties also dumped at the Coakley Site. These additional 126 parties were informed by letter that EPA may notice them in the future. Copies of the Proposed Plan were sent to parties to provide them with an opportunity to comment on the EPA's Preferred Remedial Alternative.

The PRPs were active in the source control remedy selection process for the first operable unit of the Site. The steering committee retained a technical consultant to review the RI/FS and to evaluate EPA's preferred alternative. The Coakley Landfill Steering Committee submitted technical comments to the EPA during the public comment period. Responses to these comments as well as comments from other members of the public were included in the Responsiveness Summary attached to the source control Record of Decision.

On March 29, 1991 Special Notice was sent to 55 parties who either owned or operated the facility (Coakley family members, towns of Newington, North Hampton and the city of Portsmouth), or generated wastes (two federal facilities, Pease Air Force Base and Portsmouth Navy Yard, and some private companies) that were shipped to the facility, arranged for the disposal of wastes at the facility, or transported wastes to the facility of their potential liability with respect to the Site.

A consent decree was lodged with the court on March 2, 1992 concerning the Operable Unit 1 (source control) remediation of the Coakley Landfill pursuant to the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), 42 U.S.C. 9601 et. seq. The consent decree was entered with the court on May 5, 1992 which sets forth the remediation to be performed by 32 potentially responsible parties (PRPs).

Currently, the PRPs have completed the predesign studies as of June 1994 and are currently performing the design for the source control remediation.

The PRPs have been active in the management of migration remedy selection process for the second operable unit of the Site. The steering committee's technical consultant reviewed the RI/FS and evaluated EPA's preferred alternative. The Coakley Landfill Steering Committee submitted technical comments to the EPA during the public comment period. Responses to these comments as well as comments from other members of the public are summarized in the attached Responsiveness Summary.

III. COMMUNITY RELATIONS

Through most of the Site's history, community concern and involvement has been high. EPA and the State have kept the community and other interested parties appraised of the Site activities through informational meetings, fact sheets, press releases and public meetings.

A. Activities During Operable Unit 1 Source Control Remedy Selection

During January 1986, EPA released a community relations plan which outlined a program to address community concerns and keep citizens informed about and involved in activities during remedial activities. On May 14, 1986, EPA held an informational meeting at the North Hampton Town Hall, North Hampton, New Hampshire to describe the plan for the RI/FS. On November 3, 1988, EPA held an informational meeting at North Hampton Town Hall, North Hampton, New Hampshire to discuss the results of the Remedial Investigation (RI).

On May 10, 1988, EPA made the administrative record available for public review at EPA's offices in Boston and at the North Hampton Public Library. Additional materials were added to the Administrative Record on October 31, 1988 with release of the RI and on March 2, 1990 with release of the FS and the Proposed Plan. Comments on the RI were received from Coakley, the Town of Newcastle and the City of Portsmouth. EPA published a notice and brief analysis of the Proposed Plan for Operable Unit 1 in Foster's Daily Democrat and in the Portsmouth Herald on March 9, 1990 and made the plan available to the public at the North Hampton Public Library and EPA's Record Center in Boston.

On March 15, 1990, EPA held an informational meeting at the North Hampton Elementary School to discuss the results of the Remedial Investigation and the cleanup alternatives presented in the Feasibility Study and to present the Agency's Proposed Plan for Operable Unit 1. Also during this meeting, the Agency answered questions from the public. From March 16 to May 14, 1990, the Agency held a 60-day public comment period to accept public comment on the alternatives presented in the Feasibility Study and the Proposed Plan and on any other documents previously released to the public. On April 3, 1990, the Agency held a public hearing at the North Hampton Elementary School to discuss the Proposed Plan and to accept any oral comments. A transcript of this meeting and comments from the general public and from the Coakley Landfill Steering Committee along with the Agency's response to comments are included in Operable Unit 1 Record of Decision's Responsiveness Summary.

B. Activities During Operable Unit 2 Management of Migration Remedy Selection

On March 3, 1992, EPA held an informational meeting on the start-up of the Coakley Landfill OU-2 Management of Migration RI\FS. On May 23, 1994, EPA made the Management of Migration RI\FS and the OU-2 Proposed Plan available for public review at the site Repositories at EPA's Record Center in Boston and at the North Hampton Public Library. EPA published a notice and brief analysis of the Proposed Plan in the Hampton Union and in the Portsmouth Herald on May 24, 1994.

On June 1, 1994, EPA held an informational meeting at the North Hampton Elementary School to discuss the results of the Management of Migration Remedial Investigation, the cleanup alternatives presented in the Feasibility Study and to present the Agency's Proposed Plan. Also during this meeting, the Agency answered questions from the public. From June 2 to August 1, 1994, the Agency held a 61-day public comment period to accept public comment on the alternatives presented in the Feasibility Study and the Proposed Plan and on any other documents previously released to the public. On June 21, 1994, the Agency held a public hearing at the North Hampton Elementary School to discuss the Proposed Plan and to accept any oral comments. A transcript of this meeting and comments from the general public and from the Coakley Landfill Steering Committee along with the Agency's responses to comments are included in the attached Responsiveness Summary.

IV. SCOPE AND ROLE OF THE RESPONSE ACTION

The selected remedy which is the second operable unit of a two operable unit approach to the remediation at the Site, provides for the remediation of the contaminants which have migrated from the landfill (i.e., management of migration). During this phase a Remedial Investigation and Feasibility Study including a human health risk assessment were undertaken to better characterize the nature and extent of this off site groundwater contamination and to develop and evaluate alternatives for remediation. An environmental risk assessment was also performed to evaluate the impact of an exposure to ecological receptors from contaminants migrating from the landfill into the adjacent wetlands. The studies identified ingestion of groundwater as the principal threat to human health. EPA considers the environmental risk posed by the site to be low.

The response action for the Management of Migration Operable Unit 2 will therefore address the threat to human health posed by the future ingestion of off site contaminated groundwater.

V. SITE CHARACTERISTICS

Section 1.0 of the Feasibility Study ("Management of Migration Remedial Investigation and Feasibility Study (RI/FS), Volume 3", May 1994), contains an overview of the Remedial Investigation. The study area, as defined in the RI\FS, Volume 1, includes all the land area beyond the landfill where contamination from the landfill has migrated or may be impacted by future migration. The study area boundaries are generally as follows: the entire wetland to the west and north of the site; to the northeast, the boundary is set with consideration of the presence of the Rye Landfill; to the east Lafayette Road (Route 1); to the south, North Road. This study area is smaller than OU-1 study area due to more information being available from the OU-1 RI and FS on the nature and extent of contamination at the Site. A detailed Site map showing the study area is shown in Appendix A, Figure 2.

Migration of the contaminants from the landfill source is primarily due to leachate contaminated groundwater movement and surface water runoff which can contain sediment. Therefore, these were the media sampled during the Remedial Investigation for the Management of Migration operable unit 2.

The significant findings of the RI (Volume 1 & 2 of the RI/FS) are summarized below. A complete discussion of Site characteristics can be found in the RI/FS, Volume 1, Section 4 and 5.

A. Sediments

Two rounds of sediment samples were obtained for quantitative chemical analyses at seventeen sampling points Appendix A, Figure 3. Laboratory and field analyses were performed for volatile organic compounds (VOCs), semi-volatile organic compounds, inorganic compounds, pesticides/PCBs, total organic carbon (TOC) and grain size. Sediments with detectable limits of contaminants were observed within the Little River wetlands, and within the Berry's Brook wetland and at a location downstream in Berry's Brook.

Contaminants were detected at sample locations throughout the study area and at the background sample location for some compounds. However, compounds from each contaminant group were most consistently detected in sediment collected from an area immediately north of the landfill having visible evidence of leachate contamination. VOCs detected at the site include benzene, ethyl benzene, chloroethane, chlorobenzene and xylene. Semi-VOCs detected at the site include predominantly PAHs and dichlorinated benzenes. Inorganic compounds were detected in all sediment samples and include arsenic, barium, iron, lead, manganese, nickel, beryllium, selenium and vanadium. All of these inorganic compounds occur naturally in the environment, however, elevated concentrations associated with the Coakley Landfill are indicated for arsenic, barium, iron, manganese, nickel, and zinc. Mercury and silver do not appear to be associated with the landfill. These two compounds were sporadically detected and were not detected in sediment north of the landfill in the area of visible leachate contamination. Vanadium does not appear to be landfill related based on concentrations which are fairly evenly distributed across the study area.

Pesticides were also detected in sediment samples, but do not appear to be landfill related. The pesticide 4,4-DDE was detected in 9 of the 17 sample locations, including the background sample S-15. Pesticide distribution did not indicate the landfill as the source. Concentrations were not consistently greater at sample locations closer to the landfill particularly in the area of visible leachate contamination north of the landfill. No PCBs were detected in any sediment samples.

B. Surface Water

Two rounds of surface water samples were taken at seventeen sampling station locations during the management of migration Remedial Investigation Appendix A, Figure 3. Laboratory and field analyses were performed for VOCs, Semi-VOCs, inorganic compounds and water quality parameters.

VOCs, Semi-VOCs, and inorganics were detected in surface water samples collected in the study area. These contaminants were detected at several sample locations and in some cases at the background sample location. However, contamination from each contaminant group was most consistently detected in samples collected in an area immediately north of the landfill with visible leachate staining (S-9, -10, and -11). Two VOCs, benzene and chlorobenzene were detected in this northern area. Semi-VOCs detected include bis-(2-ethylhexyl) phthalate; 1,4-dichlorobenzene and dimethylphthalate. Inorganic compounds detected in study area surface water samples include aluminum, barium, calcium, iron, lead, magnesium, manganese, nickel, potassium, sodium, vanadium and zinc. Not all metals are clearly attributed to landfill contamination. The distribution pattern of barium, iron, manganese and sodium indicates the landfill as the source of the elevated concentration of these substances in surface water.

C. Groundwater

Groundwater samples were collected from 29 overburden monitoring wells, 21 bedrock monitoring wells, and 4 residential wells during the management of migration Remedial Investigation. Well locations are shown in Figure 2-3. Analytical results are summarized in Volume 1, Tables Section 4, Tables 4-5 through 4-17 of the RI/FS and organized by contaminant category: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), inorganic compounds, and water quality parameters.

VOCs and inorganics are the predominant compounds present in overburden and bedrock groundwater. Semi-VOCs are present as well, but in fewer wells and at lower concentrations. The greatest concentrations and frequencies of detection for most groundwater contaminants were at the landfill perimeter wells. The predominant VOCs detected include aromatics, chlorinated hydrocarbons and ketones. The most frequently detected compounds include chloroethane; 1,1-dichloroethane; chlorobenzene; ethylbenzene and benzene.

Predominant SVOCs present in groundwater include phthalates, polycyclic aromatic hydrocarbons, phenols and dichlorinated benzenes. Naphthalene and 1,4-dichlorobenzene were most frequently detected.

Several inorganic compounds were detected in the majority of study area wells, including the background overburden well GZ-129 and bedrock well GZ-130. These compounds include aluminum, arsenic, barium, calcium, chromium, cobalt, iron, magnesium, manganese, nickel, potassium, sodium, vanadium and zinc.

Appendix B, Tables 1 & 2, summarizes some of the commonly observed contaminants detected in the overburden and bedrock wells. The average and maximum contaminants are presented and compared to the acceptable regulatory levels for drinking water.

Observed Contaminants in the Overburden Hydrogeological Unit for OU-1

Groundwater samples were obtained from 23 overburden monitoring wells in the OU-1 study area. Concentrations of total VOCs detected in seven monitoring wells located within and along the border of the Coakley Landfill ranged from 600 ppb (MW-1, MW-2) to 10,000 ppb (MW-3D).

Commonly observed contaminants detected in the overburden wells and the observed concentration ranges detected were as follows:

COMPOUND	CONCENTRATION (PPB)
benzene	6-60.6
ethyl benzene	18-499
chlorobenzene	less than 5-182
toluene	21-1200
acetone	14-2800
methyl ethyl ketone	17-2700
methyl isobutyl ketone	11-1130
tetrahydrofuran	16-1650
diethyl ether	12-198.8
1,1-dichloroethane	7.3-20.8
1,2-dichloroethane	less than 5-72
1,2-dichloropropane	30
trans-1,2-dichloroethylene	11-16

Inorganics detected in these same seven overburden wells and their detected concentration ranges are presented below.

COMPOUND	CONCENTRATION
arsenic	7.6-89 ppb
aluminum	152-337 ppb
barium	243-368 ppb
chromium	330 ppb
iron	21,000-280,000 ppb
lead	less than 1.7-43 ppb
manganese	2,620-27,000 ppb
nickel	122-200 ppb
potassium	16,000-480,000 ppb
sodium	1,000,000-1,460,000 ppb
arsenic	10-89 ppb
vanadium	23-45 ppb
zinc	less than 1.1-34 ppb

Observed Contaminants in the Bedrock Hydrogeological Unit for OU-1

Groundwater samples were obtained from 20 bedrock monitoring and 17 bedrock domestic wells within the OU-1 study area. Bedrock monitoring wells are those installed outside of the landfill itself by EPA and the State of New Hampshire. Bedrock domestic wells are also located off site and are either current or past commercial and residential drinking water sources. Highest measured total VOC concentrations within the bedrock wells were detected in samples obtained from MW-5, MW-6 around the southern perimeter of the landfill and in GZ-105 located approximately 800 feet off site in a westerly direction. Maximum total VOC concentrations were 2,400 ppb, 97 ppb and less than 807 ppb, respectively.

Individual compounds comprising the bulk of the observed contaminants in both the monitoring and domestic bedrock wells and the observed concentration ranges detected were as follows:

COMPOUND	CONCENTRATION
benzene	5.2-12.8 ppb
chloroethane	294 ppb
toluene	125-1,340 ppb
diethyl ether	180-350 ppb
methyl ethyl ketone	170-407 ppb
methyl isobutyl ketone	85-96 ppb
tetrahydrofuran	238-715 ppb
acetone	16-437 ppb
xylene	21-87 ppb
ethyl benzene	less than 34 ppb
1,1-dichloroethane	7-47 ppb

VOCs were detected in bedrock domestic wells located off site to the southeast at Lafayette Terrace (R-25, R-26 and R-28). Observed total VOCs concentrations ranged from none detected (R-28) to 1,445 ppb (R-25). Observed compounds in these wells were similar to those observed within the off site bedrock wells.

Metals detected in the bedrock monitoring and domestic wells located throughout the source control OU-1 study area of the Coakley Landfill and the observed concentration ranges detected were as follows:

COMPOUND	CONCENTRATION
aluminum	119-200 ppb
barium	12-269 ppb
iron	14-140,000 ppb
manganese	100-120,000 ppb
nickel	8-65 ppb
potassium	2500-190,000 ppb
sodium	15,000-720,000 ppb
arsenic	5-9.6 ppb
vanadium	5-49 ppb

Monitoring Reports Previous to the OU-1 RI

Groundwater samples collected prior to the OU-1 RI from on site monitoring wells in bedrock, overburden and from off site residential drinking water supply wells indicated the presence of VOCs and are reported in the WSPCC, "Hydrogeological Investigation of the Coakley Landfill Site". Ten VOCs were frequently detected in on site and off site wells, (toluene, MEK, diethyl ether, tetrahydrofuran, xylenes, ethylbenzene, dichlorobenzene, benzene, 1,1-dichloroethane and 1,2-dichloroethylene).

VI. SUMMARY OF SITE RISKS

A human health baseline risk assessment (HHRA) found in Volume 1, Section 6 of the RI/FS and an ecological risk assessment (ERA) found in Volume 1, Section 7 of the RI/FS were performed to estimate the probability and magnitude of potential adverse human health effects and environmental effects from exposure to contaminants associated with the Site. The public health risk assessment followed a four step process: 1) contaminant identification, which identified those hazardous substances which, given the specifics of the site, were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; 3) toxicity assessment, which considered the types and magnitude of adverse human effects associated with exposure to hazardous substances, and 4) risk characterization, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the Site, including carcinogenic and noncarcinogenic risks. The results of the public health risk assessment for the Coakley Landfill Superfund Site are discussed below followed by the conclusions of the environmental risk assessment.

Twenty-one (21) contaminants of concern, listed in Appendix B, Tables 1 through 7, were selected for evaluation in the HHRA. These contaminants constitute a representative subset of the more than fifty-one contaminants identified at the Site during the Remedial Investigation. As shown in these tables, the seventeen contaminants of concern were selected to represent potential Site-related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment. A summary of the health effects of each of the contaminants of concern can be found in Volume 1, Section 6, Pages 6-31 to 6-39 of the RI/FS.

Potential human health effects associated with exposure to the contaminants of concern were estimated quantitatively through the development of several hypothetical exposure pathways. These pathways were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the Site. Currently the land use east and south of the site is either residential or commercial, while west and north of the site the land use is residential and undeveloped woodlands or wetlands. In the future land use is expected to be used for residential, commercial, agricultural and recreational purposes. The following is a brief summary of the exposure pathways evaluated. Ingestion of contaminated groundwater was evaluated for an adult consuming 2 liters per day, 350 days per year for thirty years. This pathway was evaluated separately for residential wells, overburden groundwater and bedrock groundwater. Dermal contact with sediments was qualitatively evaluated for a child who may be exposed 36 days per year for 12 years. Incidental ingestion of sediment was evaluated for a child of 6-17 years of age who might be exposed 36 days per year for 12 years while wading and playing in nearby brooks and wetlands. A thorough discussion of exposure pathways and parameters can be found in Section 6.4 of the RI/FS. For each pathway evaluated, an average and reasonable maximum exposure estimate was generated corresponding to exposure to the average and maximum concentration detected in that particular medium.

Excess lifetime cancer risks were determined for each exposure pathway by multiplying the exposure level with the chemical specific cancer potency factor. Cancer potency factors have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is very unlikely to be greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g. 1×10^{-6} for 1/1,000,000) and indicate (using this example), that an individual is not likely to have greater than a one in a million chance of developing cancer over 70 years as a result of Site-related exposure as defined to the compound at the stated concentration. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

The hazard index was also calculated for each pathway as EPA's measure of the potential for noncarcinogenic health effects. The hazard index is calculated by dividing the exposure level by the reference dose (RfD) or other suitable bench mark for noncarcinogenic health effects. Reference doses have been developed by EPA to protect sensitive individuals over the course of a lifetime. They reflect a daily exposure level that is likely to be without an appreciable risk of an adverse health effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. The hazard index is often expressed as a single value (e.g. 0.3) indicating the ratio of the stated exposure as defined to the reference dose value (for this example of 0.3, the exposure as characterized is approximately one third of an acceptable exposure level for the given compound). The hazard index is only considered cumulative for compounds that have the same or similar toxic endpoints (the hazard index for a compound known to produce liver damage should not be added to a second whose toxic endpoint is kidney damage).

Presented in Appendix B are cumulative risk tables for those exposure pathways which exceeded EPA's target risk range. These include the future ingestion of overburden groundwater (Table 8), bedrock groundwater (Table 9) and groundwater in residential wells (Table 10). Risks from all other pathways are summarized below in Table 11.

TABLE 11

SUMMARY OF RISK ESTIMATES FOR EXPOSURE PATHWAYS NOT EXCEEDING EPA'S TARGET RISK RANGE

Exposure Pathway	Cumulative Excess Lifetime Cancer Risk		Cumulative Hazard Index	
	Maximum	Average	Maximum	Average
Direct Contact (DC) with Surface Water (SW)	1.9×10^{-7}	4.0×10^{-8}	0.04	0.006
Incidental Ingestion of SW	4.8×10^{-6}	1.0×10^{-6}	1	0.16
Total Risk from SW	5.0×10^{-6}	1.0×10^{-6}	1	0.17
DC with Sediment from streams, wetland and Leachate Area	1.0×10^{-5}	2.7×10^{-6}	0.12	0.028
DC with Sediment in Streams	2.7×10^{-6}	1.6×10^{-6}	0.026	0.016

Cumulative potential cancer risks associated with incidental ingestion and direct contact with, surface water, and sediments did not exceed EPA's target cancer risk range of 10^{-4} to 10^{-6}. Similarly, cumulative hazard indices as a measure of the potential for non-carcinogenic effects for each of the above exposure pathways did not exceed unity (1.0).

Potential risks associated with the ingestion of groundwater as a drinking water supply were estimated based on data from overburden and bedrock monitoring wells and domestic wells. The cumulative excess lifetime cancer risk predicted for the consumption of groundwater from overburden and bedrock monitoring wells exceeded EPA's target risk range of 10^{-4} to 10^{-6}.

In overburden groundwater the major contributors to carcinogenic risk estimated were arsenic and beryllium. The major contributors to non carcinogenic risk estimates were antimony, arsenic, beryllium, chromium and nickel. The action level for lead in was also exceeded.

In bedrock groundwater, the majority contributors to the carcinogenic risk were arsenic and beryllium. The major contributors to noncarcinogenic risks were antimony, arsenic, manganese and vanadium. Maximum Contaminant Levels (MCLs), established in the Safe Drinking Water Act, 40 CFR, Part 141, were exceeded for benzene, antimony, beryllium, chromium and nickel. The action level for lead was also exceeded.

For groundwater monitored in residential/commercial wells only noncarcinogenic risk estimates exceeded EPA's target risk level and the major contributor to this risk was manganese. MCLs were exceeded for chromium and an action level was exceeded for lead.

Based on the human health risk assessment the only pathway which could result in a risk is the ingestion of contaminated groundwater, therefore the response action(s) for the management of migration operable unit (OU-2) will deal with the mitigation of this potential threat. Actual or threatened releases of hazardous substances in groundwater from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health or welfare.

The results of the environmental risk assessment indicates that arsenic in sediment may pose a potential risk to shrews whose diet is obtained entirely from contaminated OU-2 areas. The assessment indicates the shrew is the only wildlife species at risk of three key species evaluated.

For the shrew (as well as for the muskrat and mallard), the majority of the estimated risks are attributable to consumption of terrestrial (soil) macroinvertebrates or earthworms. Arsenic is the principal contaminant of concern responsible for the majority of predicted risks.

Based on the conservative assumptions applied in the risk analysis for wetland wildlife and the comparison of exposure point concentrations with background concentrations, it is unlikely, however, that the risks associated with potential shrew exposures to contaminants of concern in wetland and stream sediments are significant. Risk estimates associated with landfill runoff areas are approximately 2- to 5-fold higher than those estimated for the wetlands and streams. The estimated risk is based on the assumption that the shrews entire dietary intake of arsenic over a lifetime is received from the site areas of concern. The conservatism introduced throughout this analysis is expected to outweigh the uncertainties which may tend to under estimate exposures. Under the existing baseline conditions, the estimated risks of adverse effects at the individual or population level are concluded to be low. Therefore, EPA considers the environmental risks posed by the site to be low.

VII. DEVELOPMENT AND SCREENING OF ALTERNATIVES

A. Statutory Requirements/Response Objectives

Under its legal authorities, 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 Comprehensive Environmental Response, Compensation, and Liability Act of 1980, (as amended by Superfund and Reauthorization Act of 1986) (CERCLA) establishes several other statutory requirements and preferences, including: a requirement that EPA's remedial action, when complete, must comply with all federal and more stringent state environmental standards, requirements, criteria or limitations, unless a waiver is invoked; a requirement that EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for remedies in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances is a principal element over remedies not involving such treatment. Response alternatives were developed to be consistent with these Congressional mandates.

Based on preliminary information relating to types of contaminants, environmental media of concern, prior and potential use as a drinking water source and potential exposure pathways, remedial action objectives were developed to aid in the development and screening of alternatives. These remedial action objectives were developed to mitigate existing and future potential threats to public health and the environment. These response objectives were:

1. To prevent ingestion of groundwater contamination in excess of drinking water standards (MCLs/MCLGs) or in their absence, an excess cancer risk level of 10^{-6}, for each carcinogenic compound. Also to prevent ingestion of contaminated groundwater in excess of a total cancer risk level for all carcinogenic compounds outside the risk range of 10^{-4} to 10^{-6}.

2. To prevent ingestion of groundwater contaminated in excess of drinking water standards for each noncarcinogenic compound and a total hazard index greater than one for each noncarcinogenic compound.

3. To facilitate the restoration of the groundwater aquifer to drinking water standards or in their absence, the more stringent of an excess cancer risk of 10^{-6}, for each carcinogenic compound or a hazard quotient of one for each

noncarcinogenic compound. Also, restore the aquifer water quality to the more stringent of 1) a total excess cancer risk within the risk range of 10^{-4} to 10^{-6} and 2) a hazard index of 1-10.

4. Ensure that the remedy does not negatively impact the wetlands and facilitates the restoration of the wetland environment.

B. Technology and Alternative Development and Screening

CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives was developed for the Site.

With respect to this groundwater management of migration response action, the RI/FS developed a limited number of remedial alternatives that attain site specific remediation levels within different time frames using different technologies; an alternative that involved no treatment but provides protection through institutional controls; and a no action alternative.

As discussed in Volume 3, Section 4.0 of the RI/FS identified, assessed and screened technologies based on implementability, effectiveness, and cost. These technologies were used for the management of migration (MM) alternatives. Volume 3, Section 5.0 of the RI/FS presented the remedial alternatives developed by combining the technologies identified in the previous screening process in the categories identified in Section 300.430(e) (3) of the NCP. The purpose of the initial screening was to narrow the number of potential remedial actions for further detailed analysis while preserving a range of options. Each alternative was then evaluated and screened in Volume 3, Section 5.0 of the RI/FS.

In summary, of the four management of migration remedial alternatives screened in Volume 3, Section 5.0, all four were retained for detailed analysis. Volume 3, Section 5, Pages 5-1 and 5-2 of the RI/FS identifies the four alternatives that were analyzed.

VIII. DESCRIPTION OF ALTERNATIVES

This section presents a narrative summary of each alternative evaluated. A detailed tabular assessment of each alternative can be found in Table 6-10 in Volume 3, Section 6 of the RI/FS.

A. Management of Migration (MM) Alternatives Analyzed

The management of migration alternatives address contaminants that have migrated from the Coakley Landfill, the original source of contamination. Contaminants have migrated radially from the landfill with the majority of the flow towards the wetland to the west. All of these alternatives assume that the Remedial Action for the source control operable unit (OU-1) is in place and operating. The Management of Migration alternatives evaluated include:

MM-1: No-action Alternative;

MM-2 Limited Action Alternative;

MM-3: Groundwater Treatment/Disposal - In Conjunction with OU-1 Source Control Remedy; and

MM-4: Groundwater Treatment/Disposal - Independent from Source Control Remedy.

A more detailed description for each of the management of migration alternatives follows.

MM-1
No-Action

This alternative is included in the Feasibility Study (FS), as required by CERCLA, to serve as a basis for comparison with the other source control alternatives being considered.

This alternative was evaluated in the FS to serve as a baseline for all remedial alternatives under consideration. Under this alternative, no action would be taken except for long-term monitoring of groundwater for thirty years near the Site. The results of the groundwater sampling from groundwater monitoring wells would be reviewed to evaluate any changes that occur and to reassess the need for additional remedial actions.

This alternative is primarily a data collection activity; no treatment or containment of the landfill wastes or contaminated groundwater would occur, and no effort would be made to reduce the risk of potential human exposure to contamination. It is expected that a reduction in the level of contaminants to meet cleanup levels in the groundwater would occur over an eleven (11) year period due to natural attenuation.

Estimated Time for Design and Construction: None
Estimated Capital Cost (1994 Dollars): $ 0
Estimated Annual Operation and Maintenance Costs: $ 98,000
Estimated Total Cost Over 30 Years(1993 Dollars): $ 1,212,000

This alternative is not protective since it does not prevent the use of contaminated groundwater as a drinking water supply. If the groundwater was to be used as a drinking water supply it would not meet all of the identified applicable or relevant and appropriate environmental regulations (ARARs), particularly since MCLs would be exceeded at the Site.

MM-2

Alternative MM-2, Limited Action, Natural Attenuation and Groundwater Monitoring

The main elements of the Limited Action remedy are listed below:

- institutional controls (such as deed restrictions) to prevent use of contaminated groundwater;
- natural attenuation for the contaminated groundwater plume; and
- groundwater monitoring.

The key element of this alternative is the ability of the groundwater contamination to naturally attenuate. A mathematical model was used to predict the effect of the natural processes (dilution and biodegradation) to reduce contaminant levels in the groundwater. The model predicted that the contaminants in the groundwater will naturally attenuate to cleanup levels in approximately 11 years. This compares to the estimated 5 to 10 years it will take to actively pump and treat the groundwater until cleanup levels are met.

This alternative is similar to a No-Action remedy (see MM-1 above), except in addition to a groundwater monitoring program for thirty years, it would include institutional controls to prevent use of contaminated groundwater as a drinking water supply until cleanup levels are maintained. This alternative allows for the installation of additional monitoring wells to observe and evaluate the natural attenuation of the plume and to confirm the distance of migration. The monitoring program will include establishing the naturally occurring background levels of Manganese and Antimony in the adjacent aquifers.

Estimated Time for Design and Construction: 1 year
Estimated Capital Cost (1993 Dollars): $ 301,000
Estimated Annual Operations and Maintenance Costs: $ 98,000
Estimated Total Cost Over 30 Years (1993 Dollars): $ 1,412,000

MM-3
Alternative MM-3: Groundwater Treatment/On-site Disposal in Conjunction with OU-1 Groundwater Treatment System.

This alternative would include the construction of a groundwater extraction system in the wetlands west of the landfill. The groundwater would then be pumped to the OU-1 source control groundwater treatment system. After the groundwater is treated by the OU-1 system the water would be recharged back to the local groundwater by the OU-1 recharge and/or discharge system. The OU-1 treatment system would be able to treat the contaminated groundwater since the contaminants are similar. MM-3 includes institutional controls to prevent use of contaminated groundwater as a drinking water supply until cleanup levels are maintained.

Estimated Time for Design and Construction: 2 years
Estimated Capital Cost (1993 Dollars): $ 586,000
Estimated Annual Operation and Maintenance Costs: $ 151,000
Estimated Total Cost Over 30 Years (1993 Dollars): $ 2,067,000

MM-4
Alternative MM-4: Groundwater Treatment/On-site Disposal (separate system)

This alternative is similar to MM-3 except that the extracted groundwater would be treated and recharged using a separate system constructed and operated independently from the source control system used for OU-1. The treatment plant would be built above the 100 year flood plain. The system's processes would include metals precipitation for treatment of the metals and carbon adsorption for the VOCs. MM-4 would include institutional controls to prevent use of contaminated groundwater as a drinking water supply until cleanup levels are maintained.

Estimated Time for Design and Construction: 2 years
Estimated Capital Cost (1993 Dollars): $ 1,438,000
Estimated Annual Operation and Maintenance Costs: $ 196,000
Estimated Total Cost Over 30 Years (1993 Dollars): $ 3,232,000

IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that at a minimum EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

A detailed analysis was performed on the five alternatives using the nine evaluation criteria in order to select a site remedy. The following is a summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria. These criteria and their definitions are as follows:

<u>Threshold Criteria</u>
An alternative must meet the two threshold criteria described below in order to be eligible for selection in accordance with the NCP.

1. **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.

2. **Compliance with Applicable or relevant and appropriate requirements (ARARS)** addresses whether or not a remedy meets all ARARs or other Federal and State environmental laws and/or provides grounds for invoking a waiver.

<u>Primary Balancing Criteria</u>
The following five criteria are used to compare and evaluate elements of alternatives which have met the threshold criteria to each other.

3. **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 clean-up goals have been met.

4. **Reduction of toxicity, mobility, or volume through treatment** addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume including how treatment is used to address the principal threats posed by the site.

5. **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 clean-up goals are achieved.

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

7. **Cost** includes estimated capital and operation & maintenance (O&M) costs, as well as present-worth costs.

Modifying Criteria

The modifying criteria are factored into the final balancing of remedial alternatives. This generally occurs after EPA has received public comment on the RI/FS and Proposed Plan.

8. **State acceptance** addresses the state's position and key concerns related to the preferred alternative and other alternatives; and the state's comments on ARARs or the proposed use of waivers.

9. **Community acceptance** addresses public general response to the alternatives described in the Proposed Plan and RI/FS report.

A detailed tabular assessment of the nine criteria applied to each alternative can be found in Table 6-10 in Volume 3, Section 6 of the RI/FS.

Following the detailed analysis of each individual alternative, a comparative analysis, focusing on the relative performance of each alternative against the nine criteria, was conducted. This comparative analysis can also be found in Table 6-10.

The section below presents the nine criteria and a brief narrative summary of the alternatives and the strengths and weaknesses according to the detailed and comparative analysis.

1. Overall protection of human health and the environment

Each of the alternatives is protective at the completion of the remedy. MM-1 will be protective after an expected eleven year period, however, in the interim there would be nothing in place to prevent the drinking of contaminated groundwater.

2. Compliance with ARARS

Each alternative was evaluated for compliance with ARARs, including chemical specific, action specific and location specific ARARs. These alternative specific ARARs are presented in Volume 3, Section 6 of the RI/FS in Appendix B. Alternatives MM-2, MM-3 and MM-4 will meet their respective ARARs. MM-1 fails to meet a state groundwater regulation (Env-Ws 410) which, among other things, requires the establishment of a Groundwater Management Zone (GMZ) when a groundwater plume is migrating from a landfill or other source area. Groundwater needs to be restricted in the GMZ.

3. Long term effectiveness and permanence

MM-1 and MM-2 are equivalent in terms of meeting the long term effectiveness and permanence criteria. Neither will generate residual waste which will require disposal and/or long term management. Any residual contamination remaining after cleanup levels are met will be within EPA's acceptable risk range. A five year review would be necessary since cleanup levels are not expected to be attained for ten to eleven years. Long term monitoring will done for up to thirty years to confirm that the cleanup level are achieved and maintained.

MM-3 and MM-4 are similarly long term effective and permanent. In MM-3 and MM-4 the contaminated groundwater will be extracted and treated in a treatment plant which will generate residual wastes requiring disposal off site and long term management. Once cleanup levels are met, however, the residual contamination in the groundwater will be within EPA's acceptable risk range. Five year reviews will be required until cleanup levels are met.

Therefore, MM-1 and MM-2 are the most long term effective and permanent when compared to MM-3 or MM-4.

4. Reduction of toxicity, mobility, or volume through treatment

Alternatives MM-1 and MM-2 do not employ any active treatment technologies although, the toxicity of the groundwater will be reduced with time due to natural attenuation processes. Alternatives MM-3 and MM-4 use treatment technologies that result in a reduction of toxicity, mobility and volume through treatment, however, residuals are created which will require treatment and/or long term management. Compared to each other, MM-3 and MM-4 provide equivalent reduction of toxicity, mobility and volume through treatment. MM-3 would use the Source Control treatment plant and MM-4 would construct a new treatment plant.

5. Short-term effectiveness

Alternatives MM-1, MM-2, MM-3 and MM-4 have similar times until protection is achieved. MM-1 and MM-2 are expected to achieve cleanup levels in approximately 11 years according to the groundwater model developed in the RI/FS. MM-3 and MM-4 are expected to achieve cleanup levels in 5 to 10 years. For groundwater remediation these time frames are considered similar due to the uncertainties with any groundwater extraction and treatment remediation.

Alternatives MM-1 would have the least impact to the community, site workers or the environment since there is no construction or disruptive activities during implementation of this alternative.

Alternative MM-2 will require construction of more monitoring wells in the wetlands which will temporarily impact the wetland and potentially expose the site workers to contaminated groundwater. These activities are not expected to adversely impact the community during or after implementation since they are, for the most part, occurring in the wetland away from the residential area.

Alternatives MM-3 and MM-4 have the greatest potential for causing health risks to the community, site workers and the environment. Although unlikely, the public could be exposed to contaminants as a result of the construction of the groundwater treatment plant and during its operation. Also, MM-3 and MM-4 has the greatest risk of impacting the site workers during construction and operation of the groundwater treatment plant by exposing them to the groundwater contamination from direct contact or an accidental release. During implementation of the remedy the wetland has a great potential of environmental damage from disruption of the water balance and could cause permanent damage to this natural resource.

6. Implementability

Alternatives MM-2, MM-3 and MM-4 can be implemented using standard construction methods. MM-1 requires no construction activities which makes it the easiest alternative to implement. MM-2 involves the construction of only a few monitoring wells in the wetland and is the next easiest alternative to implement. MM-3 involves constructing a groundwater extraction system in the wetlands and, therefore, significant implementation/construction problems are likely. MM-4 will encounter the most implementation problems since it involves the most construction (the extraction system and a treatment plant).

All alternatives are technically and administratively feasible. There is no special technology proposed for these alternatives. All materials and services are readily available for these alternatives to be implemented.

7. Cost

The capital, operation and maintenance, and total cost for each alternative is provided below. For comparative purposes, the costs are all based upon thirty years of operation and/or monitoring of each alternative. The actual costs would differ somewhat based upon the length of time necessary to achieve cleanup levels. The estimated present worth value of each alternative and the options are as follows:

COST COMPARISON OF SOURCE CONTROL ALTERNATIVES

		Capital Costs	O&M Costs ($/yr)	Present Worth
MM-1	No Action	$ 101,000	98,000	1,212,000
MM-2	Limited Action	301,000	98,000	1,412,000
MM-3	Groundwater Treatment w/ OU-1 System	586,000	151,000	2,067,000
MM-4	Groundwater Treatment w/ New System	1,438,000	196,000	3,232,000

8. State acceptance

The New Hampshire Department of Environmental Services (DES) has been involved with the Site from the beginning as summarized in Section II of this document "SITE HISTORY AND ENFORCEMENT ACTIVITIES". The Source Control Operable Unit-1 Remedial Investigation and Feasibility Study was performed as a state lead through a cooperative agreement between the State and the EPA. The New Hampshire DES and the Attorney Generals Office have reviewed this document and concur with the alternative selected for the management of migration remedy as documented in Appendix D, the Declaration of Concurrence.

9. Community acceptance

The comments received during the public comment period and the discussions during the Proposed Plan and RI/FS public meeting are summarized in the attached document entitled "The Responsiveness Summary" (Appendix C). Varied comments were received from residents living near the Site (concerned citizens and property owners) and from the Coakley Landfill Potentially Responsible Parties (PRPs). One concerned citizen wanted EPA to choose MM-4 and also wanted soils treated. The adjacent property owners generally agreed with the Limited Action Remedy but were concerned with the possibility of deed restrictions, which limited the use of groundwater under their property, being used as an institutional control. The PRPs generally want the EPA to choose the No-Action alternative, MM-1, which would be the least costly and most easily implemented remedy.

X. THE SELECTED REMEDY

EPA has selected alternative MM-2, Limited Action, for the Second Operable Unit, Management of Migration, at the Coakley Landfill Site. A detailed description of this remedy is presented below.

The limited action alternative requires a long term monitoring program. Existing and additional monitoring wells in the area of vicinity of the management of migration plume and the expected extent maximum extent of the plume shall be monitored for up to but not limited to 30 years. During the time natural attenuation is expected to occur and institutional controls will need to be in place to assure the contaminated groundwater is not used for drinking water. The institutional controls that need to be implemented could take the form of a deed restriction, a local ordinance, or other control that is deemed protective by EPA.

A. Interim Groundwater Cleanup Levels

Interim cleanup levels have been established in ground water for all contaminants of concern identified in the Baseline Risk Assessment found to pose an unacceptable risk to either public health or the environment. Interim cleanup levels have been set based on the ARARs (e.g., Drinking Water Maximum Contaminant Level Goals (MCLGs) and MCLs) as available, or other suitable criteria described below. Periodic assessments of the protection afforded by remedial actions will be made as the remedy is being implemented and at the completion of the remedial action. At the time that Interim Ground Water Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment shall be performed on the residual ground water contamination to determine whether the remedial action is protective. This risk assessment of the residual ground water contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by ingestion of ground water. The potential risks associated with the inhalation of volatile organic compounds during showering would be comparable to those risks predicted for the ingestion route of exposure. If, after review of the risk assessment, the remedial action is not determined to be protective by EPA, the remedial action shall continue until either protective levels are achieved, and are not exceeded for a period of three consecutive years, or until EPA deems the remedy protective. These protective residual levels shall constitute the final cleanup levels for this Record of Decision and shall be considered performance standards for any remedial action.

Because the aquifer impacted by the remedy is a Class IIB aquifer, which is a potential source of drinking water, MCLs and non-zero MCLGs established under the Safe Drinking Water Act are ARARs.

Interim cleanup levels for known, probable, and possible carcinogenic compounds (Classes A, B, and C) have been established to protect against potential carcinogenic effects and to conform with ARARs. Because the MCLGs for Class A & B compounds are set at zero and are thus not suitable for use as interim cleanup levels, MCLs and proposed MCLs have been selected as the interim cleanup levels for these Classes of compounds. Because the MCLGs for the Class C compounds are greater than zero, and can readily be confirmed, MCLGs and proposed MCLGs have been selected as the interim cleanup levels for Class C compounds.

Interim cleanup levels for Class D and E compounds (not classified, and no evidence of carcinogenicity) have been established to protect against potential non-carcinogenic effects and to conform with ARARs. Because the MCLGs for these Classes are greater that zero and can readily be confirmed, MCLGs and proposed MCLGs have been selected as the interim cleanup levels for these classes of compounds.

In situations where a promulgated State standard is more stringent than values established under the Safe Drinking Water Act, the State standard was used as the interim cleanup level. In the absence of an MCLG, an MCL, a proposed MCLG, proposed MCL, State standard, or other suitable criteria to be considered (i.e., health advisory, state guideline) an interim cleanup level was derived for each compound having carcinogenic potential (Classes A, B, and C compounds) based on a 10^{-6} excess cancer risk level per compound considering the ingestion of ground water. In the absence of the above standards and criteria, interim cleanup levels for all other compounds (Classes D and E) were established based on a level that represent an acceptable exposure level to which the human population including sensitive subgroups may be exposed without adverse affect during a lifetime or part of a lifetime, incorporating an adequate margin of safety (hazard quotient = 1) considering the ingestion of groundwater. If a value described by any of the above methods was not capable of being detected with good precision and accuracy or was below what was deemed to be the background value, then the practical quantification limit or background value was used as appropriate for the Interim Ground Water Cleanup Level.

Table 12, below, summarizes the Interim Cleanup Levels for carcinogenic and non-carcinogenic contaminants of concern identified in ground water.

TABLE 12: INTERIM GROUND WATER CLEANUP LEVELS

Carcinogenic Contaminants of Concern (class)	Interim Cleanup Level (ug/l)	Basis	Level of Risk
Benzene (A)	5	MCL	$1.7x10^{-6}$
1,2-Dichloropropane (B2)	50	MCL	$3.9x10^{-6}$
Arsenic* (A)	50	MCL	$1.0x10^{-4}$
Beryllium (B2)	4	MCL	$2.1x10^{-4}$
		SUM	$3.2x10^{-4}$

Non-carcinogenic Contaminants of Concern (Class)	Interim Cleanup Level (ug/l)	Basis	Target Endpoint of Toxicity	Hazard Quotient
Antimony (D)	6	MCL	Blood	0.4
Arsenic (A)	50	MCL	Skin	4.5
Beryllium (B2)	4	MCL	None	0.02
Chromium (D)	100	MCL	None	0.003
Lead (B2)	15	AL	CNS	-
Manganese	180	HB	CNS	1
Nickel (D)	100	MCL	Organ W1	0.1
Vanadium (D)	260	HB	CNS	0.5
				6.6
Totals			Skin	4.5
			CNS	1.5
			Blood	0.4
			Other	1.2

*Recent studies indicate that many skin tumors arising from oral exposure to arsenic are non-lethal and that the dose-response curve for the skin cancers may be sub-linear (in which case the cancer potency factor used to generate risk estimates may be overestimate). It is Agency policy to manage these risks downward by as much as a factor of ten. As a result, the carcinogenic risk for arsenic in the above table has been managed as if it were one order or magnitude lower than the calculated risk. Consequently, the risk level for arsenic in the above table reflects a risk management factor.

These interim cleanup levels are consistent with ARARs or suitable TBC criteria for ground water, attain EPA's risk management goal for remedial actions and are determined by EPA to be protective. However, the true test of protection cannot be made until residual levels are known. Consequently, at the time that Interim Ground Water Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment will be performed on residual ground water contamination to determine whether the remedial action is protective. This risk assessment of the residual groundwater contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by ingestion of ground water. If, after review of the risk assessment, the remedial action is not determined to be protective by EPA, then remedial actions shall continue until either protective levels are achieved and are not exceeded for three consecutive years or until the remedy is otherwise deemed protective. These protective residual levels shall constitute the final cleanup levels for this Record of Decision and shall be considered performance standards for any remedial action.

All Interim Ground Water Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy and protective levels determined as a consequence of the risk assessment of residual contamination, must be met at the completion of the remedial action at the points of compliance for the source control remedy. EPA has estimated that these levels will be attained within 11 years after completion of the source control component.

The compliance boundary established for source control groundwater cleanup levels (OU-1) is the perimeter of the Site which runs close to the current property boundary of the Coakley Landfill on the south, west and east sides and approximately 200 feet from the current toe of the slope of the landfill to the north and northeast within the Site boundary. Groundwater cleanup levels established in this ROD need to be attained within the area of groundwater beyond the source control compliance boundary that is impacted by contamination from the landfill or could be impacted as a result of pumping activities. This groundwater cleanup area is the same as the area where institutional controls need to be implemented as defined in the next section (B. Description of Remedial Components) and designated in Appendix A, Figure 5. The remedy will be reviewed and a revised plan will be adopted, if EPA determines that groundwater contamination from the landfill has migrated beyond the boundary of the groundwater cleanup area. Based on available data, the groundwater contamination is not expected to migrate beyond the area of institutional controls.

B. Description of Remedial Components

The Limited Action remedy allows for the natural attenuation of the groundwater plume migrating from the source control area. The main elements of the Limited Action remedy are listed below:

- institutional controls (such as deed restrictions) to prevent use of contaminated groundwater;
- natural attenuation for the contaminated groundwater plume; and
- groundwater monitoring.

The key element of the remedy is the ability of the groundwater contamination to naturally attenuate. A mathematical model was used to predict the effect of the natural processes (dilution and biodegradation) to reduce contaminant levels in the groundwater. The model predicted that the contaminants in the groundwater will naturally attenuate to cleanup levels in approximately 11 years. This compares to the estimated 5 to 10 years it will take to actively pump and treat the groundwater until cleanup levels are met.

A monitoring program will be developed and implemented as part of the remedy to evaluate and determine the extent of migration of the contaminated groundwater and other potentially affected media (surface water and sediments) and to track the natural attenuation of the contamination. EPA will determine the frequency of sampling, the types of analyses, the sampling method and the media to be sampled for the monitoring program during the design phase. Initially, monitoring wells at a minimum shall be sampled on a semi-annual basis. The other affected media (surface water and sediments) at a minimum will be sampled annually. Each sampling location shall be analyzed for priority pollutants (volatile organic compounds, semi-volatile organic compounds and inorganics) unless EPA determines that the analyses are not necessary. The monitoring program is currently estimated to continue for thirty years.

The monitoring program will include establishing the naturally occurring background levels of manganese and antimony in the adjacent aquifers. This remedy provides for the installation of additional monitoring wells to accomplish this and to confirm the distance that contaminated groundwater has migrated. EPA will determine the number and location of additional monitoring wells that are necessary during the remedial design.

In order for the remedy to be considered protective, institutional controls need to be implemented to prevent use of contaminated groundwater as a drinking water supply for the duration of the remedy. Institutional controls are required within the groundwater cleanup area. The area where institutional controls will need to be implemented is currently estimated to be Lafayette Road (Route 1) to the south, the power line easement to the north, the extent of the wetlands immediately to the west of the landfill and railroad tracks and approximately 1400 feet from the landfill property boundary to the south (see Appendix A, Figure 5). There are no groundwater wells in use within the groundwater cleanup area. The exact area where institutional controls will be implemented will be determined during the remedial design as approved by EPA. All residences within the expected area of institutional controls are currently connected to a community water system and do not depend on private drinking water wells. The number of private property owners that will be adversely impacted by the imposition of institutional controls is anticipated to be few. Further, the remedy will be reviewed and a revised plan will be adopted, if EPA determines that the contamination from the landfill in the groundwater has migrated beyond the boundary of the groundwater cleanup area. Institutional controls can be removed from affected property after the remedy has been determined by EPA to be protective. The types of institutional controls which may be implemented are deed restrictions, local ordinances or other controls if they meet ARARs, including NH Env-Ws 410.26, provided EPA determines the controls would be protective. Though they are not ARARs, the administrative provisions NH Env-Ws 410.20 and 410.21 may provide useful guidance for the implementation of these controls.

To the extent required by law, EPA will review the Site at least once every five years after the initiation of remedial action at the Site if any hazardous substances, pollutants or contaminants remain at the Site to assure that the remedial action continues to protect human health and the environment.

XI. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the Coakley Landfill Superfund Site is consistent with CERCLA and, to the extent practicable, the NCP. The selected remedy is protective of human health and the environment, attains ARARs and is cost effective. Although this operable unit for the management of migration involves no treatment and therefore does not satisfy the preference for treatment which permanently and significantly reduces the mobility, toxicity or volume of hazardous substances as a principal element, the remedy for the Site as a whole, including the OU-1 remedy, satisfies this statutory preference. Additionally, the selected remedy utilizes alternate treatment technologies or resource recovery technologies to the maximum extent practicable.

A. The Selected Remedy is Protective of Human Health and the Environment

The remedy at this Site will permanently reduce the risks posed to human health and the environment by eliminating, reducing or controlling exposures to human and environmental receptors; more specifically the management of migration OU-2 remedy reduces exposure through institutional controls during an interim period as cleanup levels are reached through natural attenuation.

Moreover, the selected remedy will achieve potential human health risk levels that attain the 10^{-4} to 10^{-6} incremental cancer risk range and a level protective of noncarcinogenic endpoints, and will comply with ARARs and to be considered criteria. At the time that the Interim Ground Water Cleanup Levels identified in the ROD and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of three consecutive years, a risk assessment shall be performed on the residual ground water contamination to determine whether the remedial action is protective. This risk assessment of the residual ground water contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by ingestion of ground water. If, after review of the risk assessment, the remedial action is not determined to be protective by EPA, the remedial action shall continue until protective levels are achieved and have not been exceeded for a period of three consecutive years, or until the remedy is otherwise deemed protective. These protective residual levels shall constitute the final cleanup levels for this Record of Decision and shall be considered performance standards for any remedial action.

B. The Selected Remedy Attains ARARs

This remedy will attain all applicable or relevant and appropriate federal and state requirements that apply to the Site. Environmental laws from which ARARs for the selected remedial action are derived, and the specific ARARs include:

- Resource Conservation and Recovery Act (RCRA)]
- Toxic Substances Control Act (TSCA)
- Clean Water Act (CWA)
- Safe Drinking Water Act
- Executive Order 11988 (Floodplain Management)
- Executive Order 11990 (Protection of Wetlands)
- Clean Air Act (CAA)
- Occupational Safety and Health Administration (OSHA)

- State Superfund Laws
- State Hazardous Waste Facility Laws
- State Groundwater Protection Rules

The specific ARAR table associated with this remedy are attached in Appendix B, Table 13. It should be noted that RCRA Land Disposal Restriction requirements are not an ARAR if the remedy is implemented as described in this ROD.

A discussion of why these requirements are applicable or relevant and appropriate may be found in Volume 3, Section 2 of the RI/FS at pages 2-2 through 2-30.

The following is a discussion of the applicable or relevant and appropriate State of New Hampshire Groundwater Protection Rules, Env-Ws 410, February 1993.

<u>Chemical Specific</u>

Env-Ws 410.05. Ambient Groundwater Quality Standards (to the extent they are more stringent than MCLs and non-zero MCLGs)

Env-Ws 410.03. Groundwater Quality Criteria

<u>Location Specific</u>

Env-Ws 410.26, Groundwater Management Zone

<u>Action Specific</u>

Env-Ws 410.24 (a) and (b), Criteria for Remedial Action. Note: Other criteria in 410.24, which do not impose distinct requirements but rather are weighed more generally in selecting remedial action plans would not be ARARs.

Env-Ws 410.27, Groundwater Management Permit Compliance Criteria.
Note: This provision requires a revised remedial action plan if contamination migrates beyond the area where institutional controls are implemented. The remedy will be reviewed and a revised plan will be adopted, if EPA determines that the contamination from the landfill in the groundwater has migrated beyond the boundary of the groundwater cleanup area.

The following policies, criteria, and guidance will also be considered (TBCs) during the implementation of the remedial action:

a) USEPA Human Health Assessment Cancer Slope Factors (CSFs);
b) U.S. EPA Risk Reference Doses (RfD's); and
c) U.S. EPA Carcinogen Assessment Group Potency Factors.

C. The Selected Remedial Action is Cost-Effective

In the Agency's judgment, the selected remedy is cost effective, i.e., the remedy affords overall effectiveness proportional to its costs. In selecting this remedy, once EPA identified alternatives that are protective of human health and the environment and that attain, or, as appropriate, waive ARARs, EPA evaluated the overall effectiveness of each alternative by assessing the relevant three criteria--long term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short term effectiveness, in combination. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs. The costs of this remedial alternative are:

COST COMPARISON OF SOURCE CONTROL ALTERNATIVES

		Capital Costs	O&M Costs ($/yr)	Present Worth
MM-1	No Action	$ 101,000	98,000	1,212,000
MM-2	Limited Action	301,000	98,000	1,412,000
MM-3	Groundwater Treatment w/ OU-1 System	586,000	151,000	2,067,000
MM-4	Groundwater Treatment w/ New System	1,438,000	196,000	3,232,000

The time to meet cleanup levels for MM-2 is estimated to take eleven (11) years. The time to meet cleanup levels for MM-3 and MM-4 is estimated to take five (5) to ten (10) years. These time periods are relatively similar for cleaning up groundwater. Therefore, MM-2 is the most cost effective alternative that is protective and meets ARARs, the threshold criteria.

D. The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

Once the Agency identified those alternatives that attain or, as appropriate, waive ARARs and that are protective of human health and the environment, EPA identified which alternative utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by deciding which one of the identified alternatives provides the best balance of trade-offs among alternatives in terms of: 1) long-term effectiveness and permanence; 2) reduction of toxicity, mobility or volume through treatment; 3) short-term effectiveness; 4) implementability; and 5) cost. The balancing test emphasized long-term effectiveness and permanence and the reduction of toxicity, mobility and volume through treatment; and considered the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste, and community and state acceptance. The selected remedy provides the best balance of trade-offs among the alternatives.

The limited action remedy is as effective in the long term and permanent as any active treatment system alternative since cleanup goals will be reached in a similar time period and will be permanent once met for both the source control and this management of migration remedy (OU-1 and OU-2). Also MM-3 and MM-4 will result in the production of residuals which would have to be disposed of off site. Although treatment will not be used to achieve a reduction in toxicity, mobility, or volume in the selected remedy, reductions will be similar to the MM-3 and MM-4 alternatives, where treatment would be used, at a significantly lower cost. The short term effectiveness is greater for the limited action remedy than the active remedies since construction involves minimal impact to the wetland with the drilling of wells and there is little to no exposure threat to the workers, local community during construction and protectiveness is attained in a similar time frame. All the remedies are implementable with limited action being the more implementable based on the complexity of the alternatives. The limited action remedy is also the most cost effective when compared to the active treatment remedies. Overall, the balancing criteria favor the limited action remedy.

The State has reviewed the ROD and concurred with the remedy. The community varied in their acceptance of the limited action remedy. The property owners were against institutional controls but did not prefer the active treatment alternatives. The PRPs wanted the no-action remedy to be chosen and some of the community members wanted an active treatment remedy chosen. Overall, the modifying criteria did not change the EPA preferred alternative.

The selected remedy meets the statutory requirement to utilize permanent solutions and treatment technologies to the maximum extent practicable. The source control remedy OU-1 provides treatment of the more concentrated contamination. Although the management of migration remedy OU-2 does not utilize treatment, it does provide a permanent solution by allowing natural attenuation of the lower concentration of contaminated groundwater migrating from the site. Since the result of natural attenuation is similar to the result of active treatment of the groundwater EPA concludes that natural attenuation remedy is the most practical alternative.

E. The OU-2 Selected Remedy does not Satisfy the Preference for Treatment as a Principal Element

The selected remedy is an operable unit limited in scope. It involves no treatment and therefore does not satisfy the preference for treatment as a principal element. However, the source control OU-1 remedy fulfills the preference for treatment as a primary element for the overall Site cleanup. The remedy requires treatment of the groundwater from under the landfill and treatment of the landfill gases. The limited action remedy does not use treatment as the principle element. However, the natural attenuation model used in the RI/FS estimates a similar time in meeting cleanup levels as an active system and natural attenuation would cause less impact to the wetlands, thereby satisfying one of the response objectives.

XII. DOCUMENTATION OF NO SIGNIFICANT CHANGES

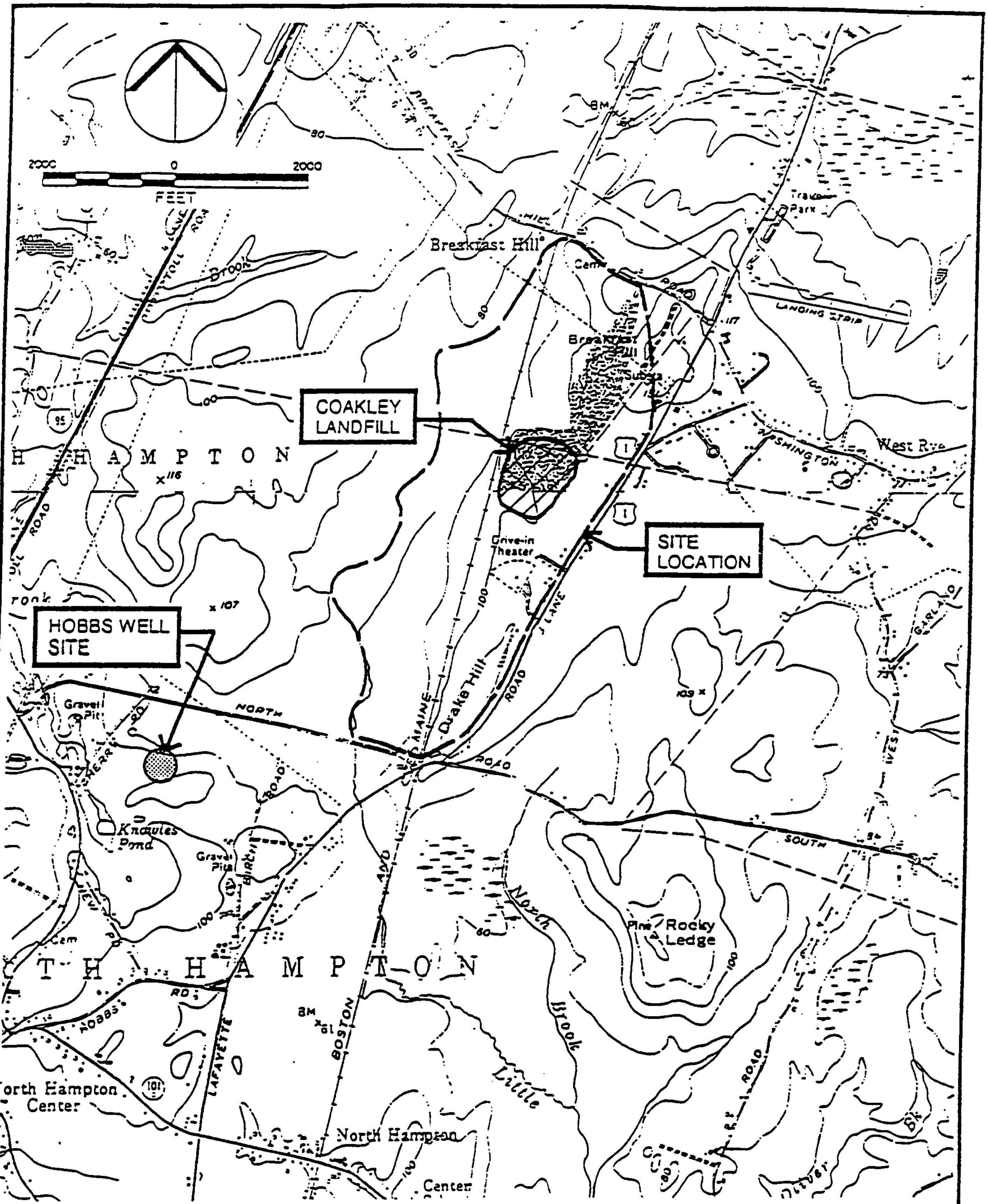
EPA presented a proposed plan (preferred alternative) for remediation of the Site on May 23, 1994. This management of migration preferred alternative included a limited action remedy based on natural attenuation of the contaminated groundwater migrating from the site. The remedy includes long term monitoring for up to thirty years and institutional controls to prevent the affected groundwater from being used as a source for drinking water. The remedy contains no significant changes from that proposed.

XIII. STATE ROLE

The State of New Hampshire, Department of Environmental Services (DES) has reviewed the various alternatives and indicated its support for the selected remedy. The State has also reviewed the Remedial Investigation, Risk Assessment and the Feasibility Study to determine if the selected remedy is in compliance with applicable or relevant and appropriate State Environmental laws and regulations. The New Hampshire DES concurs with the selected remedy for the Coakley Landfill Superfund Site. A copy of the declaration of concurrence is attached as Appendix D.

APPENDIX A

FIGURES

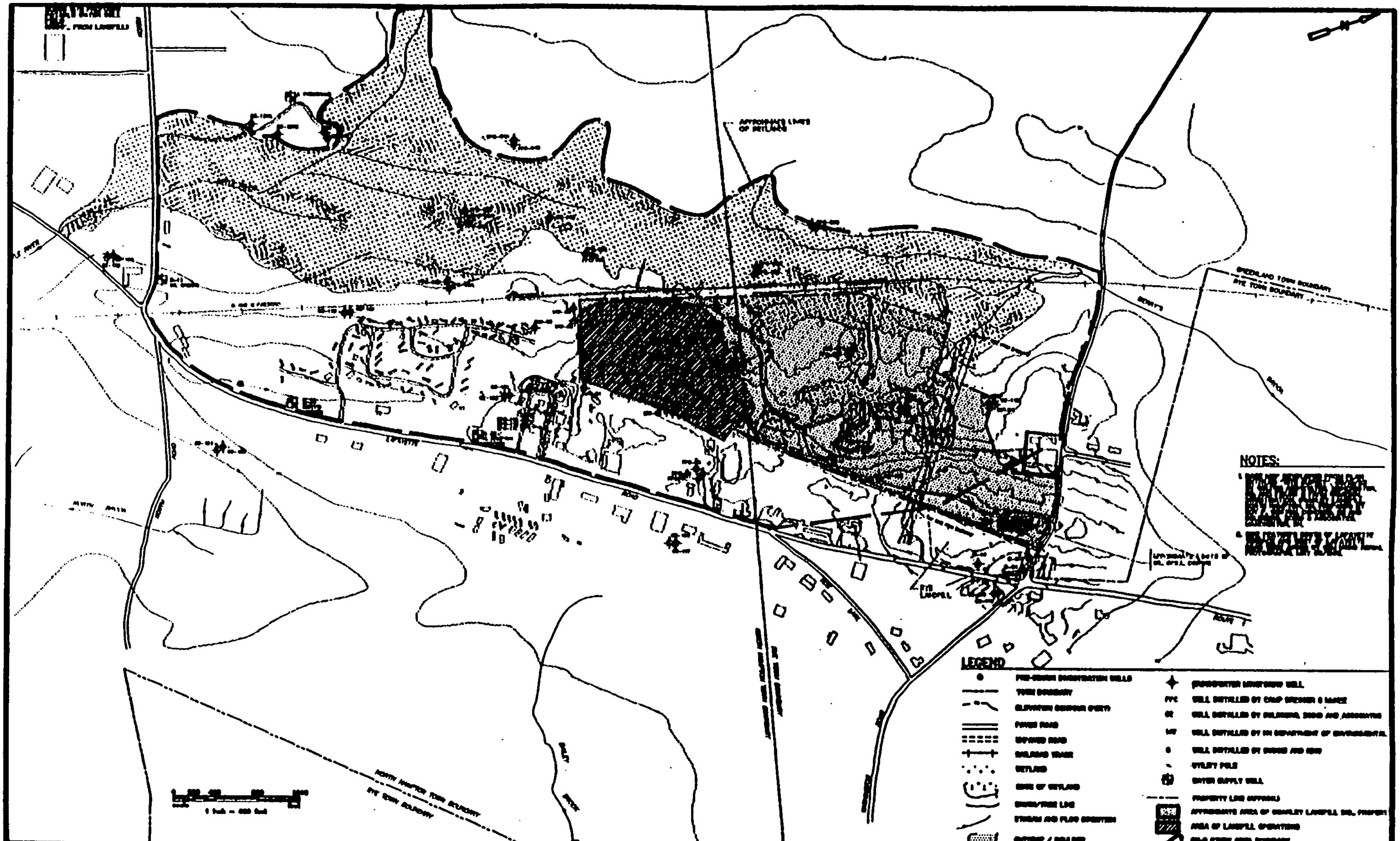


COAKLEY LANDFILL
NORTH HAMPTON, NEW HAMPSHIRE
OPERABLE UNIT - 2
REMEDIAL INVESTIGATION / FEASIBILITY STUDY

LOCUS PLAN

CDM

FIG. 1

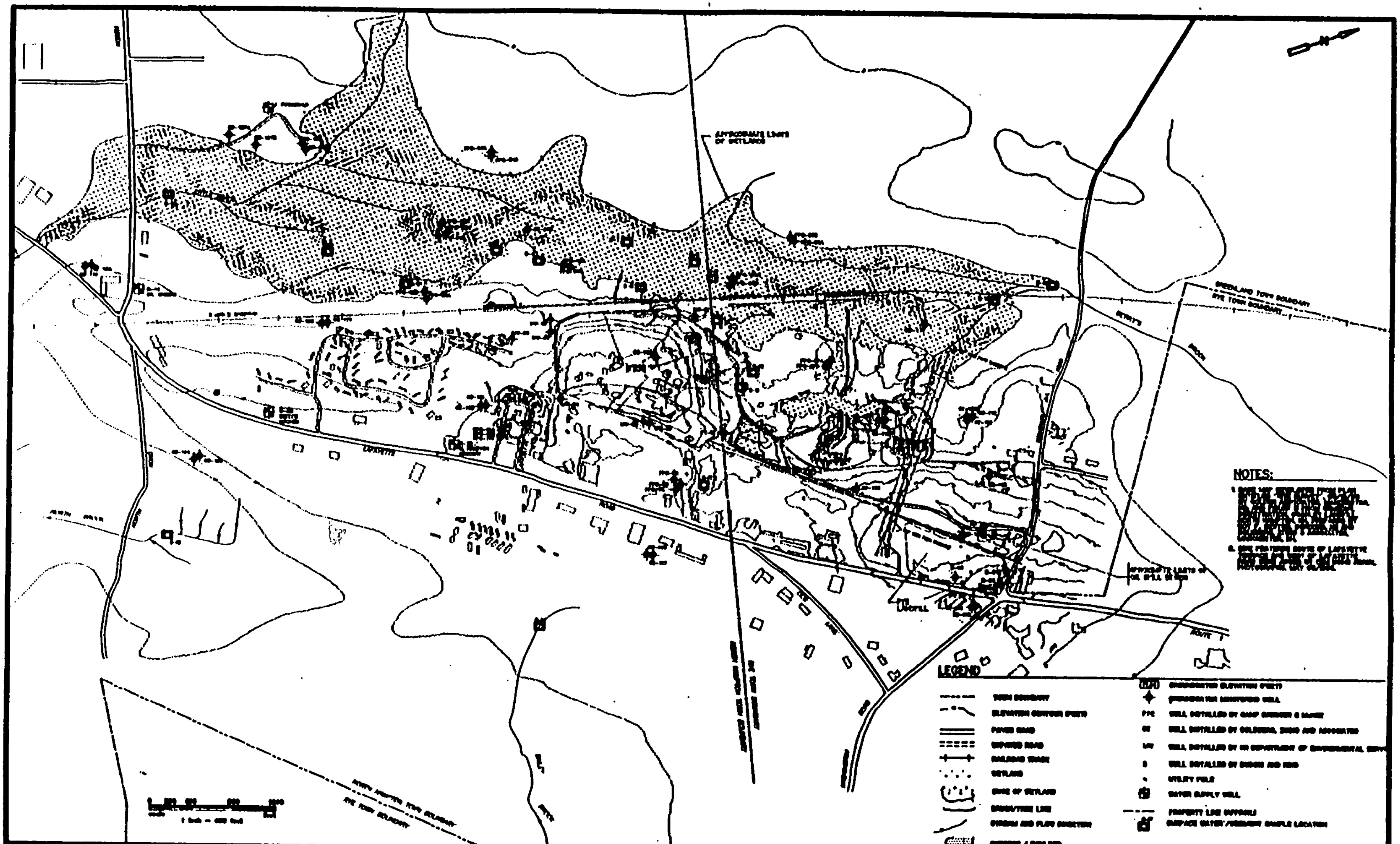


COAKLEY LANDFILL
NORTH HAMPTON, NH

STUDY AREA BASE MAP

CDM
environmental engineers, scientists, planners, & management consultants

FIGURE No.2

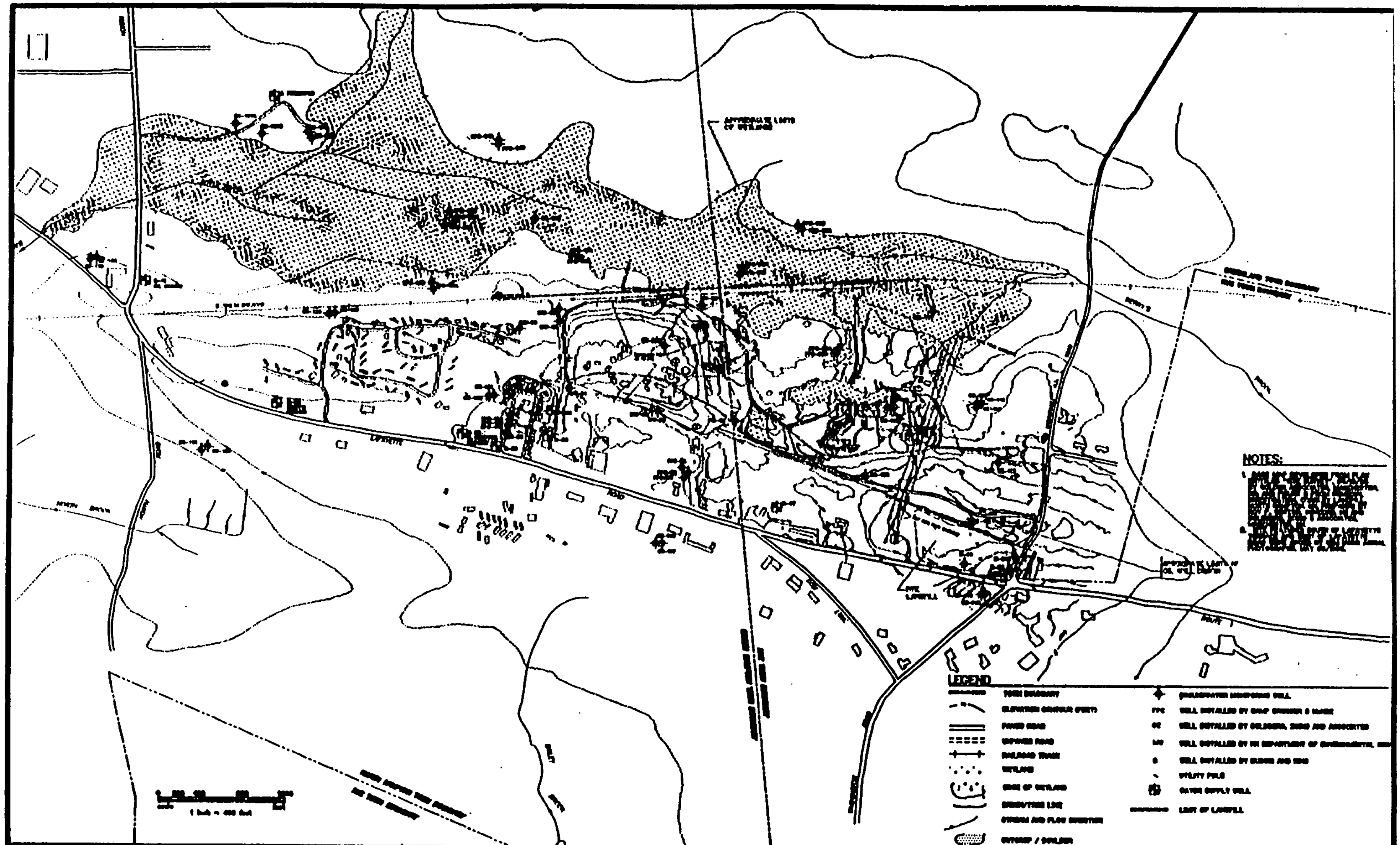


COAKLEY LANDFILL
NORTH HAMPTON, NH

SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS

CDM
environmental engineers, scientists, planners, & management consultants

FIGURE No. 3

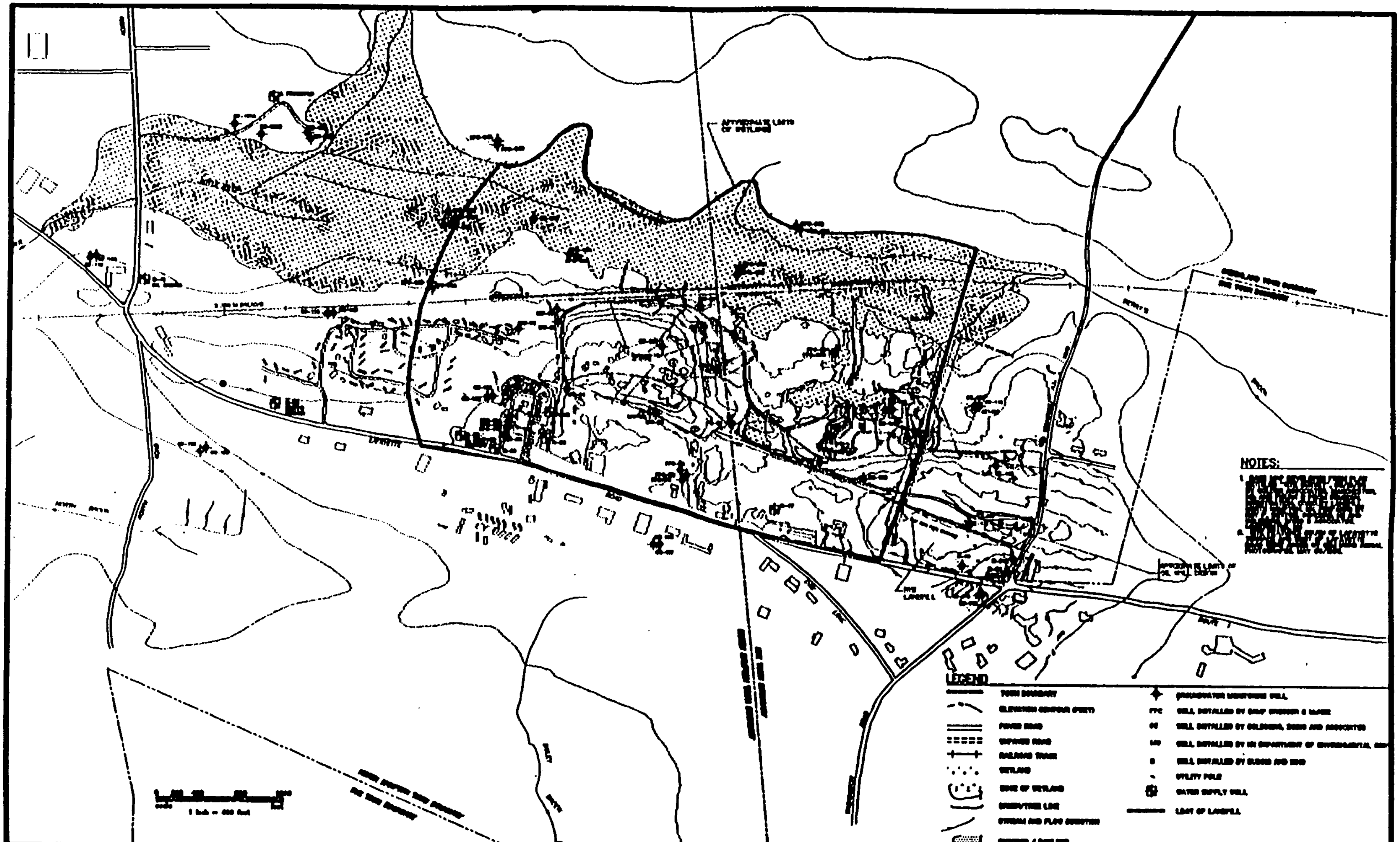


COAKLEY LANDFILL
NORTH HAMPTON, NH

GROUNDWATER MONITORING WELL LOCATION PLAN

CDM
environmental engineers, scientists, planners, & management consultants

FIGURE No.4



COAKLEY LANDFILL
NORTH HAMPTON, NH

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ESTIMATED AREA OF INSTITUTIONAL CONTROLS LOCATION PLAN

FIGURE No.5

APPENDIX B

TABLES

TABLE 1: SUMMARY OF CONTAMINANTS OF CONCERN IN OVERBURDEN GROUNDWATER

Contaminants of Concern	Average Concentration (ug/l)	Maximum Concentration (ug/l)	Frequency of Detection
Volatile Organic Compounds			
Benzene	5.7	30	14/57
Chlorobenzene	4.7	17	15/57
1,2-Dichloropropane	1.1	10	2/57
Vinyl Chloride	0.53	1	1/57
Semi-Volatile Organic Compounds			
4-Methylphenol	ND	ND	0/56
Inorganics			
Antimony	18	37	3/39
Arsenic	36	210	44/47
Barium	420	1,500	47/47
Beryllium	4.5	16	22/47
Chromium	240	980	41/47
Lead	56	160	41/47
Manganese	6,000	21,600	47/47
Nickel	200	700	42/47
Vanadium	180	680	41/47
Zinc	240	980	35/39

TABLE 2: SUMMARY OF CONTAMINANTS OF CONCERN IN BEDROCK GROUNDWATER

Contaminants of Concern	Average Concentration (ug/l)	Maximum Concentration (ug/l)	Frequency of Detection
Volatile Organic Compounds			
Benzene	3.3	19	11/47
Chlorobenzene	3.1	24	12/47
1,2-Dichloropropane	0.88	4	6/47
Vinyl Chloride	0.53	1	1/47
Semi-Volatile Organic Compounds			
4-Methylphenol	90	1,100	6/50
Inorganics			
Antimony	14	50	1/38
Arsenic	9.5	26	24/42
Barium	170	640	36/41
Beryllium	2	12	8/42
Chromium	88	340	8/43
Lead	14	52	13/43
Manganese	2,000	5,300	43/43
Nickel	100	470	30/43
Vanadium	73	350	23/43
Zinc	93	440	27/40

TABLE 3: SUMMARY OF CONTAMINANTS OF CONCERN IN RESIDENTIAL/COMMERCIAL GROUNDWATER WELLS

Contaminants of Concern	Average Concentration (ug/l)	Maximum Concentration (ug/l)	Frequency of Detection
Arsenic	2.5	3	3/15
Barium	17	32	10/21
Chromium	31	113	6/21
Lead	22	43	12/21
Manganese	759	1,900	21/21
Nickel	25	64	6/21
Vanadium	6.8	11	6/21
Zinc	2,300	8,400	14/21

TABLE 4: SUMMARY OF CONTAMINANTS OF CONCERN IN SURFACE WATER (STREAMS ONLY)

Contaminants of Concern	Average Concentration (ug/l)	Maximum Concentration (ug/l)	Frequency of Detection
Arsenic	ND	ND	0/7
Barium	18	27	7/9
Beryllium	ND	ND	0/9
Lead	11	36	8/9
Manganese	460	980	9/9
Vanadium	1.7	2.6	1/9

TABLE 5: SUMMARY OF CONTAMINANTS OF CONCERN IN SURFACE WATER (STREAMS, WETLAND & LANDFILL RUNOFF)

Contaminants of Concern	Average Concentration (ug/l)	Maximum Concentration (ug/l)	Frequency of Detection
Arsenic	24	130	10/30
Barium	430	4,900	24/31
Beryllium	2	2.9	4/31
Lead	51	300	24/31
Manganese	6,100	41,000	30/31
Vanadium	23	76	17/31

TABLE 6: SUMMARY OF CONTAMINANTS OF CONCERN IN SEDIMENT (STREAMS, WETLAND & LANDFILL RUNOFF)

Contaminants of Concern	Average Concentration (mg/kg)	Maximum Concentration (mg/l)	Frequency of Detection
Semi-Volatile Organic Compounds			
Total Carcinogenic PAHs	0.91	0.91	43/171
Inorganics			
Arsenic	14	64	32/32
Barium	62	110	32/32
Beryllium	0.69	2.2	17/27
Manganese	500	2,500	32/32
Mercury	0.21	1.3	10/28
Nickel	22	42	31/31
Vanadium	25	46	32/32
Zinc	47	78	32/34

TABLE 7: SUMMARY OF CONTAMINANTS OF CONCERN IN SEDIMENT (STREAMS)

Contaminants of Concern	Average Concentration (mg/kg)	Maximum Concentration (mg/l)	Frequency of Detection
Semi-Volatile Organic Compounds			
Total Carcinogenic PAHs	0.84	0.84	21/48
Inorganics			
Arsenic	7.7	13	9/9
Barium	46	75	9/9
Beryllium	0.61	1.1	6/9
Manganese	230	280	9/9
Mercury	0.28	0.4	5/9
Nickel	25	35	9/9
Vanadium	28	46	9/9
Zinc	52	78	8/9

TABLE 8

CARCINOGENIC RISKS FOR THE POSSIBLE FUTURE INGESTION OF OVERBURDEN GROUNDWATER BY ADULTS

Contaminant of Concern (Class)	Conc. (mg/L) ave	max	Exposure Factor (L/kg/day)	Cancer Potency Factor $(mg/kg\text{-}dy)^{-1}$		Risk Estimate ave	RME
antimony	0.018	0.037	$1.2x10^{-2}$	-		-	-
arsenic (A)	0.036	0.21	$1.2x10^{-2}$	1.75		$7.6x10^{-4}$	$4.4x10^{-3}$
barium	0.42	1.5	$1.2x10^{-2}$	-		-	-
benzene (A)	0.0057	0.03	$1.2x10^{-2}$	0.029		$2.0x10^{-6}$	$1.0x10^{-5}$
beryllium (B2)	0.0045	0.016	$1.2x10^{-2}$	4.3		$2.3x10^{-4}$	$8.3x10^{-4}$
chlorobenzene(D)	0.0047	0.017	$1.2x10^{-2}$	-		-	-
chromium (D)	0.24	0.98	$1.2x10^{-2}$	-		-	-
1,2-dichloropropane(B2)	0.0011	0.01	$1.2x10^{-2}$	0.067		$8.8x10^{-7}$	$8.0x10^{-6}$
lead (B2)	0.056	0.16	$1.2x10^{-2}$	-		-	-
manganese (D)	6	21.6	$1.2x10^{-2}$	-		-	-
nickel	0.2	0.7	$1.2x10^{-2}$	-		-	-
vanadium (D)	0.18	0.68	$1.2x10^{-2}$	-		-	-
vinyl chloride (A)	0.00053	0.001	$1.2x10^{-2}$	1.9		$1.2x10^{-5}$	$2.3x10^{-5}$
zinc (D)	0.24	0.98	$1.2x10^{-2}$	-		-	-
					SUM	$1.0x10^{-3}$	$5.3x10^{-3}$

TABLE 8A

NONCARCINOGENIC RISKS FOR THE POSSIBLE FUTURE INGESTION OF OVERBURDEN GROUNDWATER BY ADULTS

Contaminant of Concern	Conc. (mg/l.) ave	Conc. (mg/l.) max	Exposure Factor (L/kg/day)	Reference Dose (mg/kg/dy)	Toxicity Endpoint	Hazard Quotient ave	Hazard Quotient RME
antimony	0.018	0.037	0.027	0.0004	blood	1.2	2.5
arsenic	0.036	0.21	0.027	0.0003	skin	3.2	19
barium	0.42	1.5	0.027	0.07	cardiovas.	0.16	0.58
benzene	0.0057	0.03	0.027	-	-	-	-
beryllium	0.0045	0.016	0.027	0.005	none	$2.4x10^{-2}$	$8.6x10^{-2}$
chlorobenzene	0.0047	0.017	0.027	0.02	liver	$6.3x10^{-3}$	$2.3x10^{-2}$
chromium	0.24	0.98	0.027	1	none	$6.5x10^{-3}$	$2.6x10^{-2}$
1,2-dichloropropane	0.0011	0.01	0.027	-	-	-	-
lead *	0.056	0.16	0.027	-	-	-	-
manganese	6	21.6	0.027	0.005	CNS	32	120
nickel	0.2	0.7	0.027	0.02	organ wt.	0.27	0.95
vanadium	0.18	0.68	0.027	0.007	liver	0.69	2.6
vinyl chloride	0.00053	0.001	0.027	-	-	-	-
zinc	0.24	0.98	0.027	0.3	blood	$2.2x10^{-2}$	$8.8x10^{-2}$
					ENDPOINT HIs		
					CNS	32	120
					SKIN	3.2	19
					BLOOD	1.2	2.5
					LIVER	0.7	2.6

* - Lead is evaluated quantitatively by use of EPA's IEUBK Model, Version 0.5. See Human Health Risk Assessment.

TABLE 9

CARCINOGENIC RISKS FOR THE POSSIBLE FUTURE INGESTION OF BEDROCK GROUNDWATER BY ADULTS

Contaminant of Concern (Class)	Conc. (mg/L) ave	Conc. (mg/L) max	Exposure Factor (L/kg/day)	Cancer Potency Factor (mg/kg-dy)-1		Risk Estimate ave	Risk Estimate RME
antimony	0.014	0.05	$1.2x10^{-2}$	-		-	-
arsenic (A)	0.0095	0.026	$1.2x10^{-2}$	1.75		$2.0x10^{-4}$	$5.5x10^{-4}$
barium	0.17	0.64	$1.2x10^{-2}$	-		-	-
benzene (A)	0.0033	0.019	$1.2x10^{-2}$	0.029		$1.1x10^{-6}$	$6.6x10^{-6}$
beryllium (B2)	0.002	0.012	$1.2x10^{-2}$	4.3		$1.0x10^{-4}$	$6.2x10^{-4}$
chlorobenzene(D)	0.0031	0.024	$1.2x10^{-2}$	-		-	-
chromium (D)	0.088	0.34	$1.2x10^{-2}$	-		-	-
1,2-dichloropropane(B2)	0.00088	0.004	$1.2x10^{-2}$	0.067		$7.1x10^{-7}$	$3.2x10^{-6}$
lead (B2)	0.014	0.052	$1.2x10^{-2}$	-		-	-
manganese (D)	2	5.3	$1.2x10^{-2}$	-		-	-
nickel	0.1	0.47	$1.2x10^{-2}$	-		-	-
vanadium (D)	0.073	0.35	$1.2x10^{-2}$	-		-	-
vinyl chloride (A)	0.0002	0.0002	$1.2x10^{-2}$	1.9		$4.6x10^{-6}$	$4.6x10^{-6}$
zinc (D)	0.093	0.44	$1.2x10^{-2}$	-		-	-
					SUM	$3.1x10^{-4}$	$1.2x10^{-3}$

TABLE 9A

NONCARCINOGENIC RISKS FOR THE POSSIBLE FUTURE INGESTION
OF BEDROCK GROUNDWATER BY ADULTS

Contaminant of Concern	Conc. (mg/L)		Exposure Factor (L/kg/day)	Reference Dose (mg/kg/dy)	Toxicity Endpoint	Hazard Quotient	
	ave	max				ave	RME
antimony	0.014	0.05	2.7×10^{-2}	0.0004	blood	0.95	3.4
arsenic	0.0095	0.026	2.7×10^{-2}	0.0003	skin	0.86	2.3
barium	0.17	0.64	2.7×10^{-2}	0.07	cardiovas.	6.6×10^{-2}	0.25
benzene	0.0033	0.019	2.7×10^{-2}	-	-	-	-
beryllium	0.002	0.012	2.7×10^{-2}	0.005	none	1.1×10^{-2}	6.5×10^{-2}
chlorobenzene	0.0031	0.024	2.7×10^{-2}	0.02	liver	4.2×10^{-3}	3.2×10^{-2}
chromium	0.088	0.34	2.7×10^{-2}	1	none	2.4×10^{-3}	9.2×10^{-3}
1,2-dichloropropane	0.00088	0.004	2.7×10^{-2}	-	-	-	-
lead *	0.014	0.052	2.7×10^{-2}	-	-	-	-
manganese	2	5.3	2.7×10^{-2}	0.005	CNS	11	29
nickel	0.1	0.47	2.7×10^{-2}	0.02	organ wt.	0.14	0.63
vanadium	0.073	0.35	2.7×10^{-2}	0.007	liver	0.28	1.4
vinyl chloride	0.0002	0.0002	2.7×10^{-2}	-	-	-	-
zinc	0.093	0.44	2.7×10^{-2}	0.3	blood	8.4×10^{-3}	4.0×10^{-2}
					ENDPOINT HIs		
					CNS	11	29
					SKIN	0.9	2.3
					BLOOD	1	3.4
					LIVER	0.3	1.4

* - Lead is evaluated quantitatively by use of EPA's IEUBK Model, Version 0.5. See Human Health Risk Assessment.

TABLE 10

CARCINOGENIC RISKS FOR THE POSSIBLE FUTURE INGESTION
OF GROUNDWATER IN RESIDENTIAL/COMMERCIAL WELLS BY ADULTS

Contaminant of Concern (Class)	Conc. (mg/L) ave	max	Exposure Factor (L/kg/day)	Cancer Potency Factor (mg/kg-dy)-1		Risk Estimate ave	RME
arsenic (A)	0.0025	0.003	$1.2x10^{-2}$	1.75		$5.3x10^{-5}$	$6.3x10^{-5}$
barium	0.017	0.032	$1.2x10^{-2}$	-		-	-
chromium (D)	0.031	0.113	$1.2x10^{-2}$	-		-	-
lead (B2)	0.022	0.043	$1.2x10^{-2}$	-		-	-
manganese (D)	0.759	1.9	$1.2x10^{-2}$	-		-	-
nickel	0.025	0.064	$1.2x10^{-2}$	-		-	-
vanadium (D)	0.0068	0.011	$1.2x10^{-2}$	-		-	-
zinc (D)	2.3	8.4	$1.2x10^{-2}$	-		-	-
					SUM	$5.3x10^{-5}$	$6.3x10^{-5}$

TABLE 10A

NONCARCINOGENIC RISKS FOR THE POSSIBLE FUTURE INGESTION OF GROUNDWATER RESIDENTIAL/COMMERCIAL WELLS BY ADULTS

Contaminant of Concern	Conc. (mg/L) ave	Conc. (mg/L) max	Exposure Factor (L/kg/day)	Reference Dose (mg/kg/dy)	Toxicity Endpoint	Hazard Quotient ave	Hazard Quotient RME
arsenic	0.0025	0.003	2.7×10^{-2}	0.0003	skin	0.23	0.27
barium	0.017	0.032	2.7×10^{-2}	0.07	cardiovas.	6.6×10^{-3}	1.2×10^{-2}
chromium	0.031	0.113	2.7×10^{-2}	1	none	8.4×10^{-4}	3.1×10^{-3}
lead*	0.022	0.043	2.7×10^{-2}	-	CNS	-	-
manganese	0.759	1.9	2.7×10^{-2}	0.005	CNS	4.1	10
nickel	0.025	0.064	2.7×10^{-2}	0.02	organ wt.	3.4×10^{-2}	8.6×10^{-2}
vanadium	0.0068	0.011	2.7×10^{-2}	0.007	liver	2.6×10^{-2}	4.2×10^{-2}
zinc	2.3	8.4	2.7×10^{-2}	0.3	blood	0.21	0.76
					ENDPOINT HIs		
					CNS	4.1	10
					SKIN	0.2	0.3
					BLOOD	0.2	0.8
					LIVER	0.03	0.04

* - Lead is evaluated quantitatively by use of EPA's IEUBK Model, Version 0.5. See Human Health Risk Assessment.

TABLE 13

COAKLEY LANDFILL SUPERFUND SITE
NORTH HAMPTON, NH

RECORD OF DECISION FOR OU-2

ARARs FOR REMEDY MM-2

Media	Type/#	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARARs
Groundwater - Federal	Chemical Specific/1	Safe Drinking Water Act, Maximum Contaminant Levels (MCLs), 40 CFR, Part 141	Relevant and Appropriate	MCLs have been promulgated for a number of organic and inorganic contaminants. These levels regulate the concentration of contaminants in drinking water supplies. MCLs are considered relevant and appropriate for groundwater because it is federally classified as a potential drinking water source.	Through a combination of reduction in landfill infiltration and natural attenuation, constituents of concern will meet MCLs, and this ARAR will be attained. Long-term monitoring will be performed to ensure that these standards are met.
Groundwater - Federal	Chemical Specific/2	Safe Drinking Water Act, Maximum Contaminant Level Goals (MCLGs), 40 CFR, Part 141	Relevant and Appropriate	Non-enforceable health goals for public water systems. The USEPA has promulgated non-zero MCLGs for specific contaminants.	Through a combination of reduction in landfill infiltration and natural attenuation, constituents of concern will meet non-zero MCLGs, and this ARAR will be attained. Long-term monitoring will be performed to ensure that these standards are met.
Groundwater - Federal	Chemical Specific/3	Safe Drinking Water Act (SDWA) - Maximum Contaminant Levels (MCLs) (40 CFR 141.11 - 141.16)	To Be Considered	MCLs have been promulgated for a number of common organic and inorganic contaminants. These levels regulate the contaminants in public drinking water supplies but may also be considered relevant and appropriate for groundwater aquifers potentially used for drinking water.	When the risks to human health due to consumption of groundwater were assessed, concentrations of contaminants of concern were compared to their MCLs and were included as a component of the risk assessment.
Groundwater - Federal	Chemical Specific/4	USEPA Human Health Assessment Cancer Slope Factors (CSFs)	To Be Considered	CSFs are developed by EPA for health effects assessments or evaluation by the Human Health Assessment Group (HHAG)	These values present the most up to date cancer risk potency information. CSFs shall be used to compute the individual cancer risk resulting from exposure to contaminants.
Groundwater - Federal	Chemical Specific/5	Safe Drinking Water Act, Maximum Contaminant Level Goals (MCLGs), 40 CFR, Part 141	To be considered	MCLGs are non-enforceable health goals. They establish drinking water quality goals at levels of no known or anticipated health effects with an adequate margin of safety.	Groundwater contaminant concentrations were compared to non-zero MCLGs and were included as one component of the risk assessment.
Groundwater - Federal	Chemical Specific/6	U.S. EPA Risk Reference Doses (RfD's)	To be considered	RfD's are dose levels developed based on the noncarcinogenic effects.	U.S. EPA RfD's were used to characterize risks due to exposure to contaminants in groundwater (for ingestion pathways).

TABLE 13

COAKLEY LANDFILL SUPERFUND SITE
NORTH HAMPTON, NH

RECORD OF DECISION FOR OU-2

ARARs FOR REMEDY MM-2

Media	Type/#	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARARs
Groundwater - Federal	Chemical Specific/7	U.S. EPA Carcinogen Assessment Group Potency Factors	To be considered	Potency factors are developed by the EPA from Health Effects Assessments or evaluation by the Carcinogens Assessment Group.	U.S. EPA Carcinogenic Potency Factors were used to compute the individual incremental cancer risk resulting from exposure to site contaminants.
Groundwater - Federal	Action Specific/1	RCRA - Groundwater Protection (40 CFR 264) Subpart F	Relevant and Appropriate	This regulation details requirements for a groundwater monitoring program to be installed at the site.	A groundwater monitoring program is a component of all alternatives. All groundwater monitoring requirements of this subpart will be met.
Groundwater - State	Action Specific/2	N.H. Admin. Code Env-Ws 604, Abandonment of Wells	Applicable	This provision requires that abandoned wells must be sealed to prevent the entry of contaminants into the groundwater.	Once monitoring wells have fulfilled their useful life, requirements for closure will be followed.
Groundwater - State	Chemical Specific/1	Ambient Groundwater Quality Standards, 410.05	Applicable	Standards for quality of groundwater.	When the state standards are more stringent than federal MCLs, and non zero MCLGs, the state standards are used.
Groundwater - State	Chemical Specific/2	New Hampshire Primary Drinking Water Criteria (MCLs and MCLGs) under RSA Ch. 485, promulgated at Env-Ws 316 and 317	Relevant and Appropriate	Standards for public drinking water system. Used as cleanup standards for aquifers and surface water bodies that are potential drinking water sources.	Through a combination of reduction of landfill infiltration and natural attenuation, constituents of concern will meet these state standards if they are more stringent than federal MCLs and non-zero MCLGs. Long term monitoring will ensure that these standards are met.
Groundwater - State	Chemical Specific/3	Groundwater Quality Criteria, Env-Ws 410.03 (a) and (b)	Applicable	Groundwater shall be suitable for use as drinking water without treatment and shall not contain any regulated contaminant in concentrations greater than ambient groundwater quality standards established in Env-Ws 410.05.	Remedial action will be required to treat affected groundwater or eliminate discharge of substances that may be harmful to the drinking water or groundwater, which may include substances exceeding 10^{-6} cancer risk level health advisory limits.
Groundwater - State	Chemical Specific/4	Groundwater Quality Criteria, Env-Ws 410.03 (c)	Applicable	Unless naturally occurring, groundwater shall not contain any contaminants at concentrations such that the natural discharge of that groundwater to surface water results in a violation of surface standards in any surface water body within or adjacent to the site, unless the groundwater discharge is exempt under Env-Ws 410.04.	Groundwater must be remediated to ensure nondegradation of surface water. Any discharges to groundwater must not cause any degradation to surface water so as to violate surface water quality standards in adjacent surface waters. Class B waters are to be maintained as acceptable for use, after adequate treatment, as water supplies.

TABLE 13

COAKLEY LANDFILL SUPERFUND SITE
NORTH HAMPTON, NH

RECORD OF DECISION FOR OU-2

ARARs FOR REMEDY MM-2

Media	Type/#	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARARs
Groundwater - State	Location Specific/1	Env-Ws 410.26 Groundwater Management Zone	Relevant and Appropriate	At contaminated sites, requires groundwater management zone to be designated and use restricted.	Use of groundwater extraction from wells within the groundwater cleanup area will be restricted by institutional controls and/or groundwater management zone requirements. All other relevant and appropriate provisions of Env-Ws 410.26 will be implemented.
Groundwater - State	Action Specific/3	Requirements for Owners and Operators of Hazardous Waste Facilities, Env-Wm 700 and as follows:		These provisions establish operating and monitoring requirements for owners and operators of hazardous waste facilities, as well as general, environmental, health and design requirements.	Remedial activities which include construction of a hazardous waste facility must meet the requirements listed below.
		En-Wm 707.02(l) Groundwater Monitoring	Relevant and Appropriate	Requires operators of existing hazardous waste facilities to comply with the requirements of 40 CFR Subpart F.	A groundwater monitoring program will be installed as required to monitor groundwater within the groundwater cleanup area.
		Env-Wm 702.11/.12 Groundwater and Other Monitoring	Relevant and appropriate	Specified types of hazardous waste treatment facilities must monitor migration of hazardous waste as specified.	A groundwater monitoring program will be installed as required to monitor groundwater within the groundwater cleanup area.
Groundwater - State	Action Specific/4	Env-Ws 410.24(a) and (b), Criteria for Remedial Action	Applicable	Requires remedial action for groundwater to ensure protection of human health and the environment and attain the groundwater quality criteria of Env-Ws 410.03.	The remedy must achieve these specific goals.
Groundwater - State	Action Specific/5	Env-Ws 410.27, Groundwater Management Permit Compliance Criteria	Applicable	Where an approved remedial action plan fails to meet performance standards, a revised plan must be developed. Additional investigation or remedial action may be required. Groundwater must be monitored and managed in accordance with the plan until contamination sources ar removed or treated and compliance with groundwater quality criteria are achieved.	If the remedy fails to meet performance standards, the remedy will be reviewed and a revised plan will be adopted. Groundwater must be monitored and managed as prescribed.

TABLE 13

COAKLEY LANDFILL SUPERFUND SITE
NORTH HAMPTON, NH

RECORD OF DECISION FOR OU-2

ARARs FOR REMEDY MM-2

Media	Type/#	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARARs
Surface Water - Federal	Chemical Specific/1	Clean Water Act (CWA) Federal Ambient Water Quality Criteria (AWQC) 40 CFR 122.44	Applicable	Federal AWQC are health-based criteria that have been developed for 95 carcinogenic and noncarcinogenic compounds.	AWQC were considered in characterizing human health risks and toxic effects on aquatic organisms due to concentrations in surface water. Because this water is not used as a drinking water source, and is not good habitat for fish, only the criteria for aquatic organism protection were relevant. These standards will be met for any discharge to surface water.
Surface Water - State	Chemical Specific/1	RSA 485-A:8	Applicable	This identifies physical, chemical, and bacteriological standards Class A, B, and C waters must satisfy.	These set cleanup standards for waters that are potential drinking water supplies. These standards are also used to determine compliance with the Stat's nondegradation policy.
Surface Water - State	Chemical Specific/2	RSA 485-A:12	Applicable	This prohibits discharges that will lower the quality of any surface water below the minimum requirements of the surface water classification. Specific standards for classification of surface waters are found at RSA 485-A:8.	Remedial Action should eliminate any discharge to surface waters in or adjacent to the site which lowers the quality of any surface water body below the applicable classification requirements.
Surface Water - State	Chemical Specific/3	Env-432	Relevant and appropriate	Water quality criteria for toxic substances in fresh and marine waters are established. They are essentially the same as the federal ambient water quality criteria.	Discharges to surface waters in or adjacent to the site must meet NH's surface water quality standards to the extent they are more stringent then the federal criteria
Air Quality - State	Action Specific/1	N.H. Admin. Rules, Env-A 1002 Fugitive Dust	Applicable	Construction and excavation activities restricted from causing fugitive dust.	Construction and/or excavation for access roads or well or pipe installation shall control fugitive dust in accordance with this regulation.
Wetland - Federal	Location Specific/1	CWA - Section 404	Applicable	This regulation outlines requirements for discharges of dredged or fill material. Under this requirement, no activity that affects a wetland shall be permitted if a practicable alternative that has less impact on the wetland is available. If there is no other practicable alternative, impacts must be mitigated.	Activities in wetlands will comply with the substantive provisions of this regulation.

TABLE 13

COAKLEY LANDFILL SUPERFUND SITE
NORTH HAMPTON, NH

RECORD OF DECISION FOR OU-2

ARARs FOR REMEDY MM-2

Media	Type/#	Requirement	Status	Requirement Synopsis	Action to be Taken to Attain ARARs
Wetland - Federal	Location Specific/2	Wetlands Executive Order (EO 11990), 40 CFR Part 6 Appendix A	Applicable	Under this regulation, federal agencies are required to minimize the destruction, loss, or degradation of wetlands and preserve and enhance natural and beneficial values of wetlands.	Construction in wetlands must include all practicable means of minimizing harm to wetlands. Wetlands protection considerations must be incorporated into the planning and decision making about remedial alternatives.
Wetland - Federal	Location Specific/3	Flood Plains Executive Order (EO 11988) 40 CFR Part 6 Appendix A	Applicable	Federal agencies are required to reduce the risk of flood loss, to minimize impact of floods, and to restore and preserve the natural and beneficial value of flood plains.	The potential effects of any action must be evaluated to ensure that the planning and decision making reflect consideration of flood hazards and flood plain management, including restoration and preservation of natural underdeveloped floor plains.
Wetland - State	Location Specific/1	Criteria F and Conditions for Fill and Dredge in Wetlands: RSA 482-A, Env Wt 300-400, 600.	Applicable	These regulations are promulgated under the New Hampshire Wetlands Board, which regulate dredging, filling, altering, or polluting inland wetlands.	Filling or other activities in or adjacent to wetlands will comply with these requirements.
Wetland - State	Location Specific/2	Dredging and Control of Run-off: RSA 485-A:17 Dredging Rules: Env-Ws 415	Applicable	These regulate activities in or near surface waters which may impact water quality, impede natural runoff or create unnatural runoff.	Filling or other activities in or adjacent to wetlands will comply with these requirements.
Wetland - State	Location Specific/3	RSA 217A NH Native Plant Protection Act	Applicable	Prohibits damaging plant species listed as endangered within the state.	Listed species will be identified and remedial activities will comply with requirements.
Wetland - State	Location Specific/4	Res-N 100-300	Applicable	Prohibits damaging plant species listed as endangered within the state.	Listed species will be identified and remedial activities will comply with requirements.

APPENDIX C

RESPONSIVENESS SUMMARY

COAKLEY LANDFILL
MANAGEMENT OF MIGRATION

RESPONSIVENESS SUMMARY

COAKLEY LANDFILL MANAGEMENT OF MIGRATION
RESPONSIVENESS SUMMARY

Preface

The U.S. Environmental Protection Agency (EPA) held a 61 day public comment period from June 2, 1994 to August 1, 1994 to provide an opportunity for interested parties to comment on the Remedial Investigation and Feasibility Study Report (RI/FS) and the Proposed Plan prepared for the Coakley Landfill Superfund Site (the Site) in North Hampton, New Hampshire. This is the second operable unit (OU-2) Responsiveness Summary for the management of migration remedy. The first operable unit was for the source control remedy and the ROD and responsiveness summary was signed in June 1990. As part of the OU-2 RI/FS the Human Health Risk Assessment and the Ecological Risk Assessment are presented. EPA made a preliminary recommendation of its preferred alternative for Management of Migration Remediation in the Proposed Plan issued on May 23, 1994, before the start of the public comment period.

The purpose of the Responsiveness Summary is to document EPA's responses to comments and questions raised during the public comment period. EPA considered all of the comments summarized in this document before selecting a final Management of Migration remedial alternative to address contamination at the Site.

This Responsiveness Summary is organized into the following sections:

I. Overview of Remedial Alternatives Considered in the Feasibility Study and Proposed Plan - This section briefly outlines the remedial alternatives evaluated in the FS and Proposed Plan, including EPA's preliminary recommendation of a preferred alternative.

II. Site History and Background on Community Involvement and Concerns - This section provides a brief Site history, and a general overview of community interests and concerns regarding the Site.

III. Summary of Comments Received During the Public Comment Period and EPA Responses to These Comments - This section summarizes and provides EPA's responses to the comments received from residents and other interested parties during the public comment period. During the comment period there was a letter received by the Regional Administrator, John P. DeVillars from Senator Bob Smith which is Attachment E of this document. Additionally, comments received from the Potentially Responsible Parties (PRPs) are summarized and EPA's responses to the comments are provided.

Attachment A - List of community relations activities that EPA has conducted to date at the Site.

Attachment B - Potentially Responsible Parties' comments

Attachment C - Transcript of the June 21, 1994 informal public hearing on the Site, held in North Hampton, New Hampshire.

Attachment D - Guidance and other documents on Institutional controls and residential property at Superfund Sites.

I. OVERVIEW OF REMEDIAL ALTERNATIVES CONSIDERED IN THE FEASIBILITY STUDY AND PROPOSED PLAN

Using information gathered during the Remedial Investigation (RI) (an investigation of the nature and extent of contamination) and the Risk Assessment (an assessment of the potential risks to human health and the environment associated with the contamination migrating from the site), EPA identified several cleanup objectives for the Site.

The primary cleanup objective is to reduce the risks to public health and the environment posed by exposure to contamination that migrates off-site away from the landfill source. (Source control at the landfill was the subject of operable unit 1.) Cleanup goals for groundwater are set at levels that EPA considers to be protective of public health and the environment.

After identifying the cleanup objectives, EPA developed and evaluated potential cleanup alternatives, called remedial alternatives. The Feasibility Study (FS) describes the remedial alternatives considered to address groundwater, surface water, and sediment contamination associated with off-site migration. The FS also describes the criteria EPA used to narrow the range of alternatives to four.

EPA's preferred alternative to address the off-site contamination includes institutional controls to prevent use of contaminated groundwater, natural attenuation of the contaminated groundwater and groundwater monitoring.

REMEDIAL ALTERNATIVE EVALUATED IN THE OU-2 FEASIBILITY STUDY

The four management of migration remedial alternatives considered for detailed analysis by EPA are listed below. The May 1994 Proposed Plan should be consulted for a detailed explanation of these remedial alternatives as well as EPA's preferred alternative.

<u>ALTERNATIVES TO ADDRESS MANAGEMENT OF MIGRATION</u>

Alternative MM-1: No Action

Alternative MM-2: Limited Action, Natural Attenuation and Groundwater Monitoring (EPA has recommended this as the preferred alternative)

Alternative MM-3: Groundwater Treatment/On-Site Disposal in Conjunction with OU-1 Groundwater Treatment System

Alternative MM-4: Groundwater Treatment/On-Site Disposal (separate system)

II. SITE HISTORY AND BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

The Coakley Landfill Superfund Site is situated on approximately 100 acres of land within the Towns of Greenland and North Hampton, New Hampshire. It is located west of Lafayette Road (U.S. Route 1) and bordered on the north by Breakfast Hill Road. The landfill itself covers approximately 27 acres and is situated within the southernmost portion of the Site.

In 1971, the New Hampshire Department of Public Health granted the Town of North Hampton a permit to operate a landfill on the Coakley Site. The Coakley Landfill accepted municipal and industrial waste from the Portsmouth area from early 1972 through 1983 and incinerator residue generated by an incinerator located at Pease Air Force Base from 1982 through 1985. The landfill stopped accepting material in July 1985. A temporary cap was eventually placed on the landfill.

In early 1983 the New Hampshire Department of Environmental Services (DES) (formerly the Water Supply and Pollution Control Commission, or WSPCC) received a complaint from a resident of Lafayette Terrace, near the southeastern corner of the Coakley Landfill, concerning drinking water quality in a residential well. DES analysis determined that the well was contaminated with volatile organic compounds (VOCs).

Subsequent sampling of residential wells by DES detected additional areas of VOC contamination to the south, northeast, and southeast, of the Coakley Landfill site. As a result of these findings, water supply distribution lines were extended into the area in March 1983.

In December 1983 the site was placed on EPA's National Priorities List (NPL) making it eligible to receive Federal Superfund money for investigation and cleanup. The OU-1 RI was conducted at the Site from April 1986 to May 1987.

In general, results of the OU-1 RI indicated that VOCs and metals were observed to be the predominant contaminants within the landfill and in the overburden and bedrock wells under and immediately adjacent to the landfill.

Using data collected during the OU-1 RI, EPA developed a FS that included the initial screening of the source control (SC) remedial alternatives and the management of migration (MM) remedial alternatives. EPA's selected source control remedy was capping the landfill, on-site groundwater extraction and treatment and on-site disposal. Design of the preferred remedy is currently underway.

The OU-2 (Management of Migration) RI/FS was conducted from September 1990 to May 1994. The OU-2 RI indicated that landfill contamination had migrated off-site in the groundwater in the westerly direction into the wetland. Groundwater was the primary media contaminated with VOC's and metals while surface water and sediment were impacted to a lesser extent.

Foremost concerns of Town residents continue to focus on the potential health risks to residents living near the Site, the delay in action toward site cleanup, and the cost and responsibility for cleaning up the Site. Some residents believe that contamination from the Site caused and may cause serious health problems in the area. They are also concerned that continued delays in Site cleanup may result in further migration of contamination from the Site, causing an increase in potential health risks. Another concern of area residents is cost and responsibility for Site cleanup. Residents feel that the State and EPA are spending too much time and money on investigation rather than taking action to clean up the Site. Finally, many residents have expressed concern that EPA's proposed OU-2 remedial alternative unfairly penalizes adjacent property owners to the Coakley site. They were concerned that the proposed institutional controls would lower there property values and they would not be fairly compensated.

A complete list of community relations activities conducted at the Site is included in Attachment A at the end of this document.

III. SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND EPA RESPONSES TO THESE COMMENTS

This Responsiveness Summary summarizes the comments received during the public comment period held from June 2, 1994 to August 1, 1994. Six sets of written comments were received: four from individual residents and two from the Coakley Landfill Group (PRP comments). Three sets of the written comments received by EPA, were also presented orally at the informal public hearing held on June 21, 1994. In addition, two other people made comments orally at the informal public hearing. Public comments are summarized below. The PRP comments are included as Attachment B. A copy of the transcript from the informal public hearing is included as Attachment C of this document and is available in the Administrative Record located at the Site information repositories at the North Hampton Public Library North Hampton, New Hampshire and at the EPA Records Center, 90 Canal Street, Boston, Massachusetts. Attachment D contains some of EPA's guidances and reports on institutional controls and residential property at Superfund sites.

A. <u>Summary Of Resident Comments</u>

Comments from residents are summarized below. The comments are organized into the following categories:

1. Comments Regarding Site Characterization
2. Comments Regarding Remedial Alternatives
3. Comments Regarding the Preferred Alternative
4. Comments Regarding the Site's Impact to Property Owners
5. Comments Regarding the Coakley Landfill's Compliance with Federal, State and Local Regulations

1. Comments Regarding Site Characterization

Comment a: One commentor asked how contamination associated with the Rye Landfill which is located close to the Coakley Landfill was addressed in the Remedial Investigation.

EPA Response: The OU-2 investigation did not focus on the Rye Landfill. The focus was on the contamination associated specifically with the Coakley Landfill. Sample locations were selected based on the potential contaminant migration pathways identified in the work plan for the site and based on existing information from the first operable unit. The first operable unit RI/FS concluded that the groundwater from the Rye landfill is separated by the presence of high bedrock and groundwater levels in the area between the two landfills. Therefore, commingling of contaminants from the Coakley and Rye landfill is unlikely. OU-1 RI/FS results allowed for the OU-2 investigation to focus on contamination associated specifically with the Coakley Landfill.

Comment b: Several commentors questioned the assessment of the bedrock groundwater contamination at the site. Specific questions focused on what area of bedrock was assessed and the degree of certainty to which the extent of contamination was defined. One commentor ask if the information that bedrock was previously blasted and removed from the site was used.

EPA Response: EPA was aware that rock quarrying as well as sand and gravel mining activities were performed at the site and that bedrock was blasted and removed as part of the quarrying operation. The bedrock groundwater evaluation provided in the OU-2 RI refers to bedrock remaining at the site below the landfill and overburden soils. Rock blasting and excavation would have removed bedrock to a limited depth in the quarry area but bedrock would remain below that depth and throughout the site. The OU-2 RI information on bedrock groundwater is based on hydrological and analytical data from the nine new monitoring wells installed to depths of approximately 20 feet into the bedrock. Existing monitoring wells installed as part of prior investigations in the bedrock (e.g. GZ-105) were also a source of information. The OU-2 RI bedrock investigation focused on the shallow bedrock (upper 20 feet) which is more heavily fractured than deeper bedrock at the site and as a result is a more significant groundwater migration pathway.

The extent of bedrock groundwater contamination was conservatively defined based on the information obtained during this investigation and prior studies in the site area. With the conservative assumptions made in defining the extent of contamination, it is unlikely that significant contamination associated with the Coakley Landfill would be encountered in bedrock groundwater beyond the limits identified in the RI/FS.

Comment c: One commentor asked about the possibility of surface water runoff from the Coakley Landfill carrying contamination from the landfill onto his property approximately 1100 to 1200 feet away.

EPA Response: Surface water runoff was identified as one of the potential contaminant migration pathways at the site. Based on the sampling results of the surface water and sediment, there was no indication of contamination associated with the Coakley Landfill at distances over 1000 feet north of the landfill. Contamination was found in surface water and sediment locations immediately adjacent to the Coakley Landfill.

Comment d: One commentor asked if samples were taken at the bottom or sides of surface water bodies.

EPA Response: Sediment samples were collected at the bottom of the surface water bodies. The specific locations were chosen based on where sediment would most likely collect due to the site drainage characteristics.

Comment e: One commentor said actions by parties other than those identified as PRPs to date caused the problems at the Coakley Landfill.

EPA Response: The information available to EPA was used in development of the PRP list. EPA conducted a detailed PRP search to identify those parties liable for the cleanup at the Coakley Landfill site. A total of 60 parties were ultimately included in the final PRP list. Notification of the potential liability was based on the Superfund law which defines the liability of parties as:

i. an owner or operator of a facility were hazardous waste is disposed,

ii. a generator of the hazardous waste disposed of at the facility, and

iii. a transporter of hazardous waste to the facility.

EPA is always interested in obtaining any information on possible new PRPs. Information can be forwarded to Steven J. Calder (HSN-CAN5), EPA New England, JFK Federal Building, Boston, MA 02203-2211.

Comment f: One commentor asked about radioactive dust that was disposed of at the Coakley Landfill.

EPA Response: EPA found no evidence of any disposal of radioactive dust at the site. Several radioactive surveys done at the site during the OU-1 Remedial Investigation found only background (normal) radioactivity.

Comment g: One commentor asked who was responsible for the health affects of the residents at Lafayette Terrace who were drinking contaminated groundwater.

EPA Response: The PRPs may be responsible if it could be determined that health affects were caused by the exposure of contamination at Coakley Landfill.

2. Comments Regarding Remedial Alternatives

Comment a: One commentor questioned whether the shorter projected cleanup time associated with alternatives MM-3 and MM-4 was worth the additional cost and risk to the wetlands and whether a deed restriction (institutional controls) would be required for these alternatives.

EPA Response: The chosen remedy MM-2 is expected to achieve cleanup levels in approximately 11 years according to the groundwater model developed in the RI/FS. MM-3 and MM-4 are expected to achieve cleanup levels in 5 to 10 years. For groundwater remediation these time frames are considered similar due to the uncertainties with any groundwater extraction and treatment remediation.

Institutional controls are necessary in all the alternatives reviewed except for no-action MM-1 no action which is used as a comparison as required by EPA guidance.

Comment b: One commentor asked what the future uses of the Coakley Landfill Superfund Site would be.

EPA Response: The remedy selected for the Coakley Landfill contains the waste material under a cap which must be maintained until such time as it is determined that this material no longer presents a threat to public health or the environment. Any foreseeable use for the landfill would have to be consistent with the requirement that the caps integrity be maintained. EPA will conduct 5-year reviews at the site to insure the remedy remains protective. EPA is currently unaware of any proposed uses for the landfill area.

3. Comments Regarding the Preferred Alternative

Comment a: Numerous comments were received regarding the financial impact of the proposed institutional controls, specifically deed restrictions, on use of groundwater as a component of the preferred alternative. Commentors noted that along with the loss of property value associated with their proximity to the Coakley Landfill Superfund Site, the additional restrictions on groundwater use for an extended period of time was an unfair burden. Commentors viewed deed restriction as punishment for a situation over which they had no control and for which they bore no responsibility. Numerous comments on the specifics of the proposed institutional controls were also voiced, including financial compensation for loss of property value, the exact areal extent of any deed restriction. Also commentors asked if the restriction could be the subject of negotiation with EPA.

EPA Response: EPA is aware of the potential for financial hardship associated with the implementation of institutional controls on the use of groundwater on properties abutting the Coakley Landfill. The institutional controls which will restrict groundwater use is intended to safeguard the public while addressing the issue of groundwater contamination. The implementation of the OU-1 remedy to control the source of the contamination along with the institutional controls on the use of contaminated groundwater moving away from the landfill perimeter is considered by EPA to be a necessity if the remedies are to be protective of public health. The expected areal extent of the institutional controls are designated in Figure 5 in Appendix A of the Record of Decision. Deed restrictions are not the only option for implementing institutional controls. There are fundamentally two types of institutional controls, governmental and proprietary. A local ordinance restricting the use of groundwater is an example of a governmental control. A deed restriction or easement are examples of proprietary controls. The type of institutional control used at the site needs to be approved by EPA. EPA will base its decision to approve an institutional control on its ability to protect human health by restricting the use of groundwater for drinking at Coakley Landfill for the duration of the cleanup.

Comment b: A commentor thought that 30 years was too long for groundwater monitoring for this remedy.

EPA Response: Thirty years is a conservative estimate used to allow the proper monitoring throughout the implementation and long-term monitoring portions of the remedy. It is also a requirement according to Resource Conservation and Recovery Act (RCRA), which is an ARAR for the remedy.

Comment c: A commentor thought that 5 days to sample 13 wells was excessive.

EPA Response: 5 days was used for a conservative cost estimate. 5 days may not be unreasonable since the sampling at a hazardous waste site is a lengthy process in order to assure the safety of the sampler and the data accuracy. The sampling procedures will be defined in the Sampling and Analysis Plan developed during the implementation of the remedy.

Comment d: A commentor asked if groundwater outside of the area of the institutional controls could be pumped and used a drinking water source.

EPA Response: The groundwater model used to estimate the extent of contamination with time did not predict the impact of pumping the groundwater. Excessive pumping of the aquifers near the landfill might cause the contamination to migrate further than originally expected. The groundwater monitoring program should be able to detect the migration of the contamination in this case. Institutional controls would need to be extended in the affected area or other action would be taken to assure that public health is protected.

4. Comments Regarding the Site's Impact to Property Owners

Comment a: There was a comment regarding inability to sell or get bank loans on property near the landfill.

EPA Response: EPA has attempted to address these concerns on a national basis by promulgating the Lender Liability Rule in 1992. However, this regulation was challenged and eventually struck down by a federal court.

Comment b: Several comments focused on the rights, liabilities and options of property owners in the Coakley Landfill area. The comments addressed current issues and potential future issues assuming that contamination was discovered in the future on their property as a result of landowner's activities. The commentors requested information on how such issues were addressed at other Superfund sites and what help is available to the site area land owners. The commentors ask what are their options for dealing with the negative impact the landfill has had on their properties. They asked what is the full extent of the current problem, what are the potential future ramifications and how can they best resolve the situation based on EPA's experience at other Superfund sites.

EPA Response: In general, land owners adjacent to Superfund sites may not be considered liable for contamination unless they fall within one of the four categories of liable persons under CERCLA (owner, operator, generator or transporter, see response to A.1.e).

Whether individuals may have claims for damage to their property is a question for those individuals' legal representatives. Any deed restriction, easement or property transfer would need to be negotiated with the landowner and the party performing the remedy if such actions are deemed necessary by EPA. Attachment D of this Responsiveness Summary has guidance and other documents that help explain institutional controls and residential property at Superfund sites.

Comment c: One commentor noted that wells north of landfill near Breakfast Hill Road had not been sampled recently and asked if they could be sampled.

EPA Response: EPA did not sample these wells since they were not considered in an area that would be impacted by the Coakley Landfill groundwater contamination. NH DES has, however, sampled residential wells, since this request, in this area and the results were forwarded to the homeowners. The need for sampling of the monitoring wells in this area will be reevaluated at the time the Sampling and Analysis Plan is prepared for the OU-2 remedy.

5. Comments Regarding the Coakley Landfill's Compliance with Federal, State and Local Regulations

Comment a: Several comments requested information regarding the Coakley Landfill's compliance with federal, state and local regulations during its construction and operation.

EPA Response: The information available to EPA indicates that in March, 1971, the Town of North Hampton requested approval from the New Hampshire Department of Public Health to operate a landfill at the Coakley site and that in April 1971 the necessary permit was granted. In March 1983, the Bureau of Solid Waste Management ordered an end to the disposal of unburned residue at the Coakley Landfill. In July 1985, after additional investigation conducted by the EPA and the WSPCC, the Coakley Landfill ceased operations.

In general, there has been increased regulation on the disposal of solid waste and hazardous waste by federal, state and local authorities since the Coakley Landfill began accepting waste in the early 1970's. Practices which were acceptable in the past are now unacceptable and the disposal of waste is now highly regulated to protect the public. Some materials disposed of at the landfill in the past are now the subject of stricter disposal restrictions.

B. <u>Summary of Potentially Responsible Parties Comments</u>

Comments from the Potentially Responsible Parties were submitted by Aries Engineering, Inc. The comments organized into the following categories and summarized below:

1. Evaluation of Remedial Investigation
   i. General Comments
   ii. Specific Comments

2. Evaluation of the Feasibility Study and EPA's Preferred Alternative (MM-2)

1. Evaluation of Remedial Investigation

i. General Comments. In Section 2.0 of the Aries report focused on the Remedial Investigation and concerned primarily four general issues. These 4 issues and the specific comments from the Aries report with responses are provided below.

General Comment a: High turbidity and suspended solids in monitoring well groundwater samples collected at the Coakley site during the OU-2 investigation are the source of elevated inorganic compound concentrations reported in the groundwater due to using unfiltered samples. Comments suggest that EPA guidance, well construction and groundwater sampling techniques used were not appropriate.

EPA Response: The issue of collection of filtered (dissolved) versus unfiltered (total) inorganic compound was discussed prior to the start of sampling activities and it was EPA's opinion that the unfiltered samples presented a more accurate and conservative indication of actual groundwater quality at the site. EPA approved procedures were performed both during monitoring well development following installation and prior to actual sampling to minimize suspended solids and turbidity in the samples. EPA's conservative approach on this issue was followed to ensure that data used in the risk assessments performed as part of the RI ensured adequate protection of public health and the environment. While conducting the "Limited Action" remedy, the sampling technique will be altered to the new "low flow" procedure, which should minimize any high levels which may have occurred as a result of using the unfiltered samples.

General Comment b: Conservatively high hydraulic conductivity data included in the RI report overestimates site groundwater migration travel distances and rates.

EPA Response: Several comments noted that conclusions on the contaminated groundwater migration rates and travel distances from the landfill are based on unrealistically high hydraulic parameter values resulting in overestimation of the magnitude of the groundwater contamination problem. It is EPA's opinion that it is appropriate to use maximum or "worst case" values to determine the maximum possible extent of contamination to ensure the protection of public health and the environment. This conservative approach to evaluating the magnitude and potential extent of contamination was generally followed throughout the RI/FS to ensure the maximum amount of protection to the local community.

General Comment c: Elevated sediment and surface water inorganic compound concentrations are naturally occurring and unrelated to the Coakley Landfill.

EPA Response: Several comments highlighted RI statements which noted that inorganic compounds are naturally occurring in the site area, inferring that the elevated concentrations detected in surface water and sediment samples are, in general, unrelated to the Coakley Landfill. Although it is true that naturally occurring background sources contribute to the concentrations of inorganics detected at the site, distribution patterns of certain inorganics indicate the landfill as a potential and likely source. The issue of the contribution of naturally occurring background concentrations of compounds is considered in the development of the human health and ecological risk assessments for the site. Part of the remedy is a monitoring program which will include attempting to establish naturally occurring background levels of certain inorganic compounds such as Manganese and Antimony in area aquifers.

General Comment d: Several comments questioned the accuracy of the groundwater risk assessment estimates based on; the likelihood of this exposure pathway, a consideration of external sources of groundwater contamination, and the concentration term used to assess exposure. Organic compound contamination of site groundwater is relatively low and associated with non-landfill sources.

EPA Response: EPA considers the ingestion of groundwater in the vicinity of the Coakley Landfill as a reasonable future exposure scenario. Although nearby residents are no longer ingesting groundwater due to the availability of municipal water sources, the groundwater surrounding the Coakley Landfill is considered potable by the State of New Hampshire under the New Hampshire Ambient Groundwater Quality Standards. Thus the future intent and use for this groundwater is as a drinking water source. Regarding external sources, some off-site sources of groundwater contamination may exist near the Coakley Landfill. Current groundwater studies, however, do not support the conclusion that those contaminants retained in the risk assessment originate from off-site sources. Based on the above, EPA considers it reasonable and conservative to include these chemicals in the HHBRA.

Finally, four rounds of groundwater data were used to assess exposure in the risk assessment. One round of data was collected at the end of 1991 and the other three were collected at the end of 1992 and beginning of 1993. A review of all groundwater data collected at the site since 1987, suggests a general decrease in VOC concentrations between 1985-1987 with concentrations stabilizing in 1991. A review of inorganic groundwater trends suggests that although a slight decrease in concentrations has occurred since 1987, inorganic contamination has continued since that time at a relatively steady state in the overburden and bedrock aquifers. Thus the four rounds of groundwater data collected between 1991 and 1993 provide a reasonable basis for estimating human exposure to groundwater. EPA chooses the maximum groundwater concentration of all four rounds to estimate the RME and an average concentration to estimate a central tendency exposure. EPA considers the use of a maximum concentration for the RME reasonable since an individual could develop a residential well anywhere within the plume.

Regarding the contribution of non-landfill sources, it is EPA's responsibility to report all of the contamination found at the site regardless of its source. While it is possible that some unknown non-landfill sources may have contributed to some small extent to the organic compound contamination found, in most cases a clear connection to the landfill has been established. The RI focused on organic compounds which the data indicted as landfill related. Benzene, for example, was detected in a characteristic pattern of high concentrations at the landfill perimeter monitoring wells and at decreasing concentrations at wells located away from the landfill. Benzene was also detected at concentrations exceeding regulatory standards and above concentrations with reported toxicological effects. Although non-landfill sources may have contributed to some of the groundwater organic concentrations reported in the RI, their potential contribution does not diminish the significance of the landfill related organic contaminants detected in groundwater at the site.

ii. Specific Comments. Responses to specific comments on the RI from the Aries report are provided below.

Specific Comment a: The RI indicates that one bedrock topographical peak is located in the Coakley Landfill at an elevation of 90 feet. The RI Table 3-2 and Figure 3-3 indicates the bedrock elevation at monitoring well RP-2 in the Coakley Landfill is 112.4 feet. This 22.4 discrepancy should be explained.

EPA Response: Topographic peaks of 90+ ft. were noted in the OU-2 RI and also in the OU-1 RI and prior investigations. The bedrock high of 112.4 ft in the Coakley Landfill was discovered during the pre-design investigation conducted by the PRPs contractor in the summer of 1993 following the OU-2 RI field work. This data was added to the final version of the RI report and does not conflict with the conclusion that a bedrock peak exists in the area of the Coakley Landfill.

Specific Comments: The hydraulic conductivity values and linear velocity values used in the hydrogeological evaluation in the RI were high.

EPA Response: EPA does not disagree with some of the comments; however, Aries focused their comments on the high end of the groundwater velocity range presented in the RI. EPA agrees that hydraulic conductivity measured by grain size is less accurate than rising/falling head in situ test. For that reason, the average hydraulic conductivity used in groundwater velocity calculations is based on only the in situ results. The RI presents a range of groundwater velocities using available data. The range is intended to present possible groundwater flow conditions. Lastly, the travel distance reported in the RI are presented as a worst-case estimate of groundwater travel. The purpose of the travel distance is to provide a possible range using current available data. The results reflect groundwater travel distance and not necessarily contaminant migration. Contaminant migration at the groundwater flow rate is a conservative "worst case" assumption designed to provide maximum protection to the public.

Specific Comment: The RI states that off-site sources may contribute to study area groundwater contamination. The comment points to VOCs not detected at the Coakley Landfill.

EPA Response: Noting that VOCs other than those identified as associated with the Coakley Landfill were detected in the site area does not diminish the risks associated with landfill related VOC groundwater contamination.

Specific Comment: The low concentrations of contaminants indicate the overall magnitude of site groundwater contamination is extremely low and close to the MCL.

EPA Response: EPA agrees that in general groundwater contamination beyond the perimeter of the landfill is relatively low. However, ARARs such as MCLs are exceeded in numerous locations. Therefore, an action must be taken. We believe MM-2 which primarily consists of natural attenuation and monitoring is appropriate and consistent with the NCP.

Specific Comment: Since the RI/FS does not consider techniques to reduce off site sources or naturally occurring concentrations, inorganic concentrations would not be significantly affected by the remedy alone.

EPA Response: Naturally occurring background and other non-landfill sources may contribute to the elevated inorganic groundwater concentrations, but the data also indicates the landfill as the elevated source of inorganic compounds. If the source control remedy stops the migration of the elevated source of inorganic compounds on site then the off site levels will reduce with time through dilution. Establishing background levels of inorganic contamination is an objective of the monitoring program for the OU-2 remedy.

Specific Comment: The conclusion that the Coakley Landfill is a source of the arsenic, barium, iron, manganese and sodium in surface water is not consistent with the RI page 5-22 discussion indicating that elevated concentrations of metals in surface water are associated with high suspended solids concentrations and naturally occurring soil particles.

EPA Response: The RI states that distribution patterns of certain compounds indicate the landfill as a potential source and that naturally occurring sources also contribute to the elevated concentrations detected at the site.

Specific Comment: Sediment concentrations do not indicate a pattern and, therefore, the landfill is not the potential source. Based on literature values of barium and other inorganic compounds, there is the argument that the Coakley Landfill is not the source and within anticipated naturally occurring concentrations.

EPA Response: Regional (Eastern United States) soil data provides a wide range of typical soil inorganic concentrations which gives some indication of the significance of soil concentrations found at a specific location within the region. However, site specific information such as a distribution pattern indicating elevated concentrations close to the landfill with decreasing or stable concentrations away from the landfill. This provides a clearer indication that the landfill is the potential source of the elevated concentrations of inorganic compounds.

2. Evaluation of the Feasibility Study and EPA's Preferred Alternative (MM-2)

A summary of the comments and responses provided on the FS by Coakley Group's consultant, Aries Engineering, Inc. is provided below.

Comment a: In general, there was agreement with the conclusions of FS in comments in comments 5, 15, and 20.

EPA Response: The Aries report agrees with the conclusions of the FS for these comment numbers. The Aries document concurred with the recommendation that no further active management of migration remedy is required for OU-2. The recommendation contained in the FS is based on a conservative approach to human and ecological risk, groundwater concentrations, and dispersion analysis. Therefore, the conservative results of the FS only more strongly supports the recommendation for no further active remedy is warranted.

Whether any further action was or was not required, institutional controls are appropriate for this site since water quality could cause a risk to public health if used as drinking water. This measure is temporary, until the water quality improves by elimination of contaminant migration by the OU-1 remedy and by the dispersion of contaminants within the OU-2 study area.

However, the FS interpretation would not exclude lead since the average calculated concentration was 6 ppb in the FS in response to comment 20.

Comment b: The Aries reported discrepancies between RI and FS in comments 1,3,9,10 & 13.

EPA Response: These comments suggest that there are differing statements between the two documents. Paraphrasing of the RI in the FS may suggest that the conclusions vary. However, this is not the intention nor the case. The FS builds upon the RI with the incorporation of methodology considerations of how data shall be interpreted and evaluated.

Comment c: The Aries report discussed differences between the OU-1 groundwater controls vs. FS assumptions in comments 2,14,16 & 17.

EPA Response: The Aries document cites differing remedial methods by which OU-1 will contain the groundwater that could migrate from the landfill itself. Although the methods of containment and collection may vary, the OU-2 FS assumes that no groundwater contaminated above cleanup levels will migrate from OU-1. Therefore, the specific design of collection/containment will not change the basic approach or assumptions.

The primary impact of a different containment/collection scheme is the capture zone around the landfill. The extent of the capture zone will determine the amount of contaminated groundwater that would be excluded from the dispersion analysis because of collection by OU-1. Where existing information for the OU-1 capture zone analysis did not fully encompass the landfill, the capture zone was assumed to extend to the limit of the landfill since this is part of the OU-1 ROD requirement.

Comment d: The Aries report discussed differences of opinion with regards to the site hydrogeologic assumptions used in the FS in comments 6,8,11 & 18.

EPA Response: Site hydrogeology was based on the data and discussion contained in the RI. A uniform radial flow was assumed around the landfill based on hydrogeologic recommendations and groundwater divides. The overburden strata and upper fractured bedrock formed one unit for groundwater transport, with average hydraulic properties derived for the unit. Bedrock was generally fractured in the upper surface and it was considered to transport groundwater as the overburden. It is noted that deeper bedrock was excluded from consideration in the RI and FS.

No specific flow paths were delineated for this site since they could not be located with a high degree of certainty. Groundwater divides were noted along Lafayette Road and in the wetland area west of the landfill. These divides impacted the overall regional groundwater flow for the site. The continued radial flow was continued but only until the limit of the long-term divides were attained considering post-closure conditions of OU-1.

Comment e: The Aries discussed differences of opinion with the human health risk methodology used in the FS in comments 4,12,19,21 & 22.

EPA Response: Although, the majority of the cancer and noncancer risks at the Coakley Landfill Superfund site are due to inorganic contaminants, several organic contaminants exceeded their respective federal drinking water standards or resulted in cancer risks exceeding EPA's point of departure for carcinogens ($1x10^{-6}$). These exceedances indicate that these compounds, (benzene, 1,2-dichloropropane, 4-methylphenol, and vinyl chloride), could potentially result in risks to public health. Thus, these compounds were evaluated in the human health baseline risk assessment (HHBRA) and will be monitored during and at the completion of EPA's remedial effort.

For the health risk assessment, the methodology used was to identify contaminants above levels that could cause a risk to the public. The basis of the methodology was to utilize highest detected concentrations to determine if a risk could be present. Averaged values were used quantify groundwater quality and to assess dispersion impacts to groundwater quality. The impacts of the OU-1 capture zone were considered in the analysis to reduce the potential volume of contaminated groundwater within OU-2. Where limited quantities of data were available, conservative assumptions were made so that the final recommendation would be fully protective of human health and the environment.

Comment f: The Aries report discussion differences in opinion with respect to the dispersion methodology used in the FS in comments 7,23,24,25,26,27 and the Appendix C discussion.

EPA Response: The dispersion methodology was based on site hydrogeology and the interpretation of local soil conditions and characteristics. The use of sorption was used in this model. Although the model using sorption may be a valid method, the objective of this RI/FS was to assess the migration of contamination assuming the OU-1 remedy is implemented. The Aries model reviews the time that cleanup levels will be met if a cap is installed. Twenty years is too long and not considered reasonable. A groundwater extraction and treatment system is part of the OU-1 remedy and therefore not a subject of this remedy. The FS model used considered a conservative method to ensured adequate protection of public health.

The extent of dispersion to achieve MCLs is clearly dependent on the groundwater contaminant concentrations and the transport mechanism.

For this site, the groundwater concentrations for the contaminants of concern were based on the available RI data. Where interpolation was needed between monitoring wells, a linear interpolation was used since radial and uniform transport of groundwater was assumed. Those wells with detection levels above the MCLs were set at the MCLs.

The dispersion analysis was limited to numerical methods and did not utilize extensive computer modeling. This was based on the interpretation of groundwater flow patterns, and on the averaged soil strata and hydrogeologic properties for the site.

Note that Appendix C of the FS was included as a comparison if OU-1 did not install a groundwater containment/collection system. This scenario was evaluated at EPA's request for informational purposes only. It is not the objective of the FS to consider this option and it is not an option in OU-1 ROD.7

Comment g: The Aries report discussed a difference of opinion with regard to the remedial alternatives evaluated in the FS in comments 28,29 & 30.

EPA Response: The remedial alternative that includes additional monitoring wells was based on the need to monitor groundwater quality at specific points within the dispersion zone around the landfill and to establish background levels of inorganics in the area.

The 30 years of monitoring (quarterly and semiannually) was utilized as a standard basis to help evaluate long-term compliance with groundwater quality regulations. It is also a requirement according to Resource Conservation and Recovery Act (RCRA), which is an ARAR for the remedy. This requirement is consistent in all the alternatives evaluated.

The possibility that a well can be installed and used for drinking water is a consideration that must be assessed as potential exposure scenario.

ATTACHMENT A

COMMUNITY RELATIONS ACTIVITIES

ATTACHMENT A

COMMUNITY RELATIONS ACTIVITIES CONDUCTED AT THE LANDFILL SUPERFUND SITE IN NORTH HAMPTON, NEW HAMPSHIRE

EPA/DES have conducted the following community relations activities at the Coakley Landfill Superfund Site:

- August 18, 1983 - Site Tour (presentations by NH WSPCC, North Hampton Selectmen, US EPA, and Senator Gordon Humphrey).

- November 4, 1985 - North Hampton Board of Selectmen hold a Public Informational Meeting to receive State input about the hydrogeological study to assist the town in planning water line extensions.

- January 1986 - DES/WSPCC prepared a Community Relations Plan.

- April 1986 - DES issues a Press Release announcing the Public Meeting to kickoff the RI/FS.

- May 14, 1986 - DES holds the RI/FS kickoff Public Informational Meeting.

- July 8, 1988 - NH Division of Public Health Services issues Report #88-007, "Evaluation of Cancer Incidence and Mortality."

- October 13, 1988 - ATSDR issues a Health Assessment Report.

- October 25, 1988 - EPA issues a Press Release announcing the Public Meeting to discuss DES/EPA Remedial Investigation results.

- October 1988 - EPA issues a Fact Sheet on the RI results.

- October 1988 - DES issues a Fact Sheet on the RI results.

- November 3, 1988 - DES/EPA hold a Public Informational Meeting on the results of the RI.

- November 30, 1988 - EPA issues a Public Notice in the Portsmouth Herald announcing the availability of the Administrative Record.

- February 1990 - EPA issues the Proposed Plan for Site cleanup.

- March 7, 1990 - EPA issues a Press Release announcing the availability of the Proposed Plan, the dates of the Public Informational Meeting and Informal Public Hearing and the beginning of the Public Comment Period.

- March 9, 1990 - EPA issues Public Notices in the Portsmouth Herald and Foster's Daily Democrat announcing the Proposed Plan, the dates of the Public Informational Meeting and Informal Public Hearing, and the beginning of the Public Comment Period.

- March 15, 1990 - EPA/DES hold a Public Informational Meeting on the Proposed Plan for site cleanup.

- March 16, 1990 - May 14, 1990 - Public Comment Period on the Proposed Plan.

- March 30 1990 - EPA issues a press release announcing the extension of the Public Comment Period.

- April 3, 1990 - EPA/DES hold an Informal Public Hearing on the Proposed Plan.

- March 3, 1992 - EPA hold an informational meeting on the start-up of the Coakley Landfill OU-2 Management of Migration RI\FS.

- May 23, 1994 - EPA makes the Management of Migration RI\FS and the OU-2 Proposed Plan available for public review at the site Repositories at EPA's Record Center in Boston and at the North Hampton Public Library. EPA publishes a notice and brief analysis of the Proposed Plan in the Hampton Union and in the Portsmouth Herald on May 24, 1994.

- June 1, 1994 - EPA hold an informational meeting at the North Hampton Elementary School to discuss the results of the Management of Migration Remedial Investigation, the cleanup alternatives presented in the Feasibility Study and to present the Agency's Proposed Plan. Also during the meeting, the Agency answers questions from the public.

- June 2 to August 1, 1994 - EPA hold a 61-day public comment period to accept public comment on the alternatives presented in the Feasibility Study and the Proposed Plan and on any other documents previously released to the public.

- June 21, 1994 - EPA hold a public hearing at the North Hampton Elementary School to discuss the Proposed Plan and to accept any oral comments.

ATTACHMENT B

POTENTIALLY RESPONSIBLE PARTY COMMENTS

ARIES ENGINEERING, INC.
environmental engineers and hydrogeologists

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July 29, 1994
File No. 92033

Mr. Steven J. Calder, HSN/CANS
Remedial Project Manager
US EPA Region 1
JFK Federal Building
900 Canal Street
Boston, Massachusetts 02114

Re: May 1994 Coakley Landfill Management of Migration Remedial Investigation and Feasibility Study Report Comments

Dear Mr. Calder:

On behalf of the Coakley Group, Aries Engineering, Inc. (Aries) is submitting the following comments to the May 1994 Coakley Landfill Management of Migration Remedial Investigation and Feasibility Study Report.

Sincerely,
Aries Engineering, Inc.

Thomas E. Roy, P.E.
Supervising Contractor

cc: Coakley Executive Committee
Coakley Technical Committee
Mr. Tal Hubbard, NHDES

TER/emr
Enclosure

92033mig.lt2

May 1994 Coakley Landfill Management of Migration Remedial Investigation and Feasability Study Report Comments

Prepared for:
Unites States Environmental Protection Agency
JFK Federal Building
Boston, Massachusetts

Prepared by:
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July 1994
File No. 92033

Thomas E. Roy, P.E.
Supervising Contractor

TABLE OF CONTENTS

1.0 INTRODUCTION

The Coakley Group generally concurs with the May 1994 Remedial Investigation and Feasibility Study (RI/FS) conclusion that further management of migration remedial action is not required. However, the Coakley Group feels the May 1994 RI/FS was based on several conservative assumptions which overstate the Coakley landfill risks to human health and the environment, and overestimates the time for area contaminants to attenuate to background conditions.

The Coakley Group also feels the RI/FS Appendix C OU-1 non-pumping analysis included several conservative assumptions that underestimate OU-1 remedial impacts on site ground water, and overestimate the ground water area affected by OU-1 non-pumping conditions. Our comments on the RI/FS Appendix C are in two parts for clarity as follows: direct comments on Appendix C are presented in Section 4.1; our analysis of OU-1 remediation impacts under non-pumping conditions, with the relevant RI/FS Appendix C comments are presented in Section 4.2.

Our detailed RI/FS comments follow.

2.0 REMEDIAL INVESTIGATION - (RI)

1. Page (Pg.) 2-11, paragraph (para.) 2 In describing ground water monitoring well installation, the RI states "To filter fine sediment and enhance well production, quartz sand was backfilled around the screen section."

Comment EPA publication EPA/530-R-93-001 "RCRA Ground-Water Monitoring: Draft Technical Guidance" recommends that the filter pack grain size be 3 to 5 times the 50 percent retained size of the formation materials or two times the 50 percent retained size for fine-grained formations. The EPA publication recommends a minimum filter pack thickness of two inches between the well screen and the borehole wall. These recommendations would provide monitoring wells "capable of producing samples of acceptably low turbidity." The RI does not indicate that the monitoring well filter packs were designed according to these or similar procedures for producing low turbidity samples. Acceptably low turbidity is defined by the EPA as less than 5 nephelometric turbidity units (NTUs). The RI indicates monitoring well FPC-3B was constructed of 1.5-inch diameter casing in a 3-inch diameter borehole, leaving an approximately 0.75-inch thick filter pack which is less than the recommended minimum. This could result in excessively turbid ground water samples with artificially elevated inorganic concentrations. EPA's guidance indicates that to use unfiltered ground water samples for inorganic analysis, the monitoring well should be appropriately designed, adequately developed, suitably purged at a low rate, and sampled with a low flow sampling technique of about .1 liters per minute. The EPA guidance indicates these precautions are necessary to avoid a "false indication of contamination."

The RI does not indicate that these precautions were taken and further notes samples were collected with bailers which are not recommended by the EPA to collect unfiltered samples. The unfiltered samples, therefore, likely resulted in sampling artifacts indicating elevated inorganic concentrations. Filtered ground water samples would have better reflected site ground water conditions given the monitoring well construction, development, purging and sampling techniques employed.

2. <u>Pg. 2-12, para.1</u> The RI indicates that turbidity was measured during monitoring well development.

<u>Comment</u> The RI does not indicate whether well development was continued until turbidity less than 5 NTU was measured as recommended by the EPA. Continued well development would be important to avoid turbid ground water samples which can produce artificially-elevated inorganic concentrations.

3. <u>Pg. 2-19, bullet 5</u> The RI indicates that "pH, temperature, conductivity, and turbidity measurements were taken" during purging of monitoring wells for ground water sampling and that "sampling was performed when stable readings of pH, temperature and conductivity were obtained."

<u>Comment</u> The RI does not explicitly state that steps were taken to obtain low turbidity ground water samples. Table 4-5 indicates that of 91 RI ground water samples collected, only 6 samples had turbidity readings less than EPA's recommended 5 NTU. Most RI turbidity readings were in the hundreds of NTU and many were off-scale (reading of 999) indicating very turbid ground water samples.

These turbid ground water samples would likely result in artificially-elevated ground water inorganic concentrations.

4. <u>Pg. 3-11, para. 3</u> The RI indicates that one bedrock topographical peak is located in the Coakley Landfill at an elevation of 90 feet.

<u>Comment</u> RI Table 3-2 and Figure 3-3 indicate the bedrock elevation at monitoring well RP-2 in the Coakley Landfill is 112.4 feet. This apparent 22.4-foot discrepancy should be explained.

5. <u>Pg. 3-11, para. 4</u> In the discussion of photolineaments, the RI states that "fracture zones significantly increase hydraulic conductivity, creating preferred ground water flow/contaminant migration pathways" and that two significant lineament swarms were identified, one paralleling the bedrock valley west of the landfill and one north of Breakfast Hill Road.

<u>Comment</u> The RI does not distinguish between observed lineaments and field-verified fracture zones exhibiting enhanced hydraulic conductivity. Lineaments may indicate low permeability dikes or fracture zones that are sediment-filled or mineralized. In New Hampshire, many northwest-southeast trending photolineaments are the result of glacial

erosion/deposition of the southeast moving glacier. To conclude that a photolineament indicates a permeable fracture zone requires additional evidence such as geophysical surveys or, preferably, rock coring and hydraulic conductivity testing. RI Table 3-4 hydraulic conductivity testing results do not show higher hydraulic conductivities in bedrock monitoring wells located in the lineament swarm west of the landfill which would suggest this fracture zone is not a preferred ground water flow pathway.

6. Pg. 3-20, para.1 The RI states that "A localized and deeper fracture system was identified by photolineament and fracture trace analysis reported by Weston."

   Comment Identifiable fracture zones having enhanced permeability consistent with Weston's photolineament locations are not evident in site bedrock core data, hydraulic conductivity data or ground water flow data. It would be more accurate to interpret the photolineament analysis results to indicate possible directional orientations of site area fracture systems. Site bedrock structural information, fracture fabric data and photolineament analysis results suggest a dominant north-northeast fracture system. However, site area bedrock ground water flow and contaminant migration data do not indicate a significant anisotropy in the north-northeast direction.

7. Pg. 3-22, para. 2 The RI states that site estimated hydraulic conductivity values for glacial till exceed the high-end literature range by two orders of magnitude. One hydraulic conductivity value was from rising/falling head tests, while two of the high hydraulic conductivity values were from grain size analysis.

   Comment If a small volume of well water is displaced during a rising or falling head test, the resulting hydraulic response observed in the well may be due to the filter pack, which would give hydraulic conductivity values orders of magnitude higher than glacial till. Grain size analysis is generally less reliable than in-situ hydraulic testing. This may account for the high estimated hydraulic conductivity.

8. Pg. 3-25, para. 3 The RI references overburden and bedrock ground water flow directions shown in Figures 3-11 and 3-12. The RI indicates that overburden ground water flow is radial at the Coakley Landfill and that bedrock ground water beneath the landfill is probably mounded because of the overburden mound.

   Comment. The overburden flowline shown on Figure 3-11 from the center of the landfill ground water mound toward the southeast does not take into account vertical flow of overburden ground water into bedrock. The OU-1 Remedial Design site three-dimensional 2-layer ground water model and flow path analysis indicates that most east-flowing overburden ground water in the landfill mound turns north or south and then flows into bedrock where flow is predominantly toward the west. As indicated by the RI, bedrock ground water mounding at the Coakley Landfill is inferred. Aries anticipates that radial flow associated with possible bedrock ground water mounding would be localized as indicated by the RI.

10. Pg. 3-28, para. 3 The RI indicates that overburden ground water average linear velocity between the Coakley Landfill and the wetland to the west is from 296 feet per year (ft/yr) to 1,482 ft/yr.

Comment The RI estimate of overburden ground water average linear velocity between the Coakley Landfill and the wetland to the west appears unrealistically high. The RI assumed hydraulic conductivity of 11 feet per day (ft/day) for the landfill appears high based on hydraulic conductivity data from the west side of the landfill. Using a high ground water velocity to estimate travel times for contaminants would overestimate the distance contamination could travel from the landfill since landfill operation began.

11. Pg. 3-28, para. 3 Average linear ground water velocities were calculated for assumed overburden ground water flowlines from the landfill.

Comment Using a porosity of 0.1 for outwash deposits with relatively high hydraulic conductivity is not appropriate and results in unrealistically large velocities. RI Table 3-6 indicates the literature range for porosity of outwash is 0.25 to 0.5. Using a porosity of 0.1 may cause unrealistically high estimates of ground water contaminant migration distances from the landfill.

12. Pg. 3-29, para. 3 The RI discusses estimated ground water travel distances along assumed flowlines in various directions from the Coakley Landfill for the time since landfilling began.

Comment. The assumed ground water flow paths may not be valid. Because the travel distances are based on the RI estimated ground water average linear velocities which range too high, the larger estimated travel distances are not realistic. Further, the assumed flow paths were estimated based on general ground water conditions after the completion of the landfill. Before the landfill was completed in the early 1980's, there likely was not a ground water mound in the landfill and therefore ground water flow paths from the landfill until the early 1980's were likely toward the west. Ground water flow from the landfill toward the east may not have developed until as late as the early 1980's which limits the potential travel time for migration of contamination from the landfill.

13. Pg. 4-20, bullet 1 The RI discussion of sediment sample inorganic compound analytical results states "The data indicates that arsenic, barium, chromium, iron, lead, manganese, nickel, vanadium, zinc and probably beryllium, copper and selenium are naturally occurring elements at the site."

Comment. The Coakley Group concurs with the conclusion that the stated elements are naturally occurring in sediments and soils at the site.

14. Pg. 4-20, bullet 2 The RI states that "Chromium and copper were detected at concentrations [in sediment samples] which did not clearly indicate the landfill as their source."

Comment The Coakley Group concurs that chromium and copper in sediment samples is not associated with a landfill source.

15. Pg. 4-31, para. 2 In discussing bedrock ground water inorganic analytical results, the RI states "Interpretation of the inorganic data is complicated by significant fluctuations associated with highly turbid samples and naturally occurring background concentrations."

Comment The Coakley Group concurs with the stated difficulties in interpreting the ground water inorganic analytical data. The high turbidity of the samples is documented in RI Table 4-5. Only six of 91 samples (less than 7%) were within EPA's acceptable turbidity range of less than 5 NTU. Most RI samples had noted turbidity readings in the hundreds of NTU. The samples were analyzed for total inorganics. The total inorganics analysis methods would include the naturally-occurring metals contained in the sample sediment responsible for elevated turbidities. The resulting metal concentrations would therefore, be erroneously high. The fluctuation of RI inorganic compound concentrations from one sampling round to the next was as much as one to two orders of magnitude at some monitoring wells. This indicates that the total inorganic compound analytical methods employed in the RI are inappropriate for ground water samples collected from monitoring wells not specifically designed, constructed, developed, purged or sampled for low turbidity, unfiltered samples. Therefore, due to turbidity interference, the RI inorganic analytical data are not reliable to assess contaminant concentrations in ground water or contaminant migration from the Coakley Landfill. A better analytical technique would be to use filtered ground water samples for the RI well construction and sampling methods.

16. Pg. 4-34, para. 1 The RI states that "landfill associated contamination of overburden and shallow bedrock ground water has continued at a relatively steady state with some slight reduction."

Comment The Coakley Group concurs with the interpretation of steady state ground water conditions. RI Table 4-32 indicates that for the three on-site monitoring wells listed, concentrations of benzene, ethylbenzene, toluene and sodium have decreased or remained stable since 1987. Concentrations of benzene and sodium in off-site bedrock monitoring well GZ-105 have remained generally stable since 1987 and have decreased slightly since October 1991. RI Figures 4-18 through 4-34 show 1991 through 1993 concentrations for selected contaminants of concern. The figures show that contaminant concentrations have stabilized or decreased where concentrations are above detection limits or above background concentrations.

Steady state ground water contaminant migration conditions indicate an approximate equilibrium between the flux of contaminant mass from a source and the natural attenuation processes such as dilution, dispersion, degradation and adsorption. Contaminant concentrations within the contaminant plume do not increase under steady state conditions. Contaminants do not migrate downgradient beyond the plume at detectable concentrations under steady state conditions. Steady state conditions would be expected to be followed by gradually declining contaminant concentrations because of contaminant source reduction caused by dilution and degradation. Therefore, decreases in site contaminant plume size and concentrations would be expected without remedial action. Further, FS dilution analysis assumptions are not consistent with observed site steady state plume conditions causing the dilution analysis results to over-estimate site contaminant migration.

17. Pg. 4-36, para. 1 and 3 The RI states that non-landfill potential sources in the area include underground storage tanks (USTs), domestic and commercial septic systems, and stormwater runoff. The RI indicates that all residences and commercial and industrial establishments use individual septic systems. According to the RI, compounds potentially present in commercial and industrial septage include chlorinated and aromatic solvents which are frequently used in cleaning products used by most retail and commercial stores. The RI states that non-landfill source contamination is expected along Lafayette Road and may affect monitoring wells and monitoring well clusters FPC-11, FPC-9, GZ-109/117, GZ-101/103, Betty's Kitchen, and North Hampton Grocery. This indicates VOCs observed in the wells would be due to off-site sources other then the Coakley landfill. These sources would likely continue to contaminated these wells regardless of remedial action taken at the Coakley site.

Comment The Coakley Group concurs with the RI statement that non-landfill contamination sources are present along Lafayette Road east of the Coakley Landfill. Previous ground water analytical data indicate that some VOC compounds detected in off-site monitoring wells and private wells were not detected at Coakley Landfill monitoring wells. The Waste Management Division (WMD) maintains files concerning the Ferland property which abuts the Coakley Landfill to the east. The WMD documents include: Environmental Site Assessment, by Normandeau Associates (Normandeau) of Bedford, New Hampshire, dated June 1986; Subsurface Investigation, by Shevenell Gallen Associates (SGA) of Portsmouth, New Hampshire, dated October, 1986; and a letter to Mr. Richard Ferland from SGA dated March 1987. The Normandeau ESA indicated that a 500-gallon heating oil UST was located on the property. The Normandeau ESA also indicated that two empty 55-gallon drums were observed on the property and that screening of the drums with an HNU photoionization detector (HNU) indicated readings of 0 parts per million (ppm) to 5 ppm. Normandeau screened the surface and shallow subsurface soil near the drums with the HNU and reported readings of 0 ppm to 5 ppm. Normandeau did not observe soil stains near the drums. SGA installed two test borings and monitoring wells as part of their Subsurface Investigation. Ground water in the monitoring wells was sampled and analyzed for VOCs. Of the 12

VOCs reported in the Ferland ground water samples, 4 VOCs, carbon tetrachloride, tetrachloroethylene, 1,1,1-trichloroethane and trichlorofluoro-methane, have not been reported in RI ground water samples from the Coakley Landfill and its perimeter. This indicates a likely non-landfill contamination source abutting the landfill to the east.

18. Pg. 4-37, bullet 2 The RI states that VOCs and semi-VOCs are significant contaminant types identified at the Coakley Landfill and that benzene is the most significant VOC because it exceeded the EPA Maximum Contaminant Level (MCL).

Comment The MCL for benzene is 5 micrograms per liter (ug/l), while the highest observed concentrations in landfill monitoring well ground water samples has been typically between 5 ug/l and 60 ug/l, averaging approximately 14 ug/l in 1994. Concentrations of semi-VOCs in landfill monitoring well ground water samples did not exceed MCLs in the 1994 sampling round. These low concentrations of contaminants indicate the overall magnitude of site ground water contamination is extremely low and close to the MCL.

19. Pg. 4-37, bullet 2 The RI states that the inorganic compounds arsenic, barium, iron, manganese, mercury and sodium were identified as primary indicators of landfill inorganic contamination.

Comment As previously indicated in comment 17, the RI total inorganic compound analytical methods employed are inappropriate for ground water samples collected from monitoring wells not specifically designed, constructed or sampled for low turbidity, unfiltered samples. Therefore, the RI inorganic analytical data likely overstate ground water metal concentrations and are therefore not reliable to assess inorganic contaminant concentrations in ground water or contaminant migration from the Coakley Landfill.

20. Pg. 4-37, bullet 9 The RI states that sediment inorganic compound distribution patterns indicate the landfill as a potential source for arsenic, barium, iron, manganese, nickel and possibly zinc.

Comment Sediment barium concentrations do not indicate a pattern. The sediment inorganic data show possibly elevated concentrations of arsenic, iron, manganese, nickel and zinc only in one or two samples adjacent to the landfill. The remaining samples do not indicate higher arsenic, iron, manganese, nickel and zinc concentrations near the landfill. Therefore, the RI statement that sediment inorganic compound distribution patterns indicate the landfill as a potential source for arsenic, barium, iron, manganese, nickel and possibly zinc is not supported by the data.

21. Pg. 5-14, para. 2 The RI states that leachate from the landfill is primarily migrating into glacial till of limited thickness and/or into bedrock.

Comment The average linear ground water velocities estimated by CDM appear to be too high for glacial till and bedrock which, according to the RI are the primary pathways for contaminant migration in ground water.

22. Pg. 5-18, para. 1&2 The RI indicates that off-site inorganics may be naturally occurring or due to off-site sources such as septic systems. Elevated chromium, lead, nickel, vanadium and zinc may be due to the landfill, but off-site sources and naturally occurring sources are indicated.

Comment The Coakley Group agrees that these inorganics are naturally occurring and due to other off-site sources. Since the RI/FS does not consider techniques to reduce off-site sources or naturally occurring concentrations, inorganic concentrations would not be significantly affected by Coakley Landfill remedial action alone.

23. Pg. 5-21, para. 2 The RI notes VOCs were observed in off-site surface water samples and interprets these VOCs as due to off-site sources.

Comment The Coakley Group concurs with this conclusion and notes the VOC benzene is very common and is anticipated to be widely present in the study area due to nearby petroleum storage and vehicle traffic. We anticipate benzene will remain in area ground water due to numerous sources separate from the Coakley Landfill regardless of OU-1 Remedial Action.

24. Pg.5-22, para. 1 The RI indicates elevated concentrations of metals in surface water are associated with high suspended solids concentrations and naturally occurring soil particles.

Comment The Coakley Group concurs and notes the same effect would be anticipated for high suspended solids in ground water samples. Unlike surface water, however, these soil particles would not be transported with ground water flow, would be filtered by the soil medium and would therefore not be an anticipated constituent of ground water.

25. Pg. 5-22, para. 2 The RI notes slightly elevated VOC concentrations along the B&M railroad tracks and associates lead residuals with train traffic.

Comment The Coakley Group concurs and notes elevated lead concentrations would also be anticipated with vehicular traffic such as that in the site area.

26. Pg. 5-27, para. 1 The RI indicates that pumping the Hobbs area ground water at a rate sufficient to intercept Coakley Landfill ground water, would result in environmental dewatering impacts more severe than adverse impacts from contaminant diversion from the landfill.

Comment The Coakley Group concurs and notes that pumping the Hobbs area ground water would likely induce contaminated ground water flow from surrounding off-site contaminant source areas unrelated to the Coakley Landfill.

27. Pg. 5-27, bullet 6. The RI states that "the distribution pattern of arsenic, barium, iron, manganese and sodium indicate the Coakley Landfill as a potential source of these compounds..."

Comment The conclusion that the Coakley Landfill is a source of the arsenic, barium, iron, manganese and sodium in surface water is not consistent with the RI page 5-22 discussion indicating that elevated concentrations of metals in surface water are associated with high suspended solids concentrations and naturally occurring soil particles.

28. Pg. 5-28, bullet 1 The RI indicates that "compounds which exhibited a distribution pattern indicating the landfill as a potential source included: arsenic, barium, iron, manganese, nickel and possibly zinc."

Comment The barium content in eastern United States soils is reported to average 420 milligrams per kilogram (mg/kg) and range from 10 mg/kg to 1,500 mg/kg[2]. Site sediment barium concentrations for the September 1992 sampling round ranged from 9.3 mg/kg to 94.4 mg/kg. Barium, therefore, does not appear to be elevated. Zinc content in eastern United States soils is reported to average 52 mg/kg and range from <5 mg/kg to 2,900 mg/kg. Site sediment zinc concentrations for the September 1992 sampling round ranged from 14.4 mg/kg to 78.2 mg/kg, with the highest concentration observed at sample S-16 approximately 4,000 feet from the landfill. Zinc does not appear to be elevated due to the landfill. The arsenic content in eastern United States soils is reported to average 7.4 mg/kg and range from <0.1 mg/kg to 73 mg/kg. Site sediment arsenic concentrations for the September 1992 sampling round ranged from 2.4 mg/kg to 52.3 mg/kg, with the highest concentrations observed in samples S-10 and S-11 approximately 200 to 400 feet north of the landfill. Therefore, while arsenic is elevated slightly in two samples compared to other site sediment samples, it is within anticipated naturally occurring concentrations. Iron, manganese and possibly nickel were very slightly elevated in sediment sample S-10 compared to other site sample concentrations, but well within naturally occurring concentrations.

3.0 FEASIBILITY STUDY - (FS)

1. Pg. 4, para. 2 The FS states that elevated concentrations of inorganics associated with the Coakley Landfill are indicated for arsenic, barium, iron, manganese, nickel and zinc.

Comment As RI comment 25 indicates, barium and zinc are not likely associated with the landfill. Arsenic is slightly elevated in two samples compared to other site sediment samples, but is within anticipated naturally occurring concentrations. Iron, manganese and possibly nickel were very slightly elevated in one sediment sample, but well within anticipated naturally occurring concentrations.

2. Pg. 7, para. 2 The FS indicates that the OU-1 remedy will impact OU-2 ground water contaminant concentrations because of the capture zone of OU-1 ground water extraction wells. The FS refers to Weston's 1989 proposed OU-1 source control remedy to assess the OU-1 capture zone.

Comment. Proposed OU-1 Remedial Action ground water extraction design is based on PDI data and differs significantly from Weston's 1989 proposal. OU-1 Remedial Action ground water extraction is proposed only from the west side of the landfill, while Weston's OU-1 source control includes ground water extraction from the east side of the landfill. Ground water extraction from the west side of the landfill is appropriate because capping of the landfill will reduce or eliminate ground water mounding within the landfill and both overburden and bedrock ground water will flow westward beneath the landfill. The cap alone will eliminate off-site flow of ground water from the landfill on the east, south and northeast sides. Capping the landfill will reduce total off-site migration of contaminants because of the following: the volume of ground water flowing through the landfill will be reduced; precipitation will not infiltrate downward through the refuse and leach contaminants; and lowering of the ground water table will substantially reduce the amount of refuse located within the ground water zone. The FS therefore does not consider the likely impacts of OU-1 Remedial Action on OU-2 ground water conditions.

3. Pg. 7, para. 3 The FS states "Due to high concentrations in background monitoring wells, manganese was eliminated as a contaminant expected to reach clean-up goals."

Comment The Coakley Group agrees that manganese should be eliminated as a contaminant of concern because background data indicate that it is naturally occurring and therefore could not be reduced below background levels. Likewise, lead should also be eliminated as a contaminant of concern because background data indicate lead concentrations above the clean-up goal. As indicated in comment 17, the total inorganic compound analytical methods used in the RI are appropriate for ground water samples collected from monitoring wells specifically designed, constructed and sampled for low turbidity, unfiltered samples. However, RI information indicates the RI monitoring wells were not specifically designed, constructed and sampled for low turbidity samples. Therefore, the RI inorganic analytical data likely overstate metal contaminant concentrations in ground water and metal contaminant migration from the Coakley Landfill.

4. Pg. 8, para. 2 The FS states that area ground water poses a threat to human health.

Comment Ground water would pose a potential threat to human health only if ingested. Because the developed OU-2 area is served by municipal water supply, human ingestion of ground water is unlikely and therefore the ground water threat is very low and only potential. Further, if ground water were ingested, off-site source areas other than the Coakley Landfill would contribute to the potential threat. Off-site source area remediation is not contemplated for OU-1 Remedial Action.

5. Pg. 8, para. 2 The FS states that remediation in the wetlands would pose more potential damage to the environment than the low risk posed by landfill contamination.

Comment The Coakley Group concurs.

6. Pg. 8, para. 3 The FS states that "A numerical ground water dispersion analysis was conducted for the contaminants retained for consideration... The dispersion analysis determined the extent of ground water migration required to dilute contaminant plume concentrations to the clean-up goals."

Comment The FS analysis assessed dilution but did not address dispersion of contaminants. The FS analysis did not fully assess ground water migration, because ground water migration occurs along flow paths, while the analysis was based on dilution volumes and disregarded site ground water flow paths. To fully assess contaminant migration, site ground water flow paths must be considered.

7. Pg. 8, para. 3 The FS indicates that, based on the dilution analysis, lead would reach clean-up levels at up to 1,380 feet from the landfill.

Comment RI data indicate that the background overburden ground water concentration for lead, based on total metals analysis, is 29.7 ug/l while the clean-up goal is 15 ug/l. Therefore, the clean-up goal for lead, if based on total metals analysis concentrations, would not be attainable because it exceeds background conditions.

8. Pg. 1-19, para. 5 The FS states "The primary hydrogeologic features controlling contaminant transport include the ground water mound within the landfill...".

Comment Although the groundwater mound within the landfill is recognized as a primary feature controlling contaminant transport, the reduction of this mound by the OU-1 Remedial Action cap is not considered in the contaminant transport analysis. Reducing the landfill ground water mound will significantly reduce and control contaminant transport.

9. Pg. 1-21, para. 1 The FS states "The plume extending toward Lafayette Terrace is broadly shaped."

Comment The RI concluded that contaminants in monitoring well cluster FPC-11 located at Lafayette Terrace are likely from non-landfill sources. Benzene and other VOCs have not been observed at monitoring well cluster GZ-101/103 located adjacent to the southwest corner of Lafayette Terrace. Therefore, site data do not indicate a plume extending toward Lafayette Terrace.

10. Pg. 1-21, para. 2 The FS states "Off-site migration of benzene and chlorobenzene in bedrock ground water is indicated along a preferential fractured bedrock pathway toward monitoring well GZ-105 in the west wetland."

Comment It is not clear that the RI concluded that ground water migrates toward GZ-105 from the landfill along a preferential fractured bedrock pathway. The RI did not identify and confirm enhanced permeability fracture zones between the landfill and GZ-105. Site hydrogeologic data do not indicate a preferential fractured bedrock pathway from the landfill to GZ-105.

11. Pg. 1-21, para. 3 The FS indicates that "Contaminant distribution of these compounds [inorganics] does not illustrate the preferential pathway indicated by benzene and chlorobenzene."

Comment This information indicates that preferential bedrock fracture pathways are not likely significant site ground water migration mechanisms.

12. Pg. 1-22, para. 2 The FS indicates that potential risks were evaluated for ingestion of ground water from monitoring wells and commercial/residential wells.

Comment The RI concluded that contamination in residential and commercial wells along Lafayette Road is likely from non-landfill sources including USTs and septic systems. The FS does not indicate that risk was apportioned between contaminants from non-landfill sources and landfill contaminants.

13. Pg. 1-23, para. 4 The FS states that "Maximum overburden ground water exposure point concentrations exceeded federal or state standards for benzene, 1,2-dichloropropane, antimony, arsenic, beryllium, chromium, lead, manganese, and nickel. In bedrock ground water, maximum exposure point concentrations exceeded these

standards for benzene, 4-methylphenol, antimony, beryllium, chromium, lead, manganese, and nickel."

Comment The RI concluded that manganese is present in background concentrations that would prevent attaining clean-up goals. Lead is present in Lafayette Terrace overburden ground water background samples exceeding clean-up goals. Antimony was detected in Lafayette Terrace overburden monitoring well FPC-11 which the FS states is in an area of off-site sources. Antimony was detected in one off-site bedrock monitoring well and is unlikely to be related to the Coakley Landfill. The FS states on page 1-20, paragraph 3 that "chromium, lead, nickel, vanadium, and zinc concentrations are fairly uniformly distributed in the ground water beneath both the landfill and off-site. The data suggests naturally elevated levels or off-site source contributions." The purpose of the RI/FS is to assess risk associated with the Coakley Landfill. Risk associated with non-landfill or natural sources should not be considered in assessing appropriate remedial actions for the Coakley Landfill, because OU-2 Remedial Actions will not affect these sources. Therefore, manganese, lead, nickel, vanadium, antimony and zinc should be eliminated from the risk assessment.

14. Pg. 3-3, para. 3 The FS indicates a capture zone analysis was performed for the ground water collection system preliminary design presented by Weston in the OU-1 Feasibility Study.

Comment The OU-1 PDI Report and Remedial Design included additional site data collection and analyses, and 2-dimensional and 3-dimensional ground water flow modeling. This design work indicates that, as stated in the RI and FS, capping of the landfill will result in the reduction or elimination of ground water mounding at the landfill. Because elimination of the ground water mound results in landfill overburden and bedrock ground water flowing westward, proposed OU-1 extraction wells are located on the western, downgradient side of the landfill. This is a significant difference from Weston's preliminary design which has extraction wells located along the landfill eastern and northeast sides as well as the western side. The proposed ground water extraction capture zone would include the whole landfill area. These significant changes should be considered in the ground water contaminant transport analysis.

15. Pg. 3-5, para. 2 The FS states that "...several inorganic compounds were detected throughout the study area, regardless of proximity to the landfill itself. The delineation of these contaminants extended beyond the study area and, therefore, were not considered in the FS, since it is not practical to include these with OU-2."

Comment It is not appropriate to assess contaminants not associated with the landfill source because Coakley Landfill Remedial Action cannot affect these sources.

16. Pg. 3-5, para. 3 The FS indicates that the RESSQC module of the EPA Well Head Protection Area (WHPA) model was used to assess the capture zones of Weston's

proposed OU-1 pumping wells. In the following bullet 7, the FS indicates that ground water mounding effects in the landfill overburden can be assumed absent from the extraction analysis because OU-1 remediation will contain and collect the landfill ground water.

Comment The Coakley Group agrees that ground water extraction analyses should assume the overburden ground water mound will be absent. However, capping of the landfill, not extraction of ground water, will eliminate the ground water mound. Review of FS Appendix A calculations and figures, and Figures 3-3 through 3-10 appear to show that the FS assumed a landfill ground water mound would be present. This is not a realistic assumption and would likely provide unrealistic results for capture zone analysis.

17. Pg. 3-7, bullet 1 The FS assumed infiltration through the Coakley Landfill cap as a conservative assumption.

Comment The OU-1 Remedial Action cap will be a composite cap. Infiltration through the first cap liner, if any, will be stopped by the second cap liner. In cap sloped areas, over 95% of incident precipitation will be removed through run-off before contacting the first liner. It is therefore unlikely precipitation will infiltrate the cap.

18. Pg. 3-7, bullet 3 The FS indicated an estimated outwash drain flow rate of 3,330 gallons per day (gpd), while Weston's FS estimated a flow rate of 87,500 gpd.

Comment The Coakley Group agrees that the FS estimated flow rate for outwash is more realistic than Weston's. The FS does not indicate flow rates from other hydrogeologic units, however.

19. Pg. 3-8, para. 2 FS Table 3-1 lists ground water contaminants that have been shown to present an unacceptable risk from the RI and the screening rationale for retaining or eliminating each contaminant.

Comment The table includes antimony, beryllium, chromium, lead, manganese, nickel, and vanadium. The FS previously stated that chromium, lead, nickel and vanadium were evenly distributed over the study area and therefore did not indicate a landfill source. Because these contaminants are not shown to be associated with the landfill, they should not be retained for screening. Interpretation of site antimony and beryllium data does not indicate the landfill as a source. Therefore, antimony and beryllium should be eliminated for screening.

20. Pg. 3-10, para. 1 The FS states that "The MCLs/MCLGs for [manganese and antimony] were exceeded throughout the area and no dilution would occur that would result in the attainment of ARARs within the study area."

Comment The same condition applies to ground water lead which was observed in background wells in concentrations above the action level. Therefore, lead should be excluded from the screening analysis.

21. Pg. 3-10, para. 3 The FS states that the OU-1 ground water concentration for each contaminant was represented by the highest concentration of that contaminant detected in any of the landfill perimeter wells during any previous sampling event.

Comment Using the highest concentration among a group of wells is not a statistically reasonable method to estimate concentrations in areas between ground water data points. Averaging the ground water concentrations at the known data points is a widely accepted method of estimating values for intermediate areas. Similarly, using the highest ground water concentration observed in any previous round is not realistic. Site historical data indicates a general reduction of ground water contaminant concentrations with time. Combining of two overly conservative assumptions to estimate the OU-1 contaminant concentrations provides unrealistic concentration values that overstates Coakley Landfill source strength and likely affects the analysis results.

22. Pg. 3-20, para. 3 The FS indicates that for VOCs, the OU-2 plume concentration assigned was the highest level detected in any of the wells within this plume.

Comment Using the highest observed contaminant concentrations among a group of wells is not a statistically reasonable method to estimate ground water contaminant concentrations in areas between the data points. Averaging the ground water contaminant concentrations at the known data points is a more realistic technique.

23. Pg. 3-20, para. 4 The FS indicates MCLs were assigned as the estimated plume concentrations in areas where the plume did not encompass wells.

Comment This assumption is overly conservative and results in an excessively conservative analysis.

24. Pg 3-21, para. 5 The FS indicates representative ground water contaminant concentrations were assigned for the dispersion calculations.

Comment The ground water contaminant concentrations selected were not representative of current conditions, but as previously indicated are instead overly conservative.

25. Pg. 3-25 through 3-29 The FS presents results of the dilution analysis. The analysis indicates that benzene would travel 240 feet beyond the FS-delineated limit of benzene concentrations above MCLs. The analysis indicates that inorganics generally would travel 230 feet to 340 feet beyond the FS-delineated MCL limits for those

contaminants. Lead is estimated to travel 1,380 feet beyond the landfill footprint before diluting to its clean-up goal.

Comment The dilution analysis results are not realistic because of conservative analysis approach, assumptions, and input parameters. The RI and FS conclude, and site data show, that ground water contamination concentrations from the landfill have reached steady state and may be declining. Steady state contaminant plumes do not increase in size or concentration. Thus, the extent of contamination would not increase even if no action were taken to reduce the flux of contamination migrating from the Coakley Landfill in ground water. If a source of a steady state contaminant plume is eliminated or reduced, the plume will gradually degrade with decreasing contaminant concentrations. The FS analysis assumes the flux of contaminant migration from the landfill would be zero. Therefore, over time the contaminant plumes sizes should decrease, not increase.

The FS indicates that the purpose is to assess the effects of OU-1 remedial action on OU-2 area ground water quality. The RI/FS indicates that capping of the landfill would result in elimination of the landfill overburden ground water mound. The ground water flow direction would then be westward and the east side of the landfill would be upgradient. Therefore, it is more representative of anticipated site ground water conditions to model the effects of OU-1 remedial action by assuming westward ground water flow. Ground water contaminant transport modeling can be performed for the anticipated site conditions using models based on the advection-dispersion equation, which is the basis for most accepted and verified ground water contaminant transport models. An additional analysis of contaminant transport is presented in the following Appendix C discussion.

26. Pg 3-28, para. 3 The FS states "It was conservatively assumed that inorganics will travel at the same rate as ground water. For inorganics, this should be acceptable since there is no impact of natural attenuation (biodegradation) for inorganics."

Comments FS assumes that inorganic contaminants in ground water would travel at the same rate as ground water and would not be affected by adsorption to organic matter and layered silicates contained in overburden deposits. Sorption processes include adsorption, chemisorption and absorption (Fetter, 1993). Additional inorganic reversible reactions that would retard inorganic substances are ion exchange and solubility/dissolution/precipitation. The ability of a porous medium to absorb cations is measured by the cation exchange capacity (CEC). Clay and glacial till, which contains clay, typically have significant CEC. Site OU-1 and OU-2 data indicate ground water flows within glacial till and marine deposits in many site areas.

Cation mobility in ground water typically decreases over time as cation complexation proceeds toward larger, less reactive and less mobile forms (Bohn, et al, 1979). Freeze and Cherry (Groundwater, 1979) state that the mobility of trace metals in ground water environments can be strongly influences by adsorption processes. Therefore, the FS assumption of no adsorption and attenuation of metals in ground water is overly conservative and overstates the potential migration rates and distances of metals in site ground water.

27. Figures 3-2 through 3-10 Figures 3-2 through 3-10 depict the results of FS dilution analyses.

Comment The plume for benzene is extrapolated toward FPC-11 and GZ-103/101. This is not justified on the basis of site data because benzene ground water concentrations were below detection limits in FPC-11 and GZ-103/101.

The dilution analysis appears to show radial ground water flow from the plumes for each plume. This is not consistent with site conditions nor the fact that plume concentrations have reached steady state. Radial ground water flow and increasing plume size are not a realistic assumptions because the OU-1 cap will reduce or eliminate the landfill ground water mound and plumes have reached steady state.

28. Pg. 5-6, para. 3 The FS MM-2 Limited Action alternative proposes up to 20 additional ground water monitoring wells.

Comment The present monitoring well network of approximately 75 individual installations is more than adequate to assess the effects of remedial actions on ground water concentrations. The FS does not include a justification of the need for additional wells, such as data gaps. It is therefore not cost-effective to install additional monitoring wells.

29. Pg 6-9, para. 1 The FS indicates ground water monitoring would occur for 30 years and include 4 residential wells.

Comment The FS assumes 10 years to reach ground water clean-up goals. Environmental monitoring for 20 years beyond this period is not justified.

The ground water monitoring is quarterly, which is excessive. Annual or semi-annual sampling would be adequate.

The residential/commercial wells referred to in the FS were interpreted to be affected by contaminant sources other then the Landfill. Continuing to sample these wells is not warranted.

30. Pg 6-9, para. 2 The FS indicates there is no protection of human health since there is no way of controlling ground water from being used in the short term.

Comment The RI/FS indicates there are actually no residents known to be exposed to contaminants. Further, with the OU-1 cap constructed, ground water flow will be to the west which includes a wetland with no residences and no likelihood of development. It is therefore not accurate to say there is no protection of human health because there is now no human exposure and no likelihood of future human exposure.

4.0 FS APPENDIX C - GROUND WATER SOLUTE TRANSPORT

Following are comments on the FS Appendix C. For clarity, the comments are divided into those comments that address the FS Appendix C work, and a separate detailed solute transport analysis that provides detailed comments on the FS Appendix C conclusions.

4.1 - FS APPENDIX C COMMENTS

1. Pg. C-1, para. 3 The FS states that the ground water contaminants were eliminated from the analysis if their source appeared unrelated to the landfill such as for antimony and beryllium.

   Comment Although the FS indicates beryllium should be eliminated, Figure C-8 depicts beryllium dispersion. The FS previously stated that chromium, lead, nickel and vanadium were evenly distributed over the study area and therefore did not indicate a landfill source. Because these contaminants are not shown to be associated with the landfill, they should not be retained for analysis. Chromium, lead, nickel and vanadium dispersion analyses were presented in Appendix C.

2. Pg. C-1, para. 3 The FS states that the OU-1 ground water concentration for each contaminant was represented by the highest concentration of that contaminant detected in any of the landfill perimeter wells. Table C-1 provides the concentrations used for the dispersion analyses.

   Comment OU-1 February 1994 ground water analytical data indicate an average benzene concentration of 14 ug/l for landfill wells, which is less than half of the FS value of 30 ug/l. 1,2-Dichloropropane was not detected above the detection limit of 1 ug/l, which is less than 0.15 of the FS value of 7 ug/l. OU-1 February 1994 ground water analytical data indicate an average total arsenic concentration of approximately 162 ug/l compared to the FS value of 212 ug/l.

   The FS values therefore are much more conservative than current site conditions indicate.

3. Pg. C-1, para. 3 Figures C-1 through C-8 depict the results of the FS dilution analyses.

   Comment Figure C-1 shows that the benzene plume concentration is estimated at 11 ug/l, while OU-1 February 1994 data indicate benzene concentrations for landfill perimeter monitoring wells to be 7 ug/l for MW-1, 5 ug/l for MW-2, 10 ug/l for MW-3D, 9 ug/l for MW-4 and 10 ug/l for MW-5D. Therefore, the estimated off-site plume concentration is too high. With a cap, Landfill ground water flow would be to the west.

The conditions are assumed to include a capped landfill which would eliminate radial flow components in the landfill, according to the RI/FS. The figures show that ground water flow is assumed to be radial from the estimated plumes, which is not reflective of present or anticipated site ground water flow paths.

4. Pg. C-15 through C-19 The FS presents results of the dilution analysis. The analysis indicates that benzene would travel 1,180 feet beyond the FS-delineated limit of benzene concentration above MCLs. The analysis indicates that inorganics generally would travel 334 feet to 825 feet beyond the FS-delineated MCL limits for those contaminants. Lead is estimated to travel 2,830 feet beyond the landfill footprint before diluting to its clean-up goal.

Comment The analysis results are excessively conservative because of conservative analysis design, assumptions and input parameters. The RI /FS concludes, and site data show, that ground water contamination from the landfill has reached steady state and contaminant concentrations may be declining. Steady state contaminant plumes do not increase in size or concentration. Thus, the extent of ground water contamination would not increase even if no action were taken to reduce the flux of contamination migrating from the Coakley Landfill in ground water. If a source of a steady state contaminant plume is eliminated or reduced, the plume will gradually degrade. The FS analysis assumes the flux of contaminant migration from the landfill would be zero. Therefore, over time the contaminant plumes sizes should decrease, not increase.

The purpose of the Appendix C analysis was to assess OU-2 area impacts, assuming OU-1 ground water pumping and treatment did not occur. However, the analysis does not consider OU-1 cap effects. The RI/FS indicates that capping of the landfill would result in elimination of the landfill overburden ground water mound. The ground water flow direction would then be westward. The east side of the landfill would be upgradient. Therefore, it is more representative of anticipated site ground water conditions to model the effects of OU-1 remedial action by assuming westward ground water flow. Ground water contaminant transport modeling can be performed for the anticipated site conditions using models based on the advection-dispersion equation, which is the basis for most accepted and verified ground water contaminant transport models.

4.2 - PRELIMINARY OU-2 GROUND WATER SOLUTE TRANSPORT ASSESSMENT

INTRODUCTION

The May 1994 Coakley Landfill OU-2 RI/FS (RI/FS) contains ground water solute transport analyses to assess the effect of OU-1 Remedial Actions on OU-2 ground water contaminant concentrations. The analysis performed did not consider OU-1 cap effects on area ground water quality.

To further assess OU-1 cap impacts on area ground water quality under OU-1 non-pumping conditions, Aries Engineering, Inc. (Aries) conducted a preliminary ground water solute transport analysis for selected chemicals. The analysis resulted in more detailed comments on the FS Appendix C which are provided in the Discussion and Conclusions and Recommendations sections which follow on pages 32 through 35.

OBJECTIVES

Aries' preliminary ground water solute transport analyses objectives were to assess potential off-site migration of selected ground water chemicals of concern assuming non-extraction and treatment of OU-1 ground water after Coakley Landfill capping. Aries' solute transport analyses, which considered chemical attenuation mechanisms, were compared to the RI/FS dilution analyses which relied on dilution factors only.

SITE HYDROGEOLOGY AND GROUND WATER QUALITY SUMMARY

GEOLOGY

A site plan is provided on Figure 1. Observed site area overburden geology generally consists of a thin layer of glacial outwash deposits which overlie marine deposits and glacial till deposits. Observed site area overburden deposits are discontinuous and vary in thickness. Observed marine deposits are sufficiently thick to act as an aquitard in some areas primarily east of the site and in scattered areas around the landfill.

Observed site bedrock consists of intrusive granite-gneiss surrounded by metasedimentary quartzite, schist, phyllite and amphibolite. Site data indicate the upper portion of bedrock is moderately to highly weathered and well fractured. Observed bedrock elevations in the model area range from -27 feet national geodetic vertical datum (NGVD) to 136 feet NGVD. Bedrock elevations are highest within and northeast of the landfill.

HYDROGEOLOGY

Site ground water occurs under water table conditions in the uppermost saturated deposits while semi-confined conditions are likely where significant thicknesses of marine deposits overlie saturated glacial till or bedrock. Site area ground water originates as infiltrating precipitation on the uppermost geologic deposits and flows mainly through the more permeable strata toward streams and wetlands which then act as discharge areas. A distinct downward vertical hydraulic gradient is present over much of the landfill area indicating a component of ground water flow from the upper overburden deposits toward the underlying bedrock. A strong upward vertical hydraulic gradient was measured in the wetland areas where bedrock and overburden ground water discharge. Site bedrock pump test data did not indicate anisotropic conditions.

Previous ground water flow modeling conducted by Aries indicates that there is a local eastward overburden ground water flow component from the Coakley Landfill. This eastward flow component is small and is caused by local ground water mounding at the landfill. The low hydraulic gradients east of the landfill result in a small volume of easterly flowing ground water. Moreover, Aries' previous ground water flow model flow path analysis indicates that the initial eastward flow paths turn westerly and flow either beneath the landfill in the bedrock, or around the landfill then toward the west in the overburden deposits. Simulated ground water flow after Coakley Landfill capping indicates that overburden and bedrock ground water flows to the west. These flow paths are consistent with site monitoring well observed ground water quality.

GROUND WATER QUALITY

Site ground water quality data from between 1985 and 1994 generally indicate the presence of VOCs including the petroleum-related VOCs benzene, toluene, ethylbenzene and xylene (BTEX), as well as inorganic compounds including arsenic and metals such as iron, manganese, and lead.

Historically, ground water observed benzene concentrations in landfill monitoring wells have ranged from approximately 5 ug/ℓ to 60 ug/ℓ which is above the 5 ug/ℓ MCL. Benzene concentrations in ground water generally decrease with distance from the landfill. Benzene concentrations detected in OU-2 RI/FS monitoring wells have ranged from 0.5 ug/ℓ to 11 ug/ℓ. Ground water analytical results indicate that area ground water observed benzene concentrations have generally decreased since monitoring well sampling began in 1985.

Observed concentrations of inorganic compounds, metals and metalloids in particular, were variable in the landfill vicinity. Area ground water quality samples were analyzed for either total or dissolved metals from 1985 to 1993. Area ground water samples were filtered for dissolved metals analysis and unfiltered for total metals analysis. Because inorganics adsorbed onto or present in sediments in ground water samples are dissolved when preserved with acid for subsequent analysis, total metals concentrations are substantially greater than dissolved metals concentrations unless special well construction and sampling methods designed to reduce sample turbidity are used.

In February 1994 ground water samples were analyzed for both total and dissolved metals as part of the OU-1 Environmental Monitoring Plan (EMP). February 1994 OU-1 observed arsenic total concentrations were on average four times greater than the dissolved arsenic concentrations from the same monitoring well.

While a February 1994 OU-1 ground water sampling round from landfill monitoring wells indicated concentrations of total beryllium, total chromium, total lead, and total nickel above their respective MCLs, historic site vicinity water quality data indicate that concentrations of these metals have been periodically observed higher further away from the landfill than at the landfill itself. Moreover, metals concentrations in site vicinity monitoring wells have varied by up to an order of magnitude within a 12-month period. The RI/FS concluded that the spatial and temporal variability in the site vicinity ground water inorganic concentrations may be related to elevated background concentrations, non-landfill source areas, or variability in sampling techniques affecting sample turbidity.

GROUND WATER SOLUTE TRANSPORT ANALYSES

GROUND WATER SOLUTE TRANSPORT ANALYSES APPROACH

Aries used an analytical two-dimensional advection dispersion model to assess migration of contaminants from the Coakley Landfill to off-site ground water monitoring wells. The model used by Aries simulates contaminant transport from a strip source. A strip source is appropriate because the landfill is large compared to the distance of off-site wells from the landfill. Therefore, the landfill areal extent and potential area for chemical leaching would not appropriately be modeled as a point source.

The analytical flow and transport model used was developed for and is used by the EPA to assess chemical solute transport in ground water.

Aries used site hydrogeologic data and historical ground water quality data from 1985 through February 1994 to estimate ground water solute transport model parameters representative of site conditions. The ground water solute transport model was then used to predict future ground water contaminant concentrations after landfill capping.

PRINCE ANALYTICAL FLOW AND TRANSPORT MODEL

Aries used Princeton Analytical Models of Flow and Mass Transport (PRINCE). PRINCE contains both solute transport models and flow models. The solute transport models are solutions to the advection-dispersion equation (ADE) for transient one-, two-, and three-dimensional conditions. The solute transport model solutions incorporate longitudinal and transverse dispersivity, ground water seepage velocity, chemical first order decay constants, and linear, equilibrium sorption (retardation factor). Fundamental model assumptions include: aquifer properties are uniform in space (homogeneous); and the source concentration is uniform in time, although source concentration first order decay may be simulated

There are 14 input parameters to PRINCE shown in Table 1. Descriptions of the input parameters and methods of estimating these parameters follow.

First Order Decay Constants (k and Gamma)

PRINCE accounts for first order decay of the contaminant source and plume. The decay coefficients represent chemical and biological processes that remove contaminant mass from the system over time. Decay processes include biodegradation of organic compounds and abiotic reactions such as hydrolyzation of chlorinated hydrocarbons, while inorganic compound decay processes include radioactive decay, complexation, speciation and oxidation/reduction. The decay constant values are empirically estimated based on literature values and site historical ground water quality data.

First order decay of the contaminant source (gamma) and plume (k) are expressed mathematically as

$$C_{aquifer} = C_{on} \; e^{-k\,t}$$

$$C_{source} = C_{on} \; e^{-Gamma\,t}$$

where

$C_{aquifer}$	=	concentration in aquifer, $[M/L^3]$
C_{source}	=	concentration in source area, $[M/L^3]$
C_{on}	=	concentration in source area at time 0, $[M/L^3]$
t	=	time, [T]
e	=	exponential function

where

M	=	mass
L	=	length
T	=	time

First order decay of the source (gamma) can be estimated using concentration data for different times. First order decay of the plume (k) can be estimated using literature values for a given contaminant, where available. Reported literature values for first order decay of BTEX compounds range from 0.0001/day to 0.004/day (Olsen and Davis, 1990).

Longitudinal and Transverse Dispersion Coefficients (D_x and D_y)

Dispersion is an attenuation mechanism that results in dilution of the leading edge of a contaminant plume caused by differential flow velocities (mechanical mixing) and chemical diffusion (Fetter, 1993). At very low average linear ground water velocities, diffusion is the primary cause of dispersion, while at higher velocities mechanical mixing is the dominant process (Freeze and Cherry, 1979). Dispersion causes contaminants to arrive at a point in the flow path before the average linear velocity would predict. Longitudinal dispersion (D_x) refers to spreading of a plume in the primary (x) direction of flow, whereas transverse dispersion (D_y) refers to spreading of a plume in the lateral (y) direction. The dispersion coefficients D_x and D_y are the product of dispersivity (a) and average linear ground water velocity (V):

$$D_x = a_x V$$
$$D_y = a_y V$$

Researchers have observed that the value of dispersivity generally increases with the length of flow (Gelhar, 1986; Lallemand-Barres and Peaudecert, 1978) according to the relationship $D_x = (0.1)(X)$, where X is the length of flow. D_y is generally taken as one to two orders of magnitude smaller than D_x.

Average Linear Ground Water Velocity (V)

Average linear ground water velocity V is defined by the relationship

$$V = K^*i/n$$

where

K = aquifer hydraulic conductivity, [L/T]
i = hydraulic head gradient, [L/L]
n = aquifer porosity, [L^3/L^3]

The primary mechanism for contaminant migration in aquifers is advection wherein contaminants are transported by bulk ground water movement. Solutes are assumed to travel in the same direction and with the same velocity as the ground water.

Values of aquifer hydraulic conductivity are generally estimated from aquifer pumping tests, hydraulic conductivity tests and literature values for similar geologic materials. The hydraulic gradient is estimated from water level measurements across a site, and porosity can be estimated based on the type of geologic materials. Typical values of porosity for different aquifer types are summarized in Freeze and Cherry (1979) and other literature sources.

Source Concentration (C_{oo})

The source concentration is estimated as the concentration of the contaminant of concern at time zero. For ground water contaminant transport analyses, C_{oo} is the concentration of contaminant at the source. However, when that concentration is unknown, C_{oo} is estimated from contaminant concentrations observed in a wells near the contaminant release at a time shortly after the release. If the release occurs prior to available data,

C_{on} can be estimated by extrapolating available data with the source first order decay constant (Gamma).

Retardation Factor (R_d)

The retardation factor (R_d) is a measure of reversible mass exchange processes such as sorption of contaminant to aquifer materials. Sorption processes include adsorption, chemisorption and absorption (Fetter, 1993). Additional inorganic reversible reactions that would increase the retardation factor are ion exchange and solubility/dissolution/precipitation. Retardation causes contaminants to migrate slower than the average ground water velocity. The retardation factor R_d for linear equilibrium sorption can be estimated using the following relationship (Fetter, 1993):

$$R_d = 1 + [(K_d * P_b)/n]$$

where

K_d = Distribution coefficient, $[L^3/M]$
P_b = Dry bulk density, $[M/L^3]$
n = Aquifer porosity, $[L^3/L^3]$

Aquifer bulk density P_b can be estimated using the relationship

$$P_b = P_s * (1-n)$$

where P_s is the soil grain density $[M/L^3]$ of aquifer materials. For most mineral soils, P_s varies between 2.6 g/cm^3 to 2.77 g/cm^3 (Cleary and Ungs, 1994).

The distribution coefficient K_d approximates the slope of the linear equilibrium sorption isotherm, and can be estimated either from laboratory column experiments, field-scale tracer experiments or the following relationship (Fetter, 1993):

$$K_d = K_{oc} * f_{oc}$$

where

K_d = Distribution Coefficient $[L^3/M]$
K_{oc} = Organic Carbon Partitioning Coefficient $[L^3/M]$
f_{oc} = Organic Carbon fraction $[L^3/L^3]$

Ranges of contaminant-specific values of the Organic Carbon Partitioning Coefficient (K_{oc}) can be found in the literature (Fetter, 1993; US EPA, 1989). Values of organic carbon fraction (f_{oc}) are soil-specific and are based either on laboratory analysis of soil samples or on knowledge of geologic conditions within the soils. Conservatively low estimates of soil organic carbon fraction (f_{oc}) range from 0.0001 to 0.001.

The preceding linear relation for organics or inorganics adsorbing onto the soil organic carbon does not account for the inorganics removal from ion exchange and solubility/dissolution/precipitation. These factors must be estimated separately and would increase the retardation of inorganics.

Model Time and Geometry Parameters (T_{on}, T_{off}, X_o, Y_o, W, Theta and NGauss)

PRINCE can account for various model geometries. T_{on} is the time at which the contaminant release began; T_{off} is the time at which the contaminant release ends. X_o and Y_o are the cartesian coordinates of the centroid of the source. For a strip source, X_o and Y_o mark the mid-point of the strip. W is the width of the strip source, and Theta is the direction of ground water flow counterclockwise off the x axis (degrees); ground water flow is assumed to be perpendicular to the strip source. NGauss is a parameter associated with the numerical integration performed in PRINCE.

PRINCE MODEL FOR OU-2 SOLUTE TRANSPORT ASSESSMENT PARAMETER ESTIMATION

Aries estimated the solute transport model input parameters based primarily on available site hydrogeologic and ground water quality data. For parameters not measured at the site, including plume and source decay constants, Aries used literature values for similar chemicals and hydrogeologic conditions.

Aries performed sensitivity analyses to assess the model results sensitivity to changes in individual input parameters. The sensitivity analyses were directed toward parameters not measured at the site.

Aries did not rigorously calibrate the model simulations because of the following site data and model limitations: the landfill source area is widespread and heterogeneous; ground water chemistry variations in the landfill likely affect contaminant mobility; and the density of the monitoring well network and frequency and duration of site water quality data limits model calibration. Site ground water quality data are available from 1985 for MW-series monitoring wells, from 1987 for GZ-series monitoring wells and from 1992 for most FPC-series monitoring wells.

Aries selected PRINCE Model 4 - Two-Dimensional Mass Transport, Strip Boundary Condition for the Coakley Landfill OU-2 solute transport assessment. Model 4 assumes a contaminant source of width W, oriented perpendicular to ground water flow in an aquifer of infinite width. PRINCE input parameter units are in feet and days, except concentrations which may be mass per volume or normalized concentration based on the initial contaminant concentrations.

Previous hydrogeologic investigations of the Coakley Landfill area indicate that ground water flow occurs both in glacial and marine deposits (overburden) and in underlying metamorphic and igneous bedrock. The direction of ground water flow appears to differ locally between the overburden and bedrock. Historical observed water level data suggests that site ground water flow in the underlying bedrock is predominantly to the west, beneath the landfill as shown on Figure 2 and overburden ground water flows is radial from the landfill as shown on Figure 3. The OU-1 Remedial Design calibrated 3-D numerical ground water flow model for the landfill (Golder and Aries, 1994) supports these observed ground water flow directions.

Contaminant transport depends on contaminant property, the ground water flow medium property and hydrogeologic conditions. Therefore, for this OU-2 solute transport assessment, Aries estimated the model parameters for the transport of two contaminants, benzene and arsenic as follows: in bedrock flow only between the two bedrock wells MW-5 and GZ-105; in overburden flow only between MW-3D and FPC-9A; and a combination of bedrock and overburden flow between RP-1 and MW-1. The solute transport model flow path in bedrock is shown on Figure 1 and Figure 2, and the flow paths in overburden and overburden/bedrock are shown on Figure 1 and Figure 3. These flow paths are generally consistent with observed site hydraulic heads depicted on Figures 2 and 3. Solute transport model parameter estimation sensitivity analysis flow path selection was limited to locations with available historical ground water quality data.

Benzene and arsenic were selected for two reasons: 1) both are locally present in the landfill vicinity at concentrations above their respective MCLs, and 2) concentrations of these contaminants are generally higher at the source area (landfill) than in surrounding wells. Solute transport model simulations were not performed for other inorganic compounds such as metals observed in the site vicinity due to the variability of this data.

Table 1 summarizes estimated input parameters. The basic model geometry was similar for all six simulations. Because of limited information on timing of source releases of individual contaminants, Aries modeled each contaminant source as a 30-year continuous release beginning in 1971 (T_{on} = 0) and ending in 2001 (T_{off} = 10,950 days) to represent a continuous source. The source was simulated as a 300-foot wide strip orientated parallel to the Y axis centered at (0,500): W = 300, X_o = 0, Y_o = 500, Theta = 0. NGauss was set equal to 20 as recommended in the PRINCE Users Manual.

Input parameters that were varied between solute transport simulations included the contaminant source and plume first order decay constants k and Gamma, longitudinal and transverse dispersion coefficients D_x and D_y, ground water seepage velocity V, and the contaminant retardation factor R_d. The individual solute transport model simulations are summarized in the following.

Bedrock Flow Path Estimated Model Parameters (MW-5 to GZ-105)

Benzene - Bedrock

As shown in Table 1, Aries used a value of 0.0001 for the benzene plume first order decay rate (k) in bedrock and overburden. This value is conservative, and is consistent with values reported in the literature for BTEX compounds (Davis and Olsen, 1990). The first order decay constant for the source area (Gamma) was estimated at 0.0001 based on observed changes in benzene concentrations in ground water collected from well MW-5 between 1985 and 1991. D_x, the coefficient of longitudinal dispersivity, was estimated at 100 based on the following relationship (Lallemand-Barres and Peaudecert, 1978):

$$D_x = 0.1 * X$$

where

X = the flow distance, [L]

The approximate flow distance between MW-5 and GZ-105 is 1,000 ft, so D_x was estimated at 100. D_y for fractured bedrock was assumed to be two orders of magnitude smaller than D_x (D_y = 1) due to the observed narrow site bedrock benzene plume.

The average linear ground water velocity between MW-5 and GZ-105 was estimated at 0.30 ft/day based on the observed hydraulic gradient in bedrock in this vicinity of the site of 0.0167 shown on Figure 2, a hydraulic conductivity of 1 ft/day from the OU-1 Remedial Design calibrated 3-D flow model (Golder and Aries, 1994), and an estimated effective porosity of 0.05. Aries estimated the retardation factor R_d for benzene to be 2.6 based on a benzene-specific K_{oc} value (Fetter, 1993), and estimated values of aquifer organic carbon content and porosity. The organic carbon content was estimated at .0005 which is a conservatively low value for site fractured and weathered upper bedrock.

The source concentration of benzene for the MW-5 to GZ-105 flow path was estimated at 30 ug/ℓ. This was estimated by extrapolating backward to 1971 using the observed benzene concentrations in MW-5 in 1985 and the first order source decay constant Gamma = 0.0001. The estimated source concentration is consistent with site historical ground water benzene concentrations.

Figure 4 depicts model calculated benzene concentrations from 1971 to 2001 in well GZ-105 using the above parameters. As shown, the observed benzene concentrations are within 3 ug/ℓ of the model-predicted concentrations.

Arsenic - Bedrock

Table 1 lists the values for Aries' solute transport model arsenic parameter estimation simulation. Aries' parameter estimation for arsenic transport in bedrock used the same input parameters as those selected for benzene transport in bedrock with the following exceptions:

- The retardation factor for arsenic was calculated as 1.0 based on a literature K_{oc} value of 5 for arsenic trioxide (USEPA, 1986) and conservatively estimated values for f_{oc} and porosity. Generally metals have higher retardation factors than organics, as much as 1,000 or more (Wilson and Clark, 1994). Aries' retardation factor of one is based only on the linear adsorption of arsenic trioxide to available soil organic carbon and does not include other arsenic compounds or other reactions such as complexation, ion-exchange, solubility/dissolution/precipitation. Therefore, Aries simulated the most mobile species and conservative conditions for arsenic transport.

- The arsenic source concentration C_{on} was estimated at 30 ug/ℓ in 1971 following the same technique employed to estimate C_{on} for benzene.

- The first order arsenic plume decay constant was estimated at 0.0005 in order to best fit observed arsenic concentrations in well GZ-105. It is reasonable to assume a larger first order decay constant for arsenic than for benzene, as inorganic compounds are generally subject to a wide variety of reactions that limit their mobility in the subsurface (Fetter, 1993; Allen, H.E., et. al, 1993; Mirecki and Parks, 1994).

Figure 4 depicts model calculated arsenic concentrations from 1971 to 2001 in well GZ-105 using the above parameters. As shown, the observed arsenic concentrations are within 6 ug/ℓ of the model-predicted concentrations.

<u>Overburden (Glacial Till) Flow Path Estimated Model Parameters (MW-3D to FPC-9A)</u>

Benzene - Overburden (Glacial Till)

Aries used the same parameter values for first order decay, source decay, retardation factor, model geometry and time for the benzene overburden model input parameters as were used for the benzene bedrock model input parameters. The following parameter values were used for the benzene overburden solute transport parameter estimation simulation.

- The average linear ground water velocity in the overburden was estimated at 0.0008 ft/day based on observed hydraulic gradients on the northeast side of the landfill shown on Figure 3, Remedial Design 3-D ground water flow model-calibrated values of hydraulic conductivity (Golder and Aries, 1994), and estimated values of till porosity.

- The source concentration C_{on} of benzene in 1971 was based on the observed concentration in well MW-3D and a source decay constant of 0.0001.

- A longitudinal dispersivity coefficient D_x of 50 feet was estimated based on the flow path length between MW-3D and FPC-9A (500 feet) and the relationship $D_x = 0.01 * X$. Transverse dispersivity D_y was estimated at 5 feet, one order of magnitude less than Dy.

Figure 5 depicts model calculated benzene concentrations from 1971 to 2001 in FPC-9A using the above parameters. As shown, observed benzene concentrations are within 6 ug/ℓ of model-predicted concentrations.

Arsenic - Overburden (Glacial Till)

Aries used the same parameter values for solute decay, source decay, retardation factors, model geometry and time for the arsenic overburden input parameters as were used for the arsenic bedrock input parameters. The following parameter values were used only for the arsenic overburden solute transport parameter estimation simulation.

- The average linear ground water velocity in the overburden was estimated at 0.0008 ft/day.

- A longitudinal dispersivity coefficient D_x of 50 feet was estimated based on the flow path length between MW-3D and FPC-9A (500 feet) and the relationship $D_x = 0.01 * X$. Transverse dispersivity D_y was estimated at 5 feet, one order of magnitude less than D_y.

- A source concentration C_{on} of arsenic in 1971 of 270 ug/ℓ was based on the observed concentration in well MW-3D and a source decay constant of 0.0001.

Figure 5 depicts model calculated arsenic concentrations from 1971 to 2001 in FPC-9A using the above parameters. As shown, the observed arsenic concentrations are generally 10 ug/ℓ to 20 ug/ℓ higher than model-predicted concentrations. This is likely because the model is based on dissolved arsenic concentrations and FPC-9A available analytical data reports total arsenic concentrations including arsenic adsorbed to sample sediment. The difference between the simulated arsenic concentrations and the observed concentrations is similar to the difference in dissolved and total concentrations in site analytical data.

Combined Bedrock/Overburden Flow Path Estimated Model Parameters (RP-1 to MW-1)

Aries also used PRINCE to evaluate benzene and arsenic transport between wells RP-1 and MW-1. Both RP-1 and MW-1 are screened in overburden deposits. However, when Aries employed model input parameters for overburden solute transport from the MW-3D to FPC-9A flow path, the match between observed and model-predicted arsenic and benzene concentrations was poor. However, the match between model-predicted concentrations versus observed arsenic and benzene concentrations improved when input parameters were adjusted to simulate ground water flow between the landfill and MW-1 in both overburden and bedrock. OU-2 RI/FS geologic cross-section Figure 3-9 shows that an overburden/bedrock flow path is likely in the RP-1 to MW-1 area.

Benzene - **Flow through both Overburden (Till) and Bedrock**

As shown in Table 1, Aries estimated D_x at 40 feet (X = 400 feet) and D_y at 4 feet. The estimated benzene source concentration at RP-1 in 1971 was 30 ug/ℓ. The observed hydraulic gradient between RP-1 and MW-1 is shown on Figure 3 and hydraulic conductivity values for the area (Golder and Aries, 1994) indicate that average linear ground water velocities should be approximately 0.02 ft/day. However, this value was increased to V = 0.10 ft/day to provide a better match between observed benzene concentrations in MW-1. This higher average linear ground water velocity suggests that ground water may also be migrating within portions of the underlying bedrock.

Figure 6 depicts model-predicted benzene concentrations in monitoring well MW-1. MW-1 simulated benzene concentrations were close to observed concentrations for the 1990 data, but observed benzene concentrations during the 1980s were up to 30 ug/ℓ higher than predicted. The steady decrease in observed benzene concentrations may be due to a higher than anticipated source reduction rate.

Arsenic - **Flow through both Overburden (Till) and Bedrock**

Figure 6 depicts model-predicted arsenic concentrations in monitoring well MW-1. MW-1 simulated arsenic concentrations were generally 15 ug/ℓ to 25 ug/ℓ higher than observed. The arsenic source concentration of C_{on} was estimated by assuming that observed 1991 through 1994 arsenic concentrations in landfill monitoring well RP-1 apparently decayed according to a first order decay constant of k = 0.0005. The difference between model-predicted and observed arsenic concentrations may be due to variations in source strength, ground water conditions affecting arsenic mobility, heterogeneities in ground water flow paths and other factors not simulated in Aries' preliminary solute transport model.

MODEL PREDICTION OF SOLUTE TRANSPORT AFTER LANDFILL CAPPING

Aries used the PRINCE model with the estimated input parameters shown in Table 2 to predict the concentration of benzene and arsenic at 10- and 20-year intervals following capping of the landfill. The strip source for the model prediction, shown on Figures 9 and 10 is 1,400 feet wide, the approximate north-south length of the landfill. With the exception of source concentration C_{on} and average linear ground water velocity V, Aries' model-prediction parameters were the same as the estimated model input parameters in Table 1. The direction and average linear ground water velocity (V = 0.26 ft/day) of ground water flow are based on hydraulic conductivities and hydraulic heads in the bedrock and overburden from the Remedial Design 3-D ground water flow model of predicted heads following capping of the landfill (Golder and Aries, 1994). The 3-D model predicts the landfill ground water mound will be eliminated by the cap and will result in westerly ground water flow. The source concentrations of 14 ug/ℓ for benzene and 170 ug/ℓ for arsenic are based on 1994 ground water quality data from landfill monitoring wells. The assumed benzene concentration in the average of the OU-1 EMP February 1994 landfill monitoring well benzene concentrations. Aries used total arsenic concentrations to be consistent with the OU-2 dilution analysis. The assumed arsenic concentration is the total arsenic reported for RP-1 and is close to the average total arsenic concentration for landfill monitoring wells of 162 ug/ℓ. The OU-1 February 1994 average dissolved arsenic concentration for landfill monitoring wells was approximately 50 ug/ℓ.

PREDICTED BENZENE CONCENTRATIONS

Model-predicted benzene concentrations at 10- and 20-year intervals following capping of the landfill are shown on Figure 7. As shown, after 10 years, the 5 ug/ℓ contour, which is the benzene MCL, extends approximately 600 feet downgradient of the strip source, which is approximately 300 feet to 400 feet from the western landfill edge. After 20 years, the 5 ug/ℓ contour is still located approximately 600 feet downgradient of the strip source, but upgradient concentrations have decreased.

Predicted Arsenic Concentrations

Figure 8 depicts model-predicted total arsenic concentrations at 10- and 20-year intervals following capping of the landfill. As shown, after 10 years, the 50 ug/ℓ contour (arsenic MCL) extends approximately 750 feet downgradient of the strip source. After 20 years, the 50 ug/ℓ contour extends approximately 500 feet downgradient of the strip source. The reduction in plume concentration observed in the simulated arsenic plume compared to a smaller reduction in the benzene plume after 20 years is probably due to the higher value of the arsenic plume first order decay ($k = 0.0005$ for arsenic as opposed to $k= 0.0001$ for benzene). Also, the higher value of the benzene retardation factor would tend to prolong the arrival of the benzene front.

DISCUSSION

IMPLICATIONS OF ARIES' SOLUTE TRANSPORT PREDICTIONS

Aries's solute transport predictions were based on a simplified 2-D analytical solute transport model adjusted to site conditions with a limited amount of spatially and chemically variable data. The model accounted for processes governing solute transport with parameters such as first order decay constants and retardation. The model assumed that the source concentration was evenly distributed along a line source and followed a simple first order decay in time. The model is not capable of reproducing the effects of small localized releases of high concentrations at various locations and times which may occur at a landfill. Ground water velocities for model predictions were estimated based on Golder and Aries' Remedial Design 3-D ground water flow model predictions for ground water flow conditions following landfill capping.

Aries' solute transport model indicated that following landfill capping, within 10 years benzene concentrations would likely reach the 5 ug/ℓ MCL within approximately 100 feet to 200 feet from the western edge of the landfill. Moreover, Aries' model predicted that the position of this 5 ug/ℓ benzene contour would not change substantially through time, indicating that the benzene plume is decaying and being attenuated at approximately the same rate it migrates. Site ground water flow and analytical data suggest that steady state conditions have developed as chemical concentrations appear to have generally decreased with time and are not fluctuating substantially.

Aries' model simulations indicated that, based on total arsenic concentrations, arsenic concentrations could reach the 50 ug/ℓ MCL 200 feet to 300 feet downgradient of the landfill boundary within 10 years of landfill capping, and 50 feet downgradient (west) of the landfill boundary within 20 years of landfill capping. It should be noted that OU-1 EMP February 1994 data indicate that arsenic concentrations do not generally exceed the 50 ug/ℓ arsenic MCL in wells downgradient (west) of the landfill. It is likely that the preliminary solute transport model overestimates the arsenic concentrations because of the following: 1) several attenuation mechanisms that reduce the arsenic concentrations are not simulated in the model 2) and as previously indicated the arsenic source may not be widespread in the landfill compared to that of the model simulation.

COMPARISON WITH OU-2 FS DISPERSION CALCULATIONS

The OU-2 FS dilution model differed substantially from Aries' solute transport model because the FS analysis did not use ground water flow paths to simulate solute transport and did not include the attenuation of inorganics and decay of the chemical source for organics or inorganics. Aries' solute transport model used widely-accepted solute transport advection and dispersion equations relied on by the EPA and others in analyses at other Superfund sites. The source area concentrations selected for the landfill area were based on total metals analytical data which is elevated compared to the dissolved metals data analytical results. Further, OU-2 FS dilution calculations included the highest observed concentration to represent the entire landfill although historical and recent landfill ground water quality data do not support this assumption. OU-1 Remedial Design ground water flow and solute transport model results indicate a westerly flow after capping the landfill. The OU-2 FS model was based on the assumption that the chemicals will disperse radially from the landfill even after capping which will not likely occur.

Site data indicates that the contaminant plume is in steady state. Under steady state conditions, a contaminant plume does not increase in size or contaminant concentration. The conservative OU-2 FS model results were not consistent with site data because it indicated contaminant transport will occur well beyond the most recent observed contaminant plume boundaries.

Radial flow in the overburden near the landfill is due to the ground water mound beneath the landfill caused by increased ground water recharge in the refuse area. Placing a low permeability cap over the landfill will eliminate ground water recharge in the landfill, and will therefore eliminate the observed ground water mound and associated radial flow. OU-1 Remedial Design 3-D ground water flow model supports this, indicating that capping the landfill will result in generally westerly flow in both overburden and bedrock. The conservative OU-2 FS model was apparently based on the assumption that ground water contaminants will disperse radially from the landfill even after capping. Aries' analytical solute transport model predictions assumed that flow in both bedrock and overburden will be essentially westerly following landfill capping.

OU-2 FS Appendix C dilution calculations for benzene indicate that ground water would need to flow radially 1,178 feet from currently delineated extent of the benzene plume to attain a uniform benzene plume concentration of 5 ug/ℓ. Aries' model predicts that the 5 ug/ℓ benzene MCL may be attained at a distance of approximately 100 feet to 300 feet from the landfill's western edge within 10 years without OU-1 ground water extraction and treatment. Figure 9 depicts Aries' simulated 10-year benzene dispersion concentration contours.

OU-2 FS Appendix C dilution calculations for arsenic suggested that ground water would need to flow radially 825 feet from the arsenic plume boundary with an estimated travel time of 4 years to attain a uniform arsenic concentration of 50 ug/ℓ (MCL). Aries' solute transport model indicates that arsenic concentrations could reach 50 ug/ℓ 200 feet to 400 feet downgradient from the landfill western edge within 10 years without OU-1 ground water extraction and treatment. Figure 10 depicts Aries' simulated 10-year arsenic dispersion concentration contours. Arsenic concentrations in most wells downgradient of the landfill do not exceed 50 ug/ℓ, suggesting that arsenic may be considerably less mobile than assumed by both the OU-2 FS and Aries' models.

CONCLUSIONS AND RECOMMENDATIONS

Based on the preliminary OU-2 ground water solute transport assessment, Aries' concludes the following:

- Considering the hydraulic effects of capping the landfill and chemical decay and attenuation, concentrations of benzene and arsenic that exceed their respective MCLs may be limited to an area within 100 feet to 400 feet downgradient (west) of the landfill. Therefore, landfill capping without ground water extraction and treatment may reduce site ground water contaminant concentrations to within clean-up goals in an acceptable time period.

- Aries' site ground water solute transport analysis-predicted ground water contaminant plume geometry is significantly smaller than the OU-2 FS prediction and located to the west of the landfill only rather than surrounding the landfill.

- Chemical concentrations in ground water at and surrounding the landfill appear to be in a steady state condition. Site ground water data indicate that contaminant concentrations have generally stabilized through the 1980s and may be decreasing slightly. VOC concentrations do not appear to be fluctuating substantially at the present time.

- Aries' model predicted concentrations of arsenic greater than those currently observed in the landfill vicinity, suggesting that arsenic concentrations were overestimated because of the following: 1) several attenuation mechanisms that reduce arsenic concentrations are not simulated in the model, 2) as previously indicated the arsenic source may not be widespread in the landfill compared to that of the model simulation, 3) arsenic is less mobile than assumed by the model.

- The spatial and temporal variability of the site ground water metals data are too great for use in the simplified 2-D analytical solute transport model employed by Aries for this analysis. This data variability is likely a result of total metals analysis being compared to dissolved metals analysis, variability in sampling techniques resulting in samples with differing turbidities and spatially and temporally variable metals source areas within the landfill.

Based on this study, Aries recommends that ground water conditions be monitored following capping of the landfill. Landfill capping without ground water extraction and treatment may reduce ground water contaminant concentrations to clean-up goals about as quickly as would occur with ground water treatment. Future ground water quality and elevation monitoring data should be used to update the solute transport model results. A more detailed assessment of contaminant transport would be required to better assess whether OU-1 Remedial Action consisting of capping without OU-1 area ground water treatment, could attain OU-1 and OU-2 cleanup standards about as quickly as with OU-1 ground water treatment.

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Table 1
Parameters for Analytical Model of Flow and Mass Transport

Aries No. 92033

Coakley Landfill
OU-2 Ground Water Contaminant Transport Assessment

07/29/94

Parameter Description	Parameter symbol	Units	Bedrock MW-5 to GZ-105 (Figure 5)		Overburden (Till) MW-3D to FPC-9A (Figure 6)		Till/Bedrock* RP-1 to MW-1 (Figure 7)	
			Benzene	Arsenic	Benzene	Arsenic	Benzene	Arsenic
Solute first order decay	K	[1/days]	0.0001	0.0005	0.0001	0.0005	0.0001	0.0005
Source first order decay	Gamma	[1/days]	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Longitudinal dispersivity	Dx	[feet]	100	100	50	50	40	40
Transverse dispersivity	Dy	[feet]	1	1	5	5	4	4
Average linear ground water velocity	V	[ft/day]	0.3	0.3	0.0008	0.0008	0.1	0.1
Initial source concentration	Con	[ppb]	30	30	70	270	30	200
Solute retardation factor	Rd	[ ]	2.6	1	2.6	1	2.6	1
Simulation start time	Ton	[days]	0	0	0	0	0	0
Simulation end time	Toff	[days]	10,950	10,950	10,950	10,950	10,950	10,950
X-coordinate of center of strip source	Xo	[feet]	0	500	0	500	0	500
Y-coordinate of center of strip source	Yo	[feet]	500	500	500	500	500	500
Width of strip source	W	[feet]	300	300	300	300	300	300
Angle of ground water flow direction	Theta	degrees	0	0	0	0	0	0
Numerical integration parameter	NGauss	[ ]	20	20	20	20	20	20

NOTES:
* Ground water flowing northwest from landfill monitoring well RP-1 vicinity towards MW-1 may migrate through both bedrock and till.

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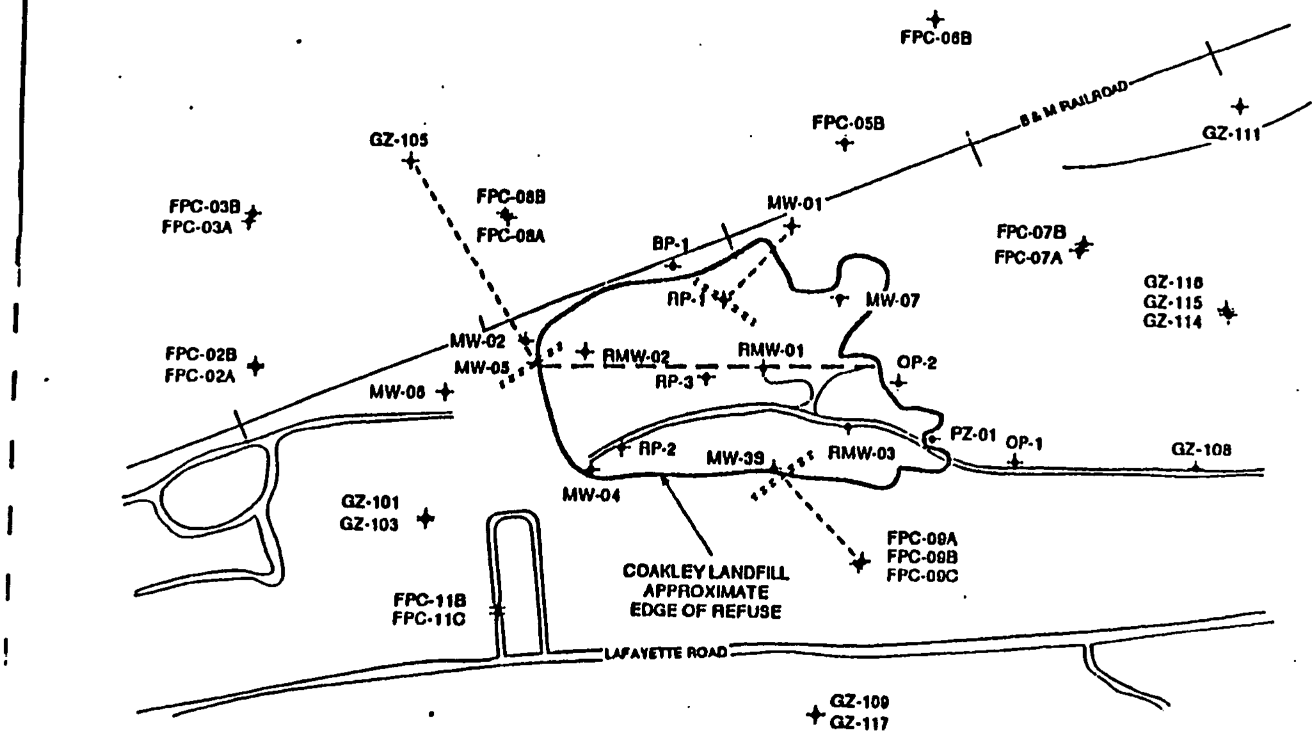
Table 2
Model Prediction Parameters for Contaminant Transport After Landfill is Capped
Analytical Model of Flow and Mass Transport
Aries No. 92033

Coakley Landfill
OU-2 Ground Water Contaminant Transport Assessment

Parameter Description	Parameter	Units	Total Hydrogeologic System (Bedrock and Overburde Benzene (Figure 8)	Arsensic (Figure 9)
Solute first order decay	K	[1/days]	0.0001	0.0005
Source first order decay	Gamma	[1/days]	0.0001	0.0001
Longitudinal dispersivity	Dx	[feet]	100	100
Transverse dispersivity	Dy	[feet]	10	10
Average linear ground water velocity	V	[ft/day]	0.26	0.26
Initial source concentration	Con	[ppb]	14	170
Solute retardation factor	Rd	[ ]	2.6	1
Simulation start time	Ton	[days]	0	0
Simulation end time	Toff	[days]	18250	18250
X-coordinate of center of strip source	Xo	[feet]	0	0
Y-coordinate of center of strip source	Yo	[feet]	700	700
Width of strip source	W	[feet]	1400	1400
Angle of ground water flow direction	Theta	degrees	0	0
Numerical integration parameter	NGauss	[ ]	20	20

Aries Engineering, Inc.



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NOTES:

1. Aries developed this plan from a plan titled "Interpreted Potentiometric Surface in Shallow Bedrock, Figure 25" contained in the January 1994 Phase I Pre-Design Investigation Report prepared by Golder Associates (Golder).
2. Site feature locations are approximate.

LEGEND:

GZ-114 ✦	Monitoring well.
— — —	Solute strip source for model prediction.
▪ ▪ ▪ ▪	Solute strip source for model calibration.
· · · · · · ·	Model solute flow path.

0 500 750 1,000

APPROXIMATE SCALE 1" = 500'

JOB # 92033

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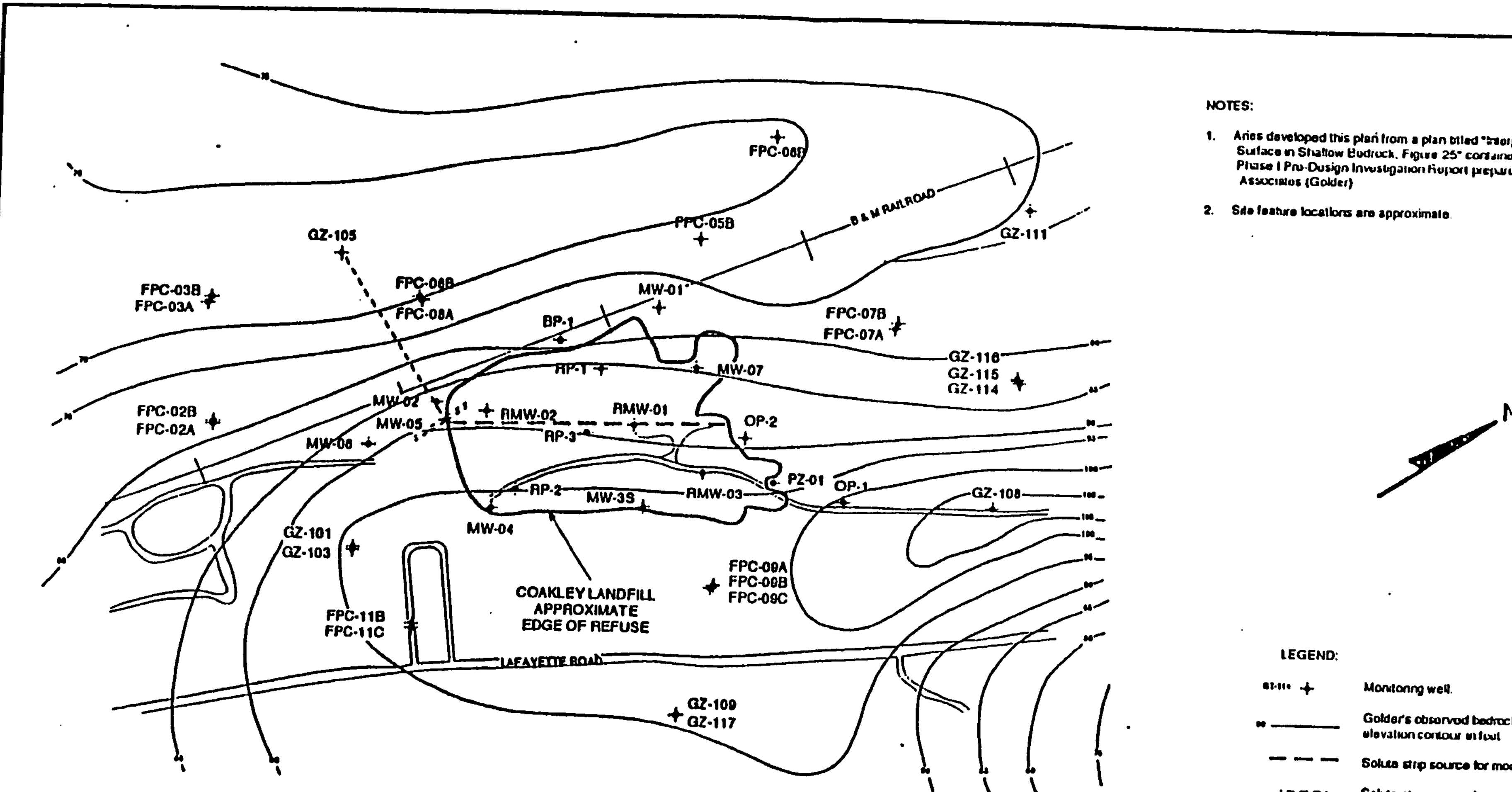
OU-2 PRELIMINARY SOLUTE TRANSPORT MODELING REPORT
COAKLEY LANDFILL
NORTH HAMPTON, NEW HAMPSHIRE

SITE PLAN

JULY 1994 FIGURE 1



NOTES:

1. Aries developed this plan from a plan titled "Interpreted Potentiometric Surface in Shallow Bedrock, Figure 25" contained in the January Phase I Pre-Design Investigation Report prepared by Golder Associates (Golder)

2. Site feature locations are approximate.

LEGEND:

- Monitoring well
- Golder's observed bedrock groundwater elevation contour in feet
- Solute strip source for model prediction
- Solute strip source for model calibration
- Model solute flow path

APPROXIMATE SCALE: 1" = 500'

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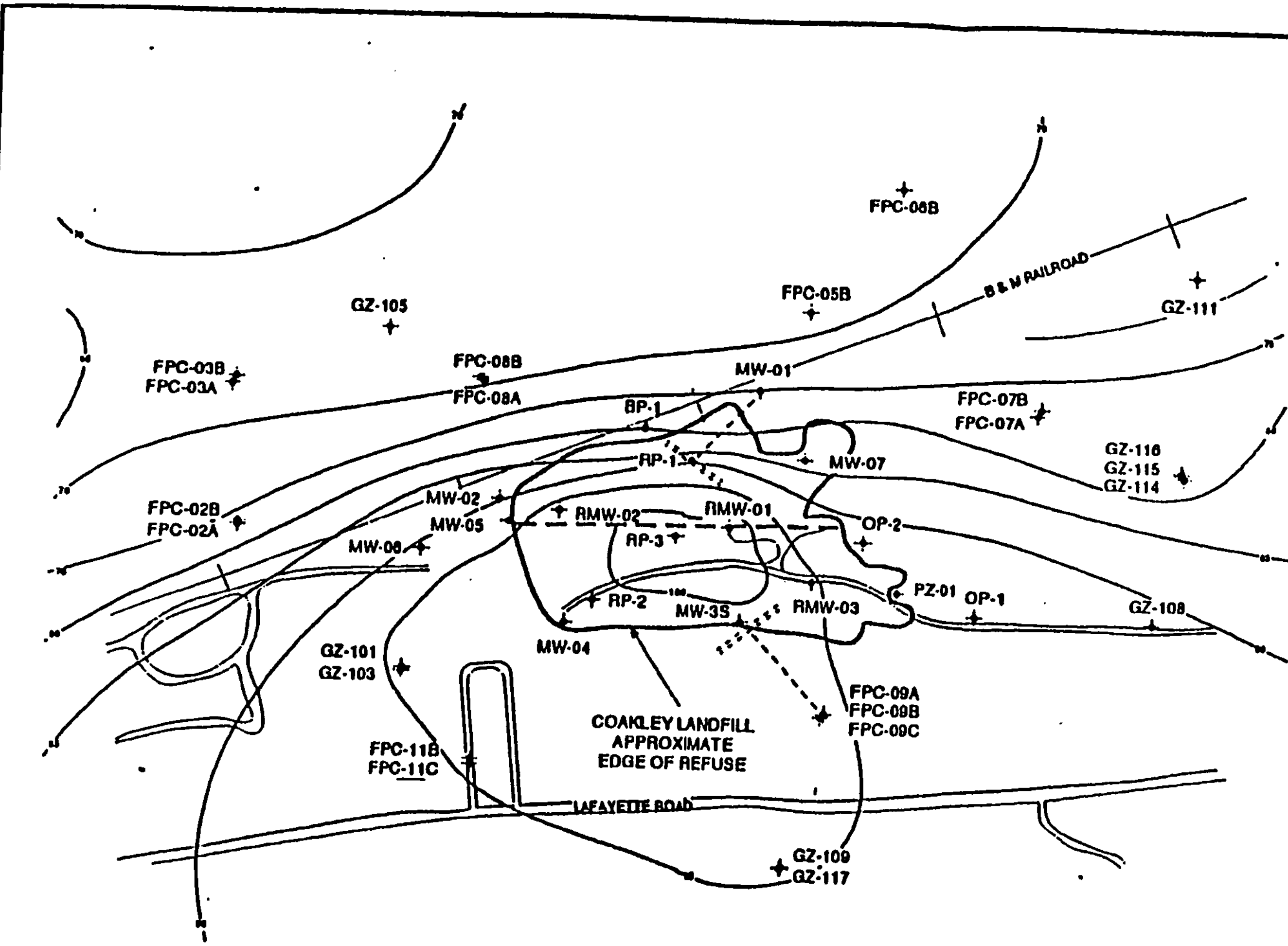
OBSERVED BEDROCK GROUNDWATER ELEVATION CONTOURS
JULY 1994
FIGURE 2



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NOTES:

1. Aries developed this plan from a plan titled "Interpreted Elevations Phreatic Surface, Figure 24" contained in the January 1994 Phase I Pre-Design Investigation Report prepared by Golder Associates (Gol

2. Site feature locations are approximate.

LEGEND:

- GZ-114 ✦ Monitoring well.
- Golder's observed overburden groundwater elevation contour in feet.
- Solute strip source for model prediction.
- Solute strip source for model calibration.
- Model solute flow path.

APPROXIMATE SCALE: 1" = 500'

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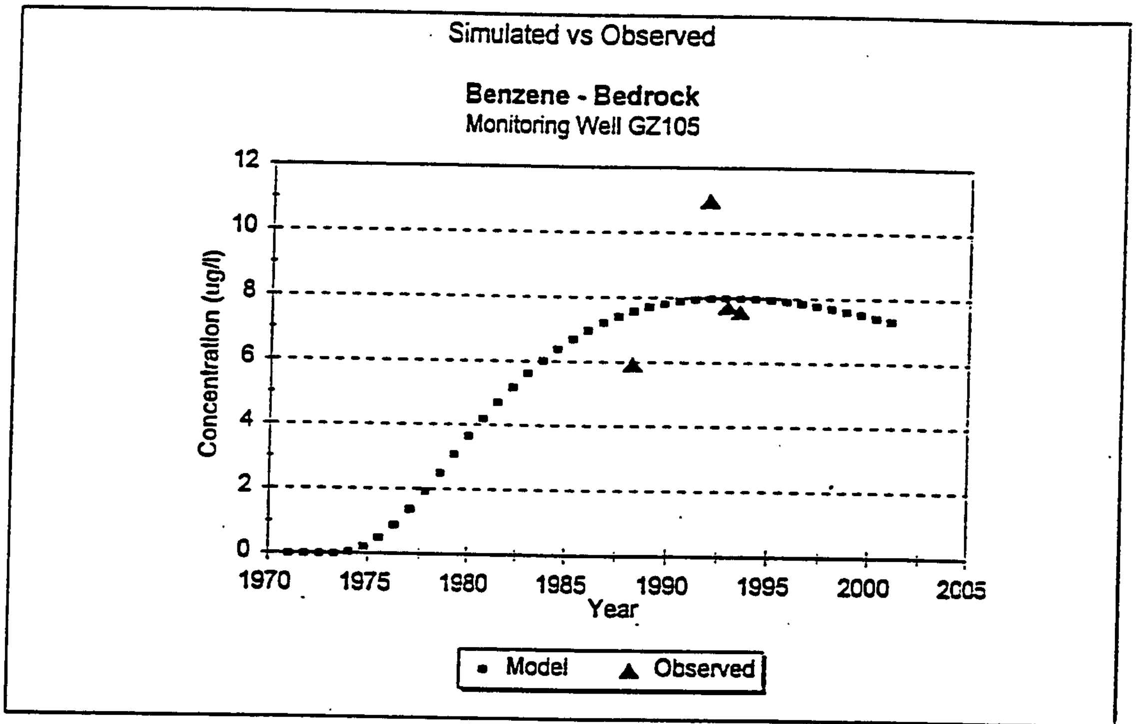
COAKLEY LANDFILL
NORTH HAMPTON, NEW HAMPSHIRE

OBSERVED SHALLOW OVERBURDEN GROUNDWATER ELEVATION CONTOURS
JULY 1994
FIGURE 3

Figure 4

Coakley Landfill OU-2
Preliminary Solute Transport Assessment

Simulated vs. Observed Ground Water Concentrations
Ground Water Flow Path from MW-5 to GZ-105



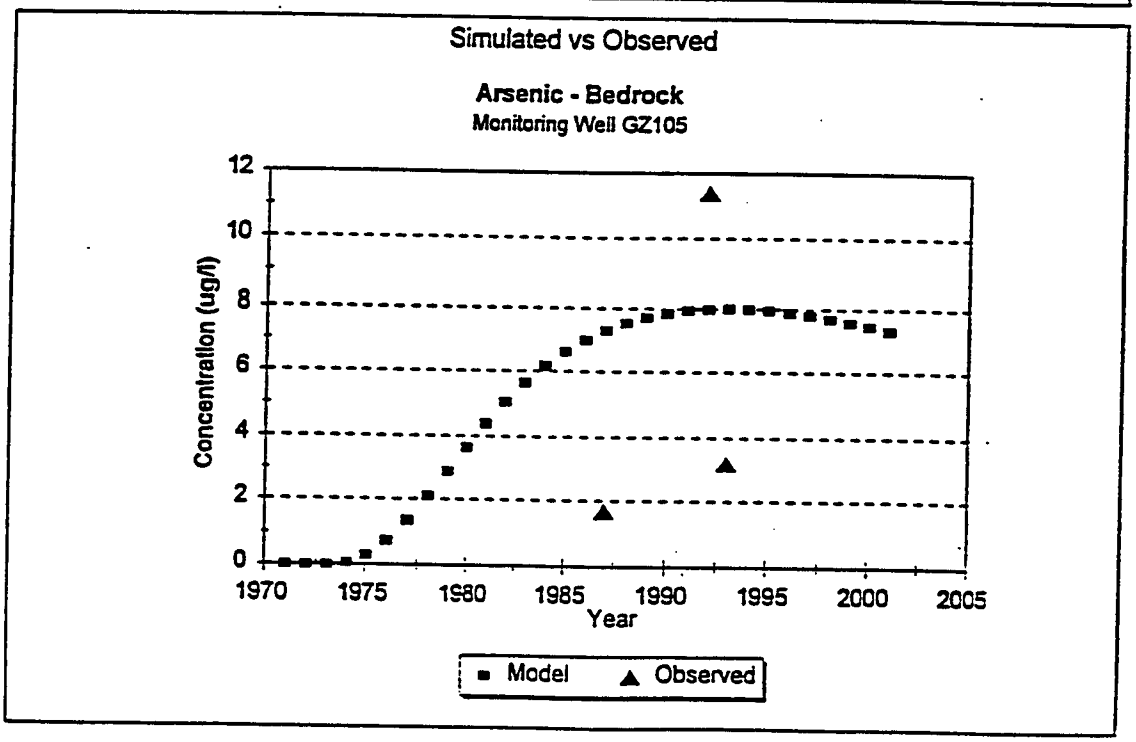
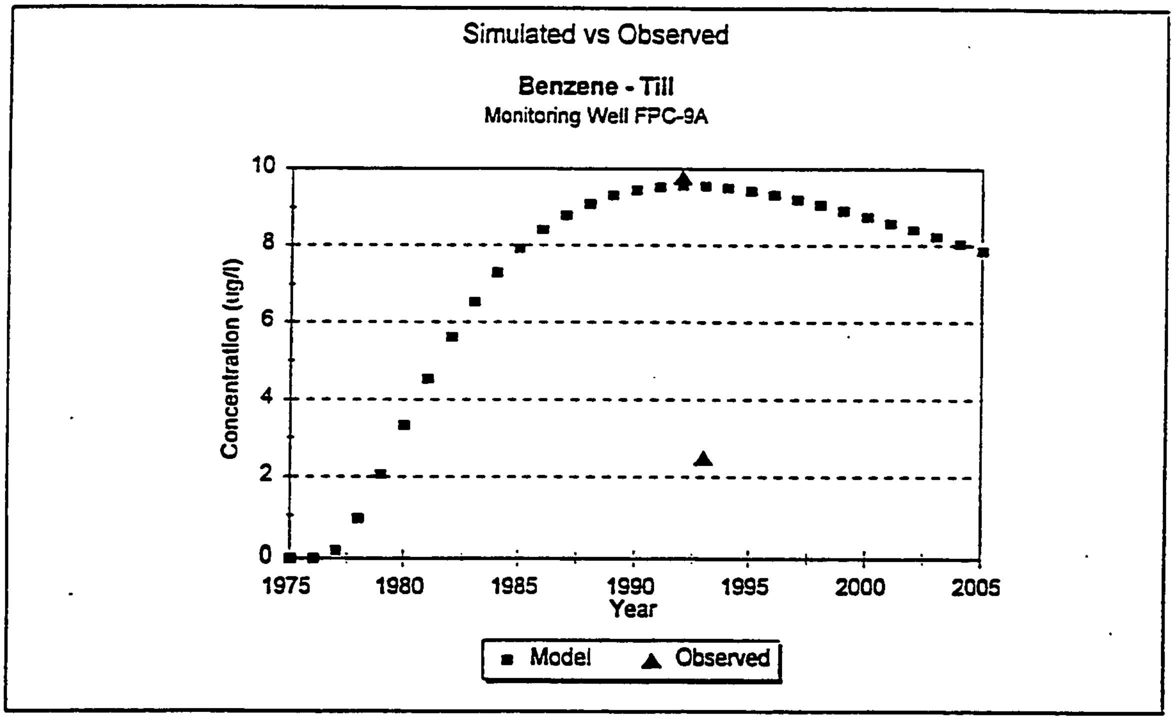


Figure 5

Coakley Landfill OU-2
Preliminary Solute Transport Assessment

Simulated vs. Observed Ground Water Concentrations
Ground Water Flow Path from MW-3D to FPC-9A



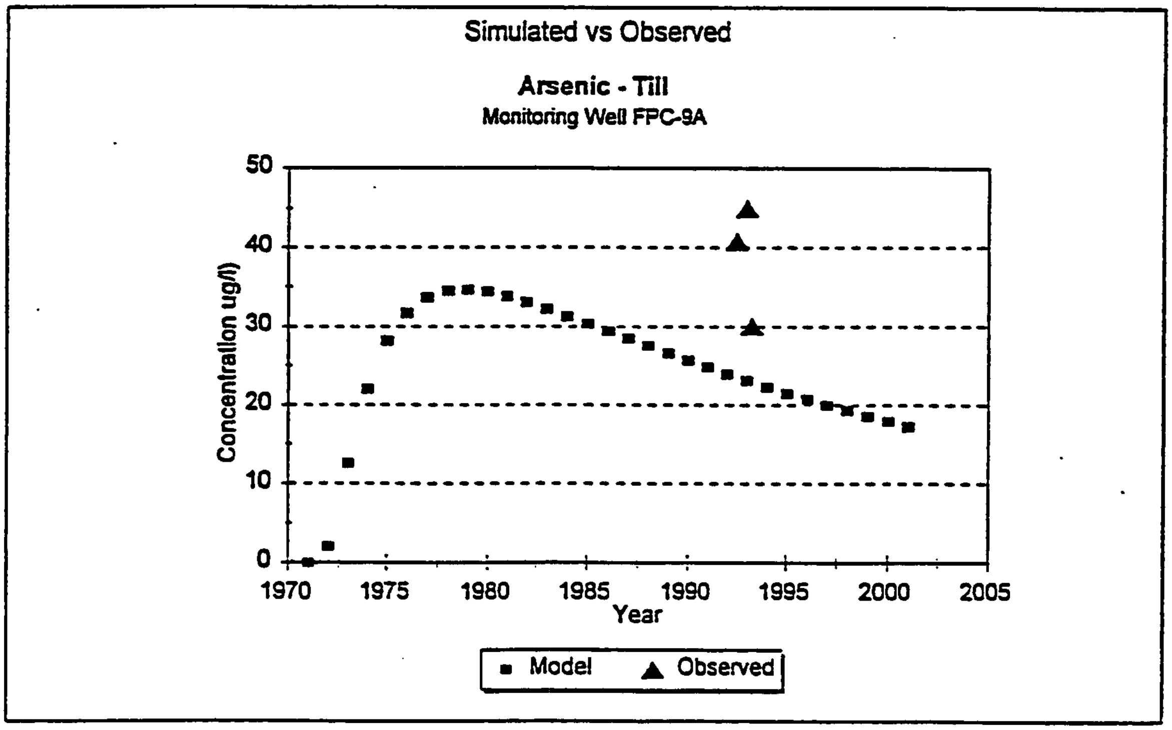
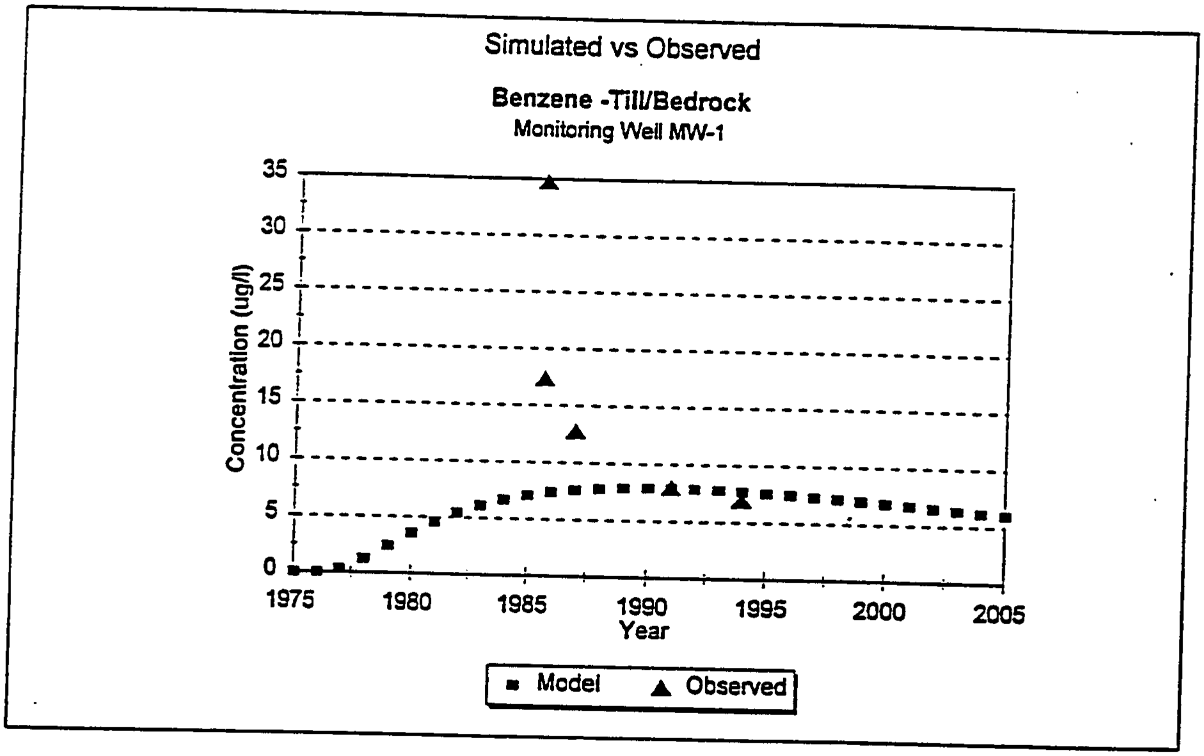
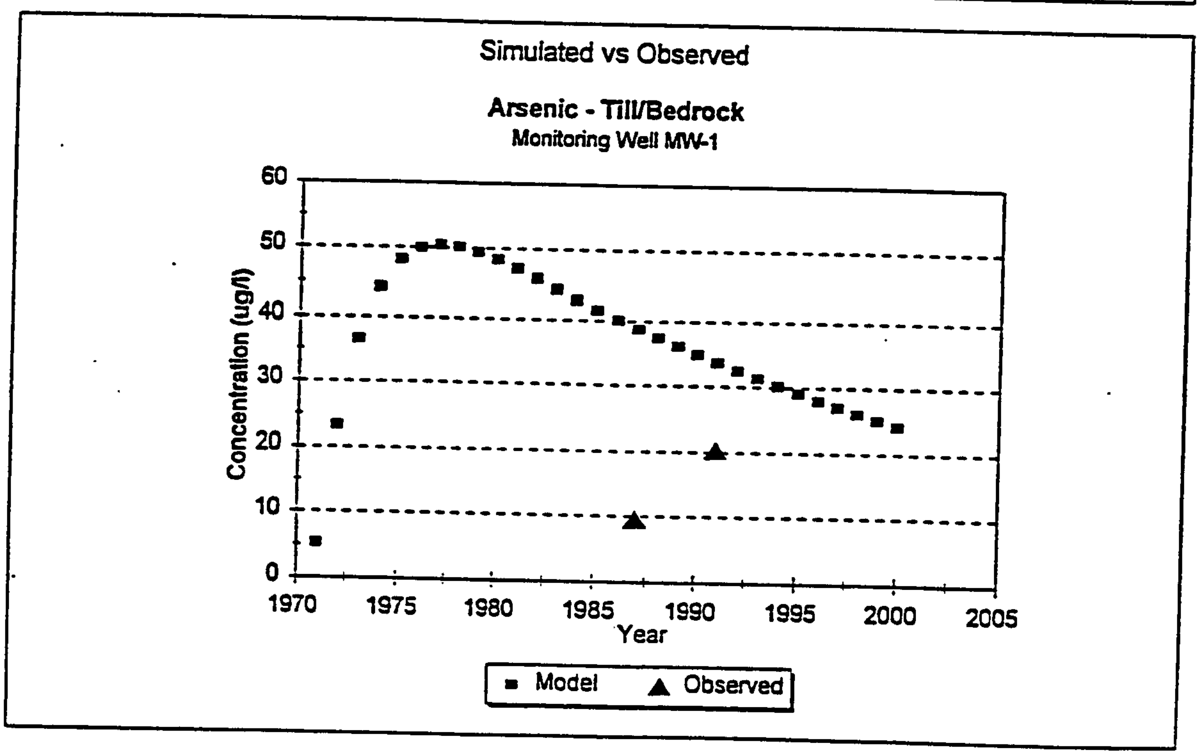


Figure 6

Coakley Landfill OU-2
Preliminary Solute Transport Assessment

Simulated vs. Observed Ground Water Concentrations
Ground Water Flow Path from RP-1 to MW-1





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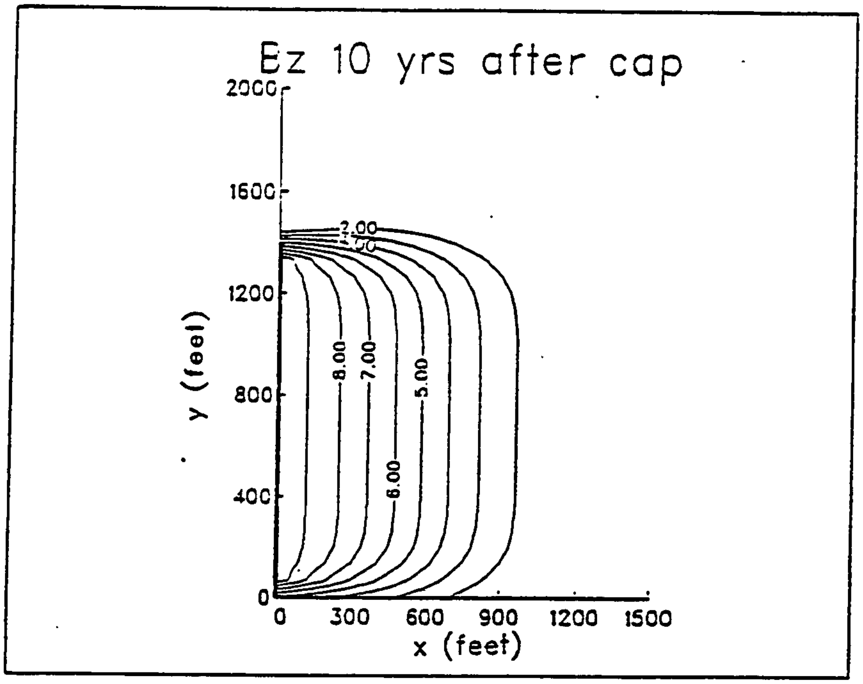
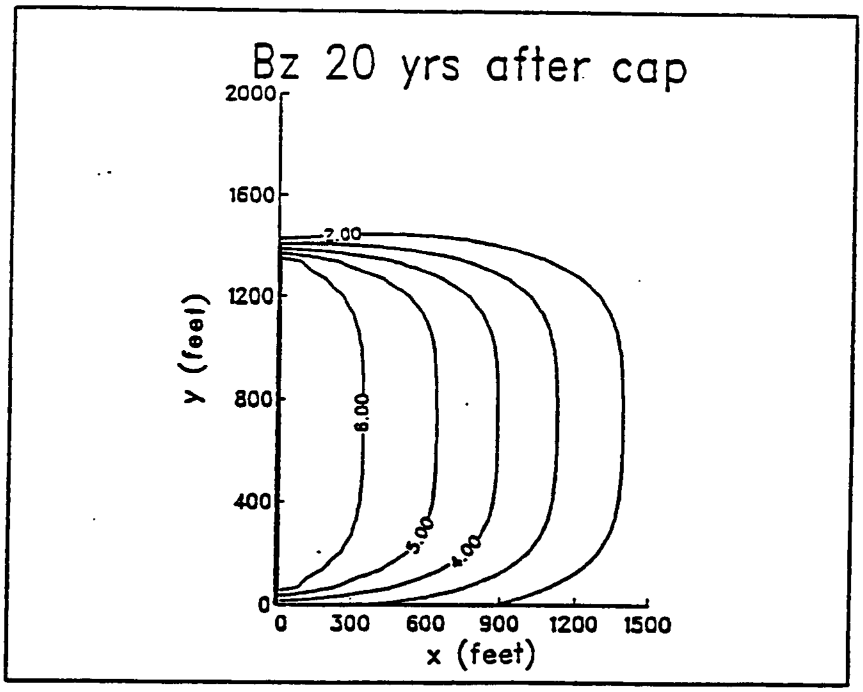


Contours illustrate model-predicted contaminant concentration in micrograms per liter (ug/l).



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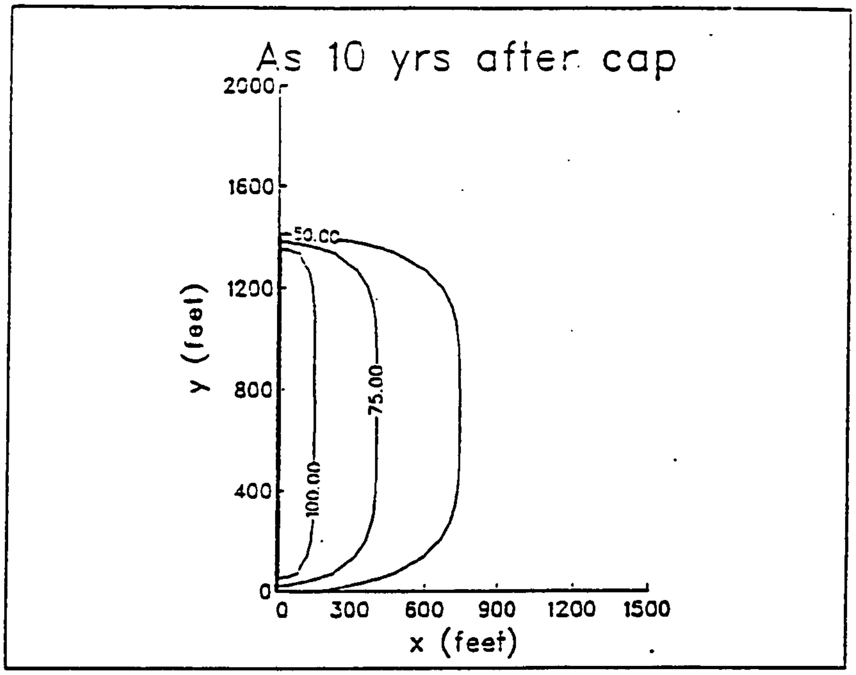
COAKLEY LANDFILL

NORTH HAMPTON, NEW HAMPSHIRE

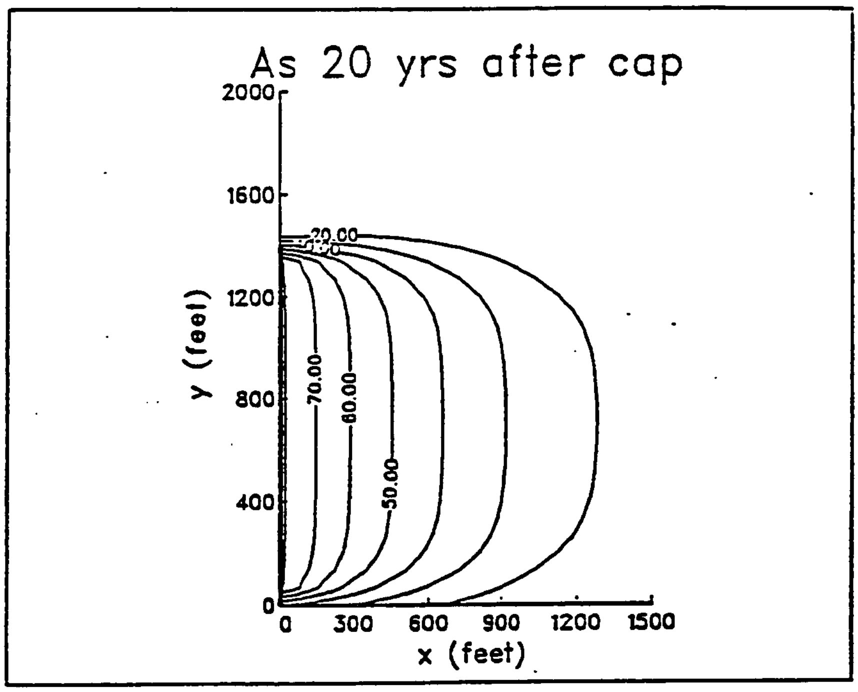
MODEL-PREDICTED BENZENE CONCENTRATIONS AFTER LANDFILL IS CAPPED

JULY 1994

FIGURE 7

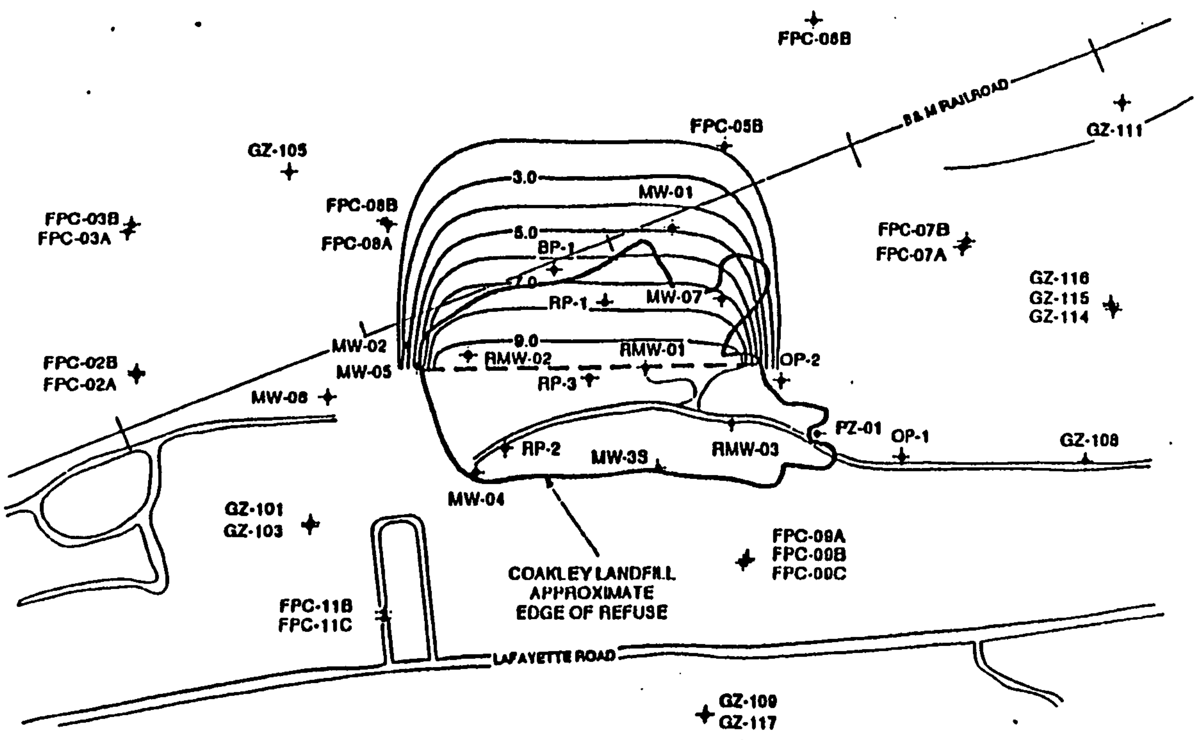


Contours illustrate model-predicted contaminant concentration in micrograms per liter (ug/l).



JOB # 92033

ARIES ENGINEERING, INC. environmental engineers & hydrogeologists	OU-2 PRELIMINARY SOLUTE TRANSPORT MODELING REPORT COAKLEY LANDFILL NORTH HAMPTON, NEW HAMPSHIRE	MODEL-PREDICTED ARSENIC CONCENTRATIONS AFTER LANDFILL IS CAPPED JULY 1994 FIGURE 8



N

NOTES:

1. Aries developed this plan from a plan titled "Interpreted Potentiometric Surface in Shallow Bedrock, Figure 25" contained in the January 1994 Phase I Pre-Design Investigation Report prepared by Golder Associates (Golder).

2. Site feature locations are approximate.

LEGEND:

GZ-114 +	Monitoring well.
— — —	Solute strip source for model prediction
—5.0—	Simulated benzene concentration contour in micrograms per liter (ug/l) 10 years after landfill cap.

0 500 750 1,000

APPROXIMATE SCALE: 1" = 500'

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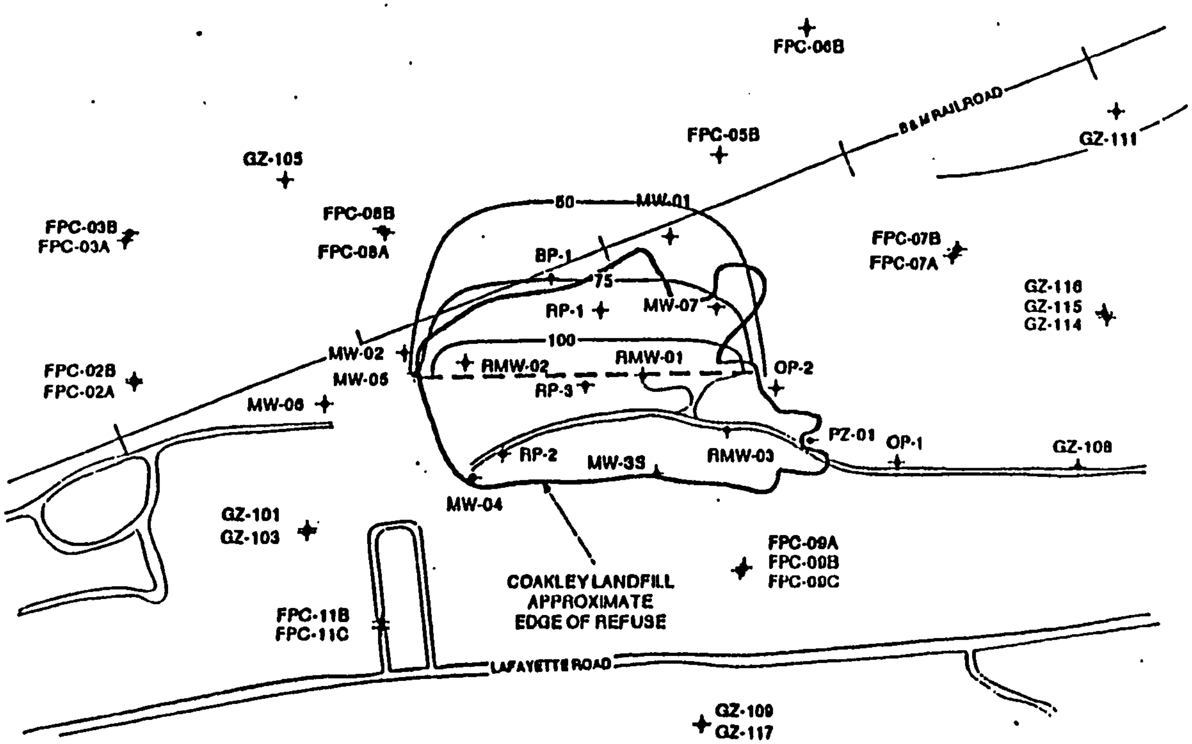
COAKLEY LANDFILL
NORTH HAMPTON, NEW HAMPSHIRE

BENZENE DISPERSION WITHOUT OU-1 CAPTURE ZONE

JULY 1994 FIGURE 9



NOTES:

1. Aries developed this plan from a plan titled "Interpreted Potentiometric Surface in Shallow Bedrock, Figure 25" contained in the January 1994 Phase I Pre-Design Investigation Report prepared by Golder Associates (Golder).

2. Site feature locations are approximate.

LEGEND:

GZ-114 +	Monitoring well.
— — —	Solute strip source for model prediction.
—50—	Simulated arsenic concentration contour in micrograms per liter (ug/l) 10 years after landfill cap.

APPROXIMATE SCALE 1" = 500'

JOB # 02033

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OU-2 PRELIMINARY SOLUTE TRANSPORT MODELING REPORT
COAKLEY LANDFILL
NORTH HAMPTON, NEW HAMPSHIRE

ARSENIC DISPERSION WITHOUT OU-1 CAPTURE ZONE

JULY 1994 FIGURE 10

ATTACHMENT C

TRANSCRIPT OF THE JUNE 21, 1994 INFORMAL PUBLIC HEARING

* * * * * * * * * * * * * * * * *

IN RE: COAKLEY LANDFILL
SUPERFUND SITE, NORTH HAMPTON,
NEW HAMPSHIRE

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Public Hearing conducted by the U. S. Environmental Protection Agency at North Hampton Elementary School, North Hampton, New Hampshire, on Tuesday, June 21, 1994, commencing at 7:30 p.m., before Dan Coughlin, Moderator.

Court Reporter:

John G. Kinchen, RPR-CP

I N D E X

P R O C E E D I N G S

MR. COUGHLIN: Could I have your attention, please? We would like to start the hearing. Could you please take your seats?

Good evening. Can everybody hear me all right? If you can't hear, please, raise your hand and we will do something to accommodate you.

Thank you for coming tonight. My name is Dan Coughlin. I am the chief of the New Hampshire Superfund section in Boston. My staff and I are responsible for the implementation of the Superfund program in New Hampshire.

With me tonight is Steve Coughlin, the project manager for EPA. We have in the audience John Cavanaugh, who is representing Senator Judd Greg's office, and we have a representative from the New Hampshire environmental services in the audience with us.

We are here tonight to conduct a public hearing to gather public comments on the proposed plan for the clean up of the Coakley landfill site. I will be the hearing officer.

As you probably are aware, the EPA held a public informational meeting on June 1, 1994 to describe alternatives evaluated in the FS. A 30 day comment period began on June second and will end July first.

Before we start the meeting, I would like to give you the agenda. Steve will give you an overview of the proposed plan. Following his presentation we will accept any comments you wish to make into the record.

Those of you who wish to make a comment should have indicated by filling out an index card back at the desk. Also available are copies of the propose plan. It looks like this.

I am just going to stop for a moment and let the people sign their cards, so I don't confuse anybody. Okay.

As I said, there are copies of the proposed plan out back as well as the index cards. I will call on those wishing to make a statement in the order in which you signed in this evening unless you have some commitments that require you to speak earlier. Please, indicate so and I will accommodate that.

When you come to the microphone to give your comments, please tell us your name and who you represent. Speak clearly so our stenographer can hear you and record your comments accurately.

If you think your comments are going to be more than 10 or 15 minutes long, we would request that you summarize them for us and give us a copy of the text of the comments tonight or mail them at the address in the proposed plan. That will give everybody an opportunity or a chance to speak.

If you wish to submit written comments, please, do so. I encourage you to do so. The address is in the proposed plan on page two. Just write them down and send them in to us by the end of the -- postmarked by July first in the comment period.

All the comments we receive tonight and any written comments will be responded to and considered in the remedy decision and responded to in a document called the responsive summary. That document becomes part of the record of the decision, which is the EPA's decision document for the remedy of the clean-up of the site. This summary will be included with the record of decision and become a public document.

We anticipate the record of decision will be issued some time around September of this year. If after I have closed the hearing anybody would like to come up front and speak with us, we will stay around and answer your questions. Feel free to come up and speak with us and Steve and I will stay around as long as possible.

Any questions on the format of the hearing? Okay. Again, I would encourage you to submit written comments if you would. We would like all comments we could get on this plan.

With that, if I can get the cards, these are in order I assume more or less.

Thomas Roy. Sorry, Tom. I messed up. My apologies.

Steve, as I told you, was going to give a brief description of the proposed plan and the proposed remedy. Let's let him to do that and I will open the hearing for comments.

MR. CALDER: I know my voice carries quite well, so I am not going to use the microphone. Welcome to the Coakley landfill public hearing for the management of migration operable unit. I am EPA's project manager for the Coakley landfill Superfund sight and I am responsible in over seeing all remedial activities at the the Coakley landfill.

Tonight as Dan as said, you are given an opportunity to enter any comments on EPA's proposed remedy.

First I would present this quick summary before the public comment section begins. The Environmental Protection Agency is recommending natural attenuation of the groundwater as a proposed remedy for the management of migration for the contamination at the Coakley landfill. Natural attenuation refers to letting the contamination in the groundwater degrade naturally with time through dilution, dispersion, and other mechanisms such as biodegradation.

As part of the remedy, institutional controls such as deed restrictions will be put in place on affected properties to prevent the groundwater from being used as a drinking water source.

A quick history on the site. It's a 27 acre landfill. It's privately owned and municipally operated. It operated from 1972 to 1985. In 1983 the state sampled a domestic well and detected volatile organic compounds. The public water supply was extended to the residence in 1983 by the Town of North Hampton.

In December 1983, the Coakley landfill was listed on the national priorities list. The RI/FS were conducted by Roy F. Weston as a state lead that identified drinking of the groundwater as the principal risk of human health.

The operable unit one record of decision was signed in June 1990. The remedy for the first operable unit, the source control remedy, is being done by three municipalities, two federal facilities, and about 40 private generators and transporters.

The remedy calls for consolidation of sediments in the wetland, consolidation of the solid waste, capping of the landfill, collection and treatment of landfill gases, groundwater extraction and treatment, long-term environmental monitoring, and institutional controls where possible.

We have conducted a second remedial investigation for the management of migration of the waste. The results of the R I identified the following contaminants of concern. In the groundwater, surface water and sediments, the human health risk looked at the following pathways which was ingestion of groundwater, ingestion of surface water, and dermal contact of surface water and the sediments. In the human health risk assessment the only pathway that was above EPA's acceptable levels was the drinking of the groundwater.

The results of the remedial investigation identified the following clean up levels for the groundwater for the second operable unit. Again the volatile organic compounds or industrial solvents are the main compound of concern and metals are another major type of contamination.

Also as a result of the remedial investigation, we also looked at -- we also performed an ecological risk assessment, and here they are described in this chart, summarized in this chart. There is a risk to an individual mammal, but not to the population, except in the landfill run off area, which is part of the source control remedy.

It was concluded that the slight risk to the wetland wildlife did not warrant an active remediation which could negatively impact the wetland by disturbing the natural species or disrupting the water balance in the wetland.

We moved into the feasibility study and took a look at the potential remedies to clean up the groundwater, to clean up to levels establish in the risk assessment, and that would meet the drinking water standards. Management of migration, number one, the no action remedy used for a cost comparison, involves monitoring the groundwater for 30 years. This remedy is estimated to cost one point two million dollars. The limited action remedy, which is also the preferred remedy here by -- the proposed remedy by EPA, includes monitoring the groundwater for 30 years, and uses a conservative natural attenuation groundwater model to predict the time of clean up if the natural attenuation processes were allowed to occur without any active pump and treat system. Natural attenuation refers to letting the contamination of the groundwater degrade naturally.

Here are the dispersion results on

the groundwater model. The groundwater is expected to clean up in approximately 11 years, which is here ten point eight for the benzene. Also in order to prevent the groundwater from being used as a drinking water source, institutional controls such as deed restrictions need to be placed on properties surrounding the site. The remedy is estimated to cost one point four million dollars. Management of migration, number three, the groundwater treatment remedy proposes using the same groundwater treatment system that is to be built by the potentially responsible parties. This remedy is estimated to cost two point one million dollars. The management migration number four is the groundwater treatment remedy that uses a separate treatment system than the one being used for the source control remedy. The treatment processes would be metals precipitation and carbon absorption. This remedy is estimated to cost three point two million dollars.

The Environmental Protection Agency

uses nine criteria when evaluating remedy selection. Here we have the threshold criteria, which are the overall protection of human health and the environment in compliance with applicable and appropriate and relevant regulations, environmental regulations that is. The balancing criteria is a long-term effectiveness and permanence, reduction of toxicity mobility and volume. The short-term effectiveness, implementability, and cost, and the modifying, and that's one reason why we are here today is state acceptance and community acceptance.

Again, the EPA's proposed remedy is the management of migration number two, limited action, which is the preferred alternative, which uses natural attenuation as the basis of the clean-up of groundwater.

I would now like to reintroduce Dan Coughlin who will be opening up the floor for comments to be taken.

MR. COUGHLIN: Let me reopen the hearing now for comments. Do we have any more

-- I saw some people come in later -- do I have any more cards? Does anybody else wish to make a presentation tonight. If you do, fill out a index card. It helps us keep an accurate account of who spoke, et cetera

So with that, we will go back to Thomas Roy.

MR. ROY: My name is Thomas Roy. I am an engineer with Aries Engineering in Concord, New Hampshire. Aries Engineering is the supervising contractor for the Coakley landfill operable unit one, remedial action.

I speak here tonight representing the Coakley landfill group that is performing OU-1 remedial action.

In the interest of keeping my comments brief, I have summarized them and I will read them to you tonight in a summary format. The Coakley group will provide more detailed comments that we will submit to you before the comments period concludes.

The Coakley group concurs with the OU-2 draft remedial investigation study conclusion that there is no current unacceptable risk to public health or the environment. The group notes that the potential threat to the public health would occur only if contaminated groundwater is used for drinking water purposes. The potential risk even in this circumstance would be low, due to the low concentration of contaminants in site groundwater. However, contaminated groundwater is not used for drinking water. And an alternate water supply is available.

It also appears unlikely that site groundwater would be used for drinking water even without institutional controls such as a town ordinance or deed restrictions temporarily limiting site groundwater supply development.

The RI/FS appear to understate the attenuation of site contaminants. Based on our review of site data, it appears clear that groundwater contaminants will not move as far from the landfill as indicated in the RI/FS.

The group notes that the RI/FS did not assume attenuation metals as they moved through site groundwater. We would expect due to the till formation and marine sediments in the area that there would be a high cationic exchangeable capability in the soils that would retire and attenuate metals that may move from the landfill area. The attenuation would be for a greater extent than estimated in the RI/FS and would result in a smaller contaminated groundwater area.

The group concurs with the RI/FS conclusion that there are other nonlandfill sources of inorganic and volatile compounds that have been observed in the study area groundwater. These sources could contaminate groundwater independently from the landfill.

We also concur with the RI/FSs . conclusion that many inorganic constituents are native to the environment and will present in area -- and will be present in area groundwater regardless of any remedial action taken. We would expect, however, that there would be some reduction in the leaching of inorganic contaminants from study area soils as the operable unit one cap reduces leachate generation, and therefore reduces the potential to leach metals from area soils.

We note that the RI/FS indicate that a level of 15 parts per million has been selected for lead in groundwater. However, the report also notes that the background concentration of lead was observed at a higher concentration of 30 parts per billion, which is above the action level. It does not appear to reduce lead concentrations to less than the native lead concentrations in the area.

There are an active number of monitoring wells in the site area to monitor OU-1 and OU-2 site groundwater. There are currently scores of monitoring wells in the area of the Coakley landfill, and another score plus in this heavily monitored area is not needed to adequately monitor groundwater.

The cost estimate for groundwater monitoring could be reduced in recognition of the ongoing operable unit one environmental model plant. And incremental addition of sampling would adequately monitor the environmental effect of OU-1 remedial action on area groundwater and environmental resources.

We do not agree that one point four million dollars would be required to adequately protect and monitor site area groundwater. Adequate monitoring should be done for less.

We suggest that the OU-2 environmental monitoring plan when developed could be revised consistent with State of New Hampshire groundwater monitoring requirements to sample groundwater not more than three times a year and probably on a reduced frequency based on the observed groundwater results. Reducing the cost of monitoring would be consistent with the requirement that Superfund work be cost effective while fully protecting the public health and the environment.

We are currently reviewing the RI/FS Appendix C, OU-1 nonpumping analysis. Based on your previous comments presented here this evening and OU-1 groundwater modeling, we feel a nonpumping analysis overstated contaminant migration.

We will provide a more detailed analysis of the assessment. Because of the large amount of RI/FS data and report information to review, the group requests the formal comment period be extended to August 12, 1994. That concludes my comments.

MR. COUGHLIN: Thank you. Mary Herbert.

MS. HERBERT: I am Mary Herbert. I am chairman of the North Hampton board of selectmen and I would like to read a very brief statement.

The board of selectmen are aware that since the installation of a water line by the town to certain residents located nearby to the site no further public health problems have been reported. The board also notes that the current projected cost of the work involved with unit one is in excess of 25 million dollars. The EPA denotes May 23, 1994, may involve further cost or responsibilities placed on the town.

The town continues to recognize its responsibility to protect and preserve the health, safety, and welfare of the citizens of North Eampton. However, the board of selectmen do not presently understand the necessity to expend substantial amounts of town funds without a demonstrated risk of adverse consequences to the public health, safety, and welfare caused by the Coakley landfill.

The board is also concerned with the financial stability of the town in the face of further costs related to the Coakley site. On behalf of the town, the board of selectmen would respectfully request that the EPA's public input process and any future administrative action address the town's concern with respect to the status of the Coakley landfill and the actual need to continue with the present as well as any future expensive clean up program. Thank you.

MR. COUGHLIN: Thank you. Peter Bresciano.

MR. BRESCIANO: My name is Peter

Bresciano. I am from Portsmouth, New Hampshire, and I am sorry to say, ma'am, but you are dealing with the EPA. And you will never, never, never get the costs down. It's been 11 years since the Coakley landfill was placed on the EPA's national priority list. 11 years since the water supply distribution lines were extended into the area. Nine years since the landfill stopped accepting material, and four years since the record of decision. 11 years, hundreds of thousands of dollars, and yet not an ounce of clean up.

We are now entering into the second phase of the Coakley clean up, and the cost to the taxpayers continues to go unchecked. Take a look at some of the costs we are expected to pay. Tell me the figures contained in the FS are estimates, and I will tell you what you see today is one thing. And by tomorrow, this is going to cost the taxpayers much, much more.

I just briefly want to look at a couple of the costs. 75 dollars a day for gloves and jars. Gentlemen, that's 28 dollars per well for gloves and jars.

Normally in talking to other engineering firms, they tell me that usually the analysis lab gives them the jars for nothing. I mean let's be serious. 75 dollars a day for the gloves and jars. 45 dollars a day for O&M costs. And what's an O&M cost? I don't know, because it's not in the report, but if you look at the FS, you will find more data in there about swamps and grasses, and bushes, and trees. It's enough to make your head spin, but let the public know what the cost is or to even put that data -- break that data cost down. It's not in the FS. It's scribbled in there in handwriting.

Thirteen monitoring wells. It's going to take the contractor five days to get samples out of 13 wells. Now, that's a bit much. I mean we have got six overburden wells and one bedrock well. That's going to take two and a half days. You know, if you break it down by like the way the EPA did or the way the contractor did, three hours per well, we can get two and a half wells done a day on an eight hour day, 40 hour week. When you look at the 40 hour week, you look at the figures in the FS, we are talking about each well three hours per well. That adds up to about 39 hours, but the labor cost at 71 dollars an hour, it gets to be very, very expensive. And to add to that, we are not going to do it three times a year, we are going it to do it four times a year even though we know that the contaminants are not moving. We are going to do it four times a year.

Now, does that make any sense? It does to the contractor. It makes a lot of sense to the contractor and the EPA, because the EPA is in this business.

You must remember, the EPA is a regulatory agency. If they stopped making regulations, they would go out of business. So the contractor is the one that's going to make the money on this one, four times a year, for not ten years as it may be that the contaminants that will attenuate themselves, not for 12 years. We are going to do this for 30 years. That's what we say in the FS. We are going to do this 30 years, monitor these wells.

I agree with the engineer, it's too long, and it's too expensive. In the FS, they talk about limited action alternative will have the same cost as alternative MM-1, which is no further action, with the possibility of additional incremental costs that may be associated with the potential loss of property value as a result of the deed restriction.

Now, this has been in the FS, this statement has been in the FS for how long? For as long as the FS has been out, but, what, two weeks ago, we sat here and we talked about deed restriction, and nobody had an answer. Do you get the answers about if I own a hundred acres and 25 of those acres is on Coakley and it's in the footprint, do I get a deed restriction on those 25 acres or do I get a restriction on the whole hundred acres? The value of my land decrease on a hundred acres or just on the 25 acres?

Who is going to do this survey? Am I paying for the survey to figure out this portion of my property has a deed restriction on it? And if I feel like dropping a well a hundred feet from where the deed restriction line is or whatever it is, can I start pumping water out of there, or is it going to affect the Coakley contaminants starting to move, because I am using a well to draw water. Where are the answers? We didn't have them at the information session and we still haven't got them.

I would like to say in closing that I agree that as a layman reading through the FS, a lot of it goes over my head, but the overall picture says why are we spending this kind of money that the residents don't have -- and I hate to say this, because I sit and listen to the people up in Rochester, I sit and listen to the people over at the shipyard.

I racked my brain trying to tell the Air Force to stay off of the empty NPL at

Pease. Don't get on the national priority list, because it does no good. They don't listen, but you have got to start listening, because we don't have deep pockets.

The guys sit down there in the board room and say, hey, the taxpayer has the money. He's got the money in his pocket. All we have to do is set the goal, set the price, and they will have to pay for it. They have just got to come up with it.

The residents can't come up with it any more. We saw that last night at the Portsmouth city budget. We don't have the money, and, therefore, we are telling you if you want to cut services, cut them, but we don't have the money. We don't have the money to pay for the Coakley landfill clean up. And one day, some representative, some town selectmen, some chairman, some mayor, is going to stand before you and say, no, and they are going to stand their ground. Thank you.

MR. COUGHLIN: Thank you, sir. Lillian Wylie.

MS. WYLIE: I am Lillian Wylie from Lafayette Terrace, North Hampton, and I represent most of the people of Lafayette Terrace and the Martin family.

First of all on paragraph two, we are not in a football game, we are not in a kick off for anything. This is a major comment period in the lives of human beings that affects the whole area of North Hampton and our water supply.

You might say you are doing a little of nothing, next to an option of doing nothing. A low cost movie costs three hundred thousand dollars. Portsmouth is paying seven hundred thousand dollars. A high cost movie costs in the millions.

This is an environmental tragedy. By the way, this is not typical of a clean sanitary landfill. Only of a clean sanitary landfill going wrong by responsible people who should have known what they were doing, and the money making scheme that put big bucks in certain pocket books at the cost of innocent lives.

The idea that the land is going to naturally dilute is obscure. I cannot see it -- excuse me -- I can see it, though, when there was a plan for culverts that leads to the wetland and the streams, why you would say it would dilute right into the ocean where Berry's Brook and Little River go.

Why don't you be honest, which hasn't been the case right along. If you pump and treat, you will draw in our water that is the municipal water.

This report is wrong just like the health reports, so cleverly done by the state and by the word of the mouth of the feds, by the follow up of the feds. This is the human side of the story. Now I want to ask why, why, why? Why in 1971, in 1972, did the town promise Ruth Martin a clean sanitary landfill? All she got was a dead husband, an adopted dead son, a daughter dead, and only one living daughter that is not expected to live long. Why in 1975 did Coakley send Lafayette Terrace notices that you will be dynamiting at Coakley landfill company? Little did we know that it was the bedrock that protected our aquifers that was being blown up and sold for crushed rock.

In 1975 was there noticeable leaching? Why wasn't the Lafayette Terrace residents informed of this and why is it not in the fed's reports? Why in 1991 and 1992 was the master plan for North Hampton ignored when it said around Coakley landfill and company was contaminated or could become contaminated? The state, the town, the feds were going to tell -- when were the state and the feds going to tell us that our water was contaminated? They knew, but we didn't know. Was we all going to die one-by-one?

Why in 1984 did Senator Humphrey and all public officials, state town and feds, get up on Coakley landfill and tell everybody there wasn't a problem, but -- and -- and the only problem that there might be would be that the residents of Lafayette Terrace was eating too much peanut butter.

Why has there been no mention of culverts at the landfill that was taking chemicals away from the landfill by way of wetlands into the streams and into the ocean?

At one of the first meetings with the feds, why was a man hushed up that was telling of putting radioactive dust at Coakley from the Navy Yard? Why didn't you tell us -- why don't you tell us everything and anything went into Coakley landfill after blowing up the bedrock, including chemicals from as far away as New York. You speak with a forked tongue.

When we were drinking the contaminated water, there was no health effect, but now if we drink the water, there will be a health effect.

Somebody is responsible for our well-being. It hasn't been the feds, the state, or the town in which we live in North Hampton.

You have a steering committee for the responsible parties to steer them out of liability when they should get a jail term.

You know, the human -- you know, the society for the prevention of the cruelty to animals gets more protection than the people did of Lafayette Terrace, and I want you to know, I am dying, so it doesn't matter to me, but Lafayette Terrace is not going to be my cemetery or the cemetery of my family or the cemetery of the residents who lived at Lafayette Terrace.

MR. COUGHLIN: Thank you, ma'am. Elmer Sewall.

MR. SEWALL: My name is Elmer Sewall, and I am an advisor for the North Hampton landfill site. Let me further identify myself as a landowner. We own a 14 acre parcel in North Hampton which is directly opposite from the landfill site, and we own a 170 acre parcel that is immediately adjacent to the North Hampton parcel and runs northerly and westerly to Breakfast Hill Road. We also have a 30 acre parcel which abuts the landfill property and is situated approximately 11 to 12 hundred feet from the landfill area. And this runs to Breakfast Hill Road.

Now, I am deeply troubled with the prospect of deed restrictions being placed on my property. As I regard this, it is tantamount to saying there is virtually nothing that I can do with my land, and as I see it, such action would put the kiss of death on the entire parcel, not the area under study.

I fear it would also hurt the values of buildings and land that we own on the opposite side of the road from the involved land and is separated only by the road.

Now, in reviewing the history of the Coakley -- the EPA -- this environmental news bulletin makes the point that abutters on the northeast, southeast, and south are served by a public water line and shall provide relief to owners affected by the contamination. With the public water line in place, further development would be possible. And land use would be less restricted.

I would like to point out that there

is no public water line on Breakfast Hill Road and we do not have such relief.

I have tried to cooperate with the State of New Hampshire and the EPA and the responsible parties for 11 years while they have been, quote, studying, unquote, the problem, and have not as yet done any actual clean up. My land has been used by them at no cost for 11 years for their studies, and now we are being told that they will be using it for another 11 years for what I see is a giant filtration system to attenuate the groundwater contamination. Not only that, but now we are told that it will be a cloud cast over all our properties in the form of deed restrictions which will probably last far beyond my life expectancy.

Enough I say. It is time for some sort of compensation. My retirement has already been constrained because of the inability to dispose of my property due to the proximity of Coakley. My hopes for aiding in the education of my grandchildren are abated.

I don't wish to become uncooperative. I don't wish to make a fortune in damage awards. I merely seek to be in as good a position as I was in before the landfill came into existence.

I have lost the sale of property on three occasions. Prospective buyers could not obtain bank loans. Imagine what it would be like getting bank loans with a deed restriction in place.

Now, I propose two possible solutions. The cost of either would be a mere pittance when compared to the millions already spent. Or in fact it would be less than the difference in the cost between MM-4 and MM-2.

The first proposal is simple. Extend the public water line down Breakfast Hill Road. The second proposal would be in several parts.

A, the EPA should require the responsible parties to delineate by survey by a registered surveyor the area where contaminated groundwater exists, plus all surrounding areas where monitoring needs to be done, plus whatever is considered necessary to be marked off as a safety zone, and that this area be marked off by fencing or some other acceptable means.

B, the EPA require the responsible parties to buy the land, the price to be determined by good faith negotiations with the landowners involved.

C, if the responsible parties or designated representatives hold title to the land as long as the monitoring and clean up activities continue, that when contamination has abated to an acceptable level and monitoring is no longer necessary, that the land shall be deeded to the respective towns as conservation land and wildlife refuge in perpetuity. Indeed, the EPA issue to the landowner a statement to the effect that as a result of their exhaustive studies and to the best of their knowledge and belief, contamination from the Coakley landfill is not nor is deemed likely to in the future affect the remainder of our lands.

In addition to the above comment, I ask you to direct your attention to the question of contamination as it may or may not involve our property on the northeast side of Coakley property. As you know, this land fronts on Breakfast Hill Road, runs from the former Coakley house westerly to the railroad and hence southerly along the railroad to a point approximately 11 or 12 hundred feet from the formal landfill. A lot of surface water is running off the Coakley property on to our property. To a less knowledgeable person such as me, it would seem probable to be bringing contaminants with it. Do you find this to be true and is this property also included in that area in which deed restrictions are to be proposed? One of the earlier investigations done at GZ110, GZ111 and GZ112 and GZ133 was placed upon this piece of land and shows small amounts of, I believe, chloromethane, but I have seen no tests of this well for several years.

If this has not been done recently,

could it be sampled so that we may know its present status? Also I would be interested in the status of well number GZ111 as it is on the Coakley property, but only 20 feet away from my property line. Thank you.

MR. COUGHLIN: Thank you, sir. That is all the cards that I have. Is there anybody else who would like to make a statement for the record?

All right. As I previously said, I would recommend and encourage you to send us written comments if you would like to for the rest of the comment period. We heard at least one and perhaps two requests for extensions of that comment period. We will take those back and consider that and get back to you. I am obviously not in a position to rule on that, but we will take up those requests.

I would also like to request of you who did make a request tonight to send a letter direct to Steve Calder's position so we will have something we can officially act on. We will take that request and consider it immediately.

If there are no other statements, then I will declare the hearing closed. As I said in the beginning, Steve and I will stay if you have any questions and you want to come up front and discuss those. Thank you.

(The public hearing was adjourned at 8:30 p.m.)

C E R T I F I C A T E

I, John G. Kinchen, a Certified Shorthand Reporter, do hereby certify that the foregoing is a true and accurate transcript of my stenographic notes of the hearing, taken at the place and on the date hereinbefore set forth.

I further certify that I am neither attorney nor counsel for, nor related to or employed by any of the parties to the action in which this hearing was held, and further that I am not a relative or employee of any attorney or counsel employed in this case, nor am I financially interested in this action.

THE FOREGOING CERTIFICATION OF THIS TRANSCRIPT DOES NOT APPLY TO ANY REPRODUCTION OF THE SAME BY ANY MEANS UNLESS UNDER THE DIRECT CONTROL AND/OR DIRECTION OF THE CERTIFYING REPORTER.

JOHN G. KINCHEN, RPR-CP

ATTACHMENT D

GUIDANCE AND OTHER DOCUMENTS ON INSTITUTIONAL CONTROLS AND RESIDENTIAL PROPERTY AT SUPERFUND SITES

INSTITUTIONAL CONTROLS
at
CLARK FORK SUPERFUND SITES

TOOLS AND PROPOSED IMPLEMENTATION PROCESS

April, 1991

MURRAY LAMONT & ASSOCIATES, INC.

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CLARK FORK SUPERFUND SITES

INSTITUTIONAL CONTROLS (1)

TOOLS / POTENTIAL USES	ACCESS RESTRICTIONS	LAND USE RESTRICTIONS	GROUNDWATER RESTRICTIONS	ALTERNATE WATER SUPPLIES	MANAGEMENT OF LANDS, WATER BODIES	VISUAL ENHANCEMENTS	LIABILITY PROTECTION	PUBLIC/PRIVATE FUNDING MECHANISMS FOR FINANCING IMPROVEMENTS	PHASING IMPROVEMENTS	BUFFER REQUIREMENTS
REAL PROPERTY INTERESTS IN LAND INCLUDING EASEMENTS, DEVELOPMENT RIGHTS, FEE OWNERSHIP OR RESTRICTIONS INCLUDING COVENANTS	●	●	●		●		●			●
LAND USE REGULATIONS INCLUDING ZONING, FLOOD PLAIN AREAS...		●			●					●
DEDICATION OF LANDS FOR PUBLIC USES AND/OR GOVERNMENTAL MANAGEMENT INCLUDING OPEN SPACE, PARKS, LAKES, GREENWAY STRIPS ALONG RIVERS	●	●	●		●	●		●	●	●
SPECIAL LEGISLATION TO PROHIBIT OR REGULATE ACTIVITIES SUCH AS WELL-DRILLING, DEVELOPMENT...		●	●	●	●			●	●	
MASTER PLANNING						●		●	●	●
FINANCIAL ASSURANCES/INSURANCE							●			
CONTRACTUAL AGREEMENTS	●	●		●	●	●			●	●
FINANCIAL POOLS INCLUDING ESCROWS, TRUSTS, DEPOSITS, BONDS...FOR SUPPORT OF DEDICATIONS TO PUBLIC FACILITIES, CONTINGENCIES, ASSURANCES					●			●	●	

1 SEE NOTES, FOLLOWING PAGE

MURRAY LAMONT & ASSOCIATES, INC.

Footnotes to Matrix of Institutional Controls

Application of these, and other institutional controls tools will normally depend on site-specific characteristics of areas, including the land and water, and their location and situation.

Typically the institutional controls are used in combination with each other and together with treatment and engineering measures.

Depending on the particular institutional control, cooperation or action and commitment may be required among some of the following:

- A PRP
- County/town
- Citizens group
- State of Montana
- Forest Service/Bureau of Land Management
- Environmental Protection Agency
- Other private entities such as banks, insurance companies, etc.

Institutional Controls Tools for
Clark Fork Superfund Sites
Montana

Real property interests in land, including easements, deed restrictions, development rights and ownership

Description: A variety of options exist to acquire and/or control property rights at a site or areas surrounding a site for the purpose of limiting access, controlling development, providing buffer areas, or controlling groundwater use. First, ownership of property may be transferred to a governmental or quasi-governmental entity, accountable to the public for use of the property. Second, the owner of the property may give an easement or transfer the development rights to a public entity or some other person which would limit development of the site. Third, an owner may impose on his property a covenant restricting the uses to which he can put his land.

An important aspect for the citizens is that their interests are best protected by placing a degree of control in a public body.

Implementation: All of these tools are generally implementable under Montana law, providing there is agreement among the various parties. These tools would typically require the cooperation of the current land owner, although in some instances the condemnation power of the State may be available. It may be necessary to create new legal entities for the purpose of holding property rights. It may also be necessary to provide limited financial resources and assurances for ongoing management of the contaminated properties to entities to whom property interests would be transferred.

Enforcement: If properly implemented, these property interests run with the property and would be enforceable against the owner of the "burdened" property, either in an action for damages or for an injunction to enforce the restrictions. Who the person or entity is who can enforce the restriction depends on how the restriction is set up, and in whose favor.

"The Test of Time": If properly implemented these property rights are independent of ownership and run with the property until they are abandoned or terminated or until they become purposeless. Involvement by a public entity such that that entity has the power of enforcement may assure that the restrictions are continued for as long as they are in the public interest.

Institutional Controls Tools for
Clark Fork Superfund Sites
Montana

Land use regulations, including zoning, development permit systems, and subdivision regulations, flood plain regulations, or development regulations.

Description: Land use regulations are systems of county and/or town laws and regulations that limit or shape allowed land uses in the county or town. Zoning is the most common form of land use regulation, and is used by many cities and towns in the State. Recently, some local governments have adopted an alternative to zoning commonly known as a "development permit system". Few counties in Montana are zoned or have adopted a development permit system. Land use regulations can explicitly identify allowed land uses for specific sites, or as in the case of a development permit system, set forth a set of criteria and a process for determining allowed uses for any site in the county or town.

Implementation: Land use regulations, including zoning and development permit systems are implemented by adoption of local laws passed by the local government. It may be necessary to have a master plan before a local governing body can adopt such laws. These laws usually can be adopted or changed by a simple majority vote of elected officials.

Enforcement: Land use regulations are enforced by the local government which adopts the pertinent law. Most often enforcement actions are initiated by citizen complaint or by the conditions stated on the permit of a developer. Then the proper authorities of the town or county have the power to prevent or remedy the illegal act or to seek penalties against those violating the law. Withholding grading, foundation or building permits is the process of enforcement when a new development or major redevelopment is proposed and the proposal does not meet the local requirements.

"The Test of Time": Land use regulations adopted by governing bodies as local law usually require a simple majority, and can be changed by future bodies with a majority vote. Public hearings are required. Their strength rests with the level of community support that holds elected officials responsible for the commitment.

Dedication of Lands for public uses and/or governmental management, including open space, parks, lakes, greenway strips along river, etc.

Description: Privately owned lands, or real property interests therein, are often dedicated to public agencies for the purpose of serving a public benefit. For instance, local roads constructed by a private developer in a new subdivision are typically dedicated to the town or county for their management and maintenance. This may also be an option for certain lands in a cleanup program. This could be the case for lands that have the potential for public benefit. And, it may allow for a future land use that makes possible a particularly advantageous cleanup option, like capping a landfill site, whereby future land use must be restricted to prevent penetration of the site. It may also make possible future custodianship by a public body, thereby bringing the public interest directly into the picture.

Implementation: Such arrangements must be mutually agreed- upon by the land owner and a public body who will undertake future management of a site. It may require the public body be provided financial assurances against contaminant-related liabilities. The public body must find a public benefit in accepting dedicated lands, and may require a commitment of resources, or other provisions for carrying out future custodial or management responsibilities.

Enforcement: The public body's commitments for future management of a site can be spelled out in a contract with the party dedicating the site. In some communities, once park land is dedicated, a public vote is required to change the land use. If part of a master planned development, like a river greenway program, open space or parks program, public involvement would be substantial, and public pressure would enhance enforcement of the contracts. Issues of continuing protection of the environment may be enforced by EPA, and the State, through the applicable laws or contractual arrangements, and typically notice of violations would be based on complaints filed by citizens or environmental groups.

"The Test of Time": Public management or custodianship of lands will ultimately follow the demands of the citizenry through the elective process. These demands can change over time, but will normally be most fundamentally driven by the public interest. Once the land is dedicated to a public entity, the public entity has a contractual obligation concerning future management of the land.

Financial Assurances/Insurance

Description: These are methods of ensuring that parties who are not Potentially Responsible Parties (PRP) in a cleanup, but who might play some role in remediation, or use a site after remediation, are assured that they will not be financially responsible for environmental impairment resulting from the contamination. Financial assurances may be through a contractual agreement with the PRP or insurance may be acquired via premium payments paid by the PRP, and based on actuarial risk.

Implementation: Contracts would be used to provide financial assurances to a non-PRP. Insurance could be obtained through an insurance underwriter or financial institution, who is able to show sufficient financial strength to cover all potential liability.

Enforcement: Enforcement would be through standard legal provisions for breach of contract, and/or proof of insurance pr(. ied by the insurer. Legal remedies for breach of contract may include damages and specific performance requirements. The beneficiaries of the financial assurances would be responsible for ensuring the contract, and/or insurance remains in force.

"The Test of Time": A contract would be valid until terminated. It may depend on the financial strength of the party providing the financial assurances. Insurance would remain in effect so long as premiums were paid. Premiums could be prepaid. A trust fund could be created to ensure sufficient money would be available in the event of breach of contract.

Institutional Controls Tools for
Clark Fork Superfund Sites
Montana

Special Legislation to prohibit or regulate activities like well drilling, development, etc.

Description: Special State legislation has been used in other states to create special institutional controls such as groundwater management zones. These are delineated geographic areas in which certain activities (well drilling) must be permitted, or may be completely prohibited by State law. A similar concept of legislation might designate a river course, and buffer lands as a protected area in which development activities are limited to serve flood and open space interests. Having declared that an area would be protected in this way, a broader range of advantageous remediation options may be available, because of the land use restrictions inherent in the State law.

Special legislation could also be local. Such legislation would have to fall within the powers of local government in Montana and be adopted according to local laws.

Implementation. Special State legislation would require identification of a public benefit, obtaining local and a certain degree of statewide support, possibly substantial educational and lobbying efforts, and could take several years to gain passage of a measure. For local legislation, less time probably would be required.

Enforcement: There would be the force of State and/or local law, and also possibly local administrative or regulatory responsibilities. New local responsibilities may need to be funded in order to be effective. The precise method of enforcement would likely depend on the nature of the law. For example, groundwater management zone enforcement is achieved through a well-drilling permitting system. Violations would be discovered through complaints, or inspections.

"The Test of Time": Once established, and funded, public programs tend to become institutionalized. In order to be effective public programs must be properly funded. State and local laws can be changed, though they will tend to hew to the public interest through a political process.

Institutional Controls Tools for
Clark Fork Superfund Sites
Montana

Master Planning

Description: Master planning is a local government process designed to set forth a town's or region's future direction, addressing development, redevelopment, investment in infrastructure, public amenities, and other actions, including setting priorities, assigning responsibilities, and designating funding. Master plans are long range in outlook, but usually also address near term actions. Such plans often identify general land uses that should occur in certain locations, but are not specific like a zoning map would be.

Implementation: Master plans are generally created with significant community involvement over several months, or even years. The public agency (town, county) is in charge, and the plan is its responsibility to create, adopt and administer. For a master plan to serve as useful in remediation of contaminated sites, a concept that shows how the cleanup relates to broad issues of public interest must be offered during the planning process.

Enforcement: Master plans themselves rarely carry the force of law. They are guidelines for adoption of more specific programs (like zoning, development regulations, a bond issue, or a budget allocation) that may be local laws.

"The Test of Time": A master plan can set the stage for a concept that is subsequently put into a specific action program. Master plans themselves change over time as conditions change, and they are updated. The value is measured by the level of community commitment and agreement that exists with regard to the concepts in the plan. A master plan widely understood and endorsed by the community can have a long term effect and force over time by virtue of such endorsement.

Contractual Agreements

Description: A contract is a legally enforceable agreement between parties who agree to perform or refrain from performing certain acts. Any of the major players in the Montana remediation, ARCO, Montana Resources, a town, county, the State, etc. could enter into contracts with any or all of each other regarding land transfers, future land uses, access restrictions, phasing cleanup or public improvements, or other issues including management of remediated lands.

Implementation: The contract itself is simply a signed agreement among the parties. A contract may be only part of a broader set of public/private agreements as to how certain responsibilities or lands will be handled in the remediation. Thus substantial negotiations may be necessary amongst the key parties.

Enforcement: Breach of contract constitutes grounds for legal action. Such action would have to be initiated by one of the parties to the contract. Damages and/or specific performance are remedies that may be available

"The Test of Time": A contract would remain in effect until terminated by the parties. To be effective, parties must monitor performance, and parties must be financially capable of handling their responsibilities.

Financial Pools, including escrows, trusts, deposits, bonds, etc.

Description: These are a variety of forms of financial resources that would be held by a disinterested third party until or if certain terms and conditions of interest to the original parties occur. Such resources could be used to ensure the involvement of a public agency, or other party in post-remediation land uses, where there is some uncertainty as to future financial demands or other contingencies that might arise for management, land sales prices, costs for operating responsibilities, or the like. The financial pool would be available to address enumerated needs or contingencies per a contractual agreement, such as between a PRP and a public body, or other entity involved.

Implementation: There are many standard methods for trusts, escrows, etc. using financial institutions, including most banks in Montana. The financial resources would be made available pursuant to a contractual agreement possibly between a PRP and a public body whereby the public entity takes on certain responsibilities. More importantly, the creation of a financial pool probably would be a small part of a broader agreement among all the affected parties involved in the remediation, and involved in afteruse of remediated lands.

Enforcement: There are standard legally enforceable measures similar to the remedies for breach of contract. (See glossary.) Most banks have trust departments whose function it is to manage such funds pursuant to the terms of the escrow or trust agreement. This would normally be formed under contract, and be subject to all the laws that govern a trustee's responsibilities.

"The Test of Time": These measures may not be dependent on the financial resources of the party creating the pool. Once created "pay-in" could be phased so that financial soundness may be an issue, or prepaid so it would not. This would be negotiated among the parties at the outset.

POSSIBLE STEPS FOR
APPLICATION OF INSTITUTIONAL CONTROLS
IN CLARK FORK SUPERFUND SITES MONTANA[1]

Step 1 Based on the nature of a given site, including contamination, location, physical characteristics such as slope, flood plain, topography, etc., and possible effectiveness of various approaches to remediation, determine general options and critical limitations for future land uses for each site in question.

Step 2 Determine community land use needs, in light of the opportunities and limitations afforded by the site(s). These may be public needs, including for example recreational uses such as parks, greenways, recreational water courses, ... or economic development needs, and/or private needs such as development sites at certain locations, or of a certain size, etc. To some extent this information may be available from existing local master plans or developed as part of the creation of a new master plan. However, there may be opportunities present that were not previously considered where cleanup has been narrowly construed.

Step 3 In cooperation with the community, focus in on the most desirable end use options for the sit) based on physical/environmental possibilities and areas of greatest community need.

Step 4 Working toward the most desirable end use options identified in Step 3, evaluate the potential application of institutional controls, to complement treatment and engineering technologies. Do this to maximize the land use benefits, public and private, taking into account the mandate of environmental protection. (See matrix of example institutional controls and their potential uses on the following page.) Use of the matrix together with the background of Steps 1-3 will permit a narrowing of viable options with a specific purpose in mind.

Step 5 Implementation by ARCO and State/local governments, as required, of the necessary actions over a phased period to make physical improvements, including Superfund cleanup and the companion improvements aimed at the public benefit, and adopt needed institutional controls.

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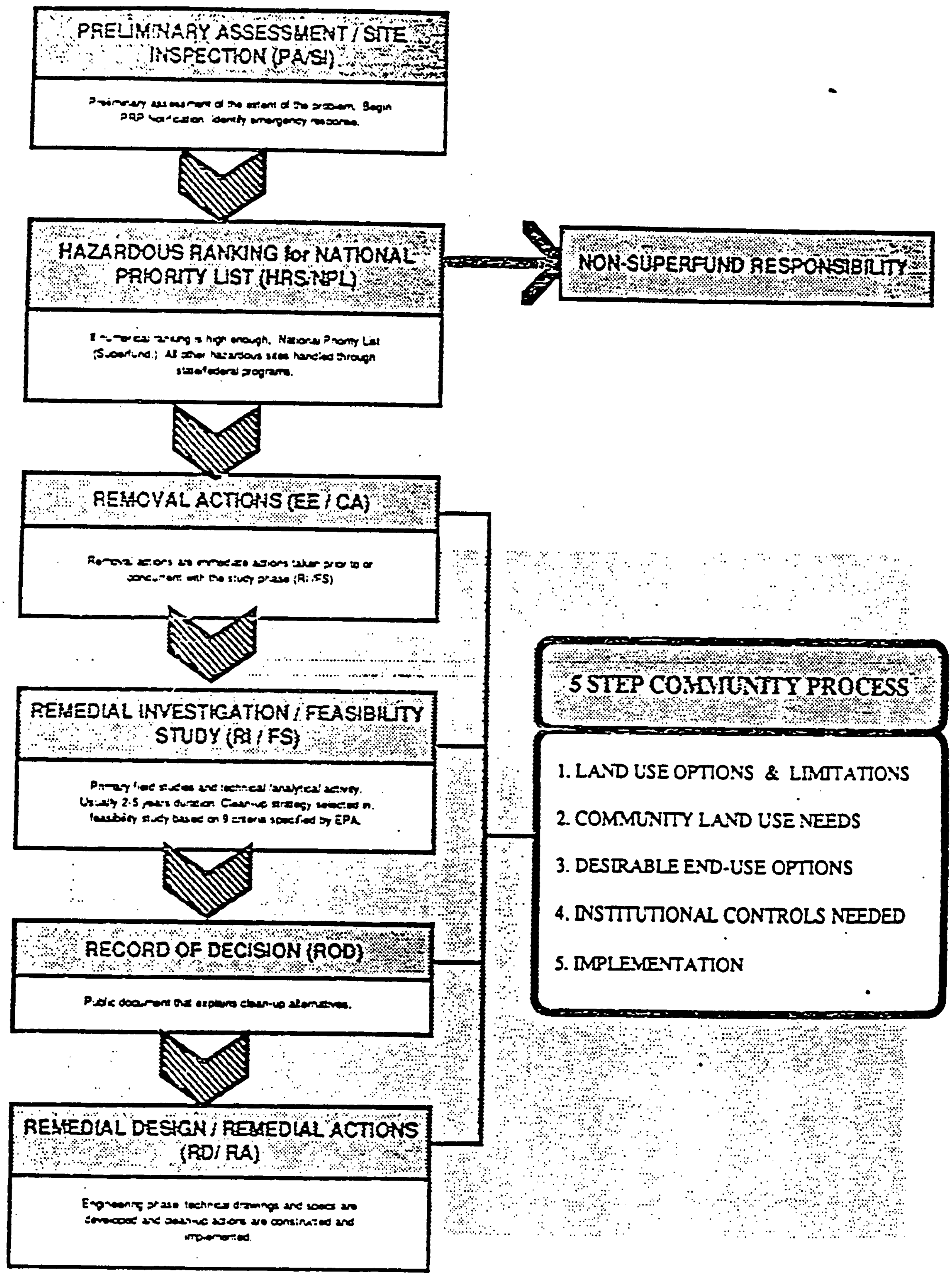
[1] These general steps delineate a joint process with the affected communities to gain agreement on certain end land uses that then makes it possible to determine the most advantageous use of institutional controls.

SIMPLIFIED SUPERFUND PROCESS



MURRAY LAMONT & ASSOCIATES, INC.

GLOSSARY OF TERMS

CLARK FORK SUPERFUND SITES MONTANA

Breach of Contract: Violation of any of the terms or conditions of a contract without legal excuse; default; nonperformance. Depending on the terms of the contract involved, the nonbreaching party to the contract may seek one of three possible alternative remedies upon a material breach of the contract: rescission of the contract, action for money damages, or an action for specific performance.

Contract: A legally enforceable agreement between competent parties who agree to perform or refrain from performing certain acts for a consideration. In essence, a contract is an enforceable promise.

Covenant: An agreement or promise between two or more parties in which a party or parties pledge to perform or not to perform specified acts on a property that, under certain circumstances, is enforceable against purchases of the property affected by the covenant. A covenant also may be a written agreement that specifies certain uses or nonuses of the property. Covenants are found in such real estate documents as leases, mortgages, contracts for deed, and deeds. Damages may be claimed for breach of a covenant.

Development Permit System: A form of land use regulation that sets criteria and standards that must be attained by any of a variety of land uses to be allowed in certain locations. Such standards would typically address issues that relate to a community's objectives in regard to compatability of uses, safety, environmental protection, economic viability, design, aesthetics, etc.

Development Rights: The rights a landowner sells to another to develop and improve the property.

Easement: A property interest that one person (the benefited party) has in land owned by another (the burdened party), entitling the holder of the interest to limited use or enjoyment of the other's land. An easement is an actual interest in land. Accordingly, the grant of an easement must be in writing, usually in the form of a separate deed or a reservation in a deed.

Escrows: The process by which money and/or documents are held by a disinterested third person until the satisfaction of the terms and conditions of the escrow instructions (as prepared by the parties to the escrow). When these terms and conditions of the escrow instructions have been satisfied, the escrowed funds and documents are delivered as specified in the escrow instructions.

Fee (simple) Ownership: The maximum possible estate one can possess in real property. A fee simple estate is the least limited interest and the most complete and absolute ownership in land; it is of indefinite duration, freely transferable, and inheritable. Fee simple is the most common form of ownership for all type of property.

Land Use Regulations: Governmental regulatory controls over the use of private land including such measures as zoning, developmet permit systems, subdivision regulations, sign codes, landscaping ordinance, ... Land use regulation generally provides for no compensation to the private landowner.

Parties of Interest: The principals in a transaction or judicial proceeding. For example, the buyer and seller (not the broker) are the parties to the sales contract; the plaintiff and defendant are the parties to a lawsuit.

Subdivision Regulations: Governmental regulatory controls over the division of tracts of land into lots, and for he provision of public facilities necessary, including streets, utility rights of way, park lands, open space, drainageways, etc.

Third Party: A person who is not party to a contract but who may be affected by it; one who is not a principal to the transaction, such as the broker or escrow agent.

Trustee: One who holds property in trust for another to secure the performance of an obligation.

Trusts: An arrangement whereby legal title to property is transferred by the grantor (or trustor) to a person called a trustee, to be held and manage by that person for the benefit of another, called a beneficiary.

Zoning: The regulation of structures and uses of property within designated districts or zones. Zoning regulates and affects such things as use of the land, lot sizes, types of structure permitted, building heights, setbacks, and density (the ratio of land area to improvement area).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUL 27 1992

OFFICE OF GENERAL COUNSEL

MEMORANDUM

SUBJECT: Use of Institutional Controls at Superfund Sites

FROM: David F. Coursen, Attorney-Advisor

TO: Howard F. Corcoran, Associate General Counsel
Grants, Claims and Intergovernmental Division

I. Introduction

Institutional controls (ICs) are restrictions on the use of land. As applied to CERCLA, their purpose is to reduce the dangers to the public from a Superfund release. ICs may be used instead of or in addition to active response measures such as treatment or physical or engineering controls. ICs may operate by broadly preventing activities at or near a site or through a narrow, specific restriction, such as restricting use of contaminated groundwater.

The NCP sets out EPA's expectation that ICs "shall not substitute for active response measures ... [that actually reduce, minimize, or eliminate contamination] as the sole remedy unless such measures are determined not to be practicable, based on the balancing of trade-offs among alternatives that is conducted during the selection of remedy." 40 CFR § 300.430(a)(1)(iii)(D). Nevertheless, where active remediation is not practicable, ICs may be "the only means available to provide for protection of human health." 55 Fed. Reg. 8666, 8706 (March 8, 1990). However, where controls are the sole remedy, "special precautions must be made to ensure that the controls are reliable." 55 Fed. Reg. at 8706. Controls may also be "a necessary supplement where waste is left in place as it is in most response actions." Id.[1]

[1] The provisions of the NCP relating to institutional controls have been challenged in litigation concerning the NCP, State of Ohio et. al. v. U.S. EPA, Case No. 86-1096 (and consolidated cases), contending, among other things, that institutional controls may not be selected based on cost considerations, and that institutional controls may never be the sole remedy. As of the date of this memorandum, a decision has not been issued in that case. Any decision could affect the availability or usefulness of institutional controls in particular cases.

The NCP does not discuss or identify the precautions needed to ensure the reliability of ICs. It does specify, however, that, in appropriate cases, the Agency cannot provide remedial action unless a state assures "that institutional controls implemented as part of the remedial action are in place, reliable, and will remain in place after initiation of operation and maintenance." 40 CFR § 300.510(c)(1). <u>See, also,</u> 42 U.S.C. § 9604(c)(3).

An IC may fail if it is inadequately designed or not fully and effectively implemented or if full and effective implementation cannot be maintained for the desired time period. For example, an IC established as a restriction on land use is unlikely to be effective if the restriction is eliminated, reduced, or ignored. For this reason, it is critical to determine what measures can be taken to maximize the effectiveness of ICs. It is equally critical to give careful consideration, early in the planning process, to the development of appropriate controls that will meet the needs at the site where they are to be used.

Because an institutional control restricts the use of property, it is possible that in some circumstances the implementation of an IC may give rise to a claim that the control effectively "takes" the property. Under the Fifth Amendment, it is entirely proper for government to take property, but when it does so, it has the obligation to provide just compensation to the property's owner. Meeting this obligation may increase the cost of the use of institutional controls.

II. Types of ICs

There are two fundamentally distinct types of ICs, which might be characterized as governmental and proprietary controls. Governmental controls involve a state or local government using its police powers to impose restrictions on citizens or sites under its jurisdiction. Proprietary controls involve property owners using their rights as owners to control the use of, or access to, their property. The two types of controls must be discussed separately, since they differ significantly in regard to scope, reliability, and appropriate mechanisms for implementation.

III. Methods of Implementing ICs

A. Governmental Controls

As the NCP points out, institutional controls typically are unlikely to be implemented by the Agency.[2] Governmental ICs, by definition, involve restrictions that are generally within the traditional police power of state and local governments to impose and enforce. Among the more common governmental institutional controls are water and well use advisories and restrictions, well-drilling prohibitions, building permits, and zoning and other land use restrictions.

In appropriate circumstances, a state may provide EPA with assurances concerning the continued effectiveness of a governmental control. Typically, the mechanism for providing such an assurance will be a Superfund cooperative agreement or Superfund State Contract (SSC) in which the state, pursuant to CERCLA § 104(c)(3), assures EPA that it will operate and maintain a remedy. In many cases, the continued enforcement of the IC can be characterized as an aspect of the effective operation and maintenance (O&M) of a site.

With a cooperative agreement or SSC in place, the state retains whatever authority it has to alter or permit the alteration of zoning or other use restrictions but is contractually obligated to EPA to continue the controls to the extent it has the authority to do so. Thus if the remedy fails, EPA may be able (depending on applicable law), to pursue a breach of contract claim against the state. The ultimate utility of such an action may depend both on whether EPA prevails in the action, and, if it does, on whether it could obtain specific performance or would be limited to a damages remedy.

However, states may have delegated the types of police power that are needed for ICs to local governments, which often are not parties to an agreement with EPA and are not required, under

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[2] The United States has authority under CERCLA § 106(a) to issue orders or take other appropriate actions "as may be necessary to protect public health and the environment," if there "may be an imminent and substantial endangerment." An order issued under this authority may, in appropriate cases, require the implementation of institutional controls by other parties. In addition, the order itself, to the extent it effectively restricts or prohibits certain land uses, may function as an institutional control with respect to the party to whom it is issued.

CERCLA, to give an O&M assurance. Since it is the state that has made the assurance, EPA's remedy for a failure of the control is from the state, which may not have the legal authority to prevent the local government from actions that might lead to the failure of the IC, such as a change in zoning regulations.

This arrangement would appear to be less reliable than one in which the same entity that has the authority to maintain the institutional control provides EPA with the assurance. To some extent, this lack of reliability may be something that governmental ICs have in common with most other aspects of O&M at a site; typically, O&M is implemented by a local government, although it is the state that has provided the O&M assurance. If the local government fails to carry out activities necessary to O&M, the state's O&M assurance would appear to obligate the state to step in. Nevertheless, while a state typically possesses the legal authority to carry out O&M, it may not have the legal authority to impose an institutional control.

One approach to increasing the reliability of governmental ICs is to create a direct contractual relationship between EPA and the governmental entity responsible for implementing and enforcing the use restriction. In situations where the state proposes to have the local government implement O&M, arguably an adequate assurance should include some commitment by the local government to EPA in a three party agreement or to the state in a separate agreement, that it will not reduce or eliminate the necessary use restrictions; the effectiveness of such a commitment will depend in part on the extent that the commitments of the signatory government are binding on successive governments. In some cases, this could be done in a three-party SSC or a cooperative agreement. Before entering into such an agreement, Regional counsel should be consulted regarding the remedies available in the event of a breach.

The most obvious application of this approach is to remedial actions; § 104(c)(3) expressly requires that, before EPA provides remedial action at a site, the state in which the site is located must provide certain assurances, including an assurance of all future maintenance; if a state will not provide this assurance, it may be difficult to implement institutional controls. Where EPA is not providing remedial action, some comparable method of formalizing a contractual relationship between EPA and the State or local government in which EPA receives an assurance that the institutional control will remain in place may be useful. Cf. 40 CFR §§ 35.6200-6205 (authorizing removal response cooperative agreements). The mere fact that CERCLA does not require certain types of assurances in certain circumstances does not preclude the Agency from obtaining assurances needed to maximize protection of health and the environment at the site.

A less formal, but perhaps more effective means of ensuring the reliability of this type of control is to emphasize obtaining community understanding of, and support for, the IC. A community's belief in the importance and appropriateness of an IC, could, as a practical matter, increase the likelihood of adequate implementation of the control.

B. Proprietary Controls

Where governmental authority is not the basis for an institutional control, property ownership must be. For example, a consent agreement under which a PRP agrees to ensure that a particular IC will remain in place may be unreliable unless the PRP has the power to enforce the restrictions in the IC. Where the PRP is not a sovereign, the most likely source of the power to control the use of private property would be the ownership of an interest in that property. The rights of property owners are generally defined by the property law of the state where the property is located. This makes it critical to identify and understand the applicable property law principles as part of the process of developing an IC.

Full fee title obviously constitutes an interest in property which is sufficiently broad to support an IC, since fee owners can generally restrict the uses of their properties as they see fit, within the limits imposed by applicable law. A lesser interest (preferably recordable) that encompasses rights and control over the property sufficient to enforce a use restriction could also be adequate. Note also that a sovereign may act in the capacity of a property owner and implement a proprietary IC subject to the same conditions that apply to a private party's proprietary controls.

With a proprietary control, a party owning sufficient rights in a property restricts the use of the property. To ensure the reliability of such an arrangement, it may be desirable to clarify the terms and conditions under which the owner will enforce the restriction and to address the possible conveyance of the property interest that provides the right to enforce the restriction, and the owner's continuing responsibility to enforce the restriction even where there has been a conveyance.[3] Thus, if the restriction were violated, EPA could pursue a remedy against the party for breach of the agreement (even if it could not enforce the use restriction as to a new owner). Ideally, a proprietary control will be implemented with sufficient

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[3] Any such restriction, however, must be framed so that it does not violate the prohibition of restraints on alienation as reflected in the property law of the state where the restriction is to be imposed.

flexibility to allow all appropriate uses of the property, and to permit the owner to convey most interests in the property.

An easement is a common, reliable type of property interest sufficient for implementing a proprietary IC. Not only is an easement well-recognized at common law, but it has sufficient flexibility so that it can be crafted to give the holder precisely the rights needed to restrict the use of the property.

Other interests may also provide a basis for an IC. For example, a covenant, running with the land, restricting uses of the property might be adequate, so long as some party has both the ability and willingness to enforce it.[4]

Another alternative might be a reverter clause in a deed, by which the property reverts to a former owner or some other party if it is ever used in a prohibited way. Yet another option would be the creation of an irrevocable trust to hold the interest and ensure that the property is not used in the prohibited manner.

Although interests less than full fee title may be adequate to protect an IC, it is critical to ensure that, in fact, the party overseeing the IC will be able to manage use of the property in the desired ways. Certain instruments, for example those requiring privity, may not reliably ensure this, since the ability to enforce will cease, and the control may fail, once the property passes out of privity.[5]

A similar analysis appears to apply to any institutional control based on property ownership. To implement such a control, the Agency must enter into an agreement in which a party possessing a sufficient interest in the property to prevent the inappropriate use formally agrees to enforce that right and prevent the use.

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[4] It might be useful to explore the possibility that a local community group, motivated by a desire to ensure adequate environmental protection of an area, might hold such an interest. In considering such a possibility, factors affecting the long-term viability of the group must be examined such as its likely longevity, its resources for taking legal action to address violations of the control, and its ability to take various actions.

[5] However, to the extent that failure of such a control entails a CERCLA release, the owner or operator may be liable under CERCLA § 107. Moreover, the presence of a use restriction or notice in a deed would probably be relevant to the ability of a party to maintain an innocent landowner defense to liability.

C. Property Acquisition

Proprietary controls can often be implemented, particularly in an enforcement context, under consent agreements between EPA and property owners. However, in some cases, implementation may require the acquisition of an interest in real property. Further, in some such situations, a necessary part of the response may be for EPA to acquire property on its own behalf. Whenever EPA acquires property, certain procedures and rules apply.

1. Authority to Acquire

As part of a remedial action, the Agency may "acquire, by purchase, lease, condemnation, donation, or otherwise, any real property or any interest in real property" under CERCLA § 104(j). A condition of the exercise of acquisition authority under CERCLA § 104(j) is that, before an interest in real estate is acquired "the State in which the interest to be acquired is located assures ... [EPA] ... that the State will accept transfer of the interest following completion of the remedial action." § 104(j)(2). Where the property interest will be extinguished (e.g., a lease with a limited term or an easement for a specific term or purpose) by the completion of the remedial action, no assurance is necessary.

2. Process of acquiring property

EPA's Facilities Management and Services Division (FMSD) has sole authority within the Agency to acquire real property under Agency Delegation of Authority 1-4. In addition, CERCLA Delegation 14-30 requires the approval of the Assistant Administrator for Solid Waste and Emergency Response, with the concurrence of the General Counsel, for all real property acquisitions, "by EPA or pursuant to a cooperative agreement for response action, including a removal, remedial planning activity, or remedial action." After the necessary concurrences, the Hazardous Site Control Division sends a request for acquisition to FMSD. FMSD may complete the real estate transaction with its own personnel, by contract with a commercial firm, or through an Interagency Agreement with the U.S. Army Corps of Engineers or U.S. Bureau of Reclamation.

Conclusion

It would appear that certain types of proprietary controls can, when implemented properly, be extremely reliable. In deciding how to fashion and implement a proprietary control, it is critical to ensure adequate rights to restrict property uses in the desired ways. To maximize the effectiveness of the IC, it is critical to analyze, in addition to the adequacy of the rights themselves, the willingness of the party holding the rights to exercise them and the likely effects of a conveyance of the property on those rights.

Conversely, governmental controls, to the extent that they are expressed in laws, policies, or regulations, may be subject to change. To maximize the effectiveness of this type of control, it may be useful to attempt to develop some formal agreement in which the government possessing police power over the activity to be regulated assumes responsibility for implementing and maintaining the control.

OSWER Directive #9834.6

POLICY TOWARDS OWNERS OF RESIDENTIAL PROPERTY AT SUPERFUND SITES

U.S. Environmental Protection Agency
Office of Solid Waste and Emergency Response
Office of Enforcement
Washington, D.C. 20460

I. INTRODUCTION

A. Purpose and Summary

This guidance describes EPA's policy for enforcement actions to recover response costs or to require response actions under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), with respect to owners of residential property located on a Superfund site.

Under this policy, EPA, in the exercise of its enforcement discretion, will not take enforcement actions against an owner of residential property to require such owner to undertake response actions or pay response costs, unless the residential homeowner's activities lead to a release or threat of release of hazardous substances, resulting in the taking of a response action at the site.[1] This policy does not apply when an owner of residential property fails to cooperate with the Agency's response actions or with a state that is taking a response action under a cooperative agreement with EPA pursuant to section 104(d)(1) of CERCLA. This policy also does not apply where the owner of residential property fails to meet other CERCLA obligations, or uses the residential property in any manner inconsistent with residential use.

EPA is issuing this policy to address concerns raised by owners of residential property, and to provide a nationally consistent approach on this issue.

B. Background

Several sites that are the subject of a response action (removal or remedial activities) under CERCLA include properties that are used exclusively as single family residences (one-to-four dwelling units). At several larger sites, soil or ground water contamination may be so extensive that there are several hundred of these residential properties located on a Superfund site.

Some owners of residential property located on a Superfund site are concerned about potential liability for performance of a response action or payment of cleanup costs because they may come

[1] This policy does not provide an exemption from potential CERCLA liability for any party; it is a statement of the Agency's enforcement discretion. Liability is governed by Section 107 of CERCLA.

within the definition of "owner" under the statute.[2] Owners of residential property located on a Superfund site have expressed the concern that they may be unable to sell these properties because the buyer and the lending institution may also be concerned about potential liability.

C. Past Agency Practice and Basis for Policy

In the past, the Agency has not required owners of residential property located on a Superfund site to perform response actions or pay response costs except where the residential homeowners' activities lead to a release or threat of a release of hazardous substances, resulting in the taking of a response action at the site.[3] Despite this general practice, some owners of residential property have asked EPA for individual assurances that the Agency not take an enforcement action against them for performance of the response action or payment of response costs. The Agency has not been able to provide individual owners of residential property with assurances of no enforcement action outside the framework of a legal settlement, and this policy does not alter EPA's policy of not providing no action assurances.[4]

This guidance instead constitutes a general statement of policy regarding the Agency's exercise of enforcement discretion with respect to owners of residential property located on a Superfund site. The purpose of this policy is to continue the Agency's past practice and to provide guidance for Agency enforcement staff.

II. DEFINITION OF KEY TERMS

The following definitions are applicable for the limited purposes of this policy, and do not represent the Agency's interpretation of these or any similar or related statutory terms in any context other than this policy:

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[2] Under section 107(a)(1) of CERCLA, a person is liable if it is the owner or operator of a facility. 42 U.S.C. Section 9607(a)(1). Under section 101(9)(B) of CERCLA, a facility is defined to include "any site or area where a hazardous substance...has...come to be located." 42 U.S.C. Section 9601(9)(B).

[3] The Agency has required owners of residential property to provide access to the residential property in order to assess the need for a response action or implement a response action, and to otherwise cooperate with cleanup activities.

[4] See "Policy Against No Action Assurances," (November 15, 1984).

- The term "owner of residential property," means a person, as defined under section 101(21) of CERCLA, who owns residential property located on a Superfund site, and who uses or allows the use of the residential property exclusively for residential purposes. The term also includes owners who make improvements that are consistent with residential use. Such term does not include 1) any owner who has conducted or permitted the generation, transportation, storage, treatment or handling of hazardous substances on the residential property other than in quantities and uses typical of residential uses; 2) any owner who disposes of hazardous substances on the residential property resulting in the taking of a response action; and 3) any owner who acquires or develops the residential property for commercial use, or for any other use inconsistent with residential use.

- The term "residential property," refers to single family residences of one-to-four dwelling units, including accessory land, buildings or improvements incidental to such dwellings which are exclusively for residential use.[5]

- The phrase "located on a Superfund site" means properties that are within an area designated for investigation or study under CERCLA, listed as a Superfund site on the National Priorities List, identified as the subject of planned or current removal or remedial activities, where hazardous substances have come to be located, or which are subject to or affected by a removal or remedial action.

III. STATEMENT OF POLICY

In implementing CERCLA, EPA may use enforcement discretion in pursuing potentially responsible parties (PRPs) for enforcement actions. It is within the Agency's enforcement discretion to identify appropriate PRPs to perform response actions or pay response costs.[6]

In the exercise of its enforcement discretion, the Agency

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[5] EPA notes that this definition of "residential property" is consistent with the designation for single family residences under the National Housing Act, 12 U.S.C. Section 1701.

[6] See generally, Heckler v. Chaney, 470 U.S. 821 (1985); U.S. v. Helen Kramer, et al, No. 89-4340 (D.N.J. February 8, 1991).

has determined that it will not require owners of residential property located on a Superfund site to perform a response action or pay response costs if the owner's activities are consistent with this policy.[7] Under this policy, EPA's exercise of enforcement discretion will extend to lessees of residential property provided that the lessees' activities are consistent with this policy. This policy also applies to persons who acquire residential property through purchase, foreclosure, gift, inheritance or other form of acquisition, as long as those persons' activities after acquisition are consistent with this policy.[8]

This policy does not apply to an owner of residential property who has undertaken activities leading to a release or threat of release of hazardous substances, resulting in the taking of a response action at the site.[9] In such situations, the Agency would contemplate bringing an enforcement action against the owner of the residential property to perform a response action or to pay response costs. In addition, if an owner of residential property located on a Superfund site develops or improves the property in a manner inconsistent with residential use, or the development of the residential property leads to a release or threat of release of hazardous substances resulting in the taking of a response action at the site, then the owner would not be within the scope of this policy. Also, if an owner of residential property fails to provide the Agency with access to the residential property located on a Superfund site to evaluate the need for a response action or to implement a response action, or fails to comply with any other CERCLA obligations, this policy would not apply.[10]

This exercise of enforcement discretion applies to owners of residential property located on a Superfund site who purchased or

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[7] Consistent with the Agency's no action assurance policy (see footnote 4), this policy does not require the Agency to make prospective determinations of whether particular owners of residential property meet the requirements of this policy.

[8] If the Agency has perfected a federal lien on the residential property prior to the acquisition by the new owner, this policy does not affect the status of that lien.

[9] The Agency's experience has been that in general, activities which are undertaken consistent with single family residential use do not lead to a release or threat of a release of hazardous substances, resulting in a response action being taken at a site.

[10] See Section IV of this policy for a further discussion of other CERCLA obligations.

sold the residential property in the past or who purchase or sell the residential property after the issuance of this policy. Whether an owner of residential property has or had knowledge or reason to know that contamination was present on the site at the time of purchase or sale of the residential property will not affect EPA's exercise of enforcement discretion under this policy.

This policy is not based on, and has no effect on, the defenses to liability available to an owner of residential property, or any other person, under section 107(b) of CERCLA. This policy is not related to the "innocent landowner defense" described in sections 107(b)(3) and 101(35) of CERCLA; it is based entirely on EPA's enforcement discretion. Thus, the ability of an owner of residential property to assert any defense to liability is unaffected by this policy.

IV. OTHER CERCLA OBLIGATIONS

Although the Agency, in the exercise of its enforcement discretion, will not require owners of residential property to undertake or pay for response actions if the owners' activities are consistent with this policy, to benefit from this policy an owner of residential property must comply with other CERCLA obligations.

To come within the scope of this policy, owners of residential property must provide access to the residential property when requested by EPA, or report information requested by the Agency.[11] In addition, owners of residential property must cooperate with EPA and not interfere with any of the Agency's activities on the residential property taken to respond to the release or threat of release. Similarly, owners of residential property must cooperate with and not interfere with the activities of a state that is taking a response action under a cooperative agreement with EPA pursuant to section 104(d)(1) of CERCLA. Moreover, owners of residential property must comply with institutional controls placed on their residential property in order to facilitate performance of a response action and to protect human health and the environment.[12]

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[11] The Agency has developed guidance which explains the authorities and procedures by which EPA obtains access or information. <u>See</u> OSWER Directive #9829.2, <u>Entry and Continued Access under CERCLA</u> (June 5, 1987). <u>See also</u> OSWER Directive #9834.4-A, <u>Guidance on Use and Enforcement of CERCLA Information Requests and Administrative Subpoenas</u> (August 25, 1988).

[12] Institutional controls are conditions or limitations commonly placed on property by local or state authorities to ensure that activities (e.g., excavation, construction or other

Nothing in this policy is intended to affect any other obligations required of owners of residential property or any other person under CERCLA or other federal, state and local laws.[13] EPA reserves its authority to obtain access and to enjoin owners of residential property from interfering with response actions, and to seek recovery of response costs if bringing such actions becomes necessary.

This policy does not change the opportunities available to owners of residential property located on a Superfund site to participate in the response selection process. To the extent such parties wish to receive individual notice of response activities, EPA will provide individual notice of public meetings, public comment periods or other public participation activities to owners of residential property which are on the Agency's community relations mailing list.[14] The eligibility of owners of residential property for Technical Assistance Grants under CERCLA is also unaffected by this policy.

V. PURPOSE AND USE OF THIS GUIDANCE

This policy and any internal procedures adopted for its implementation are intended exclusively as guidance for employees of the U.S. Environmental Protection Agency. This guidance does not constitute rulemaking by the Agency and may not be relied upon to create a right or a benefit, substantive or procedural, enforceable at law or in equity, by any person. The Agency may take action at variance with this guidance or its internal implementing procedures.

VI. FURTHER INFORMATION

For further information concerning this policy, please contact Gary Worthman in the Office of Waste Programs Enforcement at FTS (202) 382-5646, or Patricia Mott in the Office of Enforcement at FTS (202) 245-3733.

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similar activity) undertaken by the owner of residential property do not exacerbate the conditions at the site, in some way diminish the effectiveness of a remedy which has been or is being implemented, or otherwise present a threat to human health or the environment.

[13] For example, if the owner of residential property has knowledge that a release has taken place on the residential property, the owner must notify appropriate authorities.

[14] For each site the Community Relations Coordinator in each Region maintains a community relations mailing list.

APPENDIX D

STATE OF NEW HAMPSHIRE CONCURRENCE LETTER

State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES
6 Hazen Drive, P.O. Box 95, Concord, NH 03302-0095
603-271-3503 FAX 603-271-2867
TDD Access: Relay NH 1-800-735-2964

NHDES

September 29, 1994

John P. DeVillars
Regional Administrator
USEPA-Region I
JFK Federal Building (RAA)
Boston, MA 02203

Post-it™ brand fax transmittal memo 7671	# of pages ▸ 2
To STEVE CALDER	From CARL BAXTER
Co. USEPA	Co. NHDES
Dept.	Phone # 603-271-2909
Fax #	Fax #

RE: Record of Decision
Coakley Municipal Landfill, Operable Unit 2
North Hampton, New Hampshire

Dear Mr. DeVillars:

The New Hampshire Department of Environmental Services has reviewed the United States Environmental Protection Agency's Record of Decision (ROD) for Operable Unit 2 of the Coakley Municipal Landfill in North Hampton, NH. The ROD selects a preferred remedy having the following components:

- Institutional controls (such as deed restriction) to prevent use of contaminated groundwater;
- natural attenuation for the contaminated groundwater plume; and
- groundwater monitoring.

State of New Hampshire Remedial Policy

New Hampshire groundwater management policy, as implemented through Env-Ws 410, establishes standards, criteria and procedures to remediate sites with contaminated groundwater. Under state regulations, remediation of such sites includes source removal, containment or treatment; containment of groundwater contamination within the limits of a specified groundwater management zone (GMZ); restriction of groundwater use for drinking water purposes within the GMZ; and reduction of groundwater contaminant levels within the GMZ. If contamination migrates beyond the established GMZ, an alternative remedial action plan must be prepared and more aggressive containment and treatment of the contaminated plume may be required. Pursuant to state regulations, groundwater use on properties within the GMZ must be restricted by easement or ownership, unless alternate water has been made available.

The preferred remedy described in the ROD is generally consistent with the approach that would be required under Env-Ws 410 and state policy. In complying with ARARs, the preferred remedy will meet applicable or relevant and appropriate state requirements that pertain to the site.

State Concurrence

The New Hampshire Department of Environmental Services, acting on behalf of the State of New Hampshire, concurs with the preferred remedy described in the ROD. The State assures that if the Superfund Trust Fund is used, the State will contribute its statutorily required cost share, if State funds are available.

Sincerely,

Robert W. Varney
Comissioner

cc: Daniel Coughlin, P.E., USEPA
Steve Calder, USEPA
Philip J. O'Brien, Ph.D., Director, NHDES-WMD
Carl W. Baxter, P.E., NHDES-WMEB
Talcott Hubbard, P.E., NHDES-WMEB
Anne Renner, Esq., NHDoJ-AGO

APPENDIX E

ADMINISTRATIVE RECORD INDEX

Introduction

This document is the Index to the Administrative Record for the Coakley Landfill Operable Unit II - Management of Migration National Priorities List (NPL) site. Section I of the Index cites site-specific documents, and Section II cites guidance documents used by EPA staff in selecting a response action at the site.

The Administrative Record is available for public review by appointment at the EPA Region I Records Center in Boston, Massachusetts (telephone: 617-573-5729) and **the North Hampton Public Library, 235 Atlantic Avenue, North Hampton, New Hampshire 03862.** Questions concerning this Administrative Record should be addressed to the EPA Region I site manager.

The Administrative Record is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

Coakley Landfill
Operable Unit II - Management of Migration
NPL Site Administrative Record

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for the

Coakley Landfill NPL Site
(O.U.II Management of Migration)

3.0 Remedial Investigation (RI)

3.2 Sampling and Analysis Data

Sampling and Analysis Data for the Remedial Investigation (RI) may be reviewed, by appointment only, at the EPA Region I Records Center in Boston, Massachusetts.

3.4 Interim Deliverables

1. "Sampling and Analysis Plan/Quality Assurance Project Plan (Revision 1)," CDM Federal Programs Corporation (September 1991).

3.6 Remedial Investigation (RI) Reports

1. "Management of Migration Remedial Investigation and Feasibility Study Report, Volume 1," CDM Federal, (May 1994).
2. "Management of Migration Remedial Investigation and Feasibility Study Report, Volume 2," CDM Federal, (May 1994).
3. "Management of Migration Remedial Investigation and Feasibility Study Report, Volume 3," CDM Federal, (May 1994).

3.7 Work Plans and Progress Reports

1. "Revised Work Plan - Volume 1 - Technical Scope of Work," CDM Federal Programs Corporation (June 1991).

3.9 Health Assessments

1. "Health Assessment Addendum for Coakley Landfill," U.S. Public Health Service Agency for Toxic Substances and Disease Registry (ATSDR) (March 23, 1992).

4.0 Feasibility Study (FS)

4.9 Proposed Plan

1. Proposed Plan "EPA Proposes Cleanup Plan for the Coakley Landfill Site (May 1994).

5.0 Record of Decision

5.3 Responsiveness Summaries

1. Cross Reference: Responsiveness Summary is Appendix "C" of the Record of Decision [Filed and cited as entry number 1 in 5.4 (ROD)].

The following citations indicate written comments received by EPA Region I during the formal comment period:

2. Comments Dated June 1994 from Lillian E. Wylie, North Hampton, NH resident on the May 1994 Proposed Plan, "EPA Proposes Cleanup Plan for the Coakley Landfill Site".

3. Comments Dated June 22, 1994 from Elmer M. Sewall, Greenland, NH resident on the May 1994 Proposed Plan, "EPA Proposes Cleanup Plan for the Coakley Landfill Site".

4. Comments Dated June 27, 1994 from Joseph F. Fitzgerald , North Hampton, NH resident on the May 1994 Proposed Plan, "EPA Proposes Cleanup Plan for the Coakley Landfill Site".

5. Comments Dated July 30, 1994 from Robert Tibbetts, Janet Tibbetts, Katie Tibbetts and Matthew Tibbetts, Middletown, CT residents on the May 1994 Proposed Plan, "EPA Proposes Cleanup Plan for the Coakley Landfill Site".

5.4 Record of Decision (ROD)

1. Record of Decision, EPA Region I (September 30, 1990)

13.0 Community Relations

13.1 Correspondence

1. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Steven J. Calder, EPA Region I (April 19, 1991). Concerning attached correspondence:
   - A. Letter from Stanley W. Knowles to Keith W. Bossung, Hampton Water Works (February 27, 1991).
   - B. Letter from Jeffrey S. Knowles to Keith W. Bossung, Hampton Water Works (March 9, 1991) with attached map.
   - C. Letter from Arline Deschenes to Henry B. Fuller (March 10, 1991).
   - D. Letter from Henry B. Fuller to Rene Pelletier, New Hampshire Department of Environmental Services (April 14, 1991) with attached news clipping.
   - E. Letter from Henry B. Fuller to William H. Zeliff Jr., U.S. House of Representatives (April 15, 1991) with attached citizens petition and news clippings.
2. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Steven J. Calder, EPA Region I(September 13, 1991). Concerning transmittal of correspondence regarding the proposed Hobbs Well.
3. Letter from Steven J. Calder, EPA Region I to John H. Hoar, Camp, Dresser & McKee Inc. (September 23, 1991). Concerning attached correspondence:
   - A. Letter from Keith W. Bossung, Hampton Water Works to Edward J. Schmidt, New Hampshire Department of Environmental Services (August 5, 1991) with attached review of assessment report.
   - B. Letter from Richard P. Crowley Jr., Town of North Hampton to Robert W. Varney, New Hampshire Department of Environmental Services (August 8, 1991).
   - C. Letter from Robert W. Mann, New Hampshire Department of Environmental Services to Lillian E. Wylie (August 12, 1991) with attached Letter from Lillian E. Wylie (July 19, 1991).
   - D. Letter from Keith W. Bossung, Hampton Water Works to Robert W. Varney, New Hampshire Department of Environmental Services (September 5, 1991).

13.1 Correspondence (cont'd.)

4. Letter from Steven J. Calder, EPA Region I to Richard P. Crowley Jr., Town of North Hampton (December 4, 1991). Concerning attached correspondence:
   A. Letter from Steven J. Calder, EPA Region I to Robert W. Mann, New Hampshire Department of Environmental Services (July 29, 1991).
   B. Letter from Steven J. Calder, EPA Region I to Robert W. Mann, New Hampshire Department of Environmental Services (December 4, 1991).
5. Letter from Stuart M. Leiderman to Steven J. Calder, EPA Region I (December 13, 1991). Concerning meeting to discuss water-quality testing at the site and request for clarification of EPA's cleanup plan.

Attachments associated with entry number 6 may be reviewed, by appointment only, at the EPA Region I Records Center in Boston, Massachusetts.

6. Letter from Steven J. Calder, EPA Region I to Stuart M. Leiderman (December 26, 1991) with attached EPA guidance documents. Concerning response to residents' questions regarding EPA's cleanup plan.
7. Letter from Stuart M. Leiderman to Steven J. Calder, EPA Region I (March 2, 1991). Concerning unaddressed items of concern to residents.
8. Letter from Stuart M. Leiderman to Steven J. Calder, EPA Region I (March 12, 1991). Concerning additional items of concern to residents with attached:
   A. Cost List Wylie Family - 16 Years 1975-1991 (December 15, 1991).
   B. Page 24, Homes & Land of The Seacoast, Volume XII Number 12.
9. Letter from Concerned Citizens of Lafayette Terrace to Steven J. Calder, EPA Region I (March 30, 1992). Concerning false claims by Lillian E. Wylie of COAST (Citizens Organized Against Seacoast Toxics).
10. Letter from Lillian E. Wylie, COAST to Steven J. Calder, EPA Region I (May 26, 1992). Concerning log-in procedures for EPA contractors.
11. COAST Newsletter for May 1992.
12. Memorandum from Louise A. House, U.S. Department of Health & Human Services Agency for Toxic Substances and Disease Registry to Greg Ulrisch (June 11, 1992). Concerning transmittal of tape cassette used during the March 23, 1992 meeting with COAST.

13.1 Correspondence (cont'd)

Letters to Residents Regarding Sample Results

13. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Elliot Burritt (March 10, 1992). Concerning results of well-water analysis.
14. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Norman Corporon (March 10, 1992). Concerning results of well-water analysis.
15. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Mike Cresta (March 10, 1992). Concerning results of well-water analysis.
16. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Karen Dufour, Seacoast Mental Health Center (March 10, 1992). Concerning results of well-water analysis.
17. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Henry Fuller (March 10, 1992). Concerning results of well-water analysis.
18. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Bruce Harris (March 10, 1992). Concerning results of well-water analysis.
19. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Carol Hyatt (March 10, 1992). Concerning results of well-water analysis.
20. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Jody Nordstrom (March 10, 1992). Concerning results of well-water analysis.
21. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Mr. Robinson, Arcway Welding (March 10, 1992). Concerning results of well-water analysis.
22. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to David Sewall (March 10, 1992). Concerning results of well-water analysis.
23. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Dr. Sewall (March 10, 1992). Concerning results of well-water analysis.
24. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Bernard Thibault (March 10, 1992). Concerning results of well-water analysis (sample #198632).

13.1 Correspondence (cont'd)

25. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Bernard Thibault (March 10, 1992). Concerning results of well-water analysis (sample #198633).
26. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Jim Tucker and Harold Wilkins, Dexter Shoe (March 10, 1992). Concerning results of well-water analysis.
27. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Walter Wilhelm, Pine Haven Motel(March 10, 1992). Concerning results of well-water analysis.
28. Letter from Michael J. Robinette, New Hampshire Department of Environmental Services to Ben Young (March 10, 1992). Concerning results of well-water analysis.

13.3 News Clippings/Press Releases

News Clippings

1. "Water Firm Gives Up On Well Next To Waste Site," December 10.

Press Releases

2. "Environmental News - EPA Issues Plan, Announces Public Meetings to Address Contaminated Groundwater Moving from Coakley Landfill," EPA Region I (May 23, 1994).
3. "Environmental News - EPA Announces Public Meeting to Discuss the Status of Work at the Coakley Landfill Superfund Site in North Hampton, New Hampshire," EPA Region I (February 19, 1992).

13.4 Public Meetings

1. Notice of Public Meeting with State of New Hampshire (July 9, 1991).
2. Attendance List, Informal Community Meeting, EPA Region I(May 26, 1992).

14.0 Congressional Relations

14.1 Correspondence

1. Letter from William H. Zeliff Jr., U.S. House of Representatives to Julie Belaga, EPA Region I (April 19, 1991). Concerning attached correspondence from constituents:
   A. Letter from Richard P. Crowley Jr., Town of North Hampton to William H. Zeliff Jr., U.S. House of Representatives(March 30, 1991).
   B. Letter from Robert W. Mann, New Hampshire Department of Environmental Services to Board of Selectmen, Town of North Hampton (April 8, 1991).
   C. Letter from Henry B. Fuller to William H. Zeliff Jr., U.S. House of Representatives (April 15, 1991) with attached news clippings.
2. Letter from Paul Keough for Julie Belaga, EPA Region I to William H. Zeliff Jr., U.S. House of Representatives (May 24, 1991). Concerning potential contamination of the proposed Hobbs Well.
3. Letter from Bob Smith, U.S. Senate to Julie Belaga, EPA Region I (December 5, 1991). Concerning potential contamination of the proposed Hobbs Well.
4. Letter from Julie Belaga, EPA Region I to William H. Zeliff Jr., U.S. House of Representatives (August 4, 1992). Concerning agenda of August 5, 1992 meeting with PRPs to explain terms of the Superfund settlement process.
5. Letter from Gregory M. Kennan, EPA Region I to Pam Murphy, Office of William H. Zeliff Jr., U.S. House of Representatives (August 7, 1992). Concerning responses to questions asked at the August 5, 1992 meeting.

17.0 Site Management Records

17.7 Reference Documents

Reference documents may be reviewed, by appointment only, at the EPA Region I Records Center in Boston, Massachusetts.

I N D E X