UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

4/30

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION I

RECORD OF DECISION

WESTERN SAND & GRAVEL SITE
BURRILLVILLE AND NORTH SMITHFIELD, RHODE ISLAND

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

DECLARATION FOR THE RECORD OF DECISION

Western Sand & Gravel Superfund Site
Burrillville and North Smithfield, Rhode Island

STATEMENT OF PURPOSE

This Decision Document presents the selected remedial action for the Western Sand & Gravel Superfund Site in Burrillville and North Smithfield, Rhode Island, 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 (SARA), the National Oil and Hazardous Substances Contingency Plan (NCP), and 40 CFR Part 300 et seq., as amended. The Region I Administrator has been delegated the authority to approve this Record of Decision (ROD).

The State of Rhode Island does not concur with 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 Burrillville Town Building, 105 Harrisville Main Street, Harrisville, Rhode Island, and at the Region I Waste Management Division Records Center at 90 Canal Street, Boston, Massachusetts. The Administrative Record Index (Appendix F to the ROD) identifies the items which comprise 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 remedy is the third remedy selected for the Site. The remedies selected in 1984 and 1985 and implemented in 1988, 1989 and 1990 reduced the immediate risk posed by the groundwater contamination and reduced the source of contamination. This remedy addresses the potential future risks caused by the groundwater contamination remaining at the Site.

The remedial measures to address the groundwater contamination include:

- Reliance on natural attenuation of contaminated groundwater with contingent active restoration. Natural attenuation will lower contaminant concentrations through physical, chemical and biological processes until groundwater interim cleanup levels are met. According to hydrogeologic groundwater models, groundwater is expected to be restored to the interim cleanup levels in approximately 24 to 28 years. If the groundwater is not restored at the rate predicted by modeling or faster, active restoration shall be utilized to restore the groundwater. Groundwater monitoring data shall be evaluated every three years for the first nine years, and every five years thereafter to determine if natural attenuation is restoring the contaminated groundwater at the rate predicted by modeling or faster.

- Utilization of institutional controls to reduce the risk to public health from consumption of the groundwater. Such controls may include regulatory restrictions, acquisition of affected properties or groundwater rights, and other restrictions on property transactions. Institutional controls shall be imposed in the area where the risk to public health is outside EPA's acceptable risk range. In addition, this area also includes a buffer zone which allows for a residential well to be installed without drawing contaminated groundwater from the area which poses an unacceptable risk. This buffer zone is equal to 300 feet at this Site.

- Implementation of a site monitoring program that shall include, at a minimum, long-term monitoring of the overburden groundwater. In addition, the site monitoring program may include long-term monitoring of the bedrock system, the surface water, and the sediments. The groundwater monitoring program shall operate until the groundwater is restored which is predicted by modeling to occur within 24 to 28 years.

In addition to requiring active restoration if natural attenuation is not restoring the groundwater at a rate predicted by modeling or faster, there are three other scenarios which trigger active restoration. First, the selected remedy also requires active restoration of the groundwater and/or long-term monitoring of the surface water and sediments if necessary to protect Tarkiln Brook. Second, based on a review of the new information collected to characterize bedrock impacts, active restoration and/or long-term monitoring may be implemented if necessary for the protection of public health and the environment. Finally, if effective institutional controls cannot be implemented, the selected remedy utilizes active restoration to restore the groundwater.

DECLARATION

The selected remedy is protective of the 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. If natural attenuation restores the groundwater to the interim cleanup levels effectively, there is no reduction of toxicity, mobility or volume through treatment for this alternative. However, if the groundwater is not restored at the rate predicted by modeling or faster, the selected remedy utilizes active restoration to achieve the necessary reductions of toxicity, mobility and volume. Therefore, the selected remedy utilizes treatment to reduce toxicity, mobility or volume to the extent necessary. In addition, this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

April 16 1991
Date

Julie Belaga
Regional Administrator
U.S. EPA, Region I

ROD DECISION SUMMARY
WESTERN SAND & GRAVEL SITE

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

APPENDICES

I. SITE NAME, LOCATION AND DESCRIPTION

The Western Sand & Gravel (WS&G) Site (the Site), is located on Douglas Pike, also known as Route 7, on the boundary of Burrillville and North Smithfield, Rhode Island (Appendix A, Figure 1). Prior to 1975, the Site were used for a gravel mining operation. Beginning in 1975 and continuing until April 1979, approximately twelve (12) acres of the Site had been used for the disposal of liquid wastes, including hazardous substances and sewage waste. These wastes were dumped into twelve (12) unlined lagoons and pits at the Site. The wastes subsequently infiltrated through the porous soils and contaminated the groundwater.

The area surrounding the Site is primarily semi-rural. Tarkiln Brook is located immediately to the west of the disposal area. Tarkiln Brook flows north and discharges into the Slatersville Reservoir (Appendix A, Figure 2). Tarkiln Brook and the Slatersville Reservoir are Class B water bodies according to Rhode Island Water Quality Standards, suitable for fishing, swimming and other recreational purposes. A wetland area borders Tarkiln Brook. To the east of the Site is an area used for sand and gravel mining. To the south of the Site is a sand and gravel processing operation owned by Western Sand & Gravel, Inc., which is bounded on the southern property line by Douglas Pike (Route 7).

A residential area is located to the west and north of the Site. There are several homes near the Site that currently have private wells and use treated groundwater as a source of drinking water. These homes are located on Douglas Pike, Pulaski Road and other nearby roads. These shall be connected to a permanent alternate water supply in the near future. The nearest residences are approximately 1000 feet northwest of the disposal area. The Site is also located over the Slatersville Aquifer which has been designated as a drinking water source by the State of Rhode Island.

A more complete description of the Site can be found in the "Groundwater Remedial Investigation, Western Sand & Gravel Site, Burrillville, Rhode Island," June, 1990, in Section 1.0 of Volume I.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Land Use and Response History

The Site, owned by Western Sand & Gravel, Inc., was a sand and gravel quarry operation from 1953 until 1975. Beginning around 1975, approximately twelve (12) acres of the twenty (20) acre parcel were used for the disposal of liquid wastes, including hazardous substances and sewage wastes. Wastes were dumped into

twelve (12) unlined lagoons and pits. A fire occurred in one of the chemical pits in March 1977, and Fire Department officials from Burrillville and North Smithfield ordered Mr. James Cardi, Jr., the Site owner and operator, to remove the chemicals from the Site. Mr. Cardi responded by burying the contents of the waste pit. On April 24, 1979, a Cease and Desist Order was issued to Mr. Cardi by the Rhode Island Department of Environmental Management (RIDEM) for violations of water and air pollution regulations. After April 1979, wastes were no longer accepted at the Site. RIDEM records indicate that about 470,000 gallons of waste were deposited at the Site during its last year of operation.

In March 1980, at the request of RIDEM, EPA began a removal of the hazardous liquid still remaining in the lagoons. It is estimated that approximately 60,000 gallons of liquids were pumped and removed from the lagoons. These actions were taken under the authority of Section 311 of the Clean Water Act and were completed in the fall of 1980, prior to the passage of the Comprehensive, Environmental Response, Compensation and Liability Act (CERCLA). Analysis of these wastes showed that they contained high levels of volatile organic compounds (VOCs). In October 1981, EPA proposed the addition of the Site to the National Priorities List (NPL) making it eligible to receive Superfund monies for investigation. The Site was thereafter finalized on the NPL in September 1983. In 1982, RIDEM took the lead responsibility for the activities at the Site and began a groundwater recirculation system in an effort to control the spread of contaminants in the groundwater. In May 1984, RIDEM completed the first Remedial Investigation and Feasibility Study (RI/FS) for the Site under a cooperative agreement with EPA. The conclusions of the RI were as follows:

- Organic chemicals have infiltrated through highly permeable soil into groundwater;
- Some private drinking water wells show low levels of contamination;
- Contaminated groundwater has discharged into nearby Tarkiln Brook and Slatersville Reservoir;
- Organic chemicals have migrated from the site through the upper fractured bedrock and have contaminated residential wells downgradient from the Site;
- Contaminated soil and sludges exist in various locations on the site; and,
- There is no indication of hazardous air emissions.

In September 1984, EPA issued the first Record of Decision (ROD) for the Site which required the following:

- Install of water filters as an Initial Remedial Measure (IRM) to provide protection for homes with contaminants identified in their wells, until the permanent alternate water supply is functional; and,

- Install of a permanent alternate water supply to service approximately 56 parcels of land.

Starting in August 1984, Olin Hunt Specialty Products, Inc. (Hunt), a potentially responsible party at the Site, installed water filters in private homes with contaminated wells and in homes with wells that might become contaminated. EPA began construction of the permanent water supply in April 1990. The U.S. Army Corps of Engineers has indicated that the permanent alternate water supply is certifiably complete and operational.

EPA conducted additional investigations in 1984 and 1985 which concluded with the preparation of an Addendum to the 1984 RI/FS Report developed by RIDEM. Following the finalization of the Addendum in August 1985, EPA issued a second ROD in September 1985 which required the following:

- Grade contaminated soil to the cap area;

- Install an impermeable cap consistent with RCRA provisions;

- Phase-out the operation of the groundwater recirculation system, and remove and dispose of the associated equipment;

- Grade, loam and seed the cap and the surrounding Site surface;

- Fence and post the Site;

- Provide inspection and maintenance of the cap, fence and postings consistent with RCRA provisions;

- Conduct groundwater monitoring consistent with RCRA post-closure provisions; and,

- Conduct a RI/FS to characterize the extent of the groundwater contamination and to develop and evaluate alternatives for groundwater remediation.

Pursuant to a consent decree among the EPA, the State of Rhode Island and Hunt, construction activities for the impermeable cap were completed by Hunt in 1987. All contaminated soils were graded to the cap site and an impermeable cap, of approximately two (2) acres, was installed and now covers the contaminated soils. The graded site and cap are fenced and posted with

warning signs and comprise approximately six (6) acres. Post closure monitoring and inspections of the cap and graded site area are ongoing.

Also pursuant to the consent decree, Hunt initiated the Groundwater Remedial Investigation and Feasibility Study in 1988. Hunt submitted the Draft Groundwater RI Report for the Site on February 26, 1990. In a letter dated March 30, 1990, EPA submitted comments on the document. In letters dated April 9, 1990 and May 3, 1990, RIDEM submitted comments on the document on behalf of the State of Rhode Island. On June 22, 1990, Hunt submitted a Revised Groundwater RI Report and responses to EPA's and RIDEM's comments. In letters dated July 24, 1990 and September 10, 1990, RIDEM identified deficiencies in Hunt's responses to RIDEM's comments. EPA also commented in a letters dated October 25, 1990 and October 31, 1990 on Hunt's analysis of the data and the conclusions presented in the report. In November 1990, EPA generated an Addendum to the report to present the major findings of the RI and the remedial action objectives for the Site as determined by EPA based on the data collected by Hunt and presented in the Revised Groundwater RI Report (June 1990).

Hunt submitted the Draft Groundwater FS Report for the Site on May 8, 1990. In a letter dated June 13, 1990, EPA submitted comments on the document. In a letter dated June 14, 1990, the RIDEM submitted comments on the document on behalf of the State of Rhode Island. In letters dated October 12, 1990 and October 22, 1990, Hunt submitted a Revised FS Report and responses to EPA's and RIDEM's comments. In a letter dated January 14, 1991, EPA submitted comments to Hunt on the Revised Groundwater FS Report. EPA's comments focused on the detailed analysis, Section 4 of the report. EPA also generated an Addendum to that report to address EPA's comments on the Revised FS Report developed by Hunt. Specifically, the addendum contains a detailed analysis of the alternatives developed by Hunt in the Revised Groundwater FS Report and a new alternative developed by EPA.

A more detailed chronology of the Site history can be found in Appendix A of the Revised Groundwater RI Report (June 1990) developed by Hunt.

B. Enforcement History

In February 1982, EPA notified approximately eight (8) 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. Negotiations commenced with these potentially responsible parties (PRPs) in early 1982 regarding the settlement of the PRP's liability at the Site. These early negotiations did not result in any settlements with any of the PRPs.

In late 1983, EPA notified approximately ninety one (91) parties of their potential liability. On February 7, 1984, a meeting attended by forty nine (49) of the ninety one (91) PRPs was held in Boston, MA to begin negotiations in order to determine whether any responsible party was willing and able to undertake the remedial design/remedial action (RD/RA) for the first Record of Decision (ROD). The PRPs formed a steering committee and substantial negotiations between EPA and the PRPs were conducted. To date, these negotiations resulted in a settlement concerning the Site in late 1986 with approximately forty five (45) parties. The settlement covered the activities described by the two RODs that had been issued as of that time. The consent decree for the settlement became effective on June 3, 1987. Pursuant to the consent decree, the settling parties have: paid for past costs expended by EPA and RIDEM as of the settlement; paid for the costs of future oversight by EPA and RIDEM related to the first two RODs; implemented the interim water filter program; paid for the construction and operation of the permanent water supply system; closed the Site consistent with the second ROD; and undertaken the RI/FS for groundwater contamination, although final approval of RI/FS activities has not been granted. Additional work relating to the bedrock characterization, and additional surface water and sediment monitoring is still necessary.

The PRPs have been active in the remedy selection process for the groundwater contamination at the Site. EPA mailed a copy of the proposed plan for the groundwater contamination to the PRPs in February 1991. Technical comments presented by PRPs during the public comment period are included in the Administrative Record. A summary of these comments as well as EPA's responses, which describe how these comments affected the remedy selection, are included in the Responsiveness Summary, Appendix C of this document. EPA expects that special notice for this remedy will be issued in April 1991.

III. COMMUNITY PARTICIPATION

Throughout the Site's early history, community concern and involvement had been moderate to high. In 1978, local citizens formed a group called Protect Our Water (POW) in response to the potential hazards posed by the Western Sand & Gravel Site and other sites in the area. In 1979, the Town Councils of Burrillville and North Smithfield also held joint meetings to discuss the problems caused by the Site. In December 1982, the Western Sand & Gravel Coordinating Committee was formed by the Burrillville Town Council to facilitate communications on matters involving the Site.

EPA has kept the community and other interested parties apprised of the Site activities through informational meetings, fact

sheets, press releases and public meetings. EPA's public meetings on the first ROD in 1984 was attended by between 50 and 100 persons. The 1985 public meetings on the second ROD, however, was attended by only 10 to 20 attendees. The Coordinating Committee was never officially disbanded, but has not been active for almost five (5) years. In general, community interest and awareness now is relatively low compared to the activity that took place during the initial site investigation phases.

In September 1982, RIDEM issued the first community relations plan for the Site. In November 1990, EPA released a revised community relations plan which outlined a program to address community concerns and keep citizens informed about and involved in activities during remedial activities. Also in November 1990, EPA released a fact sheet to describe the results of the Remedial Investigation.

On October 25, 1990, EPA made the administrative record available for public review at EPA's offices in Boston and at the Burrillville Town Building, 105 Harrisville Main Street, Harrisville, Rhode Island. EPA published a notice and brief analysis of the Proposed Plan in the Woonsocket Call on February 4, 1991 and made the plan available to the public at the Burrillville Town Building.

On February 11, 1991, EPA held an informational meeting 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. Also during this meeting, the Agency answered questions from the public. From February 12, 1991 to March 13, 1991, the Agency held a thirty (30) 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 February 28, 1991, the Agency held a public hearing to discuss the Proposed Plan and to accept any oral comments. A transcript of this hearing and the comments and the Agency's response to comments are included in the Responsiveness Summary in Appendix C.

IV. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

The activities at the Site have been divided into three operable units. The first operable unit was defined by the first ROD issued in 1984 and consisted of providing water filters for homes with contaminated wells and installing the permanent alternate water supply. The remedy in the 1984 ROD for the first operable unit reduced the immediate risk to public health from exposure to contaminated groundwater. The second operable unit was defined by the second ROD issued in 1985 and consisted of site closure activities. The remedy in the 1985 ROD for the second operable unit reduced the risk to public health from exposure to

contaminated soils remaining onsite and reduced the source of the groundwater contamination. The third operable unit for the Site addresses the groundwater contamination. This remedial action will address the remaining principal threats to human health and the environment posed by the contaminated groundwater at the site.

V. SUMMARY OF SITE CHARACTERISTICS

The significant findings of the Groundwater Remedial Investigation are summarized below.

A. Overburden Groundwater

Forty two (42) wells were installed at varying depths and fifteen (15) locations in the overburden aquifer during the RI. In addition, nine (9) piezometers were also installed to aid in defining the hydrogeology of the study area. Water level measurements were recorded from each well and each piezometer on a monthly basis. Based on the water level data, EPA has determined that groundwater in the overburden aquifer flows in a north and northwest direction. Some of the groundwater discharges into Tarkiln Brook. However, there is also a component of flow in the deep portion of the overburden aquifer that passes under the brook and discharges into the Slatersville Reservoir to the west of the brook. The magnitude of the component of flow which passes under the brook varies seasonally. This observation is based on a review of the groundwater elevation contour maps prepared with the water level data from the wells in the deep portion of the overburden aquifer and without the surface water elevations of Tarkiln Brook. Figure 3 in Appendix A is an example of one such groundwater contour map based on data collected during the month of February 1989. Groundwater flows in a direction which is perpendicular to the contours.

Groundwater samples were taken quarterly at each of the monitoring wells and analyzed for over 100 different contaminants. The RI found that volatile organic compounds (VOCs) are the principal site-related groundwater contaminants. Table 1 in Appendix B identifies the VOCs detected, the concentrations, and the frequency of detection in the overburden groundwater. Some semi-volatile organic compounds (SVOCs) and metals were also detected in the groundwater. However, the concentration and frequency of detection for both the SVOCs and metals were low and below MCLs. Tables 2 and 3 in Appendix B identify the SVOCs and metals detected, the concentrations, and the frequency of detection in the overburden groundwater, respectively.

Based on the analytical results of the groundwater monitoring performed during the RI, the current maximum areal extent of

contamination in the overburden aquifer is described in Figure 4 in Appendix A. As noted from the figure, the greatest concentrations of contaminants are currently found at and near the Site. These concentrations gradually decrease with distance from the Site. In addition, the current vertical extent of contamination in the overburden aquifer is described in Figure 5 in Appendix A. As noted from these figures, the greatest concentrations of contaminants are found in the deeper portions of the overburden aquifer. Concentrations of VOCs near the Site exceed federal safe drinking water standards. Concentrations of SVOCs and metals do not.

Based on a review of the hydrological data, including the water level data discussed above, EPA has determined that it is likely that the historical extent of contamination could have been larger. The potential historical maximum areal extent of contamination is described in Figure 6 in Appendix A. The total concentrations of VOCs presented in Figure 6 are based on data collected in 1983 during the first RI/FS. Based on a comparison of the current and historical data, EPA has concluded that the magnitude and extent of contamination has decreased significantly and will continue to decrease with time as the integrity of the cap is maintained.

B. Bedrock Groundwater

The bedrock system at the Site consists of an uppermost zone of bedrock which is weathered and fractured and a lower competent (less fractured) zone which contains isolated zones of horizontal and vertical fracturing. Groundwater in the upper weathered fractured zone can readily move into and out of the unconsolidated sediments above. Therefore, the uppermost zone of the bedrock is considered part of the overburden aquifer. The following discussion of the bedrock system pertains to the lower competent zone of the bedrock system.

In order to determine if the bedrock system was contaminated, two bedrock wells were installed in the lower competent zone of the bedrock system. The bedrock well locations were selected based on the sampling results from the overburden aquifer and were located in areas which had elevated concentrations of contaminants in the deep portion of the overburden aquifer. Groundwater samples were taken from the two bedrock wells and found to be contaminated primarily with VOCs. Table 4 in Appendix B identifies the concentrations of VOCs and SVOCs detected in groundwater from the bedrock wells. Since metals were not detected in the overburden groundwater at significant concentrations, samples from the bedrock were not analyzed for metals.

Hunt has concluded that the contamination found in the bedrock wells is from faulty well seals which resulted in contaminated groundwater leaking from the overburden aquifer to the bedrock

system due to artificially induced vertical migration. Hunt theorizes that during the sampling process, the bedrock wells were completely evacuated (emptied). The evacuation created an exaggerated head difference between the surrounding overburden aquifer and the bedrock wells. In other words, once water was evacuated during sampling, the water levels in the bedrock wells were substantially lower than the water levels in the overburden aquifer. Since groundwater tends to flow from areas of higher water elevation to areas of lower water elevation, the evacuation created a large artificially induced downward flow potential. Bedrock wells are typically constructed with seals to prevent the groundwater in the overburden from interacting with the bedrock wells. However, if the well seals are faulty, groundwater could flow from the overburden aquifer into the bedrock wells and contaminate the bedrock system. EPA agrees that this theory is possible though certainly not conclusive. However, since it is impossible to examine the integrity of these wells, this theory cannot be verified by the data collected during the RI. Furthermore, if the wells are faulty, conclusions regarding the bedrock system are questionable.

EPA believes that there is another explanation for the contamination detected in the bedrock wells. Contaminated groundwater could have migrated under natural conditions and contaminated the groundwater in the bedrock system. As stated above, the greatest concentrations of contaminants have been detected in the deep portion of the overburden aquifer. If a fracture is present in the bedrock system in these areas, there is a potential for contaminants to migrate from the overburden aquifer into the bedrock system under natural conditions. Since a fracture network analysis was not conducted during the RI to locate the fractures, the possibility of the presence of fractures in these areas cannot be ruled out. The fact that there are a number of residential wells drilled into the competent zone of the bedrock system which provide some residential homes with water is evidence of substantial groundwater flow in the fracture network in this area. Furthermore, some of the residential bedrock wells have shown contamination throughout the history of the Site. This contamination may be from the Site or from unknown sources. Currently, these residential wells are treated prior to use.

In summary, EPA has determined that there are two possible explanations for the contamination detected in the bedrock wells. One possible explanation is that the groundwater migrated under natural conditions. The other possible explanation is that the contamination resulted from faulty wells. However, even if the wells are faulty, the possibility that the bedrock system is contaminated remains. Therefore, further data must be collected to verify whether or not the bedrock system is contaminated.

Presently, there are two (2) bedrock wells designated C-4B and II-3B. Under the provisions of the existing Consent Decree, Hunt

shall monitor these wells on a quarterly basis for VOCs for one year. In addition, three (3) additional bedrock wells shall be installed pursuant to the Consent Decree. These wells shall also be monitored on a quarterly basis for VOCs for one year at a minimum.

C. Residential Wells

During the RI, information was gathered on the location and depth of the existing residential wells. Much of the information was obtained through discussions with the current property owners. In many instances, the information obtained was not supported by well installation boring logs. Based on the information gathered, twelve (12) residential wells are known to be drilled into the overburden aquifer, fourteen (14) residential wells are known to be drilled into the bedrock and fourteen (14) residential wells are of unknown depth. Maps identifying each of these groups are presented in the Revised Groundwater RI Report.

In evaluating the impacts of the Site on the residential wells, EPA considered a number of factors. First, as stated above, there is very limited information on the construction and depth of the residential wells. Second, the full extent of contamination in the bedrock system has not been determined. Third, the sampling location for the residential wells is between a small storage tank and the carbon filtration units. This location may not provide analytical results which are representative of the groundwater in the aquifer. Fourth, there is very little historical data available for the area to the west of the Site between the Site and Pulaski Road. In conclusion, due to a number of factors, it is difficult, if not impossible, to determine exactly which residential wells have been impacted by the Site. However, based on a review of the hydrologic and analytical data collected, the following conclusions can be made:

- Eight (8) of the twelve (12) residential overburden wells are located downgradient from the Site and are located in the path of a potential Site plume during at least a portion of the year. The other four (4) overburden residential wells are located upgradient from the Site.

- Due to the uncertainties regarding the extent of contamination in the bedrock, it is not possible to identify positively which of the residential bedrock wells have been impacted by the Site.

- For the wells of unknown depth, conclusions regarding impacts from the Site can not be made.

D. Surface Water and Sediments

Tarkiln Brook is located immediately to the west of the source

area of the Site and flows north discharging into the Slatersville Reservoir. Six (6) locations in Tarkiln Brook were sampled during the RI. The sampling locations included one location that was upgradient from the Site and one location at the mouth of the Slatersville Reservoir.

Several volatile organic compounds (VOCs) were detected at two (2) downgradient surface water sampling locations along Tarkiln Brook. The concentrations of VOCs detected at these two locations are presented in Table 5 in Appendix B. Isophoron at 2 ppb is the only semi-volatile organic compound (SVOC) that was detected in the surface water downgradient from the Site. Four (4) metals, aluminum, barium, copper and zinc were detected in the surface water. Copper and zinc were also detected at the upgradient locations. The concentrations of these metals are also presented in Table 5 in Appendix B.

Four (4) VOCs, acetone, chloroform, methylene chloride and tetrachloroethene, were detected in the sediments of Tarkiln Brook. The concentrations of VOCs detected in the sediments are presented in Table 6 in Appendix B. Several SVOCs were detected at the upgradient sampling location and at one downgradient sampling location. The concentrations of SVOCs detected in the sediments at these locations are also presented in Table 6 in Appendix B. Finally, several metals were also detected in the sediments. Elevated levels of metals were detected at one downgradient location as compared to the upgradient location. The concentrations of metals detected in the sediments at these locations are also presented in Table 6 in Appendix B.

As stated above, one sample was taken at the mouth of the Slatersville Reservoir. No contaminants were detected in this sample. These results can be explained by the fact that the detectable portion of the contaminant plume currently does not extend into the Reservoir. Therefore, the source for contamination in the Reservoir no longer exists.

Additional information on the site characteristics can be found in Sections 4.0 and 5.0 of the Groundwater Remedial Investigation Report (June, 1990) and in the Groundwater Remedial Investigation Report Addendum (November, 1990).

VI. SUMMARY OF SITE RISKS

A Risk Assessment (RA) was performed to estimate the probability and magnitude of potential adverse human health 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 health effects associated with exposure to hazardous substances, and 4) risk characterization, which integrated the three earlier steps to summarize the potential and actual carcinogenic and noncarcinogenic risks posed by hazardous substances at the site. The results of the public health risk assessment for the Western Sand and Gravel Site are discussed below followed by the conclusions of the environmental risk assessment.

Fifty contaminants of concern for groundwater, eighteen for surface water and ten for sediment, listed in Tables 7 and 8 in Appendix B, were selected for evaluation in the risk assessment. A detailed summary of contaminants found within each group along with the frequency, concentration, range and average concentration is presented in Tables 6.2 through 6.8 of the RI Report (June, 1990) for the Site. These contaminants constitute a representative group of the more than fifty contaminants in groundwater, 21 in surface water and 36 in sediments which were identified at the Site during the RI. 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 is presented in Section 6.2.4 and in Appendix AB of the RI Report (June, 1990).

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. The following is a brief summary of the exposure pathways evaluated. A more thorough description can be found in Section 6.4 of the RI Report (June, 1990). For each pathway evaluated, an average and a reasonable maximum exposure, (RME), estimate was generated corresponding to exposure to the average and the maximum concentration detected in that particular medium.

A. Exposure Pathways

1. Residential use of groundwater

The exposure pathways identified for the residential use of groundwater were 1) ingestion of drinking water, 2) inhalation of volatile compounds released indoors from household use of contaminated groundwater and 3) dermal contact during showering and bathing. Ingestion of drinking water was evaluated by assuming that a 70 kg individual would ingest two liters of water per day for a lifetime. These assumptions were considered representative of a possible future exposure scenario. A current exposure scenario was not evaluated since residents in the study

area accessing groundwater all have treatment systems in place. Dermal contact with household water and inhalation of indoor air was not quantitated but instead was discussed qualitatively in the Uncertainty Analysis of the risk assessment in Section 6.6 of the RI Report (June, 1990).

2. Recreational use of surface water and sediments

Study area surface water bodies include Tarkiln Brook which flows into the Slatersville Reservoir and a seep area adjacent to the Site. Since contamination was not detected in Slatersville Reservoir, exposure to study area surface water bodies is defined here as exposure to Tarkiln Brook and the adjacent seep. Three exposure pathways were identified for a recreational use of Tarkiln Brook and the seep; 1) dermal contact with surface water and sediments, 2) incidental ingestion of surface water and sediments and 3) ingestion of fish from Tarkiln Brook.

The exposure scenarios assumed that children, ages 6 to 15, may come in contact with surface water and sediments 21 times a year for 2.6 hours at a time. For each wading event, a child was assumed to incidentally ingest 50 milliliters of surface water and to contact legs, hands and feet with surface water and sediments. The exposure intakes quantitated for dermal and oral exposure to surface water were combined to produce a total intake from surface water bodies. These exposure assumptions were considered representative of current and future use of the area.

Ingestion of fish and sediments was considered to contribute negligible amounts to total exposure and so was not quantitatively evaluated. Table 9 in Appendix B lists all exposure assumptions incorporated into the risk scenarios.

B. Risk Characterization

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 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. 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 non-carcinogenic health effects.

The hazard index is calculated by dividing the exposure level by the reference dose (RfD) or other suitable benchmark for non-carcinogenic health effects. Reference doses have been developed by EPA to protect sensitive individuals over the course of a lifetime and 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 (in this example, the exposure as characterized is approximately one third of an acceptable exposure level for the given compound). The hazard index is only considered additive for compounds that have the same or similar toxic endpoints (for example: the hazard index for a compound known to produce liver damage should not be added to a second whose toxic endpoint is kidney damage).

1. Residential Use of Groundwater

Table 10 in Appendix B depicts the cumulative carcinogenic and noncarcinogenic risk summary for the contaminants of concern in all seven monitoring well groups for groundwater, evaluated to reflect the potential future ingestion of groundwater corresponding to the average and the RME scenarios. Wells were divided into seven groups based on the type of well, (residential or monitoring), and the location of the well relative to the plume, (laterally and geologically).

a. Monitoring Wells Groups 1 and 2

The wells in Group 1 were selected to represent the extent of contamination in monitoring wells on-site in the overburden aquifer plume while those in Group 2 were selected to represent similar conditions but also included bedrock wells. The RME total cancer risk predicted for these well groups are the same, 3×10^{-2}. The average risk estimates are slightly different, 3×10^{-4} (Group 1) and 1×10^{-4} (Group 2). The compound that contributes most significantly to these carcinogenic risk estimates is vinyl chloride which accounts for 80-97% of the average and RME risk estimates, respectively.

The RME risk estimates for the on-site monitoring wells located within the plume exceed the Superfund target risk range of 10^{-4} to 10^{-6}. The average cancer risk estimate for Group 1 slightly exceeds the Superfund target risk range and for Group 2 is at the upper end of the Superfund target risk range.

A summation of all RME hazard indices for this well grouping produces a value greater than one. When segregated by toxic endpoint, however, the highest HI obtained is 1.5 for blood effects. The greatest contributor to this HI is 1,2-

dichloroethene, (1,2-DCE), with a HI of 1.1. This slight excursion of the HI was considered insignificant due to safety factors inherent in the derivation of the HI. All remaining individual HI values are less than one.

Maximum Contaminant Levels (MCLs), Proposed Maximum Contaminant Levels (PMCLs) or Secondary Proposed Maximum Contaminant Levels (SMCLs) were exceeded for the following compounds identified in monitoring wells from Group 1 and 2; trichloroethene (TCE), 1,2-DCE (total), 1,1,1-trichloroethane (1,1,1-TCA), tetrachloroethene (PCE), methylene chloride, toluene, vinyl chloride, chlorobenzene, benzene, 1,1-dichloroethene (1,1-DCE), nickel, lead, aluminum and bis(2-ethylhexyl)phthalate (DEHP).

b. Monitoring Well Groups 3 and 4

The wells in Group 3 were selected to represent the extent of contamination in monitoring wells off-site in the overburden aquifer plume while those in Group 4 were to represent similar conditions but also included bedrock wells. The average and RME total cancer risk estimates for these well groups are the same, 7 x 10^{-5} and 3 x 10^{-3}, respectively. The compound that contributes most significantly to these risk estimates is vinyl chloride which accounts for approximately 70 and 80% of the average and RME risk estimates, respectively. 1,1-DCE is also a significant contributor to the risk estimates. The RME cancer risk estimates for both well groups is above the Superfund target risk range. The estimated average cancer risk for both groups is within the Superfund target risk range of 10^{-4} to 10^{-6}.

The cumulative HIs predicted for the RMEs equals 1.0. When segregated by target endpoint, HIs fall below one, indicating that lifetime exposure should not result in adverse non-cancer effects.

MCLs, PMCLs or SMCLs were exceeded for the following compounds identified in monitoring wells from Groups 3 and 4; TCE, PCE, methylene chloride, toluene, vinyl chloride, chlorobenzene, lead, benzene and DEHP.

c. Residential Well Groups 5, 6 and 7

(Group 5)

The wells in Group 5 were selected to represent all residential wells in the overburden aquifer which were hydrogeologically downgradient of the site and which were in the historical plume path. The average and RME cancer risk estimates for the future potential ingestion of water from these wells are 4 x 10^{-6} and 2 x 10^{-5}, respectively. Nearly 90% of the predicted risk can be attributed to three chemicals listed here in the order of their importance; 1,1-DCE, 1,1,2,2-tetrachloroethane, and trans-1,3-

dichloropropene (1,3-DCP). The MCL for methylene chloride was the only standard exceeded among this group of wells. However, its also important to note that this compound may be the result of laboratory contamination during the sampling and analysis process and may not be Site related.

(Group 6)

Wells in Group 6 were selected to represent residential wells, drilled into bedrock, which were hydrogeologically downgradient of the site and which were in the historical plume path. The average and RME cancer risk estimates for the future potential ingestion of water from these wells is 2×10^{-6} and 2×10^{-5}, respectively. The majority of the predicted risk, (greater than 50 percent), is due to, 1,1-DCE and 1,3-DCP. Only the MCL for methylene chloride was the only standard exceeded among this group of wells and may also be the result of laboratory contamination.

(Group 7)

Wells in Group 7 were selected to represent residential wells of unknown depth potentially affected by site contamination. The average and RME cancer risk estimates associated with the future potential ingestion of water from these wells are 4×10^{-7} and 5×10^{-6}, respectively. The majority of the predicted risk, (greater than 50 percent), is due to 1,1,2,2-tetrachloroethane and 1,4-dichlorobenzene. No MCLs, PMCLs or SMCLs were exceeded in wells from this group.

Summary - Cancer Risks and Hazard Indices

The RME and average risk estimates associated with the possible future ingestion of groundwater from the residential wells (Groups 5,6, and 7) are all within the Superfund target risk range. Chemical specific and total HIs for both the RME and average exposure scenarios are well below one within each well grouping.

2. Recreational use of surface water and sediments

Table 11 in Appendix B depicts the carcinogenic and noncarcinogenic risk summary for contaminants of concern in surface water and a seep tributary from potential present and future exposure. Exposure parameters for both present and future scenarios are assumed to be the same, thus there is one calculation for surface water. Since exposure to this medium may occur through dermal contact and incidental ingestion, exposure intakes and risk estimates were combined. Calculated risks reflect only the RME exposure scenario.

Table 12 in Appendix B depicts the carcinogenic and

noncarcinogenic risk summary for the contaminants of concern in sediment from Tarkiln Brook and the seep evaluated to reflect present and potential future dermal contact, corresponding to the RME. Exposure to this medium may occur though dermal contact. Exposure parameters for the present and potential future scenarios are assumed to be the same, thus there is one calculation for this medium.

Summary - Carcinogenic Risks and Hazard Indices

The cancer risks associated with surface water and sediments from Tarkiln Brook and the seep are within Superfund's target risk range. The cumulative surface water risk estimate in the seep of 4×10^{-5}, is dominated by the presence of vinyl chloride. The cumulative surface water risk estimate in Tarkiln Brook of 9×10^{-8} is well below the Superfund target risk range. The RME risk estimate due to sediment exposure of 2×10^{-10} in the seep area, is well below Superfund's target risk range. The RME HI values for surface water and sediment are substantially lower than one.

C. Uncertainties and Conclusions of Public Health Assessment

The potential risks for residential use of groundwater are based solely upon the potential ingestion of untreated drinking water. Consequently, this RA may under estimate risk because inhalation of volatiles released to the air during household use of contaminated groundwater and dermal contact during showering have not been quantitated. Current research with volatile chemicals has shown that showering, washing dishes and clothes, and flushing of the toilet can result in elevated concentrations of these chemicals in the indoor air. A potential also exists for chemicals to be adsorbed through the skin during showering and bathing. At present, models to predict exposure via inhalation and dermal contact are still in the developmental stage and yield highly variable results.

The exposure assessment for recreational use of the seep area and Tarkiln Brook is conservative. The location of the highest observed concentration is in a shallow seep tributary to the brook. The banks of the tributary are steep and covered with vegetation. The main portion of the brook has significantly lower concentrations and these chemicals were not detected in Slatersville Reservoir.

Actual or threatened releases of hazardous substances from this Site into groundwater within the area identified in Figure 7 in Appendix A, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

D. Environmental Risk Assessment

The focus of the environmental risk assessment is to identify the potential for toxic impacts to aquatic life in Tarkiln Brook and the Slatersville Reservoir due to chemicals in the surface water and sediments. The environmental risk assessment followed a similar protocol to the public health risk assessment.

a. Surface water

The results to the investigation of the surface water are presented in Table 5 in Appendix B. The results in Table 5 in Appendix B were compared to federal aquatic water quality criteria. In cases where federal aquatic water quality criteria were not available, instream criteria were developed from information published by EPA on the toxic effects to aquatic organisms. Except for copper and zinc, all the compounds detected in the surface water were below the federal aquatic water quality criteria. Four locations labeled STR1, STR3, SUPL, STR5, were sampled for metals.

Compound	STR1	STR3	SUPL	STR5	FWQC*
Copper	69	44	30	43	1.65
Zinc	58	25	39	48	15.07

* Federal Water Quality Criteria - Concentration instream that should not be exceeded to minimize chronic effects based on a hardness of 10 mg/l of $CACO_3$. All concentrations are in parts per billion.

As stated previously, VOCs are the primary contaminants detected in the groundwater at the Site. Since locations STR1 and STR3 did not contain VOCs, these locations appear to be upgradient of the discharge of contaminated groundwater from the Site. However, STR1 contained a number of SVOCs and was determined to be contaminated from a source other than the Site. Therefore, STR3 appears to best represent upgradient conditions. Since there is not clear indication of an increase in concentrations of contaminants downgradient from the Site, it is not clear whether the metals detected in the surface water are from the Site or from natural conditions.

b. Sediments

The results to the investigation of the sediments are presented in Table 6 in Appendix B. Since there are no federal criteria for sediments, the results for the organic compounds in Table 6 in Appendix B were compared to federal instream aquatic water quality criteria. In addition, the concentrations of metals in the sediments were compared to a state wide survey of sediment quality in Rhode Island streams. The concentrations of organic

contaminants in the sediments were below the instream criteria for surface waters. In addition, with the exception of beryllium and arsenic, the concentrations of metals were below the average concentrations for other sediments in Rhode Island.

d. Summary of Results

The RI Report developed by Hunt concluded that the concentrations of contaminants in the surface water and sediments represent a negligible potential for adverse impacts to the environment. RIDEM has concluded that the investigations of the surface water and sediment contamination in Tarkiln Brook and the Slatersville Reservoir were inadequate. The State has requested, by letter dated March 5, 1991, that Hunt conduct additional work under the provisions of the existing Consent Decree to characterize the impacts to Tarkiln Brook.

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 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, 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. The response objectives were:

- Restore contaminated groundwater in the overburden aquifer, from the boundary of the existing cap to the outer boundary of the contaminant plume, to State and Federal applicable, relevant and appropriate requirements (ARARs), including drinking water

standards, and to a level that is protective of human health and the environment as soon as practicable.

- Restore contaminated groundwater in the bedrock system, to State and Federal applicable, relevant and appropriate requirements (ARARs), including drinking water standards, and to a level that is protective of human health and the environment as soon as practicable unless EPA determines, based on additional information, that contamination in the bedrock does not exceed protective levels.

- Protect uncontaminated groundwater and surface water for current and future use.

- Prevent human and animal exposure to contaminated groundwater.

- Protect environmental receptors.

B. Technology and Alternative Development and Screening

CERCLA and the NCP set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives were developed for the site.

With respect to groundwater response actions, the RI/FS developed a limited number of remedial alternatives that attain site specific remediation levels within different time frames using different technologies; and a no action alternative.

Pursuant to the Consent Decree, Hunt submitted the Revised Groundwater FS Report to EPA and RIDEM on October 12, 1990. As discussed in Section 2 of the Feasibility Study, the RI/FS identified, assessed and screened technologies based on implementability, effectiveness, and cost. These technologies were combined into alternatives. Section 3 of the Feasibility Study presented the remedial alternatives developed by combining the technologies identified in the previous screening process in the categories identified in Section 300.430(e)(4) of the NCP. Each alternative developed was once again screened in Section 3 of the Feasibility Study according to effectiveness, implementability, and cost. 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.

In summary, Hunt developed and screened seven remedial alternatives in Section 3 of the Feasibility Study. As a result of the screening process, five alternatives were retained by Hunt for the detailed analysis. Table 13 in Appendix B identifies the alternatives that were evaluated during the screening process. Table 14 in Appendix B identifies those that were retained for

the detailed analysis.

In a letter dated January 14, 1991, EPA submitted comments to Hunt on the Revised Groundwater FS Report. EPA's comments focused on the detailed analysis, Section 4 of the report. To address EPA's comments on the Revised FS Report developed by Hunt, EPA developed the Groundwater FS Report Addendum (February 1991). The addendum contains a detailed analysis of the alternatives developed by Hunt in the Revised Groundwater FS Report. In addition, EPA developed and evaluated a new alternative in the addendum. The new alternative developed by EPA is also identified in Table 14 in Appendix B.

VIII. DESCRIPTION OF ALTERNATIVES

This Section provides a narrative summary of each alternative evaluated.

A. Alternatives developed by Hunt

Hunt conducted a detailed analysis of five alternatives in the Revised Groundwater FS Report. A description of the alternatives is presented below. A more detailed description of the alternatives may be found in Section 4 of the Revised Groundwater FS Report.

Alternative 1 (No Action)

- Restoration by natural attenuation
- Groundwater monitoring

Alternative 1 allows for the restoration of the contaminated groundwater in the overburden aquifer and bedrock system by natural attenuation. According to hydrogeologic models presented in the Revised Groundwater FS Report, restoration of the groundwater to the cleanup standards presented in Table 15 in Appendix B by natural attenuation is predicted to occur in approximately 24 to 28 years. According to actual groundwater data collected to date, restoration by natural attenuation may take between 8 and 18 years. This alternative also includes a long-term groundwater monitoring program for both the overburden aquifer and the bedrock system. A detailed description of the groundwater monitoring program is presented in the Groundwater FS Report. This alternative does not include surface water or sediment monitoring.

ESTIMATED TIME FOR DESIGN & CONSTRUCTION:	0
ESTIMATED TIME FOR RESTORATION:	24 to 28 years
ESTIMATED CAPITOL COST:	$ 0
ESTIMATED OPERATION & MAINTENANCE COST:	$ 794,037
ESTIMATED TOTAL COST:	$ 794,037

Alternative 2

- Restoration by natural attenuation
- Temporary access restrictions for potential future residences
- Groundwater monitoring

Like Alternative 1, Alternative 2 allows for the restoration of the contaminated groundwater in the overburden aquifer and bedrock system by natural attenuation. Therefore, the predicted time frame for restoration to the cleanup standards in Table 15 in Appendix B is the same as Alternative 1. Alternative 2 utilizes temporary access restrictions to reduce the risk to public health from consumption of the groundwater. The temporary access restrictions considered by Hunt in the Groundwater FS Report included the following:

- Deed restrictions
- Zoning restrictions
- Well use advisories
- Restrictions on individual sewer disposal system permits
- Acquisition of property or groundwater rights

In order to evaluate temporary access restrictions, the area needing restrictions was delineated by Hunt. Hunt utilized the 1 ppb total volatile organic compound (TVOC) plume contour as the area needing restrictions (Appendix A, Figure 4). The area delineated by Figure 4 is approximately 28 acres in size and impacts 9 existing lots including the Western Sand & Gravel Property. Hunt concluded that the most effective means to control access was to acquire the property within the area delineated. Therefore, Hunt conducted the detailed analysis with acquisition of property as the institutional control. The groundwater monitoring program for this alternative is the same as the one utilized in Alternative 1. This alternative does not include surface water or sediment monitoring.

ESTIMATED TIME FOR DESIGN & CONSTRUCTION:	0
ESTIMATED TIME FOR RESTORATION:	24 to 28 years
ESTIMATED CAPITOL COST:	$ 192,500
ESTIMATED OPERATION & MAINTENANCE COST:	$ 944,981
ESTIMATED TOTAL COST:	$ 1,137,481

Alternative 3

- Restoration by natural attenuation
- Temporary alternate water supply for potential future residences
- Groundwater monitoring

Like Alternatives 1 and 2, Alternative 3 allows for the restoration of the contaminated groundwater in the overburden

aquifer and bedrock system by natural attenuation. Therefore, the time for restoration is the same as Alternative 1. Alternative 3 utilizes a temporary alternate water supply for future residences to reduce the risk to public health from consumption of the groundwater. The temporary alternate water supply considered by Hunt in the Groundwater FS Report included the following:

- Well head treatment
- Use of existing supply system

The existing supply system considered by Hunt is the permanent alternate water supply required by the September 1984 ROD. With the exception of the residential connections, construction of the system is complete. Residential connections will be completed after RIDEM or the Nasonville Water District begins operation of the system. The system was designed with the capacity to service only the existing sixty (60) lots in the affected area of the Site. Since the source for this system is located upgradient and in the vicinity of the site, expansion beyond the 60 lot capacity may result in contamination of the source. Therefore, this system may not have the capacity to service any future lots created by subdivisions. For this reason, use of the existing system may not be feasible and was not considered any further in the detailed analysis conducted by EPA in the Groundwater FS Report Addendum. The groundwater monitoring program for this alternative is the same as the one utilized in Alternative 1. This alternative does not include surface water or sediment monitoring.

ESTIMATED TIME FOR DESIGN & CONSTRUCTION:	0
ESTIMATED TIME FOR RESTORATION:	24 to 28 years
ESTIMATED CAPITOL COST:	$ 19,250
ESTIMATED OPERATION & MAINTENANCE COST:	$ 1,114,162
ESTIMATED TOTAL COST:	$ 1,133,412

Alternative 4

- Active restoration
  - Collection of contaminated groundwater by extraction wells
    Scenario 1: Collection of the 1 ppb plume
    Scenario 2: Collection of the 100 ppb plume
  - Groundwater treatment using an onsite treatment system
  - Discharge of treated groundwater to local surface water
- Temporary access restrictions or well head treatment
- Groundwater monitoring

Alternative 4 restores the contaminated groundwater in the overburden aquifer by collecting the contaminated groundwater using extraction wells, treating the contaminated groundwater using sedimentation, filtration, an air stripping column and

carbon adsorption, and discharging the treated groundwater to Tarkiln Brook. In the Revised Groundwater FS Report, Hunt evaluated two collection scenarios for restoring the overburden groundwater within the area delineated by the 1 ppb TVOC plume contour. Scenario 1 collects the entire volume of groundwater within the area delineated by the 1 ppb TVOC plume contour (Appendix A, Figure 4) and consists of five extraction wells. The total discharge rate from this scenario is 132.5 gallons per minute (gpm). Scenario 2 collects the volume of groundwater within the area delineated by the 100 ppb TVOC plume contour and consists of two extraction wells. The total discharge rate from this scenario is 80 gpm.

Some of the contaminated groundwater in the bedrock system would be collected and treated in this alternative. The amount of groundwater that would be collected from the bedrock system can not be determined from the data collected to date. Groundwater from the bedrock system that is not collected and treated would be restored by natural attenuation.

According to the results of the hydrogeologic model, the groundwater would be restored to the cleanup standards in approximately 11 years for Scenario 1 and approximately 17 years for Scenario 2.

To reduce the risks to public health from consumption of contaminated groundwater, this alternative utilizes temporary access restrictions as described in Alternative 2 or well head treatment as described in Alternative 3. The groundwater monitoring program for this alternative is the same as the one utilized in Alternative 1; however, groundwater monitoring would continue until the groundwater is restored which is predicted by modeling to occur within 11 to 17 years. This alternative does not include surface water or sediment monitoring.

<u>With Access Restrictions</u>

ESTIMATED TIME FOR DESIGN & CONSTRUCTION:	1 year
ESTIMATED TIME FOR RESTORATION:	11 to 17 years
ESTIMATED CAPITOL COST:	$ 1,331,300
ESTIMATED OPERATION & MAINTENANCE COST:	$ 2,789,181
ESTIMATED TOTAL COST:	$ 4,120,481

<u>With Well Head Treatment</u>

ESTIMATED TIME FOR DESIGN & CONSTRUCTION:	1 year
ESTIMATED TIME FOR RESTORATION:	11 to 17 years
ESTIMATED CAPITOL COST:	$ 1,158,050
ESTIMATED OPERATION & MAINTENANCE COST:	$ 2,909,666
ESTIMATED TOTAL COST:	$ 4,067,716

Alternative 5

- Active restoration
  - Collection of contaminated groundwater by extraction wells
  - Groundwater treatment using an onsite treatment system
  - Discharge of treated groundwater to the aquifer with excess flow to local surface water
- Temporary access restrictions or Well head treatment
- Groundwater monitoring

Alternative 5 is similar to Alternative 4 except this alternative consists of one collection scenario, collection of the entire volume of water within the area delineated by the 1 ppb TVOC plume, and discharging the treated groundwater back into the aquifer using groundwater injection wells. Since it is expected that the entire flow from the treatment system may not be assimilated using groundwater injection wells, discharge to surface water may still be required for part of the flow. Alternative 5 restores the groundwater to the cleanup standards in approximately 10 years, according to modeling.

To reduce the risk to public health from consumption of groundwater, this alternative utilizes temporary access restrictions as described in Alternative 2 or well head treatment as described in Alternative 3. The groundwater monitoring program for this alternative is the same as the one utilized in Alternative 1; however, groundwater monitoring would continue until the groundwater is restored which is predicted by modeling to occur within 10 years. This alternative does not include surface water or sediment monitoring.

With Access Restrictions

ESTIMATED TIME FOR DESIGN & CONSTRUCTION:	1 year
ESTIMATED TIME FOR RESTORATION:	10 years
ESTIMATED CAPITOL COST:	$ 1,532,540
ESTIMATED OPERATION & MAINTENANCE COST:	$ 2,647,155
ESTIMATED TOTAL COST:	$ 4,179,695

With Well Head Treatment

ESTIMATED TIME FOR DESIGN & CONSTRUCTION:	1 year
ESTIMATED TIME FOR RESTORATION:	10 years
ESTIMATED CAPITOL COST:	$ 1,359,290
ESTIMATED OPERATION & MAINTENANCE COST:	$ 2,761,138
ESTIMATED TOTAL COST:	$ 4,120,428

B. Alternative 6 (Developed by EPA)

After reviewing the circumstances at the Site and the alternatives developed by Hunt in the Revised Groundwater FS Report, EPA developed a sixth alternative for the Site that

included a pump and treat contingency should the groundwater not be restored by natural attenuation in the time predicted by modeling. A more detailed description of the alternative may be found in Section II.B. of the Revised Groundwater FS Report Addendum (February 1991).

Alternative 6

- Restoration by natural attenuation with contingent active restoration
- Temporary access restrictions for potential future residences
- Site monitoring

This alternative restores the groundwater in the overburden aquifer and the bedrock system by natural attenuation. According to hydrogeologic models presented in the Revised Groundwater FS Report, Hunt determined that groundwater restoration will take approximately 24 to 28 years. Active restoration would be implemented to restore the contaminated groundwater if the groundwater is not restored by natural attenuation at the rate predicted by modeling or faster or if effective temporary access restrictions cannot be imposed.

EPA selected four indicator compounds to evaluate and monitor the effectiveness of natural attenuation. The four indicator compounds are vinyl chloride, trichloroethene, tetrachloroethene and benzene. For Alternative 6, the monitoring data would be evaluated every three years for the first nine years and every five years thereafter to determine if natural attenuation is restoring the contaminated groundwater at a rate at least as fast as that predicted modeling. Active restoration would be implemented to restore the contaminated groundwater if the contaminated groundwater is not restored by natural attenuation at a rate at least as fast as the rate predicted by modeling. Depending on the results of the evaluation, active restoration could begin at any one of these intervals. The evaluation process for this alternative is described in more detail in Section II.B. of the Revised Groundwater FS Report Addendum.

The active restoration process to be utilized for this alternative is the same as the active restoration process utilized in Alternative 4. The collection scenario for this alternative is the same as collection Scenario 2 in Alternative 4. Scenario 2 collects the volume of groundwater within the area delineated by the 100 ppb TVOC plume contour. The time to restore the groundwater using active restoration shall depend on the concentrations of contaminants at the time when active restoration is begun. Assuming that the area requiring remediation at the time when active restoration is begun is equal to the area delineated by the 100 ppb TVOC plume contour, it is estimated that the groundwater shall be restored within 11 years.

This alternative utilizes access restrictions to reduce the risk to public health from consumption of the groundwater. For this alternative, access restrictions would be imposed in the area delineated in Figure 7 in Appendix A. This area includes the area where the risk to public health is greater than 1×10^{-4} (i.e. in this area contaminant concentrations in groundwater could be injurious to human health). In addition, this area also includes a buffer zone which allows for a residential well to be installed without drawing contaminated groundwater from the area which poses an unacceptable risk. This buffer zone is equal to 300 feet at this Site. The risk to public health from consumption of groundwater beyond the area delineated by EPA is 1×10^{-5} which is within EPA's acceptable risk range. The area delineated in Figure 7 is approximately 17 acres in size and impacts four (4) existing lots including the lot owned by Western Sand & Gravel, Inc.

The alternative includes a site monitoring program. The site monitoring program includes a groundwater monitoring program which is described in more detail in Section II.B. of the Revised Groundwater FS Report Addendum. The groundwater monitoring program shall operate until the groundwater is restored to interim cleanup levels which is predicted by modeling to occur within 24 to 28 years. In addition to requiring active restoration if natural attenuation is not restoring the groundwater at a rate predicted by modeling or faster, this alternative also requires active restoration of the groundwater and/or long-term monitoring of the surface water and sediments if necessary to protect Tarkiln Brook.

Without Active Restoration

ESTIMATED TIME FOR DESIGN & CONSTRUCTION:	0
ESTIMATED TIME FOR RESTORATION:	24 to 28 years
ESTIMATED CAPITOL COST:	$ 82,000
ESTIMATED OPERATION & MAINTENANCE COST:	$ 1,041,452
ESTIMATED TOTAL COST:	$ 1,123,952

With Active Restoration

ESTIMATED TIME FOR DESIGN & CONSTRUCTION:	1 year
ESTIMATED TIME FOR RESTORATION:	11 years
ESTIMATED CAPITOL COST:	$ 1,049,076
ESTIMATED OPERATION & MAINTENANCE COST:	$ 2,990,151
ESTIMATED TOTAL COST:	$ 4,039,227

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 National Contingency Plan articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

In the FS, a detailed analysis was performed on the 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:

Threshold Criteria

The two threshold criteria described below must be met in order for the alternatives 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 will meet all of the ARARs of other Federal and State environmental laws and/or provide grounds for invoking a waiver.

Primary Balancing Criteria

The following five criteria are utilized to compare and evaluate the elements of one alternative to another that meet the threshold criteria.

3. **Long-term effectiveness and permanence** addresses the criteria that are utilized to assess alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.

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 cleanup 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 and maintenance (O&M) costs, as well as present-worth costs.

Modifying Criteria

The modifying criteria are used on the final evaluation of remedial alternatives generally 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 the public's general response to the alternatives described in the Proposed Plan and RI/FS report.

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.

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

As discussed in the Summary of Site Risks above, the potential future risks posed to human health from future exposure to contaminated groundwater, between the capped area and Tarkiln Brook, are outside of EPA's acceptable risk range. Since Alternative 1 does not utilize adequate controls to prevent exposure to the contaminated groundwater during restoration, Alternative 1 would not protect future residents from groundwater contamination associated with the Site.

For all the other alternatives evaluated in the FS, the overall protectiveness is dependent on the effectiveness of temporary access restrictions or well head treatment at preventing exposure to the contaminated groundwater during restoration. If temporary access restrictions or well head treatment are successfully implemented and fully accepted by all affected residents, all of the remaining alternatives would be protective of human health. If temporary access restrictions or well head treatment are not successfully implemented and fully accepted, protection would be achieved when the groundwater is restored to drinking water standards. In this case, Alternatives 4, 5 and 6 restore the

groundwater in approximately the same amount of time, approximately 10 to 17 years, according to modeling. Alternatives 2 and 3 take the longest period of time to restore the groundwater, approximately 24 to 28 years, according to modeling.

RIDEM has concluded that the Remedial Investigation of the Site related contamination of the surface waters and sediments of Tarkiln Brook and the Slatersville Reservoir was inadequate. In a letter dated March 5, 1991, RIDEM requested that Hunt conduct additional data to characterize the impacts to the surface water and sediments. Alternatives 1 though 5 may not be protective of the environment since they do not provide for any future activities if the data indicates that the surface water has been impacted. Alternative 6 is more protective than the other alternatives because Alternative 6 allows for additional activities such as long term monitoring and/or active restoration of the groundwater if necessary for the protection of Tarkiln Brook.

2. **Compliance with ARARs**

There are three types of applicable or relevant and appropriate requirements (ARARs) referred to as chemical-specific ARARs, location-specific ARARs and action-specific ARARs. A summary of the ARARs is presented in Table 16 in Appendix B.

The chemical-specific ARARs for all the alternatives are the same. The chemical-specific ARARs are as follows:

- Safe Drinking Water Act (SDWA) - Maximum Contaminant Levels (MCLs)
- Safe Drinking Water Act (SDWA) - Maximum Contaminant Level Goals (MCLGs)
- Clean Water Act (CWA) - Ambient Water Quality Criteria
- Rhode Island Rules and Regulations Pertaining to Public Drinking Water (R46-13-DWS)
- Rhode Island Water Quality Regulations for Water Pollution Control (R.I.G.L. 46-12, 42-17.1, 42-35)
- Rhode Island Pollutant Discharge Elimination System (R.I.G.L. 46-12, 42-17, 42-35)

All of the alternatives achieve compliance with the chemical-specific ARARs. However, the alternatives differ in the time it takes to achieve compliance. Alternatives 1, 2, and 3 rely on natural attenuation to restore the groundwater to the chemical-specific ARARs. As predicted by modeling, these alternatives shall achieve compliance with the chemical-specific ARARs within 24 to 28 years. As predicted by actual data collected to date, these alternatives may achieve compliance within a shorter period of time, approximately 8 to 18 years. Alternative 4, which utilizes active restoration with a discharge to surface water, is predicted by modeling to achieve compliance within 11 to 17

years. Alternative 5, which utilizes active restoration with discharges to both groundwater and surface water, is predicted to achieve compliance within 10 years.

Like Alternatives 1, 2 and 3, Alternative 6 achieves compliance through natural attenuation in approximately 24 to 28 years, according to modeling, or faster according to actual groundwater monitoring data. However, Alternative 6 also includes a contingent active restoration component. Specifically, if the groundwater monitoring data indicates that the groundwater is not being restored by natural attenuation to ARARs within the time predicted by modeling or faster, then Alternative 6 utilizes active restoration to achieve compliance in approximately 11 years. This time may be decreased depending on how far natural attenuation has progressed before active remediation occurs.

There are no location-specific ARARs for Alternatives 1, 2 and 3. The location-specific ARARs for Alternatives 4, 5 and 6 are as follows:

- Clean Water Act, Section 404
- Federal Protection of Wetlands Executive Order
- Fish & Wildlife Coordination Act
- Fish & Wildlife Improvement Act of 1978
- Fish & Wildlife Conservation Act of 1980
- Rhode Island Freshwater Wetlands Act (R.I.G.L. 2-1-18-27)

The collection, treatment and discharge facilities for Alternatives 4, 5 and 6 shall be designed and constructed in compliance with all location-specific ARARs. Specifically, the collection, treatment and discharge facilities would be sited so as to minimize the destruction, loss, degradation or filling of the wetlands. Furthermore, these facilities would be sited so as not to jeopardize the continued existence of any endangered or threatened species.

The action-specific ARARs for all alternatives are the requirements of the Occupational Health and Safety Act which contain requirements for workers engaged in onsite field work. In addition, the Department of Transportation (DOT) Rules for Hazardous Materials contain applicable requirements for wastes shipped offsite for laboratory analysis. These requirements shall be complied with while conducting groundwater monitoring activities.

In addition to the action-specific ARARs noted above, the action-specific ARARs for Alternatives 4, 5 and 6 also include the following laws, or regulations promulgates thereunder:

- Clean Water Act
- Clean Air Act
- Rhode Island Air Pollution Control Act

- Rhode Island Air Pollution Control Regulations
- Rhode Island Air Toxic Regulations
- Rhode Island Pollutant Discharge Elimination System Permit Regulations

For Alternatives 4, 5 and 6, the collection and treatment systems shall be designed, constructed and operated in compliance with the action-specific ARARs. Through appropriate design, emissions from the air stripper would achieve compliance with the Clean Air Act, the Rhode Island Air Pollution Control Act and the Rhode Island Air Pollution Control Regulations promulgated pursuant to that Act. These regulations, including regulations 5, 9.3.1 (e) & (f), 9.3.3, 9.3.4, 17, 22.3.1, 22.3.3, establish numerical emission limits for listed substances as well as minimum technology requirements and operating requirements. Compliance with these regulations shall be achieved with the use of a vapor phase carbon adsorption system to remove contaminants from the air stripper emissions. The discharge to the local surface water would achieve compliance with the Clean Water Act and the Rhode Island Pollutant Discharge Elimination System Permit Regulations via the onsite treatment system. Finally, offsite transportation of treatment residuals would be conducted in compliance with the DOT Rules for Hazardous Materials.

3. **Long-term Effectiveness and Permanence**

As discussed above, the potential future risks posed to human health from future exposure to contaminated groundwater are outside of EPA's acceptable risk range. Since Alternative 1 does not utilize adequate controls to prevent access to the contaminated groundwater during restoration, Alternative 1 is not protective over the long-term.

For the other alternatives evaluated, the long-term effectiveness is dependent on the effectiveness of temporary access restrictions or well head treatment at preventing exposure to the contaminated groundwater during restoration. If temporary access restrictions or well head treatment is effective at preventing exposure to the contaminated groundwater during restoration, then all the other alternatives are equally protective over the long-term. However, if temporary access restrictions are not effective at preventing exposure, protection is achieved when the groundwater is restored to interim cleanup levels.

Alternatives 2 and 3, which rely on natural attenuation, take the longest to restore the groundwater to interim cleanup levels and ARARs, approximately 24 to 28 years according to modeling. Alternatives 4 and 5, utilize treatment to permanently destroy the contaminants in the groundwater reducing the concentrations to interim cleanup levels and ARARs. Alternatives 4 and 5 restore the groundwater in approximately 10 to 17 years, according to modeling.

Like Alternatives 2 and 3, Alternative 6 also relies on natural attenuation to restore the contaminated groundwater and will take approximately 24 to 28 years to restore the groundwater. However, if the groundwater is not restored at the rate predicted by modeling or faster, or effective controls cannot be implemented, Alternative 6 utilizes treatment to restore the groundwater to interim cleanup levels in approximately 11 years, according to modeling.

4. Reduction of Toxicity, Mobility, or Volume through treatment

Alternatives 1, 2 and 3 do not utilize treatment to restore the contaminated groundwater which is the principal threat at the Site. Therefore, there is no reduction of toxicity, mobility or volume through treatment for these alternatives.

Alternatives 4 and 5 utilize active restoration to restore the contaminated groundwater. Alternatives 4 and 5 utilize the same treatment processes. Alternative 4 discharges the treated groundwater into the surface water of Tarkiln Brook or the Slatersville Reservoir while Alternative 5 discharges a portion of the treated groundwater into the groundwater and a portion into the surface water. Two collection scenarios were evaluated for Alternative 4, collection of the 1 ppb TVOC plume (Scenario 1) and collection of the 100 ppb TVOC plume (Scenario 2). Assuming that no hazardous substances adsorb to the soil, it is estimated that Scenario 1 shall permanently destroy approximately 500 lbs of hazardous substances and Scenario 2 shall permanently destroy approximately 400 lbs of hazardous substances. Alternative 5 has one collection scenario, collection of the 1 ppb TVOC plume. Alternative 5 shall permanently destroy approximately 500 lbs of hazardous substances.

Alternative 6 utilizes natural attenuation to restore the contaminated groundwater. If natural attenuation restores the groundwater to the interim cleanup levels effectively, there is no reduction of toxicity, mobility or volume through treatment for this alternative. However, if the groundwater is not restored at the rate predicted by the model, Alternative 6 utilizes the same active restoration process as Alternatives 4 with collection Scenario 2 and therefore achieves the same reduction. Therefore, Alternative 6 utilizes treatment to reduce toxicity, mobility or volume to the extent necessary.

5. Short-term Effectiveness

For all the alternatives, the potential short-term risks to the community include the potential future risks posed from residential use of the groundwater during restoration. Since Alternative 1 does not utilize adequate controls to prevent access to the groundwater during restoration, Alternative 1 is not protective over the short-term. For the other alternatives

evaluated, the short-term effectiveness is also dependent on the effectiveness of temporary access restrictions or well head treatment at preventing exposure to the contaminated groundwater during restoration. If temporary access restrictions or well head treatment is effective at preventing exposure to the contaminated groundwater during restoration, then all the other alternatives are equally protective over the short-term. However, if temporary access restrictions or well head treatment are not effective at preventing exposure, protection is achieved when the groundwater is restored to interim cleanup levels.

Alternatives 2 and 3, which rely on natural attenuation, take the longest time to restore the groundwater to interim cleanup levels, approximately 24 to 28 years according to modeling. Alternatives 4 and 5, which utilize active restoration, restores the groundwater to interim cleanup levels in approximately 10 years, according to modeling. Like Alternatives 2 and 3, Alternative 6 also relies on natural attenuation and restoration of the groundwater to interim cleanup levels would also take 24 to 28 years. However, if effective controls cannot be implemented, the preferred alternative relies on active restoration to restore the groundwater to interim cleanup levels in approximately 11 years according to modeling.

Risks to workers, the community, and the environment during construction of all the alternatives would be minimal. Alternatives 1, 2 and 3 involve monitoring which has thus far been successfully implemented with minimal impacts on the community and the environment. Construction of well head treatment systems, a component of Alternatives 3, 4, and 5, has also been successfully implemented with minimal impacts to the residents near this Site. Construction of the groundwater treatment and discharge facilities for Alternatives 4, 5 and 6 would pose minimal impacts to the community since the facilities would be located near the site. The treatment facility would be sited within the WS&G, Inc., property boundaries which is 1000 feet from the nearest residence.

6. Implementability

Alternative 1 consists of groundwater monitoring utilizing existing wells which is relatively easy to implement. The implementability of Alternatives 2 and 3, which include either temporary access restrictions or well head treatment, respectively, is dependent upon the cooperation of the property owners which cannot be determined at this time. Therefore, the implementability of these alternatives is considered questionable.

Alternatives 4 and 5 utilize active restoration consisting of technologies that are proven, reliable and readily implementable. However, like Alternatives 2 and 3, the implementability of temporary access restrictions or well head treatment, which are

components of both Alternatives 4 and 5, are considered questionable. Since Alternative 5 has two discharge points, one to groundwater and one to surface water, Alternative 5 is technically and administratively more complicated to implement than Alternative 4. If natural attenuation is utilized, the implementability of Alternative 6 is similar to Alternative 2. However, Alternative 6 should be slightly easier to implement than Alternative 2 since the area requiring restrictions is smaller for Alternative 6. If active restoration is utilized, the implementability of Alternative 6 is similar to Alternative 4.

All of the alternatives except Alternative 6 utilize the existing bedrock wells to monitor the restoration of the bedrock system. Due to the questionable integrity of the existing bedrock wells, these alternatives may not be able to monitor the effectiveness of the remedy. For Alternative 6, the long-term monitoring program for the bedrock system shall depend on the results of the additional investigations of the bedrock system conducted under the provisions of the existing Consent Decree. Therefore, this alternative is capable of effectively monitoring the performance of the remedy.

7. Cost

A comparison of the potential maximum total costs for each alternative is as follows:

Alternative	Total Capital	Total Operation & Maintenance	Total Costs (present worth)
Alternative 1	0	$794,037	$794,037
Alternative 2	$192,500	$944,981	$1,137,481
Alternative 3	$19,250	$1,114,162	$1,133,412
Alternative 4			
o with access restrictions	$1,331,300	$2,789,181	$4,120,481
o with well head treatment	$1,158,050	$2,909,666	$4,067,716
Alternative 5			
o with access restrictions	$1,532,540	$2,647,155	$4,179,695
o with well head treatment	$1,359,290	$2,761,138	$4,120,428

Alternative 6			
o without active restoration	$82,500	$1,041,452	$1,123,952
o with active restoration	$1,049,076	$2,990,151	$4,039,227

8. State Acceptance

The State's comments on the RI/FS and Proposed Plan, as received during the public comment period, and EPA's responses to their comments are summarized in the Responsiveness Summary in Appendix C of this document. The major comments received by the State are summarized below.

The Rhode Island Department of Environmental Management (RIDEM) does not approve of the use of natural attenuation to restore the contaminated groundwater. RIDEM asserts that the State Groundwater Protection Act mandates a strong policy of restoration and non-degradation. Furthermore, the State contends that failure to implement active restoration is in conflict with the Act and is inconsistent with the policies applied by the Groundwater Section of RIDEM. Therefore, the State does not approve of the selection of Alternatives 1, 2, 3 and 6 for the final remedy.

RIDEM has concluded that the investigations of the surface water contamination in Tarkiln Brook and the Slatersville Reservoir were inadequate. The State has requested, by letter dated March 5, 1991, that Hunt conduct additional work under the provisions of the existing Consent Decree to characterize the impacts to Tarkiln Brook. Furthermore, the State has indicated that selection of the remedy should not be made until after the additional data is collected.

RIDEM has also concluded that the investigations of bedrock contamination was also inconclusive. They support EPA's position of the need for additional investigations to further characterize the extent of contamination in the bedrock aquifer and have indicated that selection of the remedy should be made after the additional data has been collected.

9. Community Acceptance

The comments received from the community on the RI/FS and Proposed Plan during the public comment period, and EPA's responses to the comments are also summarized in the Responsiveness Summary in Appendix C of this document. The major comments received by the community are summarized below.

One resident of the community submitted comments on the RI/FS and proposed plan. This resident supported immediate active

restoration of the groundwater as required by Alternatives 4 and 5. However, this resident did not support temporary access restrictions or well head treatment to prevent future risks to public health. Furthermore, the Nasonville Water District (NWD) believed that Alternative 5 was the most protective since it restored the groundwater in the fastest period of time and thus should be implemented by EPA. In addition, the NWD also requested that additional data be collected to characterize the impacts to the bedrock, the surface water and sediments. Finally, if the preferred alternative is implemented, the NWD also requested that the criteria which initiate active restoration be made clear.

X. THE SELECTED REMEDY

This remedy is the third remedy selected for the Site. The remedies selected in 1984 and 1985 and implemented in 1988, 1989 and 1990 reduced the immediate risk posed by the groundwater contamination and reduced the source of contamination. This remedy addresses the potential future risks caused by the groundwater contamination remaining at the Site.

A. Interim Cleanup Levels

Interim cleanup levels have been established for 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 appropriate ARARs (e.g. Drinking Water MCLGs and MCLs) if available. In the absence of a chemical specific ARAR, or other suitable criteria to be considered, a 10^{-6} excess cancer risk level for carcinogenic effects or a concentration corresponding to a hazard index of one for compounds with non-carcinogenic effects was used to set interim cleanup levels. In instances in which the values described above were not feasible to quantify, the practical quantification limit was used as the interim cleanup level. At the time that the interim cleanup levels described in Table 15 of Appendix B, which are based on ARARs, have been achieved, a risk assessment shall be performed on the residual groundwater contamination. This risk assessment of the residual groundwater contamination shall follow EPA procedures and will assess the cumulative risks for carcinogens and non-carcinogens posed by consumption of Site groundwater. If the risks are not within EPA's risk management goal for carcinogens and non-carcinogens, then the remedial action will continue until protective levels are attained, or the remedy is otherwise deemed protective.

Because the aquifer at and beyond the compliance boundary of the Site is classified according to Federal Classification Standards as a Class IIA aquifer, a current source of drinking water, MCLs and non-zero MCLGs established under the Safe Drinking Water Act are ARARs (see NCP at 55 Fed. Reg. 8750 to 8753, March 8, 1990).

Interim cleanup levels for known and probable carcinogenic compounds (Class A & B) have been set at the appropriate MCL or non-zero MCLG. Interim cleanup levels for the Class C, D and E compounds (possible carcinogens not classified and no evidence of carcinogenicity) have been set at the MCLG. In the absence of an MCLG, an MCL or a proposed drinking water standard or other suitable criteria to be considered (i.e. health advisory, state standard), an interim cleanup level was derived for carcinogenic effects based on a 10^{-6} excess cancer risk level considering the ingestion of ground water.

Interim cleanup levels for compounds in groundwater exhibiting non-carcinogenic effects have been set at the MCLG. In the absence of a MCLG, interim cleanup levels for non-carcinogenic effects have been set at a level thought to be without appreciable risk of an adverse effect when exposure occurs over a lifetime (hazard index = 1).

Table 15 in Appendix B summarizes the interim cleanup levels for carcinogenic and noncarcinogenic contaminants of concern identified in groundwater. Five compounds identified as contaminants of concern do not have interim cleanup levels. The five compounds are arsenic, beryllium, cadmium, chromium, and copper. These compounds do not have interim cleanup levels because they are currently below the specific MCLG, MCL, proposed drinking water standard or other suitable criteria to be considered.

The point of compliance for groundwater at the Site is the perimeter of the cap represented by closure well clusters C-1 through C-6. EPA has estimated that these interim cleanup levels will be obtained within 24 to 28 years as predicted by hydrogeologic models. According to a review of the actual groundwater monitoring data collected to date, EPA has estimated that the interim cleanup levels may be achieved in a faster period of time, approximately 8 to 18 years.

While these cleanup levels are consistent with ARARs, a cumulative risk that could be posed by these compounds may exceed EPA's goals for remedial action. Consequently, these levels are considered to be interim cleanup levels for groundwater. Furthermore, once all the ARARs have been achieved in groundwater, EPA expects that due to different rates of attenuation for each compound, levels of most contaminants will be below these interim cleanup levels. Thus, when all of the ARARs have been attained, a risk assessment will be performed on the residual groundwater contamination to determine whether the remedial action is protective. Remedial actions shall continue until protective concentrations of residual contamination have been achieved 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. Description of Remedial Components

The selected remedy has the following three major components. A detailed description of each of the components is provided below.

1. Restoration of contaminated groundwater by natural attenuation with contingent active restoration

The selected remedy restores the groundwater in the overburden aquifer and the bedrock system by natural attenuation. According to hydrogeologic models presented in the Revised Groundwater FS Report, Hunt determined that groundwater restoration will take approximately 24 to 28 years. Active restoration shall be implemented to restore the contaminated groundwater if the groundwater is not restored by natural attenuation at the rate predicted by modeling or faster.

In addition to requiring active restoration if natural attenuation is not restoring the groundwater at a rate predicted by modeling or faster, there are three other scenarios which trigger active restoration. First, the selected remedy also requires active restoration of the groundwater and/or long-term monitoring of the surface water and sediments if necessary to protect Tarkiln Brook. Second, based on a review of the new information collected to characterize bedrock impacts, active restoration and/or long-term monitoring may be implemented if necessary for the protection of public health and the environment. Finally, if effective institutional controls cannot be implemented, the selected remedy utilizes active restoration to restore the groundwater. Such controls may include regulatory restrictions, acquisition of affected properties or groundwater rights, and other restrictions on property transactions.

Periodic Evaluation of Natural Attenuation

Groundwater monitoring data shall be evaluated every three years for the first nine years, and every five years thereafter to determine if natural attenuation is restoring the contaminated groundwater at the rate predicted by modeling or faster. The evaluation consists of comparing the actual data collected during future groundwater monitoring to the theoretical data predicted by hydrogeologic models. The evaluation shall be conducted on four indicator compounds: vinyl chloride, trichloroethene, tetrachloroethene and benzene. These compounds were selected based on toxicity, persistence in the environment and the magnitude and frequency of detection.

EPA generated equations for each of the indicator compounds which predicts the theoretical concentration of each indicator compound

at any point in the future. These equations were developed from the results of three hydrogeologic models, MODFLOW, STLINE and the EPA Batch Flushing Model. The evaluation shall consist of comparing the actual concentrations to the theoretical concentrations as determined by the following equations:

Benzene: $y = \text{antilog}\ (1.359 - 0.015(x))$

Tetrachloroethene: $y = \text{antilog}\ (1.804 - 0.004(x))$

Trichloroethene: $y = \text{antilog}\ (1.955 - 0.014(x))$

Vinyl Chloride: $y = \text{antilog}\ (2.117 - 0.020(x))$

where x = number of months after the ROD signing (i.e. $x = 1$ for April 1991, $x = 2$ for May 1991, etc.)

y = theoretical concentrations of contaminant (ppb)

A statistical comparison of the actual data to the theoretical data shall be conducted using the nonparametric distribution free signed rank test of Wilcoxon with a 95 percent significance level as described in Nonparametric Statistical Methods (by Hollander and Wolfe, published by John Wiley in 1973, on pages 26-38). In summary, the rank test determines whether the trend established by actual data falls below the trend established by the theoretical data. If the trend for the actual data does not fall below the trend for the theoretical data as determined by the rank test, active restoration shall be implemented. All compounds must pass the rank test. If one compound fails the rank test then active restoration shall be implemented.

The statistical comparison shall be done with the data from the following well clusters: C-2, C-3, C-4, C-5, C-6, I-2, I-3, I-6 and II-3. These nine clusters are the most contaminated well clusters at the Site. The sum of the maximum concentration in each of these well clusters, for each indicator compound, shall be the basis for the comparison. Due to the proximity of well clusters C-5 and II-3, the cluster with the greatest concentration during the particular sampling episode shall be selected for the comparison.

An example of the evaluation using the rank test is presented in Appendix D of the ROD using the data collected during the RI for Benzene. EPA believes that this approach eliminates any vagueness in the trigger for active remediation as it relates to groundwater contamination.

Since wastes remain at the Site, EPA will review the Site, to the extent required by law, during the evaluations to assure that the

remedial action continues to protect human health and the environment. During these periodic reviews, EPA shall also consider any recently promulgated standards that would have been ARARs had they been promulgated at the time of remedy selection to insure that the remedy remains fully protective in light of such new standards. EPA may also consider any newly promulgated standards sooner than these evaluation periods if appropriate.

Active Restoration Process

The active restoration process to be utilized for this alternative shall consist of collecting the contaminated groundwater using extraction wells, treating the contaminated groundwater using sedimentation, filtration, an air stripping column and carbon adsorption, and discharging the treated groundwater to Tarkiln Brook. The collection system shall be designed to collect the volume of groundwater within the area delineated by the 100 ppb TVOC plume contour (Appendix A, Figure 4). The exact location of the extraction wells and the optimum pumping rate shall be determined by pump tests conducted during predesign studies.

The extracted groundwater shall be collected in a sedimentation tank where suspended solids and metals shall be removed (Appendix A, Figure 8). The groundwater shall then be pumped into a filter for further removal of metals and suspended solids. The solids from the sedimentation and filtration system shall be disposed of in a facility licensed to accept such wastes. Land disposal of these solids may be impacted by the RCRA land disposal requirements. Tests shall be performed during operation to determine if these solids are Characteristic RCRA Hazardous Wastes and restricted under the land disposal requirements.

From the filter, the groundwater shall be pumped into a counter current air stripper for removal of VOCs. The air emissions from the air stripper shall be passed through a vapor phase carbon adsorber for removal of the VOCs from the air prior to discharge to the atmosphere. The treated groundwater effluent from the air stripper shall also be passed through a liquid phase adsorber for removal of VOCs. The treatment system shall be designed to meet the numerical effluent limits based on State water quality standards. The effluent shall be tested periodically to demonstrate that the effluent continues to meet effluent limits.

2. Institutional controls for potential future residences

The selected remedy utilizes institutional controls to reduce the risk to public health from consumption of the groundwater. For this alternative, institutional controls shall be imposed in the area delineated in Figure 7 in Appendix A. This area includes the area where the risk to public health is greater than $1 \times 10^{-}$

[4] (i.e. in this area contaminant concentrations in groundwater could be injurious to human health). In addition, this area also includes a buffer zone which allows for a residential well to be installed without drawing contaminated groundwater from the area which poses an unacceptable risk. This buffer zone is equal to 300 feet at this Site. The risk to public health from consumption of groundwater beyond the area delineated by EPA is 1 x 10^{-5} which is within EPA's acceptable risk range. The area delineated in Figure 7 is approximately 17 acres in size and impacts four existing lots including the lot owned by Western Sand & Gravel, Inc.

3. Site monitoring

The third component of the selected remedy is a site monitoring program. The site monitoring program shall include, at a minimum, long-term monitoring of the overburden groundwater. In addition, the site monitoring program may include long-term monitoring of the bedrock system, the surface water, and the sediments.

Overburden Aquifer Groundwater Monitoring Plan

The groundwater monitoring program shall operate until the groundwater is restored which is predicted by modeling to occur within 24 to 28 years.

The groundwater monitoring program for the overburden aquifer is as follows:

- The following twenty eight (28) wells shall be monitored on a quarterly basis for volatile organic compounds (VOCs) and on an annual basis for semi-volatile compounds (SVOCs) and metals.

C-1	C-3S	C-5S	I-2S	I-6S
C-2S	C-3M	C-5M	I-2M	I-6M
C-2M	C-3D	C-5D	I-2D	I-6D
C-2D	C-4S	C-6S	I-3S	II-3S
	C-4M	C-6M	I-3M	II-3M
	C-4D	C-6D	I-3D	II-3D

A review of the analytical data presented in the RI Report indicates that, with the exception of C-1 which is upgradient of the Site, these wells were the most contaminated wells in the plume (See Figure 4.2 in RI Report, Hunt, June 1990). All of these wells shall be utilized to evaluate the effectiveness of natural attenuation. Quarterly monitoring is needed to provide enough data to evaluate statistically the effectiveness of natural attenuation. In addition, it is anticipated that the probability of implementing active restoration is the

greatest in the first six (6) years. Therefore, quarterly monitoring must be conducted for a minimum of six (6) years.

VOCs are the most prevalent compounds detected at the Site. Furthermore, VOCs result in the greatest risk to public health. Therefore, the monitoring program includes long-term monitoring of VOCs to insure that the plume continues to decrease in magnitude and extent. In addition, some SVOCs and metals have also been detected in the groundwater. Based on EPA's review of the data, these compounds are not expected to increase in magnitude and extent. However, due to concerns raised by RIDEM on the impacts to Tarkiln Brook and in order to verify this conclusion, annual monitoring of SVOCs and metals has also been included in the monitoring plan.

RIDEM also has concerns regarding the presence of non-aqueous phase liquids (NAPLs). Therefore, in response to RIDEM's concern, the selected remedy includes the use of an interface probe to identify the presence of NAPLs.

Four VOCs have been selected as indicator compounds to evaluate the effectiveness of natural attenuation. All of the monitoring results shall be reviewed by EPA. EPA suspects that all the compounds detected at the Site shall behave in a similar fashion to the indicator compounds selected. If EPA determines that the results do not support EPA's conclusions, EPA shall modify the selected remedy to insure that the remedy remains protective. After a minimum of three years of monitoring, the monitoring plan may be modified to reduce the frequency of sampling if approved by EPA.

- In addition, the following twenty eight (28) wells shall be monitored on an semi-annual basis for VOCs.

I-1S	I-5S	I-8S	II-4S	II-6S
I-1M	I-5M	I-8M	II-4M	II-6M
I-1D	I-5D	I-8D	II-4D	II-6D
I-4S	I-7S	II-2S	II-5S	
I-4M	I-7M	II-2M	II-5M	
I-4D	I-7D	II-2D	II-5D	

These wells were found to be in the overburden plume or just outside of the plume during the RI. As stated above, EPA has concluded that the magnitude and extent of contamination in the overburden aquifer is decreasing. In addition, EPA has concluded that there is a small component of flow which passes under Tarkiln Brook and discharges into the Slatersville Reservoir. This conclusion is based on seven sampling episodes over a two and a half year period. However, due to concerns raised by RIDEM on the potential impacts to the Reservoir, this conclusion shall be verified

with additional long-term data. After a minimum of three years of monitoring, the monitoring plan may be modified to reduce the frequency of sampling if approved by EPA.

Bedrock System Groundwater Monitoring Plan

Presently, there are two bedrock wells designated C-4B and II-3B. Under the provisions of the existing Consent Decree, Hunt shall monitor these wells on a quarterly basis for volatile organic compounds for one year. In addition, three additional bedrock wells shall be installed pursuant to the Consent Decree. These wells shall also be monitored on a quarterly basis for volatile organic compounds for one year. After evaluating the results of the bedrock investigation, EPA will determine if it is necessary to modify this alternative to include active restoration and/or long-term monitoring of the bedrock system.

Surface water and Sediments Monitoring Program

RIDEM has concluded that the investigation of the Site related contamination of Tarkiln Brook and the Slatersville Reservoir was inadequate. In addition, RIDEM has noted certain violations of State water quality standards. RIDEM plans to request that additional data be collected under the provisions of the existing Consent Decree. After reviewing this data, EPA will determine if it is necessary to modify the selected remedy to include active restoration of the groundwater and/or long-term monitoring of the surface water and sediments.

XI. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the Western Sand & Gravel 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. If natural attenuation restores the groundwater at a rate predicted by modeling or faster, the selected remedy will not satisfy the statutory preference for treatment. However, if this does not occur, the selected remedy will satisfy the statutory preference for treatment which permanently and significantly reduces the mobility, toxicity or volume of hazardous substances as a principal element. 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 through institutional controls and through natural attenuation of

the groundwater. If the groundwater is not restored at the rate predicted by modeling or faster, the risks posed to human health and the environment shall be minimized through treatment.

The selected remedy reduces the potential future risks to public health from exposure to the contaminated groundwater by restoring the contaminated groundwater to drinking water standards. The selected remedy utilizes natural attenuation to restore the contaminated groundwater. According to hydrogeologic models, it is estimated that groundwater restoration shall take approximately 24 to 28 years. According to a review of actual data collected to date, the predicted groundwater restoration through natural attenuation may take 8 to 18 years. If the groundwater is not restored at a rate at least as fast as that predicted by modeling, the active restoration shall be implemented to restore the groundwater in a faster rate. It is estimated from modeling that the groundwater shall be restored by active restoration in approximately 11 years. However, the actual time for restoration by active restoration shall depend on the reductions that have occurred by natural attenuation.

The selected remedy at the completion of the remedial action will result in human exposure levels that are within the 10^{-4} to 10^{-6} incremental cancer risk range and that are within the hazard index of one for non-carcinogens. More specifically, during groundwater restoration, the selected remedy utilizes institutional controls to prevent use of the contaminated groundwater and prevents human exposure to the contaminated groundwater. In addition, the selected remedy includes site monitoring to insure that the groundwater is restored to drinking water standards. If the groundwater is not restored at the rate predicted by models utilizing natural attenuation or faster, the selected remedy utilizes active restoration to restore the groundwater in a faster period of time.

In addition to requiring active restoration if natural attenuation is not restoring the groundwater at a rate predicted by modeling or faster, there are three other scenarios which trigger active restoration. First, the selected remedy also requires active restoration of the groundwater and/or long-term monitoring of the surface water and sediments if necessary to protect Tarkiln Brook. Second, based on a review of the new information collected to characterize bedrock impacts, active restoration and/or long-term monitoring may be implemented if necessary for the protection of public health and the environment. Finally, if effective institutional controls cannot be implemented, the selected remedy utilizes active restoration to restore the groundwater.

Implementation of the selected remedy will not pose any unacceptable short-term risks or cross-media impacts. Groundwater restoration by natural attenuation and site

monitoring poses minimal impacts to the community and the environment. Furthermore, if active restoration is utilized, the treatment system shall be located onsite. Construction of the system shall have minimal impacts to the community and to the environment. The treatment system shall be designed and operated to meet the effluent limits necessary to protect the environment.

RIDEM has concluded that the investigation of surface water contamination of Tarkiln Brook and the Slatersville Reservoir was inadequate. RIDEM has requested that Hunt conduct additional sampling to characterize the impacts to the surface water. In addition to requiring active restoration if natural attenuation is not restoring the groundwater at a rate predicted by modeling or faster, the selected remedy allows for additional activities such as long term monitoring and/or active restoration of the groundwater if necessary for the protection of Tarkiln Brook. If additional data indicates that there is an unacceptable risk to public health or the environment, then EPA shall modify its remedy as necessary to insure that the remedy is protective.

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:

Chemical-Specific

- Safe Drinking Water Act (SDWA) - Maximum Contaminant Levels (MCLs)
- Safe Drinking Water Act (SDWA) - Maximum Contaminant Level Goals (MCLGs)
- Clean Water Act (CWA) - Ambient Water Quality Criteria
- Rhode Island Rules and Regulations Pertaining to Public Drinking Water (R46-13-DWS)
- Rhode Island Water Quality Regulations for Water Pollution Control (R.I.G.L. 46-12, 42-17.1, 42-35)
- Rhode Island Pollutant Discharge Elimination System (R.I.G.L. 46-12, 42-17, 42-35)

Location-Specific

- Clean Water Act, Section 404
- Federal Protection of Wetlands Executive Order
- Fish & Wildlife Coordination Act
- Fish & Wildlife Improvement Act of 1978
- Fish & Wildlife Conservation Act of 1980
- Rhode Island Freshwater Wetlands Act (R.I.G.L. 2-1-18-27)

Action-Specific

- Clean Air Act - National Emission Standards for Hazardous

Air Pollutants (NESHAPs)
- OSHA Record Keeping, Reporting and Related Regulations
- OSHA Health and Safety Standards
- DOT Rules for Transportation of Hazardous Materials
- Rhode Island Air Pollution Control Act
- Rhode Island Air Pollution Control Regulations
- Rhode Island Air Toxic Regulations
- Rhode Island Pollutant Discharge Elimination System Permit Regulations

To Be Considered

- Rhode Island Groundwater Protection Act
- Rhode Island Draft Groundwater Classification Regulations
- EPA Risk Reference Dose
- EPA Carcinogen Assessment Group Potency Factors
- Threshold Limit Values

A more inclusive listing of ARARs can be found in Tables 16 in Appendix B of this Record of Decision. This table gives a brief synopsis of the ARARs and an explanation of the actions necessary to meet the ARARs. The table also indicates whether the ARARs are applicable or relevant and appropriate to actions at the Site. In addition to ARARs, the table describes standards that are To-Be-Considered (TBC) with respect to remedial actions.

Location and action specific ARARs are identified in this ROD on a general level. During remedial design a more detailed ARARs analysis considering the specifics of design will be performed to insure the remedy's compliance with ARARs.

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:

Component	Capital	Operation & Maintenance	Total Costs (present worth)
Site Monitoring	0	$976,762	$976,762
Temporary Access Restrictions	$82,500	$64,690	$147,190
Active Restoration	$966,576	$1,948,699	$2,915,275
Total Costs without Active Restoration	$82,500	$1,041,452	$1,123,952
Total Costs with Active Restoration	$1,049,076	$2,990,151	$4,039,227

The selected remedy is cost effective and provides a degree of protectiveness proportionate to its costs. The selected remedy relies on natural attenuation to restore the groundwater to cleanup standards. According to groundwater models, groundwater restoration by natural attenuation is estimated to take approximately 24 to 28 years. According to an analysis of the actual data collected to date, groundwater restoration by natural attenuation may occur in approximately 8 to 18 years. According to hydrologic models, active restoration of the groundwater is estimated to take approximately 11 to 17 years. Active restoration is approximately $3,000,000 more expensive than natural attenuation and may not provide a significant reduction in the amount of time necessary to restore the groundwater. Therefore, natural attenuation is less costly than active restoration and may be as effective as active restoration. If the groundwater is not restored at the rate as predicted by models or faster, or if institutional controls cannot be imposed to insure that the remedy is protective, then the selected remedy utilizes active restoration to restore the groundwater in a faster period of time.

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.

With the exception of Alternative 1, the long-term effectiveness of all the alternatives depended on the effectiveness of institutional controls. If effective institutional controls were implemented and fully accepted, all the alternatives were equally protective over the long-term. If effective institutional controls are not implemented, those alternatives that restored the groundwater in the fastest period of time were considered more effective over the long-term. If effective institutional controls cannot be implemented, the selected remedy utilizes active restoration to restore the groundwater in the fastest time feasible and is therefore more effective over the long-term.

The selected remedy utilizes natural attenuation to restore the groundwater which is significantly easier to implement and is less expensive than active restoration while restoring the groundwater in a time frame that is reasonable given the circumstances of the Site. Such circumstances include the following: the present availability of an alternate water supply to affected residences; the groundwater plume has reached its maximum extent and is decreasing in magnitude and extent; and, natural attenuation has been demonstrated with long-term site specific data to effectively reduce the contamination at the Site. In addition, the selected remedy allows for additional activities such as long-term monitoring and or active restoration of the groundwater if additional data indicates that such activities are necessary for the protection of the environment.

Both the State and the community requested that active restoration be implemented immediately to restore the contaminated groundwater. EPA considered the concerns of both the State and the community and determined that, considering the limited areal extent of contamination and location of the groundwater plume, active restoration may not provide any advantages over natural attenuation and is not immediately practicable within the limits of CERCLA and the NCP.

The selected remedy utilizes natural attenuation to restore the contaminated groundwater. If natural attenuation restores the groundwater to the interim cleanup levels effectively, there is no reduction of toxicity, mobility or volume through treatment for this alternative. However, if the groundwater is not

restored at the rate predicted by modeling or faster, the selected remedy utilizes active restoration to achieve the necessary reductions of toxicity, mobility and volume. Therefore, the selected remedy utilizes treatment to reduce toxicity, mobility or volume to the extent necessary. At this Site, treatment shall be used to the maximum extent practicable. However, due to the circumstances of the Site, treatment will only be practicable if the natural attenuation remedy does not restore the groundwater at the rate predicted by modeling or faster. Furthermore, the remedy achieves the best balance among the other criteria.

E. The Selected Remedy does not Satisfy the Preference for Treatment which Permanently and Significantly reduces the Toxicity, Mobility or Volume of the Hazardous Substances as a Principal Element

The selected remedy relies on natural attenuation to restore the contaminated groundwater which is the principal threat. Treatment was not utilized to restore the contaminated groundwater because it was determined not to be practicable considering the circumstances at the Site. Based on a review of the hydrologic models, it is estimated that the groundwater may be restored to interim cleanup levels in approximately 24 to 28 years which is a reasonable period of time given the circumstances of the Site. Furthermore, a review of actual groundwater monitoring data collected to date indicates that the groundwater may be restored in a faster period of time, approximately 8 to 18 years. According to hydrologic models, active restoration is estimated to restore the groundwater in approximately 11 to 17 years. Therefore, EPA concluded that active restoration may not be any more effective than natural attenuation in reaching the groundwater cleanup goals.

XII. DOCUMENTATION OF SIGNIFICANT CHANGES

Based on further evaluation of the selected remedy, and in response to comments received on the RI/FS and Proposed Plan, EPA has modified its selected remedy in two ways. EPA believes these changes are significant in that they impact the overall scope, performance or cost of the remedy. However, these changes are of such a nature that they could have been reasonably anticipated, considering the inherent uncertainties associated with waste management technologies.

The change regarding institutional controls allows for greater flexibility for successful implementation of such restrictions than was presented in the Proposed Plan. In the Proposed Plan, EPA stated that the only contemplated institutional controls, or access restriction, would be property purchase. The other possible institutional controls that EPA now contemplates were presented in the FS Report, so the public has had an opportunity

to review and comment on these options.

The change regarding EPA's modified approach to evaluating the effectiveness of natural attenuation at the Site is an outgrowth of the evaluation presented in the Proposed Plan. It is more comprehensive in its analysis and ensures greater reliability in determining the success of natural attenuation.

EPA further believes that while these changes are significant, they do not radically alter the remedy from the form in which it was presented in the Proposed Plan. Accordingly, while these changes are described in detail in this section, it is not necessary to receive additional public comments on these modifications.

A. Institutional Controls

EPA presented a proposed plan (preferred alternative) for remediation of the Site on February 11, 1991. The management of migration portion of the preferred alternative included:

1. Restoration of contaminated groundwater by natural attenuation with contingent active restoration;
2. Institutional controls for potential future residences; and,
3. Site monitoring.

The institutional controls described in the Proposed Plan consisted of the purchase of the properties that lie within the area requiring institutional controls, presented in Figure 7 in Appendix A of the ROD. During the public comment period, one local resident expressed concern that this approach may be unnecessary while enriching those landowners closest to the Site. Hunt also commented that property purchase may be unnecessary.

EPA has reviewed this approach in comparison to other strategies for achieving successful institutional controls. Based on that review EPA believes that there are several options for successful implementation of institutional controls at the Site. Such institutional controls may include regulatory restrictions, acquisition of affected properties or groundwater rights, and other restrictions on property transactions. These options are potentially more cost effective than purchase of the affected properties, while still attaining protection of human health during the remediation period. Thus, EPA believes that all these options, and any others that are feasible and at least equally protective, should be explored in determining how to most efficiently implement that portion of the ROD requiring institutional controls.

B. Modified Approach to Evaluation of Natural Attenuation

The Proposed Plan indicated that a periodic evaluation of the

effectiveness of natural attenuation would be conducted. The evaluation program identified in the Proposed Plan consisted of conducting a linear regression of the actual data and comparing the results to a linear regression of the theoretical data. In response to the comments from the Nasonville Water District and RIDEM, EPA has clarified the language and the criteria in the selected remedy which shall be utilized to trigger active restoration should natural attenuation not restore the groundwater at the rate predicted by modeling or faster. Like the approach outline in the preferred alternative, the evaluation consists of comparing the actual data collected during future groundwater monitoring to the data predicted by hydrogeologic models. The evaluation shall be conducted on four indicator compounds. A statistical comparison of the actual data to the theoretical data shall be conducted using the nonparametric distribution free signed rank test of Wilcoxon with a 95 percent significance level as described in Nonparametric Statistical Methods (by Hollander and Wolfe, published in 1973 by John Wiley, on pages 26-38). In summary, the rank test determines whether the trend established by actual data falls below the trend established by the theoretical data. If the trend for the actual data does not fall below the trend for the theoretical data as determined by the rank test, active restoration shall be implemented. All compounds must pass the rank test. If one compound fails the rank test, then active restoration shall be implemented. In addition to requiring active restoration if natural attenuation is not restoring the groundwater at a rate predicted by modeling or faster, the selected remedy also requires active restoration of the groundwater and/or long-term monitoring of the surface water and sediments if necessary to protect Tarkiln Brook. An example of the test has been provided in Appendix D of the ROD using the data collected during the RI for benzene. EPA believes that this approach eliminates any vagueness in the trigger for active remediation as it relates to groundwater contamination.

XIII. STATE ROLE

The Rhode Island Department of Environmental Management has reviewed the various alternatives and has indicated its disapproval of EPA's selected remedy for the Site. The State, having reviewed the RI and RI Addendum, FS and FS Addendum and the Proposed Plan, believes that the selected remedy is inconsistent with the Rhode Island Groundwater Protection Act. The Act contains language that sets goals of restoration and non-degradation of groundwater. The State maintains that such policy statements have been consistently interpreted to require active restoration of degraded groundwater resources. The State thus contends that this policy of active restoration should be an ARAR for the Site.

EPA has thoroughly reviewed the State's position. In order to be

eligible to be a state ARAR, a state requirement must be legally enforceable. EPA does not believe that the State's policy is legally enforceable, and thus it cannot be an ARAR for this Site. A more thorough discussion of this issue is contained in the Responsiveness Summary, response to Comment 5 in Part II of Section III. A copy of the State's declaration of non-concurrence is attached as Appendix C.

5.4
ROD

APPENDIX A

RECORD OF DECISION
WESTERN SAND & GRAVEL SITE

LIST OF FIGURES

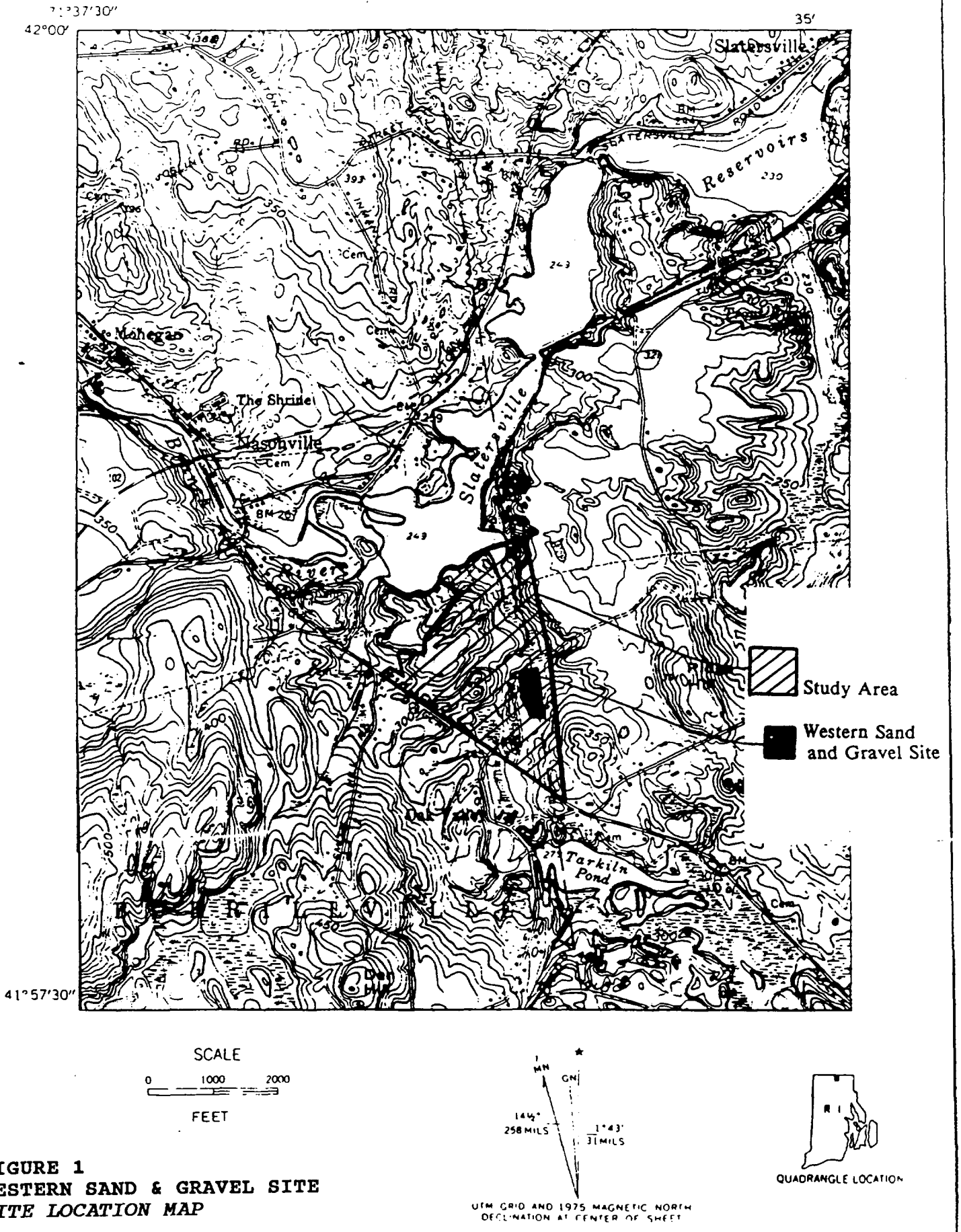


FIGURE 1
WESTERN SAND & GRAVEL SITE
SITE LOCATION MAP

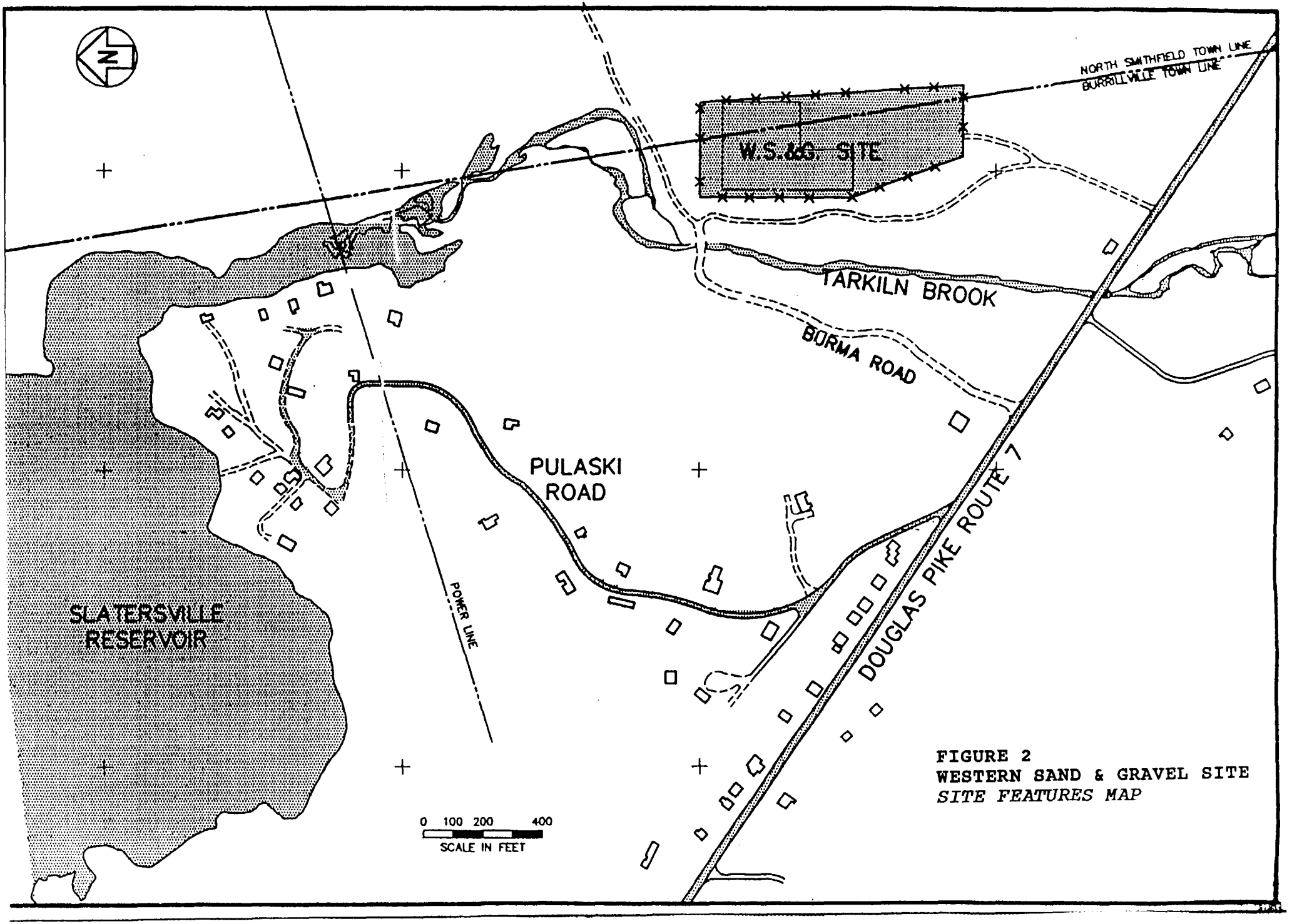


FIGURE 2
WESTERN SAND & GRAVEL SITE
SITE FEATURES MAP

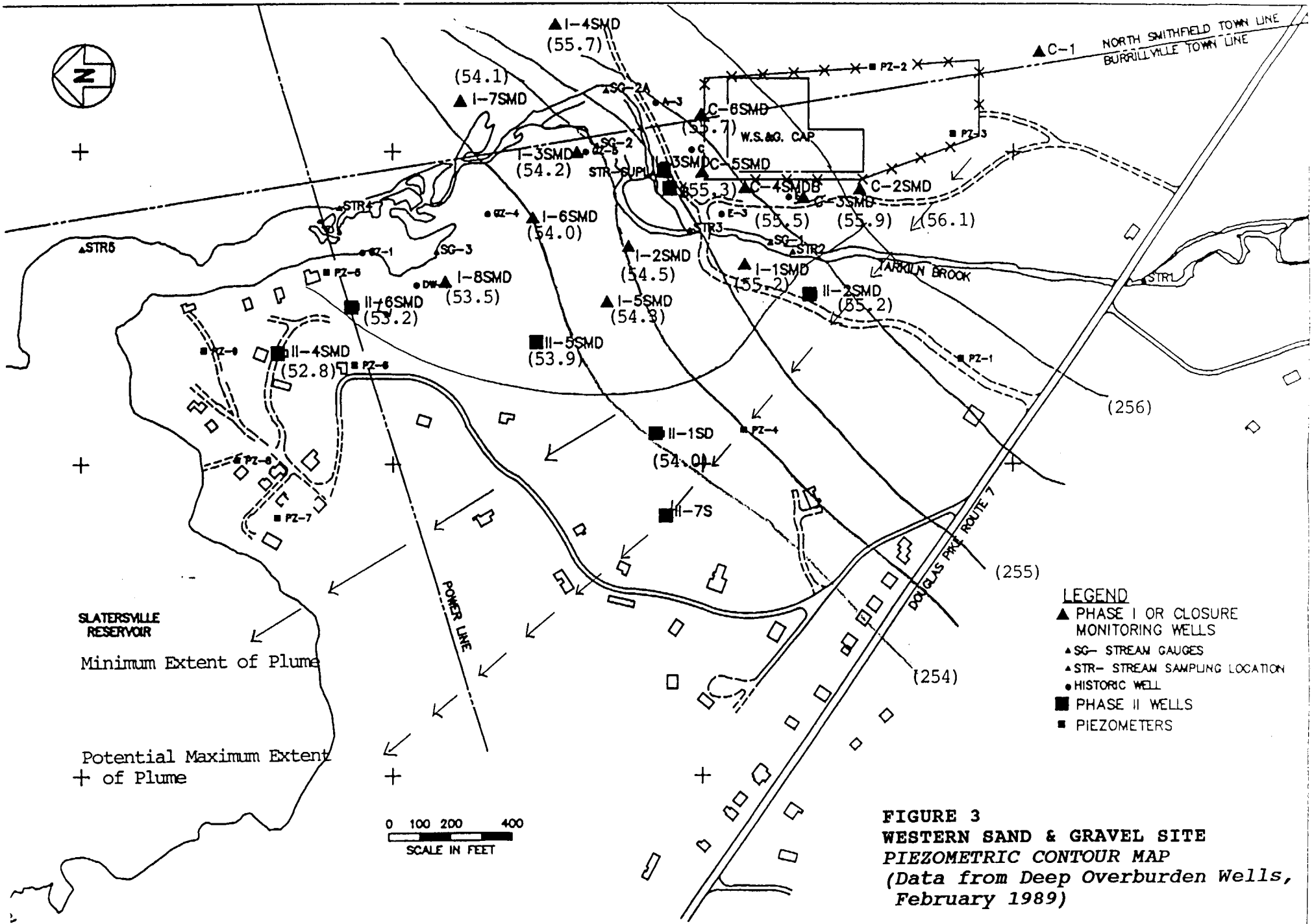
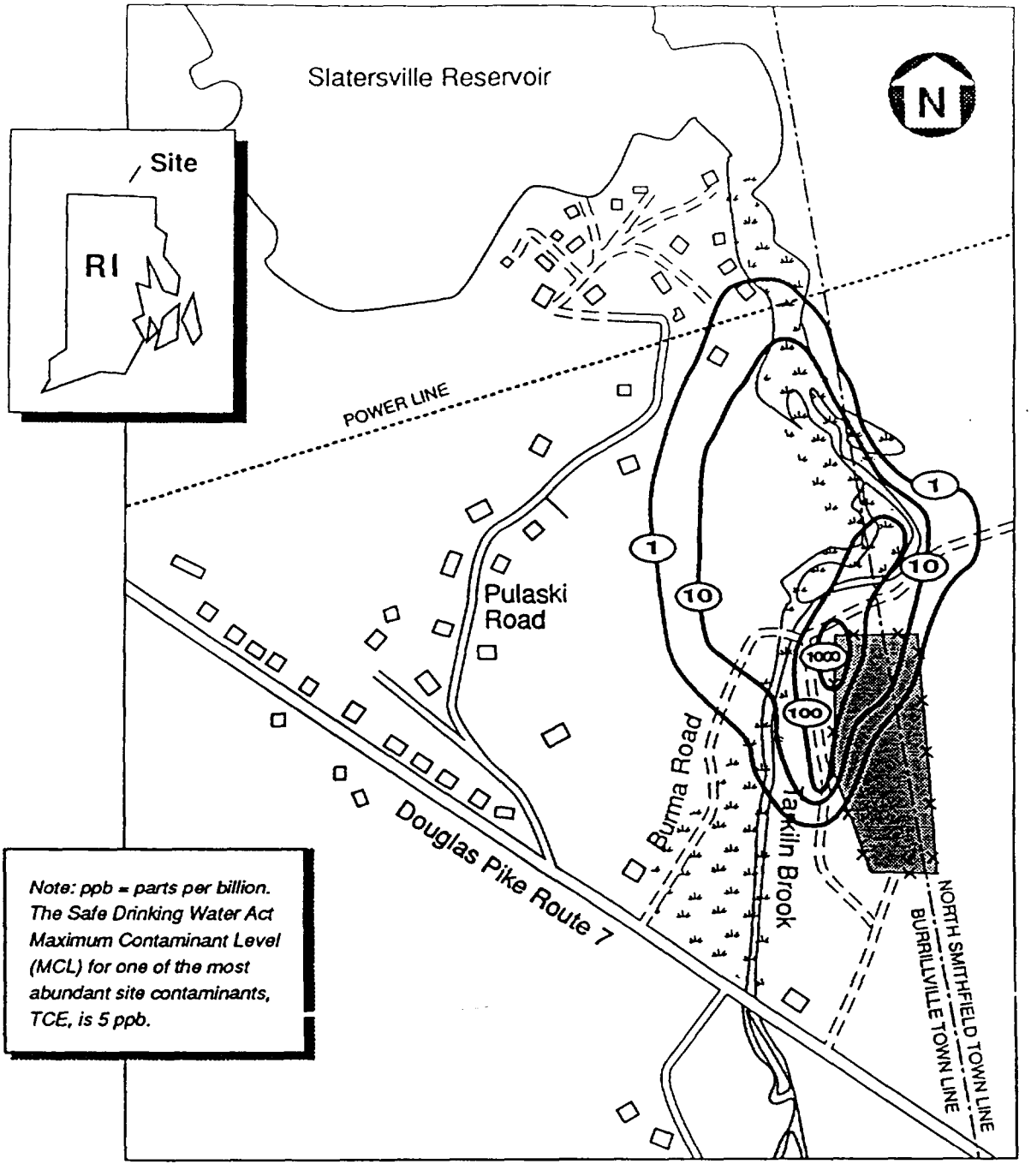


FIGURE 3
WESTERN SAND & GRAVEL SITE
PIEZOMETRIC CONTOUR MAP
(Data from Deep Overburden Wells, February 1989)

FIGURE 4
WESTERN SAND & GRAVEL SITE
CURRENT AREAL EXTENT OF CONTAMINATION IN OVERBURDEN AQUIFER



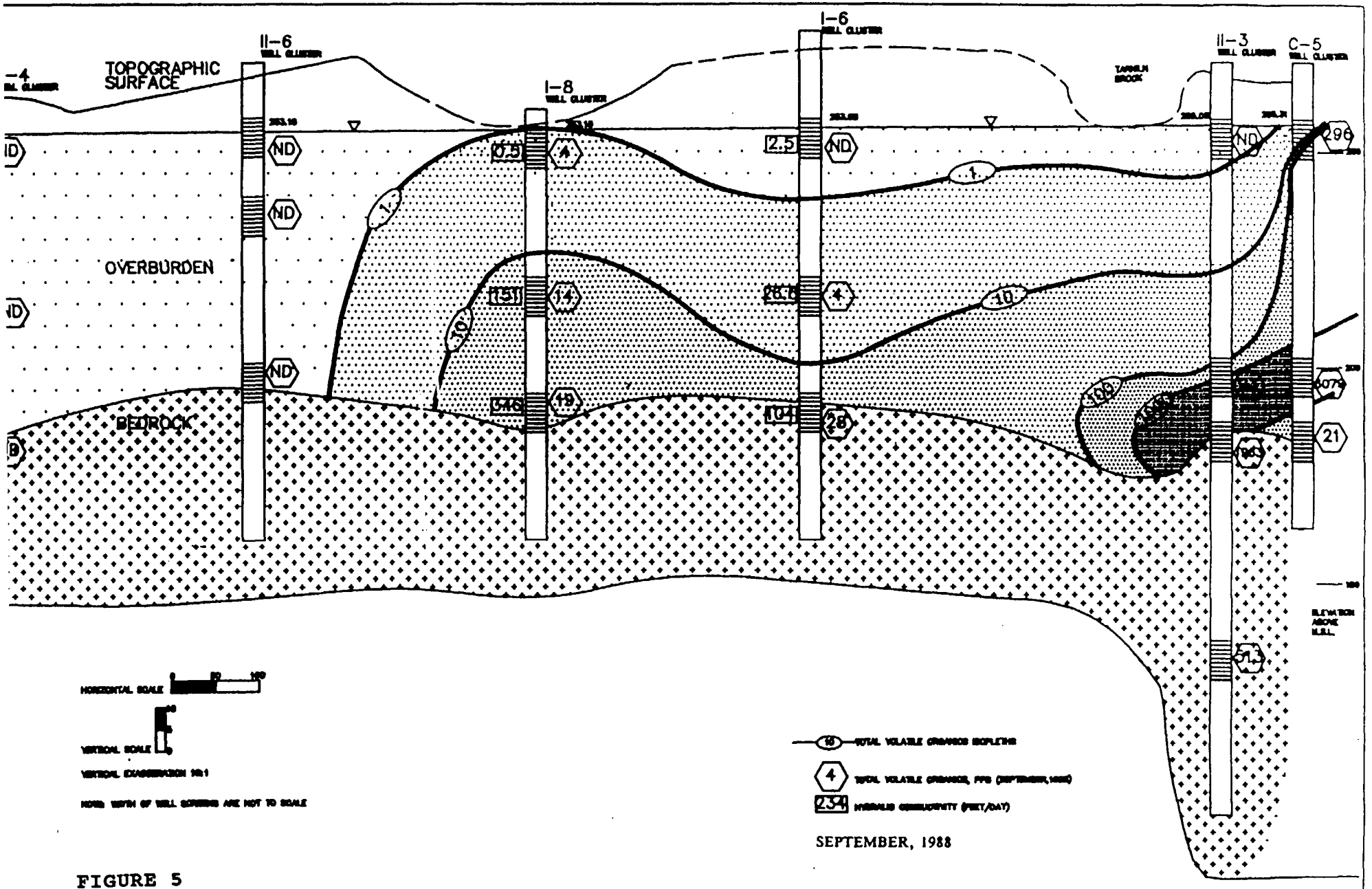
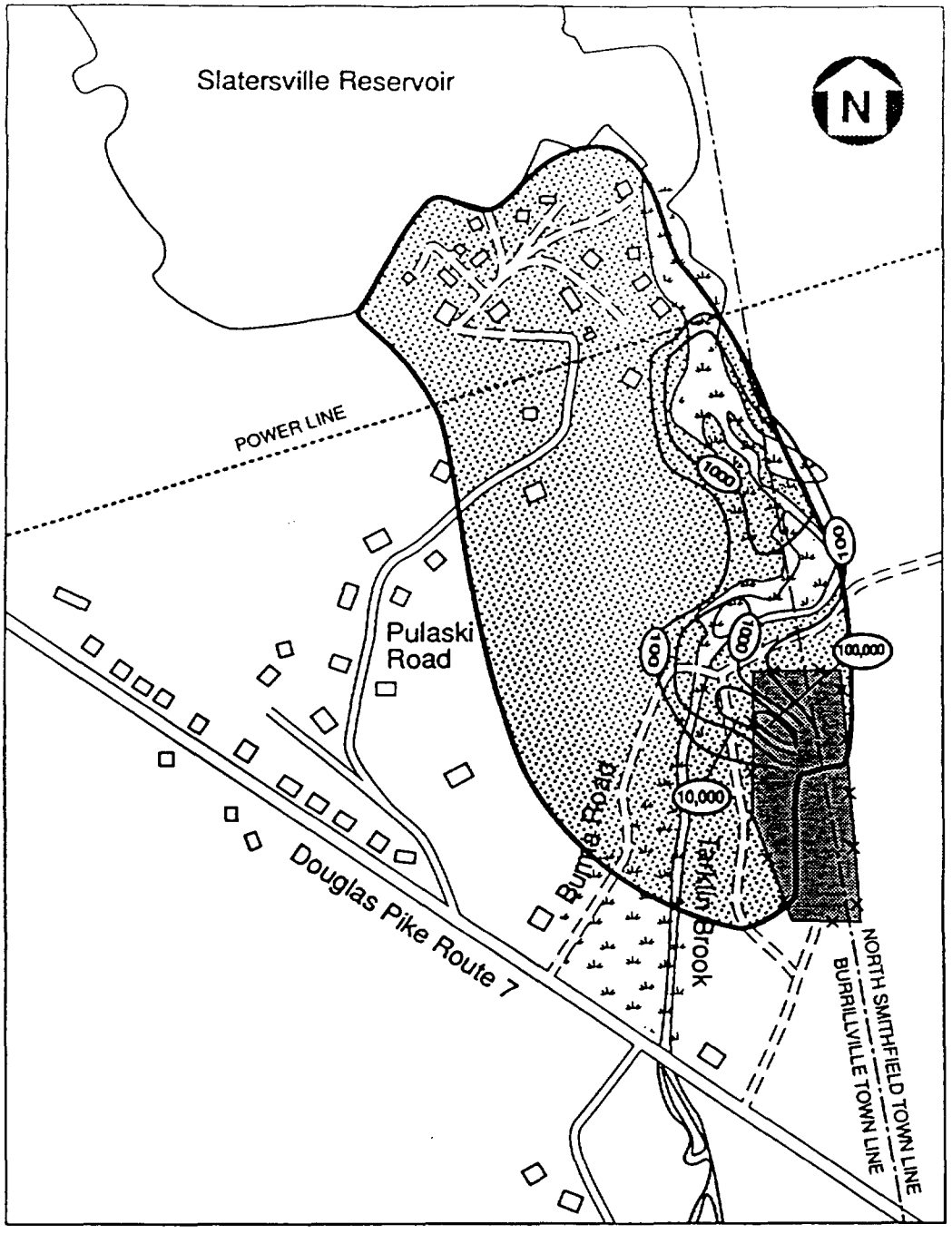


FIGURE 5
WESTERN SAND & GRAVEL SITE
CURRENT VERTICAL EXTENT OF CONTAMINATION IN OVERBURDEN AQUIFER

NORTH–SOUTH CROSS–SECTION

FIGURE 6
WESTERN SAND & GRAVEL SITE
POTENTIAL HISTORICAL MAXIMUM
EXTENT OF CONTAMINATION

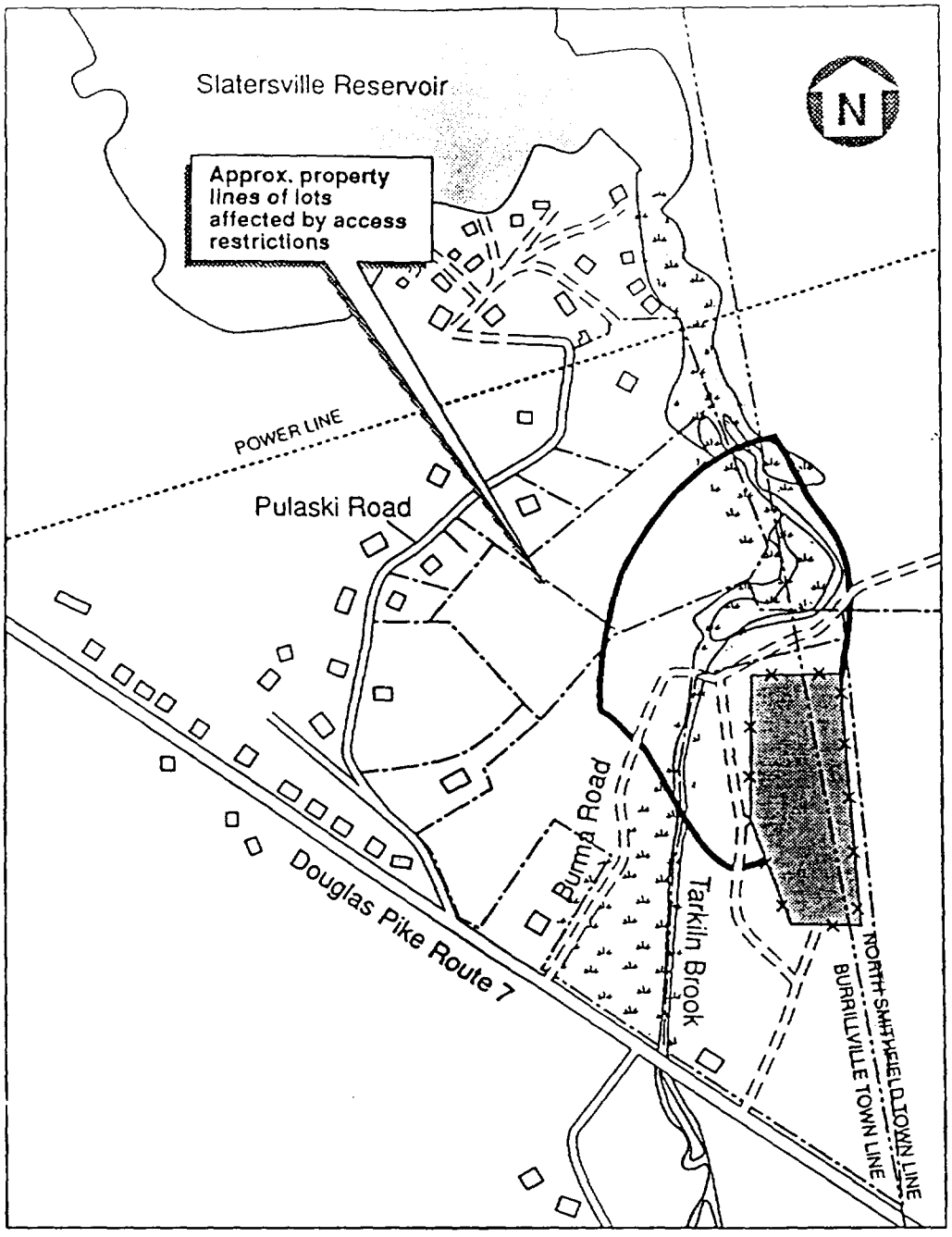


Legend

Drawing Not to Scale

- Wetlands
- Western Sand & Gravel Cap
- Estimated maximum extent of contamination.
- 100 Historic Groundwater Volatile Organics Plume (concentrations in ppb)

FIGURE 7
WESTERN SAND & GRAVEL SITE
AREA OF ACCESS RESTRICTIONS

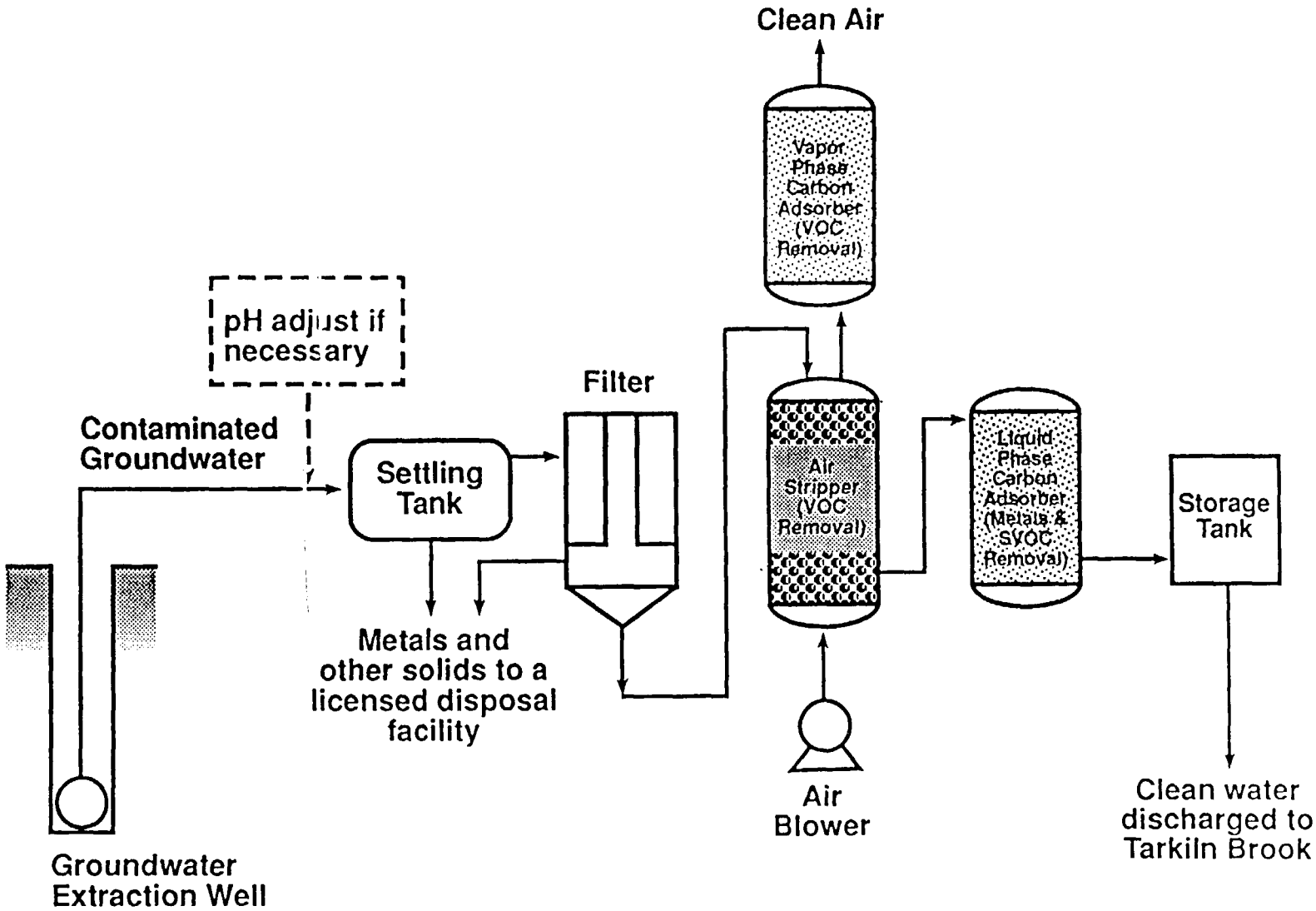


Legend

Drawing Not to Scale

- Wetlands
- Western Sand & Gravel Cap
- Approx. property lines
- Area of access restrictions

FIGURE 8
WESTERN SAND & GRAVEL SITE
ACTIVE RESTORATION PROCESS



APPENDIX B

RECORD OF DECISION
WESTERN SAND & GRAVEL SITE

LIST OF TABLES

TABLE 1
WESTERN SAND & GRAVEL SITE
OVERBURDEN GROUNDWATER - VOCS DETECTED

Parameter(ug/l)	Sample Total	Number of Detects	Maximum Conc.	Geometric Mean Conc.
Volatile Organics Detected				
Acetone	42	9	1400	1.1
Benzene	210	18	47	0.7
2-Butanone	42	2	600	0.9
Chlorobenzene	210	27	370	0.8
Chloroform	210	11	60	0.6
Chloromethane	210	1	16	0.5
1,1-Dichloroethane	210	47	160	1.0
1,2-Dichloroethane	210	1	3	0.5
1,1-Dichloroethene	210	1	11	0.6
1,2-Dichloroethene	210	86	760	1.7
Ethylbenzene	210	17	610	0.7
Methylene Chloride	210	77	280	0.8
4-Methyl-2-Pentanone	42	2	290	0.9
Tetrachloroethene	210	33	64	0.8
Toluene	210	22	2300	0.9
1,1,1-Trichloroethane	210	40	280	1.0
1,1,2-Trichloroethane	210	1	2	0.5
Trichloroethene	210	50	200	1.3
Vinyl Chloride	210	30	430	0.9
Xylene	210	24	1600	0.9

* Proposed
** MCL for total trihalomethanes
-- Criterion not available
(1988-1989 data)

TABLE 2
WESTERN SAND & GRAVEL SITE
OVERBURDEN GROUNDWATER – SVOCs DETECTED

Parameter (ug/l)	Sample Total	Number of Detects	Maximum Conc.	Geometric Mean Conc.
Semi-volatile Organics Detected				
Benzoic Acid	24	3	69+	5.6
4-Methylphenol	24	1	3+	1.0
Isophorone	24	4	20+	1.4
Bis(2-Ethylhexyl)Phthalate	24	15	30+	2.3
1,2-Dichlorobenzene	24	1	7+	1.1
Di-n-octyl Phthalate	24	1	4+	1.0
Naphthalene	24	2	8+	1.1
N-Nitrosodiphenylamine	24	1	3+	1.0
2-Methylnaphthalene	24	2	9+	1.1
1,2,4-Trichlorobenzene	24	1	3+	1.0
Di-n-butylphthalate	24	1	4+	1.0

* Proposed
-- Criterion not available
\+ Maximum concentration was estimated below the practical quantitative level
(1988-1989 data)

TABLE 3
WESTERN SAND & GRAVEL SITE
OVERBURDEN GROUNDWATER - HSL METALS DETECTED

Parameter (ug/l)	Sample Total	Number of Detects	Maximum Conc.	Geometric Mean Conc.
HSL Metals Detected				
Aluminum	18	4	13,100	71
Barium	18	15	321	68
Cobalt	18	1	55	11
Copper	18	1	40	10
Lead	18	13	17	1.6
Nickel	18	3	144	25
Silver	18	3	29	12
Zinc	18	17	269	25

* Proposed
-- Criterion not available
(1988-1989 data)

TABLE 4
WESTERN SAND & GRAVEL SITE
BEDROCK GROUNDWATER - VOCs AND SVOCs DETECTED

Parameter (ug/l)	Maximum Concentration* Detected in Wells C-4B	II-3B
Volatiles		
Chloromethane	ND	2
Vinyl Chloride	2	38
1,1-Dichloroethene	ND	1
1,1-Dichloroethane	2	77
1,2-Dichloroethene	2	22
1,2-Dichloroethane	ND	2
Chloroform	ND	4
1,1,1-Trichloroethane	ND	3
Trichloroethene	1	31
Benzene	ND	26
Tetrachloroethene	5	25
Toluene	9	110
Chlorobenzene	7	17
Ethylbenzene	7	290
Xylene	13	198
Acrolein	ND	11
Semi-Volatiles		
Isophoron	NA	4

* Based on four rounds of data collected during the RI (May 1988 - March 1989)

ND - Not detected
NA - Not analyzed

TABLE 5
WESTERN SAND & GRAVEL SITE
SURFACE WATER - VOCs, SVOCs AND METALS DETECTED

Volatiles	1 * STR1	1 STR2	1 STR3	2 * SUPL1#	2 SUPL11#	1 STR4A#	1 STR4B#	1 STR5
Acetone	2	3.5	2.5	7.5	5.5	5	4.5	--
Benzene	--	--	--	29	16	--	1	--
2-Butanone	--	--	--	2	--	--	--	--
Chlorobenzene	--	--	--	52	23	2	3	--
1,1-Dichloroethane	--	--	--	120	69	3	3	--
1,2-Dichloroethane	--	--	--	2	1	--	--	--
1,1-Dichloroethene	--	--	--	1	--	--	--	--
1,2-Dichloroethene	--	--	--	71	41	4	4	--
Ethylbenzene	--	--	--	--	--	3	3	--
Methylene Chloride	2.5	0.5	1	--	--	0.5	--	--
Tetrachloroethene	--	--	--	3	2	--	--	--
Toluene	--	--	--	390	190	9	9	--
1,1,1-Trichloroethene	--	--	--	57	35	2	2	--
Trichloroethene	--	--	--	3	3	--	--	--
Vinyl Chloride	--	--	--	51	55	--	--	--
Xylene	--	--	--	440	180	12	13	--

Semivolatiles

Isophrone at 2 ug/l in SUPL1 (August 1989) was the only semivolatile detected in the stream

Selected Metals**	STR1	STR3	SUPL1#	SUPL11#	STR5
Aluminum	<100	<100	<100	102	<100
Antimony	<10	<10	<10	<10	<10
Arsenic	<5	<5	<5	<5	<5
Barium	<50	<50	111	129	<50
Beryllium	<5	<5	<5	<5	<5
Cadmium	<5	<5	<5	<5	<5
Chromium	<10	<10	<10	<10	<10
Cobalt	<20	<20	<20	<20	<20
Copper	69	44	30	26	43
Lead	<2	<2	<2	<2	<2
Mercury	<0.2	<0.2	<0.2	<0.2	<0.2
Nickel	<40	<40	<40	<40	<40
Selenium	<2	<2	<2	<2	<2
Silver	<10	<10	<10	<10	<10
Thallium	<2	<2	<2	<2	<2
Vanadium	<50	<50	<50	<50	<50
Zinc	58	25	55	39	48

* Stream sample results for (1) September 1988 and (2) August 1989

** Calcium, magnesium, iron, potassium, manganese, and sodium not included due to negligible toxicity.

\# SUPL1 and SUPL11 are duplicate samples at location STR-SUPL and STR4A and STR4B are duplicate samples at location STR-4.

Compiled by BCM Engineers Inc. (BCM Project No. 00-4907-26)

TABLE 6
WESTERN SAND & GRAVEL SITE
SEDIMENTS - VOCs, SVOCs AND METALS DETECTED

Volatiles	1 * SED1	1 SED2	1 SED3	2 * SUPL1#	2 SUPL11#	1 SED4A	1 SED4
Acetone	27	--	--	50	24.5	19	22
Chloroform	1.5	--	--	--	3	--	--
Methylene chloride	26	10	12	17	63	21.5	13.5
Tetrachloroethene	--	--	--	--	120	--	--

Semivolatiles	SED1	SED3	SUPL1	SUPL11#	SED5
Acenaphthylene	110	--	--	--	--
Anthracene	93	--	--	--	--
Benzoic Acid	--	--	230	83	--
Benzo(a)Anthracene	430	--	--	--	--
Benzo(a)Fluoranthene	550	--	--	--	--
Benzo(b)Fluoranthene	1000	--	--	48	--
Benzo(g,h,i)Perylene	430	--	--	--	--
Benzo(k)Fluoranthene	1000	--	--	48	--
bis(2-chloroisopropyl)Ether	--	--	--	64	--
bis(2-Ethylhexyl)Phthalate	--	72	--	59	65
Chrysene	460	--	--	--	--
Fluoranthene	720	--	49	67	--
Ideno(1,2,3-cd)Pyrene	420	--	--	--	--
Phenanthrene	360	--	--	--	--
Pyrene	700	--	--	53	--

Selected Metals**	SED1	SED3	SUPL1#	SUPL11#	SED5
Aluminum	1750K	1590K	3460K	3300K	1920K
Antimony	<100	<100	<20	<20	<100
Arsenic	228	246	2170	997	364
Barium	7630	4600	21100	21300	5380
Beryllium	84	78	349	262	104
Cadmium	1010	<50	533	455	753
Chromium	1620	906	3920	3020	3870
Cobalt	<200	<200	<200	<200	<200
Copper	1370	<200	7610	4460	<200
Lead	29500	10500	23200	23100	15100
Mercury	<100	<100	<100	<100	<100
Nickel	4680	2890	7260	6890	3680
Selenium	<20	<20	<20	<20	26
Silver	<10	<10	<10	<10	<10
Thallium	<20	<20	53	40	<20
Vanadium	3650	1510	7370	7170	3450
Zinc	48800	10500	14300	13700	24900

* Sediment sample results for (1) September, 1988 and (2) August 1989
** Calcium, magnesium, iron, potassium, manganese and sodium not included not included due to negligible toxicity.
K = 1000
\# SUPL1 and SUPL11 are duplicate samples at location STR-SUPL.

Compiled by BCM Engineers Inc. (BCM Project No. 00-4907-26)

TABLE 7
WESTERN SAND AND GRAVEL SITE
CHEMICALS OF CONCERN FOR GROUNDWATER

Volatiles

Acrolein
Acetone
Benzene
Bromomethane
2-Butanone
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethene
trans-1,3-Dichloropropene
Ethylbenzene
Methylene chloride
4-Methyl-2-pentanone
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Trichlorofluoromethane
Xylene
Vinyl chloride

Metals

Aluminum
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Copper
Lead
Nickel
Silver
Zinc

Semivolatiles

Benzoic acid
bis(2-ethylhexyl)Phthalate
1,2-Dichlorobenzene
1,4-Dichlorobenzene
Di-n-Octyl Phthalate
Di-n-Butyl Phthalate
Isophorone
4-Methylphenol
2-Methylnaphthalene
Naphthalene
1,2,4-Trichlorobenzene
N-Nitrosodiphenylamine

TABLE 8
WESTERN SAND AND GRAVEL SITE
CHEMICALS OF CONCERN FOR SURFACE WATER AND SEDIMENTS

SEDIMENT

Volatiles

Acetone
Methylene chloride
Tetrachloroethene

Semivolatiles

Benzoic Acid

Metals

Arsenic
Barium
Beryllium
Cadmium
Chromium
Copper

SURFACE WATER

Volatiles

Acetone
Benzene
2-Butanone
Chlorobenzene
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethene (total)
Ethylbenzene
Methylene chloride
1,1,1-Trichloroethane
Tetrachloroethene
Toluene
Trichloroethene
Xylene
Vinyl chloride

Semivolatiles

Isophorone

Metals

Barium

TABLE 9
WESTERN SAND AND GRAVEL SITE
ASSUMPTIONS USED IN EXPOSURE CALCULATIONS

Ingestion - Groundwater	
Ingestion Rate (liters/day)	2
Body Weight (kg) - adult	70
Dermal Contact and Ingestion - Surface Water	
Skin surface area (cm^2)	5633
Exposure time (hours/event)	2.6
Exposure frequency (events/yr)	21
Exposure duration (yrs)	9
Ingestion rate (liters/event)	0.05
Body weight (kg) - child	40
Dermal Contact - Sediment	
Skin surface area (cm^2)	5633
Adherence factor (mg/cm^2)	0.5
Absorption factor-metals, organics	0.01, 0.5
Skin coverage factor	0.5
Exposure frequency (events/yr)	21
Exposure duration (yrs)	9
Body weight (kg) - child	40

TABLE 10
WESTERN SAND & GRAVEL SITE
CUMULATIVE CARCINOGENIC RISK ESTIMATES AND HAZARD INDICES
INGESTION - GROUNDWATER

Well Groupings		Cancer Risk Estimates Avg	RME	Hazard Index Avg	RME
1	On-site overburden	$3x10^{-4}$	$3x10^{-2}$	$3x10^{-1}$	$5x10^{0}$
2	On-site overburden & bedrock	$1x10^{-4}$	$3x10^{-2}$	$3x10^{-1}$	$5x10^{0}$
3	Off-site overburden	$7x10^{-5}$	$3x10^{-3}$	$2x10^{-1}$	$1x10^{0}$
4	Off-site overburden & bedrock	$7x10^{-5}$	$3x10^{-3}$	$2x10^{-1}$	$1x10^{0}$
5	Residential overburden	$4x10^{-6}$	$2x10^{-5}$	$1x10^{-2}$	$7x10^{-2}$
6	Residential bedrock	$2x10^{-6}$	$2x10^{-5}$	$1x10^{-2}$	$1x10^{-1}$
7	Residential unknown depth	$4x10^{-7}$	$5x10^{-6}$	$<5x10^{-4}$	$1x10^{-2}$

TABLE 11
WESTERN SAND & GRAVEL SITE
CUMULATIVE CARCINOGENIC RISK ESTIMATES AND HAZARD INDICES
DERMAL CONTACT AND INGESTION - SURFACE WATER

Chemical	Potency Factor (mg/kg/day)-1	Dermal Permeability Constant	Maximum Conc. ug/L		Reasonable Maximum Exposure mg/kg-day		Reasonable Maximum Cancer Risk	
			Seep	Stream	Seep	Stream	Seep	Stream
		CARCINOGENIC RISK						
Benzene	2.9E-02	1.6E-01	2.9E+01	1.0E+00	1.3E-05	4.4E-07	3.8E-07	1.3E-08
1,1-Dichloroethane	9.1E-02	1.0E-01	1.2E+02	3.0E+00	3.4E-05	8.4E-07	3.1E-06	7.6E-08
1,1-Dichloroethene	6.0E-01	1.0E-01	1.0E+00	ND	2.8E-07	-	1.7E-07	-
1,2-Dichloroethane	9.1E-02	1.0E-01	2.0E+00	ND	5.6E-07	-	5.1E-08	-
Isophorone	4.1E-03	5.0E-03	2.0E+00	ND	4.6E-08	-	1.9E-10	-
Methylene chloride	7.5E-03	1.0E-01	ND	2.5E+00	ND	7.0E-07	-	5.3E-09
Tetrachloroethene	5.1E-02	2.0E-01	3.0E+00	ND	1.7E-06	-	8.4E-08	-
Trichloroethene	1.1E-01	1.0E-01	3.0E+00	ND	8.4E-07	-	9.2E-08	-
Vinyl chloride	2.3E+00	1.0E-01	5.5E+01	ND	1.5E-05	-	3.5E-05	-
						Total	4E-05	9E-08

Chemical	Oral Reference Dose mg/kg/day	Dermal Permeability Constant	Maximum Conc. ug/L		RME Exposure mg/kg-day		RME Hazard Index	
			Seep	Stream	Seep	Stream	Seep	Stream
	NONCARCINOGENIC HAZARD							
Barium	5.0E-02	3.0E-02	1.3E+02	ND	3.7E-04	-	7.4E-03	-
1,2-Dichloroethene(total)	2.0E-02	1.0E-01	7.1E+01	7.1E+01	6.3E-04	3.5E-05	3.1E-02	1.8E-03
Chlorobenzene	2.0E-02	1.0E-01	5.2E+01	5.2E+01	4.6E-04	2.7E-05	2.3E-02	1.4E-03
Toluene	3.0E-01	5.0E-02	3.9E+02	3.9E+02	1.8E-03	4.1E-05	5.9E-03	1.4E-04
1,1-Dichloroethane	1.0E-01	1.0E-01	1.2E+02	1.2E+02	1.1E-03	2.7E-05	1.1E-02	2.7E-04
Acetone	1.0E-02	5.0E-03	7.5E+00	7.5E+00	5.4E-06	3.6E-06	5.4E-04	3.6E-04
1,1,1-Trichloroethane	9.0E-02	6.0E-03	5.7E+01	5.7E+01	4.6E-05	1.6E-06	5.1E-04	1.8E-05
Tetrachloroethene	1.0E-02	2.0E-01	3.0E+00	3.0E+00	5.2E-05	-	5.2E-03	-
Ethylbenzene	1.0E-02	1.0E+00	ND	ND	-	2.6E-04	-	2.6E-02
Xylene	2.0E+00	8.0E-02	4.4E+02	4.4E+02	3.1E-03	9.3E-05	1.6E-03	4.7E-05
1,1-Dichloroethene	9.0E-03	1.0E-01	1.0E+00	1.0E+00	8.8E-06	-	9.8E-04	-
Methylene chloride	6.0E-02	1.0E-01	ND	ND	-	2.2E-05	-	3.7E-04
2-Butanone	5.0E-02	5.0E-03	2.0E+00	2.0E+00	1.4E-06	-	2.8E-05	-
Isophorone	2.0E-01	5.0E-03	2.0E+00	2.0E+00	1.4E-06	-	7.0E-06	-
							8.7E-02	3.0E-02

TABLE 12
WESTERN SAND & GRAVEL SITE
CUMULATIVE CARCINOGENIC RISK ESTIMATES AND HAZARD INDICES
DERMAL CONTACT - SEDIMENTS

Chemical	Potency Factor (mg/kg/day)-1	Absorption Factor	Maximum Conc. ug/kg		Reasonable Maximum Exposure mg/kg-day		Reasonable Max. Cancer Risk	
			Seep	Stream	Seep	Stream	Seep	Stream
			CARCINOGENIC RISK					
Tetrachloroethene	5.1E-02	5.0E-01	1.2E+02	ND	3.1E-09	-	1.6E-10	-
Methylene chloride	7.5E-03	5.0E-01	6.3E+01	2.6E+01	1.6E-09	6.8E-10	1.2E-11	5.1E-12
						Total	1.7E-10	5.1E-12

Chemical	Oral Reference Dose mg/kg/day	Absorption Factor	Maximum Conc. ug/L		RME Exposure mg/kg-day		RME Hazard Index	
			Seep	Stream	Seep	Stream	Seep	Stream
			NONCARCINOGENIC HAZARD					
Acetone	1.0E-01	5.0E-01	5.0E+01	2.7E+01	4.1E-08	2.2E-08	4.1E-07	2.2E-07
Methylene chloride	6.0E-02	5.0E-01	6.3E+01	2.6E+01	5.2E-08	2.1E-08	8.7E-07	3.5E-07
Tetrachloroethene	1.0E-02	5.0E-01	1.2E+02	ND	9.9E-08	_	9.9E-06	-
Benzoic acid	4.0E+00	5.0E-01	2.3E+02	ND	1.9E-07	_	4.8E-08	-
Arsenic	1.0E-03	1.0E-02	2.2E+03	3.6E+02	1.8E-07	3.0E-08	1.8E-04	3.0E-05
Barium	5.0E-02	1.0E-02	2.1E+04	7.6E+03	1.7E-06	6.3E-07	3.4E-05	1.3E-05
Beryllium	5.0E-03	1.0E-02	3.5E+02	1.0E+02	2.9E-08	8.5E-09	5.8E-06	1.7E-06
Cadmium	1.0E-03	1.0E-02	5.3E+02	1.0E+03	4.4E-08	8.3E-08	4.4E-05	8.3E-05
Chromium	5.0E-03	1.0E-02	3.9E+03	3.9E+03	3.2E-07	3.2E-07	6.4E-05	6.4E-05
Copper	3.7E-02	1.0E-02	7.6E+03	1.4E+03	6.3E-07	1.1E-07	1.7E-05	3.0E-06
						Total	3.6E-04	1.9E-04

TABLE 13
WESTERN SAND & GRAVEL SITE
ALTERNATIVES SCREENED DURING FEASIBILITY STUDY

General Response Actions	Remedial Technologies	Alternatives 1	2	3	4	5	6	7
No Further Action		*						
Institutional Actions	Groundwater Monitoring	*	*	*	*	*	*	*
	Temporary Access Restrictions Use Restrictions Property Acquisition		**		**	**	**	**
	Temporary Alternate Water Supply Well Head Treatment Use of Existing Supply System Alternate Water Source			**	**	**	**	**
Collection	Extraction Wells				*	*	*	*
Treatment	Onsite: Solids Removal/ Precipitation Air Stripping Carbon Absorption					**	**	**
	Offsite: POTW Private Facility							*
Discharge	Onsite: Local Surface Water				*	*		
	Groundwater						*	
	Offsite: POTW							*

** Any of the technologies identified in the group can be used for the alternative.

TABLE 14
WESTERN SAND & GRAVEL SITE
ALTERNATIVES EVALUATED DURING DETAILED ANALYSIS

	Groundwater Restoration		Controls			Monitoring	
	Natural	Active	Access		Well Head	Groundwater	Surface Water & Sediments
1	✓					✓	
2	✓		✓			✓	
3	✓				✓	✓	
4		✓*	✓	or	✓	✓	
5		✓**	✓	or	✓	✓	
6	✓	***	✓			✓	✓

* Discharge to Tarkiln Brook
** Discharge to groundwater with excess flow to Tarkiln Brook
*** Contingent active restoration

TABLE 15
WESTERN SAND & GRAVEL SITE
SELECTED GROUNDWATER INTERIM CLEANUP LEVELS

Chemical	Reference Dose(oral) (mg/kg/day)	Carc. Potency Factor(oral) (mg/kg/day)-1	Int Cleanup Level (mg/L)	Basis	Cancer Risk Level	Noncancer Hazard Index	Noncancer Target Endpoint
(Volatile Organics)							
Acetone	1.0E-01	-	3.5E+00	HB	-	1.0E+00	liver, kidney
Benzene	-	2.9E-02	5.0E-03	MCL	4.2E-06	-	
2-Butanone	5.0E-02	-	1.8E+00	HB	-	1.0E+00	fetotoxicity
Chlorobenzene	2.0E-02	-	1.0E-01	PMCLG	-	1.5E-01	liver, kidney
Chloroform*	1.0E-02	6.1E-03	1.0E-01	MCL	1.8E-05	2.9E-01	liver
Chloromethane	-	1.3E-02	3.0E-03	RB	1.1E-06	-	
1,1-Dichloroethane	1.0E-01	-	3.5E+00	HB	-	1.0E+00	none
1,2-Dichloroethane		9.1E-02	5.0E-03	MCL	1.3E-05	-	
1,1-Dichloroethene	9.0E-03	6.0E-01	7.0E-03	MCL	1.2E-04	2.3E-02	liver
1,2-Dichloroethene (1)	2.0E-02	-	7.0E-02	PMCLG	-	1.0E-01	blood
Ethylbenzene	1.0E-01	-	7.0E-01	PMCLG	-	2.0E-01	liver, kidney
Methylene Chloride	6.0E-02	7.5E-03	5.0E-03	MCL	1.1E-06	2.4E-03	liver
4-Methyl-2-pentanone	5.0E-02	-	1.8E+00	HB	-	1.0E+00	liver, kidney
Tetrachloroethene	1.0E-02	5.1E-02	5.0E-03	MCL	7.4E-06	1.5E-02	liver
Toluene	2.0E-01	-	1.0E+00	MCL	-	1.5E-01	organ weight
trans-1,3-Dichloropropene	3.0E-04	1.8E-01	5.0E-03	DL	2.6E-05	4.8E-01	organ weight
1,1,1-Trichloroethane	9.0E-02	-	2.0E-01	MCLG	-	6.4E-02	liver
1,1,2-Trichloroethane	4.0E-03	5.7E-02	3.0E-03	PMCLG	5.0E-06	2.2E-02	clinical chem.
Trichloroethene	-	1.1E-02	5.0E-03	MCL	1.6E-06	-	
Xylene	2.0E+00	-	1.0E+01	PMCLG	-	1.5E-01	body weight, mortality
Vinyl chloride	-	1.9E+00	2.0E-03	MCL	1.1E-04	-	
Bromomethane	1.4E-03	-	3.5E-02	HB	-	7.3E-01	stomach
1,1,2,2-Tetrachloroethane	-	2.0E-01	1.0E-03	DL	-	-	
Chloroethane	-	-	1.4E+01	HB*	-	1.0E+00	blood, CNS
Acrolein	-	-	-	CNA	-	-	
Trichlorofluromethane	3.0E-01	-	1.0E+01	HB	-	9.7E-01	mortality

TABLE 15 - CONTINUED
WESTERN SAND & GRAVEL SITE
SELECTED GROUNDWATER INTERIM CLEANUP LEVELS

Chemical	Reference Dose(oral) (mg/kg/day)	Carc. Potency Factor(oral) (mg/kg/day)-1	Int Cleanup Level (mg/L)	Basis	Cancer Risk Level	Noncancer Hazard Index	Noncancer Target Endpoint
(Semivolatiles)							
Benzoic acid	4.0E+00	-	1.4E+02	HB	-	1.0E+00	irritation, malais
bis(2-ethylhexyl)phthalate	2.0E-02	1.4E-02	4.0E-03	PMCL	1.6E-06	5.8E-03	liver
Isophorone	2.0E-01	4.1E-03	8.4E-03	RB	1.0E-06	1.2E-03	kidney
2-Methylnaphthalene	-	-	-	CNA	-	-	
4-Methylphenol	5.0E-02	-	1.8E-01	HB	-	1.0E-01	neurotoxicity
Napthalene	4.0E-03	-	1.4E-01	HB	-	1.0E+00	body weight
N-nitrosodiphenylamine	-	4.9E-03	1.0E-02	DL	1.4E-06	-	
1,2,4-Trichlorobenzene	1.3E-03	-	9.0E-03	PMCLG	-	2.0E-01	blood
1,2-Dichlorobenzene	9.0E-02	-	6.0E-01	PMCLG	-	1.9E-01	liver
1,4-Dichlorobenzene	-	2.4E-02	7.5E-02	MCLG	5.2E-05	-	
Di-n-octyl phthalate	2.0E-02	-	7.0E-01	HB	-	1.0E+00	liver, kidney
Di-n-butyl phthalate	1.0E-01	-	4.0E-03	PMCL	-	1.2E-03	mortality
(Metals)							
Aluminum	-	-	5.0E-02	SMCL	-	-	
Barium	7.0E-02	-	1.0E+00	PMCLG	-	4.1E-01	blood pressure
Cobalt	-	-	-	CNA	-	-	
Lead	-	-	5.0E-03	PMCL	-	-	
Nickel	2.0E-02	-	1.0E-01	PMCLG	-	1.5E-01	body, organ weight
Silver	3.0E-03	-	9.0E-02	SMCL	-	8.7E-01	argyria-skin
Zinc	2.0E-01	-	5.0E+00	SMCL	-	7.3E-01	blood
				Total	3.7E-04	Weight Change: 6.1E+00	
						Liver: 4.1E+00	
						Kidney: 2.5E+00	
						Blood: 2.4E+00	
						Mortality: 1.1E+00	

TABLE 15 - CONTINUED
WESTERN SAND & GRAVEL SITE
SELECTED GROUNDWATER INTERIM CLEANUP LEVELS

NOTES

MCL - Maximum Contaminant Level
PMCL - Proposed Maximum Contaminart Level
MCLG - Maximum Contaminant Level Goal
PMCLG - Proposed Maximum Contaminant Level Goal
SMCL - Secondary Maximum Contaminant Level
RB - Risk Based (carcinogens)
HB - Hazard Based (noncarcinogens)
HB* - The clean-up level for chloroethane is based on the RfD for chlorobutane.
A structural similarity is assumed.
CNA - Criteria Not Available
RSD - Risk Specific Dose
DL - Detection Limit
Chloroform* - The MCL for total trihalomethanes was used for chloroform.

(1) Since the specific 1,2-Dichlorothene isomer was not identified in the RI Report, the MCL for the cis" isomer is cited. The cleanup level may be overprotective if the isomer detected is the "trans" isomer.

TABLE 16
WESTERN SAND & GRAVEL SITE
APPLICABLE, RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

ARAR	Specific Type	Legal Citation	Potential Legal Classification	Explanation of Classification	Applicability to FS Options
Federal-Contaminant					
Safe Drinking Water Act					
a. Maximum Contaminant Levels (MCLs)	Contaminant	40 CFR 141	Relevant and Appropriate	Enforceable standards for public drinking water water supply systems (at least 25 persons)	MCLs apply to public water systems which provide piped water for human consumption and are relevant and appropriate to cleanup levels to be achieved by CERCLA remedial actions for drinking water aquifers
b. Maximum Contaminant Level Goals (MCLGs)	Contaminant	40 CFR 141.50-51	Relevant and Appropriate	Non-enforceable health goals for public water	Non-zero MCLGs are relevant and appropriate standards for drinking water sources.
c. Secondary Maximum Contaminant Levels		40 CFR 143	Relevant and Appropriate	Non-enforceable guidelines for public drinking water systems	
EPA Health Advisories	Contaminant	To Be Considered	Applicable	Non-enforceable guidelines for public water supply systems	To be considered for remedial actions involving groundwater monitoring, recovery, and treatment
Health Effects Assessments	Contaminant	To Be Considered	Relevant and Appropriate	Non-enforceable toxicity data for specific chemicals for use in public health assessments. Also to be considered are Carcinogenic Potency Factors and Reference Doses provided in the Superfund Public Health Evaluation Manual.	To be considered where remedial alternatives address risk-based criteria or standard setting for cleanup Also applies to dust emissions, emissions during excavations, and emission from leachate- or groundwater treatment limits

TABLE 16 - CONTINUED
WESTERN SAND & GRAVEL SITE
APPLICABLE, RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

ARAR	Specific Type	Legal Citation	Potential Legal Classification	Explanation of Classification	Applicability to FS Options
Clean Water Act					
a. Water Quality	Contaminant	EPA 44/5-86-001	Applicable	Non-enforceable guidance developed under Clean Water Act and used by the state, in conjunction with a designated use for a stream segment to establish water quality standards	To be considered if there is a discharge to a stream that may affect aquatic organisms or human exposure from drinking the water and from consuming aquatic organisms
b. Ambient Water Quality Criteria	Contaminant	PL 92-5000 Section 304(a)(1)	Relevant and Appropriate	Non-enforceable criteria used to develop standards	To be considered for actions that involve groundwater treatment and discharge to surface water
State-Contaminant					
Rhode Island Water Quality Standards	Contaminant	RIGL 46-12	Applicable	Set criteria to meet Clean Water Act Standards for the intended use of state waters	To be used when there is a discharge of recovered groundwater to surface waters
Rhode Island Water Quality Regulations	Contaminant	RIGL 46-12,	Applicable	Regulates restoration, enhancement, and preservation of state waters	
Federal-Location					
RCRA Location Requirements	Location		Applicable	Limitations on where onsite storage treatment or disposal of hazardous	To be considered when remedial actions involve onsite actions
EPA Groundwater Protection Standard	Location		To Be Considered	EPA policy regarding protection of groundwater resources for its highest present or beneficial use	The aquifer beneath the site is considered to be of IIA Classification. The groundwater protection strategy requires consideration of applicable standards

TABLE 16 - CONTINUED
WESTERN SAND & GRAVEL SITE
APPLICABLE, RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

ARAR	Specific Type	Legal Citation	Potential Legal Classification	Explanation of Classification	Applicability to FS Options
Federal Protection of Wetlands Executive Order	Location	E.O. 11990	Applicable	Requires federal agencies to take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands	To be considered when reviewing remedial alternatives which may impact nearby wetlands
The Fish and Wildlife Coordination Act	Location	16 USC 661	Applicable	Requirements for the modification of any body of water	To be considered should remedial action potentially impact wetlands or protected habitats
a. The Fish and Wildlife Improvement Act of 1978	Location	16 USC 742a	Applicable	Provide for consideration of the impacts on wetlands and protected habitats	To be considered if remedial action could impact wetlands or protected habitats
b. The Fish and Wildlife Conservation Act of 1980	Location	16 USC 2902	Applicable	Provide for consideration of the impacts on wetlands and protected habitats	To be considered if remedial action could impact wetlands or protected habitats

TABLE 16 - CONTINUED
WESTERN SAND & GRAVEL SITE
APPLICABLE, RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

ARAR	Specific Type	Legal Citation	Potential Legal Classification	Explanation of Classification	Applicability to FS Options
State-Location					
Rhode Island Ground-Water Protection Act of 1985	Location	RIGL-46-13.1	To Be Considered	Establishes the state's classification system for groundwater resources	Protection and restoration requirements to be considered when finalized
Rhode Island Freshwater Wetlands Act	Location	RIGL - Title 2	Applicable	Regulates and preserves swamps, marshes, and wetlands. Requires capacity maintenance to support wildlife and act as a buffer zone for flood conditions	To be considered should remedial actions potentially affect swamps, marshes, or wetlands
Federal-Action					
Clean Water Act	Action	Section 404 and 40 CFR Part 230	Applicable	Prohibits discharge of dredged or fill material into waters of the U.S., including wetlands	Applicable to placement of fill material necessary to construct any of the alternatives
DOT Rules for Hazardous Materials	Action	49 CFR Parts	Applicable	Regulations for transport of hazardous materials	Applicable to wastes shipped offsite for laboratory analysis, treatment, or disposal

TABLE 16 - CONTINUED
WESTERN SAND & GRAVEL SITE
APPLICABLE, RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

ARAR	Specific Type	Legal Citation	Potential Legal Classification	Explanation of Classification	Applicability to FS Options
Occupational Health and Safety Act	Action	29 CFR Parts 1904, 1910, and 1926	Applicable	Provides occupational safety and health requirements for workers engaged in onsite field activities	Area applicable to onsite work performed during implementation of a remedial
The Clean Air Act	Action	40 CFR 50	Applicable	Establish air emission standards	Are applicable for potential releases resulting from remedial activities
General Pre-treatment Regulations	Action	40 CFR 403	Applicable	Standard for discharge to publicly-owned treatment works (POTW)	To be considered should remedial action entail discharge to POTW
State-Action					
Rhode Island Hazardous Waste Rules and Regulations	Action		Relevant and Appropriate	Correspond to RCRA hazardous waste regulations	To be considered with RCRA regulations
Rhode Island Air Pollution Control Regulations	Action		Applicable	Details the requirements of limitations and exemptions of state air emission regulations specified substances	To be considered for potential air releases resulting from remedial activities
Rhode Island Air Pollution Control Act	Action		Applicable	Outlines the policy of preserving, protecting, and improving the air resources of Rhode Island	To be considered for potential air releases resulting from remedial activities
Rhode Island Air Toxic Regulations	Action	Regulation No. 22	Relevant and Appropriate	Limits the emission of listed substances from stationary sources	To be considered for potential air releases resulting from remedial activities
Rhode Island Pre-treatment Regulations	Action		Relevant and Appropriate	Rhode Island standards for discharge to POTWs	To be considered should remedial action entail discharge to POTW
Rhode Island Pollutant Discharge Elimination System Regulations	Action		Applicable	Rhode Island permit requirements for discharge to state surface waters	To be considered should remedial action entail discharge to surface waters
Underground Injection Control Program Rules & Regulations	Action		Applicable	Requirements for underground injection of groundwater	To be considered should remedial action entail discharge to groundwater

APPENDIX C

RECORD OF DECISION
WESTERN SAND & GRAVEL SITE

RESPONSIVENESS SUMMARY

United States
Environmental Protection Agency
Region I

S U P E R F U N D

Responsiveness Summary
Western Sand & Gravel Site
Burrillville, Rhode Island

March 1991

Table of Contents

Preface

The U.S. Environmental Protection Agency (EPA) held a 30-day comment period from February 12, 1991 to March 13, 1991 to provide an opportunity for interested parties to comment on the Groundwater Feasibility Study (FS), Feasibility Study Addendum, the Proposed Plan and other documents developed for the Western Sand & Gravel Superfund Site (the Site) in Burrillville, Rhode Island. The FS and FS Addendum examined and evaluated various options, called remedial alternatives, to address groundwater contamination at the Site. EPA identified its preferred alternative for addressing groundwater contamination in the Proposed Plan issued on February 4, 1991. All the documents for the Site were placed in the Administrative Record for review. The Administrative Record is a collection of all the documents considered by EPA to choose the remedy for the Site. It was made available at the EPA Records Center at 90 Canal Street in Boston, Massachusetts and at the Burrillville Town Building at 105 Harrisville Main Street in Harrisville, Rhode Island.

The purpose of this Responsiveness Summary is to document EPA responses to the questions and comments raised during the public comment period on the FS, FS Addendum, Proposed Plan and other documents in the Administrative Record. EPA considered all of these questions and comments before selecting the final remedial alternative to address the groundwater contamination at the Western Sand & Gravel Site.

This Responsiveness Summary is organized into the following sections:

I. ***Overview of Remedial Alternatives Considered in The Groundwater Feasibility Study and Feasibility Study Addendum, Including the Preferred Alternative*** — This section briefly outlines the remedial alternatives evaluated in the Groundwater FS, FS Addendum, and the Proposed Plan, including EPA's preferred alternative.

II. ***Background on Community Involvement and Concerns*** — This section provides a brief history of community interests and concerns regarding the Site.

III. ***Summary of Comments Received During the Public Comment Period and EPA Responses*** — This section summarizes and provides EPA responses to the oral and written comments received from the public during the public comment period. In Part I, the comments received from citizens are presented. Part II contains comments from the State. Part III summarizes comments received from potentially responsible parties (PRPs).

IV. ***Remaining Concerns*** — This section describes issues that may continue to be of concern to the community during the design and implementation of EPA's selected remedy for the Site. EPA will address these concerns during the Remedial Design/Remedial Action phase of the groundwater cleanup process.

In addition, two attachments are included in this Responsiveness Summary. Attachment A provides a list of the community participation activities that EPA and the Rhode Island Department of Environmental Management (RIDEM) have conducted to date at the Site. Attachment B contains a copy of the transcript from the informal public hearing held on February 28, 1991 in Burrillville, RI.

I. Overview of Remedial Alternatives Considered in the Groundwater Feasibility Study and Feasibility Study Addendum, including the Preferred Alternative

The cleanup plan selected by EPA will restore contaminated groundwater to target cleanup levels through natural attenuation. The remedy requires groundwater monitoring to ensure that levels of contamination decrease to safe levels in 24 to 28 years, or sooner, as predicted by groundwater modeling. Progress at the Site will be evaluated every 3 years for the first 9 years, and every 5 years thereafter. A groundwater collection and on-site treatment system will be employed if natural attenuation fails to achieve EPA's groundwater cleanup goals in the projected time frame. The cleanup plan will use institutional controls to prevent any use of groundwater until contaminant concentrations have decreased to safe levels. Additional data will be collected under the provisions of the existing consent decree with the potentially responsible parties (PRPs) to further characterize the impacts to the bedrock system, the surface water and sediments. After reviewing the results of these investigations, EPA will determine if it is necessary to modify the selected remedy to include active restoration of the groundwater and/or long-term monitoring of the bedrock system, surface water and sediments. The estimated net present worth of the groundwater cleanup is $1.1 million if natural attenuation is allowed to clean the aquifer, or $4 million if active treatment of the groundwater is needed.

In the Groundwater FS and FS Addendum EPA evaluated a total of six potential cleanup alternatives, including the preferred alternative presented in the Proposed Plan, for groundwater contamination at the Western Sand & Gravel Site. The other five alternatives are described briefly below.

Alternative 1: Groundwater Restoration by Natural Attenuation and Groundwater Monitoring (No Action) This alternative did not include restrictions on groundwater use.

Alternative 2: Groundwater Restoration by Natural Attenuation, Groundwater Monitoring, and Temporary Access Restrictions for Potential Future Residents This alternative included access restrictions for an area larger than the area selected by EPA.

Alternative 3: Groundwater Restoration by Natural Attenuation, Groundwater Monitoring, and Well Head Treatment for Potential Future Residents This alternative included the use of filters to protect potential future residents from contaminated groundwater instead of access restrictions.

Alternative 4: Active Groundwater Restoration with Discharge to Surface Water, Groundwater Monitoring, and Temporary Access Restrictions or Well Head Treatment for Potential Future Residents This alternative proposed immediate treatment of groundwater to be continued for approximately 11 to 17 years.

Alternative 5: Active Groundwater Restoration with Discharge to Groundwater and Surface Water, Groundwater Monitoring, and Temporary Access Restrictions or Well Head Treatment for Potential Future Residents This alternative proposed immediate treatment of groundwater to be continued for approximately 10 years.

In addition, Alternatives 1 through 5 did not provide for additional activities after a review of the data on the bedrock, surface water and sediments.

Additional information on each of the remedial alternatives can be found in the Record of Decision (ROD), copies of which are located in the Town Clerk's Office in the Burrillville Town Building at 105 Harrisville Main Street in Harrisville, Rhode Island, and the EPA Records Center at 90 Canal Street in Boston, Massachusetts.

II. Background on Community Involvement and Concerns

Site History

The Western Sand & Gravel Site is located in the towns of Burrillville and North Smithfield, Rhode Island. The area around the Site is primarily semi-rural residential. The 20-acre Site overlies the Slatersville Aquifer, a potential major drinking water source for the State of Rhode Island.

The Site was an active sand and gravel quarry from 1953 until 1975. From 1975 to 1979, 12 acres at the north end of the Site were used for the disposal of liquid chemical and septic wastes. Contents of tank trucks were emptied directly into 12 open lagoons and pits, none of which was lined to prevent materials from escaping. Over time the wastes penetrated into the soil and reached the groundwater. A plume of contaminated groundwater spread north and northwest towards wells supplying drinking water to homes on nearby properties.

Chemical dumping on the Site stopped in 1979 following efforts by RIDEM to close the Site for violations of state regulations. In 1980, EPA removed approximately 60,000 gallons of liquid wastes remaining in the lagoons. In 1981, EPA proposed the

addition of the Western Sand & Gravel Site to the National Priorities List making it eligible to receive federal Superfund monies for investigation. In 1982, RIDEM took the lead responsibility for the Site investigations and began a groundwater recirculation program in an effort to control the spread of contaminants in the groundwater.

In 1984, EPA issued a ROD that required the installation of a permanent alternate water supply to service approximately 56 parcels of land, and the installation of water filters to provide protection for homes with contaminants identified in their wells until the permanent alternate water supply is functional. Starting in August 1984, Olin Hunt Specialty Products, Inc. (Hunt), a potentially responsible party (PRP), installed water filters in private homes with contaminated wells and in homes with wells that might become contaminated. EPA began construction of the water supply in 1990.

After conducting additional studies, EPA issued a second ROD in 1985. This ROD required the installation of an impermeable cap over the contaminated soils and a study to evaluate groundwater contamination and determine alternatives for groundwater cleanup. Construction of the cap was completed by Hunt in 1987.

Hunt submitted the Groundwater Remedial Investigation (RI) Report in June 1990 and the Groundwater FS Report in October 1990 to EPA and RIDEM. EPA and RIDEM had comments on both of these reports. EPA prepared addenda to both reports to address the comments developed by both EPA and RIDEM. The purpose of EPA's addenda was to present the conclusions as determined by EPA based on the data collected by Hunt.

History of Community Activity at the Western Sand & Gravel Site

In the past, community interest and activity around the Site had been very intense. In 1978, local citizens formed a group called Protect Our Water (POW) in response to the potential hazards posed by the Western Sand & Gravel Site and the other hazardous waste sites in the area. In 1979, the Town Councils of Burrillville and North Smithfield held a joint meeting to discuss the problems caused by the Western Sand & Gravel Site. In December 1982, the Western Sand & Gravel Hazardous Waste Coordinating Committee was formed by the Burrillville Town Council at the suggestion of RIDEM to facilitate communication between RIDEM and local government on matters involving the Site. The Committee included representatives of POW, the Burrillville Town Council, the Burrillville Conservation Commission, the Burrillville Building Inspector, and the RIDEM Project Officer. The committee met on a quarterly basis and the meetings were open to the public and attended by the press. EPA's own public meetings on the proposed water supply in 1984 drew between 50 and 100 persons each. The 1985 public meetings on the capping proposal, however, drew only 10 to 20 attendees. The Coordinating Committee was never officially disbanded, but it has not been active for almost five years.

Community Interests During the Groundwater FS

Community interest and awareness about the Western Sand & Gravel Site has been relatively low during the FS and public comment period compared to the activity that took place during the initial Site investigations. Many residents contacted for community interviews in the Summer of 1990, including those who had been very involved in the early stages of Site discovery and listing, were not aware that another remedy (groundwater treatment) remained to be decided upon. One resident noted that lack of opportunity for citizen participation had not been the problem; rather, a high rate of turnover in the neighborhood had contributed to a lower level of interest in the community. Community concerns expressed in public meeting proceedings, resident interviews, and contacts with public officials prior to the release of the Proposed Plan for groundwater cleanup are listed below.

1. ***Paving of Pulaski and Gig Roads.*** Some residents believe EPA should pave Pulaski and Gig roads after construction of the water line.

2. ***Responsibility for costs of future connections to the water supply.***

3. ***Concerns regarding construction of the waterline.*** Concerns included dust during construction, the location of the main and hydrants, the locations of household connections to the main, and the type of valves to be used.

4. ***Safety of using private wells for non-drinking water purposes.***

5. ***Potential Contamination of the New Water Supply Wells.***

6. ***Safety of eating fish caught in the Reservoir.***

7. ***Technical Feasibility of Groundwater Cleanup.***

8. ***Diminished Property Values.***

9. ***Need for communication of all well test results to residents.***

10. ***Distribution of Meeting Summaries to those who could not attend.***

11. ***Excessive length of time between EPA communications with residents.***

Approximately 20 residents attended the public informational meeting held on February 11, 1991 by EPA. The principal community concerns expressed at that meeting are given below.

- ***Potential ecological stress on Tarkiln Brook and the Slatersville Reservoir.*** Residents were unclear on the definition of "stress" and were concerned with the potential for additional off-site spread of the contamination.

- ***Proposed groundwater monitoring programs.*** Residents wanted to know if household well monitoring would continue and if new bedrock monitoring would be performed.

- ***Criteria for implementation of active groundwater treatment.*** Residents were interested in monitoring EPA's future Site evaluations and cleanup decisions.

- ***Financing of the cleanup.*** Residents wanted to know which PRPs would be approached regarding the cost of the cleanup.

- ***Operation of the access restrictions.*** Residents questioned whether EPA would have to pay the potentially responsible parties for the right to restrict groundwater access.

- ***Safety of the new water supply.*** Residents were concerned over the possibility of Site contamination reaching the new water supply.

III. Summary of Comments Received During the Public Comment Period and EPA Responses

This Responsiveness Summary addresses the comments received by EPA during the public comment period (February 12 to March 13, 1991) concerning the Groundwater FS, FS Addendum, EPA's Proposed Plan for groundwater cleanup and other documents in the Administrative Record for the Western Sand & Gravel Site. Four sets of written comments were received during the public comment period from RIDEM, Hunt, the Nasonville Water District, and a resident of the area near the Site. A local citizen and a representative of RIDEM submitted oral comments at the informal public hearing. A copy of the public hearing transcript is included as Attachment B to this document.

Part I — Citizen Comments

The citizen who commented at the hearing also submitted her comments in written form dated February 28, 1991. Comments from the Nasonville Water District were submitted by their attorney in a letter dated March 11, 1991.

Comment 1: The resident stated that the preferred alternative is not a cleanup because it does not physically and actively "clean" the groundwater. She also noted that the last two major remedies at the Site, the cap and the permanent water supply, were not cleanups for the same reason.

EPA Response: The selected remedy initially relies on natural attenuation to restore the contaminated groundwater at the Site. However, if the groundwater is not restored at the rate predicted by models or faster, then active restoration shall be utilized. Natural attenuation has been occurring through out the history of the Site and has significantly reduced the levels of contamination. According to an analysis of the

actual data collected to date, natural attenuation may restore the groundwater in a time frame that is equivalent to that of active restoration. EPA must select remedies that are protective of public health and the environment. In addition, Section 121 of CERCLA requires EPA to select remedies that utilize treatment to the maximum extent practicable, and to restore the groundwater within a timeframe that is reasonable given the particular circumstances at a site. All of the remedies selected for this Site by EPA reduced the risks to public health and the environment posed by the Site. Furthermore, since natural attenuation may restore the groundwater in a time frame that is equivalent to that of active restoration, and since EPA shall implement active restoration if natural attenuation is not effective, EPA has selected a remedy that utilizes treatment to the maximum extent practicable at the Site.

Comment 2: The resident contended that the owners of the Western Sand & Gravel Site and another nearby Superfund Site would benefit from the preferred alternative because they would be paid by EPA for the acquisition of access restrictions on their property. She recommended that no access restrictions be implemented and that the future buyers of any affected parcels should bear the responsibility for protecting themselves from any groundwater contamination on their property.

EPA Response: EPA considered a number of ways during the feasibility study (FS) to restrict access to the contaminated groundwater which poses an unacceptable risk to public health. Access can be restricted through deed restrictions, zoning restrictions, well use advisories, restrictions on obtaining sewer disposal system permits, or acquisition of property or groundwater rights. EPA utilized acquisition of property in the FS for the purposes of estimating the cost of implementing access restrictions. The actual mechanism to be utilized to restrict access shall be determined after EPA conducts negotiations with the potentially responsible parties (PRPs). However, EPA believes that some form of institutional controls are essential to insure that there is no human exposure to unacceptable risk at the Site during remediation.

Comment 3: The resident asked how the wastes under the existing on-site cap would be attenuated if the impermeable cap prevents rainwater from reaching the wastes.

EPA Response: Natural attenuation has been selected to restore the contaminated groundwater not the contaminated soils. The impermeable cap has minimized the amount of rainwater that passes through the contaminated soils. Therefore, the impermeable cap has reduced the source of contamination of the groundwater. Clean groundwater from upgradient of the Site will pass under the contaminated soils and the existing cap. The groundwater from upgradient of the Site dilutes the contaminated groundwater downgradient from the Site and reduces the concentrations of contaminants. Dilution is only one of the mechanisms that will reduce the level of groundwater contamination under natural attenuation. Natural chemical and biological processes will also reduce the level of contamination in the groundwater. In summary, the cap minimizes the source of contamination and allows

the natural chemical, biological and dilution processes to reduce any remaining contamination in the groundwater.

Comment 4: The resident urged EPA to begin active restoration of the groundwater immediately and dispense with any additional time consuming studies or reports.

EPA Response: EPA considered implementing active restoration immediately at the Site. However, EPA selected natural attenuation to restore the contaminated groundwater. As discussed in response to Comment 1 above, natural attenuation has been occurring throughout the history of the Site and has significantly reduced the levels of contamination. According to an analysis of the actual data collected to date, natural attenuation may restore the groundwater in a time frame that is equivalent to that of active restoration. In addition, natural attenuation is protective of public health and the environment, easier to implement, and cost effective. However, the remedy provides that if the groundwater is not restored at the rate predicted by models or faster, active restoration shall be implemented.

Comment 5: The resident stated that active restoration would have been more efficient if performed ten years ago as proposed by the State of Rhode Island. She said that active restoration is more difficult and time consuming now because the wastes have spread out over a larger area since the State first proposed the remedy. She stated that if groundwater treatment had been started as planned, the groundwater would be clean by now.

EPA Response: The concentrations of contaminants have decreased significantly in magnitude and extent since the early history of the Site. This decrease is in part due to natural attenuation. As indicated in Figure 6 in Appendix A of the ROD, the concentrations of total volatile organic compounds (TVOCs) in the groundwater offsite have been as high as 1000 parts per billion (ppb). During the remedial investigation conducted in 1988 and 1989, the concentrations of TVOCs in the same area have been reduced to 10 ppb as indicated in Figure 4 in Appendix A of the ROD. Therefore, the contamination has not spread out as the commenter has suggested. In fact the magnitude and extent of contamination has actually been reduced significantly.

Based on the hydrogeologic models conducted during the FS, it is estimated that it would take approximately 10 to 17 years to restore the groundwater from the currently observed concentrations to drinking water standards, by active restoration. EPA did not evaluate the time it would take to restore the groundwater based on the higher concentrations observed in the early history of the Site. However, since the concentrations of contaminants were significantly greater than those currently observed, EPA believes that it would have taken significantly greater than 10 years as stated by the citizen.

Comment 6: The Nasonville Water District noted that natural attenuation had not been used before at other Superfund sites including W.R. Grace in Acton, MA and the Valley source area at the Groveland Mills Site in Groveland, MA.

EPA Response: Although natural attenuation was not used as the principal remedy at the two Superfund Sites noted by the commenter, natural attenuation has been utilized at other Superfund Sites including the Yaworski Site in Connecticut and the Winthrop Landfill Site in Maine. The National Contingency Plan (NCP) provides EPA with the authority to select natural attenuation to restore contaminated groundwater if the circumstances at the Site warrant such a remedy (See NCP at 55 Fed. Reg. 8846, March 8, 1990). At the Western Sand and Gravel Site, natural attenuation has over time significantly reduced the level of contamination. The groundwater plume has reached its maximum extent and is decreasing in magnitude and areal extent. According to modeling, the groundwater shall be restored to cleanup levels in approximately 24 to 28 years which is a reasonable period of time giving the circumstances at the Site. According to actual data, the groundwater may be restored in a faster period of time of 8 to 18 years.

Comment 7: The Nasonville Water District endorsed Alternative 5 (active restoration with discharge to both groundwater and surface water, groundwater monitoring and access restrictions or an anlternate water supply) over EPA's preferred alternative for groundwater cleanup because they believe that it assures the greatest safety to residents in the affected area. They note that this recommendation arises from the fact that their consultants did not have sufficient time, specifically "several months", to review the groundwater study reports and addenda for the Site.

EPA Response: Except for Alternative 1 (restoration by natural attenuation and groundwater monitoring), the protectiveness of all the alternatives is dependent on the effectiveness of institutional controls at preventing future exposure to the contaminated groundwater. If the institutional controls are effective at preventing exposure, then all the alternatives are equally protective of public health. If the institutional controls are not effective at preventing future exposure, then the selected remedy shall utilize active restoration to restore the contaminated groundwater. Therefore, the selected remedy is equally protective to Alternative 5, the alternative recommended by the Nasonville Water District.

EPA announced the results of the remedial investigation (RI) to the public in a fact sheet in November 1990. At that time, the fact sheet was mailed to all persons on EPA's community relations mailing list including representatives from the Nasonville Water District. The fact sheet also announced the availability of the Administrative Record. Copies of the RI and FS Reports developed by Hunt as well as EPA's Addendum to the RI Report, were available in the Administrative Record for review at that time. EPA released the Proposed Plan on February 4, 1991 and held a comment period from February 12, 1991 through March 13, 1991. Therefore, the Nasonville Water District and their consultant had four months to review the majority of the information available on the Site.

Comment 8: The Nasonville Water District recommends that further studies be done to "verify, compliment or contradict" the groundwater investigations performed by EPA.

EPA Response: Further investigations shall be conducted to characterize the extent of contamination in the bedrock system as well as the impacts to the surface water and sediments. Based on the results of these investigations, EPA shall determine if it is necessary to modify the selected remedy to include active restoration and/or long-term monitoring of the surface water and sediments. However, with the exception of the information regarding the characterization of the bedrock, surface waters and sediments, EPA is satisfied with the accuracy of reports concerning groundwater to date and believes the information obtained to date is sufficient to select a groundwater remedy at this Site.

Comment 9: The Nasonville Water District stated that the Record of Decision should make clear the criteria to be used in determining whether or not active treatment will be implemented.

EPA Response: In response to the comments from the Nasonville Water District and RIDEM, EPA has clarified the language and the criteria in the ROD which shall be utilized to trigger active restoration should natural attenuation not restore the groundwater at the rate predicted by modeling or faster. Like the approach outline in the preferred alternative, the evaluation consists of comparing the actual data collected during future groundwater monitoring to the data predicted by hydrogeologic models. The evaluation shall be conducted on four indicator compounds: tetrachloroethene, trichloroethene, vinyl chloride and benzene. A statistical comparison of the actual data to the theoretical data shall be conducted using the nonparametric distribution free signed rank test of Wilcoxon with a 95 percent significance level as described in Nonparametric Statistical Methods (by Hollander and Wolfe, published in 1973 by John Wiley, on pages 26-38). In summary, the rank test determines whether the trend established by actual data falls below the trend established by the theoretical data. If the trend for the actual data does not fall below the trend for the theoretical data as determined by the rank test, active restoration shall be implemented. All compounds must pass the rank test. If one compound fails the rank test, then active restoration shall be implemented. An example of the test has been provided in Appendix D of the ROD using the data collected during the RI for benzene. EPA believes that this approach eliminates any vagueness in the trigger for active remediation as it relates to groundwater contamination.

In addition to requiring active restoration if natural attenuation is not restoring the groundwater at a rate predicted by modeling or faster, there are three other scenarios which trigger active restoration. First, the selected remedy also requires active restoration of the groundwater and/or long-term monitoring of the surface water and sediments if necessary to protect Tarkiln Brook. Second, based on a review of the new information collected to characterize bedrock impacts, active restoration and/or long-term monitoring may be implemented if necessary for the protection of public health and the environment. Finally, if effective institutional controls cannot be implemented, the selected remedy utilizes active restoration to restore the groundwater.

Part II — State Comments

RIDEM provided oral and written comments at the public hearing through Warren Angell, Principal Engineer, Division of Air and Hazardous Materials. RIDEM later submitted more detailed comments through a letter dated March 13, 1991 from Thomas D. Getz, Chief, Division of Air and Hazardous Materials. RIDEM comments are summarized below.

General Comments

Comment 1: RIDEM feels that EPA's refusal to extend the comment period under the current circumstances is arbitrary, capricious and characterized by an abuse of discretion. RIDEM stated that it was made aware of EPA's concerns by letter dated February 28, 1991 and that EPA required voluminous information to make an informed decision concerning State ARARs. Finally, failure by EPA to grant the requested extension may be interpreted as evidencing EPA's pre-judgement of this issue or procedurally denying the State an opportunity to supplement the record with information that substantiates the applicability of State ARARs.

EPA Response: Following issuance of its Proposed Plan, EPA offered a 30-day public comment period. That period ended on March 13, 1991. In a letter received by EPA on March 11, 1991, the Rhode Island Department of Environmental Management (RIDEM) requested a 60 day extension of that comment period. In a March 13, 1991 letter, EPA denied that request. In a March 13, 1991 response letter to EPA, RIDEM maintained that EPA's refusal to extend the comment period was arbitrary and capricious and an abuse of Agency discretion. EPA does not agree.

EPA and RIDEM have been in close contact during the development of the current remedy for the Site. EPA met with RIDEM staff on December 5, 1990 to present EPA's preferred alternative for the Site. RIDEM had no significant comments during this meeting. EPA sent RIDEM copies of the Draft FS Addendum, which described the preferred alternative, on January 4, 1991, January 9, 1991 and January 22, 1991. RIDEM did not submit any comments on these drafts. On January 31, 1991, RIDEM first indicated to EPA that it believed that the Rhode Island Groundwater Protection Act (GWPA) constituted an ARAR mandating active restoration. At that time, EPA requested that RIDEM provide the rationale for this position, in writing, as soon as possible. Thereafter, the only information that EPA received from RIDEM regarding this issue was a facsimile transmission of the GWPA itself. This was received by EPA on February 21, 1991. Thereafter, EPA requested a meeting with RIDEM to obtain further clarification of the GWPA as a potential ARAR. At that meeting, held on February 26, 1991, RIDEM again verbally explained to EPA that it believes that the policies stated in the GWPA constitute an ARAR. At the conclusion of that meeting, EPA again requested that RIDEM document its position and provide examples of how it has enforced the GWPA's policies.

Regarding requests for extensions to the public comment period,

the Preamble to the National Contingency Plan, at page 8770, states that "in order to be timely, a request generally must be received within two (2) weeks after the initiation of the comment period." The final decision on granting an extension is within the Agency's discretion. In the present case, EPA made repeated efforts to obtain information from RIDEM regarding its GWPA policies. However, it was not until March 11, 1991, thirteen (13) days after the February 26, 1991 meeting between RIDEM and EPA, that RIDEM requested the extension. RIDEM had an opportunity, as provided by the NCP, to request an extension within two weeks after the initiation of the comment period. Similarly, RIDEM could have made such a request shortly after its February 26, 1991 meeting with EPA. Considering that EPA has been in close communication with RIDEM on the Proposed Plan since early December and throughout the remedy selection process, and considering that RIDEM's request was received two days before the expiration of the comment period, EPA properly refused the request. EPA notes, however, that on March 13, 1991, RIDEM did provide to EPA an extensive set of comments to EPA's Proposed Plan as well as the Agency's RI and FS Addenda.

Comment 2: RIDEM stated that the Groundwater RI study of contamination in Tarkiln Brook and the Slatersville Reservoir was inadequate and that the findings of the study regarding risks to the environment and public health were therefore inconclusive. RIDEM requested that the PRPs conduct additional sampling that adheres to RIDEM guidelines in the Brook and Reservoir prior to EPA's selection of a groundwater cleanup remedy. RIDEM provided a sampling plan for the Brook and Reservoir, dated January 15, 1991, in the Department's comments.

EPA Response: RIDEM had the opportunity to comment on the workplan for the RI and did not submit comments on the approach for investigating the impacts to Tarkiln Brook and the Slatersville Reservoir. Hunt has indicated a willingness to cooperate with RIDEM to resolve the issues associated with the impacts to Tarkiln Brook and the Reservoir. The selected remedy allows for additional activities to be conducted if EPA determines that the remedy is not protective of public health and the environment.

Comment 3: RIDEM stated that the investigation of contamination in the bedrock system was inconclusive and that additional studies are needed prior to the selection of a remedy. RIDEM stated its belief that data from existing bedrock wells and the geology of the Site indicate that the bedrock is fractured. RIDEM recommends that the bedrock well installed in 1980 be resampled in future sampling and that, prior to the installation of any new bedrock wells, a geophysical survey be completed to insure proper placement of those wells.

EPA Response: EPA agrees with RIDEM that additional data is needed to characterize the bedrock system. In a letter dated February 7, 1991, EPA requested that Hunt conduct additional investigations of the bedrock system. EPA disagrees that selection of the remedy for the Site should be delayed pending receipt of this information. The selected remedy in the ROD provides for additional activities such as active restoration and/or long-term monitoring if necessary for the protection of public health and the environment.

In response to resampling the 1980 bedrock well, EPA has reviewed the drillers logs for all the wells drilled during the early history of the Site. The deepest well drilled in 1980 was 72 feet deep. In addition, there was a well drilled in March of 1981, labeled GZ3-2 (also identified as B-1), that was screened at a depth of 115 feet deep. Based on a comparison to the driller's logs for the two bedrock wells installed during the RI, EPA has concluded that none of the wells drilled prior to 1981 were located in the competent zone of bedrock. According to the well driller's log for C-4B, the weathered fracture zone at this location extends from a depth of 65 feet to a depth of 100 feet. The well screen for this well was located in the competent bedrock from a depth of 138 feet to a depth of 148 feet. According to the drillers log for II-3B, the weathered fractured zone at this location extends from a depth of 73 feet to a depth of 110 feet. The well screen for this well was located in the competent bedrock at a depth of 124 feet to a depth of 134 feet. In both cases, the weathered fractured zone was about 35 feet in thickness. According to the drillers log for the GZ3-2 well, bedrock was first encountered at a depth of 92.5 feet. Assuming that the depth of the fractured zone is approximately the same, the well screen for the GZ3-2 well would have to be located at a minimum depth of 127.5 feet deep to be in the competent zone of bedrock. As stated above, the GZ3-2 well was screened at a depth of 115 feet. This zone of the bedrock is the upper fractured zone of the bedrock system. Conclusions regarding the extent of contamination in this portion of the bedrock are not in question. The purpose of conducting additional investigations of the bedrock system is to characterize the deep bedrock system, not the fractured bedrock zone. Therefore, EPA does not agree that the wells drilled prior to 1981 will provide any useful information for characterizing the deep competent zone of the bedrock system.

EPA has considered the use of geophysics for locating fractures. Since geophysics is not an exact science, EPA has determined that a more appropriate approach at the Western Sand & Gravel Site is to install three additional bedrock wells between the Site and the residential neighborhood to the west of the Site. These wells shall be sampled for VOCs on a quarterly basis for one year at a minimum. Sampling would be carried out in discrete intervals of the borehole where fractures are encountered and using methods capable of isolating the interval. This approach should prevent artificially induced vertical flow from the overburden aquifer. The number of samples per borehole shall depend on the number of fractures encountered. An open borehole method of construction would be utilized with the use of sampling devices capable of sampling discrete levels in the borehole. EPA has concluded that the probability of finding a fracture using this approach is greater than using geophysics.

Comment 4: RIDEM questioned the accuracy of the groundwater model used by Hunt to characterize the Site. Specifically, RIDEM questioned the number of layers employed by the model, the piezometric contours used, the hydraulic conductivities employed, the discharge point employed, and the modeling of Tarkiln Brook. RIDEM stated that, because many of RIDEM's previously expressed concerns over the validity of the model have not been addressed, RIDEM questions the remediation scenarios and times generated by the model and the use of linear regression graphs developed by EPA.

EPA Response: EPA believes that the model provides a conservative estimate of the time necessary to restore the groundwater to cleanup levels. The hydraulic conductivity input into the model was 30 feet per day. The average hydraulic conductivity observed during the RI was 70 feet per day. Therefore, Hunt utilized a conservative hydraulic conductivity as input to the model. This approach results in conservative predictions of the restoration time frames. In other words, since Hunt utilized a conservative value for the hydraulic conductivity, the time for restoration predicted by the model may be greater than the actual time for restoration. This conclusion is also supported by the actual data collected to date. Based on EPA's review of the actual data collected, the groundwater may be restored in 8 to 18 years as opposed to the 24 to 28 years predicted by the model.

Use of a multilayer model would have been more representative of the actual conditions at the Site. Adding layers to the model would result in restoration time frames which are less than those currently predicted. However, the ratio between the time frames for natural attenuation and active restoration would have remained the same. In addition, EPA concluded that sufficient data does not exist to calibrate a multi-layer model. Therefore, EPA determined that a single layer model provides the best conservative estimate of the restoration time frame.

The model utilizes Tarkiln Brook as a discharge point for contaminated groundwater. EPA recognizes that there is a component of flow which passes under the Brook. However, EPA has concluded that this component of flow is a small component relative to the amount of water discharging into the Brook. This conclusion is based on a review of the actual concentrations observed beyond the Brook. The concentrations beyond the Brook currently meet Federal and State Drinking Water Standards. Therefore, the time for restoration to cleanup standards is negligible and will not impact the overall time for groundwater restoration at the Site.

Finally, EPA recognizes that all statistical analyses, such as linear regression, have limitations in their use. However, EPA believes that linear regression was an appropriate approach to determining an approximate estimation of the time for restoration of the groundwater based on actual data. However, EPA agrees that linear regression may not be the best approach for evaluating natural attenuation. Therefore, EPA has modified the selected remedy to include a modified approach to evaluating the effectiveness of natural attenuation.

In summary, EPA believes that the model provided a conservative estimation of the time for groundwater restoration. Since the same assumptions were utilized for modeling the natural attenuation and active restoration alternatives, the model provides a useful comparison of the relative time for restoration for each of these alternatives.

Comment 5: RIDEM asserts that EPA's natural attenuation remedy is inconsistent with the Rhode Island Groundwater Protection Act (GWPA), R.I. Gen. Laws § 46-13.1. The State asserts that this law requires active remediation of certain classes of aquifers whose waters are degraded to a level above MCLs. The basis for this assertion is provided in a March 13, 1991 memo from Sue Kiernan, Deputy Chief of

Rhode Island Department of Environmental Management's (RIDEM) Groundwater Section to Tom Getz, Chief of RIDEM's Division of Air and Hazardous Materials.

The Groundwater Protection Act, at §46-13.1-2, states, in relevant part, that "[t]he general assembly hereby declares and recognizes that: ...

(3) It is the paramount policy of the state to protect the purity of present and future drinking water supplies by protecting aquifers, recharge areas, and watersheds;

(4) It is the policy of the state to restore and maintain the quality of groundwater to a quality consistent with its use for drinking supplies and other designated beneficial uses without treatment as feasible. All groundwaters of the state shall be restored to the extent practicable to a quality consistent with this policy;

(5) It is the policy of the state not to permit the introduction of pollutants into the groundwaters of the state in concentrations that are known to be toxic, carcinogenic, mutagenic, or teratogenic. To the maximum extent practical, efforts shall be made to require the removal of those pollutants from discharges where such discharges are shown to have already occurred;

(6) Existing and potential sources of groundwater shall be maintained and protected. Where existing quality is inadequate to support certain uses, the quality shall be upgraded if feasible to protect the present and potential uses of the resource; ..."

RIDEM maintains that it has consistently implemented the above mentioned policies to require active remediation when an aquifer is degraded below its intended use. The groundwater beneath the WS&G Site is primarily classified GAA-NA, meaning that while GAA groundwater is normally suitable for public drinking water use without treatment, the groundwater at the Site is not attaining that goal. According to RIDEM's interpretation of the above policies, active remediation is required to restore the groundwater at the Site to GAA. RIDEM further contends that this interpretation of its policies should be an applicable or relevant and appropriate requirement (ARAR) that EPA applies when choosing a remedy for the Site.

EPA Response: EPA does not believe that the policies articulated under the Groundwater Protection Act are an ARAR. In order for a state requirement to be an ARAR, it must be promulgated. Section 300.400 (g)(4) of the National Contingency Plan (NCP) states that "the term "promulgated" shall mean that the standards are of general applicability and are legally enforceable." The State's policy of active remediation is not legally enforceable.

EPA defines as legally enforceable requirements those State regulations or statutes that contain specific enforcement provisions or are enforceable by means of the general authority in other laws or in the State constitution. CERCLA Compliance With Other Laws Manual, Part II, OSWER, August, 1989.

The goals set forth in the Groundwater Protection Act are not themselves enforceable. The Preamble to § 300.400 (g)(4) of the NCP states that "[g]eneral goals that merely express legislative intent about desired outcomes or conditions are not ARARs." The

relevant words of the statute are specifically phrased as policy objectives. At chapter 46-13.1-4, the GWPA mandates that "[t]he Director shall promulgate rules setting forth the range of responses that he or she may take" to maintain the integrity of the various classes of groundwater. If such rules had been promulgated and such rules had required treatment of class GAA-NA groundwater to established drinking water standards, then such rules would have been ARARs. They would have been ARARs because they would have been promulgated and enforceable standards. Although by statute such rules were to have been promulgated by February 28, 1989, to date the State has not promulgated such rules. Thus, there is currently no promulgated rule that clarifies the policies set forth above. It is unclear what factors the State uses to determine what is a "practical" versus a "practicable" effort to restore a site. Similarly, no clear definition of "restore" is provided. It is not sufficient that the State claims to consistently interpret the policy statements as requiring active remediation. There must be a promulgated rule describing the State's preference for active remediation in order to enforce this policy as an ARAR. No such promulgated rule exists.

EPA does not dispute that the director of RIDEM obtains authority from R.I. Gen. Laws chapters 42-17.1 and 46-12. These chapters give the director the general authority to, among other things, protect the state's natural resources and enforce all promulgated rules and regulations. However, for the reasons discussed above, EPA does not believe that RIDEM's policy of preference for active restoration is a standard that RIDEM can enforce.

As a non-enforceable policy, EPA recognizes that RIDEM's preference for active remediation has been applied in numerous actions between the State and private parties. As it is an effort to consistently apply the policies stated in the GWPA, EPA recognizes this preference for active remediation as a to-be-considered (TBC) standard. While not a potential ARAR, EPA has considered the State's policy during the formulation of the current remedy.

Comment 6: RIDEM stated that the Record of Decision should make clear the criteria to be used in determining whether or not active treatment will be implemented. RIDEM noted that the criteria should cover both surface water and groundwater conditions.

EPA Response: In response to the comments raised by RIDEM and the Nasonville Water District on the criteria to be used in determining whether or not active restoration shall be implemented, EPA modified the approach to conducting the evaluation of natural attenuation. Like the approach outlined in the preferred alternative, the evaluation consists of comparing the actual data collected during future groundwater monitoring to the data predicted by hydrogeologic models. The evaluation shall be conducted on four indicator compounds. A statistical comparison of the actual data to the theoretical data shall be conducted using the nonparametric distribution free signed rank test of Wilcoxon with a 95 percent significance as described in Nonparametric Statistical Methods (by Hollander and Wolfe, published in 1973 by John Wiley, on pages 26-38). In summary, the rank test determines whether the trend established by actual data falls below the trend established by the theoretical data. If the trend for the actual data does not fall below the trend for the

theoretical data as determined by the rank test, active restoration shall be implemented. All compounds must pass the rank test. If one compound fails the rank test, then active restoration shall be implemented. An example of the test has been provided in Appendix D of the ROD using the data collected during the RI for benzene. EPA believes that this approach eliminates any vagueness in the trigger for active remediation as it relates to groundwater contamination.

In addition to requiring active restoration if natural attenuation is not restoring the groundwater at a rate predicted by modeling or faster, there are three other scenarios which trigger active restoration. First, the selected remedy also requires active restoration of the groundwater and/or long-term monitoring of the surface water and sediments if necessary to protect Tarkiln Brook. EPA could not develop specific triggers for the results of the surface water and sediment investigation since it is not known, at this point, exactly what type of data shall be collected. Second, based on a review of the new information collected to characterize bedrock impacts, active restoration and/or long-term monitoring may be implemented if necessary for the protection of public health and the environment. Finally, if effective institutional controls cannot be implemented, the selected remedy utilizes active restoration to restore the groundwater.

Comment 7: RIDEM expressed concern that the proposed temporary access restrictions may not effectively prevent human exposure to the contaminated groundwater in all potential development scenarios. RIDEM did not provide any examples or elaboration on this comment. RIDEM cited this concern as a justification for immediately employing active treatment of the groundwater.

EPA Response: EPA agrees with RIDEM that the effectiveness of institutional controls, including access restrictions, is difficult to predict. Therefore, the selected remedy requires active restoration of the groundwater if effective institutional controls cannot be implemented. However, EPA does believe that institutional controls, if effectively implemented, will adequately prevent human exposure to contaminated groundwater during the remediation.

Comment 8: RIDEM noted that remedial activities carried out to date have not addressed detection or location of non-aqueous phase liquids (NAPLs). The nature of the wastes at the Site and observations made during monitoring well sampling suggest the presence of NAPLs. RIDEM recommended that future sampling address this issue.

EPA Response: The concentration of contaminants at the Site are not indicative of the presence of NAPLs. Groundwater concentrations of 5 to 10 percent of the field solubility of a compound is thought to suggest the presence of NAPLs. The concentrations of contaminants at the Site currently do not approach this level. However, in response to RIDEM's concern, the selected remedy includes the use of an interface probe to identify the presence of NAPLs. This test shall be conducted during the first round of groundwater sampling and shall confirm the conclusion.

Comment 9: RIDEM stated that historic data indicates that the "F" well area may be contaminated, but that this area has not been investigated by EPA. RIDEM recommends that this area be investigated for contamination as part of future sampling programs.

EPA Response: According to Appendix C of the RI Report (June, 1990), the "F" well area is located south of the existing cap, at the fork in the access road to the Site. As presented in Table T.8 in Appendix T of the RI Report, this well was sampled on November 29, 1979 and found to contain the following contaminants:

Contaminants	Concentration	MCL/MCLG
1,1,1-Trichloroethane	3 ppb	200 ppb
Trichloroethene	2 ppb	5 ppb
Toluene	91 ppb	1000
Cadmium	2 ppb	5 ppb
Copper	70 ppb	1300 ppb*
Lead	5 ppb	5 ppb
Zinc	85000 ppb	5000 ppb

* Proposed MCL

With the exception of zinc, all of these compounds were detected at or below the MCL or MCLG. Installation of the impermeable cap has resulted in significant decreases in the magnitude and extent of contamination. Therefore, it is not expected that contamination is currently present in this area at levels that present a risk to public health. This conclusion is also supported by the fact that contamination was not detected in the C-1 well which is located immediately to the east of the F well location. In addition, the concentrations of zinc currently detected in the groundwater downgradient from the Site do not approach the concentration detected at this well in 1979. The average and maximum concentration of zinc detected during the current RI were 25 ppb and 269 ppb, respectively. In conclusion, future investigations of contamination in this area are not justified and will not be included in the selected remedy.

Comment 10: RIDEM stated that it had found "discrepancies" in cost estimates for remedial alternatives in the Groundwater FS and that the estimates may be higher than necessary. RIDEM recommends that EPA review the cost estimates and, if necessary, meet with the PRPs concerning the cost estimates.

EPA Response: EPA conducted a thorough review of the cost estimates in the FS Report. In fact, EPA requested that Hunt recalculate some of the costs. The revised cost estimates were presented in a letter from Robert McCaleb to Lynne Fratus dated January 22, 1991. A copy of the revised cost estimates were placed in the Administrative Record. In addition, Hunt forwarded a copy of the estimates to RIDEM. According to EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G-89/004), the costs developed during the FS are prepared with an accuracy of +50 percent to -30 percent (i.e. actual costs may be 50 percent greater or 30 percent less than the estimate). The costs are intended to be estimates for the sake of relative comparison. EPA has concluded that the costs in

the FS Report are within this level of accuracy and were appropriate for the comparison of alternatives.

Comment 11: RIDEM asked for responses to all previous RIDEM comments not yet addressed by EPA on the Groundwater RI, Groundwater FS, and Addenda.

EPA Response: RIDEM's comments on the Groundwater RI Addendum and FS Report Addendum were indicated in an attachment to RIDEM's letter dated March 13, 1991 to EPA. EPA's responses to these comments are presented below. RIDEM's outstanding comments on the RI Report were indicated in a previous letter dated July 24, 1990 from RIDEM. A copy of this letter was also enclosed with RIDEM's letter dated March 13, 1991. Responses to these comments are also provided below. Since RIDEM has not identified outstanding comments on the FS Report separately, EPA has assumed that these comments were included in the attachments discussed above.

Comments on Groundwater RI Report Addendum

Comment 12: RIDEM noted that the report should indicate that tests of NAPLs were not carried out at the Site. The report should note why these tests were not carried out.

EPA Response: As discussed in response to Comment 8 above, the concentration of contaminants at the Site are not indicative of the presence of NAPLs. Groundwater concentrations of 5 to 10 percent of the field solubility of a compound is thought to suggest the presence of NAPLs. The concentrations of contaminants at the Site currently do not approach this level. However, in response to RIDEM's concern, the selected remedy includes the use of an interface probe to identify the presence of NAPLs. This test shall be conducted during the first round of groundwater sampling and shall confirm the conclusion.

Comment 13: RIDEM recommended that the Groundwater RI Addendum state that the piezometric contours for sections of the aquifer east of the Site are extrapolated contours. RIDEM requested a description of the assumptions used to generate these contours.

EPA Response: Both EPA and Camp Dresser and McKee, Inc., EPA's technical support contractor, reviewed the piezometric contour maps presented in the RI Report for those portions of the Site which were contaminated. With the exception of the piezometric maps for the deep portion of the aquifer, EPA has concluded that the maps presented in the RI Report accurately represent the hydrogeologic conditions of the overburden aquifer. EPA included a corrected piezometric map for the deep portion of the overburden aquifer in the RI Report Addendum. Based on the results from the wells labeled I-7 and I-4, which are located to the east of the plume, elevated levels of contamination have not been detected to the east of the Site. Therefore, EPA concluded that piezometric data in this area, which was demonstrated to not be

contaminated, was not necessary. Regarding RIDEM's request for the assumptions that were utilized to generate the piezometric maps, piezometric maps are developed by connecting points with equal piezometric measurements as is standard procedure in the field of hydrogeology.

Comment 14: RIDEM requested that EPA describe the off-site source of contamination found in residential wells outside of the historical maximum extent of contamination described in Fig. 5.8 of the Groundwater RI Addendum, and that EPA explain the methods used to confirm this source.

EPA Response: The purpose of the RI was to characterize the extent of contamination from the Site not from other sources beyond the Site. The extent of contamination in the overburden aquifer has been well defined by the data collected during the RI. However, further data must be collected to characterize the extent of contamination in the bedrock system. Depending on the construction technique used to install the residential wells, contamination from the bedrock system could be one source of contamination in the residential wells.

Comment 15: RIDEM stated that the Groundwater RI Addendum should indicate the total number of sampling rounds performed for VOCs, SVOCs and metals. RIDEM also recommended that the report comment on the adequacy of the number of sampling rounds for characterization of the overburden contamination.

EPA Response: The RI Report Addendum developed by EPA was intended to supplement the RI Report developed by Hunt. The number of sampling rounds for VOCs, SVOCs and metals is identified in the RI Report. The RI Report Addendum explicitly directs the reader to refer to the RI Report for additional information on the Site and the investigations. The following sampling rounds for groundwater were conducted during the RI from May 1988 through February 1989: four rounds for VOCs, two rounds for SVOCs and one round for metals. In addition, three additional sampling rounds for VOCs were conducted between September 1989 and November 1990. EPA has concluded that the amount of data collected is sufficient for characterizing the current extent of contamination in the overburden aquifer.

Comment 16: RIDEM requested that the RI Report Addendum should indicate the possible mechanisms to be used to determine if the bedrock wells are contaminated.

EPA Response: In a letter dated February 7, 1991, which was included in the Administrative Record, EPA requested that Hunt conduct additional activities to characterize the extent of contamination in the bedrock system. As a first phase, EPA requested that Hunt install three additional bedrock wells between the Site and the residential neighborhood to the west of the Site. These wells shall be sampled for VOCs on a quarterly basis for one year at a minimum. Sampling would be carried out in discrete intervals of the borehole where fractures are encountered and using methods capable of isolating the interval. This approach should prevent artificially induced vertical flow from the overburden aquifer. The number of samples per

borehole shall depend on the number of fractures encountered. An open borehole method of construction would be utilized with the use of sampling devices capable of sampling discrete levels in the borehole.

Comment 17: RIDEM stated that the RI Report Addendum should note the results of the surface water and sediment sampling of Tarkiln Brook and Slatersville Reservoir. The Report should indicate the number of sampling rounds and the last sampling date for the Tarkiln Brook and the Slatersville Reservoir.

EPA Response: As discussed in response to Comment 15, the RI Report Addendum developed by EPA was intended to supplement the RI Report developed by Hunt. The results of the surface water and sediment sampling, the number of sampling rounds and the date of the sampling rounds are identified in the RI Report. The RI Report Addendum explicitly directs the reader to refer to the RI Report for additional information on the Site and the investigations. Tables 5 and 6 in Appendix B of the ROD summarize the results of the surface water and sediment investigations conducted during the RI. Two rounds of sampling were conducted for the surface water and sediments in September 1988 and August 1989. The last sampling round for Tarkiln Brook was conducted in August 1989. The last sampling round in the Slatersville Reservoir was conducted in September 1988.

Comments on Groundwater FS Report Addendum

Comment 18: RIDEM questioned the validity of the groundwater model based on RIDEM's belief that the model assumes groundwater from the Site discharges into Tarkiln Brook even though evidence from the Groundwater RI indicates that some groundwater flow from the Site passes under the Brook. RIDEM requested a determination of which groundwater flow path is correct and an assessment of any impact this situation could have on the cleanup times predicted by the model. RIDEM expressed its lack of confidence in the model's predictions for cleanup times and recommended use of an alternate method of assessing the remedial alternatives.

EPA Response: As discussed in the response to Comment 4, the model utilizes Tarkiln Brook as a discharge point for contaminated groundwater. EPA recognizes that there is a component of flow which passes under the Brook. However, EPA has concluded that this component of flow is a small component relative to the amount of water discharging into the Brook. This conclusion is based on a review of the actual concentrations observed beyond the Brook. The concentrations beyond the Brook currently meet Federal and State Drinking Water Standards. Therefore, the time for restoration to cleanup standards is negligible and shall not impact the overall time for groundwater restoration at the Site. The models utilized in the FS Report are demonstrated and well known in the field of hydrogeology and are recommended for use in EPA's guidance documents.

Comment 19: RIDEM noted a discrepancy between the restoration time for Scenario 2 in the Groundwater FS and the restoration time for Scenario 2 in the FS Addendum. RIDEM recommended that the FS Addendum show the same time estimate as the Groundwater FS.

EPA Response: EPA reviewed the restoration time frames presented in the FS Report and found them to be incorrect. EPA requested that Hunt revise the restoration time frames. The revised restoration time frames were presented in correspondences from Robert McCaleb to Lynne Fratus dated December 14, 1990 and January 7, 1991. A copy of the revised restoration time frames were placed in the Administrative Record. In addition, Hunt forwarded a copy of the revised restoration time frames to RIDEM. In summary, the restoration time frames presented in the FS Report Addendum are based on the revised estimates and are correct.

Comment 20: RIDEM stated that for completeness, a table of toxicity, persistence, magnitude, and frequency of detection data for all contaminants at the Site as well as details of the formula used for the selection of indicator compounds should be included in the FS Addendum.

EPA Response: Information pertaining to the toxicity, persistence, magnitude and frequency of detection were summarized in Sections 5 and 6 of the RI Report. Some of these tables are also presented in Appendix B to the ROD.

Comment 21: RIDEM requested justification for EPA's proposed use of only four indicator compounds to evaluate the effectiveness of natural attenuation. RIDEM requested that EPA make a finding regarding the adequacy of using only four indicator compounds for making public health and environmental decisions. RIDEM requested details on what action EPA would take if increases are observed in the levels of compounds not among the four chosen indicators. RIDEM stated that, if effectiveness decisions are to be based on monitoring of other contaminants, EPA should describe the decision mechanisms for these other compounds.

EPA Response: The monitoring program identified in the selected remedy requires periodic monitoring of a number of contaminants. However, EPA selected four indicator compounds, tetrachloroethene, vinyl chloride, benzene and trichloroethene, to evaluate the effectiveness of natural attenuation. Specifically, EPA shall conduct a statistical analysis on the performance of each of these four compounds. Conducting such an evaluation on every compound detected would not be cost effective. The use of indicator compounds is commonly used in the Superfund process, particularly in conducting Risk Assessments, and is discussed in such guidance documents such as the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA/540/G-89/004) and Superfund Public Health Evaluation Manual (EPA/540/1-86/060).

The VOCs are the most frequently detected compounds at the Site. Furthermore, the VOCs result in the greatest risk to public health. Therefore, EPA selected four VOCs as indicator compounds. Trichloroethene was the most frequently detected

compound. Tetrachloroethene was also frequently detected and is one of the most persistent compounds detected at the Site. Vinyl chloride was the compound which presents the greatest risk to public health. Finally, benzene was selected as representative of an average for all the compounds detected with respect to all the criteria. The performance of each of these compounds shall be evaluated during future evaluations of natural attenuation. If any one of these compounds is found not to be decreasing at the rates predicted by modeling or faster, then active restoration shall be implemented. The monitoring results for the other compounds shall also be reviewed by EPA. EPA suspects that these compounds shall behave in a similar fashion to the indicator compounds selected. If EPA determines that the results do not support EPA's conclusions, EPA shall modify the ROD to insure that the remedy is protective of public health and the environment.

Comment 22: RIDEM requested justification for EPA's choice of monitoring wells to provide the data for judging the effectiveness of natural attenuation. RIDEM asked whether the movement of slugs of contaminants from the Site is expected and whether the criteria for judging the effectiveness of natural attenuation will address slug movement. RIDEM noted that the groundwater model did not consider slug movement.

EPA Response: The Proposed Plan requires that data from well clusters C-2, C-3, C-4, C-5, C-6, I-2 and I-3 be utilized in the evaluation of natural attenuation. The Proposed Plan further states that these well clusters are the seven most contaminated well clusters. In response to comments received from RIDEM and Hunt, EPA once again reviewed the results from the RI and modified the selection of well clusters. The nature of contamination detected in II-3 was similar to the nature of contamination in C-5. Therefore, the II-3 well cluster was added to the list of well clusters to be utilized in the evaluation of natural attenuation in the selected remedy. Similarly, the nature of contamination in I-6 was similar to that in I-2. Therefore, the I-6 well cluster was also added to the evaluation. The remaining wells at the Site were either not contaminated or contained compounds which did not exceed ARARs. If RIDEM did not agree with the selection of wells, RIDEM should have recommended additional wells for EPA to consider during the comment period.

Since the source of contamination has been minimized, EPA does not believe that a slug of contamination shall emerge from the Site in the future. However, the monitoring program would detect such an occurrence. Furthermore, such an occurrence would likely trigger active restoration. Groundwater flows at a rate of 250 feet per year. The distance from the cap to the Brook is approximately 185 feet. Therefore, if a slug were to emerge, increased concentrations of contaminants would be noted for a period of at least one year. Due to the sensitivity of the rank test (95 percent significance), this type of deviation in the data would most likely trigger active restoration.

Comment 23: RIDEM requested a detailed outline and justification of the decision process EPA would use to determine whether or not to implement active treatment. RIDEM specifically asked whether active treatment would be implemented if only one

contaminant were found in excess of the concentrations predicted by the groundwater model. RIDEM also asked if comprehensive public health risk analyses would be performed on the data collected during the monitoring of the cleanup and if these would be used in the decision process.

EPA Response: As discussed in response to Comment 6, EPA modified the approach to conducting the evaluation of natural attenuation. The modified approach is described in more detail in EPA's response to Comment 6. Furthermore, as discussed in response to Comment 21 above, if one of the four indicator compounds fails the rank test, active restoration will be implemented. Finally, a risk assessment shall not be conducted as part of each evaluation. However, at the time when interim cleanup levels have been achieved, EPA shall conduct a risk assessment on the residual groundwater contamination. This risk assessment shall assess the cumulative risks for carcinogens and noncarcinogens posed by consumption of site groundwater. If the risks are not within EPA's risk management goal for carcinogens and noncarcinogens then the remedial action will continue until protective levels are attained or the remedy is otherwise deemed protective.

Comment 24: RIDEM asked for an assessment of EPA's confidence in the predictions of the groundwater model for the active treatment scenario and in the location of extraction wells for active treatment given that the model used by EPA does not allow for the optimization of extraction well location and number. Based on this limitation in the model, RIDEM questioned the remediation scenarios and times generated by the model. RIDEM requested a description of mechanisms that could be used to refine the placement of extraction wells for active treatment.

EPA Response: As stated in response to Comment 4, EPA believes that the model provides a conservative estimate of the time necessary to restore the groundwater to cleanup levels. The purpose of the model is not to identify the final locations and pumping rates for the extraction wells but to estimate the restoration time frame. During the calibration of the model, Hunt evaluated different pumping rates. For example, Hunt attempted to capture the 1 ppb plume at a total pumping rate of 145 gpm. However, under this scenario, several of the cells went dry. Therefore, Hunt reduced the total pumping rate to 132.5 gpm. This scenario did not result in drying out the cells. Based on EPA's review of the assumptions utilized in the model, EPA has concluded that the results of the model are an accurate estimate of the restoration time frame. However, if active restoration is implemented, a pump test would be conducted during design to optimize the number, the location and pumping rate for the extraction wells.

Comment 25: RIDEM requested justification for the distribution of wells, the frequency of sampling and the selected list of contaminants specified in EPA's proposed groundwater monitoring plan. RIDEM specifically asked why heavy metals and semi-volatile organic compounds were not included in the groundwater monitoring even though they were included in the proposed surface water monitoring plan.

EPA Response: EPA evaluated the groundwater monitoring plan for the overburden aquifer in the FS Addendum and the Proposed Plan and has modified the monitoring plan based on comments received from RIDEM and Hunt. The modified overburden groundwater monitoring program is as follows:

- The following twenty eight (28) wells shall be monitored on a quarterly basis for volatile organic compounds (VOCs) and on an annual basis for semi-volatile compounds (SVOCs) and metals.

C-1	C-3S	C-5S	I-2S	I-6S
C-2S	C-3M	C-5M	I-2M	I-6M
C-2M	C-3D	C-5D	I-2D	I-6D
C-2D	C-4S	C-6S	I-3S	II-3S
	C-4M	C-6M	I-3M	II-3M
	C-4D	C-6D	I-3D	II-3D

A review of the analytical data presented in the RI Report indicates that, with the exception of C-1 which is upgradient of the Site, these wells were the most contaminated wells in the plume (See Figure 4.2 in RI Report, Hunt, June 1990). All of these wells shall be utilized to evaluate the effectiveness of natural attenuation. Quarterly monitoring is needed to provide enough data to statistically evaluate the effectiveness of natural attenuation. In addition, it is anticipated that the probability of implementing active restoration is the greatest in the first six (6) years. Therefore, quarterly monitoring must be conducted for a minimum of six (6) years.

VOCs are the most prevalent compounds detected at the Site. However, some SVOCs and metals have also been detected in the groundwater. Based on EPA's review of the data, these compounds are not expected to increase in magnitude and extent. However, due to concerns raised by RIDEM on the impacts to Tarkiln Brook and in order to verify this conclusion, annual monitoring of SVOCs and metals has also been included in the monitoring plan. After a minimum of three years of monitoring, the monitoring plan may be modified to reduce the frequency of sampling if approved by EPA.

- In addition, the following twenty eight (28) wells shall be monitored on an semi-annual basis for VOCs.

I-1S	I-5S	I-8S	II-4S	II-6S
I-1M	I-5M	I-8M	II-4M	II-6M
I-1D	I-5D	I-8D	II-4D	II-6D
I-4S	I-7S	II-2S	II-5S	
I-4M	I-7M	II-2M	II-5M	
I-4D	I-7D	II-2D	II-5D	

These wells were found to be in the overburden plume or just outside of the plume during the RI. As stated above, EPA has concluded that the magnitude and extent of contamination in the overburden aquifer is decreasing. In addition, EPA has concluded that there is a small

component of flow which passes under Tarkiln Brook and discharges into the Slatersville Reservoir. This conclusion is based on seven sampling episodes over a two and a half year period. However, due to concerns raised by RIDEM on the potential impacts to the Reservoir, this conclusion shall be verified with additional long-term data. After a minimum of three years of monitoring, the monitoring plan may be modified to reduce the frequency of sampling if approved by EPA.

Comment 26: RIDEM stated that the FS Report Addendum should note why well II-3B was not included in the criteria wells. The Report should also note whether additional bedrock wells will be included in the criteria well set. The EPA should outline the action to be taken if contamination is found in these wells.

EPA Response: As stated in the RI Report Addendum, there are two explanations for the contamination found in the bedrock wells. One explanation is that the groundwater migrated under natural conditions and contaminated the wells. The other explanation is that the contamination resulted from artificially induced vertical migration. The RI Report Addendum further states that additional data is needed to verify the conclusions regarding the bedrock system. The ROD states that additional investigations to characterize the extent of contamination in the bedrock shall be conducted. Based on the results of the investigations, EPA will determine if it is necessary to modify the selected remedy to include active restoration and/or long-term monitoring of the bedrock system. In summary, since the source of the contamination in the II-3B well has not yet been determined, it is not appropriate to include this well in the set of wells to be utilized to evaluate the effectiveness of natural attenuation.

Comment 27: RIDEM stated that the FS Addendum should designate the future upgradient sediment and surface water sample locations and justify the locations. Furthermore, RIDEM requested that EPA review a memo which outlines the investigations of Tarkiln Brook.

EPA Response: Since the scope of the surface water and sediment investigations had not been finalized, the details of this investigation were not included in the Final FS Report Addendum or the Proposed Plan. Furthermore, since collection of this data is not part of the selected remedy, the details of the surface water and sediment investigation have not been specified in the ROD. EPA expects that RIDEM shall specify the scope of these investigations. The selected remedy states that after reviewing the results of the investigation, EPA will determine if it is necessary to modify the selected remedy to include active restoration of the groundwater and/or long-term monitoring of the surface water and sediments.

Comment 28: RIDEM requested a clarification of what model EPA used to produce the graphs of theoretical concentrations in Section 2 of the FS Addendum. RIDEM asked whether a model used by EPA was employed to validate the model used by Hunt in the Groundwater FS, and, if so, whether the models concurred. RIDEM specifically requested documentation of concurrence. RIDEM also requested details of

the groundwater model used by EPA as described in Section 2 of the FS Addendum. RIDEM requested an assessment of EPA confidence in EPA's model for determining the need for active treatment.

EPA Response: A combination of three models were utilized to determine the time frames for restoring the groundwater at the Site. MODFLOW and STLINE were utilized to determine the time necessary to achieve one flush of the aquifer. In addition, the EPA Batch Flushing Model was utilized to determine the number of flushes necessary to reduce the concentration of a particular contaminant to its cleanup level. Hunt combined the results of these models to develop the restoration time frames in the FS Report.

EPA reviewed the input and output from MODFLOW and STLINE and determined that these models provided an accurate representation of the time it takes to conduct one flush of the aquifer. EPA staff also ran the EPA Batch Flushing Model and verified Hunt's results to this model. In addition, EPA utilized the output from the Batch Flushing Model to develop the compliance curves placed in the FS Report Addendum and Proposed Plan. The inputs and outputs to this model were previously offered to RIDEM for review. Copies of this information have been placed in the Administrative Record. In summary, EPA has concluded that the models utilized by Hunt provide an accurate estimation of the time to restore the groundwater by natural attenuation. Therefore, EPA has utilized the results of these models to generate the theoretical predictions of the contaminant concentrations in the future. If future trends determined by the actual data are not equal to or less than the trend determined by the theoretical predictions, then active restoration shall be utilized.

Comment 29: RIDEM questioned the validity of using a regression analysis to make the projections upon which decisions regarding active treatment will be based. RIDEM specifically pointed to small sample size, statistical confidence in the coefficient of less than 95%, and the elimination of outliers as critical faults in EPA's projection method. RIDEM recommended that alternative bases for the active treatment decision be investigated.

EPA Response: EPA recognizes the limitations in utilizing a regression analysis to predict the restoration time frames based on the data collected to date. Therefore, EPA concluded that the groundwater <u>may</u>, rather than will, be restored in a time frame that is faster than that predicted by the model. However, based on further investigations of statistical methods for comparing data, EPA has modified the method for evaluating the effectiveness of natural attenuation. A statistical comparison of the actual data to the theoretical data shall be conducted using the nonparametric distribution free signed rank test of Wilcoxon with a 95 percent significance as described in <u>Nonparametric Statistical Methods</u> (by Hollander and Wolfe, published in 1973 by John Wiley, on pages 26-38). EPA believes that this approach eliminates any vagueness in the trigger for active remediation as it relates to groundwater contamination.

Comment 30: RIDEM requested that statements indicating that the highest levels of contamination are located in deep portions of the aquifer and that bedrock contamination was found in three wells rather than two be added to the Proposed Plan. RIDEM also recommended that statements be added to the Proposed Plan emphasizing that cleanup times in the Proposed Plan do not apply to bedrock.

EPA Response: The statement that contamination was found in the deepest portion of the overburden aquifer was located in the RI Addendum in the Administrative Record. As a public participation document, the Proposed Plan need not contain all the technical information contained in other reports. The Proposed Plan directed the reader to review the Administrative Record for further information. Based on EPA's review of the information, there are only two wells located in the deep portion of the bedrock system. As discussed in response to Comment 3, the third well that RIDEM is referring to is located in the upper fractured zone of the bedrock system and is not indicative of the results of the deep portion of the aquifer. EPA recognizes that the cleanup times in the Proposed Plan are not indicative of the bedrock system.

Comment 31: RIDEM recommended that the Proposed Plan be amended to note whether boring logs were examined for information on the residential wells; to propose alternative sources for the domestic well contamination that was found; and, to note whether evidence exists to substantiate any proposed alternative source of the domestic well contamination.

EPA Response: The Proposed Plan notes that there was a lack of information on the depth and method of construction of the residential wells. Hunt attempted to obtain the well drillers' logs for the residential wells and determined that most of the current residents did not have the well driller's log. Appendix O in the RI Report contains a summary of the information available on the residential wells and the source of the information presented. In addition, as discussed in response to Comment 14, the purpose of the RI was to characterize the extent of contamination from the Site not from other sources beyond the Site. The extent of contamination in the overburden aquifer has been well defined by the data collected during the RI. However, further data must be collected to characterize the extent of contamination in the bedrock system. Depending on the construction technique used to install the residential wells, contamination from the bedrock system could be extracted into the residential well and be a source of contamination in the residential wells.

Comment 32: RIDEM requested justification for the statement in the Proposed Plan that many of the metals detected in Tarkiln Brook upstream from the Site may be occurring naturally given that the upstream sampling location is contaminated and therefore does not represent natural conditions.

EPA Response: EPA has concluded that the principal contaminants in the groundwater at the Site are VOCs. Therefore, a review of the results for VOCs in the surface water serves as the best indication of which sampling locations are located upgradient from the Site and which locations are located downgradient from the Site. Based on this review, EPA has concluded that three surface water and sediment

sampling locations are located upgradient from the Site, STR1, STR2 and STR3. The term "upgradient" refers to all the points upstream from the points where the contaminated groundwater is discharging into Tarkiln Brook. EPA notes that the results from STR1 indicated the presence of a number of SVOCs and agrees that this location may not be indicative of natural conditions. However, this is the only upstream location that EPA knows to be contaminated. In addition, STR2 and STR3 were not contaminated and are considered more representative of natural conditions. Therefore, these points serve as a good comparison for the downgradient locations such as SUPL1, STR4 and STR5. A comparison of the concentrations of metals in STR2 and STR3 to SUPL1, STR4 and STR5 indicates that many of the metals detected in all of these locations are of the same order of magnitude. Therefore, EPA has concluded that many of the metals may be occurring naturally.

Comment 33: RIDEM stated that the Proposed Plan should indicate that the conclusion that no contamination exists in the Reservoir is based on a "limited" number of samples from the early 1980s and that some samples taken at that time contained contaminants. Furthermore, RIDEM recommended that the Proposed Plan state that the conclusion that contaminant levels in the Brook and Reservoir do not pose a risk to public health was based on a "limited" number of samples that did not include any samples of fish flesh.

EPA Response: EPA is aware of the fact that samples of the Slatersville Reservoir taken during the earlier history of the Site showed contamination. During the early history of the Site, the source of contamination for the Reservoir, namely the groundwater plume, was at its maximum extent and most likely extended into the Reservoir. This conclusion is supported by the detection of contaminants in the Reservoir at that time. However, as indicated by Figure 4 in Appendix A, the current extent of groundwater contamination does not extend into the Reservoir. Since the source of contamination for the Reservoir has been significantly reduced, it is unlikely that contamination currently exists in the Reservoir. This conclusion is also supported by the surface water and sediment data collected during the RI. One sample was taken at the mouth of the Slatersville Reservoir during the current RI and showed no contamination. Therefore, additional samples of the Slatersville Reservoir were determined not to be necessary.

EPA also recognizes that fish flesh samples were not taken. However, tests such as this are typically not required by EPA unless the levels of contaminants in the surface water and sediments are significantly higher than those detected at the Western Sand & Gravel Site.

Comment 34: RIDEM requested documented justification for EPA's selection of the area to be covered by the access restrictions under the preferred alternative. RIDEM also asked whether EPA would protect any areas outside of the areas designated in the Proposed Plan. RIDEM recommended that EPA outline mechanisms to protect areas outside of the areas designated in the Proposed Plan if EPA does not already plan to protect those areas.

EPA Response: The area requiring institutional controls, such as access restrictions, is presented in Figure 7 in Appendix A of the ROD. This area includes a buffer zone which allows for a residential well to be installed without drawing contaminated groundwater from the area which poses an unacceptable risk. This buffer zone is equal to 300 feet at the Site. The risk to public health in this area is outside of EPA's acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$. The risk to public health outside of the area delineated in Figure 7 is within EPA's acceptable risk range. The documentation which supports the risk calculations are presented in the RI Report. Furthermore, the concentrations of contaminants beyond the area delineated in Figure 7 are below ARARs. EPA is required under CERCLA and the NCP to select a remedy that is protective of public health and the environment and which meets ARARs. Since the risk posed to public health is within EPA's acceptable range and the levels of contamination do not violate ARARs, EPA does not agree that institutional controls should also be placed beyond the area delineated in Figure 7.

Comments on Hunt's Response to Previous RIDEM Comments on the Groundwater RI

Comment 35: The RI Report states that "Rhode Island records indicate that an estimated 419,000 gallons of septage waste was deposited..." at the Site. RIDEM claims that this statement is not correct and requested that the report be corrected.

EPA Response: The documents generated by EPA correctly reflect the information regarding historical disposal of waste. In summary, EPA has stated that RIDEM records indicate that about 470,000 gallons of waste were deposited at the Site during its last year of operation.

Comment 36: RIDEM noted that the GZ3-2 well is a bedrock well screened in bedrock, not in the overburden or highly fractured zone and that the Groundwater RI be corrected to reflect that fact.

EPA Response: EPA disagrees with RIDEM's conclusion regarding the GZ3-2 well. As discussed in response to Comment 3 above, a review of the well driller's log indicates that this well is located in the fractured weathered zone of the bedrock system.

Comment 37: RIDEM stated that Section 1.2, Site Description and History, of the Groundwater RI Report should indicate that SVOCs and metals were found on the Site in high concentrations. Furthermore, RIDEM requested that the Groundwater RI Report note whether the Groundwater FS addresses potential off-site migration of these contaminants.

EPA Response: EPA agrees that, during the early history of the Site, SVOCs and metals were detected in the Site groundwater and soils. Therefore, EPA required Hunt to conduct sampling for these compounds during the RI. Based on a review of the RI

results, these compounds are no longer frequently detected or detected at elevated concentrations. A review of the risk assessment indicates that the VOCs currently pose the greatest health risk at the Site. Therefore, the VOCs are the focus of the selected remedy. However, the selected remedy also includes periodic monitoring of the SVOCs and metals to insure that these compounds continue to pose an acceptable risk to public health and the environment.

Comment 38: Regarding previous RIDEM comments on Sections 1.2, 2.2, and 2.3 of the Groundwater RI, RIDEM noted its assumption that the information on the completeness of the removal action at the Site was based on research on the subject. If this is not the case, RIDEM recommended that certain statements on the matter be deleted from the Groundwater RI and all statements on the removal process should be based on the material requested by RIDEM.

EPA Response: Detailed information on the removal process conducted at the Site is available for review in the Administrative Record. EPA acknowledges RIDEM's comment but contends that this comment has no impact on the selected remedy.

Comment 39: RIDEM's original comment on Section 4.1 of the RI Report stated that Hunt's evaluation of potential sources for the residential wells contamination (i.e. septic systems) in addition to the Site were in error. RIDEM requested that Hunt provide references for the information presented. Hunt responded by noting a report generated by CDM in 1985. RIDEM could not find the reference cited by Hunt and requested that Hunt provide the proper references.

EPA Response: EPA agrees with RIDEM that the evaluations and conclusions regarding septic tank contamination in the residential wells is not supported by the information provided by Hunt in the RI Report. However, this conclusion does not impact the selected remedy.

Comment 40: RIDEM noted that, according to the Cap Closure Final Report, the proposed contaminated material removal included soils. RIDEM stated that, therefore, the Groundwater RI had not addressed RIDEM's previous comments and the report should address the contaminated material not removed from Pit 13.

EPA Response: Based on EPA's review of the information, the purpose of RIDEM's comment is not clear. Comments on the closure work are not directly applicable to the Groundwater RI. It is evident from the results of the groundwater investigation that the source of contamination has been minimized. The post-closure plan for the cap requires continued monitoring of the groundwater to insure that the cap continues to effectively control any remaining source of contamination.

Comment 41: RIDEM commented on the Draft RI Report and noted that Section 7.3 of the RI Report should identify the average depth to groundwater. RIDEM's review of the Revised RI Report indicated that the report was not revised accordingly.

EPA Response: EPA's review of the Groundwater RI Report indicates that groundwater is found at depths ranging from 3 feet below grade to 28 feet below grade.

Comment 42: RIDEM noted that Hunt had failed to address RIDEM's previous comment on Section 7.4, page 123, 7th paragraph. RIDEM's comment was as follows:

> The report should include a statement to support the conclusion that "groundwater monitoring during the current GRI evidenced that absence of NAPL in the aquifer." This would include the method employed for detecting NAPL and a summary of the obtained results. Table 1-1, page 1-7 of the 1984 RI/FS contains an analysis of NAPL found at the Site. Information contained in Appendix K indicates that a number of compounds, previously identified in the analysis of NAPL, are still being detected.

EPA Response: As discussed in response to Comment 8 above, the concentration of contaminants at the Site are not indicative of the presence of NAPLs. Groundwater concentrations of 5 to 10 percent of the field solubility of a compound is thought to suggest the presence of NAPLs. The concentrations of contaminants at the Site currently do not approach this level. However, in response to RIDEM's concern, the selected remedy includes the use of an interface probe to identify the presence of NAPLs. This test shall be conducted during the first round of groundwater sampling and shall confirm the conclusion.

Comment 43: RIDEM noted that Hunt had failed to address RIDEM's previous comment on Section 7.4, page 124, 2nd paragraph. RIDEM's comment was as follows:

> RIDEM noted that for completeness the RI Report should include a statement concerning the historic information for alcohols in monitoring wells.

EPA Response: Alcohols were detected at elevated concentrations in the groundwater during the early history of the Site. Therefore, EPA requested that Hunt conduct analyses for alcohols during the RI. The results of these analyses indicate that alcohols do not currently pose a significant risk to public health and the environment at the Site.

Part III — Summary of Potentially Responsible Party Comments

Olin Hunt Specialty Products, Inc., (Hunt), a potentially responsible party the Site, provided written comments which are summarized below.

Comment 1: Hunt recommended that the ROD allow flexibility in the approach to be used to prevent human exposure to the contaminated groundwater. Hunt recommended that the ROD allow for either an alternate water supply, such as extension of the existing system under construction or well head treatment, or implementation of groundwater access restrictions, such as deed restrictions or purchasing the property or groundwater rights. Hunt believes that these methods can effectively protect public health and notes that they have been used at other Superfund sites. Hunt states that the ROD should not require specifically the purchase of property to achieve this protection.

EPA Response: The selected remedy in the ROD requires the implementation of institutional controls necessary for preventing exposure to the contaminated groundwater within the area delineated in Figure 7 in Appendix A. The ROD states that the institutional controls shall be implemented to reduce the risk to public health from consumption of the groundwater. Such controls may include regulatory restrictions, acquisition of affected properties or groundwater rights, and other restrictions on property transactions. An alternate water supply, such as well head treatment of expansion of the existing permanent water supply is not considered an effective means to prevent access to the groundwater. Furthermore, expansion of the existing system is not feasible without additional investigations to identify a source.

There are 45 existing residential homes in the affected area. Of these 45 residences, 41 residences participated in the well head treatment program making this program 91 percent effective at preventing exposure to the groundwater. To date, 44 residences have provided EPA with access agreements to connect to the permanent water supply making this program 98 percent effective at preventing exposure to the groundwater. While these percentages seem high, EPA does not consider these programs fully effective at eliminating exposure to the groundwater.

The affected area identified in the 1984 ROD included 56 parcels of land. An investigation was conducted by Camp Dresser and McKee in 1985 to identify a source for the water system assuming a 60 lot capacity. A pump test was conducted at the source that was finally selected. CDM concluded that the source selected for the water system had the capacity to service 60 residential lots. CDM further stated that, in the event of expansion beyond the 60 lots, additional data should be collected to determine if the source had the capacity to service additional lots. After issuance of the ROD, 9 additional lots on Douglas Pike were included in the consent decree as part of the affected area resulting in a total of 65 lots within the affected area. Since the issuance of the ROD, some of the lots within the affected area have subdivided. Currently, there are approximately 72 lots in the affected area. Therefore, the capacity

of the existing system is already consumed by the existing lots. Excess capacity is not available for future subdivisions without additional investigations. Therefore, additional investigations would have to be conducted to verify if the existing source has the capacity to service any additional lots including those created by subdividing the lots identified in Figure 7 in Appendix A.

In summary, since the provisions of an alternate water supply is not 100 percent effective at preventing exposure to the groundwater at the Site, EPA believes that institutional controls are also needed.

Comment 2: Hunt agreed to install and sample additional bedrock wells. Hunt stated that this work will more than adequately characterize the bedrock system and should be the final phase of bedrock investigations.

EPA Response: In a letter dated February 7, 1991, EPA requested that Hunt conduct additional investigations of the bedrock system. These investigations included the installation of three new bedrock wells. EPA does not agree with Hunt's statement that "this work will more than adequately characterize the bedrock system." EPA considers this conclusions premature. As stated in the February 7 letter, EPA considers this work the first phase of the investigation. EPA shall determine if additional investigations shall be conducted after reviewing the results from the first phase of the investigation.

Comment 3: Hunt believes that the existing data adequately characterizes the surface waters and sediments of Tarkiln Brook. Furthermore, Hunt believes that the results show that Tarkiln Brook is not experiencing significant environmental stress due to Site contaminants. Hunt contended that it has attempted to address all previous concerns of RIDEM on this matter. Hunt requested further opportunity to address specific RIDEM concerns regarding the Brook, including meetings with RIDEM.

EPA Response: EPA encourages Hunt to cooperate with RIDEM in resolving the issues associated with the investigations of Tarkiln Brook. EPA will evaluate any additional data collected by Hunt and determine if modifications to the selected remedy are necessary for the protection of the public health and the environment.

Comment 4: Hunt noted that the preferred alternative appears to propose sampling from all existing Groundwater RI and Site closure monitoring wells. Since the plume of contamination is already well defined, Hunt believes that the plume can be adequately monitored by a subset of the wells scheduled for future sampling in the preferred alternative. Hunt proposed a specific subset of the wells and a monitoring schedule for EPA's consideration. Hunt noted that using a subset of the wells for monitoring the plume would be consistent with past EPA and RIDEM practices at the Site. Hunt also recommended that the ROD allow for modification of the monitoring program based on new sampling data as it is accumulated during the course of the remediation.

EPA Response: EPA evaluated the groundwater monitoring plan for the overburden aquifer in the FS Addendum and the Proposed Plan and has modified the monitoring

plan based on comments received from RIDEM and Hunt. The modified overburden groundwater monitoring program is as follows:

- The following twenty eight (28) wells shall be monitored on a quarterly basis for volatile organic compounds (VOCs) and on an annual basis for semi-volatile compounds (SVOCs) and metals.

C-1	C-3S	C-5S	I-2S	I-6S
C-2S	C-3M	C-5M	I-2M	I-6M
C-2M	C-3D	C-5D	I-2D	I-6D
C-2D	C-4S	C-6S	I-3S	II-3S
	C-4M	C-6M	I-3M	II-3M
	C-4D	C-6D	I-3D	II-3D

A review of the analytical data presented in the RI Report indicated that, with the exception of C-1 which is upgradient of the Site, these wells were the most contaminated wells in the plume (See Figure 4.2 in RI Report, Hunt, June 1990). All of these wells shall be utilized to evaluate the effectiveness of natural attenuation. Quarterly monitoring in needed to provide enough data to statistically evaluate the effectiveness of natural attenuation. In addition, it is anticipated that the probability of implementing active restoration is the greatest in the first six (6) years. Therefore, quarterly monitoring must be conducted for a minimum of six (6) years.

VOCs are the most prevalent compounds detected at the Site. However, some SVOCs and metals have also been detected in the groundwater. Based on EPA's review of the data, these compounds are not expected to increase in magnitude and extent. However, due to concerns raised by RIDEM on the impacts to Tarkiln Brook and in order to verify this conclusion, annual monitoring of SVOCs and metals has also been included in the monitoring plan. After a minimum of three years of monitoring, the monitoring plan may be modified to reduce the frequency of sampling if approved by EPA.

- In addition, the following twenty eight (28) wells shall be monitored on an semi-annual basis for VOCs.

I-1S	I-5S	I-8S	II-4S	II-6S
I-1M	I-5M	I-8M	II-4M	II-6M
I-1D	I-5D	I-8D	II-4D	II-6D
I-4S	I-7S	II-2S	II-5S	
I-4M	I-7M	II-2M	II-5M	
I-4D	I-7D	II-2D	II-5D	

These wells were found to be in the overburden plume or just outside of the plume during the RI. As stated above, EPA has concluded that the magnitude and extent of contamination in the overburden aquifer is decreasing. In addition, EPA has concluded that there is a small component of flow which passes under Tarkiln Brook and discharges into the Slatersville Reservoir. This conclusion is based on seven

sampling episodes over a two and a half year period. However, due to concerns raised by RIDEM on the potential impacts to the Reservoir, this conclusion shall be verified with additional long-term data. After a minimum of three years of monitoring, the monitoring plan may be modified to reduce the frequency of sampling if approved by EPA.

In summary, EPA considered Hunt's comments on the monitoring program. EPA has concluded that based on the data collected to date, the magnitude and extent of the overburden groundwater plume appears to be decreasing. This conclusion supports EPA's selection of natural attenuation with contingent active restoration. Immediate implementation of active restoration would insure that the magnitude and extent of the plume would continue to decrease. Since active restoration shall not be implemented immediately, a comprehensive monitoring plan is needed to verify this conclusion. Furthermore, due to concerns raised by RIDEM on the impacts to Tarkiln Brook and the Slatersville Reservoir, long-term monitoring of SVOCs and metals has also been included in the monitoring plan.

Comment 5: Hunt noted that the Slatersville Aquifer is not a single regional aquifer as implied in the Proposed Plan, but is divided into several discrete units. Hunt concluded that contamination in one unit will not impact other units. In addition, Hunt emphasized that only a small portion of the aquifer in the area of the Site is impacted by contamination from the Site.

EPA Response: EPA agrees that the Site has currently impacted one portion of the Slatersville Aquifer. However, future impacts to the other portions of the aquifer will depend upon future conditions around the Site. According to the investigations of the Slatersville Aquifer conducted by the U.S. Geological Survey, a public water supply located along the east bank of the Slatersville Reservoir with a pumping rate of 1000 gpm would have a cone of influence which extends about 5000 feet. A cone of influence of this size would impact the hydrogeology of the Site. In addition, a local utility recently requested comments from EPA on the use of another portion of the Slatersville Aquifer for the purpose of providing a source of cooling water. Future changes in the use of the aquifer such as this could also result in changes to the hydrogeology at the Site. Therefore, EPA believes that it is possible that additional portions of the Slatersville Aquifer could be impacted by the Site if the hydrogeological conditions surrounding the Site are altered.

During the public hearing, RIDEM presented comments on EPA's Proposed Plan as well as the other documents in the Administrative Record. As part of Hunt's comments on the Proposed Plan, Hunt submitted responses to RIDEM's comments at presented at the public hearing. Hunt's responses are presented in comments 6 through 10.

Comment 6: RIDEM stated that the assessment of the impacts to Tarkiln Brook were inconclusive and that additional data is required and should be collected prior to finalization of the ROD. In response to this comment, Hunt notes that the Proposed Plan retains a provision for RIDEM to request additional surface water and sediment

data. Hunt stated that the existing data is sufficient to characterize Tarkiln Brook and requests further opportunity to address specific concerns.

EPA Response: As stated in EPA's response to Comment 3 in Part III of this section, EPA encourages Hunt to cooperate with RIDEM in resolving the issues associated with the investigations of Tarkiln Brook. EPA will evaluate any additional data collected by Hunt and determine if modifications to the selected remedy are necessary for the protection of the public health and the environment.

Comment 7: RIDEM stated that the bedrock investigation was inconclusive and that additional data should be collected prior to finalization of the ROD. In response to this comment, Hunt noted that the Proposed Plan retains a provision for the Agency to request additional data on the bedrock system. Furthermore, Hunt notes that EPA has already requested that Hunt collect additional data. In response to this request, Hunt has agreed to install and sample additional bedrock wells.

EPA Response: EPA believes that the issue of bedrock contamination can be addressed after issuance of the ROD. Hunt has agreed to collect additional bedrock data. After reviewing the results of this investigation, EPA shall determine if additional investigations are necessary or if the selected remedy should be modified to include active restoration and/or long-term monitoring of the bedrock system.

Comment 8: RIDEM had concerns regarding the validity of the groundwater model used in the Groundwater FS for predicting the time of restoration. Hunt noted that the same model was used to evaluate both natural attenuation and active restoration and thus provided a fair basis for a relative comparison of the two remedies. Hunt added that field data have shown that natural attenuation is actually reducing contaminant concentrations and shrinking the plume faster than predicted by the model.

EPA Response: EPA's responses to RIDEM's specific concerns with the model are presented in EPA's response to Comment 4 in Part II of this section. In summary, EPA has concluded that the model presents a conservative estimation of the actual time for restoration of the groundwater. This conclusion is supported by the actual data collected to date. In addition, since the same assumptions were utilized, the model was an accurate tool for comparing the effectiveness of natural attenuation to active restoration.

Comment 9: RIDEM stated that selection of natural attenuation is not consistent with the State of Rhode Island's statutory program regarding groundwater protection. In response to RIDEM's assertion, Hunt contended that the Groundwater Protection Act does not contain a mandate or preference for active restoration over natural attenuation where, as in this case, natural attenuation is as effective and as efficient as active treatment at restoring groundwater quality. Hunt also argued that, since RIDEM has not formally adopted a groundwater classification system or any other regulations relating to groundwater classification, natural attenuation does not conflict with RIDEM policy. Hunt added that active treatment may not be any faster than natural

attenuation because the rate at which the contaminants will be released from the aquifer soils may limit the speed of restoration regardless of the quantity of water pumped.

EPA Response: EPA's complete response to this comment is presented in response to Comment 5 in Part II of this section. In summary, EPA believes that selection of natural attenuation is consistent with the State's Groundwater Protection Act. The Groundwater Protection Act mandates the State to promulgate classification standards and regulations for the protection and restoration of aquifers in the State of Rhode Island. Those standards and regulations have not been promulgated to date. According to the Draft Groundwater Protect Standards, the groundwater at the Western Sand & Gravel Site is classified as GAA-nonattainment. Class GAA-nonattainment requires the groundwater to be restored to drinking water standards. EPA's selected remedy shall restore the groundwater to drinking water standards using natural attenuation within 24 to 28 years. This time-frame is appropriate given the particular circumstances at the Site. EPA has determined that the GWPA does not require active restoration of the groundwater at the Site.

EPA does not agree with Olin's conclusion that the desorption rate of contaminants from aquifer soils may be the rate limiting step in restoration of the aquifer. The desorption rate of contaminants is based on the organic content of the soils. Contaminants tend to bind to soils with high organic content. The aquifer soils at the Western Sand & Gravel Site consist primarily of sand deposits which contain a low organic content. Therefore, EPA has concluded that it is unlikely that the desorption rate shall be the rate limiting step in restoring the groundwater at the Site.

Comment 10: RIDEM stated that the decision mechanisms for contingent active restoration which are based on the groundwater monitoring results were vague. RIDEM further requested that detailed criteria for groundwater, surface water and sediments were needed. In response to this comment, Hunt stated that the selection of an appropriate monitoring program should not be a factor in the decision between remedies since an adequate monitoring program will be required in any case.

EPA Response: EPA agrees with the State that the decision mechanism for implementation of active restoration should be specified in detail. EPA disagrees with Hunt that selection of a monitoring program should not be a factor in the decision between remedies. Selection of natural attenuation with contingent active restoration was highly dependent on whether an effective monitoring and evaluation program could be developed. If an effective program could not be developed, the preferred alternative could not be implemented and the selection of a remedy at the Site would have been between either natural attenuation without active restoration or active restoration itself. In response to RIDEM's comments on the monitoring and evaluation plan, EPA reviewed the program established to evaluate the effectiveness of natural attenuation in the preferred alternative and has modified the monitoring and evaluation program. A discussion of the revised program is presented in response to Comment 6 in Part II of this section. EPA believes that the revised program shall be effective in determining whether natural attenuation is reducing the concentrations of

contaminants at the Site within a time frame which is reasonable given the particular circumstances at the Site.

Comment 11: RIDEM stated that they had concerns about access restrictions for future residents. Hunt responded to this statement by noting that Hunt believes that public health can be protected by provision of an alternate water supply and/or access restrictions. Furthermore, Hunt noted that protection of public health has been accomplished at other Superfund Sites using these methods.

EPA Response: EPA believes that institutional controls, such as access restrictions, are a necessary component of the selected remedy. As discussed in response to Comment 1 in Part III of this section, provisions for an alternate water supply are not considered effective and are not acceptable as a form of institutional controls.

Comment 12: Hunt stated that it had received verbal comments from the Nasonville Water District indicating that the Water District prefers an active restoration remedy based on current problems with activation of the new permanent water supply. Hunt argues that the selection of a groundwater remedy for the Site should be kept independent of disagreements related to the water supply. In addition, Hunt noted that no technical barriers exist to the operation of the water supply at this time.

EPA Response: The U.S. Army Corps of Engineers has indicated the permanent alternate water supply is certifiably complete and operational. EPA has been working towards resolving the issues associated with operation of the permanent water supply and does not believe that these issues impact the selection of the remedy for the groundwater contamination.

Comment 13: Hunt noted that the Groundwater RI Addendum should state that data from the closure wells were used to aid in defining Site hydrogeology.

EPA Response: The RI Addendum states that "forty two wells were installed at varying depths and fifteen locations in the overburden aquifer during the RI." EPA acknowledges Hunt's correction to this statement. The RI Addendum should also note that in addition to the forty two wells, sixteen wells, also known as closure wells, were installed at six locations around the perimeter of the cap. These wells were installed to monitor the effectiveness of the cap. Data from these wells was also utilized to characterize the hydrogeology of the Site.

Comment 14: Hunt believes that the decrease of contamination concentration with distance from the Site should be described in the Groundwater RI Addendum as "rapid" or "significant" rather than "gradual".

EPA Response: EPA believes that adjectives such as rapid, significant or gradual are difficult to define and are subject to the opinion of the reader. The important fact to note is that the concentrations of contaminants at the Site decrease with distance from

the Site. The readers of the addendum can review the figures and make their own judgement as to whether the decrease in concentration is gradual, rapid or significant.

Comment 15: Hunt commented that the bedrock sampling well seals were not "faulty", but were properly designed and installed. Hunt noted that even if the well seals were completely effective, artificial gradients induced by well evacuation may cause migration of contaminated overburden groundwater through natural fractures to the bedrock well screens. Hunt stated that this is a limitation of the best technology available today for monitoring well construction.

EPA Response: EPA agrees with Hunt that the wells may have been installed correctly. However, the wells were "faulty" in meeting the objective for which they were installed. The objective of installing the bedrock wells was to characterize the extent of contamination in the bedrock systems. Since the well seal may not have effectively prevented contaminated groundwater from the overburden aquifer from entering into the bedrock well, the wells were faulty in meeting the objective of the bedrock investigation. Furthermore, EPA believes that the problems encountered during the installation and monitoring of the existing bedrock wells can be eliminated with the use of an open bore hole and sampling methods capable of isolating the discrete intervals within the borehole.

Comment 16: Hunt disagrees with the conclusion that production from residential bedrock wells indicates that there is a substantial flow of groundwater in the bedrock fracture network near the Site. Rather, Hunt contends that a significant portion of residential bedrock well water is likely from the overburden.

EPA Response: Hunt has not provided evidence to support their conclusion that the primary source of water for the residential bedrock wells is actually overburden groundwater. EPA believes that it is more likely that the source of water for the bedrock wells is actually from water bearing fractures in the bedrock system. EPA's conclusion seems reasonable when considering the approach taken to install residential wells. Typically, a well driller installs wells to a depth necessary to obtain a sufficient yield of water. If the well driller had identified a sufficient yield in the overburden, the driller would have stopped drilling and left the well in the overburden aquifer. If the driller does not encounter sufficient yield in the overburden, the driller continues drilling into bedrock until a water bearing fracture is found. The conclusion is further supported by the fact that most of the known residential bedrock wells are located in proximity to one another. One possible explanation for this occurrence is the lack of a source of overburden groundwater in this general area. Therefore, EPA does not agree that the source of the water in the residential bedrock wells is overburden groundwater.

Comment 17: Hunt disagrees with the conclusion that contamination in residential bedrock wells indicates that the bedrock system may also be contaminated. Hunt contends that, since the bedrock wells receive substantial recharge from the overburden, they can also receive contamination from the overburden such as septic

system contamination. Hunt noted that additional data will "determine if the bedrock system is contaminated," not "verify that the bedrock system is contaminated."

EPA Response: As noted above in response to Comment 16 in Part III of this section, Hunt has not presented evidence to prove that the residential bedrock wells receive substantial recharge from the overburden. In addition, Hunt has not presented evidence to support the conclusion that the source of contamination in the bedrock wells is septic systems. Based on the data collected to date, it is premature to eliminate the Site as a possible source of contamination in the residential bedrock wells. Furthermore, as discussed in the RI Addendum, there are two explanations for the contamination detected in the bedrock system. One explanation is that the groundwater migrated under natural conditions and contaminated the wells. The other explanation is that the contamination resulted from artificially induced vertical migration.

Comment 18: Hunt had three comments on Figure 2 in the RI Addendum which is a contour map based on piezometric data. First, Hunt noted a correction in the presentation of the data. Hunt noted that the piezometric elevations should be presented as 256.1 rather than 56.1. Second, Hunt stated that the piezometric map should be prepared with the water levels of Tarkiln Brook. Finally, Hunt noted that the area indicated as the "Minimum Extent of Plume" should be identified as the "Minimum Potential Extent of Plume."

EPA Response: EPA acknowledges Hunt's first comment on the presentation of the piezometric information and has concluded that it has no impact on the conclusions drawn by EPA on this figure. The numerical values for the piezometric data were presented in abbreviated form due to limited space available on the map. Second, EPA disagrees with Hunt's conclusion that the water levels of Tarkiln Brook should be included in the piezometric map. As stated in the RI Addendum, there is a component of flow in the deep portion of the aquifer which passes under the Brook (emphasis added). The appropriate way to assess the direction of this component of flow is to map the piezometric elevations without the water levels in the Brook. Finally, EPA agrees with Hunt's comment that the area on Figure 2 should be identified as "Minimum Potential Extent of Plume."

Comment 19: Hunt noted that it is not certain whether residents who are not participating in the residential well treatment program are being exposed to Site contaminants.

EPA Response: EPA acknowledges Hunt's comment that residents who, by their own choice, are not participating in the residential well treatment program, <u>may</u> be exposed to Site contaminants in the groundwater. Since the residents are not participating in the residential well treatment program, data on the quality of the water in their wells is not available.

Comment 20: Hunt stated that the intent of further bedrock investigation is to identify and monitor any productive zones. However, Hunt notes that it will be difficult to completely prevent inducing artificial gradients between the overburden and the bedrock. In addition, Hunt noted that evacuation of the bedrock will be required for removal of drilling water and, determination of yield, and/or sample event purging. Such evacuations will unavoidably induce some artificial vertical gradient if the screened interval is an essentially non-water bearing zone.

EPA Response: EPA believes that the critical element in inducing artificial gradients in bedrock wells is the sampling methods not the well installation methods. Sampling from discrete ten foot intervals, continuously through the length of the borehole, will not cause artificial gradients. Utilizing this approach for sampling would allow sampling of discrete zones with adequate purging even if the entire borehole was not able to be developed.

Comment 21: Hunt argued that active restoration of bedrock groundwater is not feasible due to low yield and the likelihood of drawdown of contaminated groundwater from the overburden.

EPA Response: EPA disagrees with Hunt's conclusion that the bedrock at the Site is low yielding. This conclusion is based on the results from two wells and may not be indicative of conditions throughout the Site. Therefore, EPA also disagrees with the conclusion that active restoration of the bedrock system may not be feasible. EPA believes that sufficient data has not been collected to adequately characterize the bedrock system and that it is premature to draw conclusions on the limited data collected from the two bedrock wells.

Comment 22: Hunt disagreed with EPA's interpretation of the definitions of long- and short-term effectiveness as described in EPA's comments on the Groundwater FS and in the FS Addendum. Hunt argued that short-term effectiveness covers the time up to the point where cleanup levels are achieved. Furthermore, Hunt asserts that their discussion of ARARs was complete. Hunt recognized that the cleanup levels would be finalized at the time of the ROD. However, Hunt provided EPA with the opportunity to comment on the cleanup levels listed in Table 2.2 in the Draft deliverables.

EPA Response: Hunt's response asserts that in its discussion of ARARs in its FS report it has complied with § 300.430 (e) (9) (iii) (B) of the NCP. That section describes how the Detailed Analysis section of the Feasibility Study must assess whether each proposed remedy attains applicable or relevant and appropriate requirements (ARARs). The Preamble to that section states that"[t]he detailed analysis should summarize which requirements are applicable or relevant and appropriate to an alternative and describe how the alternative meets these requirements." The Detailed Analyses of Alternatives 1, 2 and 3 merely state that those alternatives "will achieve compliance with ARARs." This statement falls well short of the level of detail required by the NCP. The analyses of Alternatives 4 and 5 are also incomplete, in that they do not summarize the ARARs affecting those alternatives or adequately describe

how each alternative meets those ARARs. The NCP requires that such discussion occur specifically within the Detailed Analysis section.

EPA understands Hunt's response that the ARARs for alternatives 1, 2, 3, 4 and 5 were presented in Table 2.2. However, this table was not referenced at any point during the discussion of ARARs in the Detailed Analysis or the Comparison of Alternatives. Moreover, the groundwater modeling which Hunt refers to as identifying how each alternative will comply with chemical-specific ARARs is not mentioned in any ARARs discussion in the report. Finally, while EPA agrees that additional ARARs for Alternative 4 were listed in the Comparison of Alternatives ARARs discussion, EPA believes that these ARARs would have been equally applicable to Alternative 5. However, Hunt does not even mention Alternative 5 in the ARARs discussion of the Comparison of Alternatives.

Comment 23: Hunt contends that the residual risk could not be identified in the FS Report because the final clean-up levels had not been selected by EPA. Hunt stated that the residual risk would equal that associated with the clean-up level chosen by EPA and that risk would be protective of human health. Furthermore, Hunt states that the analysis of the long-term effectiveness and permanence criteria should, according to the NCP, "focus on any residual risk remaining at the conclusion of the remedial actions."

EPA Response: EPA believes that Hunt may have used ARARs in calculating residual risk at the Site. Regardless of whether residual risk could be identified in the Feasibility Study, the remedy selected in the ROD provides that residual risk will be determined only when ARARs are met and a risk assessment is conducted.

EPA understands Hunt's concerns regarding the analysis of long-term effectiveness. Due to the stated preference for active treatment in the NCP, short-term effectiveness and long-term effectiveness as defined in the NCP are difficult to apply in a remedy using natural attenuation. The clear distinction between an active remedial period and the residual risk after treatment is completed does not exist for a natural attenuation remedy. However, EPA believes that it has properly addressed long-term effectiveness and short-term effectiveness in light of the circumstances of this remedy.

Comment 24: Hunt requests justification for EPA's conclusion that a 300-foot hydrogeological radius of influence exists around residential wells.

EPA Response: EPA believes that the 300 foot buffer zone within the area requiring institutional controls is reasonable. According to Rhode Island' rules and regulations pertaining to groundwater protection (R46-13-DWQ), a 400 foot radius of protection is required for a gravel developed domestic well and a 200 foot radius of protection is required for a drilled domestic well.

IV. Remaining Concerns

Issues raised during the public comment period that will continue to be of concern as the Site moves into the RD/RA phase are listed below. EPA will continue to address these issues as more information becomes available during the RD/RA.

1 The public will remain concerned over the progress of the natural attenuation, especially in the first few years. Residents will wish to be informed of the results of the monitoring and the evaluations. Special attention may need to be paid to explaining how the evaluations are performed.

2. Potential contamination of the bedrock and surface water will also remain important concerns to the public at least until the results of the additional studies of these media have been published.

Community interest in the Site may rise due to remedial activity at neighboring Sites such as Stamina Mills and Landfill & Resource Recovery.

Attachment A

Formal Community Relations Activities Conducted To Date at the Western Sand & Gravel Superfund Site

---

2 April 1980	EPA Press Release concerning EPA and RIDEM announcement that PCBs have been discovered in material taken from an industrial waste lagoon on the Site.
30 September 1981	RIDEM status letter to Town Council.
September 1982	RIDEM Community Relations Plan.
29 December 1982	Burrillville Town Council appoints Coordinating Committee (Ethel Halsey, Chair) to work with RIDEM, as suggested by former RIDEM Director, Ed Wood, in 9/30/81 letter to Town Council.
23 February 1983	RIDEM status letter to Ethel Halsey, including copy of RIDEM quarterly status report to EPA covering 7, 8, & 9/83.
6 April 1983	EPA Press Release concerning a study to determine the extent of chemical contamination in groundwater.
23 November 1983	Letter from John P. Hartley, RIDEM, to Ethel M. Halsey, Protect Our Water, concerning an update on state and EPA activities at the Site, with attached Progress Report, RIDEM, July - September 1983.
12 December 1983	RIDEM status letter to Burrillville Building Inspector
23 December 1983	EPA Press Release regarding filing of administrative complaint against president and owner of Western Sand & Gravel, Inc. for violation of Federal Hazardous Waste Management laws.
28 December 1983	Letter from John P. Hartley, RIDEM, to Ethel M. Halsey, Protect Our Water, concerning progress on the cleanup, the RI/FS, and installation of a new pumping well at the Site.
23 January 1984	EPA newspaper advertisements in the Providence Journal and Woonsocket Call announcing the availability of the Feasibility Study and preferred alternative (water supply construction),the public comment period, and two scheduled public meetings.
23 January 1984	EPA Press Release regarding scheduled Public Meetings on 2/2 and 2/9/84, and opening of comment period.

February 1984	EPA Press Release announcing Hunt Proposal for residential water filters.
2 February 1984	EPA and RIDEM public meeting on the Feasibility Study and EPA's preferred alternative (water supply construction). Recording of meeting available for review at EPA Region I.
2 February 1984 - 7 March 1984	EPA public comment period on the Feasibility Study and preferred alternative (water supply construction).
6 February 1984	EPA Press Release announcing change of public meeting from 2/9/84 to 2/23/84, and the extension of the close of the comment period to 2/29/84.
14 February 1984	Letter from Christine J. Spadafor, EPA Region I, to Ethel M. Halsey, Protect Our Water, concerning assistance in structuring public comments on the RI/FS.
16 February 1984	Letter from Christine J. Spadafor, EPA Region I, to Ethel M. Halsey, Protect Our Water, concerning requested sections of the RI/FS.
23 February 1984	EPA and RIDEM informal public hearing to accept comments on the Feasibility Study and preferred alternative. Recording of hearing available for review at EPA Region I.
(during comment period)	Two EPA informal meetings with the Western Sand & Gravel Hazardous Waste Coordinating Committee to answer questions and receive comments on the Feasibility Study and preferred alternative.
February 1984	EPA Press Release regarding second extension of comment period, until 3/7/84.
24 February 1984	Memorandum from Christine J. Spadafor, EPA Region I, to Ethel M. Halsey, Protect Our Water, concerning requested sections of the RI/FS.
27 February 1984	RIDEM letter to WSG Coordinating Committee w/ RIDEM comments on RI/FS.
27 February 1984	Letter from John P. Hartley, RIDEM, to Ethel M. Halsey, Protect Our Water, concerning follow-up for the 2/23/84 public meeting.
29 February 1984	Memorandum from Christine J. Spadafor, EPA Region I, to Ethel M. Halsey, Protect Our Water, concerning follow-up for the 2/23/84 public meeting.
29 February 1984	Letter from John P. Hartley, RIDEM, to Arthur Denomme, North Smithfield Town Administrator, and to the Town Clerk, concerning the timetable for public comments and the Record of Decision.

20 April 1984	Letter from John P. Hartley, RIDEM, to Ethel M. Halsey, Protect Our Water, concerning the status of the RI/FS and other Site activities.
28 September 1984	EPA Responsiveness Summary/Record of Decision on water supply construction.
15 October 1984	EPA Press Release announcing the Record of Decision (water supply construction).
27 November 1984	EPA Press Release regarding $1000 fine levied against WSG for failure to respond to information request from EPA.
6 December 1984	EPA Press Release concerning EPA's review of Hunt's proposal for water filters.
18 December 1984	Letter from Jack W. McGraw, EPA Headquarters, to Ethel M. Halsey, Town of Burrillville, concerning the authorization of the design of an alternative water supply and the next phase of remedial action.
8 February 1985	EPA Press Release concerning EPA citing ACME Services owner.
August 1985	EPA information sheet about the domestic water filter systems and sampling program.
12 August 1985	EPA Press Release announcing Site capping Proposed Plan, 8/27/85 public meeting, 9/10/85 public hearing, and public comment period closing 9/13/85.
August 1985	EPA fact sheet about the Feasibility Study and preferred alternative (Site Capping).
20 August 1985 - 13 September 1985	EPA public comment period on the Feasibility Study and preferred alternative (Site Capping).
21 August 1985	EPA meeting with the Western Sand and Gravel Coordinating Committee to discuss the Feasibility Study, EPA's and preferred alternative, and upcoming public meetings.
27 August 1985	EPA public meeting on the Feasibility Study and preferred alternative.
4 September 1985	RIDEM public notice on site public meeting concerning the proposed creation of the Nasonville Waster District.
9 September 1985	EPA informal public hearing on the Feasibility Study and preferred alternative.
30 September 1985	EPA Responsiveness Summary/Record of Decision, Site capping.

1 October 1985	EPA Press Release announcing the ROD for the Second Operable Unit (Capping).
21 February 1986	Letter from John Gallagher, EPA Region I, to Ethel M. Halsey, Nasonville Water District, concerning future public meetings.
5 March 1986	Meeting of EPA, RIDEM, and Nasonville Water District.
19 May 1986	EPA Press Release announcing the allocation of $150,000 for the design of a public water supply for homes near the Site.
9 October 1986	EPA public meeting with the Nasonville Water District to discuss the public water supply.
14 November 1986	EPA Press Release announcing Consent Decree entered into with approximately 51 PRPs (a $5.8 million settlement for the Western Sand & Gravel cleanup), and Public Meeting to be held 12/15/86 to discuss agreement.
14 November 1986	Hunt (PRP) Press Release announcing Consent Decree.
15 December 1986	EPA public meeting with North Smithfield Town Council to discuss the settlement for the Site.
24 April 1987	EPA Press Release announcing finalization of EPA contract with State of RI for funding water supply installation and operation & maintenance.
4 June 1987	EPA Press Release announcing the finalization of the cleanup settlement.
5 August 1987	EPA Press Release announcing the start of cap construction at the Site.
22 March 1988	EPA public meeting with the Nasonville Water District to discuss the public water supply.
14 March 1989	EPA public meeting with the Nasonville Water District to discuss the public water supply.
27 March 1989	EPA public meeting with the Nasonville Water District to discuss the public water supply.
14 November 1989	EPA Press Release announcing the 28 November meeting to discuss construction of the new water supply to serve homes affected by Site contamination.
28 November 1989	EPA public meeting to discuss the commencement of construction of the new water supply.
19 December 1989	U.S. Army Corps of Engineers (USACE) Press Release discussing waterline construction.

19 March 1990	USACE Press Release discussing water tank/pumping station construction start.
19 April 1990	EPA/USACE Press Release announcing the start of and the schedule for construction of the new water supply.
21 June 1990	EPA conducts community interviews to gather information for the preparation of this Community Relations Plan.
25 October 1990	EPA establishes Administrative Record at two information repositories at the Burrillville Town Hall and the EPA Records Center (see APPENDIX B for the addresses and hours of operation of the repositories).
November 1990	EPA completes Community Relations Plan.
November 1990	EPA Fact Sheet on results of Groundwater RI and RI Addendum.
4 February 1991	EPA Advertisement of Proposed Plan and Public Comment Period published.
4 February 1991	EPA Proposed Plan published.
11 February 1991	EPA Public Meeting on Proposed Plan, Groundwater Feasibility Study, and Feasibility Study Addendum.
12 February 1991 - 13 March 1991	EPA Public Comment Period.
28 February 1991	EPA Informal Public Hearing on Proposed Plan, Groundwater Feasibility Study, and Feasibility Study Addendum.
15 April 1991	EPA Responsiveness Summary for Record of Decision on groundwater cleanup.

Attachment B

Transcript of the February 28, 1991 Informal Public Hearing

UNITED STATES OF AMERICA

ENVIRONMENTAL PROTECTION AGENCY

REGION ONE

In the Matter of:

INFORMAL PUBLIC HEARING RE:
WESTERN SAND & GRAVEL SUPERFUND SITE

Burrillville Town Hall
Harrisville, Rhode Island

Thursday
February 28, 1991

The above entitled matter came on for hearing, pursuant to Notice at 7:05 p.m.

BEFORE: RICHARD C. BOYNTON, Chief
Rhode Island Superfund Section
U.S. Environmental Protection Agency
Region One
JFK Federal Building
Boston, Massachusetts 02203

LYNNE FRATUS
Remedial Project Manager
and
SUSAN FRANK
Community Relations Coordinator
Office of Public Affairs
U.S. Environmental Protection Agency
Region One
JFK Federal Building
Boston, Massachusetts 02203

APEX REPORTING
Registered Professional Reporters
(617)426-3077

I N D E X

P R O C E E D I N G S

(7:05 pm)

MR. BOYNTON: My name is Richard Boynton. I'm Chief of the Rhode Island Superfund Section of EPA's Region I Office. I have supervisory responsibilities for response actions at Superfund Sites in Rhode Island.

Tonight we're here to conduct an informal public hearing to accept oral comments on the cleanup alternatives under consideration for the Western Sand & Gravel Site.

I will serve as the Hearing Officer and, also, on the hearing panel are Lynne Fratus, and I'd like to introduce Warren Angell, who is the State Project Officer, in the front row, and in the rear, from our Office of Public Affairs is Susan Frank. She's our Community Relations Coordinator.

We held a meeting in this building on Monday evening, the 11th, in this room, to present information about the evaluational alternatives for the cleanup of the site and the preferred alternative for the cleanup of the site. The public comment period began on the next day, February 12th, and will close on March 13th.

Now, I'd like to go over the hearing format for you. We'll begin with a brief presentation by Lynne Fratus, on my right. She'll describe the proposed cleanup plan. Following Lynne's presentation, we'll accept oral comments you wish -- may wish to make for the record. The panel may ask

you some questions to -- in order to clarify your comments.

We will prepare a written response to the comments received tonight, and include the written responses with EPA's final decision. After all the comments have been heard, I will close the hearing.

If you wish to submit written comments, you may submit them to us tonight or mail them -- mail them through March 13th, to Lynne, at the address on page three of the proposed plan. Copies of the plan are available in the back of the room, if you need them.

At the conclusion of the hearing, we'll stay for a short time to address questions you may have about cleanup alternatives and the decision making process.

Those wishing to make comments tonight should have filled out an index card available at the rear of the room. If you wish to speak and have not completed a card, please, complete a card and Susan will give it to me. I'll call people in the order that the index cards were completed.

When we do call your name, you should come forward to the microphone or -- I think our -- if our court reporter can hear you clearly, I don't think the microphone would be necessary, but we are making a record of the proceeding. So I'd like to have you come forward and give your name and affiliation so that we get the correct information.

A transcript of tonight's hearing will be prepared

and made available as the administrative record here in the Burrillville Town Building, and, also, at EPA -- the EPA Record Center, at 90 Canal Street, Boston, Mass.

As I mentioned, we will prepare a response to oral and written comments received during the comment period, and we'll include the responses in the responsive summary, with the record of decision.

Now, Lynne will give an overview of the preferred alternative.

(Pause.)

MS. FRATUS: Like Dick said, I'm going to give a brief overview of what our preferred alternative was in the proposed plan, as well as the other alternatives that were evaluated during the feasibility study.

Our preferred alternative has three major components. The first component is called Natural Attenuation with Contingent Groundwater Treatment.

Natural attenuation -- under natural attenuation, the EPA would rely on natural processes such as biodegradation and natural chemical reactions and dilution to restore the groundwater to cleanup standards.

Natural attenuation has been going on historically already with the groundwater contamination since the waste was deposited at the site and has been effective in reducing the levels of contaminants in the groundwater historically.

If the groundwater does not restore itself at a rate that's acceptable to EPA under natural attenuation, the EPA would utilize an active restoration process to restore the groundwater to cleanup standards.

The second component of our preferred alternative is Access Restrictions. Due to the current or the future potential risk to public health, EPA would propose restrictions on the use of the groundwater that poses that unacceptable risk to public health.

The third component is Site Monitoring. I'll explain a little bit more about the Access Restrictions and the Site Monitoring in just a minute.

In discussing the first component, I -- I stated that EPA would utilize active restoration if the groundwater was not restoring itself at a rate that was acceptable to EPA. I'd just like to take a moment to explain what I mean by that.

EPA utilized two methods for predicting the estimated time to reach cleanup standards. The first method was utilizing hydrogeologic models. The models were basically computer programs which can input site specific perimeters such as the contaminants and concentrations and the types of soils present. The model will basically calculate or simulate how the groundwater is going to behave.

According to hydrogeologic models, it was predicted that it would take approximately 24 to 28 years to

restore the groundwater to cleanup standards.

The second method that EPA utilized to project the cleanup times was we did a statistical analysis of the actual data that's been collected at the site to date. Groundwater sampling has been going on pretty consistently since 1988. So we had quite a bit of data to take a look at.

According to the analysis that we did, we determined that it would take approximately 8 to 18 years to restore the groundwater according to natural attenuation. That is, if the groundwater continues to restore itself at the rate that it currently appears to -- it currently appears to be restoring right now, if we projected that out, it would take about 8 to 18 years to reach drinking water standards. According to groundwater models, it would take approximately 11 to 17 years using an active restoration process.

The other two components of our preferred alternative, which I've mentioned, first, is Access Restrictions. Once again, as I stated, the access restrictions are necessary to reduce the risk to public health. Access restrictions would be imposed in this area delineated by this heavy -- heavy line.

Basically, there are four properties that would be impacted by our access restrictions. Each property is delineated by a different color. First property is actually the Western Sand & Gravel property, itself. Then there is

this yellow shaded property right here, the green shaded property, and the blue shaded property.

The third major component of EPA's preferred alternative is Site Monitoring. The groundwater would be sampled every three months, until it's restored to cleanup standards. Every three years EPA would conduct an evaluation of the data and determine whether or not it's restoring it's rate -- itself at a rate that's predicted by the model or faster.

If this did not happen -- and we would repeat this every three years for the first nine years and every five years thereafter.

If at any point in the process during one of these evaluations EPA determined that it was not restoring itself at a rate predicted by the model or faster, EPA would implement an active restoration process to meet the drinking water standards. In a minute I'll give you a brief description of what the active restoration process would entail.

The last component or potential component of our remedy is Surface Water and Sediment Sampling. At this point, it is not a -- planned in the remedy but there is some future sampling of the surface waters and sediments planned.

Based on the results of that monitoring, EPA would determine whether or not our preferred alternative should also include long term monitoring of the surface water and

sediments of the site.

Now, I'd just like to give you a brief description of the active restoration process. Okay, first, the groundwater would be extracted using extraction wells. The groundwater would be pumped into a settling tank where metals and other solids would be collected and settled out. Those metals and solids would be -- would be disposed of at a licensed facility capable of accepting such waste.

From the settling tank the groundwater would be pumped into a filter for further removal of metals and solids. After passing through the filter, the groundwater would pass into what we identify -- we call it an air stripper. The air stripper would remove the volatile organic compounds which are principal contaminants at the site.

Basically, the way an air stripper works is that the groundwater is passed in the opposite direction to the air which is forced against it, and just by the nature of the contaminants that tend to volitize they transfer from the water into the air.

The air is then treated using a vapor phase carbon absorber prior to discharging it into the atmosphere and any contaminants that were pulled out of the water are then transferred onto the carbon in the -- in the carbon absorber.

The water that passes to the bottom of the stripper is then pumped also into a liquid phase carbon

absorber to remove any metals and semi-volatile compounds. Finally, the water is pumped into a storage tank and eventually clean water would be discharged to the Tarkiln Brook.

The -- both the carbon and the -- the liquid phase carbon absorber and the vapor carbon absorber would have to be changed periodically.

The last thing I'd like to go over is a brief overview of what all the alternatives are that EPA considered during the feasibility study. There were six alternatives that were evaluated during the detail analysis in the feasibility study.

The first alternative is similar to the preferred alternative. It relies on natural attenuation to restore the groundwater. However, unlike the preferred alternative, there would be no access restriction or controls placed on the properties. The first alternative, also, includes groundwater monitoring.

The second alternative is similar to the first and the preferred alternative. It, also, includes access restrictions. One difference between the second alternative and EPA's preferred alternative is that the access restrictions would have been imposed in an area much larger than that identified in EPA's preferred alternative.

Alternative three includes restoration of the

groundwater by natural attenuation. Rather than access restrictions, this alternative would use what we call well head treatment to treat future wells that would be installed in the area that poses a risk. These well head treatment systems are similar to what's currently being used in the residential homes near the site. Also, the third alternative includes groundwater monitoring.

The fourth alternative restores the groundwater using active restoration. The active restoration process in the fourth alternative is identical to the one that I just described to you for the preferred alternative.

The difference is that under alternative four active restoration would be started immediately. Monitoring would be conducted, but it would not be such that we would wait for a certain period of time before we triggered the active restoration process.

For alternative four, for the controls on the property, both access restrictions or well head treatment was identified as being potential mechanisms to prevent or to reduce the risk to public health. Like I said it, also, includes groundwater monitoring.

The last alternative -- I'm sorry, the fifth alternative utilizes active restoration, as well. The difference between the fifth alternative and the fourth alternative is that the fifth alternative would discharge a

portion of the groundwater that's extracted back into the groundwater after it has been treated.

It's -- it's predicted that the groundwater would not all be able to be discharged back into the groundwater. The system wouldn't be able -- were -- the conclusion was that the groundwater system may not be able to simulate or assimilate the actual -- the total discharge that would be extracted. So a portion of the extracted groundwater would, also, have to be discharged into Tarkiln Brook. So this alternative actually has two discharges.

The controls are similar to alternative four, either access restrictions or well head treatment and, also, groundwater monitoring.

The last alternative, alternative six, is the preferred alternative, which I just described in detail.

I guess that concludes my presentation.

MR. BOYNTON: Thanks, Lynne.

We'll begin the oral comments with a statement by the Rhode Island Department of Environmental Management. Warren Angell will give that statement.

MR. ANGELL: Good evening.

As Dick mentioned, my name is Warren Angell, and I'm a principal engineer with the Division of Air and Hazardous Materials, within the DEM.

MS. FRATUS: Warren, could you just get a little

closer to the mike?

MR. ANGELL: Sure. I'd rather face the audience though.

MS. FRATUS: Yes. Can you turn the mike around?

MR. ANGELL: It's kind of taped down.

(Pause.)

MR. ANGELL: Okay. Based upon the information available at this time, the Department of Environmental Management does not concur with the remedies proposed by the EPA.

The Department of Personnel have conducted a thorough review of the technical documents generated as a result of this groundwater remedial investigation and feasibility study. This includes three drafts of the IRA and two drafts of the FS generated by Olin's contract with BCM, as well as the addenda for the RI and FS produced by the EPA.

As a result of this review, we have generated numerous technical doc -- comments and have some significant concerns with both the material presented and the conclusions drawn.

We are providing a written comment letter to the EPA during this comment period that includes all of our concerns in more detail. I will only outline a few of our main concerns this evening.

First, I would like to say that the Department of

Personnel concluded that the investigation of contamination to Tarkiln Brook and Slatersville Reservoir was inadequate. This resulted in inconclusive findings regarding potential and environmental and public health risks.

The Department will be requesting that the responsible parties conduct additional sampling and adheres to guidelines specified by the Department.

Secondly, both the DEM and the EPA have concluded that the investigation of contamination to the bedrock aquifer was also inconclusive. As noted by the EPA in the proposed plan, they will notify Olin that additional studies are necessary.

Although the DEM would like to see an expedited remedy chosen for the site, we believe that such investigations should be conducted prior to selecting a remedy, thereby, allowing for a complete, accurate, and comprehensive selection process.

Thirdly, the department has raised numerous concerns regarding the validity of the model employed by Olin to characterize groundwater at the site. As many of these concerns have not yet been addressed, we question the remediation scenarios and remediation times generated by this model. We are requesting that the EPA revisit our comments on the model prior to the final remedy selection.

Fourth, based upon groundwater classification for

this area as designated by the Department's Groundwater Section, we believe that a natural attenuation remedy is unacceptable.

The State Groundwater Protection Act mandates a strong policy of restoration and nondegradation. Failure to implement active restoration is in conflict with the Act and is inconsistent with the policies consistently applied by the Groundwater Section.

Lastly, although we feel an active restoration scheme should be implemented, we would believe that the decision mechanisms that could possibly trigger an active restoration scenario, if natural attenuation is the chosen remedy, are extremely vague.

We are, therefore, requesting that the EPA outline in detail the criteria that would trigger active restoration. This must address both groundwater and surface water triggers.

The Department is, also, concerned that the proposed temporary access restrictions may not prevent all future development that maybe impacted by contaminants from the site.

That concludes what we consider to be our major concerns at this time. As I have previously said, we're going to submit a more detailed comment letter, within the comment period, and this letter will be forwarded to the local representatives and, also, entered into the administrative

record.

Thank you.

MR. BOYNTON: Thanks, Warren.

I'd now like to call Ethel Halsey.

MS. HALSEY: This may well be a first. I think I agree with DEM tonight. It's probably the first time in 12 years.

I have some written comments which I will submit, but I would like to just give a brief summary of the written comments.

I believe that the plan, as outlined by EPA, is an insult to the intelligence of the people of the effected area. Anyone who has taken the opportunity to read and study the plan realizes that the chances of their being any real cleanup taking place under that plan are minuscule.

We weren't fooled by the former cleanup plans presented by EPA. When they told us they were going to build a cap of plastic and clay and sand and cover it over with grass and call it a cleanup, we knew that was not a cleanup. That was literally and figuratively a coverup.

When they said they were going to build us a water supply, we said, wonderful; we certainly need water, and if we ever get it, we can celebrate, but it is not a cleanup.

As I see it, the benefactors -- the big benefactors of alternative six, as outlined tonight, will be

the owners of Western Sand & Gravel, the owners of Landfill and Resource Recovery, who happen to be the same as the owners of DC Land Company; and they, also, happen to own the so-called Burma Road, which passes adjacent to the site.

These are the properties that EPA is talking about purchasing from the present owners, to limit access to the area.

Now, on the matter of natural attenuation, attenuation in my dictionary means dilution or weakening. As I understand it, the main force that will cause this attenuation to occur naturally -- that's what we're talking about natural attenuation -- is rain water.

Now, three or four years ago we sat in this room and EPA presented us a plan that they were going to build a cap -- an impermeable cap over the waste so that the rain water could not get to it. Now, they are telling us that the rain water is going to cause the natural attenuation of the waste. I'm a little confused.

My recommendation, for what it's worth, is that we've had enough studies; we've had enough monitoring; we've had enough records of decision and all the rest of the gobble-glob. We need action and we need it now.

We need the waste water -- the groundwater treatment plant should be built immediately. It should have been built ten years ago, when it was first proposed by the

State. It would have been a lot easier and a lot cheaper, because the wastes would have been in a more concentrated area. Now they are all spread out all over the place. No wonder it is going to take 18 years.

The State said that they could do it in one. I, too, question that, but maybe two or three, and by this time it would have been done.

I do not think there ought to be a buy out of the surrounding areas. I think the policy that should be instituted should be let the buyer beware and nobody who builds from now on in that area should be allowed to hook into the -- to tie into the Nasonville water supply. There should be no well head treatment for the same -- for the same reason.

In conclusion, just let me read my concluding comments from my written comments. "We've had enough studies, reports, RI's, ROD's, FS's, and other paper pushing and time wasting projects. Get the stuff out of there and get it out now."

MR. BOYNTON: Thank you.

(Pause.)

MR. BOYNTON: Is there anyone else that would like to make a comment for the record?

(Pause.)

MR. BOYNTON: If there are no further comments for the record, I'll close the hearing.

We'll remain for a short time for questions and informal discussions about the remedy and the procedures.

(Pause.)

MR. BOYNTON: This hearing is now closed.

(Whereupon, on February 28th, 1990, at 7:30 pm, the hearing in the above entitled matter was closed.)

CERTIFICATE OF REPORTER AND TRANSCRIBER

This is to certify that the attached proceedings before: RICHARD BOYNTON, Environmental Protection Agency in the Matter of:

INFORMAL PUBLIC HEARING
WESTERN SAND & GRAVEL SITE

Place: Harrisville, Rhode Island

Date: February 28, 1991

were held as herein appears, and that this is the true, accurate and complete transcript prepared from the notes and/or recordings taken of the above entitled proceeding.

Donna Brideau
Reporter & Transcriber

03/04/91
Date

APPENDIX D

RECORD OF DECISION
WESTERN SAND & GRAVEL SITE

EXAMPLE OF EVALUATION OF NATURAL ATTENUATION

BENZENE

I. Introduction

The evaluation of natural attenuation shall be conducted on each of the four indicator compounds. The evaluation has three major steps:

1) Tabulate the data and calculate the sum of the maximum concentrations detected in each well cluster;

2) Calculate the theoretical concentrations; and,

3) Conduct a nonparametric statistical rank test to evaluate how well the actual data compares to the theoretical data.

Below is an example of the evaluation for benzene.

II. Tabulate the data and calculate the sum of the maximum concentrations detected in each well cluster

The first step in the evaluation consists of tabulating the actual data collected for the Site. The data from the following well clusters must be utilized in the evaluation: C2, C3, C4, C5, C6, I2, I3, I6, and II-3. Below is a table of the actual data collected for benzene during the Remedial Investigation. Please note that the data from the RI was utilized for the example only and shall not be utilized in future evaluations. The table should identify the maximum concentration in each well cluster during each sampling round. In addition, the table should also identify the sum of the maximum concentrations for each sampling round. Finally, the table should identify the elapsed time in months. Due to the proximity of well clusters C5 and II3, the sum of the maximum concentrations detected shall be determined from using either the maximum from C5 or the maximum from II3, which ever is greater.

Tabulation of Actual Data for Benzene

Well Cluster	Maximum Concentrations Detected in Well Cluster						
	May 1988	Sept 1988	Dec 1988	Feb 1989	Sept 1989	Aug 1990	Nov 1990
C2						3	
C3							
C4	27	12	3	4	2	1	5
C5	42	35		36	34	1	4
C6							
I2							
I3	5	3	5	2	1	1	2
I6							
II3		14	16			13	19
Actual Sum of Maximum Conc.	74	50	24	42	37	18	26
Total No. of Months	0	4	7	9	16	27	30

III. Calculate the theoretical concentrations

The theoretical concentrations shall be determined from the equations presented in the ROD for each of the four indicator compounds. These equations were developed from the results of three hydrogeologic models, MODFLOW, STLINE and the EPA Batch Flushing Model. The following equation was developed by EPA to predict the theoretical concentrations for benzene:

Benzene: $y = \text{antilog}\ (1.359 - 0.015(x))$

where x = number of months after the ROD signing (i.e. x = 1 for April 1991, x = 2 for May 1991, etc.)

y = theoretical concentrations of contaminant (ppb)

The equation presented above for benzene is based on data collected after the ROD signing. Since this example utilizes data collected prior to the ROD signing, EPA had to adjust the equation. The adjusted equation to be utilized for this example only is:

Benzene: $y = \text{antilog}\ (1.869 - 0.015(x))$

To calculate the predicted theoretical concentrations, insert the time in months as identified in the previous step above.

Tabulation of Theoretical Data for Benzene

Total No. of Months	0	4	7	9	16	27	30
Theoretical Sum of Maximum Conc.	74	64	58	54	43	29	26

IV. Conduct a nonparametric statistical rank test to evaluate how well the actual data compares to the theoretical data.

A statistical comparison of the actual data to the theoretical data shall be conducted using the nonparametric distribution free signed rank test of Wilcoxon with a 95 percent significance level as described in Nonparametric Statistical Methods (by Hollander and Wolfe, published by John Wiley in 1973, on pages 26-38). In summary, the rank test determines whether the trend established by actual data falls below the trend established by the theoretical data. If the trend for the actual data does not fall below the trend for the theoretical data as determined by the rank test, active restoration shall be implemented. All compounds must pass the rank test. If one compound fails the rank test then active restoration shall be implemented.

The rank test has six steps. These six steps are summarized below followed by the actual results for the rank test.

Step 1: Compute the difference between the actual and theoretical data as follows:

$$Y_i = C_o - C_t$$

where C_o = the actual sum of the maximum concentrations determined in Section II above.

C_t = the theoretical sum of the maximum concentrations determined in Section III above.

Y_i = the difference between the actual and the theoretical.

Step 2: Rank the absolute value of the difference as follows:

where R_i = Rank of $|Y_i|$

Step 3: Determine W_i as follows:

Set $W_i = 1$ if $Y_i > 0$

Set $W_i = 0$ if $Y_i \leq 0$

Step 4: Compute T_i as follows:

$$T_i = \sum R_i \times W_i$$

Step 5 Compute T_r as follows:

$$T_r = [n(n+1)/2] - t(\alpha,n)$$

where n = the number of samples

α = 0.055 (95% significance)

NOTE: $t(\alpha,n)$ is determined from the attached tables which are found in the reference discussed above.

Step 6: Determine in active restoration should be implemented as follows:

If $T_i \leq T_r$ do not implement active restoration

If $T_i > T_r$ implement active restoration

Results of Rank Test for Benzene

C_o	C_t	Y_i	$\|Y_i\|$	R_i	W_i	$\sum R_i x W_i$
74	74	0	0	1	0	0
50	64	-14	14	6	0	0
24	58	-34	34	7	0	0
42	54	-12	12	5	0	0
37	43	-6	6	3	0	0
18	29	-11	11	4	0	0
26	26	0	0	2	0	0
					T_i=	0

$T_r = [7(7+1)/2] - t(7,0.055)$

$= 28 - 24^* = 4$

* From attached table.

Since $T_i < T_r$, active restoration shall not be implemented.

This exercise must also be conducted for the three remaining indicator compounds. If one compound fails the rank test, active restoration shall be implemented.

Table A.4. Upper tail probabilities for the null distribution of Wilcoxon's signed rank T^+ statistic: $n = 3(1)15$

For a given n, the table entry for the point x is $P_0\{T^+ \geq x\}$. Under these conditions, if x is such that $P_0\{T^+ \geq x\} = \alpha$, then $t(\alpha, n) = x$.

	n						
x	3	4	5	6	7	8	9
3	.625						
4	.375						
5	.250	.562					
6	.125	.438					
7		.312					
8		.188	.500				
9		.125	.406				
10		.062	.312				
11			.219	.500			
12			.156	.422			
13			.094	.344			
14			.062	.281	.531		
15			.031	.219	.469		
16				.156	.406		
17				.109	.344		
18				.078	.289	.527	
19				.047	.234	.473	
20				.031	.188	.422	
21				.016	.148	.371	
22					.109	.320	
23					.078	.273	.500
24					.055	.230	.455
25					.039	.191	.410
26					.023	.156	.367
27					.016	.125	.326
28					.008	.098	.285
29						.074	.248
30						.055	.213
31						.039	.180
32						.027	.150
33						.020	.125
34						.012	.102
35						.008	.082
36						.004	.064
37							.049
38							.037
39							.027
40							.020
41							.014
42							.010
43							.006
44							.004
45							.002

Hollander, M. and D.A. Wolfe, 1973, Nonparametric Statistical Methods, John Wiley and Sons, NY, pp 269 - 271.

Table A.4 (continued)

	n					
x	10	11	12	13	14	15
28	.500					
29	.461					
30	.423					
31	.385					
32	.348					
33	.312	.517				
34	.278	.483				
35	.246	.449				
36	.216	.416				
37	.188	.382				
38	.161	.350				
39	.138	.319	.515			
40	.116	.289	.485			
41	.097	.260	.455			
42	.080	.232	.425			
43	.065	.207	.396			
44	.053	.183	.367			
45	.042	.160	.339			
46	.032	.139	.311	.500		
47	.024	.120	.285	.473		
48	.019	.103	.259	.446		
49	.014	.087	.235	.420		
50	.010	.074	.212	.393		
51	.007	.062	.190	.368		
52	.005	.051	.170	.342	.500	
53	.003	.042	.151	.318	.476	
54	.002	.034	.133	.294	.452	
55	.001	.027	.117	.271	.428	
56		.021	.102	.249	.404	
57		.016	.088	.227	.380	
58		.012	.076	.207	.357	
59		.009	.065	.188	.335	.511
60		.007	.055	.170	.313	.489
61		.005	.046	.153	.292	.467
62		.003	.039	.137	.271	.445
63		.002	.032	.122	.251	.423
64		.001	.026	.108	.232	.402
65		.001	.021	.095	.213	.381
66		.000	.017	.084	.196	.360
67			.013	.073	.179	.339
68			.010	.064	.163	.319
69			.008	.055	.148	.300
70			.006	.047	.134	.281
71			.005	.040	.121	.262
72			.003	.034	.108	.244
73			.002	.029	.097	.227
74			.002	.024	.086	.211
75			.001	.020	.077	.195
76			.001	.016	.068	.180
77			.000	.013		

Hollander, M. and D.A. Wolfe, 1973, Nonparametric Statistical Methods, John Wiley and Sons, NY, pp 269 - 271.

Table A.4 (continued)

	n					
x	10	11	12	13	14	15
78			.000	.011	.059	.165
79				.009	.052	.151
80				.007	.045	.138
81				.005	.039	.126
82				.004	.034	.115
83				.003	.029	.104
84				.002	.025	.094
85				.002	.021	.084
86				.001	.018	.076
87				.001	.015	.068
88				.001	.012	.060
89				.000	.010	.053
90				.000	.008	.047
91				.000	.007	.042
92					.005	.036
93					.004	.032
94					.003	.028
95					.003	.024
96					.002	.021
97					.002	.018
98					.001	.015
99					.001	.013
100					.001	.011
101					.000	.009
102					.000	.008
103					.000	.006
104					.000	.005
105					.000	.004
106						.003
107						.003
108						.002
109						.002
110						.001
111						.001
112						.001
113						.001
114						.000
115						.000
116						.000
117						.000
118						.000
119						.000
120						.000

Hollander, M. and D.A. Wolfe, 1973, Nonparametric Statistical Methods, John Wiley and Sons, NY, pp 269 - 271.

APPENDIX E

RECORD OF DECISION
WESTERN SAND & GRAVEL SITE

STATE OF RHODE ISLAND'S NON-CONCURRENCE LETTER

FILE COPY 4/12/91

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
OFFICE OF LEGAL SERVICES
9 Hayes Street
Providence, R.I. 02908
(401)277-2771
Please note new telephone number
401-277-6607

FASCIMILE MESSAGE

FACSIMILE NO.
(401) 274-7337

ANY PROBLEMS PLEASE CALL:
(401) 277-6607

Number of pages 27 (excluding cover sheet)

URGENT!!! PLEASE DELIVER IMMEDIATELY

TO: Merrill Hulman 617-573-9662
NAME FIRM/LOCATION TEL. NO. FAX NO.

FROM: Louise Durfee, Director R.I.D.E.M.

DATE SENT: 4-12-91

TIME SENT: 10:40 (am) (pm)

COMMENTS:

Please confirm receipt of fax to H. Gene Cook at 277-6687 (Hol). or by return facsimile at 274-7337 Thank you

Gene Cook
Signed

0111f

State of Rhode Island and Providence Plantations
Department of Environmental Management
Office of the Director
9 Hayes Street
Providence, RI 02908

10 April 1991

Julie Belaga
Regional Administrator
U.S. Environmental Protection Agency
John F. Kennedy Federal Building
Boston, MA 02203-2211

RE: Western Sand and Gravel Superfund Site

Dear Ms. Belaga:

The Rhode Island Department of Environmental Management (RIDEM) has completed its review of the Record of Decision (ROD) and Responsiveness Summary for the proposed remedy at the Western Sand and Gravel Superfund Site in Burrillville, Rhode Island.

In a letter dated 13 March 1991, addressed to Lynne Fratus, this Department submitted our comments on the proposed remedy. At that time, we informed your agency that we did not concur with the proposed remedy and we cited our rationale for that determination. We have reviewed the Draft Record of Decision and your agency's response to our comments and this Department maintains its previous position of nonconcurrence.

Listed below are the Department's primary concerns regarding the Record of Decision.

1. Department personnel have concluded that the investigation of surface water contamination to Tarklin Brook and the Slatersville Reservoir was inadequate. This has resulted in inconclusive findings regarding potential environmental and public health risks. The Department has requested that the responsible parties conduct additional sampling which adheres to guidelines specified earlier by this Department (see attached); however, we have no enforceable commitment from the responsible parties that the appropriate surface water investigations will be conducted. Although the remedy allows for additional activities i.e active restoration and/or long term monitoring of surface waters and sediment "if it is necessary to protect Tarklin Brook", this Department feels strongly that additional surface water and sediment investigations with continued monitoring should be required as part of the ROD. The

additional studies should be clearly identified in the ROD and the results should be considered as part of the triggering mechanism for active restoration. With no conclusive evidence that Tarklin Brook is not being adversely impacted and with no required future surface water investigations/monitoring required, we believe the ROD is not adequately protective of the nearby surface waters.

2. Based upon groundwater classification for this area, as designated by this Department's Groundwater Section, we believe that a natural attenuation remedy is unacceptable. The State Groundwater Protection Act mandates a strong policy of restoration and non-degradation. Failure to implement active restoration is in conflict with the Act and is inconsistent with the policies consistently applied by the Groundwater Section (see attached). Although in a letter from Merrill Hohman on 27 March 1991 the EPA's position regarding State ARARs is explained, we do not agree with his assessment of the Department's enforcement capabilities related to groundwater. We also do not believe that allowing for a twenty-four year cleanup via natural attenuation versus an eleven year cleanup using an active restoration mechanism is protective of human health and the environment.

3. As mentioned above, the Department prefers an active restoration alternative. In addition, we believe the described decision mechanism that could potentially trigger an active restoration scenario should include not only the monitoring information from the overburden aquifer but additional bedrock aquifer data and surface water data. We are also concerned that the triggering mechanism itself may not be sufficiently sensitive to significant data fluctuations and, therefore, may not be adequately protective.

   The Department is also concerned that the proposed temporary access restrictions may not effectively protect all groundwater users in the area. Specifically, we are concerned that future development of significant commercial or residential/municipal groundwater users outside of the area designated for access restriction may alter contaminant migration from the site and could potentially impact unprotected areas.

Without adequate information concerning the bedrock aquifer contamination, potential impacts to surface waters and adequate institutional controls enforced and in place, this Department feels the selection of a remedy for this site at this time is premature. My staff has generated other technical comments regarding specific items in the ROD and in the Responsiveness Summary. These comments are attached.

I urge you to strongly consider our concerns prior to finalizing your Record of Decision for this site. This Department would be willing to discuss any of these issues with you in hopes of resolving the differences our agencies currently have.

Very truly yours,

Louise Durfee
Director

LD/kz
cc: James W. Foster, Thomas D. Getz, Merrill Hohman
u/s/wsgrod2

RECORD OF DECISION

The following are this Department's outstanding concerns and clarifications as they relate to Record of Decision:

General Comments:

Bedrock System Groundwater Monitoring Plan

The EPA has stated in the ROD that after evaluating the bedrock investigation they will determine if it is necessary to modify the selected remedy to include active restoration. Residential bedrock wells in the area are known to be contaminated. The source of the residential bedrock wells contamination was not confirmed as the integrity of the existing bedrock wells was questioned. Currently, data collected from the proposed bedrock wells will not be included in the decision mechanism for active restoration. Considering the distributions of contaminants at the site, the rationale for the additional bedrock investigation, and the nature of the bedrock investigations, the State feels that the bedrock wells should be included in any decisions concerning the active restoration alternative. The State would be willing to meet with the EPA to discuss possible trigger mechanisms for the bedrock wells.

Additionally, the main body of the ROD does not contain language concerning the construction and or location of additional bedrock wells (Information concerning the monitoring, general location and construction of the proposed bedrock wells is presented in Appendix C). Due to problems associated with the existing bedrock wells and our concerns regarding the sighting of additional bedrock wells, we request adequate opportunity to review and comment on any documents pertaining to the location (including location mechanisms), construction and development of the proposed bedrock wells.

Surface Water and Sediments Monitoring Program

The EPA has stated that after reviewing additional surface water and sediment data, they will determine if it is necessary to modify the selected remedy to include active restoration. The Agency has not stated the nature of the mechanism to be used to determine if modification of the remedy is necessary. The ROD should include the mechanism to be employed to determine if modification is required. The ROD should be modified to include State input and approval of the trigger mechanics for active restoration. In addition, language should be included in the ROD which would require additional sampling of the stream system as a mandatory portion of the remedy.

Specific Comments:

1. Page 3 (2nd paragraph): "The U.S. Army Corps of Engineers has indicated that the permanent alternative water supply is certifiably complete and operational."

> This statement should be revised to reflect the exact status of the project as described by the Army Corps of Engineers in correspondence to Lynne Fratus dated 19 February 1991 from Maurice Beaudion. It reads as follows: "The project exclusive of the residential connections installation and flushing of domestic water services and meters and operation and maintenance training of the selected systems operator is complete as of this date."

2. Page 9 (3rd paragraph): Typo: "Once" should be "One".

3. Page 26 (3rd paragraph): Typo: "every three years for the first three years" should read as follows: "every three years for the first nine years".

4. Page 26 (4th paragraph): "Assuming that the area requiring remediation at the time when active restoration is begun is equal to the area delineated by the 100 ppb plume contour, it is estimated that the groundwater shall be restored within 11 years."

> According to Revised Tables A-1 and A-3 (December, 1990 revision) of the Groundwater Feasibility Study, this remediation time is incorrect. Said tables indicate that the remediation time for the 1 ppb plume is and 11 years.

5. Page 36 Community Acceptance : Language should be added to this section to indicate that the residents did not support the purchase of property for access restrictions because of its potential benefit to a select few property owners.

RESPONSIVENESS SUMMARY

The following are this Department's outstanding concerns and clarifications as they relate to the Responsiveness Summary:

Comment 1

The EPA has stated that they have been in close contact with the DEM during the development of the current remedy for the site. The EPA cites a meeting that they had with the DEM on 5 December 1990, in which they presented their preferred alternative for the site. They mention that the DEM had no significant comments during this meeting or to any of the submittals of the Draft FS Addendum dated January 4 1991, January 9 1991 or January 22 1991. The EPA also states that it was not until January 1991, that we first indicated that we considered the Rhode Island Groundwater Protection Act to be an ARAR mandating active restoration.

On May 15 1990 the EPA met with State officials and presented their proposed plan for this site. The preferred alternative at this time was one of active restoration (pump and treat). The only question presented to us at that time was whether they would try to capture the 100 part per billion plume or the 1 part per billion plume. Natural attenuation was never mentioned at this time. It was not until the aforesaid December 5 1990 meeting, that we were first informed of the EPA's intent to choose a natural attenuation alternative. As this was a rather significant change in plans, we were not prepared to offer comments at that time. As mentioned, Draft FS Addendum documents were submitted to DEM throughout the month of January. The DEM provided comments to the appropriate drafts of said documents.

During a conference call with the EPA, we indicated that a remedy calling for natural attenuation was inconsistent with the RIGW Protection Act and the subsequent policies of the program consistently enforced by this Department. A copy of the relevant portions of the RIGW Protection Act was forwarded to the EPA. In a meeting of February 26 1991, and in correspondence dated 28 February 1991 and received 1 March 1991, the EPA requested specific documentation to support our position. The information requested by the EPA required an extensive record search and was quite voluminous. As we proceeded to compile information during the formal comment period we realized that more time would be necessary to complete the task in a thorough and confident manner. The EPA denied our request for an extension.

Comment 2

The EPA has stated that the selected remedy allows for additional sampling activities to be conducted of the surface water and sediments if EPA determines that the remedy is not protective of public health and the environment. Language should be included in the ROD which would require additional sampling of the stream system as a mandatory portion of the remedy.

Also, the EPA has not represented an opinion as to whether they agree or disagree with our comments and concerns regarding the adequacy of the surface water and sediment investigation. The Agency should have qualified personnel from their Water Resources Section conduct a thorough review of this assessment and offer their professional comments.

Comment 3

The EPA has stated that based upon a review of the bedrock wells installed at the site as part of the Groundwater Remedial Investigation Report the highly fractured zone of the bedrock would be approximately thirty-five feet in thickness, which would result in the GZ3-2 well being located in the highly fractured portion of the overburden and not in the more competent bedrock. The EPA should state whether any confident conclusions concerning the depth of the bedrock fracture zone can be made based upon two wells. It should be noted that information presented in the Geohydrological and Treatment Feasibility Studies indicate the depth of the fracture bedrock zone at the site is not uniform. In addition information presented in the 1981 Bedrock Water Contamination Study indicates that the GZ-3 well screen was not placed in the highly fractured zone of the bedrock (the well was screened below the highly fractured zone).

The EPA has stated that additional bedrock wells should be installed between the site and the residential neighborhood to the west of the site. A preliminary review of the Project Operations Plan for Additional Bedrock Investigation indicates that the proposed locations for these wells lie outside of the highly contaminated plumes. The need for additional bedrock wells arose from questions concerning the integrity of the existing bedrock wells and therefore whether the bedrock is contaminated. It is our understanding that the purpose of the additional bedrock wells is to determine if contamination exists in the bedrock aquifer, by placing the wells further away from the more highly-contaminated area, the likelihood of detecting contamination is decreased.

The EPA believes that geophysical techniques are not required for the sighting of these wells. The ROD as written does not require that the additional bedrock wells be functional, in that the wells do not have to be drilled into productive fractures. Considering the nature of bedrock investigations, the EPA should require that the additional wells be installed as to maximize the probability of encountering fractures or require that if possible the wells should be functional. It is the State's contention that the use of geophysical techniques would optimize the sighting of the additional bedrock wells. In addition geophysical techniques may be used to address contamination outside of the study area.

Comment 4

The EPA has stated that the model employed at the site provides a conservative estimate of the time necessary to restore the groundwater to cleanup levels, and that a multilayer model is not necessary. In addition the EPA has stated that not enough information is available to calibrate a multilayer model. During a meeting held on 28 June 1990, the EPA and the EPA's contractor agreed with the State concerning the inadequacies of the model, including the need for a multilayer model in order to allow for optimum sighting of

extraction wells and more realistic active restoration scenarios. The EPA, the EPA's contractor and the State were supposed to meet with the PRPs after they had recalibrated the model and installed additional layer to discuss possible schemes for extraction well locations. After receiving a proposed schedule from the PRP's concerning the time required to make the necessary modifications to the model, the EPA stated that the modification schedule was excessive and there was no longer a need for a multilayer model. This decision was made without consulting the State or sending the State information from the EPA or the EPA's contractor which would justify the EPA decision.

To date the EPA has not indicated how they correlated the remediation times for a one layer model to that produced by a multilayer model. The multilayer model is not subject to the same constraints as the one layer model and has the potential to allow for optimizing extraction well location, depth and pumping rate. The EPA has not indicated what additional data would be needed for the calibration of a multilayer model. It should be noted that a multilayer model was employed in the 1985 RI/FS. Also, the EPA has not addressed the State's comment concerning the apparent discrepancy between the discharge point into the Tarklin Brook used in the model and the discharge points presented in the Remedial Investigation Report. If the discharge points in the RI are correct, (the EPA apparently agree with the ROD discharge point) then the remediation time for natural attenuation may be underestimated and the time for active restoration may be overestimated.

Comment 6

The theoretical contaminant concentrations predicted by the EPA are based upon a model which the State and the public has not had the opportunity to review. Therefore the State cannot concur with the trigger mechanism as we have not had the opportunity to determine the capabilities and constraints of the EPA model.

Also, the EPA has stated that they could not develop specific triggers for surface water and sediment investigation since it is not known at this point what type of data will be collected. This issue could be resolved if the ROD specified that the surface water and sediment data needs, and based upon that, modified the trigger mechanism.

Comment 7

Access restriction boundaries should have addressed the cone of influence of supply wells for potential future development in the area, such as the construction of private residents, housing developments or a municipal well similar to that reference in Comment 5 of the EPA's Responsiveness Summary.

Comment 9

The EPA has stated that further investigation in the F well area is not justified due to the fact that, concentrations of contaminants found in the well are not significant, the installation of the cap has resulted in a significant decrease in the magnitude and extent of

contamination, and contamination was not found in the C-1 well. Remedial investigations, (with the exception of a limited number of sampling rounds) was not carried out in this F well area. Information presented in the 1980 Geohydrological and Treatment Feasibility Studies indicate that the concentrations of contaminants found in the F wells was similar to the contaminant observed in wells located closer to the visible waste pits, (concentration of certain contaminants was higher in the F well than the wells located closer to the above pits). In addition this area was not subject to any remedial actions during the construction of the cap. Finally well C-1 is screened in the bedrock overburden interface and is a low permeability well.

Comment 13

The EPA has stated that they do not understand the RIDEM's request for the assumptions used to generate the piezometric maps. In addition the EPA noted that piezometric maps are developed by connecting points of equal piezometric measurements. It should be noted that the piezometric contour maps generated in the 1989 Remedial Investigation report were limited to actual data points. The contour lines generated in the 1990 report were computer generated and used extrapolated lines outside of the sample area. RIDEM's comments were designed to address the above.

Comment 21

The EPA has indicated that trichloroethene was the most frequently detected compound. Information presented in the 1990 Groundwater Feasibility Study indicates that trichloroethene was not the most frequently detected compound, other compounds were detected at higher frequencies and at higher maximum concentrations. The most frequently detected compound according to said document appears to be 1,2-Dichloroethene.

Also, the EPA has stated that if the non-indicator compounds do not behave in a fashion similar to the indicator compounds then the EPA shall modify the ROD to ensure that the remedy is protective of public health and the environment. The EPA should verify that the non-indicator compounds are currently behaving in a fashion similar to that of the indicator compounds. In order to avoid possible problems concerning EPA determination whether non-indicator compounds are behaving in a fashion similar to that of the indicator compounds, the State proposes that a series of compliance graphs be generated for the non-indicator compounds. The State would be willing to assist the EPA in the above endeavor. In addition the EPA should specify the activation process to be employed when one of the non-indicator compounds exceeds the compliance curve. One possible mechanisms to address the nonindicator compounds is to construct a trigger curve composed of total organic compounds found at the site. This total organic compounds trigger curve would be incorporated into the ROD and would become part of the activation trigger mechanism.

Comment 32

The EPA has stated that the following locations STR1, STR2, and STR3 are located upgradient of the site. The EPA also noted that the concentrations of metals in STR2 and STR3 to SUP1, STR4 and STR5 are of the same order of magnitude and therefore concluded that many of the metals may be occurring naturally. The 1990 FS model, (A model which the EPA has apparently approved) has contaminants from the site entering the stream in the vicinity of STR2 and STR3. The EPA should clarify the above discrepancy, (ie why they believe that sampling station STR2 and STR3 are upgradient of the site, while the apparently EPA approved FS model, has the discharge points for contaminants from the site located in the vicinity of the sampling stations labeled "upgradient" by the EPA.

Appendix D

The State has completed a preliminary review of the statistically methods to be employed in the trigger mechanisms. The State questions the use of the employed alpha value and feels that an alternative alpha value such as to 0.025 or 0.01 would be more conservative and protective of public health. The State also questions the logic of using the ROD signing date as the starting x value for the equations employed by the EPA. Use of the ROD starting date produces unrealistic curves. Therefore the State proposes that x values continue from those presented in the FS Addendum.

The State also questions the mechanisms used for the input of the trigger curves presented in the ROD. The State feels that the FS Addendum Theoretical Curves are more appropriate and more protective of public health than the ones employed in the ROD. However it should be noted that the State has still not been with provided a copy of the EPA model employed in the trigger mechanism and thus has not had the opportunity to review a major component of the trigger mechanisms.

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
DIVISION OF GROUNDWATER AND
FRESHWATER WETLANDS
291 Promenade Street
Providence, R.I. 02908 - 5767

TO: Tom Getz
Chief
DEM/Division of Air and Hazardous Materials

FROM: Sue Kiernan SK
Deputy Chief
DEM/Groundwater Section

RE: Comments on the Proposed Remedy for the Western Sand & Gravel

DATE: March 13, 1991

As requested, the DEM Groundwater Section has reviewed the proposed remedy, as it pertains to groundwater contamination, for the Western Sand & Gravel NPL site. The following outlines our objection to the EPA's proposal to rely on natural attenuation to achieve restoration of the aquifer. Such an approach is in conflict with state statutes and policies pertaining to groundwater protection and restoration.

Remediation Goal

On page 7 of the document outlining EPA's analysis of remedies for the site, the remediation goal for groundwater is tied to drinking water standards or maximum contaminant levels (MCLs). We concur that the MCLs are the appropriate standards for groundwater at and around the site, excepting the area which underlies the capped fill on the site. DEM would expect the groundwater beneath the fill to likely remain degraded below MCLs.

Achieving the Remediation Goal

The remedial investigation clearly identified the off-site migration of contaminants in groundwater. Our review of the available information indicates that there continues to be an area of groundwater contamination to the south/southwest of the filled portion of the site which exhibits levels of contamination in a range of over 1,000 ppb for total VOC's. This area, if left unaddressed, represents a continuing source of groundwater contamination in the downgradient aquifer area. The Groundwater Section believes that, due to the site conditions, groundwater classification and other factors, this portion of the site warrants an active remediation approach. We further assert that

a failure to take additional action to promote remediation of impacted groundwater at this site would be a conflict with the Rhode Island Groundwater Protection Act (RIGWPA), RIGL 42-13.1, RI Water Pollution Control Act, RIGL 46-12 and the policies routinely used by the Groundwater Section to implement the statutes and associated regulations.

Applicable State Policies Regarding Groundwater

The State policies pertaining to groundwater protection are outlined in the RIGWPA which among other items requires that all groundwater be classified. In developing regulations to implement the Act, the Groundwater Section has devised a groundwater classification system which embodies a policy of differential protection. As explained in detail in the classification strategy, the state policy allows DEM to recognize the variable value of the states groundwater resources. Consistent with this, the DEM Groundwater Section, through its existing programs, imposes clean-up standards that reflect the policy of differential protection. For example, a site classified as GB will be treated differently than a site classified as GA (suitable for drinking water without treatment.)

While the policy of differential protection allows DEM a certain flexibility in protection of the state's groundwater, the RIGWPA simultaneously has mandated a strong policy of restoration and non-degradation. This is reflected in the following language from the Act: Chapter 13.1; 46-13.1-2.

(3) It is a paramount policy of the state to protect the purity of present and future drinking water supplies by protecting aquifers, recharge areas, and watersheds;

(4) It is a policy of the state to restore and maintain the quality of groundwater to a quality consistent with its use for drinking supplies and other designated beneficial uses without treatment as feasible. All groundwaters of the state shall be restored to the extent practicable to a quality consistent with this policy;

(5) It is the policy of the state not to permit the introduction of pollutants into the groundwater of the state in concentrations which are known to be toxic, carcinogenic, mutagenic, or teratogenic. To the maximum extent practical, efforts shall be made to require the removal of such pollutants from discharges where such discharges are shown to have already occurred;

(6) Existing and potential sources of groundwater shall be maintained and protected. Where existing quality is inadequate to support certain uses, such quality shall be upgraded if feasible to protect the present and potential uses of the resource;

In implementing the policies articulated in the Act, the DEM Groundwater Section has consistently required an active approach to groundwater contamination whenever feasible in areas in which the goal was to return the resource to a drinkable water quality. We call attention to the use of the wording "maximum extent practical" from 46-13.1-2. (5) This is how we believe the Western Sand & Gravel site should be addressed.

Enforcement of Active Restoration Policy

In a meeting in February 26, 1991, DEM met with EPA to discuss more specifically how the Groundwater Section administers and enforces policies regarding groundwater contamination. As indicated in the meeting the DEM Groundwater Section has consistently required an active remediation approach at sites located in GAA areas wherever feasible in order to promote restoration of the resource to a drinkable water quality. The Groundwater Section relies on the authorities of the Director as provided for in 42-17.1 and 46-12 to enforce all water quality standards and policies that pertain to achieving compliance with such standards. The specific enforcement mechanisms which are routinely utilized include Notices of Violations, Administrative Orders and Immediate Compliance Orders. These mechanisms, along with the ability to enter into consent agreements, have provided the means by which DEM has required active remediation of sites. (See Attached) The mechanisms have largely been successful in achieving the implementation of remedies, although the Section will state that there exist certain cases contested by the facility or property owners and therefore groundwater treatment systems have yet to be installed and activated pending final administrative adjudicatory or court action. Several case are currently pending with the new Administration Adjudication Division of DEM.

As to our track record, the DEM Groundwater Section deals with a variety of contaminated sites, including those resulting from leaking underground storage tanks (LUSTs). A preliminary review of LUST sites reveals the following:

Total number of sites identified	217
Number sites remediation completed/closed	95
Number sites with on-going activity	122
Number sites in GAA Area	28

Status of Sites in GAA Areas

Active remediation on-going (soil venting/pump & treat)	10
Ordered or required to implement active remediation (not yet operational)	4

Conducting site investigations to assess extent of release of contaminants	6
Contaminated soil removed; no further action required (closed cases)**	7
Other ***	1

Note * New sites are identified on an on-going basis.
** No evidence of groundwater contamination exhibited.
*** This site refers to Canob Park which pre-dated the existence of UST regulations and the RIGWPA.

This review indicates that where site inspections and/or investigations identified groundwater contamination, an active approach to remediation was required by DEM.

A complete review of other types of sites was not possible with the time frame allotted to DEM following the meeting. However, the Section has handled sites involving VOC contamination remediation and adheres to similiar policies in enforcement matters pertaining to the Underground Injection Control Program.

Groundwater Classification at Western Sand & Gravel

The Western Sand and Gravel site is classified GAA-- which means the site lies within the recharge area to one of the state's most productive sand and gravel aquifers. This designation further signifies that it is the state's goal to maintain the groundwater in a condition suitable for drinking water purposes.

The Groundwater Section has mapped the recharge areas to 20 groundwater reservoirs which were previously mapped by the RI Water Resources Board. (See attached summary of method used by RIDEM) There is a consensus among state officials and others that these aquifer areas represent the most productive, and consequently the most highly valued, portion of the state's groundwater resources. A high priority for protection is assigned to the critical portions of the recharge areas in order to preserve the aquifers value for both present and future water supply needs. The presence of a public water line does not negate the value of the resource or diminish the need to protect it.

In recognition of the specific conditions at the Western Sand & Gravel site, the Groundwater Section has further designated portions of the site both GB and GAA Non-attainment. At waste disposal sites, the GB Classification is restricted to the actual waste disposal area. The GAA/NA designation applies to groundwater beyond the source area that is not drinking water

quality, therefore it is not in compliance with the GAA Standards. The goal for groundwater designated GAA-NA is restoration to drinking water quality. The GAA-NA designation is based on monitoring well data and any other information indicating areas that do not meet the standards.

In delineating the area classified GB and designated GAA-NA at Western Sand and Gravel, the Remedial Investigation/Feasibility Study, May 22, 1984 was used. Using Figure 1-2 of the RI/FS the area labeled "site" was classified GB and the area labeled "affected area" was designated GAA-NA. At the time of our groundwater classification delineations, this was the best available information. Restoration of the area designated GAA-NA is believed feasible. Site conditions are not known to be such that remediation technologies would be arguably ineffective; such as might be found with contamination in fractured bedrock.

As more reliable groundwater data becomes available about this site or any other site in the state, the groundwater classification may change. The criteria, or method used to delineate GB and GAA-NA will remain the same. However the information used in applying the criteria will be updated, (ie) new groundwater data.

Given the GAA-NA designation for groundwater beyond the waste area that does not meet the GAA standards, the Groundwater Section believes that <u>active</u> treatment of the most contaminated groundwater is necessary and required under the RIGWPA. This would be consistent with other DEM Groundwater Section decisions regarding similar VOCs contamination incidents in GAA areas. Natural attenuation is unacceptable for the following reasons:

a. The site classification as GAA mandates all reasonable efforts be made to remediate existing contamination. DEM believes groundwater treatment is reasonable approach.

b. The site lies upgradient of property that may be developed utilizing private wells. The Groundwater Section is not confident that temporary access restrictions would effectively prevent all future development.

c. The site conditions appear to be amenable to groundwater treatment. Active remediation is not constrained by technical feasibility concerns.

d. There has been no showing-economic, technical or otherwise-that it is unreasonable to require active groundwater treatment at the site. The DEM Groundwater Section believes that the cost estimates for the

proposed treatment options may be higher than necessary. Less costly treatment systems appear to be available.

In summary, natural attenuation does not do anything to promote restoration of groundwater at the Western Sand & Gravel site. The DEM Groundwater Section finds that this proposal is therefore in conflict with state policies concerning the restoration of groundwater. To do otherwise in this case would set a precedent that suggests that is a acceptable to presume that groundwater contaminant concentrations will decline over lengthy periods of time. We remain unconvinced of the reliability of the groundwater modeling upon which the analysis of alternatives is based. Even with an effective monitoring program, EPA's proposed approach, if adopted widely would effectively render an increasing portion of the states groundwater resources unusable for long periods of time. This is clearly not the approach the DEM should be encouraging.

cc: J. Fester
S. Morin
A. Good

RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

A Summary of Recharge Area Mapping to Groundwater Reservoirs for GAA Classification

The Rhode Island Groundwater Protection Act of 1985 requires the Groundwater Section of the Rhode Island Department of Environmental Management (RI DEM) to classify the state's groundwater resources using a four class system and to develop standards for each classification. The groundwater classified GAA is considered the state's most valuable groundwater resource and will receive the highest level of protection. The major component of the groundwater classified GAA is the critical portion of the recharge area to the groundwater reservoirs. The groundwater reservoirs are the highest yielding portions of the state's stratified drift aquifers (saturated thickness greater than 40 feet and transmissivity greater than 4000 feet squared per day) that are capable of serving as a significant source of public supply.

The Rhode Island Office of the U.S. Geological Survey has developed a method to map the recharge areas to the groundwater reservoirs. This method was modified by RI DEM for use in groundwater classification mapping. The recharge area mapping methodology defines three recharge zones:

Aquifer Areas -	the groundwater reservoirs and portions of the surrounding stratified drift.
Adjacent Areas -	areas of till and bedrock from which water that percolates to the water table flows through the subsurface to the aquifer area without first discharging to a perennial stream.
Upstream Drainage Areas -	the drainage area of any surface water upstream from the aquifer area boundary.

The Groundwater Section has designated the aquifer areas and adjacent areas as the critical portion of the recharge areas to the groundwater reservoirs. These areas will be classified GAA (see Figure 1.).

In mapping the recharge areas to the groundwater reservoirs, no new hydrogeologic data was collected. The delineations are based on reasonably available information on the hydrogeologic environment associated with each groundwater reservoir. Because of the complexities of groundwater flow, several simplifying assumptions have been made, including:

- Where water table data is not available, the water table surface is considered to mimic surface topography.
- All of the groundwater of a basin (or subbasin) discharges to the perennial stream (delineated on the USGS quadrangle) that defines the basin.

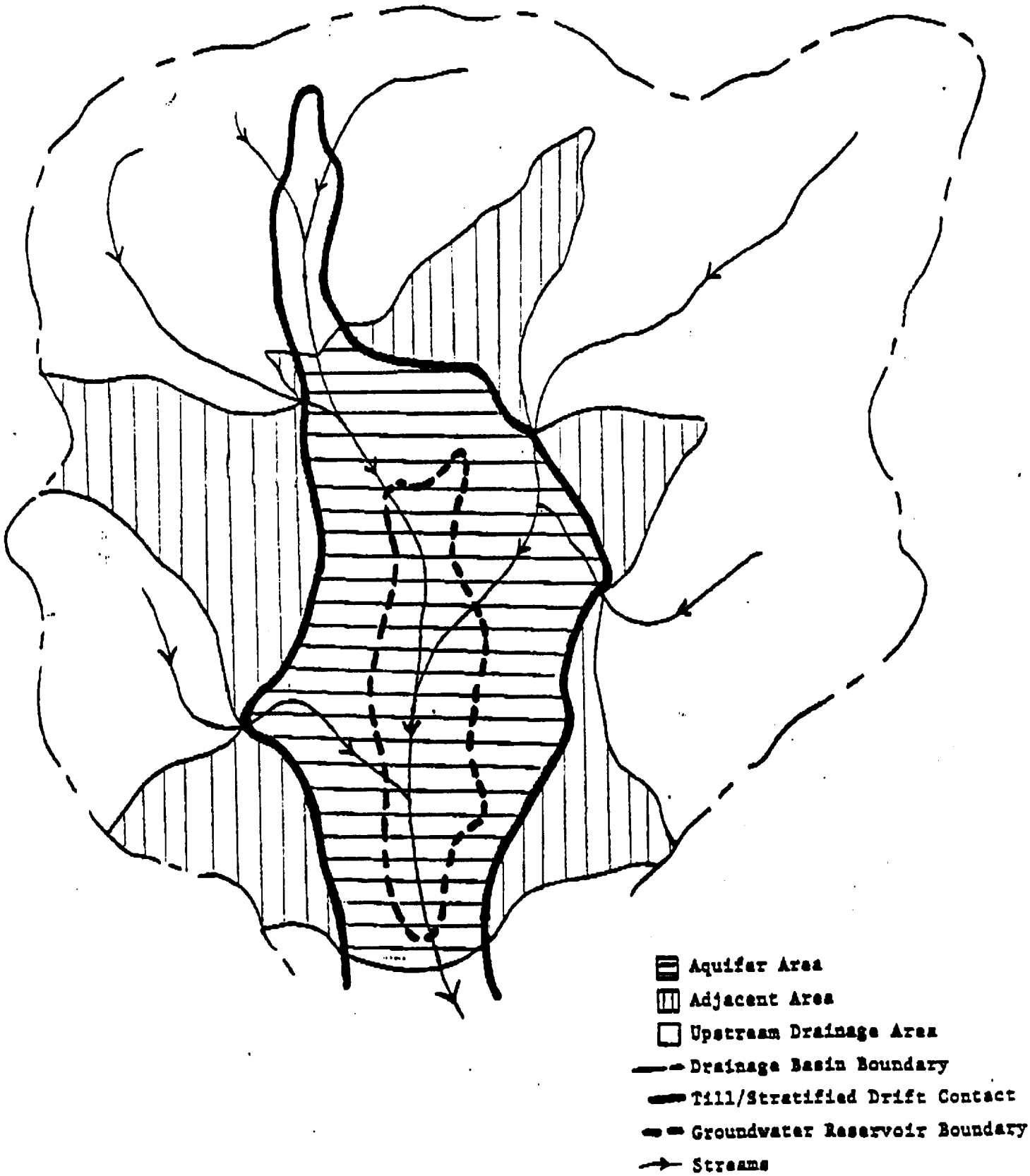
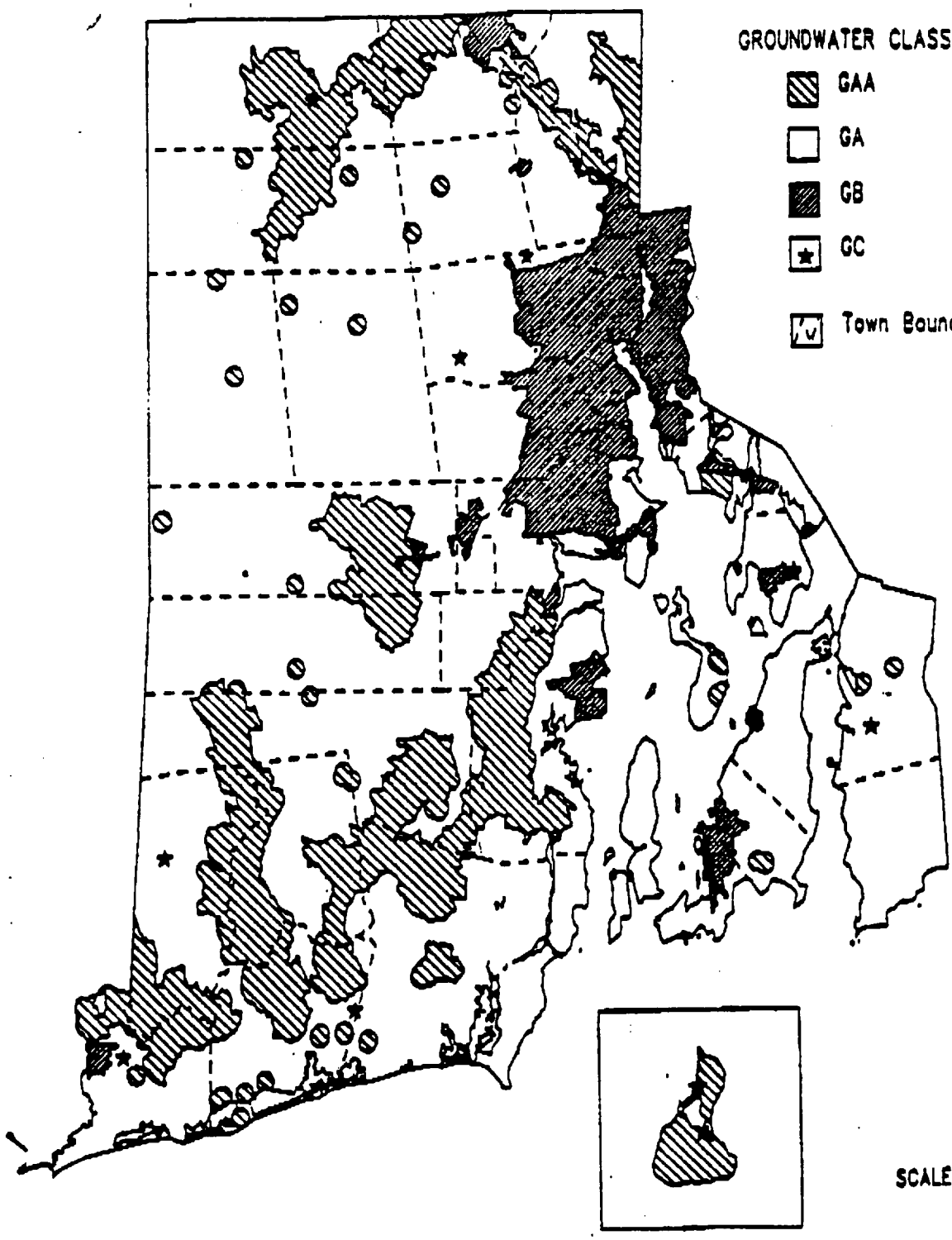


Figure 1. Hypothetical drainage basin showing the different recharge zones to the groundwater reservoir. GAA is the aquifer area and adjacent area.

DRAFT GROUNDWATER CLASSIFICATION

RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT



NOTES: Groundwater classifications were delineated on 1 : 24,000 scale U.S. Geological Survey quadrangle maps. Refer to these maps at the Groundwater Section, R.I. DEM for the precise delineation of the groundwater classifications.

Within the groundwater classified GAA and GA on the above map are areas where the R.I. DEM has determined that the groundwater does not meet standards for GAA and GA. These areas are called GAA – Nonattainment and GA – Nonattainment, and the long-term goal is restoration to GAA and GA standards. Refer to larger scale maps produced by R.I. DEM for the delineation of these nonattainment areas.

5.4
ROD

APPENDIX F

RECORD OF DECISION
WESTERN SAND & GRAVEL SITE

ADMINISTRATIVE RECORD INDEX

Western Sand & Gravel

NPL Site Administrative Record

Index

Compiled: March 16, 1990
Updated: November 21, 1990
Updated: February 4, 1991
ROD Signed: April 16, 1991

Prepared for

Region I
Waste Management Division
U.S. Environmental Protection Agency

With Assistance from

AMERICAN MANAGEMENT SYSTEMS, INC.
One Kendall Square, Suite 2200 • Cambridge, Massachusetts 02139 • (617) 621-7090

Introduction

This document is the Index to the Administrative Record for the April 16, 1991 Record of Decision (Operable Unit III - Groundwater Remedy) for the Western Sand and Gravel 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 at EPA Region I's Office in Boston, Massachusetts and at the Burrillville Town Building, 105 Harrisville Main Street, Harrisville, Rhode Island 02830. *This Administrative Record includes, by reference only, all documents included in the Administrative Record for the September 28, 1984 Record of Decision (Operable Unit I - Temporary Domestic Well Treatment and Permanent Alternative Water Supply) and the Administrative Record for the September 30, 1985 Record of Decision (Operable Unit II - Source Control).* Questions concerning the 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).

Section I

Site-Specific Documents

ADMINISTRATIVE RECORD INDEX

for the

Western Sand and Gravel NPL Site

(Groundwater Remedy - Operable Unit III)

3.0 Remedial Investigation (RI)

3.1 Correspondence

Agency for Toxic Substances and Disease Registry (ATSDR)

1. Letter from Lynne A. Fratus, EPA Region I to Louise House, Agency for Toxic Substances and Disease Registry (ATSDR) (March 2, 1990). Concerning transmittal of the Draft Remedial Investigation Report.
2. Letter from Lynne A. Fratus, EPA Region I to Louise House, Agency for Toxic Substances and Disease Registry (ATSDR) (April 2, 1990). Concerning transmittal of Appendix O of the February 1990 "Draft Groundwater Remedial Investigation Report," Olin Corporation.

Camp Dresser & McKee Inc.

3. Memorandum from Jan Drake, Camp Dresser & McKee Inc. to Lynne A. Fratus, EPA Region I (June 15, 1989). Concerning review of contamination of the bedrock aquifer.
4. Letter from Karen Stone, Camp Dresser & McKee Inc. to Rose Harvell, EPA Region I (June 27, 1989). Concerning the attached "Letter Report: Review of Olin's Stream and Surface Water Assessment," Camp Dresser & McKee Inc. (May 12, 1989).
5. Letter from John Walker, Camp Dresser & McKee Inc. to Jack Jojokian, EPA Headquarters (July 14, 1989) with the attached "Draft Report Review of PRP's Data Validation Report" (July 14, 1989).

Olin Corporation

6. Letter from John W. Gallagher, EPA Region I to Verrill M. Norwood Jr., Olin Corporation (August 4, 1986) with the attached Telephone Notes between John W. Gallagher, EPA Region I and Margaret Leshen, EPA Region I (August 4, 1986). Concerning follow-up of July 29, 1986 meeting held to discuss cleanup of site
7. Letter from John W. Gallagher, EPA Region I to James C. Brown, Olin Corporation (September 4, 1986). Concerning the groundwater study.
8. Letter from James C. Brown, Olin Corporation to John W. Gallagher, EPA Region I (September 12, 1986). Concerning clarification of agreements made in the September 4, 1986 conference call.
9. Letter from Michael J. Bellotti and Robert D. McCaleb, Olin Corporation to John W. Gallagher, EPA Region I (January 12, 1987). Concerning clarification of soil samples.
10. Letter from John W. Gallagher, EPA Region I to James C. Brown, Olin Corporation (August 3, 1987). Concerning summary of the July 30, 1987 meeting regarding the closure and groundwater study.

3.1 Correspondence (cont'd.)

Olin Corporation (cont'd.)

11. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Felix Harvey, State of Rhode Island Department of Environmental Management (March 8, 1988). Concerning Groundwater Remedial Investigation/Feasibility Study and closure field activities.
12. Letter from Lynne A. Fratus, EPA Region I to James C. Brown, Olin Corporation (March 14, 1988). Concerning certification of approval for Groundwater Remedial Investigation Site Operations Plan.
13. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (March 21, 1988) with attached model letter and well installation agreement. Concerning inability to obtain access to Lot 7/38 in North Smithfield.
14. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Felix Harvey, State of Rhode Island Department of Environmental Management (April 26, 1988). Concerning disposal of personal protective equipment.
15. Letter from Lynne A. Fratus, EPA Region I to James C. Brown, Olin Corporation (May 5, 1988). Concerning approval of contractors.
16. Letter from Richard Boynton, EPA Region I to James C. Brown, Olin Corporation (June 2, 1988). Concerning disposal of personal protective equipment and additional approval of analytical labs.
17. Letter from Richard Boynton, EPA Region I to James C. Brown, Olin Corporation (June 2, 1988). Concerning approval of Project Operations Plan.
18. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (July 22, 1988). Concerning Phase II Groundwater Remedial Investigation/Feasibility Study well installation.
19. Letter from Lynne A. Fratus, EPA Region I to James C. Brown, Olin Corporation (July 27, 1988). Concerning split sample results.
20. Letter from Robert D. McCaleb for James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (August 19, 1988) with the attached specification sheets. Concerning piezometer installation and specifications.
21. Letter from Lynne A. Fratus, EPA Region I to James C. Brown, Olin Corporation (August 24, 1988). Concerning the bedrock well at CW-4.
22. Letter from Lynne A. Fratus, EPA Region I to James C. Brown, Olin Corporation (April 5, 1989). Concerning the March 28, 1989 meeting regarding Olin Corporation's findings and conclusions for the Remedial Investigation.
23. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (August 7, 1989). Concerning findings from Olin Corporation's investigation of alternate bedrock monitoring well installation and sampling techniques.
24. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (October 27, 1989). Concerning EPA's review of the draft GRI report.
25. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (January 9, 1990). Concerning disposal of soil and bedrock samples.
26. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (January 11, 1990). Concerning Olin Corporation's designation of David L. Cummings as coordinator.
27. Letter from Lynne A. Fratus, EPA Region I to David L. Cummings, Olin Corporation (January 22, 1990). Concerning response to the January 9, 1990 letter from James C. Brown, Olin Corporation.

3.1 Correspondence (cont'd.)

Olin Corporation (cont'd.)

28. Letter from Lynne A. Fratus, EPA Region I to Robert D. McCaleb, Olin Corporation (February 6, 1990). Concerning transmittal of the December 1988 "Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites."
29. Letter from David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (February 26, 1990). Concerning the attached:
    A. Cross Reference: "Draft Groundwater Remedial Investigation Report," Olin Corporation (February 1990) [Filed and cited as entry number 3 in 3.6 Remedial Investigation (RI) Reports].
    B. Cross Reference: "Draft Groundwater Remedial Investigation Report - Appendices A-M," Olin Corporation (February 1990) [Filed and cited as entry number 4 in 3.6 Remedial Investigation (RI) Reports].
    C. Cross Reference: "Draft Groundwater Remedial Investigation Report - Appendices N-U," Olin Corporation (February 1990) [Filed and cited as entry number 5 in 3.6 Remedial Investigation (RI) Reports].
    D. Cross Reference: "Draft Groundwater Remedial Investigation Report - Appendices AA-AE," Olin Corporation (February 1990) [Filed and cited as entry number 6 in 3.6 Remedial Investigation (RI) Reports].
30. Letter from Robert D. McCaleb for David L. Cummings, Olin Corporation to Lynne A. Fratus and Warren S. Angell II, State of Rhode Island Department of Environmental Management, EPA Region I (March 16, 1990). Concerning transmittal of Appendix O of the February 1990 "Draft Groundwater Remedial Investigation Report," Olin Corporation.
31. Letter from Lynne A. Fratus, EPA Region I to Robert D. McCaleb, Olin Corporation (March 16, 1990). Concerning transmittal of the October 25, 1985 "Draft Focused Feasibility Study Report," Camp Dresser & McKee Inc.
32. Letter from Robert D. McCaleb, Olin Corporation to Warren S. Angell II, State of Rhode Island Department of Environmental Management (April 10, 1990). Concerning confirmation of the State of Rhode Island Department of Environmental Management's address.
33. Letter from David L. Cummings, Olin Corporation to Warren S. Angell II, State of Rhode Island Department of Environmental Management (April 11, 1990). Concerning request for approval or comments on the February 1990 "Draft Groundwater Remedial Investigation Report," Olin Corporation.
34. Letter from David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (June 22, 1990). Concerning the attached:
    A. Cross-Reference: "Draft Groundwater Remedial Investigation Report," Olin Corporation (June 1990) [Filed and cited as entry number 7 in 3.6 Remedial Investigation (RI) Reports].
    B. Cross-Reference: "Draft Groundwater Remedial Investigation Report - Partial Appendices," Olin Corporation (June 1990) [Filed and cited as entry number 8 in 3.6 Remedial Investigation (RI) Reports].

The maps associated with the record cited as entry number 35 are oversized and may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

35. Letter from Robert D. McCaleb for David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (August 10, 1990). Concerning transmittal of attached figures and maps to be inserted into the June 1990 "Groundwater Remedial Investigation Report," Olin Corporation.

3.1 Correspondence (cont'd.)

Olin Corporation (cont'd.)

36. Letter from Robert D. McCaleb for David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (August 27, 1990). Concerning notification that Olin Corporation will sample GRI wells during the week of August 27, 1990.
37. Letter from Robert D. McCaleb, Olin Corporation to Burrillville Police Department (September 19, 1990). Concerning notification of acts of vandalism at the site.
38. Letter from Richard C. Boynton, EPA Region I to David L. Cummings, Olin Corporation (October 25, 1990). Concerning disapproval of the June 1990 "Groundwater Remedial Investigation Report," Olin Corporation.
39. Letter from Richard C. Boynton, EPA Region I to David L. Cummings, Olin Corporation (October 31, 1990). Concerning the need for additional groundwater data and the testing of samples for volatile organic compounds.
40. Letter from Robert D. McCaleb for David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I (November 1, 1990). Concerning transmittal of the following attachments:
    A. Cross-Reference: "Groundwater Remedial Investigation - Text," Olin Corporation (June 1990) [Filed and cited as entry number 10 in 3.6 Remedial Investigation (RI) Reports].
    B. Cross-Reference: "Groundwater Remedial Investigation - Appendices A-M," Olin Corporation (June 1990) [Filed and cited as entry number 11 in 3.6 Remedial Investigation (RI) Reports].
    C. Cross-Reference: "Groundwater Remedial Investigation - Appendices N-U," Olin Corporation (June 1990) [Filed and cited as entry number 12 in 3.6 Remedial Investigation (RI) Reports].
    D. Cross-Reference: "Groundwater Remedial Investigation - Appendices AA-AF," Olin Corporation (June 1990) [Filed and cited as entry number 13 in 3.6 Remedial Investigation (RI) Reports].
41. Letter from David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (November 6, 1990). Concerning notification that groundwater sampling will be conducted November 8, 9, and 10, 1990.
42. Memorandum from Robert D. McCaleb, Olin Corporation to Warren S. Angell II, State of Rhode Island Department of Environmental Management (November 12, 1990). Concerning transmittal of sampling notes.
43. Letter from Bruce R. Cushing, BCM Engineers to Warren S. Angell II, State of Rhode Island Department of Environmental Management (November 12, 1990). Concerning transmittal of the "Biological Assessment Field Log Book" for review.
44. Letter from Robert T. Hart, Chemwest Analytical Laboratories, Inc. to Mickey Cartegena, CompuChem Laboratories, Inc. (November 15, 1990). Concerning transmittal of the attached data for November 9, 1990 sampling.
45. Letter from William Walsh-Rogalski, EPA Region I to Gregory L. Benik, Hinckley, Allen, Snyder & Comen (Attorney for Olin Hunt Specialty Products Inc.) (November 20, 1990). Concerning EPA's proposed resolution of the dispute concerning disapproval of the June 1990 "Revised Groundwater Remedial Investigation Report," Olin Corporation.
46. Letter from David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I (November 21, 1990). Concerning transmittal of the attached "Draft Summary of Groundwater Monitoring Well Data."
47. Letter from Lynne A. Fratus for Richard C. Boynton, EPA Region I to David L. Cummings, Olin Corporation (November 23, 1990). Concerning transmittal of the Addendum developed by EPA Region I to the June 1990 "Revised Groundwater Remedial Investigation Report," Olin Corporation.

3.1 Correspondence (cont'd.)

Olin Corporation (cont'd.)

48. Letter from Elaine Wong, Chemwest Analytical Laboratories, Inc. to Rick Camp, CompuChem Laboratories, Inc. (December 7, 1990). Concerning transmittal of the attached additional data for the November 9, 1990 sampling.
49. Memorandum from Robert D. McCaleb, Olin Corporation to Lynne A. Fratus, EPA Region I (December 13, 1990). Concerning transmittal of the attached groundwater monitoring well data summaries.
50. Letter from Richard C. Boynton, EPA Region I to David L. Cummings, Olin Corporation (February 7, 1991). Concerning a request that Olin Corporation conduct an investigation of the bedrock at the site.
51. Letter from David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I (March 11, 1991). Concerning notification that Olin Corporation plans to install and sample additional bedrock wells between the site and the residential neighborhood northwest of the site.

State of Rhode Island Department of Environmental Management

52. Letter from Lynne A. Fratus, EPA Region I to Warren S. Angell II, State of Rhode Island Department of Environmental Management (March 23, 1990). Concerning request for transmittal of the list of Applicable or Relevant and Appropriate Requirements (ARARs) as identified by the State of Rhode Island.
53. Letter from Lynne A. Fratus, EPA Region I to Warren S. Angell II, State of Rhode Island Department of Environmental Management (March 28, 1990). Concerning transmittal of the results of the screening of alternatives and request for a draft list of the action specific Applicable or Relevant and Appropriate Requirements (ARARs) as identified by the State of Rhode Island.
54. Letter from Lynne A. Fratus, EPA Region I to Warren S. Angell II, State of Rhode Island Department of Environmental Management (April 17, 1990). Concerning transmittal of notes from the April 16, 1990 meeting and the August 1988 "CERCLA Compliance with Other Laws Manual: Part II."
55. Letter from Lynne A. Fratus, EPA Region I to Warren S. Angell II, State of Rhode Island Department of Environmental Management (May 10, 1990). Concerning transmittal of the August 1988 "CERCLA Compliance with Other Laws Manual - Part I."
56. Letter from Richard C. Boynton, EPA Region I to Alicia M. Good, State of Rhode Island Department of Environmental Management (October 29,1990). Concerning progress at the site, transmittal of the attached October 26, 1990 "Draft Groundwater Remedial Investigation Report Addendum," EPA Region I for comments, and the Letter from Richard C. Boynton, EPA Region I to David L. Cummings, Olin Corporation (October 25, 1990).
57. Letter from Warren S. Angell II, State of Rhode Island Department of Environmental Management to Richard C. Boynton, EPA Region I (November 5, 1990). Concerning transmittal of major findings regarding the biological assessment.
58. Letter from Lynne A. Fratus, EPA Region I to Warren S. Angell II, State of Rhode Island Department of Environmental Management (November 6, 1990). Concerning the meeting scheduled for November 9, 1990 regarding the Remedial Investigation Report.
59. Letter from Lynne A. Fratus for Richard C. Boynton, EPA Region I to Alicia M. Good, State of Rhode Island Department of Environmental Management (November 23, 1990). Concerning transmittal of the Final Addendum to the June 1990 Groundwater Remedial Investigation Report.

3.1 Correspondence (cont'd.)

State of Rhode Island Department of Environmental Management (cont'd.)

60. Letter from Warren S. Angell II, State of Rhode Island Department of Environmental Management to Lynne A. Fratus, EPA Region I (December 20, 1990). Concerning transmittal of the attached information concerning the State of Rhode Island Water Quality Regulations.
61. Letter from Paul Kulpa, State of Rhode Island Department of Environmental Management to Lynne A. Fratus, EPA Region I (February 4, 1991). Concerning notification that remedial activities have not addressed Non Aqueous Phase Liquids (NAPLs).
62. Letter from Warren S. Angell II for Claude Cote, State of Rhode Island Department of Environmental Management to Gregory L. Benik, Hinkley, Allen Snyder & Comen (Attorney for Olin Hunt Specialty Products, Inc.) (March 5, 1991). Concerning a request for additional sampling and the attached Memorandum from Carlene Newman, State of Rhode Island Department of Environmental Management to Alicia M. Good, State of Rhode Island Department of Environmental Management (January 15, 1991).

3.2 Sampling and Analysis Data

1. Letter from Anita C. Rigassio, Camp Dresser & McKee Inc. to Nancy Barmakian, EPA Region I (December 28, 1987). Concerning the attached organic analytical data from two low level water samples from Camp Dresser & McKee Inc.
2. Letter from Anita C. Rigassio, Camp Dresser & McKee Inc. to Nancy Barmakian, EPA Region I (December 29, 1987). Concerning the attached "Inorganic Analytical Data from Two Low Level Water Samples," Camp Dresser & McKee Inc.
3. Memorandum from Jan Drake, Camp Dresser & McKee Inc. to Lynne A. Fratus, EPA Region I (May 11, 1988). Concerning attached well samples.
4. Memorandum from Jan Drake, Camp Dresser & McKee Inc. to Lynne A. Fratus, EPA Region I (July 21, 1988). Concerning the attached "Certificate of Laboratory Analysis," Camp Dresser & McKee Inc. (July 12, 1988).

3.4 Interim Deliverables

Reports

Camp Dresser & McKee Inc.

1. Letter from Jan Drake, Camp Dresser & McKee Inc. to Lynne A. Fratus, EPA Region I (February 18, 1988). Concerning field oversight report.
2. Weekly Status Report Summary, Camp Dresser & McKee Inc. (April 19, 1988).
3. Letter from Lynne A. Fratus, EPA Region I to Jan Drake, Camp Dresser & McKee Inc. (May 5, 1988). Concerning the attached "Western Sand and Gravel GW RI/FS CDM Split Sampling Plan," Olin Corporation (April 4, 1988).
4. Memorandum from Jan Drake, Camp Dresser & McKee Inc. to Lynne A. Fratus, EPA Region I (May 23, 1988). Concerning the attached "Summary of Phase I Sampling Event," Camp Dresser & McKee Inc. (May 1988).
5. Letter from John Walker, Camp Dresser & McKee Inc. to Rose Harvell, EPA Region I (July 11, 1988). Concerning the attached "Quality Assurance Project Plan," Camp Dresser & McKee Inc. (July 11, 1988).
6. Letter from Karen Stone for John Walker, Camp Dresser & McKee Inc. to Rose Harvell, EPA Region I (January 6, 1989). Concerning the attached "Draft Letter Report: Organic Data Validation, Case 9615," Camp Dresser & McKee Inc. (January 6, 1989).

3.4 Interim Deliverables (cont'd.)

Reports - Camp Dresser & McKee Inc. (cont'd.)

7. Letter from Karen Stone for John Walker, Camp Dresser & McKee Inc. to Rose Harvell, EPA Region I (January 6, 1989). Concerning the attached "Draft Letter Report: Inorganic Data Validation, Case 9615," Camp Dresser & McKee Inc. (January 6, 1989).
8. Letter from Karen Stone for John Walker, Camp Dresser & McKee Inc. to Rose Harvell, EPA Region I (January 10, 1989). Concerning the attached "Letter Report: Summary of Split Sampling Oversight Activities," Camp Dresser & McKee Inc. (January 10, 1989).
9. Letter from Karen Stone, Camp Dresser & McKee Inc. to Rose Harvell, EPA Region I (March 2, 1989). Concerning the attached "Draft Letter Report: Data Validation," Camp Dresser & McKee Inc. (March 2, 1989).
10. Letter from Karen Stone, Camp Dresser & McKee Inc. to Rose Harvell, EPA Region I (June 27, 1989). Concerning the attached "Letter Report: Review of Olin's Assessment of Bedrock Aquifer Contamination," Camp Dresser & McKee Inc. (June 27, 1989).

Olin Corporation

11. "Sampling Plan for Groundwater," Olin Corporation (June 1987).
12. "Construction Procedures and Specifications," Olin Corporation (June 1987).
13. "Quality Assurance Plan for Groundwater Remedial Investigation and Feasibility Study," Olin Corporation (June 1987).
14. "Quality Assurance Plan for Groundwater Remedial Investigation and Feasibility Study and for Post-Closure Monitoring," Olin Corporation (November 6, 1987).
15. "Sampling Plan for Groundwater Remedial Investigation and Feasibility Study and for Post-Closure Monitoring," Olin Corporation (November 6, 1987).
16. "Construction Procedures and Specifications for Groundwater Remedial Investigation and Feasibility Study and for Post-Closure Monitoring," Olin Corporation (November 6, 1987).
17. Letter from Robert D. McCaleb for James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Felix Harvey, State of Rhode Island Department of Environmental Management (December 23, 1987) with attached Exhibits A, B and C. Concerning a description of the soil vapor survey technique.
18. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Felix Harvey, State of Rhode Island Department of Environmental Management (March 8, 1988). Concerning transmittal of the attached "Description of Current Situation," Olin Corporation (February 1988).
19. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (April 15, 1988) with attached replacement page 15 for the November 6, 1987 "Construction Procedures and Specifications for Groundwater Remedial Investigation and Feasibility Study and for Post-Closure Monitoring," Olin Corporation (November 6, 1987).
20. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Felix Harvey, State of Rhode Island Department of Environmental Management (May 13, 1988) with the attached "Project Operations Plan," Olin Corporation.
21. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (May 26, 1988). Concerning Sampling Plan revision to use Teflon-coated stainless steel cable.
22. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (June 30, 1988). Concerning the attached "Appendix I" to the Description of Current Situation.

3.4 Interim Deliverables (cont'd.)

Reports - Olin Corporation (cont'd.)

23. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (July 1, 1988). Concerning transmittal of preliminary data for groundwater RI/FS and post-closure monitoring and the attached:
    A. Attachment 1: Well Boring Logs.
    B. Attachment 2: Chemical analytical results for the May sampling event for Groundwater Remedial Investigation/Feasibility Study and Post-Closure Monitoring.
    C. Attachment 3: Bedrock Elevations and Contour Map.
    D. Attachment 4: Water Elevations, typical piezometric gradient map, analysis of vertical groundwater gradients.
    E. Attachment 5: Map and rationale for tentative Phase II well locations.
24. "Report on the Findings of the Petrex Soil Gas Survey for BCM Eastern and Olin Corporation," Petrex (July 1, 1988).

The maps associated with the record cited in entry number 25 are oversized and may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

25. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (July 20, 1988). Concerning transmittal of additional information for July 1, 1988 package, Base Map (D-T412-120-10-1), isopleths of potentiometric heads in each zone, and residential well data summary.

The enclosures referred to the record cited in entry number 26 are oversized documents and may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

26. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (August 5, 1988). Concerning transmittal of bedrock well specifications and sketch, base map, historic well locations-partial plan, base contour map, domestic well water summary maps, topographic sheets of site area, composite topographic sheet of site area, and topographic sheet with Phase I and II well locations.
27. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (August 16, 1988). Concerning a proposal for analytical parameters for the second round of sampling.
28. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (September 8, 1988) with the attached "December Revisions to Project Operations Plan," Olin Corporation.
29. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (September 12, 1988). Concerning transmittal of the attached "September Revisions to Project Operations Plan for Groundwater Remedial Investigation and Feasibility Study and for Post-Closure Monitoring," Olin Corporation.
30. Letter from Robert D. McCaleb for James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (November 22, 1988). Concerning preliminary results of well installation and sample analysis associated with the groundwater at site and attached maps.
31. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (January 20, 1989). Concerning transmittal of Exhibits A, B, and C of the Risk Assessment.

3.4 Interim Deliverables (cont'd.)

Reports - Olin Corporation (cont'd.)

Maps associated with the record cited in entry number 32 are oversized and may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

32. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (April 11, 1989). Concerning transmittal of the attached "Draft Data Validation Review," BCM Eastern for Olin Corporation (December 1988).
33. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (May 12, 1989). Concerning transmittal of the attached "Surface Water and Sediment Assessment," Olin Corporation.
34. Letter from James C. Brown, Olin Corporation to John Zannos, EPA Region I (May 18, 1989). Concerning transmittal of attached "Bedrock Investigation," Olin Corporation.
35. Letter from Robert D. McCaleb for James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (July 18, 1989). Concerning transmittal of attached "Addendum Number 1 to the Project Operations Plan ," Olin Corporation (July 1989).
36. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (July 27, 1989). Concerning transmittal of attached "Exhibit A - Well Group Selection for Risk Assessment," Olin Corporation.
37. Memorandum from Robert D. McCaleb, Olin Corporation to Lynne A. Fratus, EPA Region I (January 8, 1990). Concerning transmittal of the attached "Groundwater Risk Assessment," Olin Corporation (January 8, 1990).
38. Letter from Robert D. McCaleb, Olin Corporation to Lynne A. Fratus, EPA Region I (April 18, 1990). Concerning transmittal of the attached "Flow Net Evaluation," Olin Corporation (March 12, 1990).

Comments

Camp Dresser & McKee Inc.

39. Memorandum from Jan Drake, Camp Dresser & McKee Inc. to Lynne A. Fratus, EPA Region I (September 19, 1988). Concerning Olin Corporation's Phase I Data and attached maps.
40. Memorandum from Bill Swanson, Camp Dresser and McKee Inc. to Lynne A. Fratus and John Zannos, EPA Region I (December 1, 1988). Concerning review of sampling and analysis at the site and attached maps and data.
41. Letter from Lynne A. Fratus, EPA Region I to James C. Brown (June 29, 1989). Concerning transmittal of the "Draft Report: Review of PRP Data Validation Report," Camp Dresser & McKee Inc. (June 29, 1989).

Comments

EPA Region I

42. Comments Dated August 1, 1986 from John W. Gallagher, EPA Region I on the draft "Quality Assurance Plan for Groundwater Remedial Investigation and Feasibility Study and for Post-Closure Monitoring," Olin Corporation.
43. Comments Dated September 22, 1987 from Charles Porfert, EPA Region I on the June 1987 "Quality Assurance Plan for Groundwater Remedial Investigation and Feasibility Study," Olin Corporation.
44. Comments Dated January 21, 1988 from Lynne A. Fratus, EPA Region I on the Groundwater Remedial Investigation/Feasibility Study and Post-Closure Monitoring Site Operations Plan.

3.4 Interim Deliverables (cont'd.)

Comments - EPA Region I (cont'd.)

45. Comments Dated February 17, 1988 from Lynne A. Fratus, EPA Region I on the November 6, 1987 "Sampling Plan for Groundwater Remedial Investigation and Feasibility Study and for Post-Closure Monitoring," Olin Corporation.

Responses to Comments

Olin Corporation

46. Response Dated August 7, 1987 from John C. Brown, Olin Corporation on the August 1, 1986 Comments from John W. Gallagher, EPA Region I.
47. Response Dated January 21, 1988 from James C. Brown, Olin Corporation on the "Olin Responses to Comments by US EPA (Conference Call of January 13, 1988) on Western Sand and Gravel Groundwater Remedial Investigation/Feasibility Study and Post-Closure Monitoring Site Operations Plan," Olin Corporation.
48. Response Dated January 27, 1988 from Olin Corporation on the January 13, 1988 Conference Call.
49. Letter Dated March 8, 1988 from James C. Brown, Olin Corporation on the February 12, 1988 Conference Call with attached "Olin Responses to Comments by US EPA on Western Sand and Gravel Groundwater Remedial Investigation/Feasibility Study and Post-Closure Monitoring Well Construction Procedures and Specifications."
50. Letter Dated March 29, 1988 from James C. Brown, Olin Corporation on the attached February 17, 1988 Comments from Lynne A. Fratus, EPA Region I, the attached March 14, 1988 Comments from Lynne A. Fratus, EPA Region I, and the March 23, 1988 Conference Call.

3.5 Applicable or Relevant and Appropriate Requirements (ARARs)

1. Letter from James Fester, State of Rhode Island Department of Environmental Management to Merrill S. Hohman, EPA Region I (June 22, 1990). Concerning the attached Applicable or Relevant and Appropriate Requirements (ARARs):

   General

   A. "Rhode Island Pretreatment Regulations," State of Rhode Island (June 26, 1984).
   B. "Rhode Island General Laws of 1956 Title 46 - Chapter 12 - Water Pollution."
   C. "Regulations for the Rhode Island Pollutant Discharge Elimination System," State of Rhode Island (June 26, 1984).

3.5 Applicable or Relevant and Appropriate Requirements (ARARs) (cont'd.)

Air

D. "Sources Required to File Applications for Approval to Construct, Install, or Modify," State of Rhode Island.
E. "Air Pollution Control Regulation No. 7 - Emission of Air Contaminants Detrimental to Person or Property," State of Rhode Island (July 19, 1977).
F. "Air Pollution Control Regulation No. 9 - Approval to Construct, Install, Modify, or Operate," State of Rhode Island (March 28, 1988).
G. "Air Pollution Control Regulation No. 15 - Control of Organic Solvent Emissions," State of Rhode Island (December 10, 1989).
H. "Air Pollution Control Regulation No. 17 - Odors," State of Rhode Island (February 22, 1977).
I. "Air Pollution Control Regulations No. 22 - Air Toxics," State of Rhode Island (November 22, 1989).

Water

J. "Chapter 12 - Water Pollution."
K. "Water Quality Regulations for Water Pollution Control," State of Rhode Island (May 21, 1984).

Groundwater

L. "Chapter 13 - Groundwater Protection."
M. "A Summary of Groundwater Classification - Draft," State of Rhode Island (January 1990).

Wetlands

N. "Preliminary Determination Application - Freshwater Wetlands Application Package," State of Rhode Island.
O. Letter from the State of Rhode Island concerning the attached compilation of rules and regulations governing the enforcement of the "Fresh Water Wetlands Act."
P. Letter from W. Edward Wood, State of Rhode Island to Robert F. Burns, Secretary of the State of Rhode Island (March 9, 1981). Concerning the enclosed "Rules and Regulations Governing the Enforcement of the Fresh Water Wetlands Act."

3.6 Remedial Investigation (RI) Reports

Reports

1. "Draft Groundwater Remedial Investigation," Olin Corporation (June 1989).
2. "Draft Groundwater Remedial Investigation Report - Appendices," Olin Corporation (June 1989).

The maps associated with the records cited as entries numbered 3 through 6 are oversized and may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

3. "Draft Groundwater Remedial Investigation Report," Olin Corporation (February 1990).
4. "Draft Groundwater Remedial Investigation Report - Appendices A-M," Olin Corporation (February 1990).

3.6 Remedial Investigation (RI) Reports (cont'd.)

Reports (cont'd.)

5. "Draft Groundwater Remedial Investigation Report - Appendices N-U," Olin Corporation (February 1990).
6. "Draft Groundwater Remedial Investigation Report - Appendices AA-AE," Olin Corporation (February 1990).
7. "Draft Groundwater Remedial Investigation Report," Olin Corporation (June 1990).
8. "Draft Groundwater Remedial Investigation Report - Partial Appendices," Olin Corporation (June 1990).
9. "Addendum Report to Groundwater Remedial Investigation (GRI)," BCM Engineers, Inc. for Olin Corporation (October 1990).

The maps associated with the records cited as entries numbered 10 through 13 are oversized and may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

10. "Groundwater Remedial Investigation - Text," Olin Corporation (June 1990).
11. "Groundwater Remedial Investigation - Appendices A-M," Olin Corporation (June 1990).
12. "Groundwater Remedial Investigation - Appendices N-U," Olin Corporation (June 1990).
13. "Groundwater Remedial Investigation - Appendices AA-AF," Olin Corporation (June 1990).
14. "Groundwater Remedial Investigation Report - Addendum," EPA Region I (November 1990).

Comments

15. Comments Dated October 19, 1989 from Lynne A. Fratus, EPA Region I on the June 1989 "Draft Groundwater Remedial Investigation," Olin Corporation.
16. Comments Dated March 30, 1990 from Lynne A. Fratus, EPA Region I on the February 1990 "Draft Groundwater Remedial Investigation Report," Olin Corporation.
17. Comments Dated April 9, 1990 from Warren S. Angell II, State of Rhode Island Department of Environmental Management on the February 1990 "Draft Groundwater Remedial Investigation Report," Olin Corporation.
18. Comments Dated May 3, 1990 from Warren S. Angell II, State of Rhode Island Department of Environmental Management on the February 1990 "Draft Groundwater Remedial Investigation Report," Olin Corporation.
19. Comments Dated July 24, 1990 from Warren S. Angell II, State of Rhode Island Department of Environmental Management on the June 1990 "Groundwater Remedial Investigation Report," Olin Corporation.
20. Comments Dated September 10, 1990 from Warren S. Angell II, State of Rhode Island Department of Environmental Management on the June 1990 "Groundwater Remedial Investigation Report," Olin Corporation.
21. Comments Dated October 22, 1990 from Warren S. Angell II, State of Rhode Island Department of Environmental Management on the June 1990 "Groundwater Remedial Investigation Report," Olin Corporation.

3.6 Remedial Investigation (RI) Reports (cont'd.)

Responses to Comments

22. Response Dated November 10, 1989 from John C. Brown, Olin Corporation to the October 19, 1989 Comments from Lynne A. Fratus, EPA Region I.
23. Response from Olin Corporation to the October 19, 1989 Comments from Lynne A. Fratus, EPA Region I.
24. Response Dated February 26, 1990 from Olin Corporation to the October 20, 1989, February 13 and February 22, 1990 Comments from Lynne A. Fratus, EPA Region I.
25. Response from Olin Corporation to the March 30, 1990 Comments from Lynne A. Fratus, EPA Region I on the February 1990 "Draft Groundwater Remedial Investigation Report," Olin Corporation.
26. Response from Olin Corporation to the April 9, 1990 Comments from Warren S. Angell II, State of Rhode Island Department of Environmental Management on the February 1990 "Draft Groundwater Remedial Investigation Report," Olin Corporation.
27. Response from Olin Corporation to the May 3, 1990 Comments from Warren S. Angell II, State of Rhode Island Department of Environmental Management on the February 1990 "Draft Groundwater Remedial Investigation Report," Olin Corporation.

3.7 Work Plans and Progress Reports

Reports

1. "Draft - Work Plan for Groundwater Remedial Investigation and Feasibility Study," Olin Corporation (February 1986).
2. "Work Plan for Groundwater Remedial Investigation and Feasibility Study," Olin Corporation (June 1987).
3. Progress Report, Olin Corporation (April 1, 1988).
4. Progress Report, Olin Corporation (May 1, 1988).
5. Progress Report, Olin Corporation (June 1, 1988).
6. Progress Report, Olin Corporation (July 1, 1988).
7. Progress Report, Olin Corporation (August 1, 1988).
8. Progress Report, Olin Corporation (September 1, 1988).
9. Progress Report, Olin Corporation (October 1, 1988).
10. Progress Report, Olin Corporation (November 1, 1988).
11. Progress Report, Olin Corporation (December 1, 1988).
12. Progress Report, Olin Corporation (January 1, 1989).
13. Progress Report, Olin Corporation (February 1, 1989).
14. Progress Report, Olin Corporation (March 1, 1989).
15. Progress Report, Olin Corporation (April 1, 1989).
16. Progress Report, Olin Corporation (May 1, 1989).
17. Progress Report, Olin Corporation (June 1, 1989).
18. Progress Report, Olin Corporation (July 1, 1989).
19. Progress Report, Olin Corporation (August 1, 1989).
20. Progress Report, Olin Corporation (September 1, 1989).
21. Progress Report, Olin Corporation (October 1, 1989).
22. Progress Report, Olin Corporation (November 1, 1989).
23. Progress Report, Olin Corporation (December 1, 1989).
24. Progress Report, Olin Corporation (January 1, 1990).
25. Progress Report, Olin Corporation (February 1, 1990).
26. Progress Report, Olin Corporation (March 1, 1990).
27. Progress Report, Olin Corporation (April 1, 1990).
28. Progress Report, Olin Corporation (May 1, 1990).

3.7 Work Plans and Progress Reports (cont'd.)

Reports (cont'd.)

29. Progress Report, Olin Corporation (June 5, 1990).
30. Progress Report, Olin Corporation (July 2, 1990).
31. Progress Report, Olin Corporation (August 1, 1990).
32. Progress Report, Olin Corporation (September 1, 1990).
33. Progress Report, Olin Corporation (October 1, 1990).
34. Progress Report, Olin Corporation (November 1, 1990).
35. Progress Report, Olin Corporation (December 1, 1990).
36. Progress Report, Olin Corporation (January 1, 1991).
37. Progress Report, Olin Corporation (February 1, 1991).
38. Progress Report, Olin Corporation (March 1, 1991).

Comments

39. Letter from John W. Gallagher, EPA Region I to Verrill M. Norwood Jr., Olin Corporation (April 14, 1986) with attached:
    A. "Preliminary Review of Olin Workplans Site Closure and Groundwater Study," Olin Corporation.
    B. Attendance List, EPA Region I, Rhode Island Department of Environmental Management, and Olin Corporation (April 1, 1986).
40. Letter from John W. Gallagher, EPA Region I to Verrill M. Norwood Jr., Olin Corporation (April 14, 1986) with attached comments on Olin Corporation's job safety plans for site closure and groundwater study.
41. Comments Dated December 31, 1987 from Lynne A. Fratus, EPA Region I on the February 1986 "Work Plan for Groundwater Remedial Investigation and Feasibility Study," Olin Corporation.

Responses to Comments

42. Response Dated May 14, 1986 from James C. Brown, Olin Corporation to the April 14, 1986 Comments from John W. Gallagher, EPA Region I.
43. Response Dated May 29, 1986 from John W. Gallagher, EPA Region I to the May 15, 1986 Response from James C. Brown, Olin Corporation.
44. Response dated July 23, 1986 from James C. Brown, Olin Corporation to the May 29, 1986 Comments from John W. Gallagher, EPA Region I.

4.0 Feasibility Study (FS)

4.1 Correspondence

Agency for Toxic Substances and Disease Registry (ATSDR)

1. Letter from Lynne A. Fratus, EPA Region I to Louise House, Agency for Toxic Substances and Disease Registry (ATSDR) (February 4, 1991). Concerning an update of activities at the site and transmittal of the addenda to the Remedial Investigation and Feasibility Study Reports.

4.1 Correspondence (cont'd.)

BCM Engineers, Inc.

2. Letter from Roy C. Peterson, BCM Engineers, Inc. to Lynne A. Fratus, EPA Region I (May 8, 1990). Concerning transmittal of the attached:
   A. Cross-Reference: "Draft Groundwater Feasibility Study Report - Volume I," Olin Corporation (May 1990) [Filed and cited as entry number 2 in 4.6 Feasibility Study (FS) Reports].
   B. Cross-Reference: "Draft Groundwater Feasibility Study Report - Volume II," Olin Corporation (May 1990) [Filed and cited as entry number 3 in 4.6 Feasibility Study (FS) Reports].
3. Letter from Roy C. Peterson, BCM Engineers, Inc. to Lynne A. Fratus, EPA Region I (October 12, 1990). Concerning the transmittal of the following attachments:
   A. Cross-Reference: "Groundwater Feasibility Study - Volume I," BCM Engineers, Inc. for Olin Corporation (October 1990) [Filed and cited as entry number 4 in 4.6 Feasibility Study (FS) Reports].
   B. Cross-Reference: "Groundwater Feasibility Study - Volume II," BCM Engineers, Inc. for Olin Corporation (October 1990) [Filed and cited as entry number 5 in 4.6 Feasibility Study (FS) Reports].
   C. Cross-Reference: "Groundwater Feasibility Study - Volume III," BCM Engineers, Inc. for Olin Corporation (October 1990) [Filed and cited as entry number 6 in 4.6 Feasibility Study (FS) Reports].

Olin Corporation

4. Letter from David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (February 1, 1990). Concerning transmittal of the attached progress report and Feasibility Study schedule.
5. Letter from Lynne A. Fratus, EPA Region I to David L. Cummings, Olin Corporation (February 23, 1990). Concerning revisions to the Feasibility Study schedule.
6. Letter from Lynne A. Fratus, EPA Region I to Robert D. McCaleb, Olin Corporation (April 17, 1990). Concerning the need for a section in the Feasibility Study addressing the potential for development of the affected area.
7. Letter from Robert D. McCaleb for David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I (May 8, 1990). Concerning notification that the February 26, 1990 "Initial Screening of Technologies and Process Options," BCM Engineers, Inc. for Olin Corporation and the March 23, 1990 "Alternative Screening Results," BCM Engineers, Inc. for Olin Corporation have been clarified and incorporated into the May 1990 "Draft Feasibility Study Report," Olin Corporation.
8. Letter from Robert D. McCaleb and David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (July 10, 1990). Concerning a summary of the June 28, 1990 meeting and a request for a project schedule extension.
9. Letter from Robert D. McCaleb and David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (July 26, 1990). Concerning a revised project schedule for the groundwater model.
10. Letter from Lynne A. Fratus, EPA Region I to David L. Cummings, Olin Corporation (August 24, 1990). Concerning notification that Olin Corporation is in violation of the Consent Decree for not submitting a revised "Groundwater Feasibility Study Report" within thirty days.

4.1 Correspondence (cont'd.)

Olin Corporation (cont'd.)

11. Letter from David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I (September 4, 1990). Concerning Olin Corporation's response to EPA's notification that Olin is in non-compliance with the Consent Decree.
12. Memorandum from Robert D. McCaleb, Olin Corporation to Lynne A. Fratus, EPA Region I (December 12, 1990). Concerning transmittal of the attached BCM Engineers acreage estimates.
13. Memorandum from Robert D. McCaleb, Olin Corporation to Lynne A. Fratus, EPA Region I (December 14, 1990). Concerning transmittal of the attached description of the modeling scenarios.
14. Letter from Robert D. McCaleb, Olin Corporation to Lynne A. Fratus, EPA Region I (January 7, 1991). Concerning calculations of contaminant mass in the aquifer.
15. Letter from Robert D. McCaleb and David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I (January 7, 1991). Concerning transmittal of the attached revisions and expansions to the October 1990 Feasibility Study alternatives.
16. Letter from Robert D. McCaleb and David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I (January 22, 1991). Concerning transmittal of the attached "Revised Cost Estimates."
17. Memorandum from Robert D. McCaleb, Olin Corporation to Lynne A. Fratus, EPA Region I (January 23, 1991). Concerning calculations of the contaminant mass in the aquifer.
18. Memorandum from Robert D. McCaleb, Olin Corporation to Lynne A. Fratus, EPA Region I (January 23, 1991). Concerning acreage estimates.
19. Memorandum from Robert D. McCaleb, Olin Corporation to Lynne A. Fratus, EPA Region I (January 23, 1991). Concerning transmittal of the attached revised figures for the Feasibility Study.
20. Letter from Robert D. McCaleb, Olin Corporation to Lynne A. Fratus, EPA Region I (January 23, 1991). Concerning transmittal of the attached calculations of contaminant mass in the aquifer.
21. Letter from Richard C. Boynton, EPA Region I to David L. Cummings, Olin Corporation (February 4, 1991). Concerning transmittal of the February 1991 "Groundwater Feasibility Study Report - Addendum," EPA Region I and the Proposed Plan for the site cleanup.
22. Letter from Lynne A. Fratus, EPA Region I to David L. Cummings, Olin Corporation (March 15, 1991). Concerning transmittal of the requested comments submitted to EPA Region I on the Proposed Plan for the site cleanup by the State of Rhode Island Department of Environmental Management.

State of Rhode Island Department of Environmental Management

23. Memorandum from Lynne A. Fratus, EPA Region I to State of Rhode Island Department of Environmental Management staff (December 5, 1990). Concerning a briefing on the proposed plan for the site.
24. Letter from Richard C. Boynton, EPA Region I to Alicia M. Good, State of Rhode Island Department of Environmental Management (January 4, 1991). Concerning the Draft Addendum to the Groundwater Feasibility Study Report.
25. Letter from Lynne A. Fratus for Richard C. Boynton, EPA Region I to Alicia M. Good, State of Rhode Island Department of Environmental Management (January 9, 1991). Concerning transmittal of Appendix A of the Feasibility Study Report Addendum for review.

4.1 Correspondence (cont'd.)

State of Rhode Island Department of Environmental Management (cont'd.)

26. Letter from Lynne A. Fratus for Richard C. Boynton, EPA Region I to Alicia M. Good, State of Rhode Island Department of Environmental Management (January 22, 1991). Concerning transmittal of a draft of the Feasibility Study Report Addendum for review.
27. Letter from Richard C. Boynton, EPA Region I to Alicia M. Good, State of Rhode Island Department of Environmental Management (February 4, 1991). Concerning transmittal of the February 1991 "Groundwater Feasibility Study Report - Addendum," EPA Region I and the Proposed Plan for the site cleanup.
28. Letter from Lynne A. Fratus, EPA Region I to Susan Kiernan, State of Rhode Island Department of Environmental Management (February 28, 1991). Concerning potential applicable or relevant and appropriate requirements regarding the site.

4.4 Interim Deliverables

Reports

1. "Summary, Remedial Objectives, and Potential Technologies for Remediation," Olin Corporation (February 8, 1990).
2. "Initial Screening of Technologies and Process Options," BCM Engineers, Inc. for Olin Corporation (February 26, 1990).
3. "Alternative Screening Results," BCM Engineers, Inc. for Olin Corporation (March 23, 1990).

Comments

4. Comments Dated February 13, 1990 from Lynne A. Fratus, EPA Region I on the February 8, 1990 "Summary, Remedial Objectives, and Potential Technologies for Remediation," Olin Corporation.
5. Comments Dated February 22, 1990 from Lynne A. Fratus, EPA Region I on the February 8, 1990 "Summary, Remedial Objectives, and Potential Technologies for Remediation," Olin Corporation.
6. Comments Dated March 14, 1990 from Lynne A. Fratus, EPA Region I on the February 26, 1990 "Initial Screening of Technologies and Process Options," BCM Engineers, Inc. for Olin Corporation.
7. Comments Dated April 10, 1990 from Lynne A. Fratus, EPA Region I on the March 23, 1990 "Alternative Screening Results," BCM Engineers, Inc. for Olin Corporation.

Responses to Comments

8. Letter from David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (February 27, 1990). Concerning transmittal of the attached:
   A. Response from Olin Corporation to the February 13, 1990 Comments from Lynne A. Fratus, EPA Region I.
   B. Response from Olin Corporation to the February 22, 1990 Comments from Lynne A. Fratus, EPA Region I.

4.4 Interim Deliverables (cont'd.)

Responses to Comments (cont'd.)

9. Letter from David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I (May 21, 1990). Concerning transmittal of the attached:
   A. Response from Olin Corporation to the March 14, 1990 Comments from Lynne A. Fratus, EPA Region I.
   B. Response from Olin Corporation to the April 10, 1990 Comments from Lynne A. Fratus, EPA Region I.

4.6 Feasibility Study (FS) Reports

Reports

1. "Draft Focused Feasibility Study Report - Task 3 - Permanent Water Supply Study," Camp Dresser & McKee Inc. (October 1985).
2. "Draft Groundwater Feasibility Study Report - Volume I," Olin Corporation (May 1990).
3. "Draft Groundwater Feasibility Study Report - Volume II," Olin Corporation (May 1990).
4. "Groundwater Feasibility Study - Volume I," BCM Engineers, Inc. for Olin Corporation (October 1990).
5. "Groundwater Feasibility Study - Volume II," BCM Engineers, Inc. for Olin Corporation (October 1990).
6. "Groundwater Feasibility Study - Volume III," BCM Engineers, Inc. for Olin Corporation (October 1990).
7. "Groundwater Feasibility Study Report - Addendum," EPA Region I (February 1991).

Comments

8. Comments Dated June 13, 1990 from Lynne A. Fratus, EPA Region I on the May 1990 "Draft Groundwater Feasibility Study Report," Olin Corporation.
9. Comments Dated June 14, 1990 from Warren S. Angell II, State of Rhode Island Department of Environmental Management on the May 1990 "Draft Groundwater Feasibility Study Report," Olin Corporation.
10. Comments Dated July 16, 1990 from Alicia M. Good, State of Rhode Island Department of Environmental Management on the May 1990 "Draft Groundwater Feasibility Study Report," Olin Corporation.
11. Comments Dated January 10, 1991 from Lynne A. Fratus, EPA Region I on the October 1990 "Groundwater Feasibility Study," BCM Engineers, Inc. for Olin Corporation.

Responses to Comments

12. Response Dated October 22, 1990 from David L. Cummings, Olin Corporation to the June 13, 1990 Comments from Lynne A. Fratus, EPA Region I and the June 14, 1990 Comments from Warren S. Angell II, State of Rhode Island Department of Environmental Management.

4.9 Proposed Plans for Selected Remedial Action

1. "EPA Proposes Cleanup Plan to Address Groundwater Contamination at the Western Sand & Gravel Site," EPA Region I (February 1991).

5.0 Record of Decision (ROD)

5.1 Correspondence

State of Rhode Island Department of Environmental Management

1. Letter from James W. Fester, State of Rhode Island Department of Environmental Management to Merrill S. Hohman, EPA Region I (March 11, 1991). Concerning a request for a 60 day extension to the comment period on the Proposed Plan.
2. Letter from Merrill S. Hohman, EPA Region I to James W. Fester, State of Rhode Island Department of Environmental Management (March 13, 1991). Concerning the response to the March 11, 1991 letter and the denial of an extension to the comment period on the Proposed Plan.
3. Letter from Merrill S. Hohman, EPA Region I to Thomas D. Getz, State of Rhode Island Department of Environmental Management (March 25, 1991). Concerning transmittal of the "Draft Record of Decision" for review and confirmation of the State of Rhode Island's position on the Proposed Plan.
4. Letter from Merrill S. Hohman, EPA Region I to Thomas D. Getz, State of Rhode Island Department of Environmental Management (March 27, 1991). Concerning the response to the March 13, 1991 letter regarding the Groundwater Protection Act.
5. Letter from James W. Fester, State of Rhode Island Department of Environmental Management to Merrill S. Hohman, EPA Region I (March 28, 1991). Concerning a request for additional time to review the Draft Record of Decision.
6. Letter from Merrill S. Hohman, EPA Region I to James W. Fester, State of Rhode Island Department of Environmental Management (March 29, 1991). Concerning the response to the March 28, 1991 request for additional time to review the Draft Record of Decision.
7. Facsimile from Louise Durfee, State of Rhode Island Department of Environmental Management to Julie Belaga, EPA Region I (April 12, 1991). Concerning comments on the Draft Record of Decision and nonconcurrence.
8. Letter from Julie Belaga, EPA Region I to Louise Durfee, State of Rhode Island Department of Environmental Management (April 16, 1991). Concerning the response to the April 12, 1991 facsimile regarding comments on the Draft Record of Decision.

5.3 Responsiveness Summary

1. Cross Reference: Responsiveness Summary is an attachment to the April 16, 1991 "Record of Decision," EPA Region I [Filed and cited as entry number 1 in 5.4 Record of Decision (ROD)].

The following citations indicate documents received by EPA Region I during the formal public comment period.

2. Comments Dated February 28, 1991 from Ethel M. Halsey on the February 1991 Proposed Plan.
3. Comments Dated February 28, 1991 from the State of Rhode Island Department of Environmental Management on the February 1991 Proposed Plan.
4. Comments Dated March 11, 1991 from Richard E. Kyte Jr. (Attorney for Nasonville Water District) on the February 1991 Proposed Plan with the attached Comments Dated February 26, 1991 from George R. Allan, Dufresne-Henry, Inc.

5.3 Responsiveness Summary (cont'd.)

5. Comments Dated March 13, 1991 from David L. Cummings, Olin Chemicals on the February 1991 Proposed Plan.
6. Comments Dated March 13, 1991 from Thomas D. Getz, State of Rhode Island Department of Environmental Management on the February 1991 Proposed Plan.
7. Comments Dated March 15, 1991 from Warren S. Angell II, State of Rhode Island Department of Environmental Management on the February 1991 Proposed Plan.

5.4 Record of Decision (ROD)

1. "Record of Decision," EPA Region I (April 16, 1991) with the attached Responsiveness Summary, State of Rhode Island Nonconcurrence Letter, and the Administrative Record Index.

6.0 Remedial Design (RD)

6.1 Correspondence

Nasonville Water District

1. Letter from Felix Harvey, State of Rhode Island Department of Environmental Management to Maria Flanagan, Nasonville Water District (September 26, 1986). Concerning location of storage tank.
2. Letter from Felix Harvey, State of Rhode Island Department of Environmental Management to Maria Flanagan, Nasonville Water District (October 15, 1986). Concerning agreement on the location of the storage tank.
3. Letter from John W. Gallagher, EPA Region I to Maria Flanagan, Nasonville Water District (October 15, 1986). Concerning construction of the water line.
4. Letter from David E. Pinsky, Camp Dresser & McKee Inc. to John Hagopian, State of Rhode Island Department of Health (June 3, 1987). Concerning design considerations for the proposed well field at Site E.
5. Letter from John W. Gallagher, EPA Region I to Ethel W. Halsey, Nasonville Water District (June 12, 1987). Concerning status on work begun as ordered by Consent Decree.
6. Letter from Warren S. Angell II, State of Rhode Island Department of Environmental Management to Ethel M. Halsey, Nasonville Water District (June 3, 1988). Concerning progress at the site.
7. Letter from Warren S. Angell II, State of Rhode Island Department of Environmental Management to Ethel M. Halsey, Nasonville Water District (June 3, 1988). Concerning progress of issues listed on the proposed June 7, 1988 Nasonville Water District meeting agenda.
8. Letter from Warren S. Angell II, State of Rhode Island Department of Environmental Management to Ethel M. Halsey, Nasonville Water District (September 13, 1988) with attached Letter from Peter P. Calise, State of Rhode Island Water Resources Board to Warren S. Angell II, State of Rhode Island Department of Environmental Management (June 9, 1988). Concerning the approval of the application for a new source of water supply.

6.1 Correspondence (cont'd.)

Nasonville Water District (cont'd.)

9. Memorandum from Ethel M. Halsey, Nasonville Water District to Lynne A. Fratus, EPA Region I (September 22, 1988) with attached:
   A. Memorandum from Ethel M. Halsey, Nasonville Water District to Nasonville Water District Board Members (September 21, 1988). Concerning the lack of progress at the site.
   B. Letter from Peter P. Calise, State of Rhode Island Water Resources Board to Warren S. Angell II, State of Rhode Island Department of Environmental Management (June 9, 1988). Concerning the approval of the application for a new water supply source.
   C. Letter from Irene Winkler, U.S. Department of Agriculture to Ethel M. Halsey, Nasonville Water District (August 31, 1988). Concerning the installation of a public water line.
10. Letter from Lynne A. Fratus, EPA Region I to Warren S. Angell II, State of Rhode Island Department of Environmental Management (October 24, 1988). Concerning response to the attached October 3, 1988 Letter from Nasonville Water District.
11. Letter from Warren S. Angell II, State of Rhode Island Department of Environmental Management to Ethel M. Halsey, Nasonville Water District (November 25, 1988). Concerning response to the October 3, 1988 Letter from Nasonville Water District.
12. Letter from Ethel M. Halsey, Nasonville Water District to Warren S. Angell II, State of Rhode Island Department of Environmental Management (December 21, 1988). Concerning the attached compilation of questions, answers and comments on progress at the site.
13. Letter from Warren S. Angell II, State of Rhode Island Department of Environmental Management to Ethel M. Halsey, Nasonville Water District (February 22, 1989). Concerning Nasonville Water District water main.
14. Letter from Mary E. Kay, State of Rhode Island Department of Environmental Management to Francis A. Gaschen (Attorney for the Nasonville Water District) (March 27, 1989). Concerning parcels of real estate needed for construction of a water line in the Nasonville Water District.
15. Letter from Lynne A. Fratus, EPA Region I to Ethel M. Halsey, Nasonville Water District (March 27, 1989). Concerning the attached estimated schedule for construction of water line.
16. Letter from Lynne A. Fratus, EPA Region I to Warren S. Angell II, State of Rhode Island Department of Environmental Management (March 29, 1989) with attached map. Concerning description of the affected area at the site.
17. Letter from Warren S. Angell II, State of Rhode Island Department of Environmental Management to Maria Flanagan, Nasonville Water District (June 6, 1989). Concerning transmittal of correspondence from U.S. Army Corps of Engineers pertaining to construction of a water line.

Miscellaneous

18. Memorandum from Robert P. Hartley, EPA Headquarters to File (January 13, 1987). Concerning summary of meeting with representatives of American Colloid Company.
19. Letter from Paul P. Ozarowski and Wesley E. Stimpson, Haley & Aldrich, Inc. to Thomas E. Taylor, Weston Services, Incorporated (July 28, 1987). Concerning the transmittal of soil testing results of Black Hills Bentonite mixture.

6.3 Applicable or Relevant and Appropriate Requirements (ARARs)

1. Letter from Felix Harvey, State of Rhode Island Department of Environmental Management to Verrill M. Norwood Jr., Olin Corporation (April 22, 1986). Concerning the attached "Regulations for Underground Storage Facilities Used for Petroleum Products and Hazardous Materials," State of Rhode Island Department of Environmental Management.

6.4 Remedial Design Documents

The record cited in entry number 1 is an oversized document and may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

1. "Permanent Water Supply, Western Sand and Gravel Superfund Site, Final Engineering Plans," Sea Consultants, Inc. (January 1988).
2. Letter from Mary E. Kay, State of Rhode Island Department of Environmental Management to Lynne A. Fratus, EPA Region I (April 12, 1989). Concerning transmittal of the attached "Statement of Condemnation of Fee Title and Construction and Maintenance Easements," State of Rhode Island Department of Environmental Management. (March 29, 1989).

Plans associated with the records cited in entry numbers 3 and 6 may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

3. "Plans and Specifications (For Construction Contract) Western Sand & Gravel Superfund Site Permanent Water Supply," U.S. Army Corps of Engineers (May 1989).
4. "Amendment No. 0001 to Specifications and Drawings for Construction of Western Sand and Gravel Superfund Site, Permanent Water Supply, Burrillville, Rhode Island," U.S. Army Corps of Engineers (May 17, 1989).
5. "Amendment No. 0002 to Specifications and Drawings for Construction of Western Sand and Gravel Superfund Site, Permanent Water Supply, Burrillville, Rhode Island," U.S. Army Corps of Engineers (June 28, 1989).
6. "Amendment No. 0003 to Specifications and Drawings for Construction of Western Sand and Gravel Superfund Site, Permanent Water Supply, Burrillville, Rhode Island," U.S. Army Corps of Engineers (July 12, 1989).
7. "Amendment No. 0004 to Specifications and Drawings for Construction of Western Sand and Gravel Superfund Site, Permanent Water Supply, Burrillville, Rhode Island," U.S. Army Corps of Engineers (July 21, 1989).

The record cited in entry number 8 is an oversized document and may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

8. Letter from State of Rhode Island Department of Environmental Management (July 24, 1989). Concerning transmittal of the attached final signed easement drawings.

7.0 Remedial Action (RA)

7.1 Correspondence

Nasonville Water District

1. Letter from Lynne A. Fratus, EPA Region I to William Flanagan, Nasonville Water District (November 7, 1989). Concerning the status of construction of the waterline which will service the Nasonville Water District.
2. Letter from Lynne A. Fratus, EPA Region I to William Flanagan, Nasonville Water District (December 4, 1989). Concerning EPA's position on future connections to the waterline.
3. Letter from Lynne A. Fratus, EPA Region I to William Flanagan, Nasonville Water District (May 9, 1990). Concerning a request that the Nasonville Water District finalize the State-Aid Agreement with the State of Rhode Island Department of Environmental Management as soon as possible.
4. Letter from Lynne A. Fratus, EPA Region I to Richard E. Kyte Jr. (August 8, 1990). Concerning the derivation of the estimated operation and maintenance costs for the waterline and the attached Letter from John Gallagher, EPA Region I to Felix Harvey, State of Rhode Island Department of Environmental Management (October 16, 1986).
5. Letter from Richard E. Kyte Jr. to Lynne A. Fratus, EPA Region I (October 17, 1990). Concerning both the desire that the roadways serviced by the waterline should be paved and the attached:
   A. Letter from Richard E. Kyte Jr. to Claude Cote, State of Rhode Island Department of Environmental Management (October 17, 1990).
   B. Letter from George R. Allen, Dufresne-Henry, Inc. to William Flanagan, Nasonville Water District (September 28, 1990).
   C. Letter Report from David L. Merithew, Robert L. Merithew, Inc. to George R. Allen, Dufresne-Henry, Inc. (September 26, 1990). Concerning the September 5, 1990 inspection of the 100,000 gallon water sphere located within the Nasonville Water District.
6. Letter from Richard E. Kyte Jr. (Attorney for Nasonville Water District) (December 6, 1990). Concerning transmittal of the attached Letter from Michael E. Grilli, Beta Engineering, Inc. to William Flanagan, Nasonville Water District (October 26, 1990) regarding paving the roads.
7. Letter from Richard E. Kyte Jr. (Attorney for Nasonville Water District) to Lynne A. Fratus, EPA Region I (February 13, 1991). Concerning the request for specific cost information regarding the site cleanup.
8. Letter from Thomas Bercher, Town of Burrillville to William Flanagan, Nasonville Water District (February 21, 1991). Concerning the inadequate reconstruction of Gig and Pulaski Roads.
9. Letter from Lynne A. Fratus, EPA Region I to William Flanagan, Nasonville Water District (February 21, 1991). Concerning transmittal of the information requested on EPA's decision to not pave the roads over the water system.
10. Letter from Richard E. Kyte Jr. (Attorney for Nasonville Water District) to Lynne A. Fratus, EPA Region I (March 13, 1991). Concerning the request for cleanup cost figures.
11. Letter from Lynne A. Fratus, EPA Region I to Richard E. Kyte Jr. (Attorney for Nasonville Water District) (March 20, 1991). Concerning a reply to the request for cleanup cost figures.

7.1 Correspondence (cont'd.)

Olin Corporation

12. Letter from John W. Gallagher, EPA Region I to James C. Brown, Olin Corporation (August 22, 1986). Concerning Bentonite-enhanced layer.
13. Letter from James C. Brown, Olin Corporation to John W. Gallagher, EPA Region I (September 29, 1986). Concerning the Bentonite-enhanced soil layer of the cap.
14. Letter from John W. Gallagher, EPA Region I to Verrill M. Norwood Jr., Olin Corporation (May 21, 1987). Concerning comments on the cover system and its installation.
15. Letter from John W. Gallagher, EPA Region I to James C. Brown, Olin Corporation (June 9, 1987). Concerning summary of plans for the cap.
16. Letter from James C. Brown, Olin Corporation to John W. Gallagher, EPA Region I and Felix Harvey, State of Rhode Island Department of Environmental Management (July 3, 1987). Concerning field permeability testing of the cap.
17. Letter from James C. Brown, Olin Corporation to Tina Cardi, State of Rhode Island Department of Environmental Management (July 3, 1987). Concerning attached Permanent Closure Application for the underground storage tank located at the site.
18. Letter from James C. Brown, Olin Corporation to John W. Gallagher, EPA Region I and Felix Harvey, State of Rhode Island Department of Environmental Management (July 13, 1987) with attached map. Concerning sources of structural and frost protection fill materials.
19. Letter from James C. Brown, Olin Corporation to John W. Gallagher, EPA Region I (August 4, 1987). Concerning field permeability testing of the cap.
20. Letter from James C. Brown, Olin Corporation to John W. Gallagher, EPA Region I and Felix Harvey, State of Rhode Island Department of Environmental Management (September 9, 1987). Concerning the handling of solid contaminated materials at the site.
21. Letter from James C. Brown, Olin Corporation to Peter Sullivan, State of Rhode Island Department of Environmental Management (October 26, 1987). Concerning transmittal of photographic documentation of the August 22, 1987 underground storage tank at the site.
22. Letter from James C. Brown, Olin Corporation to John W. Gallagher, EPA Region I and Felix Harvey, State of Rhode Island Department of Environmental Management (November 2, 1987). Concerning transmittal of report on laboratory and field test work supporting the final design of Bentonite-enhanced layer.
23. Letter from James C. Brown, Olin Corporation to John W. Gallagher, EPA Region I (November 4, 1987). Concerning notes from October 7, 1987 conference call.
24. Letter from James C. Brown, Olin Corporation to John W. Gallagher, EPA Region I and Felix Harvey, State of Rhode Island Department of Environmental Management (December 7, 1987). Concerning seeding of the fenced area at the site.
25. Letter from Lynne A. Fratus, EPA Region I to James C. Brown, Olin Corporation (December 8, 1987). Concerning letter from EPA Region I to State of Rhode Island Department of Environmental Management regarding the cover's ability to meet RCRA requirements.
26. Letter from Lynne A. Fratus, EPA Region I to James C. Brown, Olin Corporation (December 28, 1987). Concerning seeding of the cap.
27. Memorandum from Doug G. Harrod, Olin Corporation to Robert D. McCaleb, Olin Corporation (February 17, 1988). Concerning seeding of the cap.
28. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (March 3, 1988). Concerning reseeding of the cap.

7.1 Correspondence (cont'd.)

Olin Corporation (cont'd.)

29. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (March 8, 1988). Concerning the attached:
    A. "Uniform Hazardous Waste Manifest" Form, Commonwealth of Massachusetts Department of Environmental Quality Engineering (October 28, 1987).
    B. "Certificate of Destruction," SCA Chemical Services (November 11, 1987).
    C. Waste Information Form - liquid waste (September 29, 1987).
    D. Analysis of Waste Oil from Underground Storage Tank (December 1982).
    E. "Uniform Hazardous Waste Manifest" Form, Commonwealth of Massachusetts Department of Environmental Quality Engineering (October 28, 1987).
    F. "Certificate of Disposal," SCA Chemical Services (January 18, 1988).
    G. Waste Information Form - solid waste (September 29, 1987).
    H. Memorandum of Points and Authorities in Opposition to Plaintiffs' Motion for Preliminary Injunction, *Chemical Waste Management, Inc. and SCA Chemical Services, Inc. v. United States Environmental Protection Agency et al.*, United States District Court for the District of Kansas, Civil Action No. 87-2411-S (September 11, 1987).
30. Letter from Lynne A. Fratus, EPA Region I to James C. Brown, Olin Corporation (May 9, 1988). Concerning inspection of the cap.
31. Letter from Richard C. Boynton, EPA Region I to James C. Brown, Olin Corporation (September 27, 1988). Concerning list of work items necessary to complete site closure.
32. Letter from James C. Brown, Olin Corporation to Warren S. Angell II, State of Rhode Island Department of Environmental Management (September 28, 1988). Concerning removal of electrical equipment from the site.
33. Letter from Warren S. Angell II, State of Rhode Island Department of Environmental Management to James C. Brown, Olin Corporation (November 15, 1988). Concerning removal of transformers from the site.
34. Letter from Richard C. Boynton, EPA Region I to James C. Brown, Olin Corporation (March 29, 1989) with attached map. Concerning final inspection of the site.
35. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I (August 1, 1989). Concerning erosion protection at the site.

S.E.A. Consultants Inc.

36. Letter from Lynne A. Fratus, EPA Region I to Douglas F. Reed, S.E.A. Consultants Inc. (January 11, 1990). Concerning transmittal of comments from the Town of Burrillville on the design of the waterline.
37. Letter from Ronald S. Ponte for Douglas F. Reed, S.E.A. Consultants Inc. to Lynne A. Fratus, EPA Region I (February 14, 1990). Concerning responses to the Town of Burrillville's comments on the design of the waterline.
38. Letter from Douglas F. Reed, S.E.A. Consultants Inc. to John Barrett, U.S. Army Corps of Engineers (July 27, 1990). Concerning a response to the EPA Letter Dated June 18, 1990 regarding the dates for submission of the draft Rules and Regulations and Operation and Maintenance Manuals for the Nasonville Water District.
39. Letter from Douglas F. Reed, S.E.A. Consultants Inc. to Warren S. Angell, State of Rhode Island Department of Environmental Management (August 9, 1990). Concerning transmittal of the attached "Draft Construction Standards and Rules and Regulations for Public Water Mains and Services," Nasonville Water District Board of Water Commissioners (August 3, 1990) for comments.

7.1 Correspondence (cont'd.)

S.E.A. Consultants Inc. (cont'd.)

40. Letter from Douglas F. Reed, S.E.A. Consultants Inc. to Lynne A. Fratus, EPA Region I (September 10, 1990). Concerning transmittal of the attached "Draft Water Supply and Distribution System Operation and Maintenance Manual," Nasonville Water District Board of Water Commissioners (August 1990) for comments.
41. Letter from Douglas F. Reed, S.E.A. Consultants Inc. to Lynne A. Fratus, EPA Region I (October 4, 1990). Concerning response to the State of Rhode Island Department of Environmental Management's concerns over the watermain size and material used as well as providing service to Lot 50A and Lot 51.
42. Letter from Douglas F. Reed, S.E.A. Consultants Inc. to Lynne A. Fratus, EPA Region I (December 11, 1990). Concerning the Surface Water Treatment Rule.
43. Letter from Douglas F. Reed, S.E.A. Consultants Inc. to Maurice Beaudoin, U.S. Army Corps of Engineers (December 12, 1990). Concerning responses to the October 12, 1990 Department of Health concerns with the Nasonville water system.
44. Letter from Douglas F. Reed, S.E.A. Consultants Inc. to Maurice Beaudoin, U.S. Army Corps of Engineers (December 20, 1990). Concerning comments on the "Scope of Services" for an operator of the Nasonville water system.
45. Letter from Douglas F. Reed, S.E.A. Consultants Inc. to Lynne A. Fratus, EPA Region I (January 15, 1991). Concerning the attached "Evaluation of Impacts of the Surface water Treatment rule on the Tarklin Road Well Site."
46. Letter from Douglas F. Reed, S.E.A. Consultants Inc. to Lynne A. Fratus, EPA Region I (January 15, 1991). Concerning the attached "Supplemental Response to RIDOH Comments on Nasonville Water System."

State of Rhode Island Department of Environmental Management

47. Letter from Dennis Huebner for Merrill S. Hohman, EPA Region I to Thomas D. Getz, State of Rhode Island Department of Environmental Management (November 19, 1987). Concerning comments on the cover's ability to meet RCRA requirements.

7.1 Correspondence (cont'd.)

State of Rhode Island Department of Environmental Management (cont'd.)

48. Letter from Warren S. Angell II, State of Rhode Island Department of Environmental Management to Lynne A. Fratus, EPA Region I (November 28, 1989). Concerning transmittal of the following attachments:
    A. Letter from Dean H. Albro, State of Rhode Island Department of Environmental Management to Anthony J. Zuena, S.E.A. Consultants, Inc. (March 23, 1988). Concerning the review of the request for "Fresh Water Wetland Applicability Determination."
    B. Letter from Edgar R. Girard, State of Rhode Island Department of Health to Warren S. Angell II, State of Rhode Island Department of Environmental Management (June 2, 1988). Concerning the attached State of Rhode Island Department of Health's approval for a tubular well field, pumping station, and 100,000 gallon elevated storage tank to serve the proposed Nasonville Water District.
    C. Letter from Eugene A. Morin, State of Rhode Island Department of Health to Thomas D. Getz, State of Rhode Island Department of Environmental Management (June 22, 1987). Concerning the attached State of Rhode Island Department of Health's approval of a site for the proposed development of a well field to serve the proposed Nasonville Water District.
    D. Letter from Peter P. Calise, State of Rhode Island Water Resources Board to Warren S. Angell II, State of Rhode Island Department of Environmental Management (June 9, 1988). Concerning the State of Rhode Island Water Resources Board's recommendations for the State of Rhode Island Department of Environmental Management
    E. "Notice of Proposed Construction or Alteration" Form, U.S. Department of Transportation Federal Aviation Administration (July 14, 1988).
49. Letter from Lynne A. Fratus, EPA Region I to Warren S. Angell II, State of Rhode Island Department of Environmental Management (April 4, 1990). Concerning notification that construction of the waterline has begun and the attached "News Release," U.S. Army Corps of Engineers (March 19, 1990).
50. Letter from Merrill S. Hohman, EPA Region I to Michael A. Annarummo, State of Rhode Island Department of Environmental Management (May 24, 1990). Concerning the request that the State of Rhode Island Department of Environmental Management finalize the State-Aid Agreement with the Nasonville Water District as soon as possible.
51. Letter from Lynne A. Fratus, EPA Region I to Warren S. Angell II, State of Rhode Island Department of Environmental Management (August 28, 1990). Concerning comments on the August 31, 1990 "Draft Rules and Regulations for the Nasonville Water District," S.E.A. Consultants, Inc.
52. Letter from Lynne A. Fratus, EPA Region I to Warren S. Angell II, State of Rhode Island Department of Environmental Management (September 4, 1990). Concerning transmittal of the 1984 Record of Decision.
53. Letter from Richard C. Boynton, EPA Region I to Alicia Good, State of Rhode Island Department of Environmental Management (September 17, 1990). Concerning the schedule for completing construction of the waterline.
54. Letter from Michael Annarummo, State of Rhode Island Department of Environmental Management to Julie Belaga, EPA Region I (September 18, 1990). Concerning the Superfund State Contract for Remedial Measures Related to the Site and the Nasonville water system.
55. Letter from Warren S. Angell II, State of Rhode Island Department of Environmental Management to Ann Marie Gomes (October 11, 1990). Concerning transmittal of the attached "Request for Connection to the EPA Water Distribution System."

7.1 Correspondence (cont'd.)

State of Rhode Island Department of Environmental Management (cont'd.)

56. Letter from Julie Belaga, EPA Region I to Michael Annarummo, State of Rhode Island Department of Environmental Management (October 17, 1990). Concerning Superfund State Contract for Remedial Measures Related to the Site and the Nasonville water system.
57. Letter from Richard C. Boynton, EPA Region I to Alicia M. Good, State of Rhode Island Department of Environmental Management (November 13, 1990). Concerning transmittal of the draft scope of services for the operation and maintenance of the water supply.
58. Letter from Alicia M. Good, State of Rhode Island Department of Environmental Management to Richard C. Boynton, EPA Region I (November 29, 1990). Concerning an update of the State of Rhode Island's activities at the site.
59. Letter from Thomas D. Getz, State of Rhode Island Department of Environmental Management to William Flannagan, Nasonville Water District (December 4, 1990). Concerning the request of whether or not the Nasonville Water District is willing to accept operation and maintenance responsibilities for the water supply system.
60. Letter from Richard C. Boynton, EPA Region I to Alicia M. Good, State of Rhode Island Department of Environmental Management (December 14, 1990). Concerning response to State of Rhode Island Department of Environmental Management comments on the waterline.
61. Letter from June Swallow, State of Rhode Island Department of Health to Richard C. Boynton, EPA Region I (December 14, 1990). Concerning preliminary determination that the surface water treatment rule will apply to the Nasonville Water District.
62. Letter from Lynne A. Fratus, EPA Region I to Warren S. Angell II, State of Rhode Island Department of Environmental Management (December 21, 1990). Concerning transmittal of a copy of S.E.A. Consultants Inc.'s response to State of Rhode Island Department of Environmental Management's comments on the waterline.
63. Letter from Alicia M. Good for Thomas T. Getz, State of Rhode Island Department of Environmental Management to Merrill S. Hohman, EPA Region I (December 26, 1990). Concerning issues that have come up regarding the site waterline.
64. Letter from Merrill S. Hohman, EPA Region I to Thomas T. Getz, State of Rhode Island Department of Environmental Management (February 25, 1991). Concerning the status of construction and ownership of the waterline.

U.S. Army Corps of Engineers

65. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Gary D. Robinson, R.H. White Construction Company, Inc. (November 1, 1989). Concerning the confirmation that a pre-construction conference will be held on November 6, 1989 to review the contract requirements.
66. Memorandum from Maurice Beaudoin, U.S. Army Corps of Engineers to Contract Files (November 7, 1989) with the attached Attendance List. Concerning notes on the November 6, 1989 pre-construction conference.
67. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Gary D. Robinson, R.H. White Construction Company, Inc. (November 8, 1989). Concerning the confirmation that a public meeting is scheduled for November 28, 1989.
68. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to the U.S. Department of Transportation Federal Aviation Administration (January 18, 1990). Concerning transmittal of the "Notice of Proposed Construction or Alteration" for evaluation and action.

7.1 Correspondence (cont'd.)

U.S. Army Corps of Engineers (cont'd.)

69. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to William Flanagan, Nasonville Water District (March 1, 1990). Concerning transmittal of the color chart for the paint system for the elevated water storage tank to be constructed.
70. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Gary D. Robinson, R.H. White Construction Company, Inc. (March 9, 1990). Concerning a request for a price quotation to upsize the proposed pump station generator exhaust louver.
71. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Susan Frank, EPA Region I (April 16, 1990). Concerning an update on site activities and transmittal of the attached proposed "Schedule of Construction."
72. Letter from Lynne A. Fratus, EPA Region I to Maurice Beaudoin, U.S. Army Corps of Engineers (March 7, 1990). Concerning changes to be made to the waterline design.
73. Letter from Anna F. Krasko, EPA Region I to Maurice Beaudoin, U.S. Army Corps of Engineers (March 27, 1990). Concerning transmittal of the EPA logo to be posted on the construction sign for the site.
74. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Lynne A. Fratus, EPA Region I (April 23, 1990). Concerning the on-the-ground staking of the limits of the road easement.
75. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to William Flanagan, Nasonville Water District (April 26, 1990). Concerning transmittal of the color charts for the paint system for the pump station exterior door and interior surfaces.
76. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Lynne A. Fratus, EPA Region I (April 30, 1990). Concerning the following attachments:
    A. "Physical Alteration Permit Application," State of Rhode Island Department of Transportation (April 30, 1990).
    B. "Building Permit Application."
    C. Letter from James B. Duncan, The Stephen B. Church Company to Herb Johnston, U.S. Geological Survey (April 19, 1990). Concerning notification that The Stephen B. Church Company will be testing water wells on April 23 or April 24, 1990.
    D. Letter from James B. Duncan, The Stephen B. Church Company to Sue Kiernan, State of Rhode Island Department of Environmental Management (April 19, 1990). Concerning notification that The Stephen B. Church Company will be testing water wells on April 23 or April 24, 1990.
77. Letter from Lynne A. Fratus, EPA Region I to Maurice Beaudoin, U.S. Army Corps of Engineers (May 3, 1990). Concerning EPA's response to the April 23, 1990 letter recommending that the limits of the easements for the waterline be physically staked in the field and requesting an updated budget for the project.
78. Letter from Lynne A. Fratus, EPA Region I to Maurice Beaudoin, U.S. Army Corps of Engineers (May 18, 1990). Concerning transmittal of access agreements.
79. Letter from Lynne A. Fratus, EPA Region I to Maurice Beaudoin and John Barrett, U.S. Army Corps of Engineers, and Douglas F. Reed, S.E.A. Consultants Inc. (June 18, 1990). Concerning a request that the "Rules and Regulations Manual" and the "Operation and Maintenance Manual" be prepared and submitted to EPA and the State of Rhode Island Department of Environmental Management by July 31, 1990.

7.1 Correspondence (cont'd.)

U.S. Army Corps of Engineers (cont'd.)

80. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Gary D. Robinson, R.H. White Construction Company, Inc. (June 27, 1990). Concerning a request that the Operation and Maintenance Manuals for the pump station be submitted to S.E.A. Consultants Inc. as soon as possible.
81. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Ronald S. Ponte, S.E.A. Consultants Inc. (July 23, 1990). Concerning transmittal of the following attached letters:
    A. Letter from Gary D. Robinson, R.H. White Construction Company, Inc. to Maurice Beaudoin, U.S. Army Corps of Engineers (July 19, 1990). Concerning submittal of additional cost estimates to provide three phase power.
    B. Letter from Jeffrey T. Palumbo, Blackstone Valley Electric Company to Dana Johnston, Electrical Associates (June 29, 1990). Concerning utility charges associated with supplying three phase power to the Nasonville water pump station.
82. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Richard St. Sauveur, Town of Burrillville Department of Public Works (July 24, 1990). Concerning the attached diagram of a reinforced concrete collar to be constructed at all six inch diameter gate valve boxes.
83. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Douglas F. Reed, S.E.A. Consultants Inc. (August 27, 1990). Concerning transmittal of copies of plan and deed data for the Salvatore DeFelice parcel of land.
84. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Edgar R. Girard, State of Rhode Island Department of Health (September 18, 1990). Concerning transmittal of the following attachments:
    A. Letter from Ronald S. Ponte, S.E.A. Consultants Inc. to Maurice Beaudoin, U.S. Army Corps of Engineers (July 27, 1990). Concerning the conclusion that the water samples taken from the newly installed wells are not representative of the water quality to be seen when the well system is on line.
    B. "Certificate of Analysis," R.I. Analytical.
85. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Warren S. Angell II, State of Rhode Island Department of Environmental Management (September 21, 1990). Concerning transmittal of a September 18, 1990 letter from the R.H. White Construction Company, Inc. stating that the watermain was tested on June 6, 1990.
86. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Lynne A. Fratus, EPA Region I (September 28, 1990). Concerning a reply to the State of Rhode Island Department of Environmental Management's suggestion that the water supply system be redesigned and that a protective bituminous concrete pavement be constructed where watermains were installed.
87. Letter from S.L. Carlock, U.S. Army Corps of Engineers to Lynne A. Fratus, EPA Region I (September 28, 1990). Concerning the recommendation that asphalt road surfacing will not serve as any extra protection to the buried waterline.
88. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to R.H. White Construction Company, Inc. (September 28, 1990). Concerning the pre-final inspection conducted on September 26, 1990 and the attached "Deficient Work Item List As Of 27 September 1990."
89. Letter from Lynne A. Fratus, EPA Region I to Maurice Beaudoin, U.S. Army Corps of Engineers (October 10, 1990). Concerning a request that Plat 43, Lot 50A be connected to the water system.

7.1 Correspondence (cont'd.)

U.S. Army Corps of Engineers (cont'd.)

90. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Lynne A. Fratus, EPA Region I (October 18, 1990). Concerning clarification of what is expected from the U.S. Army Corps of Engineers under the existing contract.
91. Letter from Lynne A. Fratus, EPA Region I to Maurice Beaudoin, U.S. Army Corps of Engineers (October 22, 1990). Concerning transmittal of a package of information from the Nasonville Water District for review.
92. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Gary D. Robinson, R.H. White Construction Company, Inc. (October 25, 1990). Concerning notification that an operator for the water supply system has not yet been selected by the State of Rhode Island Department of Environmental Management.
93. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Gary D. Robinson, R.H. White Construction Company, Inc. (October 29, 1990). Concerning transmittal of the September 28, 1990 Letter from Dufresne-Henry, Inc. and the September 26, 1990 "Inspection Report," Robert L. Merithew, Inc.
94. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Lynne A. Fratus, EPA Region I (November 1, 1990). Concerning transmittal of the attached "Draft Scope of Services for the Operation and Maintenance of the Site's Permanent Water Supply System."
95. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Douglas F. Reed, S.E.A. Consultants Inc. (November 9, 1990). Concerning transmittal of the October 30, 1990 comments on the construction of a permanent water supply.
96. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to William Flanagan, Nasonville Water District (November 14, 1990). Concerning confirmation that painting will be conducted from November 14, 1990 to November 19, 1990.
97. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Richard St. Sauveur, Town of Burrillville (December 6, 1990). Concerning transmittal of one set of half-size prints and As-Builts swing tie information for the waterline.
98. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to R.H. White Construction Co., Inc. (December 28, 1990). Concerning transmittal of results of water sampling.
99. Letter from Lynne A. Fratus, EPA Region I to Maurice Beaudoin, U.S. Army Corps of Engineers (January 3, 1991). Concerning transmittal of a December 26, 1990 Letter from the State of Rhode Island Department of Environmental Management for review.
100. Letter from Maurice Beaudoin, U.S. Army Corps of Engineers to Lynne A. Fratus, EPA Region I (January 18, 1991). Concerning response to comments from the State of Rhode Island Department of Environmental Management and the State of Rhode Island Department of Health.

7.2 Sampling and Analysis Data

1. "Report on Low Permeability Borrow Material Investigation," Haley & Aldrich, Inc. for Olin Corporation (August 1986).
2. "Report on Supplemental Laboratory Low Permeability Soil Testing Program," Haley & Aldrich, Inc. for Olin Corporation (May 1987).

7.5 Remedial Action Documents

The records cited in entries number 1 and 2 may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

1. "Final Certification Report - Cap Closure: Volume 1 of 2," Golder Associates for Olin Corporation (April 1988).
2. "Final Certification Report - Cap Closure: Volume 2 of 2," Golder Associates for Olin Corporation (April 1988).
3. Letter from James C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (October 6, 1989). Concerning the request for written approval of site closure construction activities.
4. Letter from David L. Cummings, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management (August 20, 1990). Concerning the scheduled dates for the annual post-closure sampling event at the site and the request for formal approval of the "Post-Closure and Contingency Plan."

The map associated with the record cited in entry number 5 is oversized and may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

5. Letter from Robert D. McCaleb, Olin Corporation to Lynne A. Fratus, EPA Region I (August 29, 1990). Concerning transmittal of the attached August 11, 1989 Letter from J.C. Brown, Olin Corporation to Lynne A. Fratus, EPA Region I and Warren S. Angell II, State of Rhode Island Department of Environmental Management as well as the "Site Closure Survey Plat."
6. Letter from Richard C. Boynton, EPA Region I to David L. Cummings, Olin Corporation (September 18, 1990). Concerning transmittal of EPA Region I comments on the August 1989 "Post-Closure and Contingency Plan," Olin Corporation.
7. Letter from Lynne A. Fratus for Richard C. Boynton, EPA Region I to David L. Cummings, Olin Corporation (February 8, 1991). Concerning clarification of a comment on the post-closure and contingency plans for the site.

7.6 Work Plans and Progress Reports

1. Letter from John W. Gallagher, EPA Region I to Robert P. Hartley, EPA Office of Research and Development (October 6, 1986). Concerning proposal by Olin Corporation for the clay layer cap at the site.
2. Letter from James C. Brown, Olin Corporation to John W. Gallagher, EPA Region I and Felix Harvey, State of Rhode Island Department of Environmental Management (June 12, 1987). Concerning the attached site closure exhibits:
   A. Work Plan for Closure and Post-Closure Activities.
   B. Performance Schedule.
   C. Construction Procedure and Specifications.
   D. Groundwater Recirculation System Closeout Details Drawings.
   E. Remedial Action/Site Closure.
   F. Construction Quality Assurance Plan.
   G. Map with Site Location.
   H. Names of "Pond Washings" and Other Material Suppliers.
   I. Monitoring and Pumping Wells to be Closed.
   J. Justification for 6 inch Bentonite-Enhanced Soil.
3. "Permeability Testing for the Western Sand and Gravel Cap," Haley & Aldrich, Inc. for Olin Corporation (September 1987).
4. "Quarterly Progress Report No. 1," Olin Corporation (October 10, 1987).
5. "Quarterly Progress Report No. 2," Olin Corporation (January 10, 1988).

7.6 Work Plans and Progress Reports (cont'd.)

6. "Quarterly Progress Report No. 2, Page 2 of Appendix A," Olin Corporation (January 12, 1988).
7. "Quarterly Progress Report No. 3," Olin Corporation (April 10, 1988).
8. "Quarterly Progress Report No. 4," Olin Corporation (July 10, 1988).
9. "Quarterly Progress Report No. 5," Olin Corporation (October 10, 1988).
10. "Quarterly Progress Report No. 6," Olin Corporation (January 10, 1989).
11. "Quarterly Progress Report No. 7," Olin Corporation (April 10, 1989).
12. "Quarterly Progress Report No. 8," Olin Corporation (July 10, 1989).
13. "Quarterly Progress Report No. 9," Olin Corporation (October 10, 1989).
14. "Quarterly Progress Report No. 10," Olin Corporation (January 10, 1990).
15. "Quarterly Progress Report No. 11," Olin Corporation (April 10, 1990).
16. "Quarterly Progress Report No. 12," Olin Corporation (July 10, 1990).
17. "Quarterly Progress Report No. 13," Olin Corporation (October 10, 1990).
18. "Quarterly Progress Report No. 14," Olin Corporation (January 10, 1991).

Comments

19. Comments Dated March 31, 1986 from John W. Gallagher, EPA Region I on the draft work plans for the site closure and groundwater study.
20. Comments Dated July 8, 1987 from John W. Gallagher, EPA Region I on the July 3, 1987 letter from James C. Brown, Olin Corporation.
21. Comments Dated July 10, 1987 from Felix Harvey, State of Rhode Island Department of Environmental Management on the June 1987 "Site Closure - Exhibits A Through J," Olin Corporation.

10.0 Enforcement

10.1 Correspondence

1. Letter from John W. Gallagher, EPA Region I to Verrill M. Norwood Jr., Olin Corporation (February 20, 1986). Concerning expediting the implementation of the Remedial Action Plan for the site.
2. Letter from John W. Gallagher for Richard C. Boynton, EPA Region I to Verrill M. Norwood Jr., Olin Corporation (June 12, 1987). Concerning designation of John W. Gallagher, EPA Region I as the On-Scene Coordinator.
3. Letter from James C. Brown for Verrill M. Norwood Jr., Olin Corporation to John W. Gallagher, EPA Region I and Felix Harvey, State of Rhode Island Department of Environmental Management (June 24, 1987). Concerning designation of James C. Brown, Olin Corporation as the coordinator for administration of reports and actions called for by the Consent Decree.

10.8 EPA Consent Decrees

1. Consent Decree, *Arlene Violet vs. United States of America, Plaintiff, v. Defendants, Western Sand and Gravel, et al.*, United States District Court for the District of Rhode Island Civil Action No. 86-0608-B (March 5, 1986) with attached:
   A. Appendix I, Remedial Action Plan, Consent Decree, *Arlene Violet v. United States of America, Plaintiff, v. Defendants, Western Sand and Gravel, et al.*, United States District Court for the District of Rhode Island Civil Action No. 86-0608-B (March 5, 1986).
   B. Appendix II, Guaranty of Performance, Consent Decree, *Arlene Violet v. United States of America, Plaintiff, v. Defendants, Western Sand and Gravel, et al.*, United States District Court for the District of Rhode Island Civil Action No. 86-0608-B (March 5, 1986).
   C. Appendix III, Escrow Agreement, Consent Decree, *Arlene Violet v. United States of America, Plaintiff, v. Defendants, Western Sand and Gravel, et al.*, United States District Court for the District of Rhode Island Civil Action No. 86-0608-B (March 5, 1986).
2. Judgment, *James O'Neil, in his capacity as Attorney General of the State of Rhode Island v. Western Sand & Gravel, Inc., et al,* Civil Action No. 83-0788-B; *United States of America v. Western Sand & Gravel, Inc., et al,* Civil Action No. 86-0608-B (June 3, 1987).

Comments

3. Comments Dated January 2, 1987 from Ethel M. Halsey, Nasonville Water District on the Consent Decree filed in the United States District Court for the District of Rhode Island.

13.0 Community Relations

13.1 Correspondence

1. Letter from John W. Gallagher, EPA Region I to Ethel M. Halsey, Nasonville Water District (February 21, 1986). Concerning future public meetings.
2. Meeting Notes, Meeting for the Western Sand and Gravel Site, EPA Region I, State of Rhode Island Department of Environmental Management, and the Nasonville Water District (March 5, 1986).
3. Letter from John W. Gallagher, EPA Region I to Maria K. Flanagan, Nasonville Water District, (March 17, 1986). Concerning meeting notes from the March 5, 1986 meeting.
4. Letter from John W. Gallagher, EPA Region I to Leonard Chen, U.S. Department of Justice Land and Natural Resources Division (August 11, 1986). Concerning community relations activities for the site.
5. Letter from Lynne A. Fratus, EPA Region I to Jeff Fontaine, Prudential & Fontaine (December 4, 1989). Concerning the potential for Lot 51 to be connected to the site waterline.
6. Letter from Thomas Bercher, Town of Burrillville to Lynne A. Fratus, EPA Region I (January 2, 1990). Concerning comments on the proposed waterline design.
7. Letter from Lynne A. Fratus, EPA Region I to Thomas Bercher, Town of Burrillville (March 7, 1990). Concerning a response to the January 2, 1990 letter regarding comments on the proposed waterline design.

13.2 Community Relations Plans

1. "Community Relations Plan - Western Sand & Gravel Superfund Site, Burrillville, Rhode Island," Alliance Technologies Corporation (November 1990).

13.3 News Clippings/Press Releases

News Clippings

1. "Bill Filed to Form New Water District," Woonsocket Call - Woonsocket, Rhode Island (January 27, 1986).
2. "Federal Officials Okay Settlement for Dump's Cleanup," Evening Bulletin - Providence, Rhode Island (November 15, 1986).
3. "Water District Locks Horns With EPA," Woonsocket Call - Woonsocket, RI (December 5, 1990).
4. "The U.S. Environmental Protection Agency Invites Public Comment on the Proposed Plan for Groundwater Cleanup at the Western Sand & Gravel Superfund Site," Woonsocket Call - Woonsocket, RI (February 4, 1991).

Press Releases

5. "Environmental News - Cleanup Plans for Picillo and Western Sand & Gravel Sites Announced," EPA Region I (October 1, 1985).
6. "Environmental News - The U.S. Environmental Protection Agency (EPA) announced today that $150,000 has been allocated for the design of a public water supply for homes near the Western Sand & Gravel Superfund hazardous waste site in Burrillville, Rhode Island," EPA Region I (May 19, 1986).
7. "Environmental News - $5.8 Million Settlement Announced for Western Sand & Gravel Cleanup," EPA Region I (November 14, 1986).
8. "Environmental News - Cleanup Settlement Finalized for Western Sand & Gravel Waste Site," EPA Region I (June 4, 1987).
9. "Environmental News - Cleanup Work Begins at the Western Sand & Gravel Waste Site," EPA Region I (August 5, 1987).
10. "Environmental News," EPA Region I (November 14, 1989). Concerning the announcement of a November 28, 1989 Public Meeting to discuss construction of a waterline near the site.
11. "News Release," U.S. Army Corps of Engineers (March 19, 1990). Concerning the announcement that construction of an elevated water storage tank and a pumping station will begin in April 1990.
12. "Environmental News," EPA Region I (April 19, 1990). Concerning the announcement of the waterline construction schedule.
13. "The United States Environmental Protection Agency Invites Public Comment on the Proposed Plan for Groundwater Cleanup at the Western Sand & Gravel Site," EPA Region I (February 4, 1991).

13.4 Public Meetings

1. "Nasonville Water District," EPA Region I (October 9, 1986). Concerning project schedule and responsibilities.
2. Meeting Notes, Consent Decree Public Meeting, EPA Region I, State of Rhode Island Department of Environmental Management, and State of Rhode Island Office of the Attorney General (December 15, 1986).
3. "Summary of the Public Informational Meeting on the Proposed Plan" (February 11, 1991).
4. Cross-Reference: Transcript of the March 28, 1991 Public Hearing on the Proposed Plan is an attachment to the Responsiveness Summary which is an attachment to the April 16, 1991 "Record of Decision," EPA Region I [Filed and cited as entry number 1 in 5.4 Record of Decision (ROD)].

13.5 Fact Sheets

1. "EPA Announces the Results of Remedial Investigation and Risk Assessment for Groundwater Contamination," EPA Region I (November 1990).

14.0 Congressional Relations

14.1 Correspondence

1. Letter from John H. Chaffe, Member of the United States Senate to Julie Belaga, EPA Region I (December 11, 1990). Concerning the desire that the EPA consider paving roads near the site as a means of maintaining the remedy.
2. Letter from Julie Belaga, EPA Region I to John H. Chaffe, Member of the United States Senate (January 4, 1991). Concerning EPA's response to the December 11, 1990 letter.

16.0 Natural Resource Trustee

16.1 Correspondence

1. Letter from Gordon E. Beckett, U.S. Department of the Interior Fish and Wildlife Service to John W. Gallagher, EPA Region I (July 21, 1987) with attached April 27, 1984 Letter from Bruce Blanchard, U.S. Department of the Interior Office of the Secretary to Gene Lucero, EPA Headquarters. Concerning coordination in the development and review of draft documents relating to site activities.
2. Letter from Lynne A. Fratus, EPA Region I to Kenneth Finkelstein, U.S. Department of Commerce National Oceanic and Atmospheric Administration (February 27, 1990). Concerning transmittal of the February 1990 "Draft Groundwater Remedial Investigation Report," Olin Corporation.
3. Letter from Lynne A. Fratus, EPA Region I to William Patterson, U.S. Department of the Interior (February 27, 1990). Concerning transmittal of the February 1990 "Draft Groundwater Remedial Investigation Report," Olin Corporation.
4. Letter from Lynne A. Fratus, EPA Region I to Kenneth Finkelstein, U.S. Department of Commerce National Oceanic and Atmospheric Administration (April 2, 1990). Concerning transmittal of the February 1990 "Draft Groundwater Remedial Investigation Report - Appendix O," Olin Corporation.
5. Letter from Lynne A. Fratus, EPA Region I to William Patterson, U.S. Department of the Interior (April 2, 1990). Concerning transmittal of the February 1990 "Draft Groundwater Remedial Investigation Report - Appendix O," Olin Corporation.

16.1 Correspondence (cont'd.)

6. Letter from Lynne A. Fratus, EPA Region I to Kenneth Finkelstein, U.S. Department of Commerce National Oceanic and Atmospheric Administration (May 9, 1990). Concerning transmittal of the May 1990 "Draft Groundwater Feasibility Study Report - Volume I," Olin Corporation.
7. Letter from Lynne A. Fratus, EPA Region I to William Patterson, U.S. Department of the Interior (May 9, 1990). Concerning transmittal of the May 1990 "Draft Groundwater Feasibility Study Report - Volume I," Olin Corporation.
8. Letter from Lynne A. Fratus, EPA Region I to Kenneth Finkelstein, U.S. Department of Commerce National Oceanic and Atmospheric Administration (February 4, 1991). Concerning an update of site activities and transmittal of the addenda to the Remedial Investigation and Feasibility Study Reports.
9. Letter from Lynne A. Fratus, EPA Region I to William Patterson, U.S. Department of the Interior (February 4, 1991). Concerning an update of site activities and transmittal of the addenda to the Remedial Investigation and Feasibility Study Reports.

16.4 Trustee Notification Form and Selection Guide

1. Letter from Patricia L. Meaney for Merrill S. Hohman, EPA Region I to William Patterson, U.S. Department of the Interior (May 20, 1986) with attached Trustee Notification Form.
2. Letter from Patricia L. Meaney for Merrill S. Hohman, EPA Region I to Sharon Christopherson, U.S. Department of the Interior (May 20, 1986) with attached Trustee Notification Form.

17.0 Site Management Records

17.2 Access Records

1. Letter from William Walsh-Rogalski, EPA Region I to Michael Mosco, Hinckley, Allen, Tobin and Silverstein (Attorney for Philip A. Hunt Chemical Corporation) (November 18, 1985) with attached "Declaration of Restrictions and Protective Covenants Imposed Upon the So-Called Western Sand & Gravel Hazardous Waste Disposal Site."
2. Letter from Gregory L. Benik, Hinckley, Allen, Tobin and Silverstein (Attorney for Philip A. Hunt Chemical Corporation) to Susan B. Squires, State of Rhode Island Office of the Attorney General (May 21, 1986). Concerning the transmittal of deed restrictions.

The record cited in entry number 3 is an oversized document and may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

3. Cross Reference: Letter from State of Rhode Island Department of Environmental Management (July 24, 1989). Concerning transmittal of attached final signed easement drawings [Filed and cited as entry number 8 in 6.4 Remedial Design Documents].

17.4 Site Photographs/Maps

The photographs and maps referred to in entry numbers 1 through 5 may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

1. Six 5" x 7" Photographs of the site prior to construction of the Cap, Western Sand and Gravel Site.
2. Nine 3" x 5" Photographs of Construction of the Cap, Western Sand and Gravel Site.
3. Two 4" x 6" Photographs of Construction of the Cap, Western Sand and Gravel Site.
4. One 5" x 7" Photograph of the Completed Cap, Western Sand and Gravel Site.
5. Letter from Verrill M. Norwood Jr., Olin Corporation to John W. Gallagher, EPA Region I (January 17, 1986). Concerning two maps of the Topographic Plan of Land for the Philip A. Hunt Chemical Corporation.

17.7 Reference Documents

1. Technical Paper: "Field Evaluation of Three Methods of Soil-Gas Measurement for Delineation of Ground-Water Contamination," Henry B. Kerfoot, Lockheed Engineering and Management Services Company, Inc. (January 1988).
2. Technical Information Packet Regarding Petrex Soil Vapor Surveys, Northeast Research Institute, Inc.

17.8 State and Local Technical Records

1. "Table - Groundwater Elevations," (November 13, 1985).
2. "Table - Groundwater Elevations," (March 14, 1986).

18.0 Initial Remedial Measure (IRM) Records

18.1 Correspondence

Nasonville Water District

1. Memorandum from Ethel M. Halsey, Nasonville Water District to John W. Gallagher, EPA Region I (February 18, 1987). Concerning water sampling results.

Olin Corporation

2. Letter from Verrill M. Norwood Jr., Olin Corporation to John W. Gallagher, EPA Region I (October 15, 1985). Concerning domestic well reports.
3. Letter from Verrill M. Norwood Jr., Olin Corporation to John W. Gallagher, EPA Region I (November 14, 1985). Concerning summary of the November 7, 1985 meeting.
4. Letter from John W. Gallagher, EPA Region I to Verrill M. Norwood Jr., Olin Corporation (November 22, 1985). Concerning review of the November 7, 1985 meeting.
5. Letter from John W. Gallagher, EPA Region I to Verrill M. Norwood Jr., Olin Corporation (February 7, 1986). Concerning review of Olin's proposal to change the analysis program for the Interim Water Program.
6. Letter from Robert D. McCaleb, Olin Corporation to John W. Gallagher, EPA Region I (January 30, 1987). Concerning domestic well water sampling program.
7. Letter from John W. Gallagher, EPA Region I to Robert D. McCaleb, Olin Corporation (April 27, 1987). Concerning interim water supply response guidelines for coliform contamination.

18.1 Correspondence (cont'd.)

Olin Corporation (cont'd.)

8. Letter from Robert D. McCaleb, Olin Corporation to Lynne A. Fratus, EPA Region I (November 15, 1990). Concerning the Domestic Well Program.

State of Rhode Island Department of Environmental Management

9. Letter from John W. Gallagher, EPA Region I to Felix Harvey, State of Rhode Island Department of Environmental Management (February 11, 1986). Concerning analysis program for the interim water supply.
10. Letter from Felix Harvey, State of Rhode Island Department of Environmental Management to John W. Gallagher, EPA Region I (August 18, 1986). Concerning sampling frequency of private wells in the site area.

Section II

Guidance Documents

GUIDANCE DOCUMENTS

EPA guidance documents may be reviewed at EPA Region I, Boston, Massachusetts.

General EPA Guidance Documents

1. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, amended October 17, 1986.

2. "PCB Spill Cleanup Policy" (40 CFR Part 761), Volume 52, Number 63, April 2, 1987

3. "Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo - p - Dioxins and Dibenzofurans (CDDs and CDFs)," EPA Region I, October 1986.

4. Memorandum from J. Winston Porter to Addressees ("Regional Administrators, Regions I-X; Regional Counsel, Regions I-X; Director, Waste Management Division, Regions I, IV, V, VII,and VIII; Director, Emergency and Remedial Response Division, Region II; Director, Hazardous Waste Management Division, Regions III and VI; Director, Toxics and Waste Management Division, Region IX; Director, Hazardous Waste Division, Region X; Environmental Services Division Directors, Region I, VI, and VII"), July 9, 1987 (discussing interim guidance on compliance with applicable or relevant and appropriate requirements).
5. "National Oil and Hazardous Substances Pollution Contingency Plan," (40 CFR Part 300), November 20, 1985.

6. U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health, and Occupational Safety and Health Administration. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985.

7. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Community Relations in Superfund: A Handbook (Interim Version) (EPA/HW-6, OSWER Directive 9230.0-3A), June 1988.

8. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. A Compendium of Superfund Field Operations Methods (EPA/540/P-87/001, OSWER Directive 9355.0-14), December 1987.

9. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites (OSWER Directive 9283.1-2), December 1988.

10. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund Federal-Lead Remedial Project Management Handbook (EPA/540/G-87/001, OSWER Directive 9355.1-1), December 1986.

11. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund State-Lead Remedial Project Management Handbook, (EPA/540/G-87/002), December 1986.

12. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund Public Health Evaluation Manual (OSWER Directive 9285.4-01), October 1986.

13. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Handbook of Remedial Action at Waste Disposal Sites (EPA/625/6-85/006), October 1985.

14. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Interim Final Guidance on Conducting Remedial Investigations and Feasibility Studies under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act), October 1988.

15. U.S. Environmental Protection Agency. Office of Health and Environmental Assessment. A Compendium of Technologies Used in the Treatment of Hazardous Waste (EPA/625/8-87/014), September 1987.

16. U.S. Environmental Protection Agency. Office of Research and Development. Hazardous Waste Engineering Research Laboratory. Technology Briefs: Data Requirements for Selecting Remedial Action Technology (EPA/600/2-87/001), January 1987.

17. U.S. Environmental Protection Agency. Office of Research and Development. Hazardous Waste Engineering Research Laboratory. Treatment Technology Briefs: Alternatives to Hazardous Waste Landfills (EPA/600/8-86/017), July 1986.

18. U.S. Environmental Protection Agency. Office of Research and Development. Hazardous Waste Engineering Research Laboratory. Handbook: Remedial Action at Waste Disposal Sites (Revised) (EPA/625/6-85/006), October 1985.

19. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Data Quality Objectives for Remedial Response Activities: Development Process (EPA/540/G-87/003), March 1987.

20. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Interim Guidance on Superfund Selection of Remedy (OSWER Directive 9355.0-19), December 24, 1986.

21. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Additional Interim Guidance for Fiscal Year 1987 Record of Decisions, July 24, 1987.

22. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Draft Guidance on CERCLA Compliance with Other Laws Manual (OSWER Directive 9234.1-01), August 8, 1988.

23. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Alternate Concentration Limits Guidance (OSWER Directive 9481.00-6C, EPA/530-SW-87-017), July 1987.

24. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response and Office of Emergency and Remedial Response. Mobile Treatment Technologies for Superfund Wastes (EPA 540/2-86/003 (f)), September 1986.

25. U.S. Environmental Protection Agency. Region I Risk Assessment Work Group. Supplemental Risk Assessment Guidance for the Superfund Program (EPA 9001/5-89-001), June 1989.