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Superfund Record of Decision:

Cinnaminson Groundwater Contamination, NJ

50272-101

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16. Abstract (Limit: 200 words)

The 400-acre Cinnaminson Groundwater Contamination site is in the townships of Cinnaminson and Delran, Burlington County, New Jersey, and is comprised of a landfill, several industrial operations, and residential properties. The site overlies a deep and a shallow aquifer, and the latter is a potential source of drinking water. Furthermore, the site lies within the Delaware River floodplain. Land use in the vicinity of the site is residential, agricultural, and industrial. The onsite landfill was originally used for sand and gravel mining operations. From 1950 to 1980, municipal solid waste and other refuse were deposited in the mining pits, while mining operations continued in other site areas. In 1970, Sanitary Landfill Inc. (SLI) operated an onsite sanitary landfill in the same area, which accepted hazardous industrial waste. In 1980, the State identified improper waste disposal practices onsite, and ordered SLI to close the landfill. In 1981 as part of the closure plan, SLI capped the landfill with 18 inches of clay, installed a gas collection and venting system, and initiated ground water monitoring. Subsequent ground water studies by EPA and SLI identified onsite ground water contamination in the landfill area. Additionally, various onsite industrial operations and local area septic systems were also identified as potential sources of

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - Cinnaminson Groundwater Contamination, NJ
First Remedial Action
Contaminated Medium: gw
Key Contaminants: VOCs (benzene, PCE, TCE, toluene, xylenes), other organics (PAHs, phenols), metals (arsenic, chromium, lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 159
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Abstract (Continued)

ground water contamination. This Record of Decision (ROD) addresses remediation of onsite contaminated ground water in the shallow and deep aquifers, and prevention of further migration of contamination into municipal wells. The adequacy of the SLI landfill closure will be addressed in a subsequent ROD. The primary contaminants of concern affecting the ground water are VOCs including benzene, PCE, TCE, toluene, and xylenes; other organics including PAHs and phenols; and metals including arsenic, chromium, and lead.

The selected remedial action for this site includes pumping and treatment of ground water from the shallow and deep aquifers using chemical precipitation and biological/granular activated carbon; reinjecting the treated water onsite into the deep aquifer; ground water monitoring; and implementing engineering and institutional controls. The estimated present worth cost for this remedial action is $20,500,000, which includes an annual O&M cost of $751,000 for 30 years.

PERFORMANCE STANDARDS OR GOALS: Chemical-specific ground water cleanup goals are based on the more stringent of SDWA MCLs or State Standards including benzene 1 ug/l (State), xylenes 44 ug/l (State), and arsenic 50 ug/l (State).

ROD FACT SHEET

SITE	
Name:	Cinnaminson Ground Water Contamination Site
Location/State:	Burlington County, New Jersey
EPA Region:	USEPA Region II
HRS Score (date):	37.93; April 1984
NPL Rank:	415
ROD	
Date Signed:	09/28/90
Remedy/ies:	Groundwater extraction and treatment
Capital Cost:	$8,367,00
O & M/Year:	$751,000
Present Worth:	$20,475,000
LEAD	
Remedial/Enforcement:	Remedial
Primary Contact (phone):	Trevor Anderson, Project Manager, USEPA, (212) 264-5391
Secondary Contact (phone):	Charles Tenerella, Chief SNJRAS, USEPA, (212) 264-9382
WASTE	
Type (metals,PCB, &c):	Volatile Organic Compounds and metals
Medium (soil, g.w., &c):	Groundwater
Origin:	Landfills and underground storage tanks
Est. Area of G.W. plume:	209 acres

DECLARATION STATEMENT

RECORD OF DECISION

CINNAMINSON GROUND WATER CONTAMINATION SITE

Site Name and Location

Cinnaminson Ground Water Contamination Site
Cinnaminson Township, Burlington County, New Jersey

Statement of Basis and Purpose

This decision document presents the selected remedial action for the Cinnaminson Ground Water Contamination site, chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 and, to the extent applicable, the National Oil and Hazardous Substances Pollution Contingency Plan.

This decision document explains the factual and legal basis for selecting the remedy for this site. The information supporting this remedial action decision is contained in the administrative record for the site.

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 Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Remedy

The remedial action described in this document represents the first of two planned operable units for the site. This operable unit will address the remediation of contaminated ground water in the aquifers underlying the site. Enhancement of the existing cap on the landfill portion of the site will be the subject of a future remedial action decision.

The major components of the selected remedy for the first operable unit include the following:

- Extraction and treatment (preferably by chemical precipitation and biological/granular activated carbon) of contaminated ground water from both the shallow and deep aquifers;
- Reinjection of the treated water into the deep aquifer; and
- Installation and monitoring of additional wells to ensure the effectiveness of the remedy.

Given the size of the landfill, large volumes of low-level-risk wastes will remain on the site above health-based levels. These will continue to be addressed by engineering and institutional controls already in place.

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment which reduces toxicity, mobility, and/or volume as a principal element.

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

Constantine Sidamon-Eristoff
Regional Administrator

7/28/90
Date

DECISION SUMMARY

RECORD OF DECISION

CINNAMINSON GROUND WATER CONTAMINATION SITE

SITE NAME, LOCATION, AND DESCRIPTION

The Cinnaminson Ground Water Contamination site ("the site") covers approximately 400 acres in the Townships of Cinnaminson and Delran in Burlington County, New Jersey. The site includes properties bounded by Union Landing Road, Route 130, River Road, and Taylors Lane (**Figure 1**). The Delaware River is located approximately 5,000 feet northwest, and U.S. Route 130 passes about 2,000 feet southeast of the site. The site consists of the Sanitary Landfill Inc. (SLI), residential properties, and light to heavy industrial properties. (Figures and tables are located at the end of the document.)

A number of the industrial facilities in the study area have petroleum underground storage tanks. Unlined slurry pits and cooling ponds are located on one industrial property. There are also a number of septic systems in the study area.

The total population of Cinnaminson Township is approximately 15,600. The nearest residential property is located approximately 250 feet away from the SLI landfill. The nearest school is located three-quarters of a mile south of the site.

The topography in the Cinnaminson area is very flat, as a result of being within the boundaries of the Delaware River flood plain. The natural land surface elevation varies from about 20 feet above mean sea level (MSL) along River Road to about 80 feet above MSL at Union Landing Road.

The Delaware River is the primary surface water body in the area. Two small streams, Pompeston Creek and Swede Run, provide immediate pathways for surface water runoff from the area into the Delaware River.

The ground water resources in the Cinnaminson Study Area consist of sedimentary deposits of the Potomac-Raritan-Magothy (PRM) Formation. The study area lies within the unconfined outcrop area of the PRM. Discontinuous clay layers within the PRM Formation in part of the Cinnaminson area tend to create semi-confining conditions in the deeper portion of the aquifer, while the upper part (above the clay layers) acts as a water table aquifer. The thickness of the PRM Formation varies from 20 feet to 200 feet in the Study Area. Ground water flows in a south-southeasterly direction in this deeper aquifer.

Potable Water is provided by the New Jersey Water Company Delaware Valley District. Seventeen wells tapping the PRM Formation serve a population of 70,500. There are seven pumping stations within a two-mile radius of the site.

Land use in the immediate area consists of residential properties, farmland, small to large industrial properties, and undeveloped rural lots. Since the spring of 1985, most of the area to the east and north of the site has been significantly developed by light industry.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

SLI Landfill

The landfill portion of the site was originally owned by Lockhart Construction Company and was used for sand and gravel mining pits. The depth of mining excavations ranged between 20 feet below original ground water levels in some parts of the pits and 60 to 70 feet in other areas. During the late 1950s, municipal solid wastes were deposited in the completed mining pits while sand and gravel mining operations continued in other parts of the property. The mining operations were terminated in the late 1960s. After the mines were closed, large amounts of refuse and solid waste were deposited in the pits.

In 1970, Sanitary Landfill Inc., a subsidiary of Waste Management Incorporated, purchased the landfill property and obtained a permit from the New Jersey Department of Environmental Protection (NJDEP) to operate the site as a sanitary landfill. Municipal and institutional wastes, bulky wastes, vegetable and food processing wastes, and industrial wastes, including hazardous substances, were deposited in two areas. The landfilling operation ceased in 1980.

Industrial Operations

L & L Redi Mix, Del Val Ink & Color, and Hoeganaes Corporation are three major industrial facilities that are adjacent to the landfill.

L & L Redi Mix is a cement manufacturing facility located southeast of the SLI property. Two underground bulk storage tanks containing 3,000 gallons of diesel fuel and 2,000 gallons of gasoline, respectively, are present on L & L Redi Mix property.

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Del Val Ink & Color produces specialty printing inks. The company has stored a number of hazardous chemicals and petroleum products in underground storage tanks on its property.

Hoeganaes Corporation produces specialty iron powders. There are two unlined slurry pits and a cooling pond within the Hoeganaes property. The slurry pits are used to store a wet coke-lime mixture which is reclaimed after drying. Some empty drums with traces of solvent have been found on the property.

Enforcement Activities

During the 1970s, SLI was cited on several occasions by the NJDEP for violations of state landfill regulations for its waste disposal practices at the site. On September 27, 1980, NJDEP issued an Administrative Order to SLI to close the landfill. In 1981, Waste Management Inc., acting on the behalf of SLI, submitted a closure plan for the Sanitary Landfill to NJDEP for approval. The plan was approved by NJDEP in 1981. As part of the closure plan, the two landfill areas were capped with 18 inches of clay. The closure plan also provided for the installation of a landfill gas collection and venting system, and the initiation of a ground water monitoring program.

In June 1984, the U.S. Environmental Protection Agency (EPA) placed the Cinnaminson Ground Water Contamination site on the National Priorities List (NPL) of Superfund sites. Verification of ground water contamination was based upon the results of quarterly ground water monitoring performed by SLI, as required by the closure plan. Hydrogeological studies and annual reports on ground water quality, conducted by Geraghty & Miller Inc. (G&M 1983, 1984, and 1985) for SLI, confirmed the presence of ground water contamination in the area of the landfills.

EPA initiated a Remedial Investigation (RI) in April 1985, to determine the sources, nature and extent of contamination. The RI report was completed by an EPA consultant, Camp Dresser & McKee Inc. (CDM), in May 1989.

The report concluded that the SLI landfill was the major source of ground water contamination. Del Val Ink & Color, and L & L Redi Mix were identified as additional potential contributing sources; they both have petroleum underground storage tanks. The Hoeganaes Corporation used unlined slurry pits and cooling ponds which were also identified as potential sources of contamination. In addition, local area septic systems were also cited as a contaminant source.

A total of 28 General Notice Letters have been issued to Potentially Responsible Parties (PRPs) to date.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

On April 14, 1986, EPA held a public meeting at the Cinnaminson Township Municipal Building to discuss the initiation of the remedial investigation and feasibility study (RI/FS).

On May 15, 1990, EPA released the RI/FS Report and the Proposed Plan for the site to the public for comment. These documents were made available to the public in the Administrative Record repositories maintained at the EPA Region II office located at 26 Federal Plaza, Room 710, New York, New York 10278, and also at the following locations:

Cinnaminson Township Municipal Building
1621 Riverton Road
Cinnaminson Township, NJ 08077

Cinnaminson Public Library
1609 James Street
Cinnaminson Township, NJ 08077

East Riverton Civic Center Association
2905 James Street
Cinnaminson Township, NJ 08077

A notice of the availability of the RI/FS Report and the Proposed Plan was published in the Burlington County Times on May 24 and 29, 1990, respectively. A public comment period on the RI/FS Report and the Proposed Plan was held from May 16 to July 31, 1990. A public meeting was held on May 31, 1990 in Cinnaminson Township. At this meeting, representatives from EPA and EPA's contractor, ICF Technology, presented, discussed, and answered questions regarding the site and the remedial alternatives under consideration. A public availability session was held on June 1, 1990, and a second availability session was held on July 25, 1990, to accept additional comments from the community. All responses to the comments received during the public comment period are included in the Responsiveness Summary, which is included as part of this Record of Decision (ROD). This decision document presents the selected remedial action for the Cinnaminson Ground Water Contamination site, as amended by the Superfund Amendments and Reauthorization Act (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The decision for this site is based on the administrative record.

SCOPE AND ROLE OF THE FIRST OPERABLE UNIT

The environmental problems and hydrogeology at the Cinnaminson site are complex. As a result, EPA has decided to address the remediation of the site in two operable units.

- Operable Unit One - The first operable unit will address the remediation of the contaminated ground water.

  The contaminated ground water has migrated from the perched zones to the regional aquifer. The regional aquifer is a source of drinking water in New Jersey. There are municipal wells located about two miles south of the site, which need to be protected from contamination. The purpose of this response is to prevent the further migration of the contaminated ground water towards the municipal wells.

- Operable Unit Two - The second operable unit will address the adequacy of the current closure of the SLI landfill.

  The clay cap installed in 1985 by SLI is restricting rain water from infiltrating into the wastes, thus reducing the amount of leachate entering the ground water. However, additional information and data are needed to determine the long-term effectiveness of the existing cap. As a result, the second operable unit will not be addressed in this ROD, but will be the subject of a subsequent ROD.

  Other facilities which are not under Superfund jurisdiction have been identified in the RI Report as potential sources of ground water contamination and will be addressed under the regulatory authority of the NJDEP.

SUMMARY OF SITE CHARACTERISTICS

The RI field activities were conducted between April 1985 and May 1988, to determine the sources of ground water contamination; obtain a better understanding of the hydrogeology of the site; and identify the types, quantities, and locations of the contaminants.

The RI activities included field surveys, hydrogeologic investigations, ground water sampling, surface water/sediment sampling, and potable well sampling. Details of the RI activities are contained in the RI/FS reports.

The reports concluded that the SLI landfill was the major source of ground water contamination. Del Val Ink & Color, L & L Redi Mix were identified as additional potential contributing sources; they have petroleum underground storage tanks. The Hoeganaes

Corporation used unlined slurry pits and cooling ponds which were also identified as potential sources of contamination. In addition, local area septic systems were cited as a contaminant source.

Ground Water

The regional aquifer - the Potomac, Raritan, Magothy (PRM) Aquifer - is classified as GW-2, a source of drinking water, by the State of New Jersey.

There are 87 monitoring wells in the study area. Twelve wells were installed by EPA to investigate the ground water conditions near active surface impoundments on the property of the Hoeganaes Corporation. SLI installed 26 wells on the landfill property to monitor leachate. During the RI, EPA installed an additional 49 monitoring wells to characterize the ground water contamination throughout the study area.

The RI identified the presence of volatile organic and inorganic compounds in the two aquifers, using data gathered from the 87 monitoring wells. Contaminants that were found included vinyl chloride, 1,2-dichloroethane, trichloroethane, and benzene. These monitoring wells also showed levels of chlorides and total dissolved solids which are typically associated with leachate generated from sanitary landfills. The levels of both organic and inorganic contamination detected in the PRM aquifer (the regional aquifer) and in perched water zones (the shallow aquifer) were found to be above State and Federal Maximum Contaminant Levels (MCLs) and the New Jersey Ground water Criteria (see **Tables 1 and 2**).

The regional aquifer flows in a south-southeasterly direction. The perched water zones flow downward into the regional aquifer. The contamination appeared to be limited to an area within close proximity to the SLI landfill and was not present south of U.S. Route 130. The extent of ground water contamination is represented in **Figure 2**.

Surface Water and Sediments

Both surface water and sediment samples were taken at three retention basins within the SLI property; and at a Hoeganaes impoundment area, Hunter's Farm Pond, Swede Run and Pompeston Creek.

Surface water results indicate no organic contamination. Chromium was detected in the surface water at the Hoeganaes impoundment, a disposal area for process wastes, in concentrations ranging from 57 to 137 micrograms per Liter (ug/L).

Chemicals detected in the sediments were found in concentrations which did not exceed the NJDEP soil action levels.

Potable Wells

Twelve private wells, located upgradient of the s te, were sampled to establish background conditions related to this site. The results showed that 12 metals, nitrate, and one organic compound were detected. However, only nickel and nitrate exceeded Federal and State drinking water quality standards. The maximum concentrations of nickel and nitrate were 27 ug/L and 12 milligrams per liter (mg/L), respectively, found in one well. These concentrations are higher than the MCLs, allowed under New Jersey Statute, for nickel and nitrate in drinking water, which are 15.4 (ug/L) and 10.0 (ug/L), respectively. The resident whose well exceeded the MCLs for nickel and nitrate is now receiving drinking water from the New Jersey American Water Company (NJAWC).

However, based on the locations of these wells, relative to the site and to the direction of ground water flow, these wells are not affected by the study area ground water contaminant plume.

SUMMARY OF SITE RISKS

EPA conducted an Endangerment Assessment (EA) of the "no action" alternative to evaluate the potential risks to human health and the environment associated with the Cinnaminson site in its current state. The EA focused on the contaminants which are likely to pose the most significant risks to human health and the environment (chemicals of concern). These "chemicals of concern" and their indices of toxicity are shown in **Tables 3 and 4**.

The EA prepared for the site concluded that contaminated ground water is the exposure medium of greatest concern. Human exposure to contamination through other media, including soil and surface water, was determined not to be significant, and is not presented here.

EPA's EA identified several potential exposure pathways by which the public may be exposed to contaminant releases from the Cinnaminson site. These pathways and the populations potentially affected include:

- Potential ingestion of ground water from the perched water table and the regional aquifer by residents in the area.
- Potential exposure of workers in nearby industrial facilities to chemicals through inhalation of volatile organic compounds (VOCs) from the site.

- Potential exposure of nearby residents to chemicals through inhalation of VOCs from the site.

Under current EPA guidelines, the likelihood of carcinogenic (cancer causing) and noncarcinogenic effects due to exposure to site chemicals are considered separately. It was assumed that the toxic effects of the site related chemicals would be additive. Thus, carcinogenic and noncarcinogenic risks associated with exposures to individual indicator compounds were summed to indicate the potential risks associated with mixtures of potential carcinogens and noncarcinogens, respectively.

Noncarcinogenic risks were assessed using a hazard index (HI) approach, based on a comparison of expected contaminant intakes and safe levels of intake (Reference Doses). Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects. RfDs, which are expressed in units of mg/kg-day, are estimates of daily exposure levels for humans which are thought to be safe over a lifetime (including sensitive individuals). Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) are compared with the RfD to derive the hazard quotient for the contaminant in the particular media. The hazard index is obtained by adding the hazard quotients for all compounds across all media. A hazard index greater than 1 indicates that potential exists for noncarcinogenic health effects to occur as a result of site-related exposures. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

Potential carcinogenic risks were evaluated using the cancer potency factors (CPFs) developed by the EPA for the indicator compounds. CPFs have been developed by EPA's Carcinogenic Risk Assessment Verification Endeavor for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to generate an upper-bound estimate of the excess lifetime cancer risk associated with exposure to the compound at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes the underestimation of the risk highly unlikely.

For known or suspected carcinogens, the EPA considers excess upper bound individual lifetime cancer risks of between 1×10^{-4} to 1×10^{-6} to be acceptable. This level indicates that an individual has not greater than a one in ten thousand to one in a million chance of developing cancer as a result of exposure to site conditions.

Human Health Risks

Potential Ingestion of Ground Water from the Perched Water Table and the Regional Aquifer

The risk from ingestion of ground water from the perched water zones and the regional aquifer by local residents was quantitatively evaluated. It is unlikely that such exposures would occur directly from the perched water zones, since the perched water zones are not presently used as a drinking water source. However, water from the perched water zones flows downward into the regional aquifer, which is used as a drinking water source. Therefore, local municipal drinking water wells are potentially at risk from the migration of contamination in the perched water table.

The potential excess lifetime cancer risks associated with ingestion of ground water from the perched water zones and the regional aquifer are 1×10^{3} and 6×10^{-3} (one in one thousand and six in one thousand) respectively, for the plausible maximum cases. Vinyl chloride accounted for most of the estimated carcinogenic risk for ingestion of ground water from the perched water zones. Arsenic and vinyl chloride accounted for most of the estimated carcinogenic risks for ingestion of ground water from the regional aquifer. The Hazard Indices associated with ingestion of ground water from the perched water zones and the regional aquifer are 2 and 20 respectively, for the plausible maximum cases. **Table 5 and Table 6** present the carcinogenic risks and Hazard Indices associated with the ingestion of ground water from the perched water zones and the regional aquifer, respectively.

While the perched water zones are not used for drinking water purposes, the real risks associated with the perched zones are a result of contamination flowing from the perched zones to the regional aquifer, which is used as a drinking water source.

Inhalation of VOCs by Nearby Workers

The risks related to exposure of workers in nearby facilities to chemical releases from the SLI Landfills were quantitatively evaluated. For this exposure pathway, the excess lifetime cancer risk is well below 10^{-6}, and the HI is well below one, indicating carcinogenic and noncarcinogenic health effects are not likely to occur. **Table 7** presents the risks associated with the inhalation of VOCs by nearby workers.

Inhalation of VOCs by Nearby Residents

The risks related to exposure of nearby residents to chemical releases from the site were evaluated. The results of this assessment revealed that no adverse health effects are likely to occur as a result of exposure to airborne contaminants. For this exposure pathway, the excess lifetime cancer risk is well below $10^{[illegible]}$, and the HI is well below one, indicating carcinogenic and noncarcinogenic health effects are not likely to occur. **Table 8** presents the risks associated with the inhalation of VOCs by residents.

Environmental Risks

Potential impacts associated with the contaminants of potential concern were also assessed for nonhuman exposures at the Cinnaminson site. There are no endangered species or critical habitats located in the study area. It was determined that environmental risks were not significant at the Cinnaminson site.

Uncertainties in the EA

As in any risk assessment, the estimates of risk for the Cinnaminson site have many uncertainties. In general, the primary sources of uncertainty identified included the following:

- Environmental chemistry sampling and analysis
- Environmental parameter measurement
- Fate and transport modelling
- Exposure parameter estimation
- Toxicological data

As a result of the uncertainties, the risk assessment should not be construed as presenting an absolute estimate of risks to human or environmental populations. Rather, it is a conservative analysis intended to indicate the potential for adverse impacts to occur.

Conclusion

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

DESCRIPTION OF ALTERNATIVES

Appropriate remedial technologies identified during the screening process were assembled into combinations to address the remedial action objectives for the site, namely:

- To satisfy applicable or relevant and appropriate local, State, and Federal requirements (ARARs);

- to reduce continued degradation of the ground water; and

- to prevent contaminants from migrating toward existing municipal drinking water wells.

The FS identified two types of actions that would address the ground water problems: Source Control (SC) Alternatives aimed at stopping the further leaching of contaminants into the ground water from the landfills; and Ground Water Management of Migration (MM) Alternatives which would address the contamination already in the ground water.

In preparing the FS, several remedial technologies that could meet ground water cleanup objectives were identified and reviewed for effectiveness, implementability, and cost. Those alternatives which passed the initial screening are highlighted in this section. Descriptions of all of the remedial alternatives evaluated for the Cinnaminson Ground Water Contamination site are provided in the FS Report. The alternatives evaluated included the following:

<u>Source Control Alternatives</u>

Alternative SC-1: No Further Action
Alternative SC-2: Monitoring and Administrative Controls
Alternative SC-3: RCRA Capping

As mentioned previously, the landfill was capped with 18 inches of clay in 1985. Currently, the cap is effectively acting as a barrier to the infiltration of rain water into the landfill, which reduces the further migration of the contaminated ground water plume. Maintenance of the existing cap and the implementation of a Ground Water Management of Migration alternative will provide additional information on the long-term effectiveness of the cap. At that time, any added benefits of installing a full RCRA (Resource Conservation and Recovery Act) cap can be evaluated. Therefore, Alternatives SC-1, SC-2, and SC-3 will not be discussed in this document, but will be considered in a separate operable unit Record of Decision after the selected management of migration (ground water control) system is in place and operating.

<u>Ground Water (Management of Migration) Alternatives</u>

Alternative MM-1: No Further Action

Alternative MM-2: Monitoring and Administrative Controls

Alternative MM-3: Treatment of Ground Water from the Shallow Aquifer (Perched Zone)

Alternative MM-4: Treatment of Ground Water from the Deep Aquifer (Regional Aquifer)

Alternative MM-5: Treatment of Ground Water from Both the Shallow and Deep Aquifers

Alternatives MM-3, MM-4, and MM-5 each include three separate ground water treatment options. These are:

Option A: Chemical precipitation with air stripping

Option B: Chemical precipitation with ultra-violet oxidation

Option C: Chemical precipitation with biological granular activated carbon

(MM-1): No Further Action

Estimated Capital Cost:	$0
Estimated Operation and Maintenance (O&M) Cost:	$15,000
Estimated Present Worth:	$41,600
Implementation Period:	None

The National Oil and Hazardous Substance Pollution Contingency Plan (NCP) and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) require the evaluation of a No Action alternative as a basis for comparison with other remedial alternatives. This No Further Action alternative includes only those actions required by the existing SLI Landfill closure plan, which includes: ground water monitoring within the plume boundaries, maintenance of site fencing and the landfill cap, and controlling access to the site. Because this alternative does not entail contaminant removal, CERCLA requires that a review of site conditions be conducted every five years, which is the estimated O&M costs.

(MM-2): Monitoring and Administrative Controls

Estimated Capital Cost:	$369,000
Estimated Annual O&M Cost:	$84,000
Estimated Present Worth:	$1,702,000
Implementation Period:	6 Months

The Monitoring and Administrative Controls alternative does not include active treatment technologies, but presents passive measures to reduce the probability of human contact with the contaminated media. Monitoring controls consist of implementing a long-term monitoring program beyond the plume boundaries and continuing those actions which are required by the existing SLI landfill closure plan, including: monitoring the ground water within the site boundaries, maintaining site facilities (fences, cap, etc.), and controlling access to the site. Administrative controls involve the State or local governments placing general warnings on new well installation permits to warn of the potential health risks associated with using the ground water for potable purposes.

Because the Monitoring and Administrative Control alternative results in the contamination remaining on site, CERCLA requires that a review of site conditions be conducted every five years.

(MM-3): Treatment of Ground Water From the Shallow Aquifer or Perched Zones

Alternative MM-3 includes the components of Alternative MM-2 along with a ground water extraction and treatment system for the shallow aquifer. The conceptual model suggests that 130 extraction wells would be required in the shallow aquifer (perched zones) to capture the contaminated water. The actual number and location of these extraction wells will be determined during the design of the project. Each extraction well would extract contaminated water at a rate of approximately 1.7 gallons per minute (gpm). The extraction wells would be installed to an average depth of 35 feet. Following on-site treatment, the effluent would be discharged into the regional aquifer by two injection wells, which would be located downgradient of the contaminated plume. Locating the injection wells downgradient of the plume is expected to create a hydraulic barrier between clean and contaminated ground water. The hydraulic barrier would reduce further migration of the contaminated plume toward the municipal wells. The injection wells would be installed to an average depth of 180 feet. Each injection well would inject the treated water at an approximate rate of 140 gpm. It is estimated that the remediation would have to be carried out for approximately five years. The approximate location of the extraction wells and the treatment plant are shown in Figure 3. Since the regional aquifer is a potential source of drinking water in the area, it is classified by EPA as Class II B, and by NJDEP as GW-2. Therefore, the shallow aquifer, which percolates into the regional aquifer, would be treated to meet drinking water standards. The treatment of the extracted ground water can be accomplished by different treatment technologies. Three treatment options for Alternative MM-3 are presented:

Option A: Chemical precipitation/air stripping treatment

Estimated Total Capital Cost:	$4,739,000
Estimated Annual O&M Cost:	$506,000
Estimated Present Worth:	$6,941,000
Implementation Period:	5 years

In Option A, following ground water extraction, the water would be pumped to a centrally located treatment plant. Treatment would consist of chemical precipitation to remove inorganic contaminants, followed by air stripping to remove the volatile organic compounds. Bench-scale treatability studies during remedial design would determine unit sizes and demonstrate performance.

Option B: Chemical precipitation/UV oxidation treatment

Estimated Total Capital Cost:	$5,192,000
Estimated Annual O&M Cost:	$617,000
Estimated Present Worth:	$15,083,000
Implementation Period:	5 years

In Option B, following extraction, the contaminated water would be treated on site in an ultraviolet (UV) oxidation unit to destroy the organic contaminants. In this treatment system, after chemical precipitation, ground water would be mixed with an oxidant (such as ozone or hydrogen peroxide) and then exposed to UV light. The organic components oxidize to the point where the by-products of the reaction are carbon dioxide, water, and non-hazardous salts. The non-hazardous salts would be transported to a licensed facility for disposal. All other components of this alternative are identical to those described for Option A. Bench-scale treatability studies during the remedial design would determine unit sizes and demonstrate performance.

Option C: Chemical precipitation/biological granular activated carbon treatment

Estimated Total Capital Cost:	$8,093,000
Estimated Annual O&M Cost:	$649,000
Estimated Present Worth:	$18,633,000
Implementation Period:	5 years

Option C uses biological granular activated carbon treatment to extract the organics. In this treatment method, contaminated ground water would be pumped to an aeration basin after chemical precipitation. In the aerated basin, the contaminated water would be mixed with granular activated carbon and biological solids. Following oxidation of the organic contaminants, the mixture would be settled in a clarifier, with the overflow becoming the treated effluent. Excess biological solids and spent carbon would be collected and handled as a regulated material. The excess biological solids/spent carbon mixture would be dewatered and transported to a recovery facility for regeneration. The water collected during the dewatering process would be processed in the treatment plant. Bench-scale treatability studies during design would determine unit sizes and demonstrate performance.

(MM-4): Treatment of Ground Water from the Deep Aquifer

Alternative MM-4 includes the components of Alternative MM-2 along with a ground water extraction and treatment system for the deep aquifer. An estimated seven extraction wells would be installed in the contaminated plume to remove the contaminated ground water. Each well would extract the contaminated water at an estimated rate of 80 gpm. The extraction wells would be installed to an average depth of 240 feet. The extracted ground water would be treated by one of the three options presented in MM-3. Four injection wells would be used to reinject the treated water into the regional aquifer. The injection wells would be located downgradient of the contaminated plume and installed to an average depth of 180 feet. Each injection well would reinject the treated water at a rate of about 140 gpm. The approximate location of the extraction wells and the treatment plant are shown in Figure 4. It is estimated that the remediation would have to be carried out for approximately 30 years. Since the regional aquifer is a potential source of drinking water in the area, it is classified by EPA as Class II B, and by NJDEP as GW-2. Therefore, the regional aquifer would be treated to meet drinking water standards.

<u>MM-4 with Option A</u>

Estimated Total Capital Cost:	$5,192,000
Estimated Annual O&M Cost:	$617,000
Estimated Present Worth:	$15,083,000
Implementation Period:	30 years

<u>MM-4 with Option B</u>

Estimated Total Capital Cost:	$6,069,000
Estimated Annual O&M Cost:	$1,002,000
Estimated Present Worth:	$21,879,000
Implementation Period:	30 years

<u>MM-4 with Option C</u>

Estimated Total Capital Cost:	$5,628,000
Estimated Annual O&M Cost:	$700,000
Estimated Present Worth:	$16,796,000
Implementation Period:	30 years

The treatment components of Alternative MM-4 are identical to those for Alternative MM-3 and its subset of Options A, B, and C.

(MM-5): Treatment of Ground Water from both the Shallow and Deep Aquifers

Alternative MM-5 includes the components of Alternative MM-2 along with a ground water extraction and treatment system. This alternative combines the extraction systems from both MM-3 and MM-4 to withdraw contaminated water from both the shallow and deep aquifers. This would include the installation of an estimated 130 extraction wells in the perched zones and the installation of seven extraction wells in the regional aquifer. The total rate of extraction from both aquifers would be 781 gallons per minute (gpm). The perched and regional aquifer extraction wells would be installed to depths of 35 and 240 feet, respectively. The contaminated ground water would be treated by one of the three options presented in MM-3. After treatment, six injection wells would be used to reinject the treated water into the regional aquifer downgradient of the contaminated plume. The injection wells would be installed to an approximate depth of 180 feet. Each injection well would be designed to reinject the treated water into the regional aquifer at an estimated rate of 140 gpm.

The location of the extraction wells and the treatment plant are shown in Figure 5. It is estimated that the remediation would have to be carried out for approximately 30 years. Since the regional aquifer is a potential source of drinking water in the area, it is classified by EPA as Class II B, and by NJDEP as GW-2. Therefore, the two aquifers would be treated to meet drinking water standards.

MM-5 with Option A

Estimated Total Capital Cost:	$8,093,000
Estimated Annual O&M Cost:	$694,000
Estimated Present Worth:	$18,633,000
Implementation Period:	30 years

MM-5 with Option B

Estimated Total Capital Cost:	$9,122,000
Estimated Annual O&M Cost:	$1,114,000
Estimated Present Worth:	$26,810,000
Implementation Period:	30 years

MM-5 with Option C

Estimated Total Capital Cost:	$8,367,000
Estimated Annual O&M Cost:	$751,000
Estimated Present Worth:	$20,475,000
Implementation Period:	30 years

The treatment components of Alternative MM-5 are identical to those for Alternative MM-3, and its subset of Options A, B, and C.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

In accordance with the NCP, a detailed analysis of each remedial alternative is conducted with respect to each of the nine evaluation criteria. All selected remedies must at least attain the Threshold Criteria. The selected remedy should provide the best trade-offs among the Primary Balancing Criteria. The Modifying Criteria were evaluated following the public comment period.

Threshold Criteria

- **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- **Compliance with ARARs** addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements (ARARs) of Federal and State environmental statutes and/or provides a basis for a waiver.

Primary Balancing Criteria

- **Long-term effectiveness** refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

- **Reduction of toxicity, mobility or volume** addresses the performance of the remedy in terms of reducing the toxicity, mobility, or volume of the contaminants of concern in the environment.

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

- **Implementability** refers to the technical and administrative feasibility of implementing a remedy, including the availability of materials and services required to implement a particular option.

- **Cost** includes estimated capital, and operation and maintenance costs of the remedy, and the net present worth costs of the alternatives.

Modifying Criteria

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

- **Community Acceptance** evaluates the reaction of the public to the remedial alternatives and the Proposed Plan. Comments received during the public comment period, and EPA's responses to those comments, are summarized in the Responsiveness Summary attached to this document.

ANALYSIS

This section discusses and compares the performance of the remedial alternatives under consideration against the nine criteria.

Overall Protection

All of the action alternatives provide some degree of protection. Alternative MM-2 prevents exposure to ground water contaminants by implementing administrative controls. Alternatives MM-3, MM-4, and MM-5 would provide a greater degree of protection by extracting and treating contaminated ground water and reinjecting it, with the goal of cleaning the aquifer to drinking water standards. Alternative MM-3 provides ground water treatment of the shallow aquifer only; contaminants in the regional aquifer would be reduced by natural attenuation and biodegradation. Alternative MM-4 provides ground water treatment of the regional aquifer, which is a source of drinking water in the area. Under Alternative MM-4, contaminants in the shallow aquifer, which eventually percolate into the regional aquifer, would be captured and treated by the extraction and treatment system for the regional aquifer. This alternative is therefore more protective than Alternative MM-3. Alternative MM-5 provides direct treatment of both aquifers. Treating both aquifers would provide the greatest overall protection of public health and the environment.

Compliance with ARARs

Chemical-specific ARARs

The cleanup objectives for the ground water and the reinjected treated water are provided in **Table 9**. These levels represent the concentrations which must be attained in both the treated water before reinjection and in the ground water at the end of the remedial action. They are based on State and Federal standards for drinking and ground water. Alternatives MM-1 and

MM-2 do not address the remediation of contaminated ground water, and therefore do not comply with contaminant-specific ARARs. Alternative MM-3, which treats ground water in the shallow aquifer, would not meet ARARs for the contaminated water in the regional aquifer. Alternative MM-4 would meet ARARs for only the regional aquifer. Since Alternatives MM-1 and MM-2 would not meet the ARARs for ground water, they will not be considered further in this analysis as options.

Alternative MM-5 would meet ARARs for both the shallow and regional aquifers.

All of the treatment technology options (A, B, or C) treat the ground water to attain ARARs, with the possible exception of some semi-volatiles under Option A.

Location-specific ARARs

Alternatives MM-3, MM-4, and MM-5 would comply with State and Federal regulations governing the construction of facilities in a floodplain.

Activity-specific ARARs

Alternatives MM-3, MM-4, and MM-5 would comply with State and Federal regulations governing the construction and operation of the extraction, treatment and reinjection systems, and the off-site disposal of hazardous sludges produced by any of the treatment system options.

A list of ARARs for the clean-up is presented in **Table 10**.

Long-term Effectiveness and Permanence

Alternatives MM-1 and MM-2 do not include active treatment of ground water and therefore would not be effective or permanent. Furthermore, these alternatives do not prevent the contaminant plume from migrating toward municipal drinking water wells in the area.

Alternatives MM-3, MM-4, and MM-5 include the extraction, treatment, and reinjection of the contaminated ground water, and would be both effective and permanent, over time. Furthermore, these alternatives are designed to prevent the contaminant plume from migrating towards municipal drinking water wells in the area.

Reduction of Toxicity, Mobility, or Volume of Contaminants

Alternatives MM-3, MM-4, and MM-5 treat extracted ground water and reinject it in specific locations to reduce the toxicity, mobility, and volume of contaminants. Alternatives MM-3 and MM-4 would reduce the toxicity, mobility, and volume of contaminated ground water in the shallow and regional aquifers, respectively. Alternative MM-5 involves extraction and treatment of ground water from both aquifers. This would reduce the toxicity, mobility and volume of contaminants in both aquifers.

Short-term Effectiveness

Alternative MM-2 does not include active treatment of ground water, and therefore, would not be as effective. Unlike the treatment based alternatives, this alternative does not prevent the contaminant plume from migrating toward municipal drinking water wells in the area. Alternative MM-3 would be effective in decreasing the contaminants in the shallow aquifer only; the regional aquifer would remain contaminated. Alternative MM-4 would be effective in decreasing the contaminants in the regional drinking water aquifer. However, since the shallow aquifer would not be directly addressed, recontamination of the regional aquifer, due to the downward percolation of contaminated ground water from the shallow aquifer, is likely to occur for a long period of time. Alternative MM-5 would be most effective in directly addressing contamination throughout both aquifers during the remediation, by extracting and treating the ground water from both the shallow and regional aquifers.

Treatment of the ground water (under option A, B, or C) would produce a hazardous sludge which must be disposed of properly for the duration of remediation.

Short-term risks to workers may occur during the installation of the extraction and the reinjection wells in Alternatives MM-3, MM-4 and MM-5. The pumping and piping system would be installed below ground and would involve excavation. Risks to workers and the nearby community from airborne contaminants would be minimized during the implementation of each of these alternatives through the use of appropriate engineering controls, and comprehensive health and safety planning. New Jersey American Water Company (NJAWC) drinking water wells are located within a two-mile radius of the site. The initial start-up of the pumping system could influence the amount of ground water being extracted from these wells. The NJAWC would be consulted during the remedial design and remedial action, to minimize any effects that the pumping and reinjection system would have on these wells. It is expected that Alternative MM-3 could be started within 12 months. Alternative MM-4 could be started within 18 months; and Alternative MM-5 in 24 months.

Implementability

Alternatives MM-3, MM-4, and MM-5 utilize extraction wells and pumping systems that are proven and widely used technologies. The hydrogeological characteristics of the regional aquifer allow for easy, continuous removal of contaminated water. Alternatives MM-3 and MM-5, which involve extraction of ground water from the shallow aquifer (perched zones), may be more difficult to implement. The hydrogeological characteristics of the perched zones do not allow a large volume of water to be extracted from a single well. The conceptual model for the extraction system for the shallow zone consists of an estimated 130 wells. Due to the large number of wells, and the amount of connecting piping required to be installed in commercial and residential areas, problems with implementation could occur. Therefore, cleanup of the shallow ground water may be limited to extracting and treating the highly contaminated areas or "hot spots".

Three treatment technology options are presented for consideration. Option A involves chemical precipitation and air stripping, a proven technology for the treatment of volatile organics, and would be fairly easy to implement. However, this treatment combination may have some difficulty in removing all the semi-volatile organics from the ground water down to standards. Option B, chemical precipitation and UV oxidation, may be somewhat difficult to implement successfully, since UV oxidation technology is a relatively new technology whose effectiveness with the contaminants at this site is questionable. Option C appears to be the most viable choice; both semi-volatile and volatile organics should be more easily removed from the ground water to levels which meet MCL ground water standards by using a combination of biological media and activated carbon.

Cost

The selected remedy, Alternative 5C, is cost-effective because it provides the highest overall effectiveness proportional to its cost. The cost of Alternative 5A is somewhat less expensive than Alternative 5C. Alternative 5B is the most expensive.

Costs for the remedial alternatives are summarized in **Table 11**.

State Acceptance

The State of New Jersey, while concurring with the selected remedy has raised concerns with the selection of ARARs for discharge of treated ground water and the ultimate clean up goals for the remedy. These concerns are largely related to application of GW-2 "to-be-considered" (TBC) discharge requirements developed by the NJDEP for the point of discharge. EPA, has in this document, utilized promulgated ARARs in selecting the remedy. The appropriateness of NJDEP's "TBC" requirements and the impact on treatment requirements will be resolved during the remedial design.

Community Acceptance

Community acceptance of the preferred alternative was evaluated after the public comment period. The general public had no opposition to the preferred alternative nor did they prefer any other alternative. However, non-supportive comments were received from potentially responsible parties. Comments raised at the public meeting and during the public comment period are summarized in the attached Responsiveness Summary.

SELECTED REMEDY

EPA and NJDEP have determined that the remedial goal for this remedy is to return the regional aquifer to its beneficial use as an actual or potential source of potable water, in accordance with the expectations of the NCP. After a thorough review and evaluation of the alternatives in the Feasibility Study, EPA, in conjunction with the State of New Jersey, presented Alternative MM-5 in the Proposed Plan as the Preferred Alternative. This alternative was selected as the Preferred Alternative because it would substantially reduce contaminant levels in the affected portions of both aquifers, through pumping and treatment, and ultimately would allow the deeper aquifer to be fully utilized as a source of drinking water. Therefore, Alternative MM-5 provided the best balance among alternatives in the Proposed Plan with respect to the evaluation criteria.

The input received during the public comment period, including questions raised at the public meeting held on May 31, 1990, and comment letters received by EPA, are presented in the Responsiveness Summary. The comments received encompassed a wide range of issues, but did not necessitate any changes in the remedial approach proposed to be taken at the site.

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives, and public comments, EPA has selected the Preferred Alternative, Alternative MM-5, Treatment of Ground Water from Both the Shallow and Deep Aquifers (preferably by chemical precipitation and biological/granular activated carbon), as the remedy for the site.

It may become apparent, during implementation or operation of the ground water extraction system, that contaminant levels have ceased to decline and are remaining constant at levels higher than the remediation goal. In such a case, the system performance standards and/or the remedy may be reevaluated.

The selected remedy will include ground water extraction for an estimated period of 30 years, during which the system's performance will be monitored on a regular basis and adjusted according to performance data collected during operation. The operating system may include:

a) discontinuing operation of extraction wells in areas where cleanup goals have been attained;

b) alternating pumping at wells to eliminate stagnation points;

c) pulse pumping to allow aquifer equilibration and encourage adsorbed contaminants to partition into ground water; and

d) the installation of additional wells to optimize system performance.

Due to the large number of wells and the amount of connecting piping required to be installed in commercial and residential areas, problems with implementation could occur. Therefore, cleanup of the shallow ground water may be limited to extracting and treating contaminated ground water from the more highly contaminated perched zone "hot spots".

The treated ground water would be reinjected into the regional aquifer and would comply with ARARs identified in **Table 9**. Reinjection of the treated water into the regional aquifer downgradient of the contaminated plume is expected to create a hydraulic barrier, to prevent further migration of the plume.

Ground water monitoring will be implemented to observe the hydrologic effects associated with the ground water extraction and reinjection systems. It will also be used to appraise the effectiveness of the treatment system and to monitor the movement of the contaminated ground water plume. Furthermore, the ground water monitoring program will be used in the evaluation of the adequacy of the existing cap at the SLI landfill, which may be the subject of a subsequent Record of Decision.

The points of compliance for ground water remediation are throughout the plume.

The ground water monitoring program will comply with State requirements and with RCRA regulations specified in 40 CFR 264.97, dealing with the installation of monitoring wells.

Alternative MM-5 would result in the reduction of the Hazard Index to below 1, and carcinogenic risks to below 10^{-6}, by reducing volatile organic chemicals, semi-volatile chemicals, and metals in the ground water to levels which meet State and Federal ground water standards.

Treatment system Option C includes chemical precipitation and biological granular activated carbon. Option C would reduce the toxicity and volume of both semi-volatile and volatile organics found in the ground water, and would be designed to control air emissions of volatile organic compounds. A modified or alternative treatment system may be selected during the Remedial Design, based on changes in technical specifications, costs, or treatability studies. The final chosen technology would, of course, be required to meet ARARs.

The selected remedy poses no unacceptable short-term risks. Notwithstanding, a comprehensive health and safety plan would be prepared to ensure proper protection of the public, and workers on site, during the remedial action.

The total estimated cost (at present worth) of Alternative MM-5 over 30 years, using Option C as the selected treatment technology, is $20.5 million.

The total estimated capital cost for Alternative MM-5, using Option C as the selected treatment technology, is $8.4 million. This cost includes the design and construction of the ground water treatment system, monitoring wells, reinjection wells, associated piping, and miscellaneous facilities. The estimated annual O&M cost is $751,000.

Current engineering controls, including those actions required in the closure plan for the SLI landfill, and institutional controls, such as warnings on new well installations in the area, are included as part of the remedy.

STATUTORY DETERMINATIONS

EPA's selected remedy for the ground water remediation complies with the requirements of Section 121 of CERCLA as amended by the Superfund Amendments and Reauthorization Act. The action is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to this action, and is cost-effective. This action utilizes permanent solutions and alternative treatment technologies to the maximum extent possible. The statutory preference for treatment that reduces toxicity, mobility or volume will be addressed by this action. The selected remedy provides the best balance of tradeoffs among the criteria, especially among the five balancing criteria. A brief, site-specific description of how the selected remedy complies with the statutory requirements is presented below.

1. Protection of Human Health and the Environment

The selected remedy is protective of human health and the environment, dealing effectively with the threats posed by the contaminants which were identified.

The principle threat is the potential risk to local municipal drinking water wells from the migration of contaminants in the aquifers. By pumping and treating the contaminated ground water from both aquifers, the selected remedy will reduce the health and environmental risks associated with ground water in the area down to levels that are acceptable for drinking water. In addition, by treating a large volume of water from the regional aquifer, the selected remedy will control further migration of the plume, and thereby reduce the potential risk of contaminating municipal drinking water wells.

The selected remedy poses no unacceptable short-term risks.

2. Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will comply with the following ARARs.

Chemical-specific ARARs

The cleanup objectives for the ground water and the reinjected treated water are provided in **Table 9**. These levels represent the concentrations which would be attained in both the treated water before reinjection and in the ground water at the end of the remedial action. They are based on State and Federal MCLs for drinking water and New Jersey Ground Water Quality Criteria.

Activity-specific ARARs

New Jersey air pollution control regulations are applicable to the construction and operation of the selected remedy.

The operation of the treatment system will comply with RCRA requirements. Hazardous sludges produced by the treatment system will be disposed of off site in accordance with RCRA requirements and State Sludge Quality Criteria; the exact requirements will be determined during the design of the treatment system.

The remedial action would be designed to meet New Jersey requirements for ground water monitoring activities.

Location-specific ARARs

State and Federal regulations governing the construction of facilities in a floodplain are applicable.

To Be Considered (TBCs)

The shipment of hazardous wastes off site to a treatment and disposal facility should be consistent with the Off-site Policy Directive Number 9834.11 issued by the EPA Office of Solid Waste and Emergency Response. This directive is intended to ensure that facilities authorized to accept CERCLA generated waste are in compliance with RCRA operating standards.

A comprehensive health and safety plan would be prepared to ensure that the public and on-site workers are properly protected during the remedial action.

Federal and State ARARs for the clean-up are presented in **Table 10**.

The State of New Jersey, while concurring with the selected remedy has raised concerns with the selection of ARARs for discharge of treated ground water and the ultimate clean up goals for the remedy. These concerns are largely related to application of GW-2 "to-be-considered" (TBC) discharge requirements developed by the NJDEP for the point of discharge. EPA, has in this document, utilized promulgated ARARs in selecting the remedy. The appropriateness of NJDEP's "TBC" requirements and the impact on treatment requirements will be resolved during the remedial design.

3. Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. Contaminated ground water will be extracted from the shallow and deep aquifers, and treated before reinjection. This will significantly reduce the toxicity, mobility, and volume of the contaminants found in the ground water and restore the regional aquifer as a source of drinking water. Hazardous wastes generated by the treatment process will be treated and disposed of at approved facilities off site.

4. Preference for Treatment as a Principal Element

The selected remedy utilizes treatment to the maximum extent practicable. Contaminated ground water will be extracted from the shallow and deep aquifers, treated to meet standards, and then reinjected into the regional aquifer. Hazardous wastes generated by the treatment process will be treated and disposed of at approved off-site facilities.

5. Cost-Effectiveness

Of the alternatives which most effectively address the threats posed by the contaminant plume, the selected remedy affords the highest level of overall effectiveness proportional to its cost. Based on the information generated during the Feasibility Study, the estimated total project cost is $20,475,000.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Cinnaminson Ground Water Contamination site was released to the public in May 1990. The Proposed Plan identified the preferred alternatives for each source area. EPA reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the selected remedy, as it was originally identified in the Proposed Plan, were necessary.

EXHIBITS

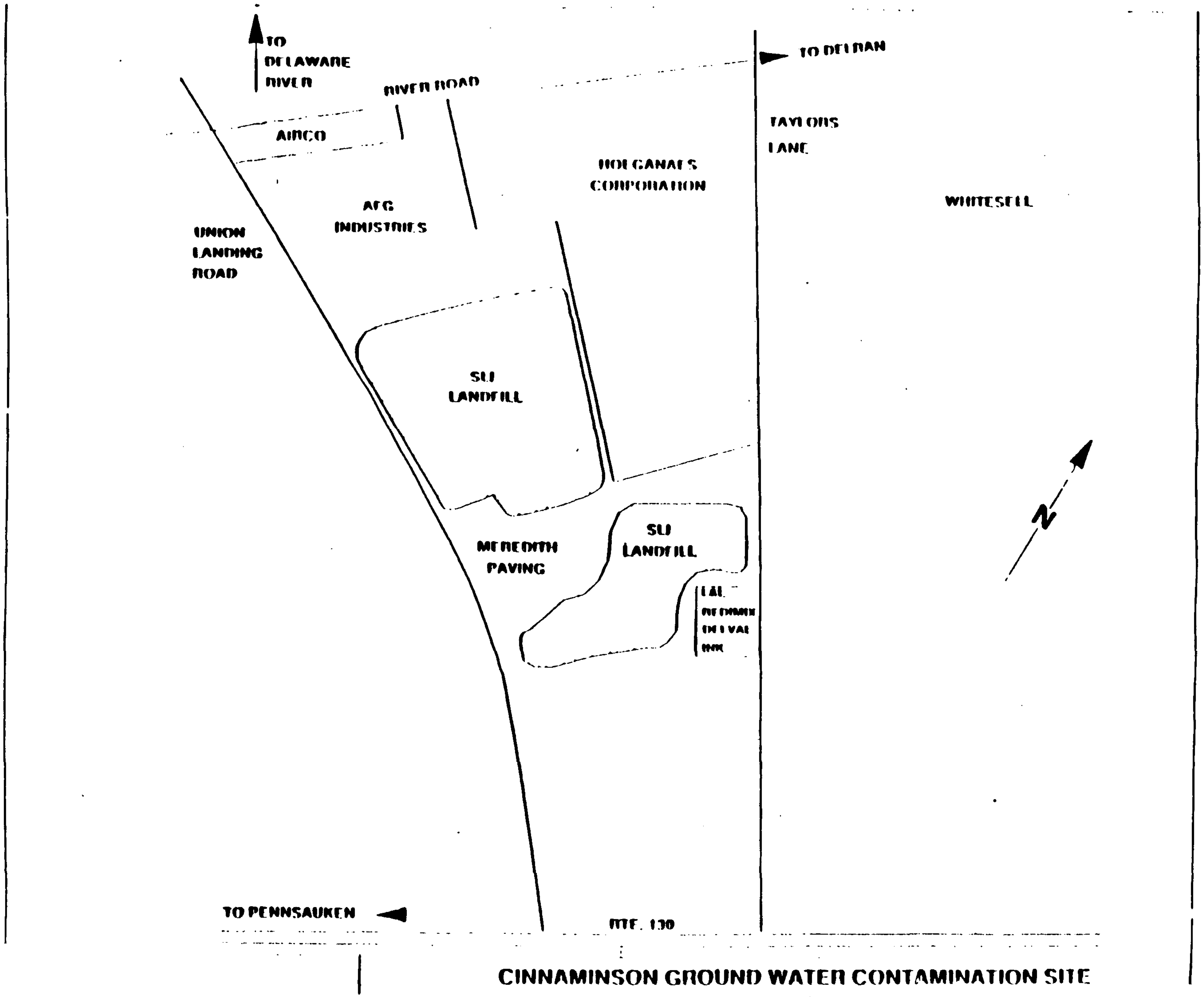

Figure 1: Cinnaminson Ground Water Contamination Site

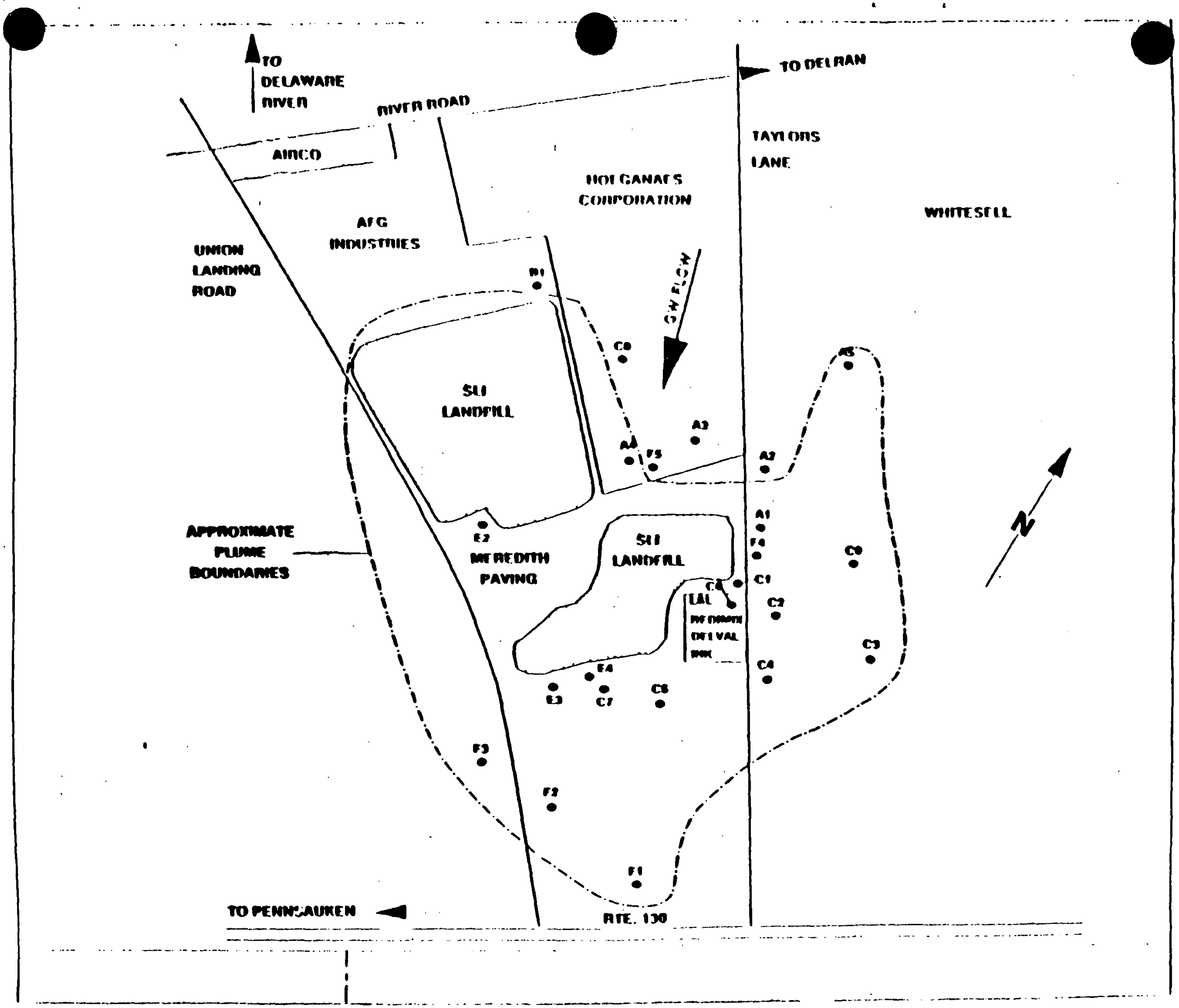

Figure 2: Extent of Ground Water Contamination

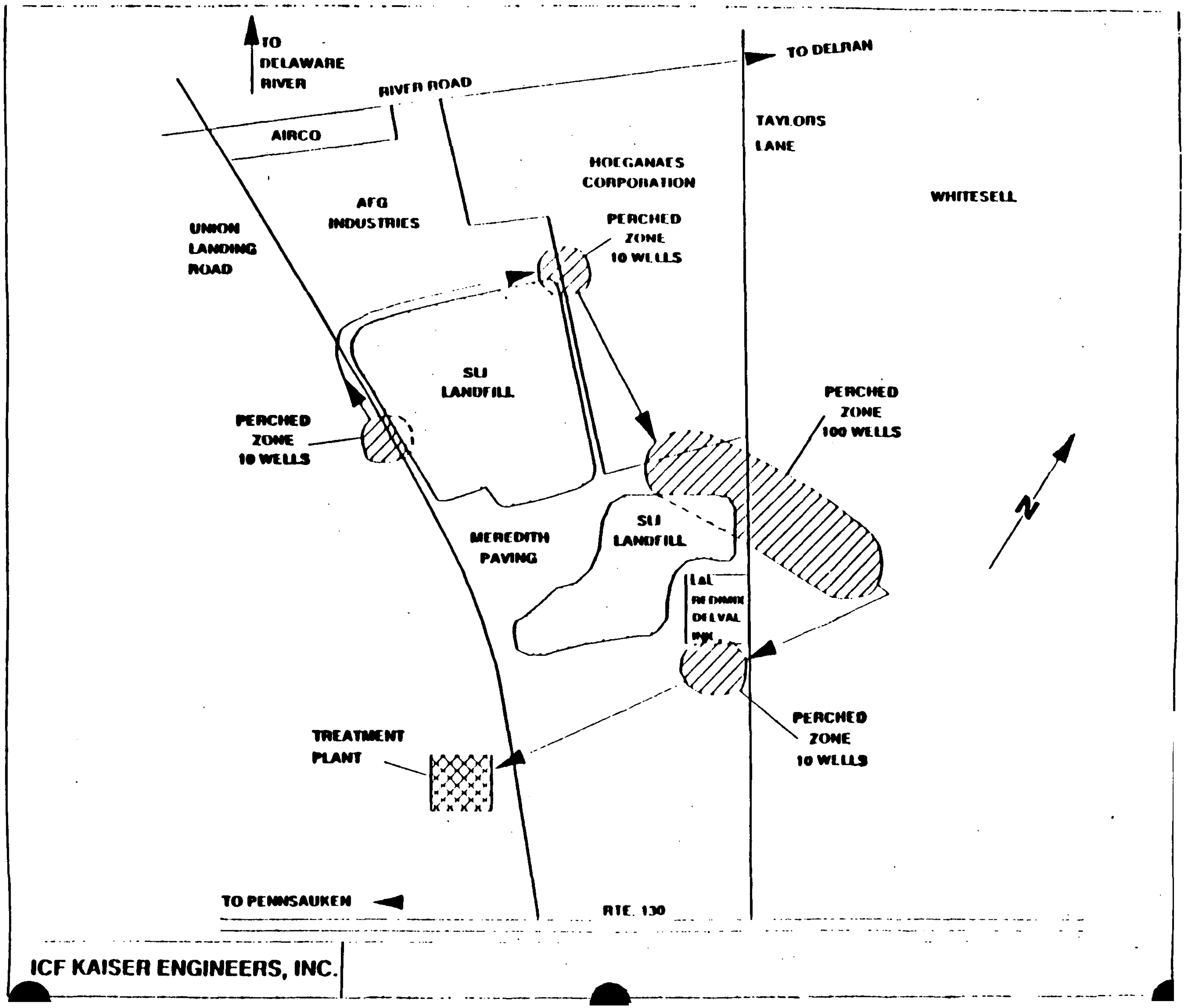

Figure 3: Perched Water Zone Extraction System

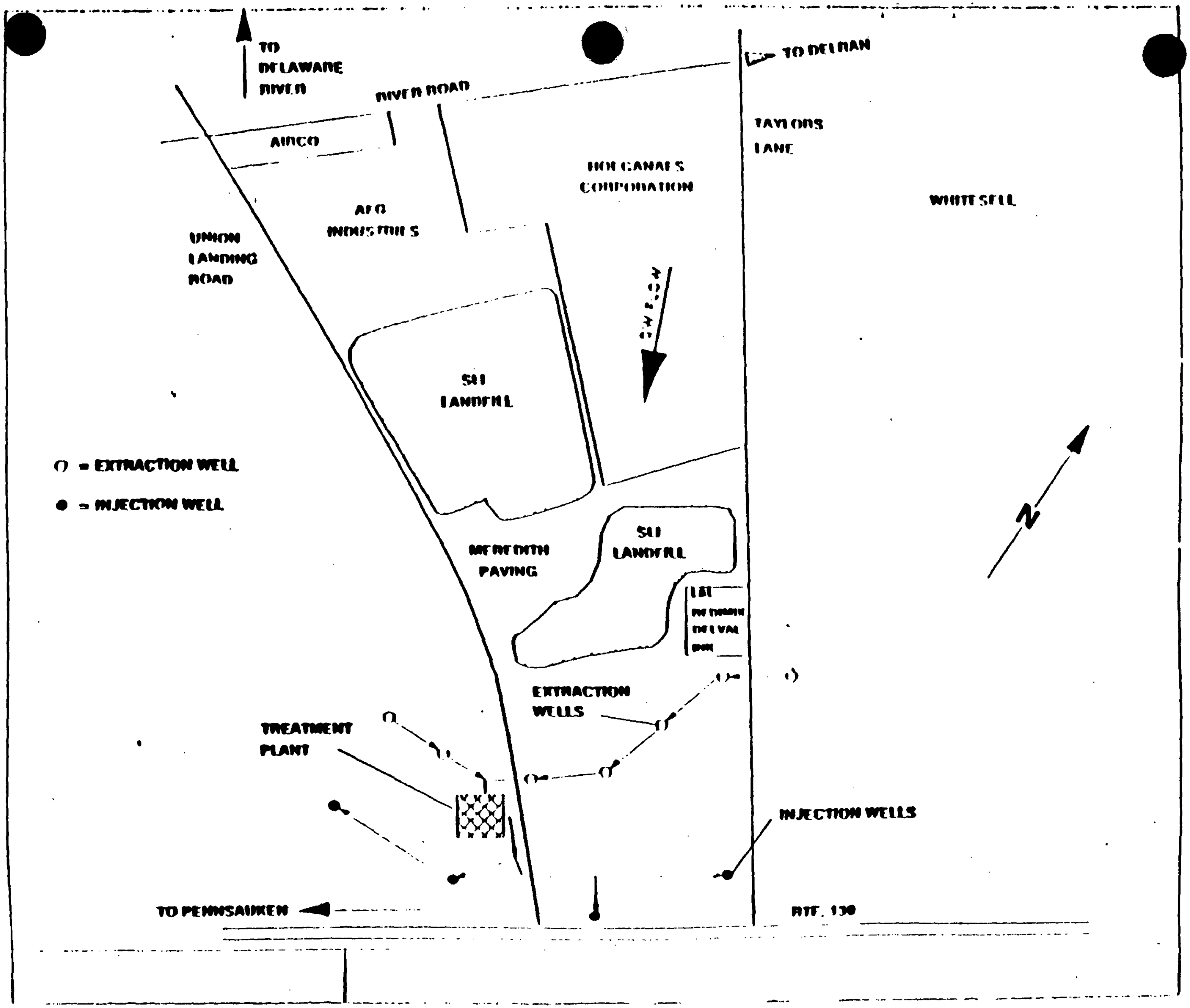

Figure 4: Regional Aquifer Extraction System

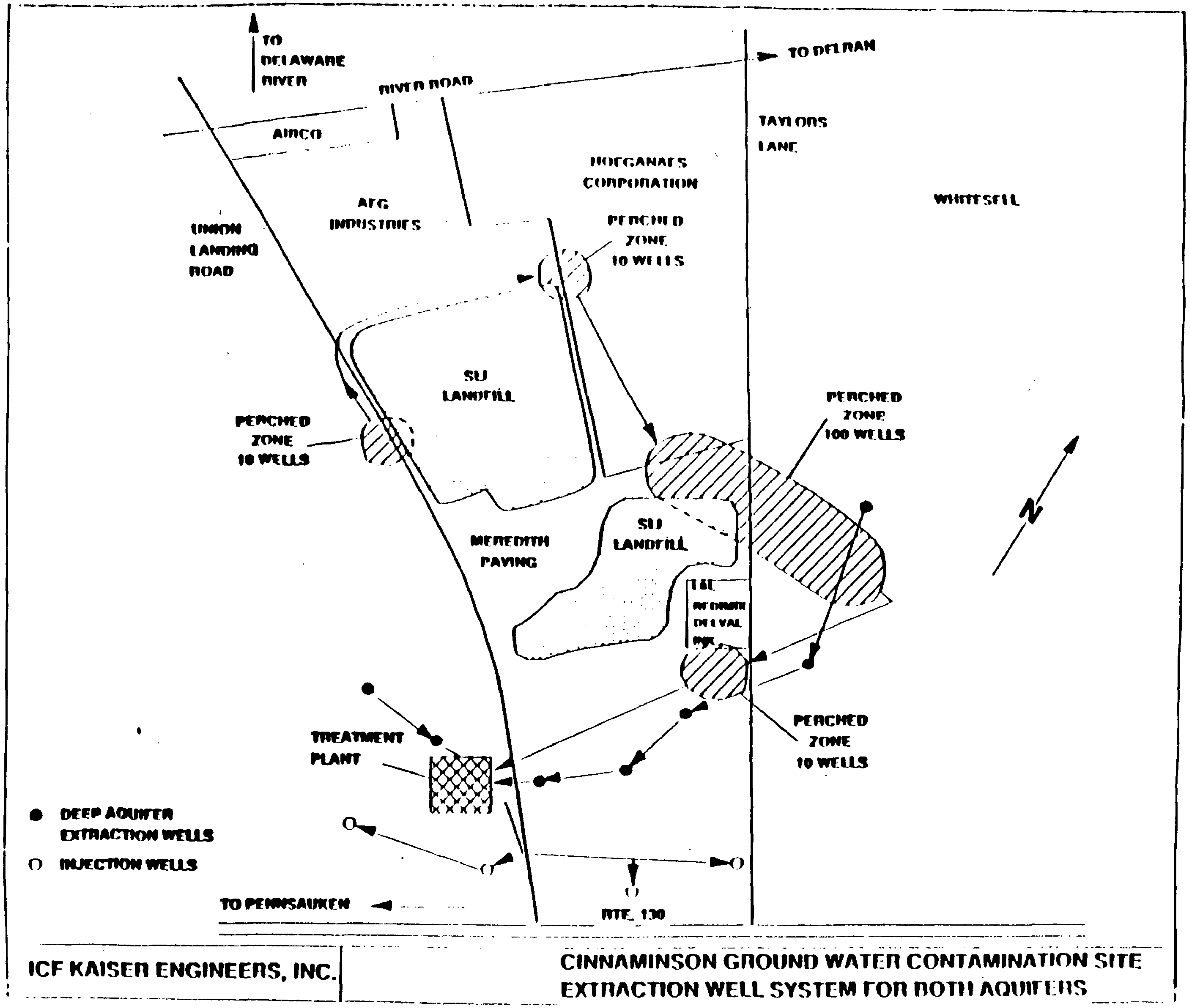

Figure 5: Shallow and Deep Aquifers Extraction System

TABLE 1

COMPARISON OF MAXIMUM CONCENTRATION
DETECTED IN THE PRM AQUIFER
(EPA WELLS ONLY) WITH THE MAXIMUM
CONTAMINANT LEVELS (MCLS)
CINNAMINSON GROUND WATER CONTAMINATION
FEASIBILITY STUDY REPORT

Chemical	Maximum Concentration (ug/l)	SDWA [1] MCL's (ug/l)	NJSDWA [2] MCL's (ug/l)
1,2-Dichlorobenzene	21.0		
1,4-Dichlorobenzene	38.0		
1,1-Dichloroethane	440.0		
1,2-Dichloroethane	230.0	5.0	2.0
1,2-Dichloroethene (total)	260.0		10.0
1,2-Dichloropropane	35.0		
1,1,1-Trichloroethane	23.0		26.0
1,1,2-Trichloroethane	3.0		
1,2,4-Trichlorobenzene	2.4		8.0
Acetone	2900.0		
Antimony	54.0		
Arsenic	110.0	50.0	50.0
Benzene	310.0	5.0	1.0
Benzoic Acid	65.0		
Beryllium	7.0		
bis(2-ethylhexyl)phthalate	400.0		
Butylbenzylphthalate	14.0		
Cadmium	13.8	10.0	
Chlorobenzene	84.0		4.0
Chloroform	2100.0	100.0	
Cyanide	30.0		
Diethylphthalate	1.0		
Di-n-butyl phthalate	2.0		
Ethylbenzene	430.0		
Manganese	14300.0	50.0	
Noncarcinogenic PAH's	20.0		
Selenium	5.0		10.0
Silver	18.7		50.0
Tetrachloroethene	110.0		1.0
Total Xylenes	1100.0		44.0
Trichloroethene	380.0		1.0
Vinyl Chloride	85.0	2.0	2.0

[1] Safe Drinking Water Act, Maximum Contaminant Levels
[2] New Jersey Safe Drinking Water Act, Maximum Contaminant Levels

TABLE 2

COMPARISON OF MAXIMUM CONCENTRATION DETECTED IN THE PERCHED ZONE (EPA WELLS ONLY) WITH MAXIMUM CONTAMINATION LEVELS (MCLs) CINNAMINSON GROUND WATER CONTAMINATION FEASIBILITY STUDY REPORT

Chemical	Maximum Concentration (ug/l)	SDWA [1] MCL's (ug/l)	NJSDWA [2] MCL's (ug/l)
1,1-Dichlorethane	10.0		
1,2-Dichlorethane	50.0	5.0	2.0
1,2-Dichloroethene (total)	25.0		10.0
1,4-Dichlorobenzene	8.0		
Chlorobenzene	430.0		4.0
Ethylbenzene	107.0		
Benzene	12.0	5.0	1.0
Vinyl Chloride	34.0	2.0	2.0
Total Xylenes	67.0		44.0
Arsenic	3.8	50.0	50.0
Manganese	7270.0		
Silver	31.0	50.0	50.0

[1] Safe Drinking Water Act, Maximum Contaminant Levels
[2] New Jersey Safe Drinking Water Act, Maximum Contaminant Levels

Chemicals of Concern for the Regional Aquifer and Perched Water Zones

Chemical	RfD (mg/kg day) [Safety Factor] (a)	Source (b)	Cancer Potency Factor (mg/kg/day)-1	EPA Weight of Evidence Category (c)
Acetone	1E-01 [1,000]	IRIS	---	---
Aluminum	---	---	---	---
Antimony	4E-04 [1,000]	IRIS	---	---
Arsenic	1E-03 [illegible]	IRIS	2	A
Barium	5E-02 [100]	IRIS	---	---
Benzene	*	IRIS	2.9E-02	A
Benzoic Acid	4 [1]	IRIS	---	---
Beryllium	5E-03 [100]	IRIS	---	B2
Bis(2-ethylhexyl)phthalate	2E-02 [1,000]	IRIS	1.4E-02	B2
2-Butanone	5E-02 [1,000]	IRIS	---	---
Butyl benzyl phthalate	2E-01 [1,000]	HEA	---	C
Cadmium	1E-03 [10] (food)	HEA	---	---
	5E-04 [10] (water)	HEA	---	---
Chlorobenzene	3E-02 [1,000]	HEA	---	---
Chloroethane	---	---	---	---
Chloroform	1E-02 [1,000]	IRIS	6.1E-03	B2
Chromium (III)	1 [1,000]	IRIS	---	---
(VI)	5E-03 [500]	IRIS	---	---
Cobalt	---	---	---	---
Cyanide	2E-02 [500]	IRIS	---	---
delta-BHC	---	---	---	---
1,2-Dichlorobenzene	9E-02 [1,000]	HEA	---	---
1,4-Dichlorobenzene	[illegible]	HA	2.4E-02	B2
Dichlorodifluoromethane	2E-01 [illegible]	IRIS	---	---
1,1-Dichloroethane	1E-01 [1,000]	HEA	9.1E-02	B2
1,2-Dichloroethane	---	---	9.1E-02	B2
1,1-Dichloroethene	9E-03 [1,000]	IRIS	6.0E-01	C
cis-1,2-Dichloroethene	1E-02 [illegible]	HA	---	---
trans-1,2-Dichloroethene	2E-02 [1,000]	IRIS	---	---
1[illegible]loropropane	---	---	6.8E-02	B2
D[illegible]	5E-05 [100]	IRIS	1.6E+01	B2
1,2-Diethoxyethene	---	---	---	---
Diethyl phthalate	8E-01 [1,000]	IRIS	---	---
Diisopropyl ether	---	---	---	---
2,4-Dimethylphenol	---	---	---	---
Di-n-butyl phthalate	1E-01 [1,000]	IRIS	---	---
Di-n-octyl phthalate	---	---	---	---
Ethylbenzene	1E-01 [1,000]	IRIS	---	---
Lead	6E-04	[illegible]	---	B2
Manganese	2E-01 [100]	HEA	---	---
Mercury	2E-03	HEA	---	---
Mercury (methyl & alkyl)	3E-04 [10]	HEA	---	---
Mercury (mercurial)	3E-04 [1,000]	HEA	---	---
Methylene chloride	6E-02 [illegible]	IRIS	7.5E-03	B2
4-Methylphenol	5E-02 [illegible]	IRIS	---	---
4-Methyl-2-pentanone	5E-02 [1,000]	IRIS	---	---
Nickel	2E-02 [300]	IRIS	---	---
PAHs				
carcinogenic (benzo[a]pyrene)	---	---	11.5*	B2
non-carcinogenic (naphthalene)	4E-01 [100]	HEA	---	---
Phenol	6E-01 [100]	IRIS	---	---
Selenium	3E-03 [15]	HEA	---	---
Silver	3E-03 [2]	IRIS	---	---
Styrene	2E-01 [1,000]	IRIS	---*	C
Tetrachloroethene	1E-02 [1,000]	IRIS	5.1E-02*	B2
Toluene	3E-01 [illegible]	IRIS	---	---
1,2,4-Trichlorobenzene	2E-02 [1,000]	IRIS	---	---
1,1,1-Trichloroethane	9E-02 [1,000]	IRIS	---	---
1,1,2-Trichloroethane	4E-03 [1,000]	IRIS	5.7E-02	C
Trichloroethene	7.35E-03 [1,000]	HA	1.1E-02	B2
Vanadium	7E-03 [100]	HEA	---	---
Vinyl chloride	---	---	2.3	A
Total Xylenes	2 [100] (mixed)	IRIS	---	---
	2 [100] (o-,m-)	HEA	---	---
Zinc	2E-01 [10]	HEA	---	---

TABLE 3 (Continued)

Chemical	RfD (mg/kg/day) [Safety Factor] (a)	Source (b)	Cancer Potency Factor (mg/kg/day)-1	EPA Weight of Evidence Category (c)
Tetrachloroethene	1E-02 [1,000]	IRIS	5.1E-02*	--
Toluene	3E-01 [100]	IRIS	---	
1,2,4-Trichlorobenzene	2E-02 [1,000]	IRIS	---	---
1,1,1-Trichloroethane	9E-02 [1,000]	IRIS	---	---
1,1,2-Trichloroethane	4E-03 [1,000]	IRIS	5.7E-02	C
Trichloroethene	7.35E-03 [1,000]	HA	1.1E-02	B2
Vanadium	7E-03 [100]	HEA	---	---
Vinyl chloride	---	---	2.3	A
Total Xylenes	2 [100] (mixed)	IRIS	---	---
	2 [100] (o-,m-)	HEA	---	---
Zinc	2E-01 [10]	HEA	---	---

(a) Uncertainty factors used to develop reference doses usually consist of multiples of 10, each factor representing a specific area of uncertainty inherent in the data available. The standard uncertainty factors include:
- A 10-fold factor to account for the variation in sensitivity among the members of the human population;
- A 10-fold factor to account for the uncertainty in extrapolating animal data to the case of humans;
- A 10-fold factor to account for uncertainty in extrapolating from less than chronic NOAELs to chronic NOAELs, and;
- A 10-fold factor to account for the uncertainty in extrapolating from LOAELs to NOAELs.

Safety factors are the products of uncertainty factors and modifying factors.

(b) Source of Reference Doses. IRIS = chemical files of the Integrated Risk Information System; HEA = Health Effects Assessments; HA = Health Advisory (Office of Drinking Water); ADI = Acceptable Daily Intake; NAAQ = National ambient air quality standard.

(c) Weight of evidence classification scheme for carcinogens: A--Human Carcinogen, sufficient evidence from human epidemiological studies; B1--Probable Human Carcinogen, limited evidence from epidemiological studies and adequate evidence from animal studies; B2--Probable Human Carcinogen, inadequate evidence from epidemiological studies and adequate evidence from animal studies; C--Possible Human Carcinogen, limited evidence in animals in the absence of human data; D--Not Classified as to human carcinogenicity; and E--Evidence of Noncarcinogenicity.

(d) Reference dose for lead is based on the USEPA (1988) guidance that 15 ug/dl is the upper bound acceptable blood level for calculating a long term acceptable daily intake for adults and a short-term ADI for children.

* = Review pending.

TABLE 4

Chemicals of Concern for the Inhalation of VOCs

Chemical	RfC (mg/kg/day) [Safety Factor] (a)	Source (b)	Cancer Potency Factor (mg/kg/day)-1	EPA Weight of Evidence Category (c)
Acetone	---	---	---	---
Aluminum	---	---	---	---
Arsenic	---	---	5.0E+01	A
Barium	1E-04 [1,000]	HEA	---	---
Benzene	---	---	2.9E-02	A
Benzoic Acid	---	---	---	---
Bis(2-ethylhexyl)phthalate	---	---	---	---
2-Butanone	9E-02 [1,000]	HEA	---	---
Cadmium	---	---	6.1	B1
Chlorobenzene	5E-03 [10,000]	HEA	---	---
Chloroethane	---	---	---	---
Chloroform	---	---	8.1E-02	B2
Chromium (III)	---	---	---	---
(VI)	---	---	4.1E+01	A
Cobalt	---	---	---	---
Cyanide	---	---	---	---
Di-n-butylphthalate	---	---	---	---
1,2-Dichlorobenzene	4E-02 [1,000]	HEA	---	---
1,4-Dichlorobenzene	---	---	---	---
1,1-Dichloroethane	---	---	---	---
1,2-Dichloroethane	---	---	9.1E-02	B2
1,1-Dichloroethene	---	---	1.2	C
trans-1,2-Dichloroethene	---	---	---	---
1,2-Dichloropropane	---	---	---	---
Dieldrin	---	---	1.6E+01	B2
Di-n-octylphthalate	---	---	---	---
Ethylbenzene	---	---	---	---
Lead	4E-04 (d)	NAAQS	---	B2
Manganese	3E-04 [100]	HEA	---	---
Mercury	5.1E-05	HEA	---	---
Methylene chloride	---	---	1.4E-02	B2
4-Methyl-2-pentanone	2E-02 [1,000]	HEA	---	---
4-Methylphenol	---	---	---	---
Nickel	---	---	--- (e)	A
PAHs				
carcinogenic (benzo(a)pyrene)	---	---	6.1*	B2
noncarcinogenic (naphthalene)	---	---	---	---
Phenol	---	---	---	---
Selenium	1E-03 [10]	HEA	---	---
Silver	---	---	---	---
Styrene	---	---	*	---
Tetrachloroethene	---	---	3.3E-03*	B2
Toluene	[illegible]	HEA	---	---
1,1,1-Trichloroethane	3E-01 [1,000]	HEA	---	---
Trichloroethene	---	---	4.6E-03	B2
Vanadium	---	---	---	---
Vinyl chloride	---	---	2.95E-01	A
Total Xylenes	4E-01 [1,000]	HEA	---	---
Zinc	---	---	---	---

(a) Uncertainty factors used to develop reference doses usually consist of multiples of 10, each factor representing a specific area of uncertainty inherent in the data available. The standard uncertainty factors include:
- A 10-fold factor to account for the variation in sensitivity among the members of the human population;
- A 10-fold factor to account for the uncertainty in extrapolating animal data to the case of humans;
- A 10-fold factor to account for uncertainty in extrapolating from less than chronic NOAELs to chronic NOAELs; and
- A 10-fold factor to account for the uncertainty in extrapolating from LOAELs to NOAELs.

Safety factors are the products of uncertainty factors and modifying factors.

(b) Source of Reference Doses: IRIS = chemical files of the Integrated Risk Information System. HEA = Health Effects Assessments; MCLG = Maximum Contaminant Level Goal, NAAQS = National ambient air quality standard.

(c) Weight of evidence classification scheme for carcinogens: A--Human Carcinogen, sufficient evidence from human epidemiological studies; B1--Probable Human Carcinogen, limited evidence from epidemiological studies and adequate evidence from animal studies; B2--Probable Human Carcinogen, inadequate evidence from epidemiological studies and adequate evidence from animal studies; C--Possible Human Carcinogen, limited evidence in animals in the absence of human data; D--Not Classified as to human carcinogenicity; and E--Evidence of noncarcinogenicity.

(d) Reference dose for lead is calculated by Clement Associates based on the NAAQS Standard of 1.5 ug/m3.

(e) Inhalation cancer potency factors have been developed for nickel subsulfide [1.7 (mg/kg/day)-1] and nickel refinery dust [0.84 (mg/kg/day)-1]. The higher of these two values is conservatively used in this assessment.

* = Review pending

TABLE 5

Risks Associated with the Ingestion of Ground Water from the Perched Water Zones

a. carcinogens

Chemical	CONCENTRATION (ug/l) Geometric Mean	CONCENTRATION (ug/l) Maximum	ESTIMATED CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Average	ESTIMATED CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Plausible Maximum	CANCER POTENCY FACTOR (mg/kg/day)-1	EXCESS UPPER BOUND LIFETIME CANCER RISK Average	EXCESS UPPER BOUND LIFETIME CANCER RISK Plausible Maximum
1,1-Dichloroethane	3.30E+00	1.00E+01	7.62E-06	1.14E-04	9.1E-02	7E-07	1E-05
1,2-Dichloroethane	3.80E+00	5.00E+01	8.77E-06	5.71E-04	9.1E-02	8E-07	5E-05
1,4-Dichlorobenzene	5.40E+00	8.00E+00	1.25E-05	9.14E-05	2.4E-02	3E-07	2E-06
Arsenic	NR	3.80E+00	NR	4.34E-05	2.0E+00	NR	9E-05
Benzene	5.10E+00	1.20E+01	1.18E-05	1.37E-04	2.9E-02	3E-07	4E-06
Vinyl Chloride	6.40E+00	3.40E+01	1.48E-05	3.89E-04	2.3E+00	3E-05	9E-04
TOTAL:						4E-05	1E-03

b. noncarcinogens

Chemical	CONCENTRATION (ug/l) Geometric Mean	CONCENTRATION (ug/l) Maximum	ESTIMATED CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Average	ESTIMATED CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Plausible Maximum	REFERENCE DOSE (mg/kg/day)	CDI:RfD RATIO Average	CDI:RfD RATIO Plausible Maximum
1,1-Dichloroethane	3.30E+00	1.00E+01	6.35E-05	2.86E-04	1.0E-01	6E-04	3E-03
1,2-Dichloroethene (total)	5.60E+00	2.50E+01	1.08E-04	7.14E-04	1.0E-02	1E-02	7E-02
1,4-Dichlorobenzene	5.40E+00	8.00E+00	1.04E-04	2.29E-04	1.0E-01	1E-03	2E-03
Chlorobenzene	9.40E+00	4.30E+02	1.81E-04	1.23E-02	3.0E-02	6E-03	4E-01
Ethylbenzene	8.00E+00	1.07E+02	1.54E-04	3.06E-03	1.0E-01	2E-03	3E-02
Manganese	1.49E+03	7.27E+03	2.87E-02	2.08E-01	2.0E-01	1E-01	1E+00
Silver	6.20E+00	3.10E+01	1.19E-04	8.86E-04	3.0E-03	4E-02	3E-01
Total Xylenes	5.60E+00	6.70E+01	1.08E-04	1.91E-03	2.0E+00	5E-05	1E-03
HAZARD INDEX:						<1 (0.2)	>1 (2)

NR - The geometric mean was not reported (NR), because the geometric mean was greater than or equal to the maximum detected value

TABLE 6

Risks Associated with the Ingestion of Ground Water from the Regional Aquifer

a. carcinogens

Chemical	CONCENTRATION (ug/l) Geometric Mean	CONCENTRATION (ug/l) Maximum	ESTIMATED CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Average	ESTIMATED CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Plausible Maximum	CANCER POTENCY FACTOR (mg/kg/day)-1	EXCESS UPPER BOUND LIFETIME CANCER RISK Average	EXCESS UPPER BOUND LIFETIME CANCER RISK Plausible Maximum
1,1-Dichloroethane	6.70E+00	4.40E+02	1.55E-05	5.03E-03	9.1E-02	1E-06	5E-04
1,2-Dichloroethane	5.70E+00	2.30E+02	1.32E-05	2.63E-03	9.1E-02	1E-06	2E-04
1,2-Dichloropropane	3.00E+00	3.50E+01	6.92E-06	4.00E-04	6.8E-02	5E-07	3E-05
1,4-Dichlorobenzene	6.10E+00	3.80E+01	1.41E-05	4.34E-04	2.4E-02	3E-07	1E-05
1,1,2-Trichloroethane	2.60E+00	3.00E+00	6.00E-06	3.43E-05	5.7E-02	3E-07	2E-06
Arsenic	7.00E+00	1.10E+02	1.62E-05	1.26E-03	2.0E+00	3E-05	3E-03
Benzene	6.20E+00	3.10E+02	1.43E-05	3.54E-03	2.9E-02	4E-07	1E-04
bis(2-Ethylhexyl)phthalate	7.10E+00	4.00E+02	1.64E-05	4.57E-03	1.4E-02	2E-07	6E-05
Chloroform	3.80E+00	2.10E+03	8.77E-06	2.40E-02	6.1E-03	5E-08	1E-04
Tetrachloroethene	3.90E+00	1.10E+02	9.00E-06	1.26E-03	5.1E-02	5E-07	6E-05
Trichloroethene	4.30E+00	3.80E+02	9.92E-06	4.34E-03	1.1E-02	1E-07	5E-05
Vinyl Chloride	5.80E+00	8.50E+01	1.34E-05	9.71E-04	2.3E+00	3E-05	2E-03
TOTAL:						7E-05	6E-03

NR = The geometric mean was not reported (NR), because the geometric mean was greater than or equal to the maximum detected value.

TABLE 8 (Continued)

b. noncarcinogens

Chemical	CONCENTRATION (ug/l) Geometric Mean	Maximum	ESTIMATED CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Average	Plausible Maximum	REFERENCE DOSE (mg/kg/day)	CDI:RFD RATIO Average	Plausible Maximum
1,2-Dichlorobenzene	5.20E+00	2.10E+01	1.00E-04	6.00E-04	9.0E-02	1E-03	7E-03
1,4-Dichlorobenzene	6.10E+00	3.00E+01	1.17E-04	1.09E-03	1.0E-01	1E-03	1E-02
1,1-Dichloroethane	6.70E+00	4.40E+02	1.29E-04	1.26E-02	1.0E-01	1E-03	1E-01
1,2-Dichloroethene (total)	7.40E+00	2.60E+02	1.42E-04	7.43E-03	1.0E-02	1E-02	7E-01
1,1,1-Trichloroethane	2.60E+00	2.30E+01	5.00E-05	6.57E-04	9.0E-02	6E-04	7E-03
1,1,2-Trichloroethane	2.60E+00	3.00E+00	5.00E-05	8.57E-05	4.0E-03	1E-02	2E-02
1,2,4-Trichlorobenzene	2.40E+00	2.40E+00	4.62E-05	6.86E-05	2.0E-02	2E-03	3E-03
Acetone	6.70E+00	2.90E+01	1.29E-04	8.29E-02	1.0E-01	1E-03	8E-01
Antimony	3.47E+01	5.40E+01	6.67E-04	1.54E-03	4.0E-04	2E+00	4E+00
Beryllium	2.70E+00	7.00E+00	5.19E-05	2.00E-04	5.0E-03	1E-02	4E-02
Benzoic acid	2.50E+01	6.50E+01	4.96E-04	1.86E-03	4.0E+00	1E-04	5E-04
bis(2-Ethylhexyl)phthalate	7.10E+00	4.00E+02	1.37E-04	1.14E-02	2.0E-02	7E-03	6E-01
Butylbenzylphthalate	5.40E+00	1.40E+01	1.04E-04	4.00E-04	2.0E-01	5E-04	2E-03
Cadmium	3.20E+00	1.38E+01 (a)	6.15E-05	3.94E-04	5.0E-04	1E-01	8E-01
Chlorobenzene	5.70E+00	8.40E+01	1.10E-04	2.40E-03	3.0E-02	4E-03	8E-02
Chloroform	3.80E+00	2.10E+03	7.31E-05	6.00E-02	1.0E-02	7E-03	6E+00
Cyanide	5.20E+00	3.00E+01	1.00E-04	8.57E-04	2.0E-02	5E-03	4E-02
Diethylphthalate	1.00E+00	1.00E+00	1.92E-05	2.86E-05	8.0E-01	2E-05	4E-05
Di-n-butyl Phthalate	NR	2.00E+00	NR	5.71E-05	1.0E-01	NR	6E-04
Ethylbenzene	3.90E+00	4.30E+02	7.50E-05	1.23E-02	1.0E-01	8E-04	1E-01
Manganese	5.42E+02	1.43E+04	1.04E-02	4.09E-01	2.0E-01	5E-02	2E+00
Noncarcinogenic PAHs	4.90E+00	2.00E+01	9.42E-05	5.71E-04	4.0E-01	2E-04	1E-03
Selenium	2.80E+00	5.00E+00	5.39E-05	1.43E-04	3.0E-03	2E-02	5E-02
Silver	5.10E+00	1.87E+01	9.81E-05	5.34E-04	3.0E-03	3E-02	2E-01
Tetrachloroethene	3.90E+00	1.10E+02	7.50E-05	3.14E-03	1.0E-02	8E-03	3E-01
Total Xylenes	3.90E+00	1.10E+03	7.50E-05	3.14E-02	2.0E+00	4E-05	2E-02
Trichloroethene	4.30E+00	3.80E+02	8.27E-05	1.09E-02	7.3E-03	1E-02	1E+00
HAZARD INDEX:						>1 (2)	>1 (20)

NR = The geometric mean was not reported (NR), because the geometric mean was greater than or equal to the maximum detected value

a) Dissolved concentration was used to be conservative because it exceeded the total concentration.

TABLE 7

Risks Assoicated with the Inhalation of VOCs by nearby Workers

a. carcinogens

Compound	CONCENTRATION (mg/m3) Geometric Mean	CONCENTRATION (mg/m3) Maximum	CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Average	CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Plausible Maximum	CANCER POTENCY FACTOR (mg/kg/day)-1	EXCESS UPPER BOUND LIFETIME CANCER RISK Average	EXCESS UPPER BOUND LIFETIME CANCER RISK Plausible Maximum
Methylene chloride	1.11E-03	1.60E-02	5.43E-12	8.96E-10	1.4E-02	8E-14	1E-11
Tetrachloroethene	9.64E-04	7.60E-03	4.72E-12	4.25E-10	3.3E-03	2E-14	1E-12
TOTAL:						9E-14	1E-11

b. noncarcinogens

Compound	CONCENTRATION (mg/m3) Geometric Mean	CONCENTRATION (mg/m3) Maximum	CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Average	CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Plausible Maximum	REFERENCE DOSE (mg/kg/day)	CDI:RfD RATIO Average	CDI:RfD RATIO Plausible Maximum
4-Methyl-2-pentanone	NC	1.08E-02	--	2.11E-09	2.0E-02	--	1E-07
Chlorobenzene	1.00E-03	1.01E-02	7.41E-11	1.98E-09	5.0E-03	1E-08	4E-07
Styrene	1.40E-03	2.80E-02	9.59E-11	5.48E-09	NA	--	--
HAZARD INDEX:						1E-08	5E-07

NC = Not calculated; a geometric mean was not calculated as the compound was detected at only one station.

NA = Not available; EPA has not developed an RfD for this chemical.

TABLE 8

Risks Associated with the Inhalation of VOCs by Nearby Residents

a. carcinogens

Compound	CONCENTRATION (mg/m3) Geometric Mean	CONCENTRATION (mg/m3) Maximum	CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Average	CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Plausible Maximum	CANCER POTENCY FACTOR (mg/kg/day) 1	EXCESS UPPER BOUND LIFETIME CANCER RISK Average	EXCESS UPPER BOUND LIFETIME CANCER RISK Plausible Maximum
Methylene chloride	1.11E-03	1.60E-02	2.06E-10	4.50E-09	1.4E-02	3E-12	6E-11
Tetrachloroethene	9.64E-04	7.60E-03	1.79E-10	2.17E-09	3.3E-03	6E-13	7E-12
TOTAL:						3E-12	7E-11

b. noncarcinogens

Compound	CONCENTRATION (mg/m3) Geometric Mean	CONCENTRATION (mg/m3) Maximum	CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Average	CHRONIC DAILY INTAKE (CDI) (mg/kg/day) Plausible Maximum	REFERENCE DOSE (mg/kg/day)	CDI:RfD RATIO Average	CDI:RfD RATIO Plausible Maximum
4-Methyl-2-pentanone	NC	1.00E-02	--	3.00E-09	2.0E-02	--	2E-07
Chlorobenzene	1.00E-03	1.01E-02	2.01E-10	2.89E-09	5.0E-03	4E-08	6E-07
Styrene	1.40E-03	2.80E-02	2.60E-10	8.00E-09	NA	--	--
HAZARD INDEX:						4E-08	7E-07

NC = Not calculated; a geometric mean was not calculated as the compound was detected at only one station.

NA = Not available; EPA has not developed an RfD for this chemical.

Table 9

COMPOUND	Ground Water ARARs (micrograms/liter)
1,2-Dichlorobenzene	600 [1]
1,4-Dichlorobenzene	75 [2]
1,2-Dichloroethane	2 [1]
1,2-Dichloroethene (cis & trans)	10 [1]
1,1,1-Trichloroethane	26 [1]
1,2,4-Trichlorobenzene	8 [1]
Benzene	1 [1]
Chlorobenzene	4 [1]
Chloroform	100 [3]
Tetrachloroethene	1 [1]
Total xylenes	44 [1]
Trichloroethene	1 [1]
Vinyl chloride	2 [1]
Arsenic	50 [4]
Cadmium	10 [4]
Cyanide	200 [4]
Manganese	50 [4]
Selenium	10 [4]
Silver	50 [4]

[1] New Jersey Maximum Contaminant Levels
[2] Federal Maximum Contaminant Levels
[3] National Interim Primary Drinking Water Regulation
[4] New Jersey Ground Water Quality Criteria

Table 10

Summary of Federal and State ARARs for the Cinnaminson Site

ARAR	Citation
<u>Federal</u>	
Safe Drinking Water Act National Primary Drinking Water Standards	40 CFR Part 141
RCRA Standards for Owners and Operator of Hazardous Waste Treatment, Storage, and Disposal Facilities	40 CFR Part 264 and Part 264.97
Resource Conservation and Recovery Act (RCRA) - Identification and Listing of Hazardous Wastes	40 CFR Part 264.1
Executive Order on Floodplain Management	Executive Order 11988 and 40 CFRs 6:302(b) and Appendix A
<u>State</u>	
New Jersey Safe Drinking Water Act	NJAC 7:10-1 <u>et</u> <u>seq.</u>
New Jersey Ground Water Quality Criteria	NJAC 7:9-6.6(b)
New Jersey Discharge of Effluents to the Ground Water	NJAC 7:14A-1 <u>et</u> <u>seq.</u>
New Jersey Requirements for Ground Water Monitoring	NJAC 7:26-9 <u>et</u> <u>seq.</u>
New Jersey Sludge Quality Criteria	NJAC 7:14-4 Appendix B-1
New Jersey Air Pollution Control Regulations	NJAC 7:27-1 <u>et</u> <u>seq.</u>
Flood Hazard Area Control Act	NJSA 58:16A-50
Flood Hazard Area Regulations	NJAC 7:13-1 <u>et</u> <u>seq.</u>

RESPONSIVENESS SUMMARY

CINNAMINSON GROUND WATER
CONTAMINATION SITE

CINNAMINSON, NEW JERSEY

SEPTEMBER 1990

Table 11

Costs of Remedial Alternatives

Alternative	Capital Costs	Annual O & M	Present Worth
MM-1	0	5,000	416,000
MM-2	369,000	84,000	1,702,000
MM-3A	4,739,000	506,000	6,941,000
3B	5,192,000	617,000	15,083,000
3C	8,093,000	649,000	18,633,000
MM-4A	5,192,000	617,000	15,083,000
4B	6,069,000	1,002,000	21,879,000
4C	5,628,000	700,000	16,796,000
MM-5A	8,093,000	694,000	18,633,000
5B	9,122,000	1,114,000	26,810,000
5C	8,367,000	751,000	20,475,000

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RESPONSIVENESS SUMMARY

CINNAMINSON GROUND WATER CONTAMINATION SITE
CINNAMINSON, NEW JERSEY

I. RESPONSIVENESS SUMMARY OVERVIEW

The U.S. Environmental Protection Agency (EPA) established a public comment period from May 16, 1990 through June 15, 1990. In response to a written request received by EPA, the public comment period was extended to July 31, 1990. The public comment period provided interested parties with the opportunity to comment on the remedial investigation and feasibility study (RI/FS) report and the Proposed Plan for the Cinnaminson Ground Water Contamination (Cinnaminson) site, in Cinnaminson Township, New Jersey.

EPA held a Public Information Meeting on May 31, 1990 at 7:30 p.m. in the Cinnaminson Township Community Center to outline the remedial alternatives described in the RI/FS and to present EPA's proposed remedial alternatives for controlling ground water contamination at the Cinnaminson site. A public availability session was held on June 1, 1990 from 10:00 a.m. to 1:00 p.m. In addition, EPA held an additional availability session on July 25, 1990 at the request of several citizens that did not attend the first meeting. The public availability sessions were held at the Cinnaminson Township Community Center for interested citizens to ask questions and to discuss concerns with EPA on a one-to-one basis.

This Responsiveness Summary summarizes the written and oral comments received by citizens during the public comment period and EPA's responses to those comments. The EPA, in consultation with the New Jersey Department of Environmental Protection (NJDEP), will select a final remedy for site cleanup only after reviewing and considering all public comments received during the public comment period.

This Responsiveness Summary is organized into four sections and five appendices as described below:

I. **RESPONSIVENESS SUMMARY OVERVIEW:** This section briefly describes the objectives and the format of the Responsiveness Summary for the Cinnaminson site.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

EPA initiated community relations activities for the Cinnaminson site with a public scoping meeting at the Cinnaminson Township Municipal Building on April 14, 1986. The meeting was held to discuss the scheduled RI/FS activities. Approximately 80 residents and local officials from Cinnaminson and nearby Delran Township attended the meeting.

According to a July 2, 1986 Meeting Summary, which is available at the information repositories identified in Appendix D of this report, the major concerns that were identified by the community at that time are listed below:

- Residents and local officials were concerned about the limited availability of information to the public regarding the status of EPA activities. They requested that they be kept informed of future investigation results.

- Residents expressed concern about contaminated ground water affecting the municipal water supply wells. They wanted to know if it was safe to drink, cook and bathe in the water they were receiving from the New Jersey Water Company.

- Residents stated that there was a lack of information regarding the SLI (Sanitary Landfill Inc.) closure plan that was approved by NJDEP.

- Local officials and residents were concerned about the funding for the remedial action at the site. They wanted to know if the Superfund reauthorization in 1986 would delay funding for the site cleanup.

Approximately 40 residents and local officials attended the recent pubic meeting held by EPA on May 31, 1990. The meeting was held to outline the remedial alternatives described in the RI/FS and to present EPA's proposed remedial alternative for controlling ground water contamination at the Cinnaminson site. Several citizens, who did not attend the May 31st public meeting, requested that EPA hold a second meeting. In response, EPA scheduled a second availability session on July 25, 1990. The community's major questions and concerns that were raised during the public meeting and the two availability sessions are summarized in the following Section.

II. **BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS:** This section provides the history of community concerns and interests regarding the Cinnaminson site.

III. **SUMMARY OF MAJOR QUESTIONS, COMMENTS AND CONCERNS:** This section summarizes the oral comments received by EPA at the May 31, 1990 public meeting and the June 1, 1990 public availability session, and provides EPA's responses to these comments.

IV. **WRITTEN COMMENTS AND RESPONSES:** This section contains all written comments received by EPA during the public comment period as well as EPA's written responses to those comments.

Appendix A: This appendix contains the Proposed Plan that was distributed to the public during the public meeting held on May 31, 1990.

Appendix B: This appendix contains sign-in sheets from: the Public Information Meeting held on May 31, 1990 at 7:30 p.m.; the Public Availability Session held on June 1, 1990 from 10:00 a.m. to 1:00 p.m.; and the availability session held on July 25, 1990 at 7:00 p.m.

Appendix C: This appendix contains the Agenda for the Public Information Meeting held on May 31, 1990.

Appendix D: This appendix contains an updated list of the information repositories designated for the Cinnaminson site.

Appendix E: This appendix contains the Superfund Update which summarizes the remedial activities conducted at the Cinnaminson site.

The remedy to control ground water contamination at the site is selected by the EPA Region II Administrator and will be documented in the Record of Decision (ROD). EPA will issue a press release to notify interested citizens that a remedial decision has been made. This Responsiveness Summary, the ROD, and the other site-related documents that EPA used to select the remedial alternative will be placed in the information repositories for public review (See Appendix D).

III. SUMMARY OF MAJOR QUESTIONS, COMMENTS AND RESPONSES

The oral comments raised during the public comment period and EPA's responses to these comments are summarized below.

A. TECHNICAL ISSUES AND CONCERNS

COMMENT: One resident wanted to know in which direction the contamination plume is moving.

RESPONSE: The results of the remedial investigation, conducted by EPA's consultant, Camp Dresser & McKee (CDM), indicated the contamination plume in the deep aquifer is generally migrating in a south-southeasterly direction. It should be noted that a slight shift occurs in the northern area where the flow direction deviates to a south-southwesterly direction. The flow of the shallow aquifer or perched zone is very localized, and the ground water in this zone primarily follows the inclination of the clay layers which are responsible for forming the perched zone. Ultimately, however, the ground water from the perched zone migrates vertically through the clay layers and enters into the deep aquifer and eventually migrates south-southeast.

COMMENT: A citizen wanted to know if it was possible for the contamination in the perched zone to migrate in a different direction other than southeast since the ground water in the perched zone follows the inclination of the clay layers.

RESPONSE: The contamination in the perched zone may temporarily migrate in a different direction from the regional plume; however, it will eventually migrate vertically into the deep aquifer and move with the regional plume toward the southeast.

COMMENT: The same resident wanted to know the flow rate and general extent of the contamination plume in the shallow and deep aquifers.

RESPONSE: Contamination in the perched zones is localized into four distinct areas; three circular, and one sausage shaped. The deep aquifer contamination extends to properties bounded by Union Landing Road, Route 130, River Road, and Taylors Lane. The rate of migration has not been determined. However, the rate could be directly influenced by the rate that ground water is pumped from the aquifer. It should be noted that, although the highest levels of contamination are found near the sources of contamination, results from ground water sampling suggest that the plume is migrating slowly.

COMMENT: One resident asked if the contaminants could sink to the bottom of the aquifers, reverse their migration direction, and backtrack north in the opposite direction of the regional ground water flow.

RESPONSE: The majority of the contaminants detected in the ground water are heavier than water and will sink to the bottom of the aquifer. There is no evidence, however, to suggest that these contaminants are backtracking and migrating north.

COMMENT: One local official wanted to know what monitoring wells were used to determine the extent of the ground water contamination plume.

RESPONSE: EPA obtained the data from 87 monitoring wells to determine the extent of the contamination plume. The data was based on information collected from several sources which include: 49 wells installed by EPA during the remedial investigation; 26 wells installed by SLI to meet closure plan requirements; and 12 wells on the Hoeganaes Corp. property.

COMMENT: A citizen asked which municipal wells would be affected first if the plume continued to extend further southeast, and wanted to know what was being done to prevent the plume from reaching these wells.

RESPONSE: According to the New Jersey American Water Authority (NJAWA), the first wells that would be impacted are the New Albany Road well and the Pomona Road well. However, if the wells became contaminated, an interconnected water supply system would enable NJAWA to shut down the contaminated wells and still provide the community water from other wells in the area.

In order to prevent contamination of the public water supply, EPA will coordinate with NJAWA during the design and construction phase of the cleanup to avoid unnecessary strain on the aquifer. Since the rate of migration could increase relative to increased pumping at wells near the site, NJAWA stated they could alter their pumping operation pattern to reduce the volume of ground water extracted southeast of the site. This reduction could substantially slow the plume's migration rate and reduce the chances of contamination at the Albany and Pomona Road municipal wells.

COMMENT: A resident wanted to know the volume of ground water that would be treated during the remediation process.

RESPONSE: If Alternative MM-5 (Treatment of Ground Water from Both the Shallow and Deep Aquifers) is selected, approximately 9,340 million gallons of ground water would be treated, over approximately 30 years.

COMMENT: A resident asked how often the municipal wells were tested for contamination.

RESPONSE: A representative from NJAWA stated a routine monitoring program was implemented to include testing of municipal wells on a monthly basis. In accordance with the Safe Drinking Water Act, these results are submitted bi-annually to NJDEP. NJAWA developed this stringent program to ensure good quality drinking water quality to its customers.

COMMENT: One resident wanted to know if there had been any studies conducted to test the water quality at Swedes Lake. He suspects that the lake may be contaminated since he has noticed less wildlife on the lake, and several members of his family had developed a rash after swimming in the lake. He also inquired if the ground water contamination from the Cinnaminson site could eventually contaminate the lake.

RESPONSE: Swedes Lake is parallel to Leon Avenue and lies outside the Cinnaminson study area, so the water quality had not been assessed by EPA. According to the Burlington County Health Department (BCHD), there have been no water quality tests performed on this lake, since it is not an approved swimming area. This lake was originally developed as a retention basin and receives the road run-off from the area. Because of suspected contaminants in the lake, the BCHD strongly suggests that residents do not swim or fish in the lake.

Since the lake is hydraulically upgradient of the landfill, it is unlikely that the landfill is contaminating the lake. However, in response to the concern, EPA will undertake sampling of the lake during the design of the remedial action.

COMMENT: One resident stated that it was difficult for him to obtain information such as the RI/FS report, Proposed Plan, and Superfund update from the information repositories.

RESPONSE: EPA had previously established three information repositories. They were the: Cinnaminson Township Municipal Building; Cinnaminson Township Community Center; and the East Riverton Civic Center Association. To better serve the pubic's needs, one of the repositories has been changed and contact information has been updated. The location of the repositories currently established for the Cinnaminson site are the:

- Cinnaminson Township Municipal Building
  1621 Riverton Road
  Cinnaminson Township, NJ 08877;
  Contact: Grace Campbell, Phone: (609) 829-6000
  Hours of operation: Mon. - Fri. 8:30 a.m. to 4:00 p.m.

- East Riverton Civic Center Association
  2905 James Street
  Cinnaminson Township, NJ 08077
  Contact: Dorothy A. Waxwood, Phone: (609) 829-1258
  Information available upon request

- Cinnaminson Public Library
  1609 Riverton Road
  Cinnaminson Township, NJ 08077
  Contact: Molly Conners, Phone: (609) 829-9340
  Hours of operation:
  Mon. - Thurs. 10:00 a.m. to 8:30 p.m.;
  Fri. 10:00 a.m. to 5:00 p.m.; and
  Sat. 10:00 a.m. to 5:00 p.m. (Except July and August).

Please note that the Cinnaminson Township Community Center repository was eliminated and replaced by the Cinnaminson Public Library repository. The information repositories designated for the Cinnaminson site contain the RI/FS report, Proposed Plan, fact sheets and other site related documents. The Responsiveness Summary and the ROD will also be placed in the repositories. EPA will continue its efforts to keep the community informed of developments related to the Cinnaminson site and to update the repositories.

COMMENT: One resident asked if the soils and/or vegetation near the site were contaminated.

RESPONSE: The RI sample analyses revealed that soil in the vicinity of the site was not contaminated and that the contamination was confined to the ground water.

COMMENT: One citizen wanted to know if the extraction wells, proposed to be installed on residential properties, would be intrusive and unsightly to homeowners.

RESPONSE: EPA intends to make the wells as inconspicuous as possible; however, the deep aquifer extraction wells need to be in place for approximately 30 years. This alone could be disturbing to homeowners. The wells will be contained, in small sheds for example, and placed as far away from the homes as possible. EPA plans to install deep aquifer wells only on properties large enough to accommodate the structure, to limit inconveniences to the residents.

COMMENT: Several residents wanted to know if EPA plans to coordinate its remediation efforts with NJAWA during the construction and implementation phase of the project.

RESPONSE: During the Remedial Design phase of the cleanup, EPA will develop design specifications for the selected alternative. During this time, EPA will consult with NJAWA and other state and local agencies.

COMMENT: One citizen wanted to know if EPA was aware that the State plans to construct an incinerator at the Pennsauken Landfill in Pennsauken, New Jersey. He asked if the incinerator and the operational landfill could contribute further to ground water contamination in the area.

RESPONSE: The Pennsauken Landfill is located at 9600 River Road Pennsauken, New Jersey. According to the NJDEP, Bureau of Resource Recovery, the incinerator has been permitted at the landfill site but construction has been delayed. Because of the location of the Pennsauken Landfill and the proposed incinerator, EPA does not anticipate the landfill to have a detrimental impact on ground water quality at the Cinnaminson site. The incinerator is designed to process approximately 500 tons of waste per day; the ash residual will be deposited at the landfill. Hazardous waste will not be deposited at the Pennsauken landfill.

COMMENT: A resident asked if the air emissions from the site were harmful.

RESPONSE: Air emissions from the site are not harmful. Ground water is the only medium that has been contaminated.

COMMENT: One citizen wanted to know if the possibility exists that contaminants could be released to the atmosphere during construction of the extraction wells. And, if so, they expressed concern that the public could be exposed to additional health risks because the contamination will no longer be limited to the ground water but released into the atmosphere. He also wanted to know how EPA intends to protect the community from such an occurrence.

RESPONSE: The possibility exists that volatile organic and inorganic compounds could be released into the atmosphere during the well construction process. As a precaution, EPA will develop a Health and Safety Plan (HSP) during the Remedial Design phase of the cleanup.

The purpose of the HSP is to establish policies and procedures, which are in accordance with the Occupational Safety and Health Administration (OSHA) standards, that protect the health and safety of on-site personnel and the community. Included in the plan, workers are required to wear protective clothing and equipment to safeguard them from exposure to contamination. In addition, air quality is monitored to detect any release of contamination into the atmosphere. The HSP also includes a

Community Emergency Contingency Plan in the event of a contamination release. In the rare event of wide spread contamination, nearby residents could be evacuated. This plan details contact information, notification systems and arrangements for community evacuation procedures.

COMMENT: A resident asked if EPA could alter the cleanup plan for this site after signing the ROD, if a more advanced treatment technology was developed.

RESPONSE: According to the current Superfund Amendments and Reauthorization Act (SARA) regulations, it is possible to re-open and modify the ROD. Modifications may also be made to the ROD if the selected treatment technologies prove to be ineffective. If significant changes are made to the ROD, EPA is required to conduct another public comment period such as this one, and would likely hold another public meeting to discuss the modifications.

COMMENT: One citizen wanted to know why it will take five years to treat the perched aquifer and 30 years to treat the deep aquifer.

RESPONSE: There is a much greater volume of water in the deep aquifer; therefore, it will take longer to treat it than the perched aquifer.

COMMENT: One resident asked why the government was planning to spend so much money to clean up the site if there was no immediate health risk to the public.

RESPONSE: In order to fund any cleanup, it must be determined that the site poses an actual or potential risk to the public and/or to the environment. Although the NJAWA public water supply is currently unaffected by the ground water contamination, and there is no immediate risk to the public, the contamination poses a potential threat. It has impacted the environment and created a potential threat to human health, should the plume migrate further and contaminate the municipal wells. Since it is critical to protect our drinking water resources, the objective of this remedial action is to confine the plume and eventually eliminate contamination in the ground water.

B. SOURCE CONTROL ISSUES

COMMENT: Several residents and local officials wanted to know why the Proposed Plan focused on cleaning up the ground water contamination and not the potential sources of contamination including the SLI Landfill, L&L Redi-Mix and DEL-VAL properties. They felt the Proposed Plan did not adequately address source control issues such as evaluating the efficiency of the landfill cap prior to ground water cleanup, and eliminating contamination from underground storage tanks.

RESPONSE: During the RI/FS, EPA identified several potential sources of ground water contamination, including the SLI Landfill. In reviewing the data collected, it was determined that insufficient information was available for some of the sources to address their remediation. In regard to the SLI Landfill, EPA determined that further evaluation is needed to determine if the closure already in place is adequate.

Therefore, EPA has elected to divide the cleanup into different phases of activity, referred to as operable units. Ground water contamination will be addressed in the first operable unit and the principal source control issue will be addressed as a separate operable unit. This phased approach provides EPA with the flexibility to examine source control issues in greater detail while proceeding with the ground water Remedial Design and cleanup activities. The State of New Jersey will be taking the lead in addressing the remediation of a number of suspected sources concurrent with the ground water cleanup.

C. POTENTIALLY RESPONSIBLE PARTY ISSUES

COMMENT: A resident asked who was going to pay for the cleanup.

RESPONSE: EPA replied that, where viable potentially responsible parties (PRPs) exist, they are offered the option of conducting and paying for the cleanup. To date, EPA has used Federal Superfund monies for the RI/FS at the Cinnaminson site. EPA intends to offer the PRPs the opportunity to conduct the Remedial Design and Remedial Action at the site. In the event that the PRPs do not perform or fund the selected remedy, EPA will pay 90 percent of the remedial action cost and the State will pay for the remaining 10 percent. EPA may then pursue legal action for cost recovery from the PRPs.

D. COST ESTIMATION AND FUNDING ALLOCATION ISSUES

COMMENT: One resident wanted to know how the present worth for the remediation alternatives was derived.

RESPONSE: The present worth costs are used to determine and to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year, usually the current year. In conducting the present worth analysis, assumptions must be made regarding the discount rate and the period of performance. In this case, the discount rate, or Cost Factor, is 5 percent and the period of performance is 30 years.

$$\text{Cost Factor} = \frac{(1 + 5\%)^{30\,yrs} - 1}{5\% \, (1 + 5\%)^{30\,yrs}}$$

Therefore, the Present Worth equals the first year cost estimate for operation and maintenance (O&M), multiplied by the 30 year period at a 5 percent discount rate, plus the Estimated Capital Cost. When applied to the preferred alternative, MM-5 with Option C, this equation translates to: [(Estimated O&M Cost) x (Cost Factor)] + Estimated Total Capital Costs = Estimated Present Worth (PW)

[(751,000) x (15.37)] + 8,367,000 = 19,909,870[1]

COMMENT: One citizen asked whether the Cinnaminson site would still be cleaned up if Superfund monies were not reauthorized in 1991.

RESPONSE: For the Cinnaminson site, as for all National Priorities List (Superfund) sites, EPA will first attempt to get the potentially responsible parties (PRPs) to perform the design and implementation of the selected remedy. Should the PRPs refuse to design and implement the selected remedy, EPA will perform these activities using federal funds, pending availability of these funds. EPA would then attempt to recover the cost of all federal activities from the PRPs.

COMMENT: The same resident wanted to know if Superfund monies had already been committed to remediate the site.

RESPONSE: After the ROD is signed, EPA will provide funds for the design of the project. Construction costs will be allocated after the completion of the design. EPA provides 90 percent of those costs; the State provides the remaining 10 percent. Long-term O&M costs are provided mostly by the State.

COMMENT: A resident asked if the cost of the proposed remedial program reflected the cost after a ten year period of inflation.

RESPONSE: The costs shown in the Feasibility Study and the Proposed Plan represent <u>compressed worth</u>. Compressed worth is the amount of money EPA would have to invest now at 8 percent interest in order to have the appropriate funds, including current projections for inflation, available at the actual time the remedial action is implemented.

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[1]The PW that is calculated in the FS varies slightly since this calculation involves estimated costs and rounded down figures.

COMMENT: A resident inquired as to whether the EPA had received bids from contractors for the cleanup, or whether the proposed budget was an estimate.

RESPONSE: The proposed budget was an estimate for the relative evaluation of cost. Therefore, the actual cost could be less or more than the number presented.

E. PROPERTY ISSUES

COMMENT: Several residents were concerned that a Superfund site in their neighborhood could have an adverse affect on the property value in the area. They wanted to know if EPA would compensate or reimburse them for any incurred loses.

RESPONSE: EPA explained that residents have three courses of action. First, they could contact the NJDEP regarding the Spill Compensation Act to determine the applicability of this act to their situation. Second, residents have the option to take legal actions against the PRPs. Third, EPA suggested that citizens could have their property reassessed. If the appraised worth is lower than its current worth, residents may qualify for a reduction in their property taxes.

COMMENT: One resident wanted to know if their property could be condemned because of the underlying contaminated aquifer.

RESPONSE: Since the ground water contamination poses no immediate health threat to residents and the local community, it is unlikely that their property could be condemned.

COMMENT: Residents wanted to know if they had the legal right to refuse access to EPA, thereby interfering with EPA's plans to install extraction wells on their property.

RESPONSE: EPA is permitted to install extraction wells on private property only with the owner's consent. The owner would be asked to sign an access agreement which would authorize EPA to proceed with the well construction plans. However, if the owner does not consent to the access agreement, EPA is not permitted on their property, unless a court order is obtained.

IV. WRITTEN COMMENTS AND RESPONSES

This section contains all written comments received by EPA during the public comment period as well as EPA's written responses to those comments.

EPA RESPONSE to D.M. KLOTZ's JUNE 13, 1990 COMMENT LETTER

COMMENT: Which company will be selected to do the overall cleanup?

RESPONSE: If the Superfund is used to fund the cleanup, EPA will provide money to the U. S. Army Corps of Engineers (COE) to oversee both the design and the construction of the remedy. The COE will select the best qualified company, through their Federal contract award procedures. If potentially responsible parties elect to manage the cleanup, EPA will oversee and approve all work.

COMMENT: If it was Waste Management or a subsidiary, how do you justify giving them the work?

RESPONSE: If Waste Management and/or other PRPs wish to manage the work, EPA would ask them to sign a legal consent order which would require them to perform the remedy as stipulated in the Record of Decision. EPA would oversee and approve all work throughout the cleanup.

COMMENT: What department(s) in the NJDEP will be supporting the EPA in this cleanup effort?

RESPONSE: The Division of Hazardous Waste Management will be supporting the EPA in this cleanup effort.

COMMENT: Is there any coordination among NJDEP's Water Resources, Allocations, Hazardous Waste, etc?

RESPONSE: The Division of Hazardous Waste Management in NJDEP works closely with EPA on all Superfund sites in New Jersey. That division coordinates internally with all other involved program offices in the NJDEP on Superfund site issues.

COMMENT: Since the petroleum underground storage tanks will not be addressed under this Plan, when will they be addressed?

RESPONSE: The petroleum underground storage tanks will be addressed under New Jersey State regulatory authorities.

COMMENT: Will there be a separate public hearing?

RESPONSE: NJDEP has specific regulatory procedures for addressing individual leaking underground storage tanks. NJDEP should be contacted directly to determine whether public meetings or hearings would be planned.

COMMENT: Will there be added cost?

RESPONSE: The Superfund law does not cover underground petroleum storage tanks, nor spills of petroleum products. Therefore, no additional costs for leaking tank cleanups would be eligible under Superfund.

COMMENT: According to Camp, Dresser & Mckee (CDM), contamination is in both the shallow and regional (PRM) aquifer. What do you estimate the cone of influence to be?

RESPONSE: A cone of influence does not exist in the shallow or the regional (PRM) aquifer. In general, a cone of influence is created by an extraction well when water is being pumped from the ground. The approximate extent of ground water contamination is represented in Figure 1 of the ROD.

COMMENT: The SLI Superfund site has many of the same characteristics and background history as the Pennsauken Landfill located on River Road including the same contaminants. The Pennsauken site is also supposed to undergo remedial cleanup as well. Is there any coordination between NJDEP and EPA pertaining to these two sites? If wells are needed for the Pennsauken site, what effect will these wells have on the Cinnaminson cleanup or water supply wells in the area?

RESPONSE: The Pennsauken Landfill is located at 9600 River Road in Pennsauken, New Jersey; it is not a Federal Superfund site. Because of the location of the Pennsauken Landfill and proposed incinerator, EPA does not anticipate that they will have a detrimental impact on the Cinnaminson's ground water cleanup activities or on the public drinking water wells.

COMMENT: How many gallons of water per day will be taken from the 130 wells?

RESPONSE: Approximately 318,240 gallons of water per day will be taken from the shallow aquifer.

COMMENT: How many from the other seven wells required for the regional aquifer?

RESPONSE: Approximately 806,400 gallon per day will be taken from the regional aquifer.

COMMENT: Will there be more wells needed for the regional aquifer?

RESPONSE: The conceptual design described in the Record of Decision may be modified somewhat during the actual Remedial Design of the remedy; perhaps, more wells may be needed or locations changed. EPA will continue to keep interested citizens informed as work progresses during both the design and the remedial action.

COMMENT: What influence will the draw from these wells have on the drinking supply wells located two miles south?

RESPONSE: The EPA wells will be drawing ground water from the regional aquifer at a lower rate than the drinking water wells. EPA believes that the lower extraction rate will not influence the drinking water wells. EPA will coordinate cleanup activities closely with the New Jersey American Water Company.

COMMENT: What influence will these extraction wells have on the Delaware River since they are hydraulically connected?

RESPONSE: Due to the rate at which the extraction wells will be pumping ground water from the regional aquifer, EPA believes that the extraction wells will not influence the Delaware River.

COMMENT: Regarding risk from ingestion of ground water from the perched water zones, do local farmers water from the perched or regional aquifer?

RESPONSE: Hunter's Farm is the only farm that is located close to the study area. Hunter's Farm receives drinking water from the New Jersey American Water Company; pond water is used for crop irrigation.

COMMENT: What health risk analysis have been done on absorption via the skin of the ground water from the perched or regional aquifer?

RESPONSE: The risk assessment prepared for the site identified the potential ingestion of contaminated ground water from the regional aquifer as the only significant threat.

COMMENT: At what velocity does the plume travel?

RESPONSE: The estimated average lateral velocity of the contaminated ground water in the regional aquifer is 35 feet per year.

COMMENT: Under Administrative Controls, a general warning is to be placed on new well installations for potable water, would the general public be notified through the mail or as a special notice on their bills?

RESPONSE: Administrative controls involve the State or local governments placing general warnings on new well installation permits to warn of the potential health risks involving the use of the ground water for potable purposes. Therefore, applicants for new well installation permits will be notified of the general warning, but not the general public.

COMMENT: Under Alternatives MM-3, MM-4 (MM-5C), will there be on-site treatment? If so, how much and what type of construction would take place?

RESPONSE: Yes, there will be on-site treatment. All of the extracted water will be treated in the treatment plant. Construction components will include: extraction wells, piping to convey the extracted ground water to an on-site treatment plant, and reinjection wells.

COMMENT: How would this affect the contamination plume?

RESPONSE: The construction activities, in and of themselves, will not affect the contaminated plume. When construction is completed, the combined process of extracting, treating, and reinjecting the ground water is expected to reduce the contaminated plume.

COMMENT: Under Option C: Chemical precipitation/biological granular activated carbon treatment.

a) How is the chemical precipitation controlled?
b) What chemicals would be used and what airborne particulates and gases will be emitted?

RESPONSE: In the chemical precipitation process, lime would be added to the contaminated water to induce metals and solids precipitation. In order to prevent air pollution, all treatment units will be designed to ensure that there will be no air emissions. For example, the equalization tank, the chemical precipitation, and the filtration process units would be equipped with floating covers to prevent loss of volatile chemicals.

COMMENT: What constitutes a waiver for an ARAR? And, who grants such a waiver?

RESPONSE: There are six circumstances when ARARs can be waived by the Regional Administrator of EPA, they include:

1) compliance with the ARAR is technically impracticable,
2) the remedial action selected will attain a standard of performance that is equivalent to that required under the ARAR using another method or approach,
3) compliance with the ARAR will cause a greater risk to health and the environment,
4) the remedial action is an interim measure to be followed by a complete measure,

5) the State has not consistently applied the ARAR, and
6) the remedial action will not provide a balance between the need for protection of public health, welfare and the environment and the availability of the amounts from the Superfund to respond to other sites.

COMMENT: The EPA and NJDEP both preferred Alternative MM-5C. Does that fill the requirement of state acceptance? Would there be any modifications to this alternative and would the public be notified?

RESPONSE: EPA and the NJDEP work closely together on all Superfund sites in the State of New Jersey. EPA gives formal notice of State concurrence (or non-concurrence) in both the Proposed Plan and the ROD. The public is notified of any major modifications to the remedy selected in the ROD.

COMMENT: Is the cost of the cleanup fixed or will it escalate during the 30 year duration?

RESPONSE: The cost presented in the Proposed Plan and the ROD is an estimate of the cleanup cost over a 30 year period. A better cost estimate will be determined during the design phase of the remedy.

COMMENT: What effect does the soil contamination at the Smythwycke development located at Church & Forklanding Roads have on the local drinking supply wells?

RESPONSE: Currently, NJDEP is investigating the soil contamination at the Smythwycke development. Preliminary sampling results indicated that the soil is contaminated with metals and pesticides. Additional investigations are needed to determine the extent of the soil and the ground water contamination. With the limited sampling information that is presently available, any effects that the soil contamination may have on local drinking water wells can not be determined at this time.

COMMENT: What remedial action is planned for the Smythwycke site? And, how will that cleanup affect both the Cinnaminson project and the proposed cleanup for Pennsauken?

RESPONSE: Additional information on the extent of the soil contamination is needed before NJDEP can evaluate and develop a remedial action plan for the site.

COMMENT: Is there a grand plan or coordinating effort to protect overall health and welfare of our communities in regard to all the contaminated sites in the area (Cinnaminson, Pennsauken, Swope, etc.)?

RESPONSE: EPA works together with the NJDEP under a variety of Federal and State legal authorities to address all of these problem sites.

COMMENT: While I am in favor of the cleanup, what preventative measures will be taken to allow permanent recharge to the aquifer without further contamination?

RESPONSE: The current landfill cap is designed to reduce the infiltration of rain water into the landfill, thereby decreasing the further migration of the contaminated plume. EPA will be monitoring the effectiveness of the landfill cap during the ground water remediation, which is expected to drain the landfill of much of its remaining contaminants during the course of the 30 year remedial action.

COMMENT: Will there be any restrictions placed on industrial growth or housing developments in the Tri-boro area?

RESPONSE: No restriction will be placed on industrial growth and housing developments in the Tri-boro area as a result of the Superfund remedial action.

EPA'S RESPONSE TO COMMENTS FROM JONATHAN PULSIFER

COMMENT: Our wells along with all other potable wells in a given radius should be included in an ongoing monitoring program.

RESPONSE: EPA is required to limit authorized monitoring and remedial activities to those actions which relate directly to the Superfund site. The well locations described in your letter are not located in, or near, the contaminant plume defined for the site.

EPA'S RESPONSE TO COMMENTS FROM SYLVIA & JOSEPH TAYLOR

COMMENT: I call on you and the Federal EPA to include five wells in your monitoring process. These wells are all within 1/2 mile of the site you are covering.

RESPONSE: EPA is required to limit authorized monitoring and remedial activities to those actions which relate directly to the Superfund site. The well locations described in your letter are not located in the contaminant plume defined for the site.

COMMENT: Get the owners of the landfill to pay a large share of the costs. There is no reason for all this cost to be borne by taxpayers.

RESPONSE: The Superfund law authorizes EPA to pay for site cleanups only when potentially responsible parties cannot be found, or if they refuse to participate in the clean-up. After the ROD is signed, EPA will determine whether any PRPs are interested in doing, or paying for, the work. If EPA continues to use government funds to pay for the cleanup, the agency can take legal action to attempt to obtain reimburse-ent of costs.

COMMENTOR: FORD ELECTRONICS AND REFRIGERATION CORPORATION (FERCO)

COMMENT: FERCO is not persuaded that a state ARAR exists that would necessitate pumping and treating the "shallow aquifer". Thus, much of the proposed remedy (MM-5C) which includes pumping and treating the perched water in addition to the lower aquifer is unnecessary, wasteful and not legally required.

RESPONSE: The New Jersey Department of Environmental Protection was contacted prior to initiation of the feasibility study to determine if it would consider the perched zone (shallow aquifer) as part of the Potomac-Raritan-Magothy (PRM) aquifer. The NJDEP stated that it did. In addition, the perched zone is hydraulically connected to the PRM. Consequently, contamination from the perched zone will migrate to the PRM if not remediated. Therefore, NJDEP ground water standards apply to the perched zone, and ground water pumping and treating from this zone was included in the FS.

COMMENT: Inadequate consideration appears to have been given to "soil flushing" technology.

RESPONSE: Soil flushing of the SLI Landfill was not included as a source control alternative because of the low permeability of landfill materials, and the potential to spread contamination further. Because of the low permeability, water added to the landfill would move very slowly through the compacted trash, raising the saturated water level within the fill, potentially increasing the rate of movement of leachate to the perched zone, and spreading the contamination to additional areas.

COMMENT: FERCO is unconvinced that the very dilute levels of inorganics are treatable by conventional chemical precipitation.

RESPONSE: Treatment for inorganics is required because inorganics were detected at concentration levels that exceeded MCLs. Chemical precipitation is a proven technology for inorganics; however, as stated in the FS Report, treatability studies will be required to verify the effectiveness. A different treatment technology could be considered, if it could meet ARARs.

COMMENT: FERCO disagrees that any sludge generated during the treatment process would necessarily be considered hazardous either as a listed waste or characteristic waste.

RESPONSE: It is quite possible that the sludge generated during the treatment process would be hazardous. The sludge characteristics and the appropriate handling techniques will be determined during treatability studies for the treatment process.

COMMENT: Other contributing sources should have been given greater attention throughout the RI/FS process.

RESPONSE: Source-specific remediation for sources other than the SLI Landfill were not considered in the FS. Other contributing sources, such as underground petroleum storage tanks and other commercial facilities, which are not regulated by Superfund, will be handled under New Jersey State law and regulations.

COMMENTOR: AMERICAN WATER WORKS SERVICE CO., INC.

COMMENT: Before the collection wells and the discharge wells are cited for the remedial project, a ground water model must be created to reflect what is actually going on within the deep aquifer.

RESPONSE: Additional ground water modeling (as requested by the commentor) can be performed as part of the remedial design.

COMMENT: When the existing monitoring wells were installed, PVC (polyvinyl chloride) casing and screening were used.

RESPONSE: EPA monitoring wells were constructed of stainless steel.

COMMENT: Because of the nature of the technology being utilized for the ground water cleanup together with the fact that the discharge from the on-site treatment plant is going to be injected into the aquifer, American Water Works Service Co. requests permission to have access to the site for the purpose of collecting samples of the water being discharged into the aquifer.

RESPONSE: NJDEP regulations covering the sampling of treated effluent will apply. The American Water Works Service Co. will be able to review analytical data concerning the treated water being discharged into the regional aquifer.

COMMENT: Since the quality of water in the production wells of New Jersey American Water are free from any volatile contamination, the quality of the discharge water from the treatment plant should be of the same quality, or at the worst, meet the maximum contaminant levels as established by New Jersey Department of Environmental Protection for drinking water supplies.

RESPONSE: The treated effluent will meet, at a minimum, Federal and State maximum contaminant levels.

COMMENT: Will the New Jersey American Water Company be eligible for Superfund cleanup money or remedial treatment of these wells if the contaminant plume reaches its wells?

RESPONSE: If the New Jersey American Water Company's wells are affected by the contaminated plume from the site, Superfund cleanup monies could be used to remediate the problem.

COMMENTOR: SANITARY LANDFILL, INC (SLI)

SLI submitted its comments in the form of a letter, dated July 30, 1990, from Katten, Muchin & Zavis, with various attachments including SLI's previously submitted comments concerning the RI (letter dated October 16, 1989); all submitted materials are part of the Administrative Record. The EPA has previously responded to these comments on the RI in its report dated July 11, 1990, which is part of the Administrative Record for the site. SLI had a consultant (GeoServices Inc, Consulting Engineers) prepare a report of the Cinnaminson RI/FS and has included this report entitled Review of the USEPA Remedial Investigation and Feasibility Study, Cinnaminson Study Area, Cinnaminson, New Jersey, as an additional attachment to its July 30, 1990 letter. SLI's findings and comments are summarized in Section 7 of the report. EPA's responses to SLI's comments will follow the order of the findings as set forth in Section 7.

COMMENT: The preferred remedial alternative does not meet the primary remedial objective, to protect public health and the environment. Ground water modeling and a review of available data indicate that implementation of the preferred remedial alternative would actually increase the threat of human health effects and environmental damage.

RESPONSE: This is incorrect. The preferred remedial alternative meets the primary remedial objective, to protect public health and the environment. The extraction and treatment system will be designed to capture the contaminants that are impacting the aquifers and posing a threat to municipal drinking water wells. The extracted water will be treated to meet State and Federal drinking water standards before it is reinjected back into the regional aquifer. The Environmental Protection Agency (EPA) believes that over time, the extraction and treatment system will reduce the levels of contaminants in both the shallow and regional aquifers, and prevent the future migration of the plume toward the municipal drinking water wells. In addition to the extraction and treatment systems, EPA will also install monitoring wells to evaluate the effectiveness of the remedial action and the current landfill cap. By reducing the contamination levels in the ground water and preventing further migration of the plume, the extraction and treatment system will actually eliminate the threat to human health and the environment.

COMMENT: Implementation of the preferred remedial alternative will not result in a significant reduction of contaminant concentrations in either the shallow perched zones or the PRM Aquifer to acceptable levels during the implementation period (30 years). In fact, water quality following the implementation period will be degraded.

RESPONSE: Over time, the preferred remedial alternative will result in significant reduction of contaminant concentrations in both the shallow and regional aquifer. Extracting the contaminated water from the shallow aquifer will reduce the amount of contaminants flowing downwards into the regional aquifer. Since the regional aquifer will be extracted concurrently with the shallow aquifer, EPA believes that the combination will reduce the contaminant concentrations and return both aquifers to drinking water quality.

COMMENT: There are other significant areas of ground water contamination than the landfills contributing to ground water contamination in the Cinnaminson Study Area. The preferred remedial alternative does not address either the source areas or the primary pathways of migration. Instead, the preferred remedy focuses on so-called "hot-spots" identified by the EPA Remedial Investigation (RI).

RESPONSE: EPA is aware of the other potential sources of ground water contamination in the area. The RI Report identified other potential sources, including petroleum underground storage tanks (USTs). The preferred alternative was developed to capture the ground water contaminants from the landfill and those contaminants which have migrated from the other sources, since those contaminants are commingled in the ground water and practically indivisible for treatment. As stated in the Record of Decision, the control of other sources will be addressed under other State and Federal regulations.

"Hot Spots" were used in describing the remediation of the shallow aquifer. The shallow aquifer does not contain significant volumes of water that would allow continuous extraction and treatment. EPA believes that the placement of extraction wells in highly contaminated regions of the shallow aquifer, defined as "hot spots", will be effective. The cone of influence that would be produced by the extraction wells will capture a significant amount of the contaminated water in the shallow aquifer.

COMMENT: Implementation of the preferred remedial alternative will result in an increase in mobility of contamination from other sources. The increase in mobility will be caused by spreading the more highly contaminated ground water from the source areas to previously uncontaminated or less contaminated areas of the aquifer.

RESPONSE: EPA does not believe that the preferred remedial alternative will spread more highly contaminated ground water from source areas to previously uncontaminated or less contaminated areas of the aquifer.

After all of the data were carefully analyzed, the RI identified the two SLI Landfills as the major sources of ground water contamination. In addition to the landfills, the RI identified several other potential sources, in close proximity to the landfills, which are contributing to the ground water problems in the area. During the design, additional ground water data will be gathered and the extraction system will be designed in detail. If it is determined during the design that contamination from other sources will contaminate previously uncontaminated areas of the aquifer, modifications to the conceptual configuration of the extraction system will be made.

COMMENT: The screening, evaluation, and selection of the preferred remedial alternative was based on an inaccurate understanding of site conditions, geology, and hydrogeology. This led to an inappropriate evaluation of remedial technologies and selection of a remedial alternative which does not fit site conditions. Ground water quality will degrade over time if the preferred remedial alternative is implemented in the Cinnaminson Study Area.

RESPONSE: To understand the site conditions, EPA carefully evaluated the information collected from both geological and hydrogeological studies that were conducted at the site. The studies and data are presented in the Final RI Report. Given the extensive studies that were conducted at the site, EPA believes that the preferred remedial alternative is appropriate and will not degrade the ground water quality in the area.

COMMENT: The treatment system selected for the organics recovered from ground water (biological granular activated carbon) is not appropriate for the organics in the study area.

RESPONSE: Biological granular activated carbon is a proven technology for the treatment of the organic compounds detected in the Study Area. Nevertheless, as stated in the FS Report, treatability studies will be performed to verify the effectiveness of the treatment system. If necessary, another treatment process will be utilized.

COMMENT: It would be impractical and extremely inefficient to deploy the recovery wells as described in the EPA feasibility study (FS).

RESPONSE: As stated above, the extraction wells will be placed at the edge of the contaminated plume and in the path of the oncoming ground water. Deploying the wells in this manner will capture the contaminated ground water from all sources in the area. In addition, as stated above, further analysis will be done during the remedial design to ensure the efficiency of the ground water extraction system.

COMMENT: The preferred remedial alternative does not consider the beneficial impacts of the existing vapor extraction systems on long-term water quality.

RESPONSE: The existing vapor extraction system is designed to extract gases from the landfills to protect the existing caps. The system is not intended to remediate the contaminated ground water.

However, soil vapor extraction for ground water remediation was considered in the FS, but was screened out because of a number of site-specific conditions which may preclude the use of vacuum extraction at the site. The most difficult condition to overcome is the heterogeneous nature of the soils at the site. The permeability and nature of these materials will vary significantly throughout the site and, in some cases, the permeability will be relatively low. Due to the potential difficulties that would prevent the successful implementation of this technology, it was not retained for further consideration.

COMMENT: The preferred remedial alternative does not consider the beneficial impacts of biodegradation on long-term water quality.

RESPONSE: In-situ biological treatment was considered in the FS, but was also screened out for further evaluation for several reasons; for example, the technology cannot meet the ground water cleanup standards, which would allow it to be considered a viable alternative. In addition, EPA believes that biodegradation would not be effective in reducing the mobility of the contaminated ground water over the long term.

COMMENT: The present worth of the preferred remedial alternative is extremely high ($20,475,000) relative to the predicted benefit.

RESPONSE: After a careful analysis of the remedial alternatives presented in the FS report, EPA believes that the preferred alternative is protective of human health and the environment, reduces the toxicity, mobility and volume of the contaminants, and provides a permanent solution to the ground water problems at the site. In balancing the beneficial effects of the remedy with its cost, EPA believes that the remedy is cost effective and necessary to remediate the ground water contamination problems.

COMMENT: The preferred remedial alternative does not address contamination from the SLI northwest landfill. This is due to the improper assumption that site conditions at the northwest and southeast landfills are similar.

RESPONSE: The preferred remedial alternative does address the SLI northwest landfill. EPA will install a total of 20 extraction wells in the shallow aquifer surrounding the northwest landfill. The RI report indicated that the contaminants in the regional aquifer beneath the northwest landfill have migrated to the southeast landfill. The regional aquifer extraction system will capture the contaminants flowing from both landfills and other potential sources in the area.

COMMENT: The preferred remedial alternative will likely fail due to increases in concentrations of organic constituents in the monitoring wells over time. These increases in contamination may result from migration of highly contaminated ground water from other sources towards the recovery systems, or because of the inefficiency of the proposed recovery systems relative to leakage from the landfills.

RESPONSE: The treatment system is designed for average ground water concentrations detected during the RI. It is not expected that these levels will increase over time to levels high enough such that the treatment system will not be effective.

COMMENT: The preferred remedial alternative will likely fail because the remedial technology selected from treatment of organics (biological granular activated carbon) is inappropriate for some of the primary organics in the contaminated ground water.

RESPONSE: As stated before, biological granular activated carbon treatment is believed to be appropriate for all of the organics detected in the ground water. Treatability studies will indicate the effectiveness of this technology.

COMMENT: The preferred remedial alternative will likely fail due to the ground water recovery system capturing only a very small percentage (less than 2%) of the overall leakage from the landfill.

RESPONSE: The ground water extraction system is intended to capture the overall leakage from the landfills, in addition to removing ground water from areas of the regional aquifer which are contaminated.

COMMENT: The preferred remedial alternative is incapable of achieving the remedial objectives for the Cinnaminson Study Area.

RESPONSE: The preferred remedial alternative was developed specifically to achieve the remedial objectives for the site. The remedial objectives for the site are to: return the aquifers to drinking water quality and prevent the further migration of the contaminated plume. The extraction and treatment systems are designed to effectively extract and treat the contaminated water to meet State and Federal standards.

COMMENT: Other sources of ground water contamination have a significant impact on the threat to public health and the environment and would have a detrimental effect on the preferred remedial alternative. The volume of discharge from the other sources may be relatively small compared to the discharge from the two SLI landfills. However, the mobility and toxicity of the ground water contamination from the other sources is much higher, resulting in a major impact on the threat to public health and the environment.

RESPONSE: Other sources of ground water contamination may have a significant impact on the threat to public health and the environment, but will not have a detrimental effect on the preferred remedial alternative. The preferred remedial alternative was developed, and will be designed, to address the contamination in the aquifers from all sources. The volume and concentrations resulting from all sources will be considered in designing both the extraction and the treatment systems.

COMMENTOR: HERCULES INCORPORATED

COMMENT: The only exposure scenario which presents a potential for health risks was that of exposure via ingestion of ground water from wells drilled on the contaminated site. Based on the risk summary for carcinogens presented in the Feasibility Study, excess lifetime cancer risks from ingestion of the contaminated ground water predominantly range between 10^{-6} and 10^{-4} for the average case. This is an acceptable range of risk by EPA criteria.

RESPONSE: The plausible maximum risk for the perched water zones and the regional aquifer are 1×10^{-3} and 6×10^{-3} respectively, which establishes a risk which is higher than the accepted range. Furthermore, contaminants exist in the perched zones and the regional aquifer that exceed the Maximum Contaminant Levels (MCLs), which are the drinking water standards to be met.

In addition, the Hazard Indices (noncarcinogenic risks) associated with the ingestion of ground water from the perched water zones and the regional aquifer are 2 and 20, respectively, for the plausible maximum cases. A hazard index greater than 1 indicates that potential exists for non-carcinogenic health effects to occur as a result of site-related exposures.

COMMENT: Monitoring showed no migration of the chemical plume toward public wells and the recommendation for continued monitoring is appropriate.

RESPONSE: Monitoring well data and ground water flow data collected during the Remedial Investigation show a strong potential for the municipal drinking water wells to eventually be affected by the contaminants in the groundwater. In addition to the active remediation of the ground water to be performed under the selected alternative, monitoring of the aquifer will continue.

COMMENTOR: DEL VAL, INK AND COLOR, INC

Del Val submitted a letter dated June 1, 1990 transmitting a report, Rebuttal to Cinnaminson Ground Water Contamination Study Final Remediation Report, November 1989, prepared by their consultant, SMC Environmental Services Group. EPA's detailed responses are contained in a response dated July 31, 1990. Both the SMC report and EPA's response is part of this Responsiveness Summary. Del Val's letter summarizes the consultants conclusions as follows:

COMMENT: It can be concluded that there is no evidence presented which confirms the conjectures stated several times [in the Remedial Investigation Report] that Del Val is a source of contamination.

RESPONSE: Monitoring well sampling data from the remedial investigation indicates that Del Val is one likely source of some contamination, specifically chloroethane, in the ground water. This determination is based on the following: Chloroethane was found at higher concentrations in the shallow well on the Del Val property and was not found in wells upgradient of the Del Val property. However, while Del Val is suspected of being a source of Chloroethane, it is recognized that they are not the only source.

COMMENT: This consultant concludes that CDM statement is misleading when it refers to Del Val as a possible minor source of contamination since they have not first established the presence of an additional source of contamination downgradient of wells found to contain contamination.

RESPONSE: Again, the pattern of ground water contamination found during the Remedial Investigation suggests that Del Val is a likely source for ground water contamination. The RI recognizes the potential for other sources. The existence of other sources of ground water contamination downgradient does not discount the likely potential that Del Val is also a source.

<u>COMMENTOR: AFG INDUSTRIES, INC.</u>

COMMENT: It appears that treatment of all ground water will be the most expensive alternative and likely unnecessary to actually protect the public interest in question.

RESPONSE: EPA has evaluated all the remedial alternatives presented in the proposed plan in light of this comment and still has concluded that of the alternatives which most effectively address the threats posed by the contaminant plume, the proposed remedy affords the highest level of overall effectiveness proportional to its cost.

COMMENT: We believe that implementation of Alternative MM-5 is contrary to the National Contingency Plan (NCP).

RESPONSE: EPA developed, proposed and selected the remedial action in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 and, to the extent applicable, the NCP.

COMMENT: We would suggest re-examination of the proposed alternatives and implementation of the least cost alternative necessary to protect the public health and environment.

RESPONSE: EPA has re-examined the proposed alternatives in considering this and other comments on the proposed plan and has determined that the remedy proposed is the appropriate remedial alternative to protect public health and the environment and is the most cost-effective.

COMMENTOR: GRINDING BALLS, INC.

COMMENT: I doubt if you are ever going to get good clean ground water in this area as long as it co-mingles with the landfill ground water.

RESPONSE: The ground water contamination from the SLI Landfills, in addition to the ground water contamination from other sources were considered in developing the alternatives and the likelihood of attaining the ground water cleanup objectives. EPA believes that the ground water can be effectively remediated. However, it may become apparent during implementation or operation of the ground water extraction system, that contaminant levels have ceased to decline and are remaining constant at levels higher than the remediation goal. In such a case, the system performance standards and/or the remedy may be reevaluated.

COMMENTOR: PEPPER, HAMILTON & SCHEETZ FOR CHEMICAL LEAMAN

COMMENT: Inadequate consideration has been given to use of soil vapor extraction and bioremedial techniques used at other sites.

RESPONSE: Soil vapor extraction for ground water remediation was considered in the FS, but was screened out because of a number of site-specific conditions which may preclude the use of vacuum extraction at the site. The most difficult condition to overcome is the heterogeneous nature of the soils at the site. The permeability and nature of these materials will vary significantly throughout the site and, in some cases, the permeability will be relatively low. Due to the potential difficulties that would prevent the successful implementation of this technology, it was not retained for further consideration.

In-situ biological treatment was considered in the FS, but was also screened out for further evaluation for several reasons; for example, the technology cannot meet the ground water cleanup standards, which would allow it to be considered a viable alternative. In addition, EPA believes that biodegradation would not be effective in reducing the mobility of the contaminated ground water over the long term.

COMMENT: The proposed plan should be reviewed in light of an EPA memorandum, dated October 18, 1989, which "warn[s] against the full scale implementation of pump and treat as recommended in the proposed plan."

RESPONSE: EPA developed the proposed plan and the Record of Decision utilizing this memorandum. This memorandum was developed because of the difficulties experienced while implementing ground water remediation alternatives. It makes several recommendations, one of which recommends providing flexibility in the selected remedy to modify the system based on information gained during its operation. In the Record of Decision, EPA recognizes the potential difficulties in ground water remediation and has provided the flexibility to modify the system as follows:

> "It may become apparent, during the implementation or operation of the ground water extraction system, that contaminant levels have ceased to decline and are remaining constant at levels higher than the remediation goal. In such a case, the system performance standards and/or the remedy may be reevaluated."

The Record of Decision then goes on to list some potential variations to the operation system to optimize the system's performance.

Appendix A

The Proposed Plan
which was distributed to the public during
the public meeting on May 31, 1990.

Proposed Plan

Cinnaminson Ground Water Contamination Site

Burlington County, New Jersey

EPA

Region 2 — May 1990

INTRODUCTION

This Proposed Plan presents the preferred options for addressing ground water contamination in an area encompassing about 400 acres in the Township of Cinnaminson, in Burlington County, New Jersey. In addition, the Plan includes summaries of other alternatives considered for remediating this site. This document is issued by the U. S. Environmental Protection Agency (EPA), the lead agency for site activities, and the New Jersey Department of Environmental Protection (NJDEP), the support agency for this project. The EPA in consultation with the NJDEP, will select a remedy for the site only after the public comment period has ended and the information submitted during this time has been reviewed and considered.

The EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This document summarizes information that can be found in greater detail in the Remedial Investigation (RI) and Feasibility Study (FS) reports recently completed, and other documents contained in the administrative record for this site. The EPA and the State encourage the public to review these other documents in order to gain a more comprehensive understanding of the site and Superfund activities that have been conducted there.

The administrative record, which contains the information upon which the selection of the response action will be based, is available at:

Cinnaminson Township Municipal Building
1621 Riverton Road
Cinnaminson Township, NJ 08077
Contact: Catherine E. Obert (609) 829-6000

Cinnaminson Township Community Center
Manor Road
Cinnaminson Township, NJ 08077
Contact: Catherine E. Obert (609) 829-6000

East Riverton Civic Center Association
2905 James Street
Cinnaminson Township, NJ 08077
Contact: Dorothy A. Waxwood (609) 829-1258

COMMUNITY ROLE IN THE SELECTION PROCESS

EPA solicits input from the community on the cleanup methods proposed at each Superfund site. EPA has set a public comment period from *May 16, 1990* through *June 15, 1990* to encourage public participation in the selection process. The comment period includes a public meeting at which EPA, with the NJDEP, will present the RI and FS reports and the Proposed Plan, answer questions, and accept both oral and written comments.

A public meeting is scheduled for *May 31, 1990* beginning at 7:30 pm in the Cinnaminson Township Community Center. A public availability session will be held *June 1, 1990* from 10:00 a.m to 1:00 p.m. in the Cinnaminson Township Municipal Building to provide interested parties with an opportunity to discuss the plan.

SITE BACKGROUND

The Cinnaminson Ground Water Contamination Site covers approximately 400 acres in the Townships of Cinnaminson and Delran in Burlington County, New Jersey (See Figure 1). It includes properties bounded by Union Landing Road, Route 130, River Road, and Taylors Lane. The Delaware River is located about 5,000 feet northwest and US Route 130 passes about 2,000 feet southeast of the site. Two small streams, Pompeston Creek and Swede Run, provide runoff from the area into the Delaware River. The site consists of residential and light to heavy industrial properties. The RI report identified several potential sources of ground water contamination, including: the Sanitary Landfill, Inc. (SLI) landfills, L & L Redi-Mix, DEL-VAL Ink and Color, and the Hoeganaes Corporation. The potential sources of ground water contamination on these properties include an unlined landfill, petroleum and solvent underground storage tanks, unlined slurry pits, cooling ponds and local septic systems.

The subject of this Proposed Plan is the ground water contamination in the area. Petroleum underground storage tanks in the area will not be addressed under this Proposed Plan, but will be addressed under other federal and State authorities, such as, the New Jersey Spill Program and the State and Federal Underground Storage Tank Program.

The major contributors to the ground water contamination are two landfills owned by SLI which operated from the 1960's until closure in 1980. The landfills received municipal waste, sewage sludge, food processing wastes, and industrial wastes, including hazardous substances. SLI implemented a closure plan under an agreement with the NJDEP. As part of the closure, the landfills were capped with 18 inches of clay. A landfill gas collection and venting system were also installed, and a ground water monitoring program was initiated. In 1981, NJDEP approved the SLI closure plan.

EPA placed the Cinnaminson Ground Water Contamination Site on the National Priorities List (NPL) of Superfund sites in June 1984. Verification of ground water contamination was based upon the results of quarterly ground water monitoring performed by SLI, as required by the closure plan. Hydrogeological studies and annual reports on ground water quality conducted by Geraghty & Miller Inc.(G&M 1983, 1984, and 1985) for SLI, confirmed the presence of ground water contamination in the area.

EPA initiated an RI in 1985 to determine the presence and impact of all sources of ground water contamination. An RI report was prepared by EPA's consultant, Camp Dresser & McKee Inc.,(CDM) under Contract No. 68-01-6939. The report concluded that the SLI Landfill was the major source of ground water contamination. Del-Val Ink and Color, together with septic systems, unlined slurry pits, and cooling ponds in the local area were identified as additional contributing sources.

Using data gathered from 87 monitoring wells, the RI identified the presence of volatile organic compounds and inorganic compounds, above Maximum Contaminated Levels (MCL) permitted for drinking water, in two separate ground water aquifers. Ground water contamination was detected in the regional aquifer known as the Potomac, Raritan, Magothy (PRM) Aquifer, which underlies the site, and also in perched water zones which lie above the regional aquifer. The regional aquifer flows in a south-southeasterly direction. The perched water zones flow downward into the regional aquifer.

The contaminants in both aquifers consist primarily of the following volatile organic compounds: benzene, ethylbenzene, chlorobenzene, 1,2-dichloroethane, xylenes, trichloroethene, and vinyl chloride. Inorganic contamination includes arsenic, beryllium, cadmium, and cyanide.

SCOPE AND ROLE OF ACTION

The environmental problems and the hydrogeology at the Cinnaminson site are complex. As a result, EPA has decided to address the three main pathways of contaminant migration:

SUMMARY OF ALTERNATIVES

The FS identified two types of actions that would address the ground water problems: Source Control (SC) Alternatives aimed at stopping the further leaching of contaminants into the ground water from the landfill; and Ground Water Management of Migration (MM) alternatives which would address contamination already in the ground water.

In preparing the Feasibility Study, four basic alternatives were considered: no action, containment, treatment, and disposal. Several remedial technologies that could meet ground water cleanup objectives were identified and reviewed for effectiveness, implementability, and cost. Those alternatives which passed the initial screening are highlighted in this section. Descriptions of all of the remedial alternatives evaluated for the Cinnaminson Ground Water Contamination Site are provided in the Feasibility Study Report.

The alternatives evaluated included the following:

Source Control (SC) Alternatives

Alternative SC-1:	**No Further Action**
Alternative SC-2:	**Monitoring and Administrative Controls**
Alternative SC-3:	**RCRA Capping**

As mentioned previously, the landfill was capped with 18 inches of clay. Currently, the cap is effectively acting as a barrier to the infiltration of rain water into the landfill, which reduces further migration of the contaminated ground water plume. Maintenance of the existing cap and the installation of a ground water control system will provide additional information on the long-term effectiveness of the cap. At that time any added benefits of installing a full RCRA cap can be evaluated. Therefore, Alternatives SC-1, SC-2, and SC-3 will not be discussed in this document, but will be considered again after the selected management of migration (ground water control) system is in place and operating.

Ground Water (Management of Migration) [MM] Alternatives

Alternative MM-1:	**No Further Action**
Alternative MM-2:	**Monitoring and Administrative Controls**
Alternative MM-3:	**Treatment of Ground Water from the Shallow Aquifer (Perched Zone)**
Alternative MM-4:	**Treatment of Ground Water from the Deep Aquifer (Regional Aquifer)**
Alternative MM-5:	**Treatment of Ground Water from Both the Shallow and Deep Aquifer**

Alternatives MM-3, MM-4, and MM-5 each include three separate ground water treatment options. Three are:

Option A: Chemical precipitation with air stripping

Option B: Chemical precipitation with ultra-violet oxidation

Option C: Chemical precipitation with biological granular activated carbon

(MM-1): No Further Action

Estimated Capital Cost:	$0
Estimated Annual O&M Cost:	$15,000
Estimated Present Worth:	$41,600
Implementation Period:	None

The National Contingency Plan (NCP) and CERCLA require the evaluation of a No Further Action alternatives as a basis for comparison with other remedial alternatives. The No Further Action alternative consists of only those actions required by the existing SLI Landfill closure plan, which includes: ground water monitoring within the plume boundaries, maintenance of site fencing and the landfill cap, and controlling access to the

Option C: Chemical precipitation/biological granular activated carbon sludge treatment

Estimated Total Capital Cost: $8,093,000
Estimated Annual O&M Cost: $649,000
Estimated Present Worth: $18,633,000
Implementation Period: 5 years

Option C uses biological granular activated carbon treatment to extract the organic. In this treatment method, contaminated ground water would be pumped to an aeration basin after chemical precipitation. In the aerated basin, the contaminated water would be mixed with granular activated carbon and biological solids. Following oxidation of the organic contaminants, the mixture would be settled in a clarifier, with the overflow becoming the treated effluent. Excess biological solids and spent carbon would be collected and handled as a regulated material. Bench scale treatability studies during design would determine unit sizes and demonstrate performance. Following on site treatment, the effluent would be discharged to injection wells.

(MM-4): TREATMENT OF GROUND WATER FROM THE DEEP AQUIFER

In this alternative, ground water is extracted only from the deep aquifer. An estimated seven extraction wells would be installed to remove ground water. These wells would be installed in the contaminated plume. The ground water would be extracted and treated by one of the three options presented in MM-3. All three options are capable of treating waters to meet Federal and State standards. Treated waters would be reinjected downgradient of the contaminated plume. It is estimated that the remediation would have to be carried out for at least 30 years.

MM-4 with Option A

Estimated Total Capital Cost: $5,192,000
Estimated Annual O&M Cost: $617,000
Estimated Present Worth: $15,083,000
Implementation Period: 30 years

MM-4 with Option B

Estimated Total Capital Cost: $6,069,000
Estimated Annual O&M Cost: $1,002,000
Estimated Present Worth: $21,879,000
Implementation Period: 30 years

MM-4 with Option C

Estimated Total Capital Cost: $5,628,000
Estimated Annual O&M Cost: $700,000
Estimated Present Worth: $16,796,000
Implementation Period: 30 years

The treatment components of Alternative MM-4 are identical to those for Alternative MM-3 and its subset of Options A, B, and C.

(MM-5): TREATMENT OF GROUND WATER FROM BOTH THE SHALLOW AND DEEP AQUIFERS

This alternative combines the extraction systems from both MM-3 and MM-4 to withdraw contaminated water from both the shallow and deep aquifer. This would include the installation of extraction wells in the perched and the regional aquifers. The contaminated ground water would be treated by one of the three options presented in MM-3. All three options are capable of treating waters to meet Federal and State standards. Treated water would be reinjected downgradient of the plume. It is estimated that the remediation would have to be carried out for at least 30 years.

MM-5 with Option A

Estimated Total Capital Cost: $8,093,000
Estimated Annual O&M Cost: $694,000
Estimated Present Worth: $18,633,000
Implementation Period: 30 years

MM-5 with Option B

Estimated Total Capital Cost: $9,122,000
Estimated Annual O&M Cost: $1,114,000
Estimated Present Worth: $26,810,000
Implementation Period: 30 years

MM-5 with Option C

Estimated Total Capital Cost: $8,367,000
Estimated Annual O&M Cost: $751,000
Estimated Present Worth: $20,475,000
Implementation Period: 30 years

The treatment components of Alternative MM-5 are identical to those for Alternative MM-3, and its subset of Options A, B, and C.

treated to meet the ground water quality criteria specified in N.J.A.C. 7:14A-1, and Federal and State Safe Drinking Water Act Maximum Contaminant Levels (MCLs). This alternative extracts water directly from the contaminated perched water zones and the PRM Aquifer.

The selected treatment process will be evaluated further during the remedial design and modified, if necessary, to ensure that it will meet ground water quality criteria.

ANALYSIS

Overall Protection. All of the alternatives provide some degree of protection. Alternatives MM-1 and MM-2 prevent exposure to ground water contaminants by implementing administrative controls. Alternatives MM-3, MM-4, and MM-5 provide a greater degree of protection by extracting and treating contaminated ground water. Alternative MM-3 provides ground water treatment of the shallow aquifer and allows for natural biodegradation of some contaminants in the regional aquifer. Alternative MM-4 provides ground water treatment of the regional aquifer; contaminants in the shallow aquifer eventually flow into the regional aquifer and are treated. Alternative MM-5 provides direct treatment of both aquifers. Treating both the aquifers would provide greater overall protection of public health and the environment.

Compliance with ARARs. Alternatives MM-1 and MM-2 do not address contaminated ground water. These alternatives do not comply with contaminant-specific ARARs. Alternative MM-3, which treats ground water in the shallow aquifer but not the regional aquifer, would not meet ARARs for the contaminated water in the regional aquifer. Alternative MM-4 (with any of the three treatment options) would be expected to meet all ARARs for only the regional aquifer. Because Alternatives MM-1 and MM-2 would not meet the ground water ARARs, they will not be considered further in this analysis as options. Alternative MM-5C (Option C) would meet ARARs for both the shallow and regional aquifers.

Long-term Effectiveness and Permanence. The preferred alternative would extract the ground water from the shallow and regional aquifers so that it can undergo treatment to destroy the contaminants. In Alternative MM-3, ground water from the shallow aquifer would be extracted and treated, but the regional aquifer would remain contaminated. In Alternative MM-4, the shallow aquifer would remain contaminated.

All of the treatment technology options (A, B, or C) would produce a hazardous sludge which must be handled for the duration of remediation.

Reduction of Toxicity, Mobility, or Volume of Contaminants. Through the use of treatment technologies, alternative MM-3 and MM-4 would reduce the toxicity and volume of contaminated ground water in the shallow and regional aquifers, respectively. Alternative MM-5, which involves extraction and treatment of both aquifers, would reduce the toxicity and volume of contaminants in the shallow and regional aquifers.

Short-term Effectiveness. It is expected that Alternative MM-4 could be started within 18 months. Alternative MM-5 could be started within 24 months and Alternative MM-3 in 12 months. Risks to workers and the nearby community would be minimized during the implementation of each alternative through the use of appropriate engineering controls and comprehensive health and safety planning.

Implementability. Alternatives MM-3, MM-4, and MM-5 utilize extraction wells and pumping systems that are proven and widely used technologies. The hydrogeological characteristics of the regional aquifer allow for easy, continuous removal of contaminated water. Alternative MM-3 and MM-5, which includes extraction of ground water from the shallow aquifer (perched zones) may not be as easy to implement. The hydrogeological characteristics of the perched zones do not allow a large volume of water to be extracted from a single well. The conceptual extraction system for the shallow zone consists of an estimated 130 wells. Due to the large number of wells and the amount of connecting piping required to be installed in a commercial residential area, problems with implementation could occur.

Cost. The preferred alternative, MM-5C, would be protective of public health and the environment, and would attain all ARARs in the long term at a cost of $20,475,000.

Glossary

- Aquifer: An underground rock or soil foundation that is capable of supplying water to wells and springs.

- Feasibility Study (FS): The second part of a two-part study Remedial Investigation/Feasibility Study (RI/FS). The Feasibility Study involves identifying and evaluating the most appropriate technical approaches for addressing contamination problems at a Superfund site. The alternatives considered in the FS are evaluated using the nine Superfund criteria, which includes effectiveness in protecting human health and the environment.

- Ground Water: Water that fills spaces between sand, soil rock and gravel particles beneath surface of the earth. Rain water that does not evaporate or drain to surface water such as streams, rivers, ponds, or lakes, but slowly seeps into the ground, forming a ground water reservoir. Groundwater flows considerably more slowly than surface water, often along routes that lead to streams, rivers ponds, lakes and springs.

- Hydrogeologic: A word in reference to the science of hydrology, which studies the interactions among surface water, ground water, and the earth's rocks and soils.

- National Priorities List (NPL): A roster of uncontrolled hazardous waste sites nationwide that pose an actual or potential threat to human health or the environment, and are eligible for investigation and cleanup under the federal Superfund program.

- Perched Ground Water Zone: Unconfined ground water separated from the underlying main body of ground water by an impermeable or semipermeable material.

- Proposed Plan: A document that describes all the remedial alternatives considered by U.S. EPA for addressing contamination at a Superfund site, including the preferred U.S. EPA alternative.

- Remedial Action: A series of steps taken to monitor, control, reduce or eliminate risks to human health or the environment. These risks were caused by the release or threatened release of contaminants form a Superfund Site.

- Remedial Alternative: A combination of technical and administrative methods, developed and evaluated in the Feasibility Study, that can be used to address contamination at a Superfund site.

- Remedial Investigation (RI): The first part of a two-part study Remedial Investigation/Feasibility Study. The Remedial Investigation involves collecting and analyzing technical and background information regarding a Superfund site to determine the nature and extent of contamination that may be present. The investigation also determines how conditions at the site may affect human health the environment.

- Responsiveness Summary: A Section within the Record of Decision that presents U.S. EPA's responses to public comments on the Proposed Plan and RI/FS.

- Superfund: The common name for the federal program established by the Comprehensive Environmental Response and, Liability Act (CERCLA) of 1980, as amended on 1986. The Superfund law authorizes U.S. EPA to investigate and cleanup the nations most serious hazardous waste sites.

Appendix B

Sign-in Sheets
from the Public Information Meeting
held on May 31, 1990 at 7:30 p.m.
in the Cinnaminson Township Community Center and
the Public Availability Session
held on June 1, 1990 from 10:00 a.m. to 1:00 p.m.
at the Cinnaminson Township Municipal Center.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK NEW YORK 10278

CINNAMINSON GROUND WATER CONTAMINATION SUPERFUND SITE

SIGN-IN SHEET

PLEASE BE SURE TO PRINT YOUR NAME AND ADDRESS CLEARLY SO THAT WE CAN ADD YOU TO OUR MAILING LIST:

NAME	ADDRESS
Edmund E. Osowski	Cinnaminson Twp 1621 Manor Rd Cinn.
FRANK A HAMEL JR	DEL VAL INK
	1301 TAYLOR RIVERTON
Christopher Mangan-Councilist	PO Box 5266 Cherry Hill NJ 08034
FRED LAUSER	Burlington Co Health Dept, Woodlane Rd Mt Holly NJ 08060
DAVID MARINO	112 Shenandoah Rd
GEORGE LAIGAIE	1202 LAUREL OAK RD, SUITE 175 VOORHEES NJ 08043
LES SCHAEVITZ	431 N LATCH'S LN MERION PA 19066
[illegible]	PO Box 272 [illegible] Riverside Rd E Riverton 08077
[illegible]	New Weekly
[illegible]	700 Rt 130 N. Suite 108 Cinnaminson 08077
Theresa [illegible]	3000 Church Rd Cinnaminson
ROY W MYERS	25 WOODSIDE LA CINNAMINSON
NANCY MYERS	" " " "
Daniel J. Iannuzzelli	603 Hilltop Rd. Cinnaminson
GARY CRAWFORD	5 DORSET DR MARLTON, NJ 08053
Jack Kunz	38 KENT AVE MARLTON, NJ 08053
[illegible] Taylor	Taylor's Lane Cinnaminson NJ 08077
Tim & Mrs J A Elenteri	2334 Riverton Rd Cinnaminson

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK NEW YORK 10278

CINNAMINSON GROUND WATER CONTAMINATION SUPERFUND SITE

SIGN-IN SHEET

PLEASE BE SURE TO PRINT YOUR NAME AND ADDRESS CLEARLY SO THAT WE CAN ADD YOU TO OUR MAILING LIST:

NAME	ADDRESS
William J. Hess	304 Plantation [illegible]
Phyllis Hess	" " "
Mark Herzberg	10 Harvey St New Brunswick NJ 08901
Walter Trommelen	Burl. Co. Health Dept, Woodlane Rd, Mt Holly Off
Bob Hess	1000 Union Ld Rd.
George L Rogers	2409 Laurel Dr. Cinn. NJ 08077
Robert L Fischer	714 Hilltop Rd Cinn NJ 08077
Edward L Jordan Jr	301 Georgian Dr Cinnaminson NJ 08077
[illegible] Moltz	406 Locust Ave Delran N.J. 08075
Jon Beal	Cinnaminson Twp Engineer - Municipal Bldg.
Richard C Strobel, Esq	2306 Laurel Drive Cinnaminson 08077
J. Jalkiewicz	Burlington County Tres, Rt. 130 [illegible]
V. Pulsifer	Taylor's Lane Cinnaminson NJ 08077
J. Lubitsky	2210 Clover Dr. Cinna. N.J. 08077
[illegible]	2407 Union Rd. Cinna. NJ 08077
John T Reilly	PO Box 321 Cinnaminson NJ 08077-0429
Frank J. Quirus Representing SCI	3329 Street Rd Bensalem PA 19020
Kathleen Kreis Pitney, Hardin, Kipp & Szuch	163 Madison Ave Morristown NJ 07960

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION II

MEETING WITH CITIZENS, CINNAMINSON TWP., N.J.

WEDNESDAY, JULY 25, 1990
CINNAMINSON TWP. MUNICIPAL BLDG.

PLEASE SIGN IN SO THAT WE CAN ADD YOUR NAME TO OUR PERMANENT MAILING LIST FOR THE CINNAMINSON GROUNDWATER CONTAMINATION SUPERFUND SITE

NAME	ADDRESS
DOROTHY EAVES	1603 TAYLORS LN CINN, NJ
[illegible]	1605 Taylors La. Cinn NJ
[illegible]	1700 Union Landing Rd
[illegible]	1900 Union Landing Rd.
Ed [illegible]	1605 TAYLORS LANE
[illegible]	1607 Taylors Lane
[illegible]	1607 Taylors Lane
[illegible]	112 [illegible] Rd
[illegible]	1801 Taylors La Cinn
[illegible]	1705 Taylors La Cinn
[illegible]	1801 Taylors La Cinn
J T [illegible]	1618 Union Landing Rd Cinn
[illegible]	1618 Union Landing Rd Cinn
[illegible]	1807 Taylors La Cinn
[illegible]	1801 Taylors La Cinn
[illegible]	1900 Union Landing "
[illegible]	1905 Taylors Lane
Charles [illegible]	1701 Taylors Lane

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION II

MEETING WITH CITIZENS, CINNAMINSON TWP., N.J.

WEDNESDAY, JULY 25, 1990
CINNAMINSON TWP. MUNICIPAL BLDG.

PLEASE SIGN IN SO THAT WE CAN ADD YOUR NAME TO OUR PERMANENT MAILING LIST FOR THE CINNAMINSON GROUNDWATER CONTAMINATION SUPERFUND SITE

NAME	ADDRESS
[illegible]	1603 Tay[illegible]

Appendix C

Agenda for May 31, 1990 Public Information Meeting

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK NEW YORK 10278

PUBLIC MEETING ON
THE CINNAMINSON GROUND WATER CONTAMINATION SUPERFUND SITE
CINNAMINSON TOWNSHIP, NEW JERSEY

THURSDAY, MAY 31, 1990
CINNAMINSON TOWNSHIP MUNICIPAL BUILDING
CINNAMINSON, NEW JERSEY
7:30 P.M.

A G E N D A

Welcome & Introduction	Ann Rychlenski Public Affairs Specialist U.S. EPA, Region II
General Overview of the Superfund Process & Purpose of Meeting	Charles Tenerella, Chief Central NJ Remedial Action Section, U.S. EPA, Region II
Site History & Results of Remedial Investigation (RI)	Trevor Anderson, Project Manager, U.S. EPA, Region II
Discussion of Feasibility Study & Remedial Alternatives	William Moran, ICF Engineering (EPA's consultant)
Presentation of Proposed Remedial Alternative & Final Summation	Charles Tenerella, Chief Central NJ Remedial Action Section, U.S. EPA, Region II

Questions & Answers

Appendix D

Updated Information Repository List

INFORMATION REPOSITORIES
FOR THE CINNAMINSON GROUND WATER CONTAMINATION SITE

- Cinnaminson Township Municipal Building
  1621 Riverton Road
  Cinnaminson Township, NJ 08877;
  Contact: Grace Campbell, Phone: (609) 829-6000
  Hours of operation: Mon. - Fri. 8:30 a.m. to 4:00 p.m.

- East Riverton Civic Center Association
  2905 James Street
  Cinnaminson Township, NJ 08077
  Contact: Dorothy A. Waxwood, Phone: (609) 829-1258
  Information available upon request

- Cinnaminson Public Library
  1609 Riverton Road
  Cinnaminson Township, NJ 08077
  Contact: Molly Conners, Phone: (609) 829-9340
  Hours of operation:
  Mon. - Thurs. 10:00 a.m. to 8:30 p.m.;
  Fri. 10:00 a.m. to 5:00 p.m.; and
  Sat. 10:00 a.m. to 5:00 p.m. (Except July and August).

Appendix E

Superfund Update

Superfund Update

Cinnaminson Ground Water Contamination Site

Burlington County, New Jersey

Region 2 — May 1990

INTRODUCTION

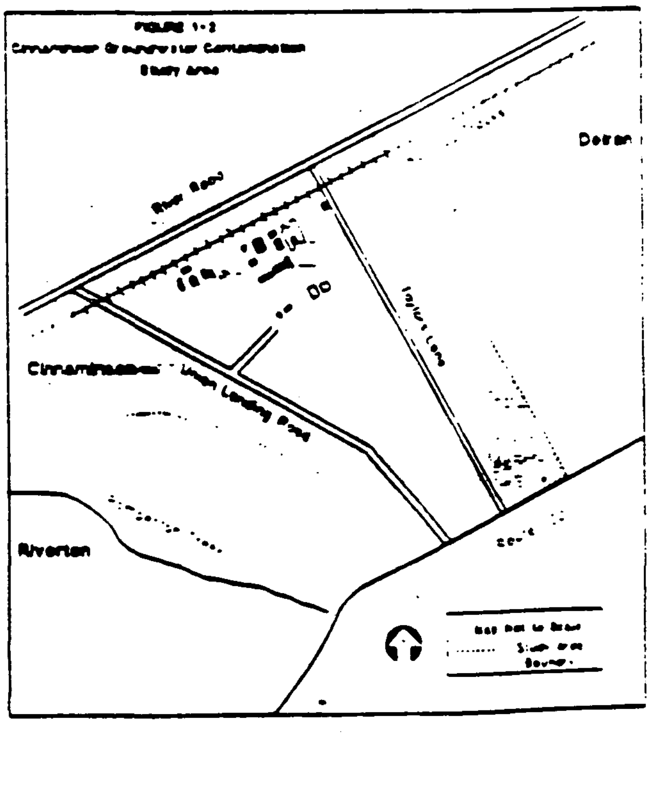
The U.S. Environmental Protection Agency (EPA) is issuing this update to briefly summarize the various remedial investigation and feasibility study activities conducted at the Cinnaminson Ground Water Contamination (Cinnaminson) Site from 1985 to date. For more detail regarding these activities, interested citizens may review the remedial investigation/feasibility study reports at the information repositories established for this site. A list of the repositories is provided on the last page of this update.

SITE BACKGROUND

The Cinnaminson site covers approximately 400 acres in the Townships of Cinnaminson and Delran in Burlington County, New Jersey. It includes properties bounded by Union Landing Road, Route 130, River Road, and Taylors Lane (Exhibit 1). The site consists of residential and light to heavy industrial properties. The Delaware River is located about 5,000 feet northwest of the Site and US Route 130 passes about 2,000 feet to the southeast.

Sand and gravel mining operations were conducted in parts of the site in the 1950s while solid wastes were deposited in previously excavated mining pits on-site. When mining operations discontinued during the late 1960s, larger amounts of refuse and solid wastes were deposited in the mining pits.

Landfilling operations continued until 1981. The landfill was permitted for use as a landfill to dispose of municipal, industrial and institutional wastes, sewage sludge, and food processing wastes. The owner of the landfill, under agreement with the NJDEP, implemented a closure plan for the site in 1981. As part of the closure: a ground water monitoring program was initiated in 1981; and in 1985, the landfills were capped with 18 inches of clay, and a gas collection and venting system was installed. Landfill closure was completed in July 1987.



REMEDIAL INVESTIGATION

In June 1984, the Cinnaminson Site was placed on the National Priority List (NPL) in response to a ground water contamination problem in the vicinity of the Sanitary Landfill, Inc. (SLI) property located in Cinnaminson Township, New Jersey.

There were several potential sources of ground water contamination detected at the Cinnaminson site. Among these sources are two landfills, which are operated by SLI, and a number of surrounding industries in the area. Based on the results from a quarterly ground water monitoring program performed by SLI, the EPA initiated a remedial investigation in 1985. The remedial investigation was performed to determine the nature and extent of contamination and how conditions may affect human health and the environment. A feasibility study followed in 1989 to identify and evaluate the most appropriate technical approaches for addressing site-related contamination problems.

Field activities were conducted between April 1985 and May 1988 to: determine the source(s) of contamination; obtain a better understanding of the hydrogeology in the area; and identify the types, quantities, and locations of contaminants. Using data gathered from 87 monitoring wells, the remedial investigation identified the presence of volatile organic and inorganic compounds in two separate ground water aquifers. The remedial investigation report was finalized in May 1989. The field activities for the remedial investigation included:

- Field Surveys
- Hydrogeologic Investigation
- Ground Water Sampling and Analysis
- Surface Water Sediment Sampling and Analysis
- Potable Well Sampling

· Field Surveys

A field survey was conducted to prepare a site property map, topographic map, and base map of sampling locations.

· Surface Water Sediment Sampling and Analysis

The objective of this task was to identify contaminants in surface water and sediments. Surface water and sediment samples were collected from retention basins as well as in Pompeston Creek and Swede Run. Detected in surface water samples were inorganic compounds, which consisted of heavy metals and cyanide. Heavy metals and two pesticides were detected in sediment samples. Several volatile and semi-volatile organic compounds were also found in both sediment and surface water samples.

· Hydrogeologic Investigation

The hydrogeologic investigation was conducted in conjunction with a geophysical investigation to determine the hydrogeologic characteristics of the site and evaluate the extent of ground water contamination. The investigation consisted of: test boring; bore-hole geophysical surveys; drilling and monitoring well installation; permeability testing; and measuring ground water depth on monthly intervals. Accurate elevations of ground water were obtained and ground water flow directions were developed.

Inorganic and organic contaminants were detected in the regional aquifer, which underlies the site, and also in the saturated perched zones, which lie above the regional aquifer. It was determined that the contaminated landfill leachate migrated along the discontinuous clay layers in the unsaturated zone and ultimately into the regional aquifer.

· Potable Well Sampling

Twelve private wells, which were not serviced by the public supply lines, were sampled to determine whether contamination was present. Following the analysis of the sampling, the potable wells were resampled to verify the results. The results showed that twelve metals, nitrate and one volatile organic compound were detected. Nickel was detected in two wells, and nitrate was detected in one well. However, the only contaminants that exceeded ambient water quality standards were nickel and nitrate.

- **Ground Water Sampling and Analysis**

Ground water quality sampling and analysis was conducted to determine the source (s) and extent of ground water contamination. Samples were collected from previously installed, and newly installed monitoring wells. In summary, the hydrogeologic and ground water data indicated that the two SLI landfills are the major sources of ground water contamination. The extent of contamination appeared to be limited to an area within close proximity of the two landfills and was not present south of US Route 130.

SUMMARY OF RESULTS

The remedial investigation report identified several potential sources of ground water contamination. The report concluded that the SLI Landfill was the major source of ground water contamination. Del-Val Ink and Color, L & L Redi-Mix, and Hoeganaes Corporation were identified as other possible sources. The potential ground water contamination sources on these properties include an unlined landfill, underground storage tanks, unlined slurry pits, septic systems and cooling ponds.

The contaminants in the upper and lower zones consist of the volatile organic compounds benzene, ethylbenzene, 1,2-dichloroethane, xylenes, chlorobenzene, trichloroethene, and vinyl chloride, among others. Inorganic contamination includes elements such as arsenic, beryllium, cadmium, and cyanide. The contamination in the regional aquifer flows in a south - southeasterly direction. The contamination in the perched water zone flows downward into the regional aquifer.

FEASIBILITY STUDY ACTIVITIES

The feasibility study focuses on identifying and evaluating the most appropriate technical approaches for addressing contamination problems that were identified at the site during the remedial investigation. These alternatives are described in detail in the Proposed Plan and the Feasibility Study report.

FOR FURTHER INFORMATION

Interested citizens may review the Remedial investigation and feasibility study report or other site related information at the following information repositories:

Cinnaminson Township Municipal Building
1621 Riverton Road
Cinnaminson Township, NJ 08077
Contact: Catherine E. Obert (609) 829-6000

Cinnaminson Township Community Center
Manor Road
Cinnaminson Township, NJ 08077
Contact: Catherine E. Obert (609) 829-6000

East Riverton Civic Center Association
905 James Street
Cinnaminson Township, NJ 08077
Contact: Dorothy A. Waxwood (609) 829-1258

FOR FURTHER INFORMATION YOU MAY ALSO CONTACT:

Mr. Trevor Anderson
Remedial Project Manager
U.S. Environmental
Protection Agency, Room 711
26 Federal Plaza
New York, New York 10278

June 13,199[illegible]

D.M. Klotz
621 Elm Terrace
Riverton, NJ 08077
(609)829-7562

Mr. Trevor Anderson
Remedial Project Manager
U.S. Environmental Protection Agency
Room 711
26 Federal Plaza
New York, New York 10278

Dear Mr. Anderson,

Thank you for this opportunity to write in comments and inquiries pertaining to the cleanup of the Superfund Site at the old SLI Landfill located in Cinnaminson, New Jersey.

I am a resident of Riverton and the subject of groundwater contamination in the area is a very real concern. Unfortunately, I was unable to attend the public meetings on May 31st and June 1 and therefore, I would like to submit the following questions:

1) Which company will be selected to do the overall cleanup?

2) If it is Wastemanagement or a subsidiary, how do you justify giving them the work?

3) What department(s) in the NJDEP will be supporting the EPA in this cleanup effort?

4) Is there any coordination among NJDEP's Water Resources, Allocations, Hazardous Wastes, etc?

5) Since the Petroleum underground storage tanks will not be addressed under this Plan, when will they be addressed?

6) Will there be a separate public hearing?

7) Will there be added cost?

8) According to Camp, Dresser & McKee (CDM) contamination is in both the shallow and regional (PRM) aquifer. What do you estimate the cone of influence to be?

9) The SLI Superfund site has many of the same characteristics and background history as the Pennsauken Landfill located on River Road including the same contaminants. The Pennsauken site is also supposed to undergo remedial cleanup as well. Is there any coordination between NJDEP and EPA pertaining to these two sites? If wells are needed for the Pennsauken site, what affect will these wells have on the Cinnaminson cleanup or water supply wells in the area?

...1/

10)How many gallons of water per day will be taken from the 130 wells?

11)How many from the other seven wells required for the regional aquifer?

12)Will there be more wells needed for the regional aquifer?

13)What influence will the draw from these wells have on the drinking supply wells located 2 miles south?

14)What influence will these extraction wells have on the Delaware river since they are hydraulically connected?

15)Regarding risk from ingestion of groundwater from the perched water zones, do local farmers water from the perched aquifer or regional?

16)What health risk analysis have been done on absorbtion via the skin of the groundwater from the perched or regional aquifer?

17)At what velocity does the plume travel?

18)Under Administration Controls, a general warning is to be placed on new well installations for potable water, would the general public be notified through the mail or as a special notice on their bills?

19)Under MM-3,MM-4(MM-5C) will there be on-site treatment? If so, how much and what type of construction would take place?

20)How [illegible]uld this affect the contamination plume?

21)Und[illegible]tion C: Chemical percipation/biological granular activated carb[illegible]ludge treatment.
[illegible] is the chemical precipation controlled?
[illegible] chemicals would be used and what airborne particulates [illegible]gases will be emitted?

22)What c[illegible]tes a waiver for ARAR? And who grants such a waiver?

23)The EPA [illegible]P both preferred MM-5C. Does that fill the require-ment of [illegible]ceptance? Would there be any modifications to this alte[illegible] and would the public be notified.

24)Is the cost [illegible] cleanup fixed or will it escalate during the 30 year duration?

25)What affect does the soil contamination at the Smythwycke development located at Church & Forklanding Rds have on the local drinking supply wells.

June 13,1990

D.M. Kletz
621 Elm Terrace
Riverton, NJ 08077
(609)829-7562

Mr. Trevor Anderson
Remedial Project Manager
U.S. Environmental Protection Agency
Room 711
26 Federal Plaza
New York, New York 10278

Dear Mr. Anderson,

Thank you for this opportunity to write in comments and inquiries pertaining to the cleanup of the Superfund Site at the old SCP Landfill located in Cinnaminson, New Jersey.

I am a resident of Riverton and the subject of groundwater contamination in the area is a very real concern. Unfortunately, I was unable to attend the public meetings on May 31st and June 1 and therefore, I would like to submit the following questions:

1) Which company will be selected to do the overall cleanup?

2) If it is Wastemanagement or a subsidiary, how do you justify giving them the work?

3) What department(s) in the NJDEP will be supporting the EPA in this cleanup effort?

4) Is there any coordination among NJDEP's Water Resources, Allocations, Hazardous Wastes, etc?

5) Since the Petroleum underground storage tanks will not be addressed under this Plan, when will they be addressed?

6) Will there be a separate public hearing?

7) Will there be added cost?

8) According to Camp, Dresser & McKee (CDM) contamination is in both the shallow and regional (PRM) aquifer. What do you estimate the cone of influence to be?

9) The SCP Superfund site has many of the same characteristics and background history as the Pennsauken Landfill located on River Road including the same contaminants. The Pennsauken site is also supposed to undergo remedial cleanup as well. Is there any coordination between NJDEP and EPA pertaining to these two sites? If wells are needed for the Pennsauken site, what affect will these wells have on the Cinnaminson cleanup or water supply wells in the area?

...1/

Mr. Trevor Anderson
U.S. E.P.A.
26 Federal Plaza
N.Y., N.Y. 10278

June 1, 1990

Dear Mr. Anderson,

I live with my wife and 4 children on Taylor's Farm at the foot of Taylor's Lane on the Delaware River in Cinnaminson, New Jersey.

Our potable well along with 3 other potable wells that service our immediate neighbors are all within 1/2 mile of the Cinnaminson groundwater contamination site that your agency is currently in the process of cleaning up.

At a public meeting held at the Cinnaminson Community Center on May 31, 1990, you asked for public comment concerning the clean up process.

I feel very strongly that the E.P.A. should include our wells along with all other potable wells within a given radius in an ongoing monitoring program. Results of such monitoring should be mailed to all residents consuming water from potable wells within the monitoring zone on a regular basis.

I assume you intend to continue monitoring your own test wells. Testing and monitoring of the surrounding potable wells, at the same time, would not be terribly expensive.

I look forward to your response.

Very truly yours,

Jonathan Pulsifer
Taylor's Lane
Cinnaminson, NJ 08077

26) What remedial action is planned for Smythwycke? And how will that Cleanup affect both the Cinnaminson project and the proposed cleanup for Pennsauken?

27) Is there a grand plan or coordinating effor to protect overall health and welfare of our communities in regards to all the contaminated sites in the area (Cinn.,Pennsauken, Swope,etc.).

28) While I am in favor of the cleanup, what preventative measures will be taken to allow permanent recharge to the aouifer without further contamination?

29) Will there be any restrictions placed on industrial growth or housing developments inthe Tri-boro area?

In conclusion, I hope a safe and effective procedure can be implemented in the very near future. I hope we can learn from our past and costly mistakes and that we have the wisdom and the courage to take the necessary action to develop the best and most responsible way of handling our waste. Intense recycling,composting, source reduction, the elimination of hazardous chemicals and most importantly education is the key to our success. It is my opinion and that of many scientist and lawmakers that incineration can only compound the problems we now face in Superfund cleanups.

Respectfully yours,

Dorothy M. Klotz

cc: Mr. Walter Engle
Mayor of Riverton

ACCF
P.O. Box 195
Palmyra, NJ 08065

American Water Works Service Co., Inc.

Eastern Region • 500 Grove Street • Haddon Heights, NJ 08035

(609) 547-3211

A. D. Marino
Director/Water Quality Control
(609) 546-2234

June 11, 1990

CERTIFIED MAIL #P428664892
RETURN RECEIPT REQUESTED

Mr. Trevor Anderson
Chemical/Environmental Engineer
U.S. Environmental Protection Agency
Region II
Emergency and Remedial Response Division
26 Federal Plaza, Room 711
New York, NY 01278

Dear Trevor:

First, I would like to thank you for extending to the representatives of New Jersey-American Water Company and myself the opportunity to meet with your project team to discuss the remedial action at the Cinnaminson landfill. As I mentioned during that meeting and again at the public meeting, there are certain operational conditions regarding the New Jersey-American Water Company operation that you must be aware of in order for your remedial project to be completely effective. In addition to the operational concerns, I have a few other concerns that I would like to address in this letter that should be viewed as formal comments regarding this plan that should be addressed prior to the record of decision being signed. As Regional Director of Water Quality Control, I am offering these comments on behalf of New Jersey-American Water Company. The comments will be categorized into existing operational concerns and future operational considerations.

Existing Operational Concerns

1. Before the collection wells and the discharge wells are sited for this remedial project, a groundwater model must be created to reflect what is actually going on within the deep aquifer. The existing information that you have regarding the movement of water through the aquifer from the existing monitoring wells located on the site has most certainly been skewed by our operating criteria for our Cinnaminson wells. Because of the location of the landfill and proximity to our groundwater sources at New Albany Road and Pomona Road, we have altered our operation to reduce the output from these locations. This action has reduced the regional cone of depression at each site thus reducing the radius of influence. When all of our wells in that area are operating, including our two wells

SYLVIA E. & JOSEPH H. TAYLOR
RIVER SIDE HOMESTEAD FARM
TAYLORS LANE
[redacted] N. J. 08077
Cinnaminson

July 12, 1990

Trevor Anderson
US-EPA, Region II
26 Federal Plaza, Room 711
New York, NY 10278

Dear Trevor Anderson:

Following up on the May 31, 1990 meeting we both attended at the Cinnaminson Township Community Center, I wish to make the following comments:

A: I call on you and the federal EPA to include five wells in your monitoring process. These wells are all within 1/2 mile of the site you are covering. They belong to and are used regularly for potable and household use by 30 or more adults and children - members of our family and neighboring families. These wells are located as follows on:

1 - Block 201, Lot 2
2 - Block 201, Lot 3
3 - Block 201, Lot 4
4 & 5 - Block 201, Lot 1.01

Note: For two of these wells I do have "Water Quality Analyses" dated July 14, 1987:

RECORD NUMBER ------ 98601128
STATION NUMBER ----- 400145075593601
STATION NAME ------- 1
(probably Block 201, Lot 3)
DATE OF COLLECTION - 06-05-1986 1100

RECORD NUMBER ------ 98600981
STATION NUMBER ----- 400147074593401
STATION NAME ------- TAYLOR 2
(probably one of two on Block 201, Lot 1.01)
DATE OF COLLECTION - 06-05-1986 1515

B: I call on you and other proper authorities to do all in your power to get the owners of the landfill located between Taylors Lane and Union Landing Road to pay a large share of the cost of your work. There is no reason for all of this cost to be borne by taxpayers!

I trust you will be able to grant these requests.

Sincerely yours,

Joseph H. Taylor

Trevor, once again, thanks for the opportunity to offer comments on this remedial project for the Cinnaminson landfill and if you need any additional information or would like to discuss any of these items further, do not hesitate to give me a call. When you have developed a response to these items, please send them to me so that I may review them with the New Jersey-American Water Company staff.

Very truly yours,

A. D. Marino

kc

cc: L. W. Brokaw
K. T. Wragg
Mayor Lawrence Eleuteri, Cinnaminson Township
Barker Hamill, NJDEP

at Chester Avenue next to the municipal building and our two wells at New Albany Road, our two wells at Pomona Road, and our two wells at Steven's Drive Station, we most definitely have a significant impact on the deep aquifer in that area. The water levels that have been obtained from all the existing monitoring wells do not reflect our true operation only an effort by the water company to modify its withdrawal pattern to minimize the leachate of material from the landfill toward its production wells. These considerations must be worked into a new model or revise the existing groundwater model.

2. When the existing monitoring wells were installed, PVC casing and screening were used. Because of the solvents present in the groundwater, some of the contamination detected from the samples collected from these monitoring wells may be influenced by the PVC casing and screen. All new monitoring wells should be constructed with materials that will not influence the integrity of the groundwater sample.

Future Operational Considerations

1. Because of the nature of technology being utilized for the groundwater cleanup and that the discharge from the on-site treatment plant is going to be injected into the aquifer, New Jersey-American Water Company requests permission to have access to the site for the purpose of collecting samples of the water being discharged into the aquifer. New Jersey Department of Environmental Protection regulations require that if treatment equipment is installed for the purpose of removing volatile organic compounds from water, that monitoring be conducted twice a month, on two week intervals, to evaluate the effectiveness of the removal process. We feel that this requirement should apply.

2. Since the quality of water in the production wells of New Jersey-American are free from any volatile contamination, the quality of the discharge water from this treatment plant should be the same as the wells, or at worst, meet the maximum contaminant levels as established by New Jersey Department of Environmental Protection for potable drinking water.

3. Although it is implied by the nature of this remedial action, no where is it stated that every effort will be made to protect New Jersey-American wells from future contamination nor what will transpire when the contaminant plume reaches these locations. Will New Jersey-American be eligible for superfund cleanup money or remedial treatment of these wells if the contaminant plume reaches the New Jersey-American wells prior to the Tri-County Regional Water Supply Project coming on line?

General Comments of Ford Electronics and Refrigeration Corporation (FERCO) to the Proposed Plan, Final Remedial Investigation Report, and Final Feasibility Study Report for the Cinnaminson Ground Water Contamination Site in Burlington County, New Jersey.

1. FERCO is not persuaded that a state ARAR exists that would necessitate pumping and treating the "shallow aquifer". The Proposed Plan, Final Remedial Investigation Report, and Final Feasibility Study Report reference a "regional aquifer" with perched water above flowing into it (lower aquifer). Thus, much of the proposed remedy (MM-5C) which includes pumping and treating the perched waters in addition to the lower aquifer is unnecessary, wasteful, and not legally required. If ground water pumping and treatment is warranted, only the lower aquifer should be extracted for treatment.

2. Inadequate consideration appears to have been given to "soil flushing" technology as a potentially quicker and more cost-effective remedy. Why install a comprehensive RCRA performance cap, thereby entombing the wastes and limiting leachate otherwise available for collection and treatment? Allowing percolation of the waste could result in a more effective remedy, since beneficial, natural chemical and biological reactions would be enhanced.

3. The proposed remedy refers to chemical precipitation of inorganics. FERCO is unconvinced that the very dilute levels indicated are treatable by conventional chemical precipitation techniques. In addition, the inorganics identified may not reflect other than naturally occurring levels found elsewhere in the region. If the Remedial Investigation indicates that the regional aquifer is contaminated with organic constituents, that aquifer should be extracted and treated for organics. Further complicating groundwater treatment by also requiring chemical precipitation of inorganics is not warranted.

4. The Proposed Plan assumes that the sludges generated by all of the treatment options would be considered hazardous waste and would have to be so managed for the duration of remedial activities. The basis for this conclusion is not indicated. FERCO disagrees that any such sludges would necessarily be considered hazardous either as a listed waste or by analysis as a characteristic waste.

5. Inadequate consideration appears to have been given in developing the Proposed Plan to implementing source-specific remediation at sites, other than the Cinnaminson Landfill, which are also contributing sources to the ground water contamination. Other contributing sources should have been given greater attention throughout the RI/FS process.

July 30, 1990

Office of the General Counsel

Ford Motor Company
Parklane Towers West Suite 401
One Parklane Boulevard
Dearborn, Michigan 48126

July 30, 1990

VIA FEDERAL EXPRESS

U.S. Environmental Protection Agency
New Jersey Remedial Action Branch
26 Federal Plaza, Room 711
New York, New York 10278
Attn: Mr. Trevor Anderson

Cinnamonson Ground Water Contamination Site
Burlington County, New Jersey

Dear Mr. Anderson:

In response to your letter of June 14, 1990, enclosed are Ford Electronics and Refrigeration Corporation's comments on the Proposed Plan, Final Remedial Investigation Report and Final Feasibility Study Report for the Cinnaminson Ground Water Contamination Site in Burlington County, New Jersey.

If you have questions or need additional information, please let me know. I may be contacted by mail at the above address, by telephone at (313) 322-1966 or by facsimile transmission at (313) 390-3083.

Sincerely,

RECostello

Robert E. Costello
Senior Attorney

rec/bg
enclosure

- The Preferred Remedial Alternative does not meet the primary remedial objective, to protect public health and the environment. Ground-water modeling and a review of available data indicate that implementation of the Preferred Remedial Alternative would actually increase the threat of human health effects and environmental damage.

- The Preferred Remedial Alternative does not comply with the statutory requirements for remedial alternatives listed in CERCLA 121(b)(1)(4). The primary areas where the Preferred Remedial Alternative is out of compliance with the statutory requirements of CERCLA are summarized below:

  - Implementation of the Preferred Remedial Alternative will not result in a significant reduction of contaminant concentrations in either the shallow perched zones or the PRM Aquifer to acceptable levels during the implementation period (30 years). In fact, water quality following the implementation period will be degraded.

  - There are other significant areas of ground-water contamination than the landfills contributing to ground-water contamination in the Cinnaminson Study Area. The Preferred Remedial Alternative does not address either the source areas or the primary pathways of migration. Instead, the Preferred Remedy focuses on so-called "hot spots" identified by the USEPA RI.

  - Implementation of the Preferred Remedial Alternative will result in an increase in mobility of contamination from other sources. The increase in mobility will be caused by spreading the more highly contaminated ground water from the source

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Summary

The USEPA Environmental Protection Agency (USEPA) conducted a remedial investigation (RI) and Feasibility Study (FS) of an area in Cinnaminson, New Jersey bounded by Union Landings Road, River Road, Taylor's Lane, and Route 130. The Cinnaminson Study Area encompasses approximately 400 acres (160 hectares) and lies approximately 5000 ft (1500 m) southeast of the Delaware River. The USEPA RI was performed by Camp, Dresser, and McKee [1989]. The USEPA FS was performed by ICF Technology [1989]. Numerous additional site studies and investigations were performed from 1983 to 1989. The results of the USEPA FS were summarized in the Proposed Plan (Plan) for the Cinnaminson Study Area [1990].

GeoServices was asked by Sanitary Landfill, Inc. (SLI) to review the USEPA RI and FS and other pertinent documents and to prepare a report addressing implementation of the Preferred Remedial Alternative, as described in the Plan. The purpose of the study was to determine if the USEPA RI and FS were consistent with the CERCLA statutory requirements, the requirements set forth in USEPA RI/FS guidance documents; and to determine if the Preferred Remedial Alternative would satisfy the primary objective of a remedial program [40 CFR 300.430(e)(9)(A)], i.e., to protect human health and the environment.

7.2 Conclusions

Based on a review of available site data and information, and a review of the USEPA RI, USEPA FS, and the Plan, GeoServices has concluded the following:

- The present worth of the Preferred Remedial Alternative is extremely high ($20,475,000) relative to the predicted benefit.

- The Preferred Remedial Alternative does not address contamination from the SLI northwest landfill. This is due to the improper assumption that site conditions at the northwest and southeast landfills are similar.

• The Preferred Remedial Alternative will likely fail due to:

  - Increases in concentrations of organic constituents in the monitoring wells over time. These increases in contamination may result from migration of highly contaminated ground water from other sources towards the recovery systems, or because of the inefficiency of the proposed recovery systems relative to leakage from the landfills.

  - The remedial technology selected from treatment of organics (biological granular activated carbon) is inappropriate for some of the primary organics in the contaminated ground water.

  - The ground-water recovery system captures only a very small percentage (less than 2%) of the overall leakage from the landfill.

  - The Preferred Remedial Alternative is incapable of achieving the remedial objectives for the Cinnaminson Study Area.

• [illegible]her sources of ground-water contamination have a significant [illegible] on the threa[illegible] public health and the environment and wo[illegible]ave a detri[illegible] effect on the Preferred Remedial Alt[illegible].

areas to previously uncontaminated or less contaminated areas of the aquifer.

- The screening, evaluation, and selection of the Preferred Remedial Alternative was based on an inaccurate understanding of site conditions, geology, and hydrogeology. This lead to an inappropriate evaluation of remedial technologies and selection of a remedial alternative which does not fit site conditions. Ground-water quality will degrade over time if the Preferred Remedial Alternative is implemented on the Cinnaminson Study Area.

- The Preferred Remedial Alternative consists of remedial technologies, which are inappropriate for the study area. Other technologies, which would be effective were not considered or were eliminated during the screening process, as summarized below:

  - The treatment system selected for the organics recovered from ground water (biological granular activated carbon) is not appropriate for the organics in the study area.

  - It would be impractical and extremely inefficient to deploy the recovery wells as described in the USEPA FS.

  - The Preferred Remedial Alternative does not consider the beneficial impacts of the existing vapor extraction systems on long-term water quality.

  - The Preferred Remedial Alternative does not consider the beneficial impacts of biodegradation on long-term water quality.

- The Preferred Remedial Alternative is an inefficient use of available resources.

Northwest Landfill and the other sources. The supplemental RI would include the following tasks:

- *Task 1 - Field Investigation*: Installation and logging of 12 soil borings; installation, development, and sampling of 11 new monitoring wells, and area-wide measurement of water levels;
- *Task 2 - Walter Quality Sampling and Analysis*:
  - sampling of 11 new wells and 40 existing monitoring wells, 9 SLI monitoring wells, and 5 gas extraction wells, and
  - analysis of ground-water samples for TCL + 30 and conventionals; and
- *Task 3 - Supplemental RI Report*:

- Ground-Water Modeling. Ground-water modeling would be performed to evaluate the impact of the existing vapor extraction systems, and biodegradation on long-term water quality. Recovery well locations and depths would be evaluated in the shallow perched zones and the PRM Aquifer. Well locations would be selected to maximize recovery of contaminated ground water and to minimize the potential of spreading contaminated ground water to previously unaffected areaa of the aquifer. The impacts of the other sources on the Alternative Remedy would be assessed.

- Risk Assessment. The risk assessment would consist of the following five elements:
  - data evaluation;
  - toxicity assessment;

- The volume of discharge from the other sources may be relatively small compared to the discharge from the two SLI landfills. However, the mobility and toxicity of the ground-water contamination from the other sources is much higher, resulting in a major impact on the threat to public health and the environment.

- The Preferred Remedial Alternative does not take the other sources into consideration. Since the recovery wells are located outside the source areas, highly contaminated ground water would be drawn from the other sources and spread into previously uncontaminated or less contaminated parts of the PRM Aquifer and the shallow perched zones. This condition would likely be perceived as a failure of the Preferred Remedial Alternative.

7.2 Recommendations

Based on the review of the USEPA FS, the Plan, and the supporting documents and studies, it is apparent that the Preferred Remedial Alternative proposed by the USEPA is inappropriate for the Cinnaminson Study Area. Ground-water modeling indicates that implementation of the Preferred Remedial Alternative would actually increase the threat to the public health and the environment. An Alternative Remedy is needed which is consistent with site conditions, geology, and hydrogeology, complies with the remedial action objectives, and satisfies the CERCLA statutory requirements. In order to select an Alternative Remedy which satisfies the above requirements, the following work must be performed.

- Supplemental RI. The Supplemental RI would provide the data needed to refine the remedial alternatives for the SLI Southeast Landfill, and select the remedial alternatives for the SLI

- Other Sources

  - shallow recovery wells, and

  - deep recovery wells (the number, locations, and depth of monitoring wells will be evaluated using ground-water modeling, following the completion of the Supplemental RI).

  The Focused FS would provide a detailed evaluation of the Alternative Remedy relative to the remedial objectives and the CERCLA statutory requirements. Risks associated with the Alternative Remedy would be compared to existing conditions and the Preferred Remedial Alternative. A Focused FS Report would be prepared with summarizes the results of the ground-water modeling, risk assessment, and Focused FS. A conceptual design and detailed cost estimate for the Alternative Remedy would be presented in the Focused FS.

- Final Design. Design drawings and construction specifications would be prepared for the Alternative Remedy.

- exposure assessment;
- risk characterization, and
- ecological assessment.

The risk assessment would be used in combination with ground-water modeling and a focused FS to evaluate the impact of candidate technologies, and to assure that the Alternative Remedy reduces the threat to public health and the environment to an acceptable level.

- Focused FS. A focused FS is required to refine the Alternative Remedy proposed for the SLI Southeast Landfill and to select appropriate remedial technologies for the SLI Northwest Landfill and the other sources. The Alternative Remedy, which would be evaluated in the focused FS, would consist of the following:

  - SLI Southeast Landfill

    - low-permeability cover system,
    - vapor extraction system,
    - shallow ground-water recovery well (number, location, and depths to be selected based on ground-water modeling),
    - treatment system to be evaluated,
    - injection or discharge system (to be evaluated).

  - SLI Northwest Landfill

    - low-permeability cover soil,
    - vapor extraction system,
    - recovery and treatment systems (the need for a recovery and treatment system will be evaluated after the mass loading has been determined from ground-water modeling).

SMC Environmental Services Group
A Subsidiary of Science Management Corporation
900 W Valley Forge Road
PO Box 859
Valley Forge Pennsylvania 19482
Telephone 215 265 2700

May 8, 1990
Ref: 9524-89000

Mr. Frank A. Hamel, Jr.
Del Val Ink and Color, Inc.
1301 Taylors Lane
Riverton, NJ 08077

Subject: Review of Geraghty & Miller's Annual Reports

Dear Mr. Hamel:

Included with this letter is one copy of our review of Geraghty & Miller's 1983 and 1985 annual reports, which were used as references by the 1989 Camp, Dresser & McKee (CDM) report. This review is intended to be used as an addendum to SMC's rebuttal to the CDM report, dated November 1989, which you already possess.

The objective of our review documented in this letter is to determine if CDM correctly interpreted information in the Geraghty & Miller annual reports for use in their 1989 Cinnaminson Landfill Study. We have determined that there are alternative interpretations of the data that differ from CDM's.

We will be pleased to discuss the content of this section should any questions arise.

Sincerely,

SMC ENVIRONMENTAL SERVICES GROUP

Peter D. Beyer

Peter D. Beyer
Project Geologist

Richard M. Winar

Richard M. Winar, CPG
Vice President
GeoEnvironmental Sciences Group

PDB:rm
Enclosures
9524:PBCL1J.WP

3-1

Formerly SMC Martin Inc

INK AND COLOR
INCORPORATED

FLEXOGRAPHIC AND ROTOGRAVURE INKS

1301 TAYLOR'S LANE
RIVERTON, NJ 08077
Phone (Area Code 609) 829-7474
Penna. (Area Code 215) 671-1500

June 1, 1990

Mr. Trevor Anderson
Remedial Project Manager
United States EPA
Room 711
26 Federal Plaza
New York, New York 10278

Gentlemen:

We are pleased to transmit copies of Science Management Corporation's review of the Camp, Dresser & McKee FRI Report for Cinnaminson Ground Water, EPA #68-01-6939, and the referenced Geraghty & Miller Report contained therein.

Our consultant's conclusions are as follows:

1. "It can be concluded that there is no evidence presented which confirms the conjectures stated several times that Del Val is a source of contamination" (Section 5, Page 11)

2. "This consultant concludes that CDM statement is misleading when it refers to Del Val as a possible minor source of contamination since they have not first established the presence of an additional source of contamination downgradient of wells found to contain contamination" (Section 7, Page 10)

Copies of the consultant's report are enclosed for your use. Based on this independent consultant's report, Del Val is not a contaminator of the soil and not a party to the CERCLA clean-up process.

Del Val, however, urgently supports the clean-up efforts since its property value has been drastically reduced by SLI's actions.

Very truly yours,

DEL VAL INK & COLOR INC.

Frank A. Hamel, Jr.
President

FAH:rf
Encls.

cc: Mr. Dick Winar, SMC

TABLE OF CONTENTS

(DRAFT)

REBUTTAL TO CINNAMINSON GROUND WATER CONTAMINATION STUDY FINAL REMEDIATION REPORT

Prepared for:

Mr. Frank A. Hamel, Jr., President
Del Val Ink & Color Inc.
1301 Taylors Lane

Prepared by:

SMC Environmental Services Group
900 W. Valley Forge Road
P. O. Box 859
Valley Forge, PA 19482

November 1989

Ref: 9524-89000

9524:ERCVPJ.WP

2.0 HYDROGEOLOGICAL REVIEW

Based on our review of The Report, we generally concur with its description of the hydrogeologic system of the study area. Conclusions a-e in The Report (page 1-3) adequately summarize the study area hydrogeology. It is important to point out that although the regional ground water flows in a southeastern direction (Figure 4-8 in The Report), the mounding of the shallow ground water under the landfills and the clay liners in the "upper zone" of the Potomac-Raritan-Magothy (PRM) formation have caused the shallow ground water to (locally) flow radially away from the landfill in all directions but at varying distances and velocities. However, the shallow ground water (upper zone) will eventually flow southeast and mix with the moderate and deep ground water (lower zone). Shallow ground water flowing in directions other than southeast as a result of the mound will eventually reach the boundary of the zone of influence of the ground water mound and will then change direction and flow southeastward. Shallow ground water migrating on top of the clay lenses will eventually reach a break or discontinuity in the clay lens, migrate vertically down, mix with the lower zone, and change direction to move southeast.

1.0 INTRODUCTION

This report describes a critique prepared by SMC Environmental Services Group (SMC) for Del Val Ink and Color Inc. (Del Val). The critique is of a 1989 report prepared by Camp, Dresser & McKee Inc. for the U.S. Environmental Protection Agency entitled "Final Remediation Investigation Report for the Cinnaminson Ground Water Contamination Study" (The Report). One purpose of this critique is identify and address any statements made in The Report which are unfounded, otherwise incorrect, and/or unjustly detrimental to Del Val. The specific objective of this report is to evaluate and discuss, if appropriate, all negative statements made in The Report concerning Del Val.

TABLE 1

DEL VAL INK & COLOR INC.
Ground Water Analytical Results
Summary of Organics Detected

Compound	Concentrations (ppb) December - 1986 GW-A6S	December - 1986 GW-A6M	July - 1987 GW-A6S	July - 1987 GW-A6M
Chloroethane	17	9 J	39	16
Acetone	6 JBR	20 BR	29	ND
1,1-dichloroethane	ND	28	3 J	59
Trans-1,2-dichloroethene	ND	2 J	ND	2 J
1,2-dichloroethane	ND	10	ND	17
Benzene	5	31	12	50
Toluene	1 J	1 J	ND	ND
Chlorobenzene	6	7	11	13
Ethylbenzene	8	10	29	53
Total Xylene	14	7	27	5
Dichlorofluoromethane	ND	8.1 J	ND	ND
1,2-diethoxyethane	ND	22 J	ND	ND
Di-isopropyl ether	ND	5.6 J	ND	ND

Notes:

ND - Compound analyzed for but not detected.
J - Estimated value. Reported value is less than the contract required detection limit but greater than zero.
R - Rejected. Compound did not meet QA/QC requirements.
B - Compound found in QC blank.

This Table was derived from data presented in The Report.

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3.0 GROUND WATER CONTAMINATION

Conclusion m in The Report (page 1-5) states that, "It appears that Del-Val Ink is also a source of ground water contamination found in the Cinnaminson Study Area. However, based on the number of compounds and their concentrations and the number of wells found contaminated, it appears that Del Val Ink & Color is only a minor source of ground water contamination found in the Cinnaminson Study Area." The basis for this conclusion is not stated. However, based on the data presented in The Report, it may be surmised that this conclusion was reached after analyzing the results of two rounds of sampling from wells EPA-A6S and EPA-A6M. These samples, from wells located on Del Val property, were collected in December 1986 and July 1989. Results of these sampling rounds are given on Tables 9-16 and 9-21 in The Report.

Various constituents and their concentrations in the ground water samples collected from GW-A6S and GW-A6M in December 1986 and July 1987 are given on Table 1. The organic chemicals detected were chloroethane; acetone; 1,1-dichloroethane; trans-1,2-dichloroethene; 1,2-dichloroethane; benzene; toluene; chlorobenzene; ethylbenzene; total xylene; dichlorofluoromethane; 1,2-diethoxyethane; and di-isopropyl ether. There is data given within The Report that suggests that all of these constituents can be attributed to sources other than Del Val. The following statements summarize this supporting data.

GW-A6M is 13.25 ppb. The average reported concentration of total xylene in the samples from the wells beneath the landfill is 394 ppb, with a qualifier that total xylene was found in a QC blank. Further, The Report does not suggest that Del Val is the source of total xylene.

4. 1,1-dichloroethane and 1,2-dichloroethane. - These compounds have been detected in comparable or higher concentrations in upgradient wells in both the upper and lower zones of the PRM. Several examples of upgradient ground water samples in which 1,1-dichloroethane was detected include: Well C6S in July 1987 with 440 ppb, Well C4M in July 1987 with 120 ppb, and Well C6M in July 1987 with 38 ppb. Examples of upgradient ground water samples in which 1,2-dichloroethane was detected include Well A1M in December 1986 with 46 ppb, Well C6S in July 1987 with 230 ppb, and Well C6M in July 1987 with 84 ppb. Average concentrations of 1,1-dichloroethane and 1,2-dichloroethane in samples obtained from the wells on Del Val property are 23.8 ppb and 9.3 ppb, respectively. Since these compounds have been detected at higher concentrations in upgradient wells, it is conceivable that the source of these contaminants is

1. Acetone. - This compound is commonly detected in environmental samples because of laboratory or field contamination. This statement is supported on page 9-33 in The Report - "Two of the sixteen compounds (methylene chloride and acetone) were also detected in the field and trip blanks. Therefore, the presence of these two compounds might be due to laboratory or field contamination."

2. Benzene, toluene, chlorobenzene, ethylbenzene, and trans-1,2-dichloroethene. - These compounds were detected at comparable or higher concentrations in well samples taken from beneath the landfill. Since the landfill is located upgradient hydrogeologically from Del Val, these compounds probably originated from the landfill. This statement is supported on page 9-33 in The Report - "Seven of the sixteen volatile organic compounds (vinyl chloride, methlyene chloride, trans 1,2-dichloroethene, benzene, toluene, chlorobenzene, and ethylbenzene) were also detected in the landfill gas vent samples at comparable or higher concentrations."

3. Total xylene. - Total xylene was also found at higher concentrations in well samples taken from beneath the landfill (Table 9-2 in The Report). The average reported total xylene concentration in wells GW-A6S and

Del Val property is 20.3 ppb. However, chloroethane is also documented in The Report (page 2-1) as being detected in a deep monitoring well identified in a report prepared by Geraghty & Miller Inc. Also, Del Val has reported to SMC that they have never used chloroethane. Thus, it is unlikely that Del Val has been a source of chloroethane contamination.

Other items of concern with regard to ground water contamination and Del Val are the following two statements made in The Report. On page 9-36, The Report claims that, "Samples from Wells EPA-A6S and EPA-A6M, located in the vicinity of Del Val, contained organic compounds (chloroethane, 1,1-dichloroethane, 1,2-dichloroethene, benzene, chlorobenzene, and di-isopropyl-ether) that indicate that Del Val operations may be the source of these contaminants." (Inclusion of "1,2-dichloroethene" on this list is probably a spelling error since this compound is not found in samples from Well EPA-A6S and EPA-ABM; but, 1,2-dichloroethane was found in these wells.) However, the presence of these organic compounds in the samples collected from the wells on Del Val property, as discussed above, is more likely due to migration from an upgradient source.

On page 9-60, The Report states that "But, other volatile organic compounds (1-1-dichloroethane, 1,2-dichloroethane, chloroform, trichloroethene, tetrachloroethene) detected during Phase IA sampling as well as in this sampling program in wells located upgradient to the north or northwest of the Del Val property.

5. Dichlorofluoromethane, 1,2-diethoxyethane, and di-isopropyl ether. - These compounds were only detected once, i.e., in Well GW-A6M in December 1986, and were reported only at estimated concentrations. None of these compounds were detected in the wells on Del Val property in July 1987. Thus, these compounds should not be of concern to Del Val. This statement is supported in page 9-60 of The Report - "Some of the organic compounds (dichlorofluoromethane, diisopropylether) detected during the earlier Phase 1A monitoring well sampling, which indicated that Del Val Ink and Color could be a possible source of contamination, were not detected in samples from wells EPA-A6S and EPA-A6M during this sampling program."

6. Chloroethane. - Excluding the wells on Del Val property, this compound was only detected twice, i.e., Well A1S in December 1986 at 55 ppb and Well C7M in July 1987 at 2J ppb. The qualifier J means that the magnitude of the reported concentration is estimated. Well A1S is located upgradient and Well C7M is located cross gradient from Del Val. The average concentration of chloroethane in the samples from the wells on

4.0 AIR CONTAMINATION

On page 5-13, The Report states that Del Val could be a source of methylene chloride contamination in air. It goes on to say that methylene chloride was detected in air samples from two of five sample stations. The air sample from Station 3, on the Del Val property, detected a methylene chloride concentration of 3.49 mg/l. The air sample from Station 5 had a methylene chloride concentration of 16.03 mg/l. Without knowing the prevailing wind direction, it is difficult to pinpoint the possible source of methylene chloride. However, contaminant transport in air for a continuous source of contamination moves from points of high concentration to points of low concentration. Thus, it is conceivable that Station 5 could be the source of the methylene chloride concentration in the air sample at Station 3.

located close to the Del Val Ink Color indicate that these compounds may be contributed by Del Val operations. Therefore, Del Val is considered a probable source of ground water contamination in the area." However, there is no evidence presented in The Report which indicates that the presence of these compounds in the ground water is related to or caused by Del Val operations. The on-site occurrence of 1,1-dichloroethane and 1,2-dichloroethane have already been discussed in this report. Chloroform, trichloroethene, and tetrachloroethene have never been detected in any of the samples obtained from the wells on the Del Val property. Further, these compounds have been detected in samples from upgradient wells. Thus, based on the data presented within The Report, there is evidence which indicates that Del Val is not the source of chloroform, trichloroethene, or tetrachloroethene contamination.

Also with regard to the area's ground water contamination and Del Val, the comments made on conventional parameters (page 9-38) and total volatile organic contaminants (VOCs) (page 9-60) in The Report should be noted. On page 9-38, The Report states that three conventional parameters (TDS, ammonia, and chloride) were detected in Well EPA-A6M at relatively high concentrations, but were probably due to the landfill. On page 9-60, The Report states that the source of the total VOCs present in Well EPA-A6S appear to be the landfill.

6.0 RECOMMENDATIONS

To strengthen Del Val's position, SMC recommends the following:

1. Conduct a Phase I Environmental Assessment as described in Task 3 of the October 19, 1989 proposal.
2. Conduct an inventory of the history of organic chemicals used at Del Val. Based on this inventory, perform a fate and persistence study on the inventoried organic chemicals to identify their potential breakdown components. This will confirm that the organic chemicals of concern discussed in this report are not breakdown products of the chemicals used by Del Val.
3. Conduct a review of the available Geraghty & Miller Inc. reports referenced in The Report.

5.0 CONCLUSION

Based on the information within The Report and our review of this data, it can be concluded that there is no evidence presented which confirms the conjectures stated several times that Del Val is a source of contamination. All of the organic contaminants identified in the ground water samples taken from the wells located on Del Val property can more logically be attributed to sources other than Del Val. The methylene chloride contamination detected in the air sample taken from Station 3, located on Del Val property can possibly be attributed to a source other than Del Val.

7.0 REVIEW OF ADDITIONAL DOCUMENTS

7.1 Introduction

The 1989 Camp, Dresser & McKee report, which was reviewed for Del Val, identified as major references the Geraghty & Miller 1983, 1984, and 1985 annual reports entitled, "Hydrologic and Ground-Water Quality Conditions at the Landfill Operated by Sanitary Landfill, Inc. Cinnaminson, New Jersey". Because of their use as references, an attempt was made to obtain these reports from the EPA and review them also. After filing a Freedom of Information request letter, and after considerable EPA delays, SMC obtained the 1983 and 1985 annual reports, but not the 1984 annual report.

Close inspection of the 1983 and 1985 reports indicated that, other than the results of the laboratory analysis of each year's ground water samples, there was little difference in content between the two publications. It was also discovered that the 1985 annual report contained the results of the laboratory analysis of the groundwater samples from 1983 and 1984, as well as 1985. Based on these two findings, SMC decided it would be sufficient to simply perform the evaluation of the 1983 and 1985 annual reports and that it would not be necessary to review the 1984 annual report.

SECTION 7.0

REVIEW OF ADDITIONAL DOCUMENTS ADDENDUM TO CAMP, DRESSER & MC KEE REBUTTAL

Prepared for:

Del Val Ink and Color, Inc.
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Riverton, NJ 08077

Prepared by:

SMC Environmental Services Group
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P. O. Box 859
Valley Forge, PA 19482

May 1990

Ref: 9524-89000

9524:PBCVPJ.WP

7.2 1983 Annual Report

Geraghty & Miller state that there is both a shallow water table aquifer, and a deeper artesian aquifer underlying the landfill.

The ground water in the deep artesian aquifer flows generally southward. The depth to the top of the deep, artesian aquifer ranges from between approximately 30 feet to 50 feet below ground surface.

The shallow water table aquifer was found to consist of localized water zones perched on top of a clay layer. This clay layer was found to be discontinuous along the northern and southern boundaries of the landfill. This lack of continuity of the clay layer indicates that ground water in the water table aquifer probably flows only a short distance radially away from the landfill along the clay layer before it finds a break in the clay and migrates vertically downward to join with the deep, artesian aquifer. Therefore, the ground water in the shallow water table aquifer flows in a direction away from the landfill and towards Del Val. The presence of discontinuities in the clay layer means that any contamination present in the shallow water table aquifer should eventually enter the deep artesian aquifer. The depth to the water table zones depends on what depth at which the clay layer supporting the ground water is found. In general, the depth to the water table aquifers ranges from between 12 feet and 32 feet.

Each well used for sampling the deep artesian aquifer has the letter "D" on the end of its code designation (e.g., GM-8D); whereas those wells used for sampling the shallow water table aquifer do not have the "D" (e.g., GM-8) in their title.

Geraghty & Miller's 1983 annual report also indicates that Del Val's location, in regard to the deep artesian aquifer flow direction, is cross-gradient to most of the landfill. Since ground water flows in a downgradient direction, and south is downgradient for this aquifer, this means that only the southeastern portion of the landfill is considered to be a likely area for recharge from any contaminated ground water that may originate from Del Val. For this reason, wells in the southeastern portion of the landfill were reviewed by SMC to determine if ground water quality in this area was affected by Del Val. A diagram of Del Val and the surrounding area is shown in Figure 1. Ground water flow direction in the shallow water table aquifer is generally perpendicular to the boundaries of the landfill. Ground water flow direction in the deep artesian aquifer flows in the southerly direction the arrows indicate. Also, wells that are important for the characterization of ground water quality near Del Val (GM-1, GM-1D, GM-8, GM-8D, GM-10) are circled and labeled.

7.2.1 <u>1983 Deep, Artesian Aquifer Sampling Results</u>

The report of Geraghty & Miller's 1983 ground water sampling program indicates that contamination was being introduced into the deep, artesian aquifer from a source north and upgradient of Del Val. Monitoring well GM-8D, the deep aquifer well located on the northern border of the landfill approximately 500 feet north and up-gradient from Del Val, was reported to contain benzene (252 parts per billion), chlorobenzene (28 ppb), chloroethane (33 ppb), chloroform (62 ppb), 1,1-dichloroethane (485 ppb), 1,2-dichloroethane (141 ppb), ethylbenzene (1,150 ppb), and toluene (2,930 ppb). By contrast, monitoring well GM-1D, the deep aquifer well which is directly downgradient of the Del Val property, contained a much lower level of contamination: benzene (12 ppb), chlorobenzene (32 ppb), chloroethane (31 ppb), and ethylbenzene (12 ppb). As can be seen, monitoring well GM-1D did not contain any compounds that were not found in monitoring well GM-8D. However, many compounds not found in GM-1D were present in GM-8D. If Del Val were a source of contamination, new contaminants and higher concentrations of contaminants would be expected in GM-8D. The fact that this condition does not exist suggests that the main source of ground water contamination for the deep, artesian aquifer originates from a source upgradient of Del Val, and/or even possibly upgradient from monitoring well GM-8D.

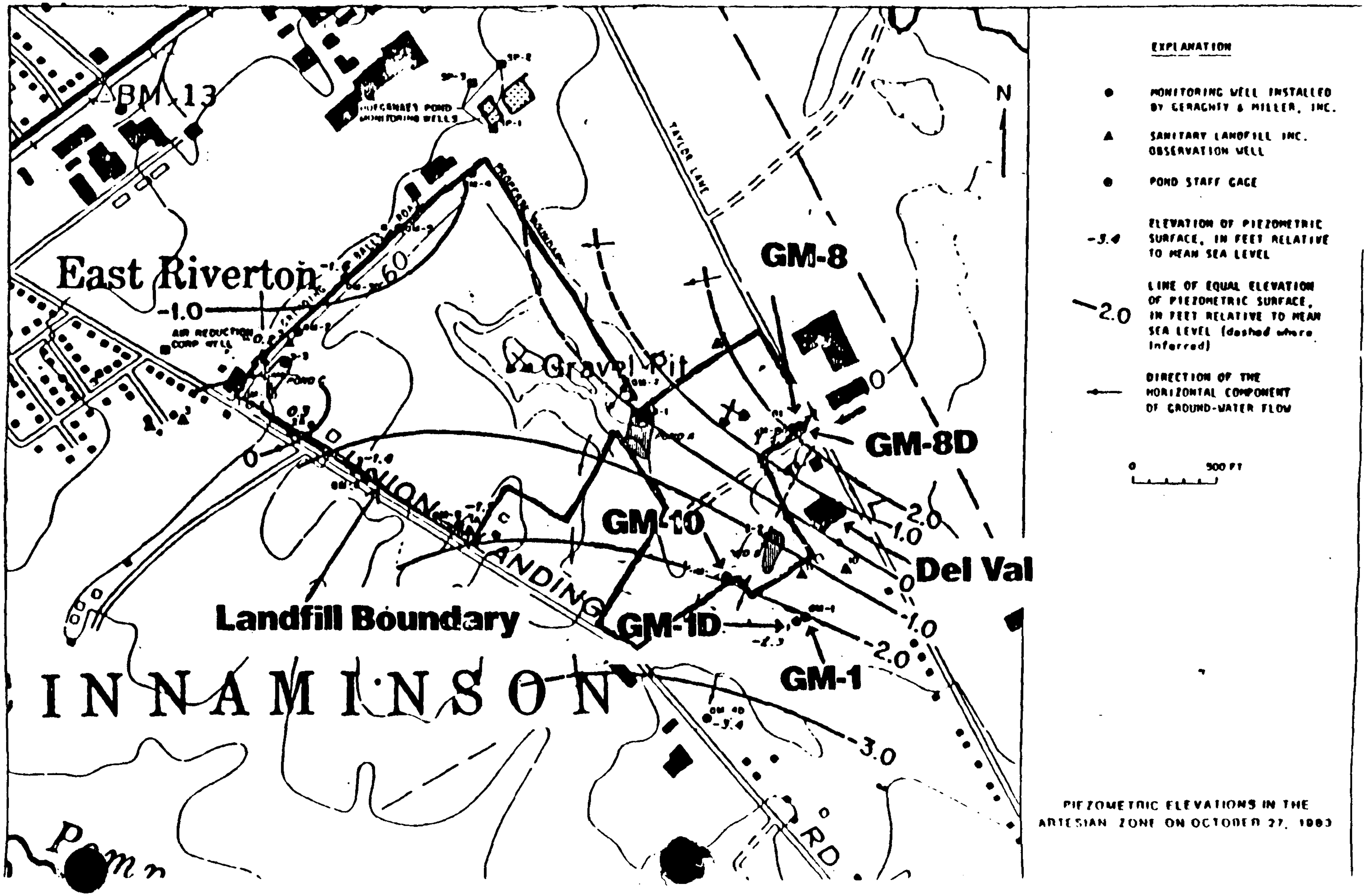
7.2.2 <u>1983 Shallow, Water Table Aquifer Results</u>

The water table aquifer monitoring well upgradient of Del Val (GM-8) was not sampled in 1983, and therefore there was

Figure 1

1983 Deep Aquifer Groundwater Flow Direction

(From Geraghty & Miller, 1983)



therefore no quantification of the amount of contamination entering the artesian aquifer from upgradient could be made in 1984. Figure 2 shows the south-southeasterly ground water flow direction (arrows) of the deep artesian aquifer and the location of each of the above mentioned monitoring wells.

7.3.1 1984 Shallow Water Table Aquifer Sampling Results

The results of the 1984 shallow water table aquifer sampling program listed in the 1985 annual report indicated high levels of contamination were still entering the landfill north and upgradient of Del Val. The 1984 data states that GM-8, the shallow water table aquifer monitoring well upgradient from Del Val, "showed high (a total of 884 parts per billion) concentrations of VOCs, primarily non-halogenated compounds (benzene, toluene, xylene). The upgradient location of this water table zone monitoring well with respect to the landfill indicates the existence of upgradient off-site source(s) of contamination." The complete list of compounds found in monitoring well GM-8 includes benzene (192 ppb), chlorobenzene (30 ppb), 1,1 dichloroethane (11 ppb), 1,2 dichloroethane (17 ppb), ethylbenzene (575 ppb), and toluene (11 ppb). By comparison, GM-10, which is the water table aquifer monitoring well downgradient of Del Val, did not report any of the above parameters but did contain 13 ppb of chloroethane. The fact that chloroethane was present in the downgradient well GM-10 but not in the upgradient well GM-8 might suggest that Del Val could have no characterization of ground water quality of the shallow water table aquifer up-gradient of Del Val in 1983.

Moreover, well GM-10, a shallow water table aquifer monitoring well downgradient from Del Val, contained no detectable levels of any volatile organic compounds. Since Del Val is a user of several volatile organic compounds, the absence of these compounds indicates that Del Val was not releasing any of these compounds into the ground water.

7.3 <u>1984 Data in the 1985 Annual Report</u>

As stated previously, SMC did not obtain a copy of Geraghty & Miller's annual report for 1984. However, SMC did obtain Geraghty & Miller's 1985 annual report which contained the laboratory results from the 1984 sampling program and a short text explaining these results.

During Geraghty & Miller's 1984 sampling program the water levels in both the artesian and water table aquifers were reported to have dropped to such low levels that several of the monitoring wells on the landfill could not be sampled because they were dry. Geraghty & Miller did sample two wells downgradient of the Del Val property (wells GM-10 and GM-1D), but only one of the wells upgradient from Del Val (well GM-8). Because the downgradient, deep aquifer, monitoring well (GM-8D) was dry, no sample could be obtained from it. This means that there was no analysis of the ground water from the artesian aquifer upgradient from Del Val in the 1984 sampling program, and been the source of this compound. However, after a comprehensive research of their past chemical purchases and inventories, Del Val can positively state that they have never used chloroethane in the plant (personal communication, A. Tobias). However, it is also conceivable that the landfill itself may have been a source of the chloroethane. In general however, these results show high levels of contamination upgradient of Del Val, but only low levels of contamination downgradient of Del Val. This again suggests that Del Val was either only a very minor source of contamination for the water table aquifer, or that there is a discontinuity of the clay layer between Del Val and GM-10 which would allow for downward migration of contaminated ground water into the artesian aquifer before it can be sampled at GM-10.

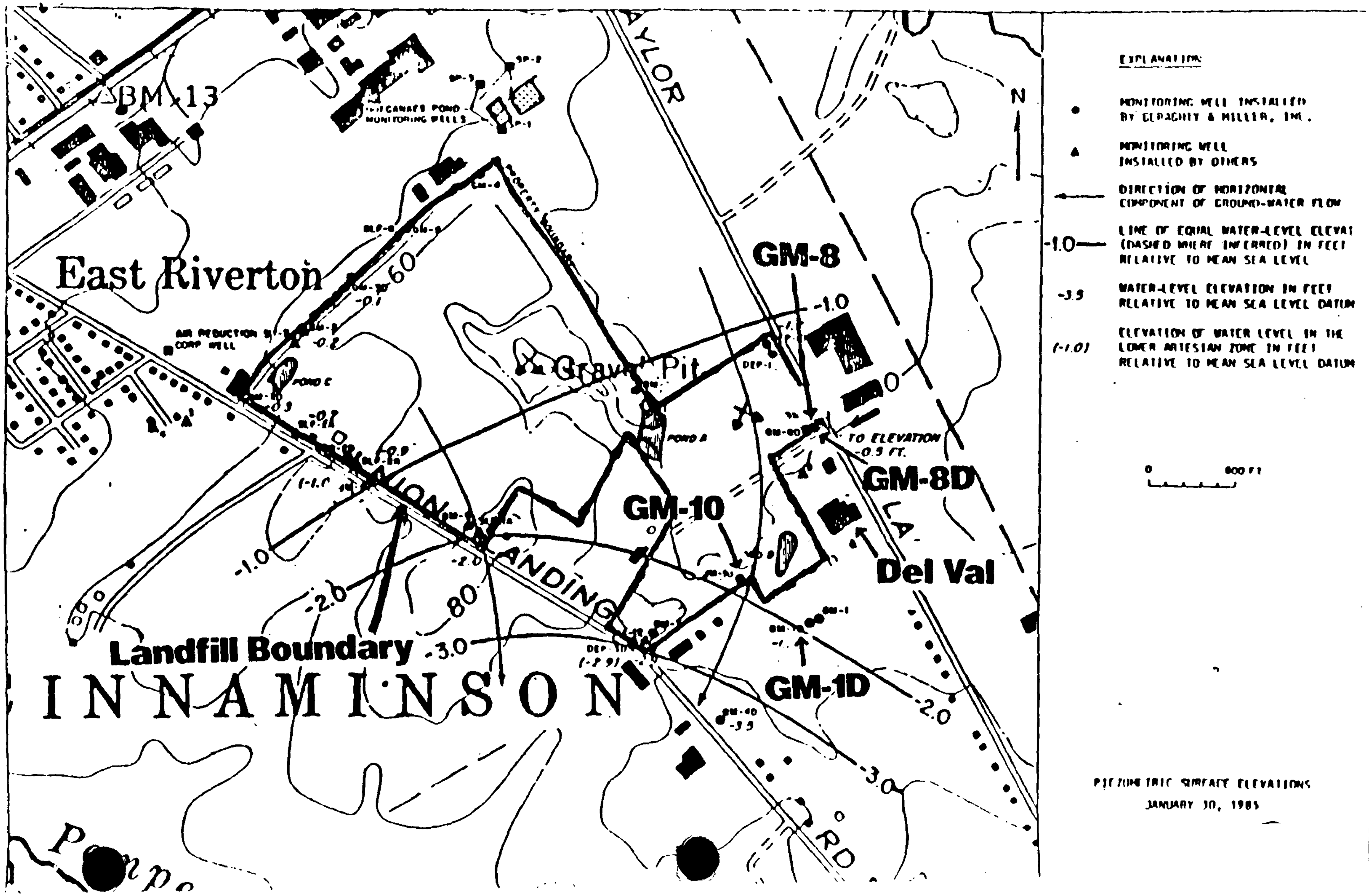
7.3.2 1984 Deep Artesian Aquifer Sampling Results

The results of the analyses of the ground water in the deep artesian aquifer show that GM-1D, the artesian aquifer monitoring well downgradient from Del Val, contained benzene (14 ppb), chlorobenzene (37 ppb), chloroethane (40 ppb), 1,1 dichloroethane (15 ppb), ethylbenzene (26 ppb), and toluene (21 ppb). Because GM-8D, the upgradient, artesian zone monitoring well, was dry, the concentration of contamination present in the artesian aquifer upgradient of Del Val could not be determined. Thus, for 1984, the origin of the ground water contamination in the artesian aquifer cannot be determined with certainty.

Figure 2

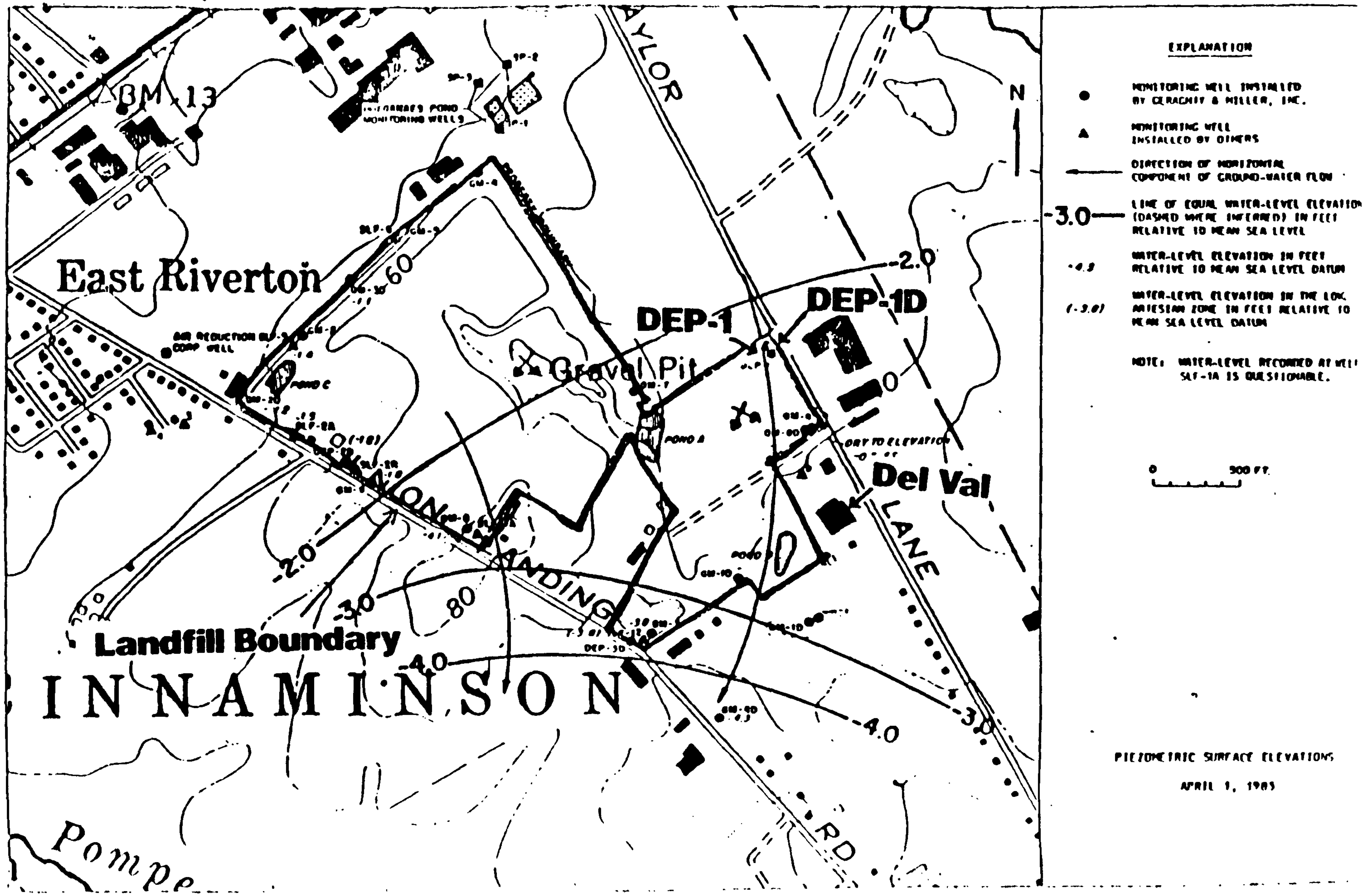
1984 Deep Aquifer Groundwater Flow Direction

(From Geraghty & Miller, 1984)



1985 Deep Aquifer Groundwater Flow Direction

(From Geraghty & Miller, 1985)



7.4 1985 Annual Report

Geraghty & Miller's 1985 sampling program was changed significantly from the previous years programs. All five monitoring wells that defined groundwater quality upgradient and downgradient of Del Val in 1983 and 1984 (GM-1D, GM-1, GM-10, GM-8, and GM-8D) were either found to be dry or were not sampled in 1985.

However, two wells installed in early 1985 yielded evidence which again indicated that contamination was continuing to be introduced into the deep, artesian aquifer upgradient of Del Val. These two monitoring wells, designated DEP-1 and DEP-1D, are located about 1,000 feet north and upgradient from the Del Val property. Figure 3 shows the south-southeasterly direction of deep aquifer ground water flow as indicated by the arrows, and the location of wells DEP-1 and DEP-1D.

7.4.1 1985 Deep Artesian Aquifer Sampling Results

The 1985 results showed that DEP-1D, the upgradient, deep artesian aquifer monitoring well contained benzene (327 ppb), chlorobenzene (405 ppb), 1,1 dichloroethane (208 ppb), 1,2 dichloroethane (186 ppb) and methylene chloride (88 ppb). Although there were no wells downgradient of Del Val that were sampled, the 1985 annual report states that, in general, for the whole landfill area, "volatile organic compound concentrations in downgradient wells are one to two orders of magnitude lower than in upgradient wells for the same species of organic compounds and data from wells that were installed after the time period covered by Geraghty & Miller's annual reports. However, this consultant concludes that CDM's statement is misleading when it refers to Del Val as a possible minor source of contamination, since they have not first established the presence of an additional source of contamination downgradient of the wells found to contain contamination. There are three reasons for this.

The first reason concerns the shallow, water table aquifer. CDM states that water in this zone flows in the direction that the clay layer upon which it is perched dips, which could be in many directions. Geraghty & Miller states that the major component of ground water movement in the shallow water table aquifer is vertically downward with little lateral movement off-site. Both of these statements indicate that ground water in the water table zone moves in a random direction and thus the source of any ground water contamination cannot be determined with certainty.

The second reason concerns the 1984 and 1985 ground water sampling program for the deep artesian aquifer. In 1984, no artesian aquifer monitoring well upgradient from Del Val was sampled. In 1985, no artesian aquifer monitoring well downgradient of Del Val was sampled. These two facts mean that a concentration gradient for 1984 and 1985 could not be established, and thus, for 1984 and 1985, no source of are probably all from the same source." This statement is based on conclusions made on data collected in the western portion of the landfill. Although it cannot be proven, Geraghty & Miller suggests that this condition exists for the landfill area as a whole.

7.4.2 1985 Shallow Water Table Aquifer Sampling Results

As stated previously, the only water table aquifer well in close proximity to Del Val that was sampled in 1985 was the upgradient monitoring well DEP-1. DEP-1 was found to contain benzene (623 ppb), chlorobenzene (1,290 ppb), ethylbenzene (1,360 ppb), methylene chloride (4.8 ppb), and 1,2 Trans-dichloroethene (60.5 ppb). These results again show that there were detectable levels of VOC contamination in the area north and upgradient of Del Val. Because no wells downgradient of Del Val were sampled at this time, this sampling program cannot be used to determine if either Del Val or the landfill was adding to the contamination of the aquifer.

7.5 Conclusion

The data from all three sampling programs indicates that, for the years 1983 through 1985, there was contamination present in wells upgradient from Del Val. However, it is important to note that Camp, Dresser, & McKee's (CDM) conclusions in their 1989 report were drawn from data collected in 1986 through 1989, while the period covered by Geraghty & Miller's annual reports was 1983 through 1985. Additionally, (CDM) was able to draw upon

**RESPONSE TO
DEL VAL INK & COLOR COMMENTS
ON THE CINNAMINSON REMEDIAL
INVESTIGATION REPORT**

prepared by
The U.S. Environmental Protection Agency

July 31, 1990

contamination in the deep artesian aquifer can be determined with certainty.

The third reason deals with the 1983 results of ground water analyses for the deep, artesian aquifer. As stated previously in this section, the upgradient well GM-8D recorded much higher levels of contamination than well GM-1D, the deep aquifer monitoring well downgradient of Del Val. This clearly states that there is contamination entering the deep aquifer upgradient of Del Val. However, the question of whether or not Del Val contributed to this contamination as it moved under Del Val can still not be answered because no rate of attenuation (dissipation) could be calculated for the contamination reduction between the upgradient and downgradient wells. If given enough information, we can calculate a rate of attenuation over short distances; however, we have insufficient data and cannot determine if new sources have been added between the two points where the contamination level is known.

Subsections 2 through 5 (pages 5 through 7) address the possibility of Del Val being a source of the following ground water contaminants: benzene, toluene, chlorobenzene, ethylbenzene, trans-1,2-dichloroethane, totaluxylenes, 1,1-dichloroethane, 1,2-dichloroethane dichlorofluoromethane, 1,2-diethoxyethane and di-isopropyl ether.

Del Val Ink is not presently suspected to be a source of any of these compounds.

Subsection 6 (pages 7 and 8) addresses the likelihood of Del Val being a source of chloroethane found in the ground water. The comment notes that Del Val has reportedly never used chloroethane. The comment also compares the average chloroethane concentration in the monitoring wells at Del Val (20.0 ppb) with the concentration in an upgradient monitoring well (A1S at 55 ppb) and a well cross gradient (C7M at 2J ppb).

The basis for the conclusion that Del Val may contribute chloroethane has previously been presented (CDM FPC, June 1990, page 19) and is as follows:

- The concentration of chloroethane is higher in monitoring well A-6S than in A-6M. The higher concentrations in the shallow aquifer suggest a local source. This pattern is in contrast with that found for the other chemicals found at the A-6 cluster. The other chemicals were found in higher concentrations in the deeper (semi-artesian aquifer) suggesting a more distant source.
- Chloroethane was not detected in well C-6S upgradient of A-6. This is in contrast to the other chemicals found at the A-6 cluster, which were found in high concentrations at C-6S and are believed to be from the landfill.
- Most of the other chemicals found in the A-6 cluster were detected in the landfill gas vent wells, while chloroethane was not.

The pattern of chloroethane contamination deviates from the pattern of all the other chemicals found in that portion of the site, suggesting a separate source. The higher level in A-6S suggested a local source, ie, Del Val. It should be noted that chloroethane contamination at other parts of the site is attributed to the SLI landfill.

Section 4.0 (page 10) of the SMC report addresses air sampling conducted at the site and states that without knowing the prevailing wind direction it is difficult to pinpoint the possible source of methylene chloride. The report also states that the source of contamination at Station 3 (Del Val) could be Station 5 (SLI landfill) because the concentration at Station 5 is higher than at Station 3.

(TV 28/17)

ATTACHMENT

Section 2.0, page 2, addresses ground water "mounding" and perched water conditions at the site. SMC Environmental Services Group (SMC) notes that shallow ground water flow is "(locally) radially away from the landfill in all directions but at varying distances and velocities" due to ground water mounding and clay "liners" of the Potomac-Raritan-Magothy (PRM) formation.

> Camp Dresser & McKee Inc. (CDM) is no longer using the term "mounding" to describe the conditions at the SLI landfill. There is no evidence of mounding of the semi-artesian aquifer. As stated in "Response to PRP comments, Cinnaminson Study Area, Cinnaminson, New Jersey (CDM FPC, June 1990, page 7) perched water exists beneath and surrounding the landfill due to natural clay layers and/or impermeable zones within the fill material itself. However, no conclusions regarding the distance perched ground water flows away from the landfill or the velocity of such flow were presented in the RI report.
>
> The flow of perched water is independent of the ground water flow in the semi-artesian zone, however radial flow in all directions outward from the landfill is not believed to occur. Perched water flow is more likely controlled by the dip of the clay layers. (CDM FPC, June 1990, pages 7-9).
>
> SMC uses the term clay "liners" in reference to the upper zone. Only natural clay layers exist. These are known to be naturally discontinuous (see RI fence diagram and CDM FPC, June 1990, page 5) and may have been removed by excavation in certain areas of the landfill. Thus, they are not believed to be very effective as liners. However, SMC is correct in their statement that perched ground water which eventually reaches a break or discontinuity in a clay lens will migrate vertically downward, mix with water in the lower (semi-artesian) zone and flow southeast with regional ground water flow.

Section 3.0 of the SMC report refers to statements in the RI report indicating that Del Val Ink & Color, Inc. (Del Val) is a source of ground water contamination. Six subsections of Section 3.0 are concerned with various chemical contaminants. Subsection 1 (page 5) states that acetone in ground water samples could be due to laboratory of field contamination.

> Data validation criteria for common lab contaminants were adhered to (see CDM FPC, June 1990 page 12). The acetone found in both the shallow and deep well from the December 1986 sampling was rejected. However, the acetone concentration found in GW-A05 in the July 1987 samples was not rejected and is believed to represent actual conditions. Therefore, Del Val is a possible source of acetone contamination.

AFG

JAMES W. BRADFORD JR.
VICE PRESIDENT AND GENERAL COUNSEL

August 25, 1990

Mr. Trevor Anderson
Remedial Project Manager
U.S. Environmental Protection Agency
Room 711
26 Federal Plaza
New York, New York 10278

Re: Cinnaminson Groundwater Contamination Site

Dear Mr. Anderson

This letter sets forth in summary form the comments of AFG Industries, Inc. concerning the proposed plan of remediation for the Cinnaminson Groundwater Contamination Site (hereinafter the "Site"). While AFG Industries, Inc. desirous of protecting the public health of area residents and persons coming in contact with the Site, we do not believe it necessary to effectuate the actions described as Alternative MM-5 in the publication dated May 1990. It appears that treatment of all groundwater will be the most expensive Alternative and likely unnecessary to actually protect the public interest in question. Further, we believe that implementation of Alternative MM-5 is contrary to the National Contingency Plan.

We would suggest re-examination of the proposed Alternatives and implementation of the least cost Alternative necessary to protect the public health and environment. AFG Industries, Inc. is <u>not</u> a contributor to the contamination of or in any way connected with the Site, but makes these comments as an interested citizen. I request this letter be made part of the Administrative Record and that AFG be advised of any modification or amendment to the remedial action proposed by EPA. Thank you for your assistance.

Sincerely,

James W. Bradford, Jr.

J15.51

AFG Industries Inc.

P O BOX 929, KINGSPORT, TENNESSEE 37662 (615) 229-7200

CDM agrees that it is difficult to determine the source or sources of methylene chloride in the air from the available data. However, it should be noted that personnel conducting the field activities notices organic vapor odors in the indoor air in the Del Val plant, as well as outside the plant building.

Section 5.0 states that all ground water contamination "can more logically be attributed to sources other than Del Val".

It is CDM's opinion that chloroethane contamination found in wells A-6S and A-6M, located on Del Val property can most likely be attributed to Del Val, while chloroethane contamination found in other areas is not attributed to Del Val.

Section 7.0 reviews the 1983 and 1985 annual reports for Sanitary Landfill Inc. by Geraghty & Miller (G&M), and discusses hydrogeological and ground water quality findings with focus on the Del Val facility.

In general, the review conducted by SMC utilizes the ground water flow direction found by G&M. This has been documented to be incorrect (CDM FPC, June 1990, page 4). G&M utilized GM-1D as a semi-artesian well, however data obtained in RI indicates it is a perched zone well. Ground water flow directions using water levels from GM-1D are skewed to the south. In addition, GM-8D is also screened in the perched zone, although designated by G&M as a semi-artesian zone well. The discussion of ground water quality and flow direction by SMC is based on the incorrect designation of these wells as screening the semi-artesian zone. Any such discussions of the semi-artesian aquifer including wells GM-8D and GM-1D will be misleading and incorrect as these wells actually represent perched water.

In addition, the discussion of GM-10 in section 7.2.2 and 7.3.1 is misleading as the well is referred to as downgradient from Del Val. This well, as acknowledged by SMC, is within the perched zone. No flow direction within the perched zone has been determined, therefore its relationship to Del Val's location with respect to ground water flow is unknown.

PEPPER, HAMILTON & SCHEETZ
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July 27, 1990

U.S. Environmental Protection Agency
New Jersey Remedial Action Board
26 Federal Plaza, Room 711
New York, NY 10287
Attn: Mr. Trevor Anderson

Re: Cinnaminson Ground Water Contamination Site

Dear Mr. Anderson:

As reflected in Katherine Laird's letter of July 23, it appears that Chemical Leaman has been incorrectly identified as a potentially responsible party at the Cinnaminson Ground Water Contamination Site. Chemical Leaman does have some limited comments regarding the Proposed Plan, however, which it would like to add to comments of other parties.

It is our belief that inadequate consideration has been given to use of soil vapor extraction. Additionally, it does appear that volatiles are the agency's concern. Volatiles have been effectively dealt with through bioremedial techniques at other sites.

As you may know, by October 18, 1989 memo, Jonathan Cannon, then Acting Assistant Administrator of EPA, warned against the full scale implementation of pump and treat as recommended in the Proposed Plan. That memo, a copy of which is attached, recommends a phased approach to pump and treat and "equal detail" to alternative remedies (see pg. 5). Additionally, he recommends obtaining additional data to better assess the likely response of ground water to extraction. I

GRINDING BALLS, INC. Manufacturers of

- *Ni-Hard Grinding Media*
- *Cr. Moly Grinding Media*
- *Iron Castings up to 50 lb.*

Plant: Union Landing Road • Box 201, Riverton, N. J. 08077 • Phone: 609-829-1505

June 23, 1990

U. S. Environmental Protection Agency
N. J. Remedial Action Branch
26 Federal Plaza, Room 711
New York, N.Y. 10278

Att. Mr. Trevor Anderson
Re: The Cinnaminson Ground Water Contamination Site in Burlington County, N. J.

Dear Mr. Anderson,

Our property directly adjoins the Sanitary landfill at the very end of Grinding Balls Lane. When we built our plant 35 years ago the level of the landfill was about 20 ft. below the normal contour of the land in this area. The area south of us was still a sand hole, containing some water - I suppose ground water. No water was available for a surface well and we were advised by Artesian well drillers that no water was available in deeper areas. This was borne out when Public Service Electric & Gas Co. tried drilling north of us and south of us with no result. We allowed them to tap into our line running to Union Landing Road where city water is available.

Our plant has no underground tanks and does not discharge any toxic materials above or below ground - with one exception- for our toilets.

I doubt if you are ever going to get good clean ground water in this area as long as it co-mingles with the landfill ground water.

We have heard many stories about trucks entering the landfill at night and dumping loads, undoubtly toxic. I have never witnessed this but it came from those living on Union Landing Road.

Call me if I can be of any further help.

Sincerely,

Harold J. Winkelspecht

arold J. Winkelspecht, Pres.

6300

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 18 1989 Directive No. 9355.4-03

OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE

MEMORANDUM

SUBJECT: Considerations in Ground Water Remediation at Superfund Sites

FROM: Jonathan Z. Cannon
Acting Assistant Administrator

TO: Waste Management Division Directors
Regions I, IV, V, VI, VII, VIII
Emergency and Remedial Response Division Director
Region II
Hazardous Waste Management Division Directors
Region III, IX
Hazardous Waste Division Director
Region X

Purpose

The purpose of this memorandum is to transmit our findings from a recently completed study of several sites where ground water extraction is being conducted to contain or reduce levels of contaminants in the ground water. In addition, this memorandum presents several recommendations for modifying the Superfund approach to ground water remediation.

Background

The most common method for restoring contaminated ground water is extraction and treatment of contaminated ground water. Recent research has suggested that in many cases, it may be more difficult than is often estimated to achieve cleanup concentration goals in ground water. In response to these findings, the Office of Emergency and Remedial Response (OERR) initiated a project to assess the effectiveness of ground water extraction systems in achieving specified goals. Nineteen case studies were developed from among Superfund and State-lead sites, RCRA and Federal facilities. These sites were selected primarily on the basis that the ground water extraction systems had been operating for a period of time sufficiently long to allow for an evaluation of the system would suggest that the Proposed Plan be reviewed with Mr. Cannon's comments in mind.

Sincerely,

Philip L. Hinerman

PLH/bab
cc: Robert Shertz
Katherine K. Laird, Esquire

Environmental Research Information (FTS 684-7391 or (513) 569-7391).

Recommendations

The findings of the study substantiate previous research and confirm that ground water remediation is a very new, complex field. Based on this study, I am recommending consideration of certain factors and approaches in developing and implementing ground water response actions. The major recommendation is to orient our thinking so that we initiate early action on a small scale, while gathering more detailed data prior to committing to full-scale restoration. These recommendations are consistent with the Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites and do not alter Superfund's primary goal of returning ground water to its beneficial uses in a time frame that is reasonable given the particular site circumstances. The recommendations do, however, encourage the collection of data to allow for the design of an efficient cleanup approach that more accurately estimates the time frames required for remediation and the practicability of achieving cleanup goals.

While standard procedures for the more refined data collection techniques suggested below are being developed, it will be beneficial at most sites to implement the ground water remedy in stages. This might consist of operating an extraction system on a small scale that can be supplemented incrementally as information on aquifer response is obtained.

These recommendations are described further below. The attached flow chart illustrates how the recommendations fit into the Superfund ground water response process.

Recommendation 1: Initiate Response Action Early.

The bias for action should be considered early in the site management process. Response measures may be implemented to prevent further migration of contaminants if they will prevent the situation from getting worse, initiate risk reduction, and/or the operation of such a system would provide information useful to the design of the final remedy. Because the data needed to design a ground water containment system are often more limited than that needed to implement full remediation, it will in a number of cases be possible and valuable to prevent the contaminant plume from spreading while the investigation to select the remediation system progresses. The determination of whether to implement a containment system should be based on existing information, data defining the approximate plume boundaries, hydrologic data, contaminants present, and approximate concentrations, and best professional judgment. Examples of situations where this type of action will probably be warranted include sites where ground water plumes are migrating

Objective

The objective of this memorandum is to describe the findings of this study and to recommend the consideration of certain factors and approaches in developing and implementing ground water response actions at Superfund sites.

Findings of Study

Several trends were identified from the case studies:

- The extraction systems are generally effective in containing contaminant plumes, thus preventing further migration of contaminants.
- Significant mass removal of contaminants (up to 100,000 pounds over three years) is being achieved.
- Concentrations of contaminants have generally decreased significantly after initiation of extraction but have tended to level off after a period of time. At the sites examined, this leveling off usually began to occur at concentrations above the cleanup goal concentrations expected to have been attained at that particular point in time.
- Data collection was usually not sufficient to fully assess contaminant movement and system response to extraction.

Several factors appear to be limiting the effectiveness of the extraction systems examined, including:

- Hydrogeological factors, such as the heterogeneity of the subsurface, the presence of low permeability layers, and the presence of fractures;
- Contaminant-related factors, such as sorption to the soil, and presence of non-aqueous phase liquids (dissolution from a separate non-aqueous phase or partitioning of contaminants from the residual non-aqueous phase);
- Continued leaching from source areas;
- System design parameters, such as pumping rate, screened interval, and location of extraction wells.

The report summarizing the study and findings, entitled Evaluation of Ground Water Extraction Remedies is attached. Additional copies of the report are available through the Public Information Center ((202) 382-2080) or the Center for the remedy may reveal that it is technically impracticable to achieve health-based concentrations throughout the area of attainment, and that another remedy or a contingent remedy may be needed.

Where sufficient information is available to specify an alternative or contingent remedy at the time of remedy selection, the ROD should discuss the contingency in equal detail to the primary remedial option, and should provide substantive criteria by which the Agency will decide whether or not to implement the contingency. See Interim Final Guidance on Preparing Superfund Decision Documents, OSWER Directive 9355.3-02 (May 1989), at page 9-17.[1] The ROD may also discuss the possibility that an ARARs waiver will be invoked when MCLs or other Federal or State standards cannot practicably be attained in the ground water; a written waiver finding should be issued at the time the contingency is invoked, or in limited circumstances, in the ROD itself.[2]

The public should be informed of the decision to invoke the contingency (and, perhaps, the waiver) through issuance of an Explanation of Significant Differences (ESD) which involves a public notice. A formal public comment period is not required when a decision is made to invoke a contingency specified in the ROD; however, the Region may decide to hold additional public comment periods pursuant to NCP section 300.825(b) (proposed) (Dec. 21, 1988, 53FR at 51516). In any event, the public may submit comments after ROD signature on any significant new information which "substantially support[s] the need to significantly alter the response action" NCP Section 300.825(c) (proposed).

There may also be situations where the Region finds that it is impracticable to achieve the levels set out in the ROD, but no contingency had been previously specified in the ROD. In such cases, a ROD amendment would be necessary to document fundamental changes that are made in the remedy based on the information gained during implementation; an ESD would be necessary to

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1 For instance, the ROD may provide that a contingent remedy will be implemented if there is a levelling-off of contaminant concentrations despite continued ground water extraction over a stated period of time.

2 It may be possible to invoke a waiver at the time of ROD signature (a "contingent waiver") where, for example, the ROD is detailed and establishes an objective level or situation at which the waiver would be triggered. However, the use of contingent waivers should only be considered on a case-by-case basis after discussion with OERR\OWPE.

rapidly (e.g., highly permeable aquifers, mobile contaminants potential migration through fractures, and sites near drinking water wells that are potentially affected by the plume.

A Record of Decision (ROD) for an interim remedy may be prepared with a limited evaluation of alternatives that compares the advantages of taking an early action to the possible ramifications of waiting until the investigation has been completed. The evaluation of this action should be included as part of the scoping phase for the site and if determined to be appropriate, implemented while the overall RI/FS is underway. The RI/FS for the final action at the site should continue and incorporate information gained from this early action. If a containment action is implemented, the ground water flow should be monitored frequently, immediately before, during, and immediately after initiation of the action to obtain information on system response.

It is also advisable to implement ground water remediation systems in a staged process at sites where data collected during the remedial investigation did not clearly define the parameters necessary to optimize system design. This might consist of installing an extraction system in a highly contaminated area and observing the response of the aquifer and contaminant plume during implementation of the remedy. Based on the data gathered during this initial operation, the system could be modified and expanded as part of the remedial action phase to address the entire plume in the most efficient manner.

Recommendation 2: Provide Flexibility in the Selected Remedy to Modify the System Based on Information Gained During Its Operation.

In many cases it may not be possible to determine the ultimate concentration reductions achievable in the ground water until the ground water extraction system has been implemented and monitored for some period of time. Records of Decision should indicate the uncertainty associated with achieving cleanup goals in the ground water.

In general, RODs should indicate that the goal of the action is to return the ground water to its beneficial uses; i.e., health-based levels should be achieved for ground water that is potentially drinkable. In some cases, the uncertainty in the ability of the remedy to achieve this goal will be low enough that the final remedy can be specified without a contingency. However, in many cases, it may not be practicable to attain that goal, and thus it may be appropriate to provide in the ROD for a contingent remedy, or for the possibility that this may only be an interim ROD. Specifically, the ROD should discuss the possibility that information gained during the implementation of that protection is being maintained at the site will take place at least every five years.

Recommendation 3: Collect Data to Better Assess Contaminant Movement and Likely Response of Ground Water to Extraction.

In addition to the traditional plume characterization data normally collected, the following data is of particular importance to the design and evaluation of ground water remedies and should be considered in scoping ground water RI/FSs. Assessments of contaminant movement and extraction effectiveness can be greatly enhanced by collecting more detailed information on vertical variations in stratigraphy and correlating this to contaminant concentrations in the soil during the remedial investigation. More frequent coring during construction of monitoring wells and the use of field techniques to assess relative contaminant concentrations in the cores are methods that may be used to gain this information. More detailed analysis of contaminant sorption to soil in the saturated zone can also provide the basis for estimating the time frame for reducing contaminant concentrations to established levels and identifying the presence of non-aqueous phase liquids. Cores taken from depths where relatively high concentrations of contaminants were identified might be analyzed to assess contaminant partitioning between the solid and aqueous phases. This might involve measuring the organic carbon content and/or the concentration of the contaminants themselves.

The long-term goal is to collect this information during the RI so that more definitive decisions can be made at the ROD stage. Standardized sampling and analytical methods to support these analyses are currently being evaluated.

For further information, please consult the appropriate Regional Ground Water Forum member, Jennifer Haley at FTS 475-6705 or Caroline Roe at FTS 475-9754 in OERR's Hazardous Site Control Division, or Dick Scalf at the Robert S. Kerr Environmental Research Laboratory (FTS 743-2308)

Attachment: Flow Chart
Summary Report

cc: Superfund Branch Chiefs, Regions I - X
Superfund Section Chiefs, Regions I - X wo/summary report

document significant but non-fundamental changes in the remedy based on the additional information.

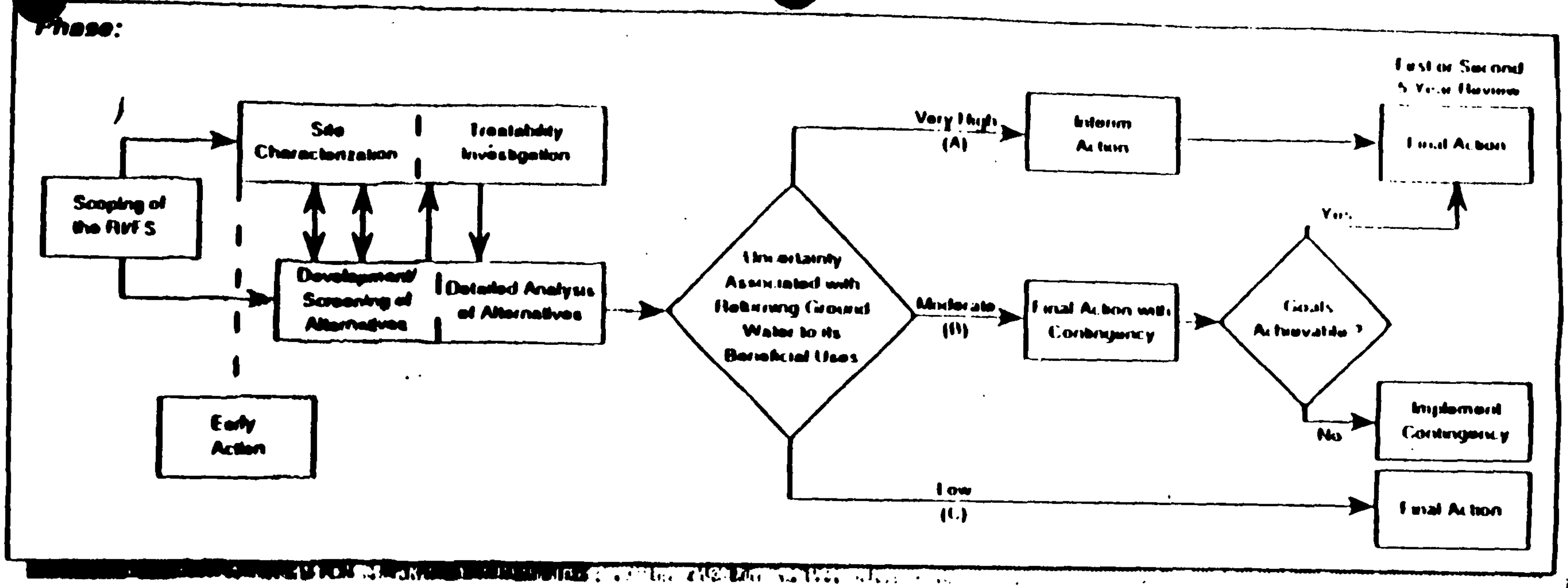
For sites where there is substantial uncertainty regarding the ability of the remedy to return the ground water to its beneficial uses (e.g., dense non-aqueous phase liquids in fractured bedrock) it is appropriate to indicate that the initial action is interim with an ultimate remedy to be determined at some specified future date. The action should be designed to achieve the basic goal and carefully monitored over time to determine the feasibility of achieving this goal. In many of these cases, this can only be determined after several years of operation. The five year review may be the most appropriate time to make this evaluation. When sufficient data have been collected to specify the ultimate goal achievable at the site (e.g., first or second five year review), a final ROD for ground water would be prepared specifying the ultimate goal, including anticipated time frame, of the remedial action.

Although overall system parameters must be specified in the ROD, it is usually appropriate to design and implement the ground water response action as a phased process. An iterative process of system operation, evaluation, and modification during the construction phase can result in the optimum system design. Extraction wells might be installed incrementally and observed for one to three months to determine their effectiveness. This will help to identify appropriate locations for additional wells and can assure proper sizing of the treatment systems as the range of contaminant concentrations in extracted ground water is confirmed.

If it is determined that some portion of the ground water within the area of attainment cannot be returned to its beneficial uses, an evaluation of an alternate goal for the ground water should be made. Experience to date on this phase of ground water remediation is extremely limited and more definitive guidance on when to terminate ground water extraction will be provided later. When the point at which contaminant concentrations in ground water level off, however, this should be viewed as a signal that some re-evaluation of the remedy is warranted. In many cases, operation of the extraction system on an intermittent basis will provide the most efficient mass removal. This allows contaminants to desorb from the soil in the saturated zone before ground water is extracted providing for maximum removal of contaminant mass per volume of ground water removed.

Ground water monitoring should continue for two to three years after active remediation measures have been completed to ensure that contaminant levels do not recover. For cases where contaminants remain above health-based levels, reviews to ensure

GROUND WATER REMEDIATION PROCESS



Actions:

- Identify data collection needs
- Identify possible containment action
- Install gradient control wells in phased process
- Monitor aquifer response
- Design and implement ground water extraction system in phased process
- Monitor aquifer response
- Evaluate data from system operation
- Determine practicable goals
- Identify any areas where long term institutional controls will be necessary

Administrative Considerations:

ROD (Early Action)

A) ROD (Interim Remedy)
B) ROD (Contingency)
C) ROD (Final)

A) ROD (Final)
B) ESD or ROD amendment

Enforcement Considerations:

Negotiate RI/FS Scope:
- Data collection
- Early action

Negotiate Consent Decree

A) Negotiate Consent Decree
B) Possible stipulation or amendment to Consent Decree

Attachment 1 - PRPs List

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Murray Hill, New Jersey 07974
Attn: Mr. Frank J. Dux, Manager
Environmental Affairs

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