Prepared For:

Signore, Inc.
Ellicottville, New York

REMEDIAL INVESTIGATION REPORT

SIGNORE FACILITY

ELLICOTTVILLE, NEW YORK

VOLUME 1 OF 2

April 1991

Prepared By:

Lozier/Ground Water Associates
Pittsford, New York
Westerville, Ohio

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EXECUTIVE SUMMARY

A Remedial Investigation (RI) has been conducted by Signore, Inc. of a study area in the Town of Ellicottville, New York, which extends from the Signore Facility to the Town Well. The purpose of the RI is to gather additional data to further evaluate source, extent and remedial alternatives for volatile organic ground water contamination identified at the Signore Facility. Work performed for the RI Project has consisted of additional on-site and off-site monitoring well installations, soil gas surveys, soil boring drilling and sampling and analysis of soils, sampling and analysis of ground water samples from on-site and off-site monitoring wells, sampling and analysis of surface water and surface water sediment samples from Plum Creek and Great Valley Creek and sampling and analysis of samples from the municipal sanitary sewer.

The aquifer in the study area consists of an unconsolidated glacial outwash unit, encountered generally from a depth of 15 to 50 feet. Ground water zones for monitoring purposes consist of: the shallow zone, the upper sand and gravel in the glacial outwash unit above a depth of 25 feet; the intermediate zone, the lower coarser-grained sand and gravel in the glacial outwash unit from a depth of 25 to 50 feet; and the deep zone, the lower part of the glacial outwash unit and the upper part of the lower, variable unit below a depth of 50 feet.

Ground water flow in the study area is generally south-southeast, paralleling State Route 219, with gradients ranging from about 0.001 to 0.007 ft/ft. A representative hydraulic conductivity for the intermediate ground water zone, calculated from an aquifer test run on the Town Well, is 2 X 10^{-1} cm/sec (400 ft/day). Using these values for hydraulic gradient and hydraulic conductivity and a representative value for effective porosity of 0.15 to 0.2, the ground water flow rate ranges from 2 to 20 ft/day.

Ground water has shown to be the only environmental media impacted by contamination from the Signore Facility. Results from sampling surface water, surface water sediment and sewer water sampling have shown that ground water contamination from the Signore Facility has not impacted surface waters of Plum Creek or Great Valley Creek or the municipal sanitary sewer. The soil sampling results show low levels of the same volatile organics as in the ground water, probably indicating residual contamination that has already infiltrated to the ground water. Ground water has been impacted by volatile organics; on-site by trichloroethene, 1,1,1-trichloroethane, 1,1-dichloroethane and 1,2-dichloroethene above maximum contaminant levels and off-site by trichloroethene, 1,1,1-trichloroethane above maximum contaminant levels.

On-site ground water contamination generally increases areally and with depth from north to south across the Signore Facility. Contamination is present in the shallow zone across the western and southern part of the Facility, in the intermediate zone in the southern part of the Facility and in the deep zone at only one monitoring well at the southern boundary of the Facility. The highest concentrations, above 100 ug/l total volatile organics, were measured in wells along the southern downgradient boundary of the Facility.

Off-site ground water contamination extends from the Signore Facility to the Town Well and is confined to the intermediate zone. Higher contaminant concentrations (TCE = 43 ug/l and TCA = 49 ug/l) were found in the wells on the west side of State Route 219, with the highest concentration immediately south of the Signore Facility. These TCE and TCA concentrations decrease to 6 ug/l and 4 ug/l, respectively, at the Town Well.

The source(s) of volatile organics contamination were leaks from floor drains, sumps, pits, underground tanks and the on-site septic system inside the building and infiltration from spills outside the building. The drains, sumps, pits and tanks have been closed or rerouted. All process and sanitary discharges were changed over from the on-site septic system to the municipal sewer system and the septic tanks are scheduled for closing in early 1991. There are no known continuing sources of volatile organics contamination at the Signore Facility and contamination present is from past leaks and spills. Thus, no source control measures can be implemented at the Signore Facility to lessen the contamination that is already present and conversely, the contamination should not worsen since no sources still exist.

The contaminant migration pathway is the movement of ground water. Leaks and spills would migrate vertically downward under the influence of gravity to the water table. Once in the saturated zone, contaminants would migrate by mechanical advection, with the concentration changes determined by hydrodynamic dispersion and chemical reactions, in the direction of ground water flow, to the south-southeast. Through dispersion, the VOCs would migrate vertically downward through the saturated zone, moving from the shallow to the intermediate and deep ground water zones as the contaminants move away from the source. Migration would then continue in the direction of ground water flow, to the south-southeast.

The receptors of contaminated ground water downgradient of the Signore Facility are domestic water supply wells and the Town Well. Interim Remedial Measures have been (or soon will be) implemented to protect these ground water receptors from contamination. These measures include connection of downgradient residences to the Town water supply, installation of an interceptor well upgradient of the Town Well and installation of an interceptor well at the downgradient boundary of the Signore Facility. With these measures in place, there will no future downgradient contaminant receptors.

A human health evaluation risk assessment has concluded that lifetime exposure to the maximum levels of volatile organic ground water contamination found in the downgradient off-site wells has a non-cancer health risk with a combined hazard index of 0.04 (where 1.0 is the threshold for adverse health effects) and a cancer risk equal to 4 x 10^{-6} (less than 4 cases of cancer should result in a population of one million exposed over an entire lifetime). This risk assessment assumes continued exposure to the ground water contamination in the future which will not occur due to the implementation of the Interim Remedial Measures. Thus, the risk will be even lower than that identified above, if any risk at all.

1.0 INTRODUCTION

Signore, Inc. entered into an Administrative Order on Consent, #B9-0258-89-03, with the New York State Department of Environmental Conservation (NYSDEC) in 1989. As part of the Consent Order, Signore agreed to conduct a Remedial Investigation (RI)/ Feasibility Study (FS) at their facility in Ellicottville, New York. This document presents the Remedial Investigation (RI) Report for the Signore RI study area, located in the Village and Town of Ellicottville, Cattaraugus County, New York. This RI is consistent with guidelines for conducting an RI/FS under CERCLA (USEPA, October 1988).

1.1 PURPOSE

The purpose of the RI is to gather additional data to further evaluate contaminant distribution at and about the Signore site, to conclusively identify the source(s) of contamination and to evaluate source control measures and alternatives for aquifer restoration.

1.1.1 RI Work Plan - As part of the Consent Order, Signore was to prepare a RI/FS work plan. After several revisions, the NYSDEC on April 13, 1990 accepted the RI/FS Work Plan developed by Signore's consultant, Lozier/Ground Water Associates (LGA). This Work Plan (LGA, February 1990) identified and documented the tasks to be conducted during the RI, including preparation of this report.

Based on a review of the results of previous investigations, the following tasks were deemed necessary to meet the additional data requirements and objectives of the RI.

- Additional on-site and off-site monitoring wells were drilled and installed and water levels were measured to more fully characterize the stratigraphic and ground water flow conditions and evaluate potential contaminant migration pathways.
- Soil gas surveys were conducted, soil borings were drilled and soil samples were collected and analyzed to evaluate potential contaminant source areas.
- Ground water samples were collected from on-site and off-site monitoring wells and analyzed to evaluate and lateral and vertical extent of ground water contaminants.
- Surface water and surface water sediment samples were collected and analyzed from Plum Creek and Great Valley Creek to evaluate if the surface water had been impacted.
- Sewer water samples were collected to determine if the sanitary sewers adjacent to the site had been impacted.

1.1.2 Report Organization - This report has been structured to discuss the results of the RI in the following five sections.

Field and Analytical Procedures (Section 2.0) presents the methodology used to conduct the field investigation and analyze the samples collected in this project.

Hydrogeologic Characterization (Section 3.0) presents a description of the subsurface conditions encountered during drilling and an evaluation of the subsurface hydrogeologic conditions, including direction and rate of ground water flow.

Contaminant Characterization (Section 4.0) presents the results of the soil gas surveys, soil screening and sampling, ground water sampling, surface water/sediment sampling and sewer sampling and an evaluation of the nature and extent of contamination.

Contaminant Migration Pathways and Receptors (Section 5.0) presents an evaluation of the contaminant sources, pathways for contaminant migration, potential contaminant receptors and assessment of risk.

HPA

Conclusions and Recommended Actions (Section 6.0) presents a summary of the RI findings and recommends additional work.

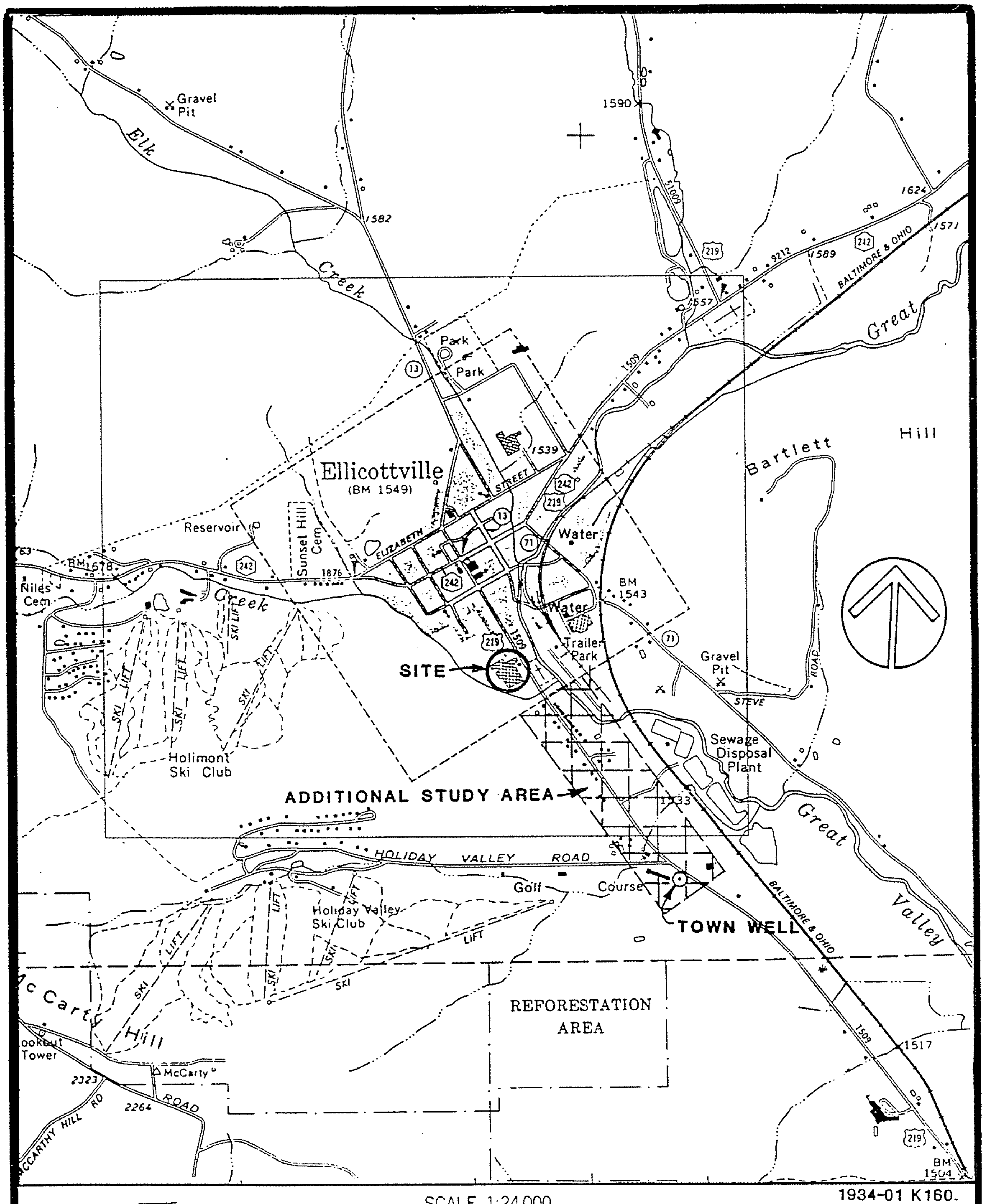
none mentioned

1.2 BACKGROUND

Signore, Inc. operates an industrial facility in the Village of Ellicottville, Cattaraugus County, New York, located on State Route 219, approximately 0.3 miles southeast of the intersection of State Routes 219 and 242, as shown on Figure 1.

1.2.1 Site Description - The Signore, Inc. Facility (Plate 1) has been used for over 30 years for the machining and fabrication of metal products and presently encompasses approximately 168,000 square feet of covered floor space situated on 13 acres of property (Dames and Moore, 1987a). Additionally, this RI report involves properties situated generally southeast of Signore, Inc., bounded on the east by the Railroad and the west by the valley wall, extending 100 feet south of the Town of Ellicottville municipal supply well (Town Well), as shown on Plate 2.

1.2.2 Physiographic Features - Physiographically, the site is situated near the southwest side of the steep-sided flat-bottomed valley which is drained by the southeasterly-flowing Great Valley Creek. Additionally, Plum Creek flows into Great Valley Creek just southeast of the Signore, Inc. Facility.



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Map base from 1964 U.S. Geological Survey 7.5-minute quadrangle.

QUADRANGLE LOCATION

Ellicottville, New York

ELLICOTTVILLE QUADRANGLE
SECOND EDITION - 1975

FIGURE 1
STUDY AREA
LOCATION MAP

1.2.3 Demography - The Cattaraugus County Department of Development, Planning and Tourism reports that the 1990 population of the Town of Ellicottville is 1597 and the Village of Ellicottville is 501. This does not include the population influx into Ellicottville during the winter ski season.

1.2.4 Land Use - As reported by the Cattaraugus County Department of Development, Planning and Tourism, land use in the Town and Village of Ellicottville consists of residential, commercial, industrial, recreational, agricultural, park and forest land. The area is a popular ski resort during the winter months.

1.2.5 Climate - The climate of the study area is predominantly continental. As reported at the Buffalo Airport, approximately 60 miles north of Ellicottville, the annual average precipitation is about 38 inches per year, the average temperature is about 48° F with the lowest temperatures in January and February and the highest in July, and the prevailing wind direction is southwest.

1.3 SITE HISTORY

As a result of previous investigations, low level volatile organic ground water contamination was found in the monitoring wells at the Signore Facility and in residential domestic wells and the Town Well downgradient of the Signore Facility.

1.3.1 Previous Studies - In late 1986, as part of a proposed real estate transaction, Dames and Moore performed a site assessment at the Signore Facility with the results presented in a June 1987 report entitled, "Oil and Hazardous Material Site Evaluation, American Locker Group, Inc. Signore Division, Ellicottville, New York" (Dames and Moore, 1987a). The results of this study indicated the presence of several volatile organic chemicals (VOCs) in the ground water beneath the site. As a result, a detailed investigation of the Signore site was conducted by Dames and Moore in early 1987 with the results presented in a June 1987 report entitled, "Ground Water Study, American Locker Group, Inc., Signore Division Ellicottville, New York" (Dames and Moore, 1987b). This study involved the installation and sampling of about 30 monitoring wells on-site at the Signore Facility. About 1/3 of these monitoring wells had detectable levels of VOCs, primarily 1,1,1 trichloroethane (TCA) and trichloroethene (TCE). It was also determined that the ground water flow in the outwash deposits was to the southeast and that the Signore site was not impacting the Village of Ellicottville municipal water supply well (Village Well), located about 500 feet northeast of the Signore site.

Based on the southeasterly ground water flow direction, a water supply well sampling and chemical testing program was conducted by Dames and Moore in the area southeast of the Signore site. This program involved the sampling of about 30 domestic wells, with the results presented in a June 1987 report entitled, "Water Supply Well Sampling and Analysis, Ellicottville, New York" (Dames and

Moore, 1987c). Analytical results from these samples indicated the general wide-spread occurrence of low levels of TCE and TCA (less than 50 micrograms per liter, ug/l) which generally decreased to the south. One of the wells sampled was the Town Well which had 11 ug/l of TCE in March 1987.

Since mid-1987, activities at the Signore Facility have involved the sampling of selected on-site wells and the collection of ground water level data on several occasions in 1987 and 1989. The results of September and November 1987 sampling were presented in letters from Ground Water Associates, Inc. (GWA) to American Locker Group, dated November 9, 1987 and December 21, 1987. In addition to on-site sampling, the Town Well and Village Well were sampled by GWA in January 1989 and April 1989 to develop an expanded database. Additional sampling and analysis of selected domestic wells south of the Signore site similar to that conducted in 1987 was conducted by GWA in May 1989.

The Cattaraugus County Department of Health and the Town and Village of Ellicottville have also sampled a number of supply wells since 1987. In 1988, the Town and Village contracted with Malcolm Pirnie, Inc. to perform an evaluation of their water systems. The results of this evaluation were presented in a February 1989 report entitled, "Water Supply Evaluation, Town and Village of Ellicottville, New York" (Malcolm Pirnie, 1988). The report indicated that both the Village and Town Wells exceed the Maximum Contaminant

Level (MCL) for TCE and outlined several options for treatment and relocation of wells to meet quality and quantity objectives. The report recommended a new Village/Town Water Supply well, which has been installed north of Town and is scheduled to go on-line in January 1991.

In April 1989, public notification was made that the Town Well and Village Well exceeded the State MCLs for drinking water. In a letter dated March 17, 1989, Signore, Inc. proposed a strategy to the NYSDEC for remediation of the site which focused on the protection of public health and restoration of the aquifer. The proposal outlined tasks for: (1) installation of an interceptor well upgradient of the Town well to reduce contaminant levels in the Town Well; (2) connection of residences with impacted private wells just south of the Village limits to the Town water distribution system; and (3) installation of an interceptor well at the Signore facility to reduce off-site contaminant migration.

At a meeting with the NYSDEC and concerned parties on May 23, 1989 (Town, Village, County Health Department and Signore), it was decided that the above three remedial strategies warranted status as interim remedial measures, prior to completion of the RI. As a result, Signore submitted a Work Plan entitled, "Interim Remedial Measures, Signore Site, Ellicottville, New York" (LGA, May 1990). This work plan presented the scope of work to complete the interceptor well upgradient of the Town Well and the connection of the residences to the Town water distribution system. The scope of work for the on-site interceptor well was retained in the Work Plan for the RI (LGA, February 1990) in order to use the RI results to for optimal placement of the interceptor well.

<u>1.3.2 Previous Remedial Measures</u> - In order to eliminate potential sources and pathways of contamination at the Signore Facility, the use of various steel and concrete underground storage tanks was discontinued through closure and/or abandonment, floor drains were closed or rerouted to the sanitary sewer system and the Facility switched from an on-site septic disposal system to the public sewer. Additionally, the use of TCE as a degreaser has been discontinued since the mid-1970's in favor of a "Safety Clean™" system that collects waste solvents for removal by the Safety Clean Service.

The use and disposal of hazardous materials (solvents, adhesives, lubricants, cutting oils, cleaners, thinners and paints) and the underground storage of hazardous materials and fuels at the Facility are described by Dames and Moore in the June 1987 report entitled, "Oil and Hazardous Material Site Evaluation, American Locker Group, Inc." (Dames and Moore, 1987a). The present or former locations of underground storage tanks, septic tanks, catch basin and the sanitary sewer are shown on Plate 1A.

As shown on Plate 1A and discussed in the Site Evaluation Report (Dames and Moore, 1987a), the following eight underground storage tanks were present at the Signore Facility.

- two 1,000-gallon steel gasoline tanks located along the eastern side of the Facility, adjacent to the old Signore house;
- one 1,000-gallon steel diesel fuel tank located along the eastern side of the Facility, adjacent to the old Signore house;
- one 1,000-gallon cement "emergency dump" tank located along the western side of the Facility, between the paint storage and maintenance buildings;
- one 1,000-gallon cement "emergency dump" tank located along the western side of the Facility, adjacent to the paint department;
- one 1,520-gallon "emergency dump" tank located along the western side of the Facility, adjacent to the steel storage area;
- one 6,000-gallon steel paint thinner storage tank located along the western side of the Facility, adjancent to the paint storage building; and
- one 500 gallon spill collection sump located along the western side of the Facility, adjacent to the maintenance building.

The three underground fuel storage tanks (two gasoline and one diesel) were closed in December 1986 by removing the fluids and sludge remaining in the tanks, cleaning the inside of the tanks and filling each of the tanks with concrete. The underground paint thinner storage tank was closed in December 1987 in a similar manner, by removing the fluid remaining in the tank, cleaning the inside of the tank and filling the tank with concrete. The purpose of the "emergency dump" tanks was to temporarily store flammable liquids underground if a fire occurred. According to Signore personnel, these tanks were never used and have never received discharges. The spill collection sump has also reportedly been disconnected from drains so that no discharges can be made.

Discharges of liquid wastes were previously disposed through a floor drain system into an on-site septic tank system; the septic tank system has since been switched to the public sewer. Areas with floor drains included the paint storage building, paint supply room, waste solvent distilling room and paint spraying room. In addition, the paint spraying room includes a skimmer and sump pit with a two-part setting tank. The treatment room has steel vats containing acid or alkali and methylene chloride. All the floor drains have either been closed with concrete or rerouted from the storm drain system. The rerouted drains now connect to collection tanks or the sanitary sewer system. All process water and sanitary discharges were changed over from an on-site septic system to the public sewer system.

As indicated above, past sanitary wastes from the Facility were discharged into an on-site septic system which consisted of several septic tanks in series with the outfall to Plum Creek. Two of these septic tanks were identified and sampled during the field work for the RI. These tanks, designated Tank No. 4 and Tank No.

2, are located in the central part of the Plant as shown on Plate 1A. Sampling procedures and results were presented in a letter submitted to the NYSDEC on November 28, 1990 entitled, "Work Plan - Septic Tank Cleaning, Signore Facility, Ellicottville, New York". These two tanks were properly abandoned on February 16-18, 1991. The liquids from the tanks were removed using an air powered pump and the solids were removed manually. The tanks were then cleaned with a pressure washer. Both tanks were filled with a concrete grout mixture.

1.4 INTERIM REMEDIAL MEASURES

As stated above, the Interim Remedial Measures (IRM) project was developed to address low level TCE and TCA ground water contamination in residential domestic wells and the Town Well, downgradient of the Signore Facility. The IRM project, consisting of installation of an interceptor well upgradient of the Town Well and connection of the residences with impacted domestic wells to the Town water supply, was initiated in June 1990 and is scheduled for completion in January 1991.

The Interceptor Well Assessment Report (LGA, August 1990) presented the results of the installation of monitoring wells, the Town Well aquifer test and the hydrogeologic evaluation and basis of design for the interceptor well. After NYSDEC approval of the Assessment Report, plans and specifications for the Town Well Interceptor Well and Pumping System (Hydro Group, October 1990) were prepared and submitted on October 29, 1990. Construction began on November 7, 1990, after NYSDEC approval of the Interceptor Well Plans and Specifications, and is scheduled for completion of the electrical connections in January 1991.

The Basis of Design Report for the Town Water Line Extension (Lozier, May 1990) was submitted on May 22, 1990. After approval by the NYSDEC and Cattaraugus County Department of Health, Plans and Specifications (Lozier, July 1990) were prepared and submitted on July 23, 1990. Following approval of these Plans and Specifications, receipt of construction right-of-way agreements from all the residences to be connected to the Town water line, and approval from the Town Board for the extension of the Town Water District, construction of the water line extension began on October 8, 1990. Construction of the water line and connections to the home were completed in December 1990 and the connections inside the home are to made in January 1991, after the new Town/Village water supply well goes on line.

2.0 FIELD AND ANALYTICAL PROCEDURES

This section presents a description of the field and analytical procedures used in the investigative tasks for the RI Project. These tasks were conducted to provide necessary data to adequately determine the extent of contamination and evaluate remedial alternatives for the site.

2.1 BASE MAP

A base map of the RI study area was developed by Lockwood Mapping of Rochester, New York using photogrammetric methods. The study area base map (Plate 2) has a scale of 1 inch = 200 feet and has a topographic contour interval of 5 feet. The study area was enlarged to make a base map of the Signore Facility (Plate 1) at a scale of 1 inch = 50 feet with a topographic contour interval of 2 feet. All elevation data were referenced to a USGS datum. A horizontal coordinate grid system was established on the base map. All horizontal survey measurements made during the field activities were referenced to the grid.

2.2 SOIL GAS SURVEY

Two soil gas surveys were conducted at the Signore Facility by Lozier Laboratories of Fairport, New York; one survey from June 4 to June 7, 1990 and the other from July 30 to August 1, 1990. The purpose of the surveys was to evaluate the presence of volatile organic compounds (VOCs) in the interstitial soil gas as a screening tool to determine potential areas of subsurface contamination. The first survey was conducted on a approximate 100-foot by 100-foot grid pattern established across the site, outside of the buildings, with a soil gas sample collected at each grid node. The second survey was conducted inside the main building on a 75-foot by 75-foot grid.

The following procedure was used for the collection of soil gas samples. The sampling station was located and referenced to the site-wide grid. After measuring the sample location, a demolition hammer was used to drive a 7/8-inch hollow carbon steel probe into the ground to a depth of 4 to 5 feet. The probe has a perforated tip which allows soil gas to enter the probe. After the probe was inserted to the proper depth, it was connected by Teflon tubing to a desiccator. The desiccator was then connected to a vacuum pump and a Tedlar sampling bag was placed in the desiccator. The design of this apparatus ensures that soil gas is collected before passing through the vacuum pump, thereby reducing volatilization and minimizing the potential for sample contamination. The vacuum pump was then turned on, creating a vacuum in the Tedlar sampling bag. The sample probe was purged for one minute to ensure that soil gas was being drawn into the sampling bag. The sampling bag was then transported to an on-site laboratory, which utilized a Photovac 10S50 Portable Gas Chromatograph (GC) for analysis. The sample was withdrawn from the Tedlar sampling bag using a syringe and injected into the GC.

Each soil gas sample was analyzed using the field GC within three hours of collection by comparison to prepared standards of the following compounds: trichloroethene; 1,1-dichloroethene; 1,2-dichloroethene; 1,1,1-trichloroethane; toluene; ethylbenzene; benzene; total xylenes; 1,1-dichloroethane and tetrachloroethene. Standard solutions of these compounds were prepared daily and the equipment calibrated daily to those standards. Additional calibration checks were performed throughout the day, as necessary. A laboratory chemist was on-site to operate the GC and interpret the results. In addition to the above compounds, an unknown compound, later identified as methane, was encountered in soil gas sample locations along Jefferson Street.

In areas in which elevated VOCs were detected during the soil gas survey, a more dense sample grid spacing was employed to further delineate areas to explore with soil borings and soil sampling.

2.3 DRILLING AND MONITORING WELL INSTALLATION

Thirteen additional monitoring wells were installed to further define the site geology, evaluate the aquifer characteristics and collect ground water samples in order to evaluate the horizontal and vertical extent of contamination downgradient of the site. Empire Soils Investigations, Inc. of Hamburg, New York completed the monitoring well installations from June 25, 1990 through August 8, 1990 under the supervision of GWA.

2.3.1 Drilling Procedures - The monitoring wells were drilled using standard 6-1/4 inch ID (inner diameter) hollow stem augers. For the locations where a shallow and intermediate zone well were installed, the deeper well was drilled and sampled first and then the shallower well was drilled and sampled only in the anticipated screen interval.

Of the 13 wells installed, 8 wells were completed to an approximate depth of 50 feet and 6 wells were completed to an approximate depth of 25 feet. All drill cuttings generated during drilling were drummed and transported to the Signore Facility.

2.3.2 Soil Sampling - Split-spoon samples were collected in each boring in accordance with ASTM D-1586. A two-inch diameter split-spoon sampler was driven two feet with blow counts being recorded every six inches. A 140-pound hammer was used to advance the sampler. Split-spoon samplers were cleaned between samples using a soap and water wash followed by a water rinse.

Split-spoon soil samples were collected at five-foot intervals starting from grade. When a shallow well was completed next to a previously sampled deeper well, only the anticipated screen interval of the shallow well was sampled. All split-spoon samples were screened in the field for the presence of volatile organics immediately upon opening the split spoon using an HNU Systems, Inc. Model PI-101 Photoionization Detector (PID). None of the soil samples exhibited PID readings above background during the drilling for the monitoring wells.

Following field screening with the PID, all samples were visually inspected and classified on a drilling log with respect to color, grain size, consistency or compactness and moisture content. Other information recorded on the drilling log includes; amount of sample recovery, blow counts per six inches of penetration, sample number, PID readings above background, completion details and important observations made during drilling.

A representative sample from each split-spoon sample collected was placed in a sample jar and labeled with location, sample number, sampled interval, and data collected. All samples were archived at the Signore Facility.

Selected soil samples were physically tested for grain size distribution. These samples were selected based on the representativeness of the different geologic units (strata) encountered at each monitoring location.

<u>2.3.3 Monitoring Well Installation</u> - With the exception of well EW-3, all of the well locations were installed as nested well pairs, i.e., shallow and intermediate depths installed in separate boreholes. The six nested well pairs consisted of an intermediate zone well, with a depth of approximately 50 feet and a screen interval of 40 to 50 feet below grade, and a shallow zone well, with a depth of approximately 25 feet and a screen interval of 15 to 25 feet below grade. Well EW-3 was installed as an intermediate zone well, with a depth of approximately 50 feet and a screen interval of 40 to 50 feet below grade.

All monitoring wells were constructed in the hollow-stem augers using 2-inch (I.D.) flush-threaded black steel casing and stainless steel (Type 304) well screen (0.01 slot). An artificial (#2 QROK) silica sand pack was placed around the screened interval from the bottom of the hole to approximately 2 to 3 feet above the screen. A bentonite pellet seal (2-3 feet thick) was then placed above the sand pack. A cement/bentonite slurry was installed to one to two feet below the ground surface. A lockable, steel, 6-inch diameter protective casing was then cemented in place over the well riser. Wells at locations EW-1, EW-3 and EW-5 were completed with the protective casings flush with the ground surface, whereas the remaining wells were completed with the protective casings sticking up from the ground surface approximately 2 feet.

Completed monitoring wells were designated as "EW" followed by a site location number and a decimal fraction representing the completion depth of the well. For example, "EW-3.50" represents a monitoring well (EW) completed at location 3 to a depth of 50 feet.

2.3.4 Monitoring Well Development - All completed wells were developed to remove drilling fluids and to assure adequate communication between the well screen and zone monitored. After a well was installed, it was developed by surging and bailing or surging and pumping using a positive displacement pump. A reasonable effort was made to develop the wells until the turbidity was less than 50 NTUs, as measured with a portable nephelometer, and until conductivity, temperature and pH stabilized. In most situations (very silty formation screened, very little water in the well, etc.), the turbidity of 50 NTUs was impractical to achieve. However, all the wells were developed a minimum of 4 hours if the turbidity standard was not achieved. Well development fluids from the wells located off-site were disposed directly in the sanitary sewer at the Signore Facility. Well development fluids from the wells located at the Signore Facility (locations EW-1 and EW-2) were contained in tanks at the decontamination pad. The storage tanks were later sampled for VOCs and after a review of the sample analytical data, the development water was then disposed into the sanitary sewer.

Well development records were kept for each individual well including observations such as recovery rate, clarity, amount of water removed and measurements of geochemical parameters (conductivity, temperature and pH).

2.3.5 Water Level Measurements - Static water level readings were recorded in all newly installed monitoring wells. These readings were used to determine ground water flow directions and hydraulic gradient. Static water level readings were measured using an electric tape and recorded to the nearest 0.01 foot. Water level readings were measured from the top of the steel riser pipes. All newly completed and existing monitor wells were surveyed by Freeman and Freeman Land Surveyors of Glenwood, New York for location based on the site grid system and for grade elevation, top of well casing elevation and top of protective casing elevation.

2.3.6 In-Situ Hydraulic Conductivity Tests - In-situ hydraulic conductivity tests (slug tests) were conducted on the newly installed wells on July 24, 1990 and August 10, 1990. The purpose of the tests were to estimate the hydraulic conductivity of the zone monitored by the monitoring well by artificially raising and lowering the water level in the well and measuring the rate at which the water level returns to static conditions. A 5-foot long, 1.5 inch ID, solid PVC "slug" was lowered into the well to displace the water. A pressure transducer, installed in the well below the slug, recorded the pressure changes associated with the changes in the water level as the slug was raised and lowered into the well.

The tests were performed according to the following procedure. The water level and total depth was recorded in the well. A pressure transducer was then lowered in the well and set to zero. The slug was then quickly lowered into the well to displace the water. The rate of return of the water level to the original static condition was then recorded. The slug was then quickly removed from the well and the rate at which the well returned to static conditions was also recorded. The rate at which the well returned to static conditions was used to calculate the hydraulic conductivity of the aquifer at the screened interval of the well.

2.4 SOIL BORING PROGRAM

Fourteen soil borings were drilled at the Signore Facility by Empire Soils from July 30 to August 3, 1990. These borings were installed to characterize the subsurface stratigraphy and collect representative soil samples to determine the vertical and horizontal extent of potential soil contamination on site. These borings were located in areas suspected of VOC presence based on the results of the soil gas survey. The borings were installed using 4-1/4 inch hollow-stem augers. Split-spoon samples were collected in accordance with ASTM D-1586. A three-inch diameter split-spoon sampler was driven two feet with blow counts being recorded every six inches. A 140-pound hammer was used to advance the sampler. Split-spoon samplers were cleaned between samples using a soap and water wash followed by a water rinse.

Split-spoon soil samples were collected continuously starting from grade and continuing to the water table. As soil samples were recovered, the soils were screened for the presence of VOCs with a PID. Following field screening, all samples were visually inspected and classified on a drilling log with respect to color, grain size, consistency or compactness and moisture content. Other information recorded on this log included amount of sample recovery, blow counts per six inches of penetration, sample number, PID readings above background, and important observations made during drilling.

A representative sample from each split-spoon sample collected was placed in a sample jar and labelled with location, sample number, sampled interval, and date collected. All samples were archived at the Signore facility. An on-site GC was used to identify and quantify VOCs, if present, in the headspace of the soil samples. A headspace analysis of each soil sample collected was analyzed by the field GC for selected volatile organic compounds within three hours of collection, according to the same procedures used during the soil gas survey. The headspace samples were each analyzed by comparison with standards for the following compounds: trichloroethene; 1,1-dichloroethene; 1,2-dichloroethene; 1,1,1-trichloroethane; toluene; ethylbenzene; benzene; xylenes; 1,1-dichloroethane and tetrachloroethene. Standard solutions of these compounds were prepared daily and the equipment calibrated daily to those standards. Additional calibration checks were performed throughout the day, as necessary. A laboratory chemist was on-site to operate the GC and interpret the results.

Soil samples exhibiting potential contamination (i.e., elevated

PID readings, elevated headspace analyses, odor, discoloration, etc.) were selected for further laboratory analysis. A total of 31 soil samples were submitted for chemical analysis to Compuchem Laboratories of Research Triangle Park, North Carolina. Of these 31 samples, 18 samples were analyzed for TCL VOCs and 13 samples were analyzed for the complete TCL.

All drill cuttings generated during drilling were drummed and stored at the Signore Facility.

2.5 DECONTAMINATION

All decontamination procedures associated with drilling activities were conducted at a pre-constructed decontamination (decon) pad. The decon pad consisted of a shallow, excavated pit lined with high density polyethylene (HDPE) liner. Decon water was pumped from the pit to storage containers. All decontamination fluids were tested for VOCs and then disposed into the sanitary sewer. Decontamination procedures performed during drilling activities involved steam cleaning of:

- all drilling equipment and the drill rig prior to the start of drilling activities,
- all downhole drilling equipment between different drilling locations,
- the back of the rig between different drilling locations, and
- stainless steel screen and steel casing prior to monitoring well installation.

Split-spoon samplers were cleaned between samples using a soap and water wash followed by a water rinse. This method was a deviation from the procedure outlined in the RI Work Plan (Section 8.9.1) which required the split-spoons to be decontaminated using soap, water and chemical rinses. Prior to implementation of this procedure, it had been approved by the NYSDEC.

Air quality was monitored during drilling operations for the presence of VOCs, explosive gases, particulates and oxygen levels. Air monitoring of the open borehole and workers breathing space was performed during all drilling activities in accordance with the Health and Safety program outlined in Section 8.0 of the RI/FS Work Plan (LGA, February 1990).

2.6 SURFACE WATER/SEDIMENT SAMPLING

Six surface water and sediment samples were collected from Plum Creek and three surface water and sediment samples were collected from Great Valley Creek to characterize any surface water quality impacts. Surface water and sediment samples were collected on July 11, 1990 by GWA and assisted by Recra Environmental, Inc. of Amherst, New York.

Each surface water/sediment sample has a designation that describes the media sampled, stream location, and sample station, and sampling round. For example, a sample designated SW-PC-1 indicates a Surface Water sample, collected on Plum Creek at station 1. A sediment sample collected from the same location was designated SED-PC-1.

Surface water samples were collected from near-shore locations. Each sample bottle was directly filled by submerging the sample bottle in the surface water body with VOC samples filled first. The sampling personnel were downstream of the sample container with the mouth of the container pointed upstream, while filling. Care was taken to avoid any floating or submerging debris from entering the sample container.

Surface water samples were not filtered, with analyses performed for Target Analyte List (TAL) metals. Each sample container requiring preservation was preserved to the appropriate pH using the proper preservative.

Sediment samples were collected at the same location following the collection of the surface water samples. Each sample was collected using a stainless-steel trowel. Enough sediment to fill the required sampling containers was collected and placed in a stainless-steel mixing bowl and composited to provide a homogenous sample. The sample was transferred to the appropriate labelled sample container. Sediment samples collected for VOC analyses were not composited and were placed directly in the appropriate sample container immediately upon collection to avoid unnecessary volatilization. All sampling began from the downstream sampling point and continued upstream.

After the samples were properly labelled they were placed in a cooler and packed with ice and readied for shipment to Compuchem Labs. Chain-of-Custody requirements were strictly adhered to. All surface water/sediment samples collected were analyzed for Target Compound List (TCL) volatiles, semi-volatiles, pesticides/PCBs, TAL metals and cyanide utilizing CLP procedures.

2.7 GROUND WATER SAMPLING

Ground water samples were collected by GWA with the assistance of Recra Environmental from 12 selected on-site existing wells at the Signore Facility on June 28 and 29, 1990 and from the newly installed wells on September 10 and 11, 1990. Ground water samples were collected from the monitoring wells to characterize the ground water quality at the site and downgradient of the site and to assist in the identification of contaminant source areas. Ground water quality data is also being used to assess and to assist in the evaluation of remedial alternatives.

The samples from the existing wells at the Signore Facility were analyzed by Compuchem Labs for complete TCL. After NYSDEC review of the analytical results from the on-site existing wells, it was agreed that ground water samples collected from the newly installed monitoring wells would be analyzed for TCL volatiles and selected metals; newly installed on-site wells (locations EW-1 and EW-2) were analyzed for all metals and cyanide and newly installed off-site wells (locations EW-3 through EW-7) were analyzed only for lead.

The collection of ground water samples was conducted according to the following procedures. The depth to water and well bottom were measured to the nearest 0.01 foot and 0.1 foot, respectively, using an electric water level meter to determine the volume of water to purge from the well prior to sampling. A minimum of three well volumes of water were purged using a bailer prior to sampling. The amount of water to purge was calculated using the following formula:

$$V = 3.14 \times (r)^2 \times (DOW - DTW) \times 7.48 \times 3$$

where: V = volume (in gallons) to purge
r = radius of well (in feet)
DTW = depth to water (in feet, measured from the inner casing)
DOW = depth of well (in feet, measured from the inner casing)

Prior to purging and sampling of the well, all sampling equipment was decontaminated. All equipment used for purging was decontaminated after each use. Purging continued until a minimum of 3 volumes were purged and the field parameter readings (temperature, pH and specific conductance) stabilized for two consecutive readings.

After purging the required volume, a stainless steel bailer, connected to a polypropylene cord was then used to collect the ground water sample. Ground water samples were collected from bottom-loading bailers, filling all containers, as required with sample containers for VOC analysis filled first.

Samples requiring preservation were preserved and pH adjusted as necessary using the appropriate preservatives. After the sample was properly labelled, it was placed in a cooler with ice and readied for shipment. Chain-of-custody procedures were implemented and strictly adhered to during shipping.

2.8 SEWER EVALUATION

The municipal sewer which runs northwest to southeast along Jefferson Street has been identified as a potential contaminant source or receptor. Four samples of the sewer water were collected by GWA and assisted by Recra Environmental on July 11, 1990. There was no sediment at any of the sample locations, therefore sewer sediment samples could not be collected. Each sewer water sample has a designation that describes the media sampled and location of sampling station. For example, a sample designated SE-1 is from a sewer water sample collected at station 1.

Sewer water samples were collected from the surface at manhole locations using a stainless steel bailer attached to a polypropylene cord. The pH, temperature and specific conductance were monitored during sampling and recorded on the sample data sheets.

Each sample was placed in the appropriate container for the analyses requested. Samples for total TAL metals were not filtered. Each sample container requiring preservation was preserved to the appropriate pH using the proper preservative.

After the sample was properly labelled it was placed in a cooler with ice and shipped to Compuchem Labs. Chain-of-Custody requirements were strictly adhered to. All sewer water samples were analyzed for the complete TCL of compounds utilizing CLP procedures.

2.9 QA/QC SAMPLING

Samples were collected throughout the project for Quality Assurance/Quality Control purposes. The purpose of these samples was to evaluate the effectiveness of the QA/QC procedures implemented during the field and laboratory activities associated with the project. The following sections describe the types of QA/QC samples collected and their purposes.

2.9.1 Duplicate Samples - One sample duplicate was collected for every ten samples collected of a particular medium as a check on the accuracy of the laboratory analysis. If less than ten samples of a particular medium were collected one duplicate sample was still collected and analyzed.

2.9.2 Trip Blanks - Trip blanks, which consisted of a sample of laboratory demonstrated analyte free water, were supplied by the laboratory with bottle shipments to ensure that no contaminants were being transported in the sample coolers. Each day aqueous sampling for VOC analysis was conducted, one trip blank was handled and transported in the same manner as the field aqueous samples acquired that day. The trip blanks were analyzed for TCL VOCs.

2.9.3 Field Blanks - Field blanks were used to audit the performance of the decontamination procedures used to clean the sampling equipment between samples and assess any sample cross-contamination. The field blank consisted of a full suite of sample containers filled with the demonstrated analyte free water used in the decontamination procedure collected from each sampling device (i.e., bailer, split spoon, etc.) used. The field blank samples were analyzed for the same parameters as the field samples. Field blanks were collected prior to sampling, after decontamination of the sampling device, and at the beginning of each subsequent day of sampling and shipped with the environmental samples collected on the same day.

2.9.4 Matrix Spike/Matrix Spike Duplicates - Triplicate sample volumes were collected to allow for the matrix spike/matrix spike duplicates (MS/MSD) to be analyzed. The purpose of these samples was to provide information on the sample homogeneity, analytical precision and accuracy and the effects of the sample matrix on the analytical methodology. One set of MS/MSD samples were submitted for every twenty samples collected.

2.10 DATA VALIDATION

The quality assurance/quality control (QA/QC) procedures followed during the analytical program were based upon USEPA guidance and protocols (USEPA, October 1988). These procedures included the collection of sample blanks, sample duplicates and matrix spike/ matrix spike duplicate samples and included use of the proper chain of custody documentation.

Upon receipt of the data from Compuchem Laboratories, the analytical results were subjected to data validation procedures adhered to in the NYSDEC RI/FS program. This validation process assures that the results are credible and adequate for their intended use. This validation was completed on all laboratory samples collected during this project by Environmental Standards, Inc. of Valley Forge, Pennsylvania.

3.0 HYDROGEOLOGIC CHARACTERIZATION

This section presents an evaluation of the ground water flow conditions of the study area. The subsurface stratigraphic conditions and ground water zones have been determined by comparing the monitoring well drilling results to published information on the Ellicottville, New York area. Direction and rate of ground water flow have been determined from potentiometric surface maps prepared from monitoring well water level measurements, from monitoring well in-situ hydraulic conductivity test results and from the Town Well aquifer test results.

3.1 MONITORING WELL NETWORK

Monitoring wells have been installed to evaluate ground water contamination in the following programs: (1) 34 monitoring wells were installed at the Signore Facility in 1986 and 1987 as part of initial ground water investigations by Dames and Moore (1987a and 1987b); (2) 5 monitoring wells were installed near the Town Well in 1990 for the IRM Interceptor Well Assessment Project (LGA, August 1990); and (3) 13 monitoring wells were installed between the Signore Facility and the Town Well in 1990 for the RI Project.

3.1.1 Existing On-Site Wells - Plate 1 presents the locations of the 31 existing on-site monitoring wells installed by Dames and Moore (1987a and 1987b). Originally, 34 monitoring wells had been installed at 12 locations; wells were installed to different depths at the same location to monitor the shallow (wells designated as "S", i.e. MW-1S), intermediate (wells designated as "I", i.e. MW-1I) and deep (wells designated as "D", i.e. MW-1D) ground water zones. In addition, well nest MW-10 also has a well installed to 90 feet, MW-10VD, to monitor the "very deep" ground water zone. The monitoring wells at locations MW-3 and MW-13 have been destroyed and thus, only 31 of the original 34 monitoring wells installed by Dames and Moore still exist. Construction and survey data for these wells are presented in Table 1 and drilling logs are presented in Appendix B.

<u>3.1.2 RI and IRM Wells</u> - Plate 2 presents the locations of the 13 monitoring wells installed for the RI Project from June through August 1990 and the 5 monitoring wells installed for the IRM Interceptor Well Assessment Project in June 1990.

The 13 RI monitoring wells were installed at seven locations, EW-1 through EW-7. At six of these locations, well pairs were installed; a 25-foot deep well was installed to monitor the shallow ground water zone and a 50-foot deep well was installed to monitor the intermediate ground water zone. The exception was at well location EW-3, where only an intermediate zone well was installed. Construction and survey details for the RI monitoring wells are presented in Table 2 and drilling logs are presented in Appendix C. The logs provide a description of the soils collected during monitoring well installations. Well construction diagrams, which

TABLE 1

ON-SITE MONITORING WELL INFORMATION

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

WELL	DATE INSTALLED	DIAMETER (IN)	TOTAL DEPTH	WELL MATERIAL	SCREEN INTERVAL (FT)	COORDINATES NORTH	COORDINATES EAST	DRILLING METHOD	ELEV. OF TOP OF PROT. CASING	ELEV. OF PVC RISER
1S	11/10/86	2	15'	PVC	5-15	15274.597	16241.926	AUGER	1532.17	1531.87
1I	2/3/87	2	50'	PVC	30-50	15271.100	16244.249	AUGER	1531.93	1531.79
1D	2/12/87	2	70' 6"	PVC	50'6"-70'6"	15274.951	16237.489	AUGER\WET ROTARY	1532.22	1532.16
2S	11/12/86	2	15'	PVC	5-15	15893.522	15777.301	AUGER	1538.97	1538.77
2I	2/7/87	2	49'	PVC	29-49	15892.281	15774.072	AUGER	1540.97	1540.87
2D	2/11/87	2	68'	PVC	48-68	15896.364	15774.168	AUGER	1540.94	1540.61
4S	11/12/86	2	17'	PVC	7-17	15787.013	15963.477	AUGER	1535.47	1535.32
4I	2/2/87	2	48' 6"	PVC	28'6"-48'6"	15780.207	15964.995	AUGER	1534.73	1534.49
4D	2/18/87	2	70'	PVC	50-70	15775.981	15958.173	AUGER\WET ROTARY	1534.74	1534.49
5S	11/12/86	2	17' 6"	PVC	7'6"-17'6"	15420.456	15903.761	AUGER	1534.35	1534.16
5I	2/4/87	2	49' 10"	PVC	29'10"-49'10"	15416.484	15902.706	AUGER	1534.26	1533.97
5D	2/7/87	2	69' 4"	PVC	49'4"-69'4"	15419.111	15899.381	AUGER	1534.26	1534.15
6S	11/12/86	2	17'	PVC	7-17	15612.224	16236.327	AUGER	1533.13	1532.92
6I	1/26/87	2	50'	PVC	30-50	15611.647	16248.641	AUGER	1532.88	1532.87
6D	1/22/87	2	70'	PVC	50-70	15612.160	16244.300	AUGER	1533.04	1532.71
8S	1/23/87	2	25'	PVC	5-25	15351.195	16346.667	AUGER	1532.82	1532.78
8I	1/22/87	2	49' 11"	PVC	29'11"-49'11"	15354.607	16342.379	AUGER	1533.21	1532.92
8D	1/30/87	2	76'	PVC	56-76	15346.174	16345.740	AUGER	1532.98	1532.65
9S	1/27/87	2	25' 6"	PVC	5'6"-25'6"	15477.673	16321.702	AUGER	1532.77	1532.67
9I	1/29/87	2	49' 6"	PVC	29'6"-49'6"	15473.632	16323.902	AUGER	1532.69	1532.30
9D	2/3/87	2	73'	PVC	53'-73'	15470.516	16326.111	AUGER	1532.62	1532.41
10S	1/28/87	2	25' 6"	PVC	5'6"-25'6"	15747.103	16175.446	AUGER	1533.61	1533.39
10I	1/30/87	2	49' 10"	PVC	29'10"-49'10"	15752.223	16180.977	AUGER	1533.38	1533.23
10D	2/2/87	2	75'	PVC	65'-75'	15756.627	16175.670	AUGER	1533.58	1533.44
10VD	1/28/87	2	89' 6"	PVC	69'6"-89'6"	15752.296	16175.759	AUGER\ROCK CORE	1533.59	1533.36
11S	1/29/87	2	24'	PVC	4'-24'	15841.450	16114.021	AUGER	1534.45	1534.35
11I	1/30/87	2	48'	PVC	28'-48'	15839.133	16111.009	AUGER	1534.55	1534.40
11D	1/27/87	2	74' 7"	PVC	54'7"-74'7"	15845.414	16110.690	AUGER	1534.41	1534.23
12S	1/23/87	2	26' 1"	PVC	6'1"-26'1"	16082.666	15675.798	AUGER	1542.57	1542.05
12I	2/4/87	2	50' 6"	PVC	30'6"-50'6"	16083.335	15672.411	AUGER	1542.14	1541.69
12D	2/11/87	2	73' 6"	PVC	53'6"-73'6"	16078.528	15679.030	AUGER	1542.13	1539.99

TABLE 2

RI MONITORING WELL INFORMATION

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

WELL	DATE INSTALLED	DIAMETER (IN)	TOTAL DEPTH	WELL MATERIAL	SCREEN INTERVAL (FEET)	COORDINATES NORTH	COORDINATES EAST	DRILLING METHOD	ELEV. OF TOP OF PROT. CASING	ELEV. OF PVC RISER
EW-1.25	7/17/90	2.00	25.00	STEEL	15-25	15279.960	16139.97	AUGER	1532.29	1531.96
EW-1.50	7/26/90	2.00	50.00	STEEL	40-50	15277.860	16145.350	AUGER	1532.16	1532.05
EW-2.25	7/11/90	2.00	25.00	STEEL	15-25	15273.948	16386.194	AUGER	1534.22	1533.50
EW-2.50	7/10/90	2.00	50.00	STEEL	40-50	15276.567	16390.334	AUGER	1534.32	1533.92
EW-3.50	8/9/90	2.00	50.00	STEEL	40-50	15408.212	16980.390	AUGER	1527.74	1527.32
EW-4.25	7/5/90	2.00	25.00	STEEL	15-25	14504.175	16736.356	AUGER	1535.92	1535.67
EW-4.50	7/5/90	2.00	50.00	STEEL	40-50	14506.821	16741.861	AUGER	1535.97	1535.65
EW-5.25	7/24/90	2.00	25.00	STEEL	15-25	14340.291	17259.048	AUGER	1530.33	1530.15
EW-5.50	7/20/90	2.00	50.00	STEEL	40-50	14344.018	17261.763	AUGER	1530.14	1529.72
EW-6.25	7/2/90	2.00	25.00	STEEL	15-25	13633.945	17303.700	AUGER	1533.66	1533.37
EW-6.50	6/29/90	2.00	50.00	STEEL	40-50	13626.637	17306.685	AUGER	1533.77	1533.64
EW-7.25	6/26/90	2.00	25.00	STEEL	15-25	13674.781	17911.218	AUGER	1530.62	1530.41
EW-7.50	6/26/90	2.00	50.00	STEEL	40-50	13668.463	17916.338	AUGER	1531.09	1530.93

detail well completion information, are presented in Appendix D and details of well development are presented in Appendix E. Selected soil samples from the RI monitoring wells were physically tested for grain size distribution. These samples were selected based on the representativeness of the different geologic units (strata) encountered at each monitoring well location. Appendix F presents the grain size distribution curves for the soil samples tested.

The five IRM Interceptor Well Assessment monitoring wells were installed at three locations. Shallow and intermediate ground water zone well pairs were installed at locations IRM-2 and IRM-3 while only an intermediate zone well was installed at location IRM-1. Details on these monitoring wells are presented in the Interceptor Well Assessment Report (LGA, August 1990, Section 2.2, Table 2-1 and Appendices A and B). Water level data and soil classifications from these wells were used to supplement this RI.

3.2 STRATIGRAPHIC EVALUATION

An evaluation of the subsurface stratigraphic conditions has been made by integrating the information obtained by drilling the monitoring wells, described above, with existing published information on the geology and hydrogeology of the Ellicottville area.

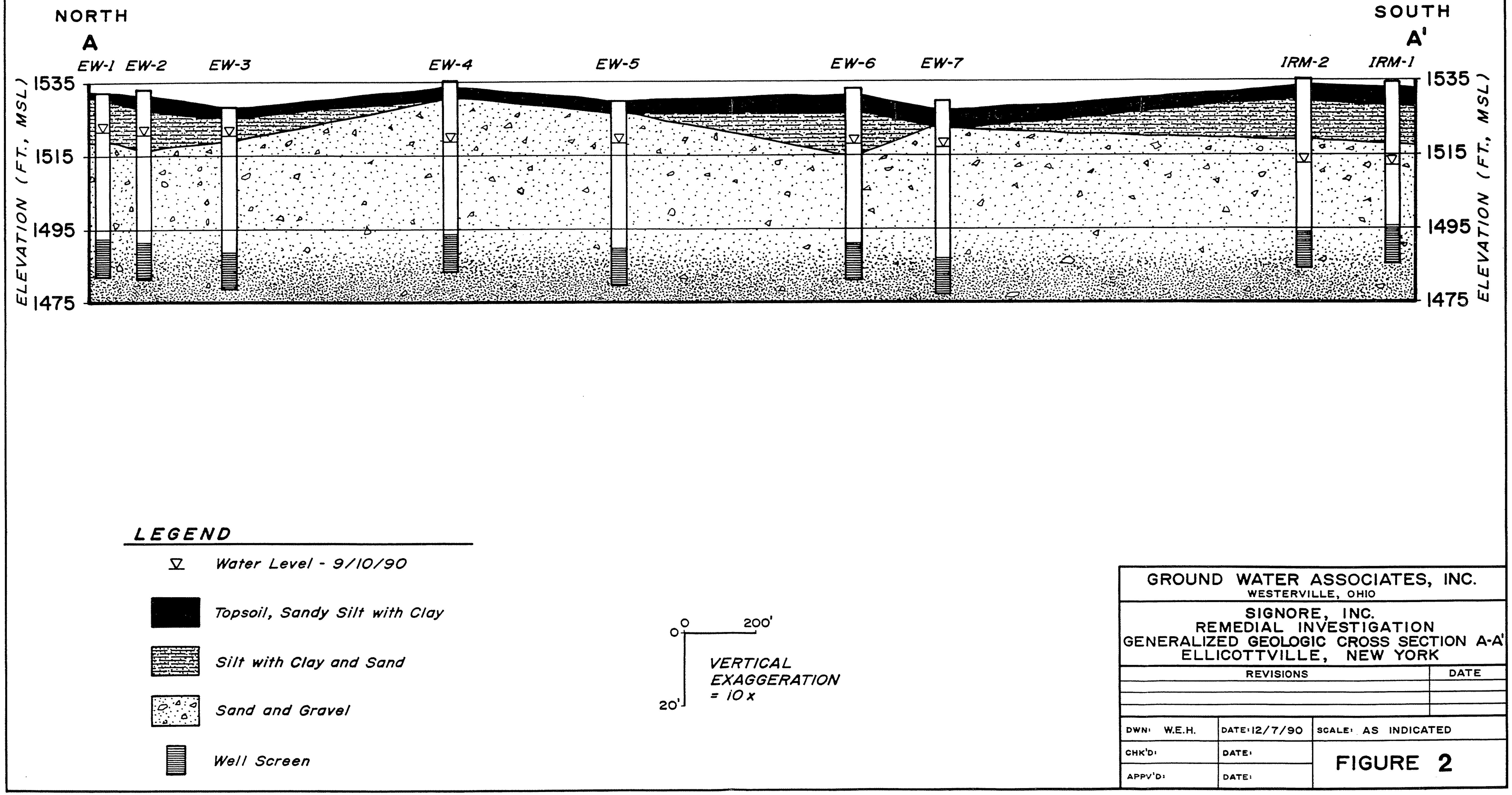
3.2.1 Geologic Setting - The geologic setting of the study area has been previously described by Dames and Moore (1987a) and Malcolm Pirnie (1989). In general, the area is located near the southern limit of Pleistocene-aged glaciation. Devonian-aged bedrock is overlain by glacial outwash deposits, which were deposited by water that originated from melting glacial ice, and more recent river-derived alluvium. The subsurface stratigraphy can be divided into three units: (1) an upper alluvial deposit, 10 to 30 feet in thickness; (2) a middle outwash unit, 20 to 50 feet in thickness; and (3) a lower zone of variable stratigraphy, consisting of outwash, till and lake deposits.

3.2.2 Subsurface Stratigraphy - As described above, the subsurface stratigraphy consists of three units: an upper alluvial unit, a middle outwash unit and a lower unit of variable stratigraphy. During the installation of the RI monitoring wells, the alluvial and the outwash units were encountered. Drilling logs from the RI monitoring well installations, in Appendix C, and from on-site soil borings, in Appendix G, describe the subsurface materials encountered during drilling. As described on the logs, a thin surficial topsoil was encountered at ground surface. Beneath the topsoil is the alluvial unit, a generally brown sandy silt with some clay and some gravel, which is approximately 5 to 10 feet in thickness. Beneath the alluvial unit is the outwash deposit unit, which generally consists of a fine to coarse-grained sand and gravel with little silt. This unit generally coarsened with depth with increasing gravel to a depth of approximately 45 to 50 feet; at a depth of 45 to 50 feet, the material became noticeably more sandy, with less gravel content.

Plate 2 shows the location of cross-section A-A', drawn across the study area in a general north-south direction. Figure 2 shows the generalized geologic cross-section through the stratigraphic profile.

3.2.3 Ground Water Zones - As described above, the stratigraphic sequence of the upper 50 feet of the study area, where the on-site shallow and intermediate wells and off-site (RI and IRM) monitoring wells are completed, consists of alluvium underlain by outwash. This outwash material comprises the water supply aquifer in the Ellicottville area. Below the outwash, the subsurface materials become highly variable, from coarse sand and gravel to clays. Thus, no areally extensive aquifer unit is probably present beneath a depth of about 50 feet in the study area.

Within the outwash, which ranges in depth from about 15 to 50 feet are two zones, an upper sequence of sand and gravel from a depth of about 15 to 30 feet and a lower sequence of coarser-grained sand and gravel from a depth of about 30 to 50 feet. The results of the Town Well aquifer test, conducted for the Interceptor Well Assessment (LGA, August 1990), indicate that there is hydraulic communication between these zones but the communication is not complete.



GROUND WATER ASSOCIATES, INC.
WESTERVILLE, OHIO

SIGNORE, INC.
REMEDIAL INVESTIGATION
GENERALIZED GEOLOGIC CROSS SECTION A-A'
ELLICOTTVILLE, NEW YORK

REVISIONS	DATE

DWN: W.E.H.	DATE: 12/7/90	SCALE: AS INDICATED
CHK'D:	DATE:	FIGURE 2
APPV'D:	DATE:	

The conceptual model for the study area consists of three ground water monitoring zones. The shallow ground water zone comprises the upper sand and gravel zone in the outwash unit. The intermediate ground water zone comprises the lower, coarser-grained sand and gravel zone in the outwash unit. The deep ground water zone comprises the lower part of the outwash unit and the upper part of the lower, variable unit. On-site monitoring wells are completed in the shallow, intermediate and deep ground water zones and the off-site wells are only completed in the shallow and intermediate ground water zones.

3.3 GROUND WATER FLOW EVALUATION

Ground water flow conditions in the study area were determined by preparing potentiometric surface maps (maps showing contours of equal water level elevation) from monitoring well water level measurements and by evaluating hydraulic conductivity from the Town Well aquifer test and from in-situ tests in the monitoring wells.

3.3.1 Water Level Measurements - Static water level measurements were measured in the on-site and off-site (RI and IRM) monitoring wells to determine ground water flow directions and hydraulic gradient. Table 3 presents ground water elevations for the on-site monitoring wells measured on September 10, 1990 and December 4, 1990. Table 4 presents the ground water elevations for the off-site monitoring wells measured on September 10, 1990 and November 5, 1990. The September 10, 1990 measurements were used to prepare

TABLE 3

GROUND WATER ELEVATIONS, ON-SITE MONITORING WELLS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

WELL	ELEVATION OF PVC RISER (FEET)	DEPTH TO WATER (FT) 9/10/90	ELEVATION OF GROUND WATER (FT) 9/10/90	DEPTH TO WATER (FT) 12/4/90	ELEVATION OF GROUND WATER (FT) 12/4/90
MW-1S	1531.87	10.28	1521.59	9.27	1522.60
MW-1I	1531.79	10.53	1521.26	--	--
MW-1D	1532.16	10.90	1521.26	9.36	1522.80
MW-2S	1538.77	12.02	1526.75	10.92	1527.85
MW-2I	1540.87	--	--	14.08	1526.79
MW-2D	1540.61	--	--	13.86	1526.75
MW-4S	1535.32	9.76	1525.56	7.57	1527.75
MW-4I	1534.49	10.19	1524.30	8.34	1526.15
MW-4D	1534.49	10.36	1524.13	8.53	1525.96
MW-5S	1534.16	8.27	1525.89	7.61	1526.55
MW-5I	1533.97	10.28	1523.69	8.24	1525.73
MW-5D	1534.15	9.47	1524.68	8.44	1525.71
MW-6S	1532.92	8.30	1524.62	7.62	1525.30
MW-6I	1532.87	9.90	1522.97	8.35	1524.52
MW-6D	1532.71	10.16	1522.55	8.68	1524.03
MW-8S	1532.78	11.42	1521.36	10.01	1522.77
MW-8I	1532.92	--	--	10.13	1522.79
MW-8D	1532.65	--	--	9.83	1522.82
MW-9S	1532.67	10.78	1521.89	9.34	1523.33
MW-9I	1532.30	10.70	1521.60	--	--
MW-9D	1532.41	10.80	1521.61	9.36	1523.05
MW-10S	1533.39	10.03	1523.36	8.20	1525.19
MW-10I	1533.23	9.26	1523.97	7.68	1525.55
MW-10D	1533.44	9.27	1524.17	7.63	1525.81
MW-10VD	1533.36	9.34	1524.02	7.71	1525.65
MW-11S	1534.35	10.62	1523.73	8.80	1525.55
MW-11I	1534.40	10.21	1524.19	8.37	1526.03
MW-11D	1534.23	--	--	--	--
MW-12S	1542.05	--	--	13.82	1528.23
MW-12I	1541.69	--	--	14.71	1526.98
MW-12D	1539.99	16.75	1523.24	--	--

--=Measurement not taken

TABLE 4

GROUND WATER ELEVATIONS, RI AND IRM MONITORING WELLS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

WELL	ELEVATION OF RISER PIPE (FT)	DEPTH TO WATER (FT) 9/10/90	DEPTH TO WATER (FT) 11/5/90	WATER LEVEL ELEVATION (FEET) 9/10/90	WATER LEVEL ELEVATION (FEET) 11/5/90
EW-1.25	1531.96	10.62	--	1521.34	--
EW-1.50	1532.05	10.64	--	1521.41	--
EW-2.25	1533.50	12.62	12.11	1520.88	1521.39
EW-2.50	1533.92	13.11	12.60	1520.81	1521.32
EW-3.50	1527.32	6.94	6.52	1520.38	1520.80
EW-4.25	1535.67	15.79	15.92	1519.88	1519.75
EW-4.50	1535.65	16.73	16.41	1518.92	1519.24
EW-5.25	1530.15	11.84	11.60	1518.31	1518.55
EW-5.50	1529.72	11.36	11.14	1518.36	1518.58
EW-6.25	1533.37	15.34	15.10	1518.03	1518.27
EW-6.50	1533.64	15.61	15.37	1518.03	1518.27
EW-7.25	1530.41	12.36	12.22	1518.05	1518.19
EW-7.50	1530.93	13.92	13.71	1517.01	1517.22
IRM-1	1534.75	22.80	22.37	1511.95	1512.38
IRM-2S	1536.04	8.65	13.41	1527.39	1522.63
IRM-2I	1535.99	23.00	22.64	1512.99	1513.35
IRM-3S	1529.37	16.64	16.31	1512.73	1513.06
IRM-3I	1529.46	17.31	16.87	1512.15	1512.59

-- = Measurement not taken

potentiometric surface maps for both the on-site and off-site monitoring wells. Plate 3 presents the map for the shallow zone monitoring wells and Plate 4 presents the map for the intermediate zone monitoring wells.

3.3.2 In-Situ Hydraulic Conductivity Testing - As described in Section 2.3.6, in-situ hydraulic conductivity tests (slug tests) were conducted on the RI monitoring wells in July and August 1990. Graphical plots of the test results are presented in Appendix H. These plots were used to calculate hydraulic conductivity using the Hvorslev method of solution (Freeze and Cherry, 1979, pgs. 340-341). In this method, a straight line is drawn through the semi-logarithmic plot to determine input values for the equation. The resultant hydraulic conductivities calculated from these plots are presented in Table 5. As shown, calculated hydraulic conductivities for the shallow zone monitoring wells range from 1.6×10^{-3} centimeters per second (cm/sec) to 9.1×10^{-3} cm/sec, with an average of 5.6×10^{-3} cm/sec, and the intermediate zone wells range from 6.6×10^{-4} cm/sec to 6.6×10^{-3} cm/sec, with an average of 3.3×10^{-3} cm/sec. In general, the hydraulic conductivities in both the shallow and intermediate zones are greater to the south, away from the Signore Facility, with the higher calculated hydraulic conductivities calculated at well locations EW-4, EW-6 and EW-7. The slug tests recovered too quickly for wells EW-5.25 and EW-5.50 to calculate hydraulic conductivity, indicating that the values for these wells are greater than any calculated for the other wells.

TABLE 5

HYDRAULIC CONDUCTIVITY TEST RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

Zone	Well	Hydraulic Conductivity (cm/sec)
Shallow	EW-1.25	2.2×10^{-3}
	EW-2.25	1.6×10^{-3}
	EW-4.25	8.6×10^{-3}
	EW-6.25	9.1×10^{-3}
	EW-7.25	6.6×10^{-3}
Intermediate	EW-1.50	2.0×10^{-3}
	EW-2.50	2.7×10^{-3}
	EW-3.50	6.6×10^{-4}
	EW-4.50	2.9×10^{-3}
	EW-6.50	4.7×10^{-3}
	EW-7.50	6.6×10^{-3}

The hydraulic conductivity values presented above are substantially lower than the hydraulic conductivity determined for the intermediate zone from the Town Well aquifer test, conducted for the Town Well Interceptor Well Assessment (LGA, August 1990). As stated in the Interceptor Well Assessment Report, a representative value for transmissivity is 130,000 gallons per day per foot. This value of transmissivity divided by the saturated thickness of the intermediate zone, 25 feet, yields a hydraulic conductivity of 5,200 gallons per day per square foot (2.5×10^{-1} cm/sec). As shown, this is two orders of magnitude greater than the hydraulic conductivity values calculated from the slug tests. The results of an aquifer test are considered more representative of overall aquifer conditions than results from a single well slug test. Therefore, a hydraulic conductivity of 2×10^{-1} cm/sec is considered more representative of the aquifer characteristics in the study area.

3.3.3 Flow Direction and Rate - The potentiometric surface maps shown in Plates 3 and 4 show that the ground water flow in both the shallow and intermediate ground water zones in the area from the Signore Facility to the Town Well is to the south-southeast, paralleling State Route 219. In the shallow zone, the hydraulic gradient (the slope of the water surface in the direction of flow) is 0.004 feet per foot (ft/ft) at the Signore Facility, 0.001 ft/ft between the Facility at well location EW-7, and 0.005 ft/ft between well location EW-7 and the Town Well. In the intermediate zone, the hydraulic gradient is 0.007 ft/ft at the Facility, 0.0009 ft/ft between the Facility and well location EW-6, and 0.004 ft/ft between well location EW-6 and the Town Well.

Ground water velocity can be calculated using the following equation.

$$V = K I / a$$

where:
V = ground water velocity, ft/day
K = hydraulic conductivity, ft/day
I = hydraulic gradient, ft/ft
a = effective porosity

Using a value for hydraulic conductivity of 2×10^{-1} cm/sec, a range of hydraulic gradients presented above and a representative value for effective porosity of a coarse sand and gravel equal to 0.15 to 0.2, the calculated ground water flow rate in the study area is in the range from 2 to 20 feet per day.

3.3.4 Ground Water/Surface Water Interflow - Based on topographic contours, the stream elevation of Great Valley Creek in the vicinity of the Signore Facility is higher than ground water elevations in the shallow zone by less than a foot. This indicates that, in the vicinity of the Signore Facility, there is a slight potential for recharge from Great Valley Creek to the aquifer. Further downgradient of the Facility, the stream elevation of Great Valley Creek is similar to ground water elevations in the shallow zone. This indicates that ground water may be discharging to Great

Valley Creek in spots and Great Valley Creek may be recharging the ground water in others. Thus, even though there is undoubtedly interconnection between the surface and ground water, there does not appear to be substantial discharge of ground water to Great Valley Creek or recharge to ground water from Great Valley Creek. This is evidenced by the potentiometric surface maps which do not show any ground water mounding under Great Valley or direct ground water flow towards Great Valley Creek.

4.0 CONTAMINANT CHARACTERIZATION

This section presents the analytical results from samples collected during the Remedial Investigation (RI) field investigation. These results were integrated with historical ground water quality data to characterize the nature and extent of contamination in the study area; at the Signore Facility and downgradient of the Signore Facility. The analytical results include laboratory chemical analyses of soil, ground water, surface water, surface water sediment and sewer samples and field gas chromatograph (GC) screening of soil gas (soil gas survey) and subsurface soil boring samples.

4.1 HISTORICAL GROUND WATER QUALITY DATA

Prior to the RI, ground water samples had been collected from domestic wells in the study area, from the Town and Village of Ellicottville municipal water supply wells (Town Well and Village Well), from monitoring wells installed to evaluate the Town Well interceptor well and from the monitoring wells installed by Dames and Moore at the Signore Facility.

4.1.1 Domestic Water Supply Wells - The area southeast and downgradient of the Signore Facility was previously not served by municipal water from the Town of Ellicottville. The 31 residences in this area shown on Plate 5 are on their own private domestic water well supplies. However, the Signore Interim Remedial

Measures (IRM) Project Water Line Extension will soon connect these residences to the Town water distribution system. The domestic wells downgradient of the Signore Facility were sampled for volatile organics (VOCs) twice, in March 1987 and May 1989, as documented in a letter report to the Cattaraugus County Department of Health (CCHD) (GWA, June 1989). A summary of these domestic well sampling results is presented in Table 6, which lists those VOC compounds found in the well samples. As shown, low levels of VOCs were detected in the domestic well samples downgradient of the Signore Facility, except in the area east of Jefferson Street and west of the Trailer Park and at the east end of Donlen Drive, where no VOCs were detected. Of the domestic well samples where VOCs were detected, none of the samples were above the 100 micrograms per liter (ug/l) NYSDOH Maximum Contaminant Level (MCL) for total organics. The only constituents found above the individual constituent MCL of 5 ug/l were trichloroethene (TCE) and 1,1,1-trichloroethane (TCA). Where detectable, concentrations of TCE and TCA ranged up to 43 and 49 ug/l, respectively, immediately southeast of the Signore Facility and west of Jefferson Street.

<u>4.1.2 Town Well</u> - The Town Well is approximately 3500 feet downgradient of the Signore Facility. Samples for VOC analyses have been collected from the Town Well by the CCHD since March 1987. During that time, the only VOCs detected were TCE, TCA and cis-1,2-dichloroethene (DCE). The results of the CCHD Town Well

TABLE 6

DOMESTIC WELL SAMPLING SUMMARY

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

SAMPLE	SAMPLE DATE	1,1-DCA	1,1-DCE	CIS-1,2-DCE	METHYLENE CHLORIDE	TETRACHLORO-ETHENE	1,1,1-TCA	TCE	TOLUENE
MILLER-20	3-24-87	ND	ND	ND	ND	ND	ND	6	ND
BOWEN-25	3-24-87	ND	ND	ND	ND	ND	20	22	ND
BATTERSON-11	3-24-87	ND	ND	ND	ND	ND	4	7	ND
	5-10-89	ND	ND	ND	1	ND	3	6	ND
WALDEN-4	3-24-87	ND	ND	ND	ND	2	3	8	ND
	5-10-89	ND	ND	ND	1	ND	2	5	ND
MUSALL-29	3-24-87	ND	ND	ND	ND	ND	21	8	ND
	5-10-89	1	ND	ND	1	ND	15	6	ND
RUHLAND-30	3-24-87	ND	ND	ND	ND	1	19	18	ND
	5-10-89	1	ND	1	1	1	10	12	ND
LUDWICK-33	3-24-87	ND	ND	ND	ND	ND	11	17	ND
	5-10-89	1	ND	ND	1	ND	11	12	ND
NORTHRUP-28	3-24-87	ND	ND	ND	ND	ND	17	10	ND
TAYLOR-27	3-24-87	ND	ND	ND	ND	1	12	14	ND
WIECHMAN-2	3-24-87	ND	ND	ND	ND	1	2	6	ND
	5-10-89	ND	ND	ND	1	1	2	6	ND
WHITING-9	3-24-87	ND	ND	ND	ND	ND	ND	1	ND
WOODS-1	3-24-87	6	ND	ND	ND	2	49	43	ND
	5-10-89	4	1	3	14	2	26	38	2
SIRIANNI-13	3-24-87	ND	ND	ND	ND	ND	ND	5	ND
	5-10-89	ND	ND	ND	1	ND	1	4	ND
M. FITZPATRICK-12	3-24-87	ND	ND	ND	ND	1	ND	11	ND
L. FITZPATRICK-26	3-24-87	ND	ND	ND	ND	1	10	19	ND
DUNBAR-22	3-24-87	ND	ND	ND	ND	1	4	9	ND
BIELICKI-14	3-24-87	ND	ND	ND	ND	ND	ND	1	ND
DINEEN-24	3-24-87	ND	ND	ND	ND	1	8	14	ND
	5-10-89	ND	ND	ND	1	ND	6	11	ND
GLEOCKLER-23	3-24-87	ND	ND	ND	ND	ND	2	8	ND

TABLE 6 (cont)

DOMESTIC WELL SAMPLING SUMMARY

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

SAMPLE	SAMPLE DATE	1,1-DCA	1,1-DCE	CIS-1,2-DCE	METHYLENE CHLORIDE	TETRACHLORO-ETHENE	1,1,1-TCA	TCE	TOLUENE
FOX-21	3-24-87	ND	ND	ND	ND	1	4	10	ND
MACQUARRIE-6	5-10-89	ND	ND	ND	1	ND	ND	ND	ND
MANNING-8	3-24-87	ND	ND	ND	ND	ND	ND	ND	ND
	5-10-89	ND	ND	ND	1	ND	ND	ND	ND
BICKELL-31	3-24-87	2	ND	ND	ND	1	23	16	ND
FENNELL-32	3-24-87	ND	ND	ND	ND	3	20	28	ND
MERGLER-18	3-24-87	ND	ND	ND	ND	ND	1	6	ND
	5-10-89	ND	ND	ND	1	ND	1	5	ND
HAWKINS-7	3-24-87	ND	ND	ND	ND	6	6	28	ND
	5-10-89	1	ND	2	1	3	6	23	ND
WAY-15	3-24-87	ND	ND	ND	ND	ND	ND	3	ND
	5-10-89	ND	ND	ND	1	ND	ND	2	ND

ND=NOT DETECTED

ALL CONCENTRATIONS IN UG/L

sampling from March 1987 through October 1990 are presented in Table 7. As shown, the concentration of TCE increased slightly from March 25, 1987 to April 8, 1987, decreased on April 21, 1987, fluctuated through 1989, and has generally been lower in 1990. The highest concentrations of TCE occurred in April 1987, 12 micrograms per liter (ug/l) and in May and August 1989, 11 ug/l. The lowest concentration of TCE, 6 ug/l, was measured in the most recent sample in October 1990. As shown in Table 7, TCA concentrations dropped slightly from March 25, 1987 to April 8, 1987, rose again on April 21, 1987, stayed the same in 1988 and has generally been at 4 - 5 ug/l in 1989 and 1990. The highest concentration of TCA, at 7 ug/l, was measured in August 1989 and the lowest concentration, at 3 ug/l, was measured in March 1987. As shown in Table 7, the concentration of DCE was present above detection limit in only four of the sampling events, May 1989, August 1989, December 1989, and January 1990, with a maximum concentration of 1 ug/l.

4.1.3 Interceptor Well Monitoring Wells - As part of the Town Well Interceptor Well Assessment (LGA, August 1990), five monitoring wells were installed; IRM-2S and IRM-3S are shallow zone wells and IRM-1, IRM-2I and IRM-3I are intermediate zone wells. In addition to these five wells, three existing Town monitoring wells are also located near the Town Well; TEW-3 is a shallow zone well and TEW-1 and TEW-2 are intermediate zone wells. The locations of all these wells are shown on Plate 2.

TABLE 7

TOWN WELL HISTORICAL VOC SAMPLING RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

Date	TCE	TCA	DCE
03/25/87	11	3	NA
04/08/87	12	2.5	NA
04/21/87	9	5	ND
02/01/88	11	5	ND
02/06/89	8	5	ND
03/13/89	8	4	ND
04/13/89	7.1	4.9	NA
05/03/89	11	5	1
06/20/89	8	4	ND
08/07/89	11	7	1
09/05/89	7	4	ND
11/13/89	10	6	ND
12/27/89	7	4	1
01/22/90	7	4	1
04/09/90	7	4	ND
07/16/90	9	5	ND
10/22/90	6	4	ND

Notes : Data reported from Cattaraugus County DOH
All results in ug/l
TCE = trichloroethene
TCA = 1,1,1-trichloroethane
DCE = cis-1,2-dichloroethene
NA = not analyzed for this compound
ND = not detected

These eight wells were sampled on June 28, 1990. The VOCs detected in the analytical results from these samples are presented in Table 8. As shown, no VOCs were detected in the shallow zone wells, IRM-2S, IRM-3S and TEW-3 and only TCE and TCA were detected in the deeper zone monitoring wells. TCE was detected at 6 ug/l in IRM-1, at 9 ug/l in IRM-2I, at 3 ug/l in IRM-3I, at 5 ug/l in TEW-1 and at 1 ug/l in TEW-2. TCA was detected at 4 in IRM-1, at 5 ug/l in IRM-2I, at 1 ug/l in IRM-3I and at 2 ug/l in TEW-1; TCA was not detected in TEW-2. Of these TCE and TCA concentrations reported, only the TCE in IRM-1 (6 ug/l) and TEW-1 (5 ug/l) and the TCE and TCA in IRM-2I (5 ug/l) are at or above MCL. These higher TCE and TCA concentrations are west of State Route 219, decreasing to lower concentrations, all below MCLs, on the east side of State Route 219.

4.1.4 On-Site Monitoring Wells - As stated previously, Dames and Moore installed monitoring well nests at 12 locations at the Signore Facility in 1986 and 1987. The 10 well nests that still exist are shown on Plate 1. These wells have been sampled for VOCs six times over the time period from November 1986 to January 1989. VOCs detected in the samples collected from these on-site monitoring wells are listed in tables in Appendix I. The only VOCs detected in the samples were TCE, TCA, chloroethane, chloroform, 1,1-dichloroethane, trans-1,2-dichloroethene, tetrachloroethene, benzene, ethylbenzene and toluene. The maximum concentration of these constituents from the six rounds of historical data for the

TABLE 8

IRM MONITORING WELL VOC SAMPLING RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

Well	TCE	TCA
IRM-1	6	4
IRM-2S	ND	ND
IRM-2I	9	5
IRM-3S	ND	ND
IRM-3I	3	1
TEW-1	5	2
TEW-2	1	ND
TEW-3	ND	ND

Notes : Samples collected June 28, 1990
All results in ug/l
TCE = trichloroethene
TCA = 1,1,1-trichloroethane
ND = not detected

on-site wells is presented in Table 9. As shown, the highest concentrations of VOCs were found in the samples from wells MW-1S, MW-1I, MW-4S and MW-5S. In addition, concentrations above 5 ug/l, the MCL for these constituents, were found in samples from wells MW-2S, MW-4I, MW-5D, MW-6S, MW-8S, MW-9I, MW-10D and MW-12D. For the most part, these wells are all located in the southern, downgradient part of the Signore Facility. It is interesting to note that VOC compounds were reported in samples from upgradient wells MW-2S and MW-12D. However, the compounds were reported in only one sample, in the November 1986 sample of MW-2S and in the February 1987 sample of MW-12D. Therefore, we do not believe that these compounds are present in the ground water upgradient of the Signore Facility.

4.2 RI SAMPLING RESULTS

The field investigation portion of the RI included soil gas surveys, field screening and laboratory analysis of soil samples collected from soil borings, and the sampling and laboratory analysis of ground water, surface water, surface water sediment and sewer samples.

4.2.1 Soil Gas Survey Results - As discussed previously, two soil gas surveys were conducted by Lozier Laboratories as part of the RI, one survey around the perimeter of the Signore Facility building from June 4 to June 7, 1990, and the other survey inside the Signore Facility building from July 31 to August 1, 1990. The

TABLE 9

HISTORICAL MAXIMUM VOC CONCENTRATIONS ON-SITE MONITORING WELLS

SIGNORE REMEDIAL INVESTIGATION REPORT ELLICOTTVILLE, NEW YORK

Well	TCE	TCA	1,1-DCA	trans-1,2-DCE	PCE	chloro-ethane	benzene	ethyl-benzene	toluene
MW-1S	1	5	77	9	0.4	3	--	--	--
MW-1I	120	35	54	100	6	--	--	--	--
MW-1D	--	--	--	--	--	--	--	--	--
MW-2S	--	--	--	--	--	--	--	--	23
MW-2I	--	--	--	--	--	--	--	--	--
MW-2D	--	--	--	--	--	--	--	--	--
MW-4S	179	18	2	28	5	--	--	--	--
MW-4I	11	1	--	1	--	--	--	--	--
MW-4D	--	--	--	--	--	--	--	--	--
MW-5S	680	62	12	140	4	--	--	91	15
MW-5I	--	1	--	--	--	--	--	--	--
MW-5D	--	--	8	--	--	--	--	--	--
MW-6S	54	--	--	--	--	--	8	5	63
MW-6I	--	--	--	--	--	--	--	--	--
MW-6D	--	--	--	--	--	--	--	--	--
MW-8S	22	6	--	--	2	--	--	--	--
MW-8I	0.5	0.4	--	--	--	--	--	--	--
MW-8D	--	--	--	--	--	--	--	--	--
MW-9S	--	--	0.9	--	--	--	--	--	--
MW-9I	20	10	--	1	3	--	--	--	--
MW-9D	--	--	--	--	--	--	--	--	--
MW-10S	--	--	--	--	--	--	--	--	--
MW-10I	--	--	--	--	--	--	--	--	--
MW-10D	8	--	--	--	--	--	--	--	--
MW-10VD	--	1	--	--	--	--	--	--	--
MW-11S	0.4	2	1	--	--	--	--	--	--
MW-11I	--	--	--	--	--	--	--	--	--
MW-11D	--	--	--	--	--	--	--	--	--
MW-12S	--	--	--	--	--	--	--	--	--
MW-12I	--	--	--	--	--	--	--	--	--
MW-12D	--	16	--	--	--	--	--	--	180

Notes : All concentrations in ug/l
TCE = trichloroethene
TCA = 1,1,1-trichloroethane
1,1-DCA = 1,1-dichloroethane
trans-1,2-DCE = trans-1,2-dichloroethene
PCE = tetrachloroethene
Represents results from sampling events 11/86 through 1/89

locations of the soil gas sampling points for both surveys are presented on Plate 6 and the Lozier Laboratories results for both surveys are presented in Appendix J.

The constituents detectable in the soil survey conducted outside the Signore Facility building are summarized in Table 10 and inside the Signore Facility building are summarized in Table 11. In order to evaluate potential contaminant sources, the results in Tables 10 and 11 are differentiated between BTEX (benzene, toluene, ethylbenzene and total xylenes) and chlorinated solvents.

When evaluating soil gas survey results, it is important to keep in mind that these results represent a relative concentration of VOCs in the air in the soil interstitial pores and that there is no direct correlation to concentrations of volatile constituents in soil or ground water samples. Therefore, areas with higher concentrations of volatiles in the soil gas generally represent areas with higher concentrations of volatiles in soil samples and the shallowest (unconfined) ground water samples.

As shown in Tables 10 and 11 and Plate 6, most of the soil gas sampling locations had detectable concentrations of volatiles. Plate 6 depicts soil gas results in units of ppb on volume/volume basis. The highest concentrations found in the soil gas survey were outside the northwest corner of the Signore Facility building, where most of the constituents detected were chlorinated solvents,

TABLE 10

SOIL GAS SURVEY RESULTS, OUTSIDE BUILDING

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

	N000 E400	N000 E500	N011 E556	N080 E300	N100 E500	N100 E556	N150 E300	N150 E400	N190 E300	N190 E497	N193 E400	N200 E196	N200 E556	N300 E115	N300 E200	N300 E556	N385 E100
Benzene	--	--	--	--	--	--	--	--	--	--	--	100	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	350	--	--	--	--	--
Total Xylenes	--	--	--	--	--	--	--	--	--	--	--	550	--	--	--	--	--
Total BTEX	--	--	--	--	--	--	--	--	--	--	--	1,000	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	14,000	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	412	--	--	--	--	--	--
trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	--	--	--	--	--	--	75	--	--	--	--	--	--	--	--	--	--
Total Chlorinated Solvents	--	--	--	--	--	--	75	--	14,000	--	412	--	--	--	--	--	--
Total Organics (Sum BTEX + Chlorinated Solvents)	--	--	--	--	--	--	75	--	14,000	--	412	1,000	--	--	--	--	--

-- = Not Detected
All results in ppb
Samples collected on 6/5/90 through 6/7/90

TABLE 10 (cont)

SOIL GAS SURVEY RESULTS, OUTSIDE BUILDING

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

	N391 E180	N391 E200	N400 E030	N400 E559	N445 E500	N450 E000	N450 E100	N479 E500	N487 E556	N500 E100	N550 E000	N550 E050	N550 E100	N555 E556	N590 E060	N600 E000	N600 E100
Benzene	**	--	--	--	--	--	--	--	--	--	Present	--	--	--	--	--	--
Ethylbenzene	**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Xylenes	**	Present	--	--	--	--	--	Present	145	--	Present	1,200	400	--	410	--	--
Total BTEX	--	Present	--	--	--	--	--	Present	145	--	Present	1,200	400	--	410	--	--
1,1-Dichloroethane	**	--	800	--	--	--	200	Present	--	--	Present	5,500	4,300	--	--	--	--
1,1-Dichloroethene	**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	**	--	--	--	--	--	--	--	--	--	Present	--	--	--	--	--	--
trans-1,2-Dichloroethene	**	--	--	--	--	--	--	--	--	--	--	410	1,100	--	20,000	--	1,580
Tetrachloroethene	**	--	--	--	--	--	1,500	--	--	--	Present	--	--	--	108	--	354
1,1,1-Trichloroethane	**	--	--	--	--	--	1,400	--	--	--	--	1,900	9,900	--	1E+06	2,930	69,390
Trichloroethene	**	--	--	--	--	--	--	--	--	--	Present	330	1,800	--	1,200	--	100
Total Chlorinated Solvents	--	--	800	--	--	--	3,100	Present	--	--	Present	8,140	17,100	--	1E+06	2,930	71,424
Total Organics (Sum BTEX + Chlorinated Solvents)	--	Present	800	--	--	--	3,100	Present	145	--	Present	9,340	17,500	--	1E+06	2,930	71,424

-- = Not Detected
All results in ppb
Samples collected on 6/5/90 through 6/7/90

TABLE 10 (cont)

SOIL GAS SURVEY RESULTS, OUTSIDE BUILDING

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

	N600 E105	N607 E356	N650 E050	N650 E100	N650 E150	N655 E456	N655 E556	N682 E356	N700 E000	N705 E100	N800 E100	N800 E200	N800 E300	N900 E200	N900 E300
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	274	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Xylenes	2,000	3,500	195	Present	--	--	--	--	--	--	--	--	--	--	--
Total BTEX	2,000	3,774	195	Present	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	10,000	15,000	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	230	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-Dichloroethene	310	--	250	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	120	--	406	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	10,000	2,500	7,500	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	--	--	--	Present	--	--	--	--	--	--	--	--	--	--	--
Total Chlorinated Solvents	20,660	17,500	8,156	Present	--	--	--	--	--	--	--	--	--	--	--
Total Organics (Sum BTEX + Chlorinated Solvents)	22,660	21,274	8,351	Present	--	--	--	--	--	--	--	--	--	--	--

-- = Not Detected
All results in ppb
Samples collected on 6/5/90 through 6/7/90

TABLE 11

SOIL GAS SURVEY RESULTS, INSIDE BUILDING

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

	N250 E230	N250 E305	N250 E380	N323 E230	N325 E300	N325 E380	N400 E230	N400 E305	N400 E380	N500 E235	N500 E305	N565 E285	N575 E160	N575 E235	N635 E200	N635 E235	N638 E160	N640 E285	N686 E235
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	1,190	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	240	124	690	121	--	610	--	150	--	280	430	--	--	--	--	--	--	--	150
Total Xylenes	3,300	200	340	90	--	230	--	--	570	260	290	65	116	--	--	--	--	--	144

Total BTEX	3,540	324	1,030	211	--	840	--	150	570	540	720	65	116	1,190	--	--	--	--	294
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	600	--	250	--
trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	--	--	--	--	20,000	1,400	650	950	210	230	390	910	--	560	--	6,620	--	3,500	140
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	--	--	--	--	--	--	--	--	630	--	--	6,445	210	9,640	113	120,600	--	76,400	484

Total Chlorinated Solvents	--	--	--	--	20,000	1,400	650	950	840	230	390	7,355	210	10,200	113	127,820	--	80,150	624
Total Organics (Sum BTEX + Chlorinated Solvents)	3,540	324	1,030	211	20,000	2,240	650	1,100	1,410	770	1,110	7,420	326	11,390	113	127,820	--	80,150	918

-- = Not Detected
All results in ppb
Samples collected on 7/31/90 and 8/1/90

primarily TCA, TCE, 1,1-dichloroethane and trans-1,2-dichloroethene. This area of chlorinated solvents in the soil gas extends under the western part of the Signore Facility building. Also, another area of chlorinated solvents in the soil gas was found outside and south of the building. In addition to chlorinated solvents, BTEX constituents were also found in the soil gas in the northwest corner of the Facility. This area of BTEX compounds extends from the northwest corner under most of the building, but was not found outside and south of the building. Several soil gas points inside the southern half of the building found tetrachloroethene, which might indicate extension of the area of chlorinated solvents. However, the tetrachloroethene was not found with any of the other solvents, as was observed in the northwest corner of the Facility. Therefore, these points where only tetrachloroethene was detected were disregarded.

The soil gas results were used to select the location of the soil borings shown in Plate 7.

4.2.2 Soil Sampling Results - Based on the soil gas survey results, fourteen soil borings were drilled at the locations shown on Plate 7 from July 30 to August 3, 1990. The borings were drilled and sampled according to the methodology described in Section 2.4. Continuous split-spoon soil samples were collected in two-foot intervals from ground surface to the water table, which ranged in depth from 6 feet at BH-1 and BH-5 to 14 feet at BH-4.

Upon opening the split spoon, each sample was screened using a photoionization detector (PID screening). In addition, a headspace soil gas analysis was made for each of the soil samples using a field gas chromatograph (GC screening). Soil samples exhibiting potential contamination based on PID and/or GC screenings were selected for laboratory chemical analysis. In addition, bottom samples in each boring were also selected for laboratory chemical analysis. A total of 31 soil samples were submitted for analysis; 14 of the samples were analyzed for TCL VOCs and 17 of the samples were analyzed for the complete TCL. The GC screening results are presented in Appendix K and the laboratory analytical results are presented in Appendix L.

The constituents detectable in the GC screening of the soil samples are summarized in Table 12. In order to evaluate potential contaminant sources, the results in Table 12 are differentiated between BTEX (benzene, toluene, ethylbenzene and total xylenes) and chlorinated solvents. The laboratory analytical results for the soil samples submitted for chemical analyses are summarized in Tables 13, 14 and 15; VOCs constituents detected are presented in Table 13, semi-volatile organics constituents detected are presented in Table 14 and inorganics analyses, primarily metals, are presented in Table 15. In general, the GC screening results did not correlate very well with the laboratory analytical results. Some of the soil samples that had high GC screening results had detectable VOC concentrations while others that had high GC

TABLE 12

SOIL SAMPLE GC SCREENING RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT ELLICOTTVILLE, NEW YORK

	BH-1 0'-2'	BH-1 2'-4'	BH-1 4'-6'	BH-2 0'-2'	BH-2 2'-4'	BH-2 4'-6'	BH-2 6'-8'	BH-3 0'-2'	BH-3 2'-4'	BH-3 4'-6'	BH-3 6'-8'	BH-4 0'-2'	BH-4 2'-4'	BH-4 4'-6'	BH-4 6'-8'	BH-4 8'-10'
Benzene	--	--	200	--	95+	--	--	--	--	--	--	--	--	--	--	320
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	70	--	--	--	--	--	--	160
Total Xylenes	--	--	--	--	--	--	--	180	80,000	18,000	2,800	--	230	160	--	--
Total BTEX	--	--	200	--	95	--	--	180	80,070	18,000	2,800	--	230	160	--	480
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	650	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	--	--	970	--	--	--	--	--	--	--	--	--	--	--	50	1,300
trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	--	--	160	--	--	--	--	--	--	--	--	--	--	--	--	300
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	30,000
Trichloroethene	--	--	130	--	--	--	--	--	--	--	--	--	45	830	1,100	1,700
Total Chlorinated Solvents	--	--	1,910	--	--	--	--	--	--	--	--	--	45	830	1,150	33,300
Total Organics (Sum BTEX + Chlorinated Solvents)	--	--	2,110	--	95	--	--	180	80,070	18,000	2,800	--	275	990	1,150	33,780

-- = Not Detected
All results in ppb
Samples collected on 7/30/90 through 8/3/90

TABLE 12 (cont)

SOIL SAMPLE GC SCREENING RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

	BH-4 10'-12'	BH-4 12'-14'	BH-5 2'-4'	BH-5 4'-6'	BH-6 0'-2'	BH-6 2'-4'	BH-6 4'-6'	BH-6 6'-8'	BH-6 8'-10'	BH-6 10'-12'	BH-7 0'-2'	BH-7 2'-4'	BH-7 4'-6'	BH-7 6'-8'	BH-8 0'-2'	BH-8 2'-4'
Benzene	--	--	--	--	--	--	140	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Xylenes	--	--	--	--	--	--	--	--	--	--	--	38,000	19,000	--	--	--
Total BTEX	--	--	--	--	--	--	140	--	--	--	--	38,000	19,000	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	200	410	--	--	--	--	--	--	--	--	--	4,600	24,000	14,000	--	--
trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	320	850	740	--	--
Tetrachloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	5,600	5,900	--	--	--	220	--	430	100	230	--	39,000	87,000	51,000	--	750
Total Chlorinated Solvents	5,800	6,310	--	--	--	220	--	430	100	230	--	43,920	111,850	65,740	--	750
Total Organics (Sum BTEX + Chlorinated Solvents)	5,800	6,310	--	--	--	220	140	430	100	230	--	81,920	130,850	65,740	--	750

-- = Not Detected
All results in ppb
Samples collected on 7/30/90 through 8/3/90

TABLE 12 (cont)

SOIL SAMPLE GC SCREENING RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

	BH-8 4'-6'	BH-8 6'-8'	BH-8 8'-10'	BH-9 0'-2'	BH-9 2'-4'	BH-9 4'-6'	BH-9 6'-8'	BH-9 8'-10'	BH-10 0'-2'	BH-10 2'-4'	BH-10 4'-6'	BH-10 6'-8'	BH-11 0'-2'	BH-11 2'-4'	BH-11 4'-6'	BH-11 6'-8'
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Xylenes	--	139	--	150	113	--	148	170	390	88	--	230	--	--	--	--
Total BTEX	--	139	--	150	113	--	148	170	390	88	--	230	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	360	--	--	730	1,040	895	1,020	930	--	1,640	1,860	1,830	--	--	460	500
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	160	250
trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	--	--	90	220	100	--	--	--	--	475	800	600	--	204	1,290	960
1,1,1-Trichloroethane	--	--	--	17,500	11,800	8,550	9,000	10,730	1,156	112,000	206,000	175,000	--	--	3,200	6,500
Trichloroethene	2,080	608	1,250	73	650	6,560	7,260	6,400	--	100	168	370	--	33	127	200
Total Chlorinated Solvents	2,440	608	1,340	18,523	13,590	16,005	17,280	18,060	1,156	114,215	208,828	177,800	--	237	5,237	8,410
Total Organics (Sum BTEX + Chlorinated Solvents)	2,440	747	1,340	18,673	13,703	16,005	17,428	18,230	1,546	114,303	208,828	178,030	--	237	5,237	8,410

-- = Not Detected
All results in ppb
Samples collected on 7/30/90 through 8/3/90

TABLE 12 (cont)

SOIL SAMPLE GC SCREENING RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

	BH-12 0'-2'	BH-12 2'-4'	BH-12 4'-6'	BH-12 6'-8'	BH-12 8'-10'	BH-12 10'-12'	BH-13 0'-2'	BH-13 2'-4'	BH-13 4'-6'	BH-13 6'-8'	BH-13 8'-10'	BH-14 0'-2'	BH-14 2'-4'	BH-14 4'-6'	BH-14 6'-8'
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Xylenes	--	--	--	--	--	--	--	--	--	--	--	54	64	--	--
Total BTEX	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	2,300	7,200	4,300	671
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	9,500	11,300	2,980	458
trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	--	--	--	--	--	--	--	--	--	--	--	5,000	2,860	1,660	4,880
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--	--	46,160	38,000	17,300	11,890
Trichloroethene	--	--	--	--	--	--	--	--	--	--	--	45,300	53,140	13,650	8,800
Total Chlorinated Solvents	--	--	--	--	--	--	--	--	--	--	--	108,260	112,500	39,890	26,699
Total Organics (Sum BTEX + Chlorinated Solvents)	--	--	--	--	--	--	--	--	--	--	--	108,260	112,500	39,890	26,699

-- = Not Detected
All results in ppb
Samples collected on 7/30/90 through 8/3/90

TABLE 13

SOIL SAMPLE VOC ANALYTICAL RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

SOIL BORING	METHYLENE CHLORIDE	ACETONE	2-BUTANONE	TOLUENE	ETHYL-BENZENE	XYLENE	1,1,1-TCA	PCE	1,2-DCE	TCE	1,1,2-TCA
BH-1 4-6	17 B	13 B	--	--	--	--	--	--	--	--	--
BH-2 2-4	23 B	72 B	17 B	--	--	--	--	--	--	--	--
BH-2 6-8	38 B	120 B	16 B	3 J	--	--	--	--	--	--	--
DUP 8 (BH-2 6-8)	18 B	46 B	18 B	--	--	--	--	--	--	--	--
BH-3 2-4	38 B	35 B	6 B	--	3 J	73	--	--	--	--	--
BH-3 4-6	42 B	100 B	7 B	6 J	--	--	--	--	--	--	--
BH-3 6-8	23 B	63 B	6 B	5 J	2 J	11	--	--	--	--	--
BH-4 6-8	9 B	20 B	2 B	--	--	--	--	--	--	--	--
BH-4 8-10	21 B	38 B	5 B	--	--	--	--	--	--	--	--
BH-4 10-12	8 B	17 B	3 B	--	--	--	--	--	--	--	--
BH-4 12-14	5 B	11 B	--	--	--	--	--	--	--	--	--
BH-5 4-6	22 B	50 B	6 B	1 B	--	--	--	--	--	--	--
BH-6 6-8	19 B	30 B	5 B	--	--	--	--	--	--	--	--
BH-6 10-12	19 B	67 B	24 B	--	--	--	--	--	--	--	--
BH-7 2-4	58 B	43 B	8 B	--	12	4 J	--	--	1 J	9	--
BH-7 4-6	22 B	43 B	6 B	--	2 J	--	--	--	2 J	15	--
BH-7 6-8	16 B	41 B	5 B	--	--	--	--	--	--	10 J	--
BH-8 4-6	36 B	30 B	5 B	--	--	--	--	--	--	--	--
BH-8 8-10	22 B	49 B	4 B	--	--	--	--	--	--	--	--
BH-9 0-2	19 B	66 B	8 B	--	--	--	3 J	--	--	--	--
BH-9 6-8	17 B	47 B	4 B	--	--	--	--	--	--	--	--
BH-9 8-10	23 B	24 B	3 B	--	--	--	--	--	--	--	--
BH-10 2-4	43 B	24 B	2 B	--	--	--	--	--	--	--	--
BH-10 4-6	23 B	26 B	3 B	--	--	--	1 J	--	--	--	--
DUP 11(BH-10 4-6)	27 B	31 B	--	--	--	--	--	--	--	--	--
BH-10 6-8	26 B	49 B	7 B	--	--	--	8	--	--	--	--
BH-11 4-6	17 B	50 B	4 B	--	--	--	--	--	--	--	--
BH-12 10-12	15 B	40 B	3 B	--	--	--	--	--	--	--	--
DUP 10(BH-12 10-12)	16 B	39 B	7 B	--	--	--	--	--	--	--	--
BH-13 8-10	26 B	28 B	5 B	--	--	--	--	--	--	--	--
BH-14 0-2	25 B	41 B	6 B	--	--	--	--	--	--	--	6 J
BH-14 2-4	12 B	19 B	2 B	--	--	--	--	--	--	2 J	6 J
BH-14 4-6	16 B	42 B	6 B	--	--	--	--	--	--	--	--
DUP 9 (BH-14 4-6)	10 B	15 B	1 B	--	--	--	--	--	--	--	--
BH-14 6-8	32 B	24 B	2 B	--	--	--	5	5 J	--	24	--

All Results in ug/kg
J=Estimated Value
B=Compound was also detected in blank
--=Not Detected
Samples collected on 7/30/90 through 8/3/90

TABLE 14

SOIL SAMPLE SEMI-VOLATILE ANALYTICAL RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

	BIS(2-ETHYL HEXYL PHTHALATE)	PHENAN-THRENE	FLUORAN-THENE	PYRENE	BENZO(A) ANTHRACENE	CHRYSENE	BENZO(B) FLUOR-ANTHENE	BENZO(K) FLUOR-ANTHENE	BENZO(A) PYRENE	ANTHRACENE	INDENO (1,2,3) CD PYRENE	BENZO (G,H,I) PERYLENE
BH-2 6-8	130 B	--	--	--	--	--	--	--	--	--	--	--
DUP 8 (BH-2 6-8)	110 B	--	--	--	--	--	--	--	--	--	--	--
BH-3 2-4	470 B	--	--	--	--	--	--	--	--	--	--	--
BH-4 8-10	160 J	--	--	--	--	--	--	--	--	--	--	--
BH-6 6-8	--	220 J	290 J	350 J	110 J	140 J	210 J	210 J	96 J	--	--	--
BH-7 4-6	--	--	--	--	--	--	--	--	--	--	--	--
BH-7 6-8	--	--	--	--	--	--	--	--	--	--	--	--
BH-8 4-6	--	--	--	--	--	--	--	--	--	--	--	--
BH-9 0-2	--	--	--	--	--	--	--	--	--	--	--	--
BH-9 6-8	--	--	--	--	--	--	--	--	--	--	--	--
BH-10 4-6	--	--	--	--	--	--	--	--	--	--	--	--
BH-11 4-6	--	--	--	--	--	--	--	--	--	--	--	--
BH-14 0-2	46 J	--	--	--	--	--	--	--	--	--	--	--
BH-14 4-6	110 J	--	48 J	47 J	--	--	--	--	--	--	--	--
DUP 9 (BH-14 4-6)	200 J	600	1200	970	430	580	440	550	400	98 J	170 J	220 J

All Results in ug/kg
J=Estimated Value
B=Compound was also detected in blank
--=Not Detected
Samples collected on 7/30/90 through 8/3/90

TABLE 15

SOIL SAMPLE INORGANIC ANALYTICAL RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

ANALYSIS	BH-2 6'-8'	DUP 8 BH-2 6'-8'	BH-3 2'-4'	BH-4 8'-10'	BH-6 6'-8'	BH-7 4'-6'	BH-7 6'-8'	BH-8 4'-6'	BH-9 0'-2'	BH-9 6'-8'	BH-10 4'-6'	BH-11 4'-6'	BH-14 0'-2'	BH-14 4'-6'	DUP 9 BH-14 4'-6'
ALUMINUM	12300	9280	14300	8130	5650	11200	9100	13300	14300	6370	8890	14100	13200	10700	10800
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	1.4 J	8.9 J	8.6 J	8.9 J	6.6 J	13.1 J	10.10 J	20 J	16.9 J	5.4 J	8.3 J	2.4 J	14.7 J	10.5 J	8.4 J
BARIUM	360	333	214	94	99.6	124	88.4	172	199	99.8	111	153	137	160	174
BERYLLIUM	0.84 J	0.87 J	0.95 J	0.43 J	--	0.60 J	0.31 J	0.50 J	0.74 J	0.29 J	0.44 J	0.66 J	0.58 J	0.75 J	0.57 J
CADMIUM	--	--	--	1.2 B	--	--	--	--	--	--	--	1.3	--	--	--
CALCIUM	2200 J	3520 J	3870 J	3140 J	16200 J	1270 J	1720 J	2190 J	4470 J	1360 J	1660 J	1930 J	1460 J	1180 J	1430 J
CHROMIUM	15.6	14.1	17.8	17.2	6.2	14.8	12.5	15.6	16.7	8	11.7	18.7	14.3	13.1	12.7
COBALT	8.5 B	6.5 B	13.2 J	6.8 B	5.2 J	11.2 J	8.3 J	9.4 J	15.5 J	6.5 J	9.4 J	9.8 J	9.6 J	16.9 J	12.7 J
COPPER	19.6 B	30.5 B	13.2 B	15.9 B	18.2 J	19.6 J	24.2 J	22.4 J	21.3 J	28.8	19.0 J	17 J	13.2 J	16.5 J	16.2 J
IRON	17100	14600	25400	19100	14800	35500	26000	26000	35900	17200	20900	26200	26400	26200	25300
LEAD	12.7 J	11.7 J	25.5 J	34.8	15.8 J	15.4 J	15.8 J	16.3 J	17.1 J	33.1 J	12 J	9.4 J	17 J	16.1 J	16.1 J
MAGNESIUM	2970	2090	3440	2620	10100	3600	3080	4060	4230	2240	2790	3750	3240	3250	3140
MANGANESE	163 B	215 J	350 B	270 B	1410 J	231 J	358 J	806 J	1240 J	1110 J	489 J	307 J	483 J	975 J	678 J
MERCURY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NICKEL	23.7	20.4	29.3	19.6	19.4	26.7	21.4	30.7	28.2	18	21	23.4	23.1	23	25.5
POTASSIUM	--	--	857	--	--	856	763	991	729	--	713	926	--	--	--
SELENIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SILVER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SODIUM	165	229	167	180	105	140	106	152	151	--	142	179	338	116	113
THALLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VANADIUM	19.6	19.6	21.1	12.3	7.5	19.0	13.9	17.2	21.1	9.2	13.6	24.8	20.4	18	17.1
ZINC	60.9 J	46.5 J	70.6 J	97.9 J	92.8 J	122 J	115 J	168 J	85.9 J	84.4 J	62.7 J	60.2 J	65.8 J	53.9 J	56.6 J
CYANIDE	--	27.5 J	--	1.7	--	--	--	--	--	--	--	--	2.6	--	--

All concentrations in mg/kg
B=Compound was detected in blank
J=Estimated Value
--=Not Detected
Samples collected on 7/30/90 through 8/3/90

screening results had nondetectable VOC concentrations. However, all the samples that had detectable VOC concentrations had high GC screening results.

As shown in Table 13, VOC concentrations in the soil samples were all less than 25 micrograms per kilogram (ug/kg), except a xylene concentration of 73 ug/kg in the 2-4 feet sample from boring BH-3. Methylene chloride, acetone and 2-butanone were detected in most of the soil samples, however these compounds were also present in the laboratory sample blanks. In addition, these compounds are common laboratory artifacts and therefore, were disregarded in the data evaluation. Of the 14 total soil borings, the laboratory analyses for the samples from borings BH-1, BH-4, BH-5, BH-6, BH-8, BH-11, BH-12 and BH-13 all had nondetectable VOC concentrations. In soil boring BH-9, the 0-2 feet sample had 3 ug/kg of TCA and the samples from 6-8 and 8-10 feet are nondetectable. In soil boring BH-2, the 2-4 feet sample was nondetectable and the 6-8 feet sample had 3 ug/kg of toluene. The other four soil borings, the total VOCs in the samples at the bottom of the boring were 17 ug/kg in boring BH-3 (toluene, ethylbenzene and total xylenes), 10 ug/kg in boring BH-7 (TCE), 8 ug/kg in boring BH-10 (TCA) and 34 ug/kg in boring BH-14 (TCE, TCA and tetrachloroethene). Of these borings, the concentrations in the samples from the bottom of borings BH-10 and BH-14 were higher than shallower samples in the same boring.

Other than bis(2-ethylhexyl)phthalate, a common laboratory contaminant, only the samples from 6-8 feet in soil boring BH-6 and 4-6 feet in soil boring BH-14 detected any semi-volatile constituents, all at concentrations estimated below the laboratory detection limit. Because these were not found in other samples from the same borings, we do not believe that there is any significance to these results.

The inorganics results presented in Table 15 show that the soil samples had various levels of metals, all of which are naturally occurring. The only results of note are the cadmium found in the 4-6 foot sample in BH-11 and the cyanide found in the 8-10 foot sample in BH-4 and the 0-2 foot sample in BH-14. However, these results are at very low concentrations, below 2 milligrams per kilogram (mg/kg).

In summary, the soil results do not indicate any new sources of contamination at the Signore Facility. Only low level VOCs were detected in the soil samples and no semi-volatile organics or metals of any significance were detected.

4.2.3 Ground Water Sampling Results - As part of the RI Project, two rounds of ground water samples were collected: 12 of the on-site monitoring wells were sampled on June 28-29, 1990 for TCL volatiles, semi-volatiles, pesticides/PCBs, TAL metals and cyanide; and the 13 RI wells were sampled on September 10-11, 1990 for TCL volatiles and lead, except wells at locations EW-1 and EW-2, which were sampled for TAL Metals and cyanide. The laboratory analytical reports for the on-site wells are presented in Appendix M and the RI wells are presented in Appendix N.

The sampling results for the on-site wells are summarized in Tables 16 and 17, where Table 16 presents the organics data and Table 17 presents the inorganics data. As shown in Table 16, a number of VOCs were detected in the samples. Methylene chloride was detected in all the samples and acetone was detected in three of the samples, however both compounds were present in sample blanks. Because of their presence in sample blanks and the fact that these compounds are also common laboratory contaminants, methylene chloride and acetone were disregarded in the data evaluation. Also, as shown in Table 16, the only semi-volatile present was bis(2-ethylhexyl)phthalate, a common laboratory contaminant, at a concentration of 1 ug/l in the sample from MW-6D. Therefore, the presence of this compound was also disregarded. No pesticide/PCBs were detected in any sample.

Of the 12 on-site monitoring wells sampled, no organics were detected in MW-2S, MW-6S, MW-6D and MW-9S and only benzene, toluene and 1,1-dichloroethane at concentrations of 1 ug/l were detected in MW-5D. Of the other 7 monitoring wells, the following VOC compounds were detected, TCE, TCA, tetrachloroethene (PCE), 1,1-dichloroethane (DCA), 1,1-dichloroethene, 1,2-dichloroethene (DCE), chloroethane and vinyl chloride. Of these 8 compounds, only TCE,

TABLE 16

GROUND WATER ORGANIC ANALYTICAL RESULTS
ON-SITE MONITORING WELLS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

	VOLATILES													SEMI-VOLATILES
WELL	METHYLENE CHLORIDE	VINYL CHLORIDE	CHLORO-ETHANE	1,1,1-TCA	TCE	PCE	1,1-DCE	ACETONE	1,2-DCE	1,1-DCA	BENZENE	TOLUENE	2-BUTANONE	BIS (2-ETHYL HEXYL PHTHALATE)
MW-1S	1 B	--	--	--	1 J	--	--	--	2	100 J	--	--	--	--
MW-1I	2 B	2 J	2 J	6	55	2 J	0.7 J	--	79 J	73 J	--	--	--	--
MW-1D	5 B	--	--	38 J	25	1 J	--	--	2 J	9	--	--	--	--
MW-2S	0.8 B	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-4S	5 B	--	--	10	27	3	--	--	3	1 J	--	--	--	--
MW-5S	3 B	--	2 J	99 J	100 J	1 J	1 J	--	20	8	--	--	--	--
MW-5D	5 B	--	--	--	--	--	--	6 B	--	1 J	1 J	1 J	--	--
MW-6S	2 B	--	--	--	--	--	--	5 B	--	--	--	--	--	--
MW-6D	4 B	--	--	--	--	--	--	2 B	--	--	--	--	--	1 J
MW-8S	3 B	--	--	5	19	3	--	--	1 J	--	--	--	--	--
DUP 4 (8S)	2 B	--	--	5	18	3	--	--	1 J	--	--	--	--	--
MW-9S	0.8 B	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-9I	14 B	--	--	10	28	2 J	1 J	--	--	--	--	--	--	--
DUP 3 (9I)	4 B	--	--	--	30	2 J	1 J	--	--	--	--	--	10 J	--

All results in ug/L

B=Compound was also detected in blank

J=Estimated Value

--=Not Detected

Samples collected on 6/28/90 and 6/29/90

TABLE 17

GROUND WATER INORGANIC ANALYTICAL RESULTS ON-SITE MONITORING WELLS

SIGNORE REMEDIAL INVESTIGATION REPORT ELLICOTTVILLE, NEW YORK

											(MW-8S)			(MW-9I)
ANALYSIS	MW-1S	MW-1I	MW-1D	MW-2S	MW-4S	MW-5S	MW-5D	MW-6S	MW-6D	MW-8S	DUP 4	MW-9S	MW-9I	DUP 3
ALUMINUM	12.3 J	0.23 B	4.82 J	36.8 J	4.73 J	2.22 J	0.326 B	5.9 J	3.25 J	3.34 J	0.948 J	1.15 J	4.21 J	0.324 B
ANTIMONY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	0.006 J	0.0164	0.0043 J	--	--	--	--	0.0043	0.0032	--	--	--	0.0022 J	--
BARIUM	0.859	0.689	1.39	2.58	0.552	0.387	0.166	0.735	0.337	0.543 J	0.304 J	0.152	0.511 J	0.238 J
BERYLLIUM	0.001	--	--	0.0038	--	--	--	--	--	--	--	--	--	--
CADMIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CALCIUM	127	104	90.9	50.3	53.4	58.9	23.9	110	70.8	142	116	77.6	106	76
CHROMIUM	0.0231	--	0.0115	0.053	--	--	--	0.0134	--	0.0076	--	--	0.0106 J	--
COBALT	0.0421	--	0.0093	0.0726	0.0075	0.0043	--	0.0169	0.005	0.006	--	0.0087	0.0127 J	--
COPPER	0.0867 J	--	0.0346 J	0.203	0.0261 J	0.0301 J	--	0.0403 J	0.026 J	0.0284 J	0.0184 J	0.0111 J	0.0341 J	--
IRON	84.7	30.2	14.1	60.3	7.63	1.54	0.826	25	7.08	5.81 J	1.63 J	5.05	11.7 J	0.759 J
LEAD	0.0894 J	0.0023 J	0.0344 J	0.148 J	0.0177 J	0.0092 J	0.0042 J	0.0296 J	0.0112 J	0.0059 J	--	0.0071 J	0.0295 J	0.0021 J
MAGNESIUM	19.2	8.86	9.68	12	8.95	5.24	0.912	22.6	8.2	17.4	13.7	15.7	15.3 J	9.5 J
MANGANESE	8.3	1.87	1.74	19	1.05	0.852	0.0754	12.6	0.386	2.16 J	0.688 J	1.62	2.35 J	0.21 J
MERCURY	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NICKEL	--	--	--	0.107	--	--	--	--	--	--	--	--	--	--
POTASSIUM	--	--	3.430	4.1	12.5	--	10.6	--	4.670	--	3.010	3.180	--	--
SELENIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SILVER	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SODIUM	29.9	8.1	24.8	3.48 B	43.7	26.3	19.5	33.7	15.4	26.4	21.3	31.2	13.3	13.3
THALLIUM	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VANADIUM	0.027	--	0.0098	0.0588	--	--	--	0.0086	0.0056	--	--	--	0.0063	--
ZINC	0.259	0.0135 B	0.145	0.64	0.122	0.135	0.156	0.148	0.058	0.148 J	0.0509 B	0.0236 B	0.14 J	0.0123 B
CYANIDE	--	--	--	--	--	--	--	--	--	--	--	0.0351	--	--

ALL RESULTS IN MG/L
B=Compound was also detected in blank
J=Estimated Value
--=Not detected
Samples collected on 6/28/90 and 6/29/90

TCA, DCA and DCE were detected at concentrations above the MCL of 5 ug/l. In addition, only wells MW-1S, MW-1I and MW-5S had above the MCL for total organics of 100 ug/l, with 103 ug/l, 223 ug/l and 231 ug/l, respectively. The RI sampling results for the on-site wells are consistent with the historic data from these wells. The highest concentrations of VOCs have been found in the MW-1 well nest along the downgradient boundary of the Facility, in MW-5S at the southeast and downgradient corner of the Facility building, and in MW-4S at the northeast corner and oldest part of the Facility building.

As shown in Table 17, a number of the TAL metals were detected in the on-site well samples and cyanide was only detected in MW-9S at a concentration of 0.0236 milligrams per liter (mg/l). The concentrations of iron and manganese were above the State drinking water standards of 0.3 mg/l in all the samples. The only other results above State drinking water standards were barium (1.0 mg/l) in wells MW-1D and MW-2S, chromium (0.05 mg/l) in well MW-2S and lead (0.05 mg/l) in well MW-1S and MW-2S. Well MW-2S is upgradient of the Signore Facility and therefore, the only metals detected above State drinking water standards in downgradient wells were barium and lead. It is important to note that these metals results are total metals from unfiltered samples and therefore the presence of metals may be related to the effects of sample turbidity rather than actual concentrations of dissolved metals in ground water.

The results of the on-site well sampling were used to select the parameters to analyze the RI monitoring well for. Because no semi-volatiles or pesticide/PCBs were found, the RI well were analyzed for only VOCs. In addition, because lead was of concern with the metals, the off-site RI wells were only analyzed for lead. The on-site RI wells, at well nests MW-1 and MW-2, were analyzed for TAL metals and cyanide.

The sampling results for the RI wells are summarized in Tables 18 and 19, where Table 18 presents the VOC data and Table 19 presents the inorganics data. As shown in Table 18, a number of VOCs were detected in the samples. Methylene chloride was detected in all the samples and acetone was detected in two of the samples, however both compounds were present in sample blanks. Because of their presence in sample blanks and the fact that these compounds are also common laboratory contaminants, methylene chloride and acetone were disregarded in the data evaluation.

Generally, the samples from the 13 RI monitoring wells detected only low levels of VOCs, with the exception of wells EW-1.25, EW-1.50 and EW-4.50. No VOCs were detected in EW-2.25, EW-4.25, EW-6.25, EW-6.50 and EW-7.25. Total VOCs of less than 10 ug/l were detected in EW-2.50 (1 ug/l TCE), EW-3.50 (2 ug/l TCE), EW-5.25 (4 ug/l TCE, 2 ug/l TCA and 1 ug/l PCE), EW-5.50 (6 ug/l TCE, 2 ug/l TCA and 1 ug/l PCE) and EW-7.50 (3 ug/l TCE and 2 ug/l TCA). Wells EW-1.25 and EW-1.50 detected 343 ug/l and 252 ug/l total VOCs,

TABLE 18

GROUND WATER ORGANIC ANALYTICAL RESULTS
RI MONITORING WELLS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

WELL	METHYLENE CHLORIDE	ACETONE	1,1,1-TCA	PCE	1,2-DCE	TCE	1,1-DCA	CHLOROETHANE	1,1-DCE
EW-1.25	--	19 B	84	--	42	180	37	--	--
EW-1.50	1 B	--	160 J	--	5	65 J	20	1 J	1 J
EW-2.25	20	--	--	--	--	--	--	--	--
DUP 16 (2.25)	24	--	--	--	--	--	--	--	--
EW-2.50	6 B	--	--	--	--	1 J	--	--	--
EW-3.50	2 B	--	--	--	--	2	--	--	--
EW-4.25	2 B	--	--	--	--	--	--	--	--
EW-4.50	2 B	--	37	0.8 J	2	29	4	--	--
EW-5.25	1 B	--	2	0.9 J	--	4	--	--	--
EW-5.50	1 B	--	2	1 J	--	6	--	--	--
EW-6.25	1 B	--	--	--	--	--	--	--	--
EW-6.50	1 B	--	--	--	--	--	--	--	--
EW-7.25	1 B	--	--	--	--	--	--	--	--
DUP 15 (7.25)	1 B	--	--	--	--	--	--	--	--
EW-7.50	1 B	--	2	--	--	3	--	--	--

All Results in ug/L
B=Compound was also detect in blank
J=Estimated Value
--=Not Detected
Samples collected on 9/10/90

TABLE 19

GROUND WATER INORGANIC ANALYTICAL RESULTS
RI MONITORING WELLS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

ANALYSIS	EW-1.25	EW-1.50	EW-2.25	(2.25) DUP 16	EW-2.50	EW-3.50	EW-4.25	EW-4.50	EW-5.25	EW-5.50	EW-6.25	EW-6.50	EW-7.25	(7.25) DUP 15	EW-7.50
ALUMINUM	61	51.1	56.1	NA	53.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ANTIMONY	--	--	--	NA	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ARSENIC	0.015 J	0.012 J	0.008 J	NA	0.012 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BARIUM	1.8	0.996	0.188	NA	1.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BERYLLIUM	0.003	0.003	--	NA	0.002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CADMIUM	--	--	--	NA	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CALCIUM	144	105	37.3	NA	185	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHROMIUM	0.076	0.062	0.022	NA	0.064	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
COBALT	0.060	0.046	0.052	NA	0.052	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
COPPER	0.255	0.156	0.033 B	NA	0.18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
IRON	132	105	29.4	NA	115	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LEAD	0.128	0.068	0.014 J	0.025 J	0.103	0.007	0.174	0.076	0.144	0.049	0.003	0.02	0.023	0.028	0.005
MAGNESIUM	39.2	26	6.15	NA	33.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MANGANESE	5.37	5.97	0.803	NA	5.69	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MERCURY	--	--	--	NA	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NICKEL	0.169	0.105	0.025	NA	0.102	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
POTASSIUM	11.1	11.2	2.54	NA	10.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SELENIUM	--	--	--	NA	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SILVER	--	--	--	NA	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SODIUM	12.2	14	25	NA	12.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
THALLIUM	--	--	--	NA	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VANADIUM	0.106	0.081	0.013	NA	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ZINC	0.830	0.543	0.121	NA	0.567	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CYANIDE	--	--	--	NA	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA = Not Analyzed for
All Results in MG/L
B=Compound was also detected in blank
J=Estimated Value
--=Not Detected
Samples collected on 9/10/90

respectively, above the MCL for total organics. These wells are along the southern and downgradient boundary of the Signore Facility and the results are consistent with the results from the nearby MW-1 well nest. Well EW-4.50 detected 73 ug/l total VOCs. The results from this intermediate zone well are consistent with the sampling results of nearby domestic wells.

As shown in Table 19, a number of the TAL metals were detected in the samples from wells EW-1.25, EW-1.50, EW-2.25 and EW-2.50. The concentrations of iron and manganese were above the State drinking water standards of 0.3 mg/l in all four samples. In addition, other results above State drinking water standards were barium (1.0 mg/l) in wells EW-1.25 and EW-2.50, chromium (0.05 mg/l) in wells EW-1.25, EW-1.50 and EW-2.50, and lead (0.05 mg/l) in wells EW-1.25, EW-1.50 and EW-2.50. The off-site RI monitoring wells were only analyzed for lead and of the samples, wells EW-4.25, EW-4.50 and EW-5.25 were above State drinking water standards.

It should be pointed out when reviewing the results of the metals analyses for both the on-site and RI monitoring wells that the samples were not filtered before analysis and thus may represent metals in the soil particles (turbidity) that are part of the sample.

4.2.4 Surface Water/Sediment Sampling Results - A total of nine surface water and surface water sediment samples were collected on

July 11, 1990. Six of the samples were collected from Plum Creek and three of the samples from Great Valley Creek, at the locations shown on Plate 8. Of the six samples collected from Plum Creek, samples PC-1, PC-2 and PC-3 are upstream of the Signore Facility. Samples PC-4, PC-5 and PC-6 are adjacent to the Facility and could receive runoff or ground water discharge from the Facility. Of the three Great Valley Creek samples, GV-1 is upstream of the mouth of Plum Creek and GV-2 and GV-3 are downstream of the mouth of Plum Creek. Therefore, samples GV-2 and GV-3 could represent potential contribution from the Signore Facility. The surface water samples (designated "SW") and surface water sediment samples (designated "SED") were analyzed for TCL volatiles, semi-volatiles and pesticides/PCBs and TAL metals and cyanide. The laboratory analytical reports for the surface water samples are presented in Appendix O and the surface water sediment samples are presented in Appendix P.

The surface water sampling results are summarized in Tables 20 and 21, where Table 20 presents the organics data and Table 21 presents the inorganics data. As shown in Table 20, methylene chloride, acetone and chloroform were reported in the laboratory results. As with the soil and ground water results, methylene chloride and acetone were also reported in sample blanks and therefore were disregarded in the data evaluation. Chloroform was detected in furthest downstream Great Valley Creek sample (SW-GV-3) at an estimated concentration of 0.6 ug/l, however the duplicate of this sample did not detect chloroform. There were no semi-volatiles or pesticides/PCBs reported in the samples. Therefore, the results show that no organics are present in the surface water samples. As shown in Table 21, several of the metals were detected in the surface water samples, however the only metal reported at concentrations above State drinking water standards was iron in the furthest downstream Great Valley Creek sample (SW-GV-3) and an upstream Plum Creek sample (SW-PC-2). The surface water sediment sampling results are summarized in Tables 22 and 23, where Table 22 presents the organics data and Table 23 presents the inorganics data. As shown in Table 22, a total of 4 volatile, 18 semi-volatile and 1 pesticide/PCB constituents were detected in the Great Valley Creek surface water sediment samples. Of these 23 organics, all were detected at equal or higher concentration in the upstream samples with the exception of 4-methylphenol in sample SED-GV-3, at an estimated concentration of 120 ug/kg. As shown in Table 22, a total of 3 volatile and 6 semi-volatile constituents were detected in the Plum Creek surface water sediment samples. Of these 9 organics, 7 were detected at equal or higher concentration in the upstream samples; the exceptions are benzo(b)fluoranthene and benzo(k)fluoranthene in samples SED-PC-5 and SEC-PC-6, at estimated concentrations ranging from 43 to 48 ug/kg. Because the compounds that were only detected in the downstream samples are semi-volatiles, which were not detected in the soil or ground water samples, it is not considered evidence of impact from the Signore Facility. As shown in Table 23, many of

TABLE 20

SURFACE WATER ORGANIC ANALYTICAL RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

SAMPLE NO.	ACETONE	METHYLENE CHLORIDE	CHLOROFORM
SW-GV-1	--	2 B	--
SW-GV-2	--	2 B	--
SW-GV-3	--	3 B	0.6 J
DUP 5 (GV-3)	--	1 B	--
SW-PC-1	--	1 B	--
SW-PC-2	--	0.8 B	--
SW-PC-3	--	--	--
SW-PC-4	--	2 B	--
SW-PC-5	--	--	--
SW-PC-6	--	1 B	--

All results in ug/L
J=Estimated Value
B=Compound was also detected in blank
--=Not Detected
Samples collected on 7/11/90

TABLE 21

SURFACE WATER INORGANIC ANALYTICAL RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

				DUP 5						
ANALYSIS	SW-GV-1	SW-GV-2	SW-GV-3	SW-GV-3	SW-PC-1	SW-PC-2	SW-PC-3	SW-PC-4	SW-PC-5	SW-PC-6
ALUMINUM	0.127 B	0.132 B	0.192 B	0.425 B	0.128 B	0.334 B	0.124 B	0.109 B	0.0866 B	0.124 B
ANTIMONY	--	--	--	--	--	--	--	--	--	--
ARSENIC	--	--	--	--	--	--	--	--	--	--
BARIUM	0.0608 B	0.0657 B	0.0664 B	0.072 B	0.0783 B	0.0823 B	0.0749 B	0.0696 B	0.0679 B	0.068 B
BERYLLIUM	--	--	--	0.001 J	0.0012 J	--	0.0012 J	0.001 J	--	--
CADMIUM	--	--	--	--	--	--	--	--	--	--
CALCIUM	30	30.4	29.9	31.3	30.4	30.3	30.6	29.1	28.7	30.1
CHROMIUM	--	--	--	0.0085 J	--	--	--	--	--	0.0111 J
COBALT	--	--	--	--	--	--	--	--	--	--
COPPER	0.0128 J	--	--	0.0107 J	0.0104 J	0.0081 J	--	--	--	0.012 J
IRON	0.292	0.251 B	0.372 J	0.856 J	0.2 B	0.515	0.118 B	0.14 B	0.105 B	0.0983 B
LEAD	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	3.76	3.8	3.78	4.01	3.78	3.81	3.78	3.6	3.57	3.67
MANGANESE	0.0303 J	0.0232 J	0.04 J	0.0608 J	0.0195 J	0.0474 J	0.0076 J	0.0124 J	0.0111 J	0.0076 J
MERCURY	--	--	--	--	--	--	--	--	--	--
NICKEL	--	--	--	--	--	--	--	--	--	--
POTASSIUM	--	--	--	--	--	--	--	--	--	--
SELENIUM	--	--	--	--	--	--	--	--	--	--
SILVER	--	--	--	--	--	--	--	--	--	--
SODIUM	7	8.21	7.27	7.5	12.7	12.7	12.8	12.3	12	12.3
THALLIUM	--	--	--	--	--	--	--	--	--	--
VANADIUM	--	--	--	--	--	--	--	--	--	--
ZINC	0.0259 B	0.0126 B	0.019 B	0.0296 B	0.0218 B	0.0204 B	0.0138 B	0.0117 B	0.0131 B	0.0258 B
CYANIDE	--	--	--	--	--	--	--	--	--	--

J=Estimated Value

B=Compound was also detected in blank

--=Not Detected

ALL RESULTS IN MG/L

Samples collected on 7/11/90

TABLE 22

SURFACE WATER SEDIMENT ORGANIC ANALYTICAL RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

COMPOUND	SED-GV-1	SED-GV-2	DUP 7 (GV-2)	SED-GV-3	SED-PC-1	SED-PC-2	SED-PC-3	SED-PC-4	SED-PC-5	SED-PC-6
VOLATILES										
2-BUTANONE	4 B	4 B	--	2 B	--	--	5 B	--	--	3 B
METHYLENE CHLORIDE	25 B	34 B	21 B	43 B	18 B	28 B	47 B	15 B	28 B	41 B
ACETONE	54 B	41 B	36 B	52 B	37 B	34 B	29 B	45 B	24 B	27 B
CHLOROFORM	2 J	--	--	--	--	--	--	--	--	--
SEMI-VOLATILES										
PHENANTHRENE	2000	870	170 J	260 J	120 J	590	--	170 J	73 J	--
FLUORANTHENE	1500	210 J	200 J	230 J	68 J	--	47 J	--	89 J	--
PYRENE	1500	190 J	160 J	190 J	65 J	--	46 J	--	65 J	--
BENZO(A)ANTHRACENE	450	90 J	62 J	75 J	--	--	--	--	--	--
CHRYSENE	610	87 J	88 J	89 J	--	--	--	--	--	--
BENZO(B)FLUORANTHANE	1100 J	140 J	280 J	200 J	--	--	--	--	48 J	43 J
BENZO(K)FLUORANTHENE	1100 J	140 J	280 J	200 J	--	--	--	--	48 J	43 J
BENZO(A)PYRENE	310 J	54 J	63 J	79 J	--	--	--	--	--	--
NAPHTHALENE	130 J	--	--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE	62 J	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	91 J	--	--	--	--	--	--	--	--	--
DIBENZOFURAN	94 J	--	--	--	--	--	--	--	--	--
FLUORENE	130 J	--	--	--	--	--	--	--	--	--
ANTHRACENE	200 J	57 J	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL) PHTHALATE	60 J	--	--	54 J	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	120 J	--	--	--	--	--	--	--	--	--
BENZO (G,H,I) PERYLENE	120 J	--	--	--	--	--	--	--	--	--
4-METHYLPHENOL	--	--	--	120 J	--	--	--	--	--	--
BENZOIC ACID	--	--	--	--	--	50 J	120 J	73 J	--	--
ACENAPHTHYLENE	--	--	--	--	--	--	--	--	--	--
PESTICIDE/PCB										
ENDOSULFAN SULFATE	27	--	--	--	--	--	--	--	--	--

All results in ug/kg
J=Estimated Value
B=Compound was also detected in blank
--=Not Detected
Samples collected on 7/11/90

TABLE 23

SURFACE WATER SEDIMENT INORGANIC ANALYTICAL RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

ANALYSIS	SED-GV-1	SED-GV-2	(GV-2) DUP 7	SED-GV-3	SED-PC-1	SED-PC-2	SED-PC-3	SED-PC-4	SED-PC-5	SED-PC-6
ALUMINUM	8630	17800	11200	13600	14100	17500	13100	14000	12200	11000
ANTIMONY	--	--	--	--	--	--	--	--	--	--
ARSENIC	10.20 J	29.4 J	17.3 J	18.6 J	32.6 J	27.7 J	13.8 J	18.7 J	19.2 J	13.2 J
BARIUM	89.90	361	193	256	250	315	217	269	192	190
BERYLLIUM	--	0.95	0.53	0.67	0.59	0.86	0.74	0.61	0.48	0.38
CADMIUM	--	--	--	--	--	--	--	--	--	--
CALCIUM	2180 J	3190 J	2090 J	3260 J	2080 J	3600 J	7590 J	1850 J	1860 J	1720 J
CHROMIUM	11.80	22.10	14.20	16.10	16.80	22.10	14.30	18.00	17.70	14.00
COBALT	8.70 J	21.90 J	16.80 J	16.10 J	15.20 J	22.30 J	15.00 J	18.20 J	14.10 J	12.00 J
COPPER	13.30 J	17.60 J	20.90 J	14.50 J	19.90 J	44.40	10.30 J	29.80	6.30 J	15.20 J
IRON	26500	50300	33600	41000	38000	57100	34700	41300	37400	30600
LEAD	21.80 J	33.20 J	20.90 J	19.50 J	19.50 J	74.40 J	16.30 J	28.00 J	25.80 J	16.50 J
MAGNESIUM	2820	5150	3410	4240	4290	5880	5340	4190	3560	3410
MANGANESE	557 J	1830 J	1160 J	1510 J	983 J	1690 J	995 J	1690 J	974 J	921 J
MERCURY	--	--	--	--	--	--	--	--	--	0.10
NICKEL	21.60	35.20	24.90	30.40	27.20	37.40	21.00	32.20	31.50	23.90
POTASSIUM	--	1740	--	1280	922	1380	1210	1440	1170	769
SELENIUM	--	--	--	--	--	--	--	--	--	--
SILVER	--	--	--	--	--	--	--	--	--	--
SODIUM	276	192	130	172	147	189	138	174	155	129
THALLIUM	--	--	--	--	--	--	--	--	--	--
VANADIUM	13.70	26.40	17.20	19.00	17.80	23.20	17.20	19.50	18.40	15.00
ZINC	118 J	180 J	118 J	127 J	119 J	169 J	122 J	111 J	127 J	107 J
CYANIDE	35.10	--	--	--	--	--	--	--	--	--

J=Estimated Value

B=Compound was also detected in blank

--=Not Detected

ALL RESULTS IN MG/KG

Samples collected on 7/11/90

the metals were detected at high concentrations in the surface water sediment samples. However, all of the metals detected in the downstream sample locations were also detected at higher concentrations in the upstream samples. The only exception is mercury, reported in sample SEC-PC-6 at a concentration of 0.10 mg/kg.

4.2.5 Sewer Sample Analytical Results - Four sewer water samples were collected on July 11, 1990 from the municipal sanitary sewer which runs parallel to and on the west side of State Route 219 (Jefferson Street), at the sample locations shown on Plate 8. Of the four sample locations, SE-4 is upstream of the Signore Facility and SE-1, SE-2 and SE-3 are downstream of discharges from the Signore Facility. The sewer water samples were analyzed for TCL volatiles, semi-volatiles and pesticides/PCBs and TAL metals and cyanide. The laboratory analytical reports for the sewer water samples are presented in Appendix Q.

The sewer water sampling results are summarized in Tables 24 and 25; Table 24 presents the organics data and Table 25 presents the inorganics data. As shown in Table 20, 3 volatile and 5 semi-volatile organic constituents were reported in the sewer water samples. Of the volatiles, methylene chloride and acetone were also reported in sample blanks and therefore were disregarded in the data evaluation. The other volatile, 2-butanone, was reported in SE-3 at an estimated concentration of 4 ug/l, however this

TABLE 24

SEWER SAMPLE ORGANIC ANALYTICAL RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

	VOLATILES			SEMI-VOLATILES				
SAMPLE NO.	2-BUTANONE	ACETONE	METHYLENE CHLORIDE	BENZOIC ACID	BIS (2-ETHYL-HEXYL PHTHALATE)	4-METHYL PHENOL	BENZYL ALCOHOL	PHENOL
SE-1	--	--	--	--	--	--	--	--
SE-2	--	44 B	4 B	9 J	3 J	--	--	--
SE-3	4 J	13 B	--	--	9 J	3 J	4 J	2 J
DUP 6 (SE-3)	--	18 B	--	18 J	8 J	--	--	--
SE-4	--	22 B	--	--	--	--	--	--

All results in ug/L
J=Estimated Value
B=Compound was also detected in blank
--=Not Detected
Samples collected on 7/11/90

TABLE 25

SEWER SAMPLE INORGANIC ANALYTICAL RESULTS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

ANALYSIS	SE-1	SE-2	SE-3	SE-4
ALUMINUM	0.123 B	0.745	0.896 J	9.03
ANTIMONY	--	--	--	--
ARSENIC	--	--	--	--
BARIUM	0.183	0.383	0.387 J	0.881
BERYLLIUM	0.001 J	--	0.001 J	0.0011 J
CADMIUM	--	--	--	--
CALCIUM	59.9	72.9	72.2 J	269
CHROMIUM	--	0.0178 J	0.0155 J	0.0125 J
COBALT	--	--	--	0.0078 J
COPPER	0.021 J	0.152	0.192 J	0.0202 J
IRON	0.192 B	6.61	4.92 J	21.8
LEAD	--	0.0408	0.0579 J	0.197
MAGNESIUM	6.61	7.49	7.45	22.5
MANGANESE	0.0645 J	0.3	0.217 J	0.583
MERCURY	--	0.00047	--	0.00068
NICKEL	--	--	--	0.0508
POTASSIUM	8	4.64	5.02	5.3
SELENIUM	--	--	--	--
SILVER	--	--	--	--
SODIUM	41.4	44.5	38.3 J	49.1
THALLIUM	--	--	--	--
VANADIUM	--	--	--	0.010
ZINC	0.0569 B	1	0.526 J	1.7
CYANIDE	--	--	--	--

J=Estimated Value
B=Compound was also detected in blank
--=Not Detected
ALL RESULTS IN MG/L
Samples collected on 7/11/90

result was not confirmed in the duplicate sample. Of the semi-volatiles, benzoic acid was reported in SE-2 at an estimated concentration of 9 ug/l and bis(2-ethylhexyl)phthalate was reported in SE-2 and SE-3 at estimated concentrations of 3 ug/l and 9 ug/l, respectively. The other semi-volatiles, 4-methylphenol, benzyl alcohol and phenol were reported in SE-3 at estimated concentrations of 3 ug/l, 4 ug/l and 2 ug/l, respectively, however these results were not confirmed in the duplicate sample. As shown in Table 25, a number of the metals were detected in the sewer water samples, however the concentrations were higher in sample SE-4, the upstream sample, than in samples SE-1, SE-2 and SE-3. Therefore, it does not appear that the sewer contains organic or inorganic constituents indicative of impact from the Signore Facility.

4.3 DATA VALIDATION

All of the laboratory analytical data collected in the RI project were validated by Environmental Standards. Their report of the data validation included summary spreadsheets of the results, which are presented in Appendix R. The tables summarizing the analytical sample results presented in this report, Tables 13 through 25, present the validated data from Environmental Standard's report.

4.4 SUMMARY: NATURE, EXTENT AND SOURCE OF CONTAMINATION

This RI report presents the results of sampling the soils, ground water, surface water, surface water sediment and sewer water in the vicinity of the Signore Facility to determine the nature, source and extent of contamination from the Signore Facility.

4.4.1 Nature of Contamination - Contamination previously identified at the Signore Facility could impact the environment via infiltration to ground water, runoff to surface waters, infiltration to sewers and subsurface discharge of ground water to surface waters. The ground water sampling results from the on-site monitoring wells and the off-site RI monitoring wells show elevated concentrations of VOCs but no evidence of impact from other organics or metals. The results of the surface water, surface water sediment and sewer water sampling show that the ground water contamination at the Signore Facility has not impacted the surface waters of Plum Creek or Great Valley Creek or the municipal sanitary sewer. The soil sampling results, presented on Plate 9, show low levels of the same VOCs identified in the ground water and thus, probably represent residual contamination that has already infiltrated to the ground water.

Ground water has shown to be the only environmental media impacted by contamination from the Signore Facility. The off-site RI monitoring wells and the domestic water supply well sampling results have shown that the only constituents to be present in the ground water downgradient of the Signore Facility above MCL are TCE and TCA. The on-site monitoring wells have shown concentrations of TCE and TCA and also 1,1-dichloroethane and 1,2-dichloroethene above MCL; the DCE and DCA are chemical breakdown products of the

TCE and TCA. Thus, contamination from the Signore Facility consists of volatile organics, primarily TCE and TCA in the ground water.

4.4.2 Extent of Contamination - The extent of VOC ground water contamination has been evaluated both at the Signore Facility and downgradient of the Signore Facility. The extent of contamination at the Signore Facility was determined from the ground water sampling results from the on-site monitoring wells and the on-site RI monitoring wells. The extent of contamination downgradient from the Signore Facility was determined from the ground water sampling results from the off-site RI monitoring wells, the domestic water supply wells, the IRM monitoring wells and the Town Well.

Plate 10 presents a summary of the on-site ground water sampling results; shown are the results from the October 1990 samples from the RI monitoring well nests EW-1 and EW-2 and the results from the June 1990 and January 1989 samples from the on-site monitoring wells. Ground water contamination, as defined by VOC concentrations above the MCL of 5 ug/l, is found from north to south at well nests MW-4, MW-5, MW-9, EW-1, MW-1 and MW-8. VOC concentrations increase areally and with depth from north to south across the site. Contamination is present in the shallow zone at well nests MW-4, MW-5, EW-1, MW-1 and MW-8, in the intermediate zone at well nests MW-4, EW-1, MW-1 and MW-9, and in the deep zone only at well nest MW-1. The greatest concentration of VOCs, above 100 ug/l total, were measured in the samples from wells MW-5S, EW-1.25, EW-1.50, MW-1S and MW-1I. When the results of the on-site well sampling are compared to the results of the soil gas surveys and soil sampling program, it would seem to indicate that ground water contamination is present in the western and southern parts of the Signore Facility.

Plate 11 presents a summary of the off-site ground water sampling results downgradient of the Signore Facility; shown are the results from the September 1990 samples from the RI monitoring wells, the results of the June 1990 samples from the IRM monitoring wells and the results from the May 1987 sampling of the domestic water supply wells. Ground water contamination, as defined by VOC concentrations above the MCL of 5 ug/l, extends from the Signore Facility to the Town Well. The contamination is confined to the intermediate zone, as shown by the results of the shallow zone wells installed at the RI monitoring well pairs and the shallow zone wells installed for the Town Well Interceptor Well Assessment. The higher concentrations were found in the wells on the west side of State Route 219, decreasing from a high of 43 ug/l and 49 ug/l for TCE and TCA, respectively, immediately south of the Signore Facility to 17 ug/l and 11 ug/l for TCE and TCA, respectively, at a domestic well near RI well nest EW-6. The TCE and TCA concentrations decrease from these values to 6 ug/l and 4 ug/l, respectively at IRM-1, an intermediate zone monitoring well, 75 feet from the Town Well. Six of the domestic wells on the south side of Donlen Drive reported TCE concentrations above 5 ug/l, ranging from 6 ug/l to 14 ug/l.

4.4.3 Source of Contamination - Various parts of the Signore Facility historically had used or stored solvents, adhesives, lubricants, cutting oils, cleaners, thinners and paints, the source(s) of the VOC contamination at the Facility. The use of TCE as a degreaser was discontinued in the mid-1970's. These materials were stored, handled and disposed into floor drains, sumps, pits, underground tanks and the on-site septic system. As stated previously, the floor drains were closed with concrete or rerouted from the storm drain system, with the rerouted drains now connected to collection tanks or the sanitary sewer system. The sumps, pits and underground tanks were taken out of service or closed with concrete. All process water and sanitary discharges were changed over from the on-site septic system to the municipal sewer system. Existing septic tanks in the Facility are being investigated and are scheduled for closing with concrete in early 1991.

Therefore, there are no known continuing sources of VOC contamination at the Signore Facility. Areas of VOC presence indicated in the soil gas survey outside the northwest corner of the Facility is probably due to previous spills. Areas of VOC presence indicated in the soil gas survey inside the Facility is probably due to leaking from the septic tanks, pits, drains or tanks, which as stated above, are no longer continuing sources. Existing ground water contamination is from historic leakage from storage and/or disposal facilities, now closed or past spills. Thus, no source control measures can be implemented at the Signore Facility to lessen the contamination that is already present and conversely, the contamination should not worsen since no sources still exist.

5.0 CONTAMINANT MIGRATION PATHWAYS AND RECEPTORS

This section presents an evaluation of the potential pathways of migration, factors affecting the migration and potential receptors for the VOC contamination identified at the Signore Facility. The evaluation is based on the data presented in this report, collected during this RI project and during previous investigations.

5.1 CONTAMINANT MIGRATION PATHWAYS

There are several potential pathways that the VOC contaminants identified during this investigation could impact the environment. The routes include volatilization to the atmosphere, runoff to surface waters, infiltration to sewers, infiltration to ground water and discharge of impacted ground water to surface waters. As discussed in Section 4, ground water is the only media shown to be impacted with detectable concentrations of VOCs. The other media sampled (soils, surface water, surface water sediment and sewer water) do not appear to be impacted from contamination emanating from the Signore Facility. Therefore, migration of ground water appears to be the pathway for migration of contaminants to the environment.

VOCs in ground water have their highest concentrations in the southeastern part of the Signore Facility. As stated previously, the potential source(s) of the VOCs were leaks from floor drains, sumps, pits, underground tanks and the on-site septic system inside the Signore Facility and infiltration from spills outside the Facility. These leaks would then migrate downward under gravity influences through the unsaturated soil zone or attenuate to the subsurface soils. The permeability of these soils would then be the primary factor controlling downward migration. The results from the drilling of the soil borings and the monitoring wells show that the near surface materials consist of alluvial deposits of silts, clays and sands, with no discernible finer-grained lower permeability zones that would cause the contaminants to move laterally through the unsaturated zone. Therefore, the primary component of migration through the unsaturated zone would be vertically downwards until encountering the water table. Once at the water table and into the saturated zone, the VOCs would migrate by mechanical advection, with the concentration changes determined by hydrodynamic dispersion and chemical reactions, in the direction of ground water flow, to the south-southeast. Through dispersion, the VOCs would migrate vertically downward through the saturated zone, moving from the shallow to the intermediate and deep ground water zones as the contaminants move away from the source. That is why, the higher VOC concentrations are only found in the shallow zone in the northern part of the Signore Facility and in the shallow, intermediate and deep ground water zones at the southern boundary of the Facility. The migration continues in the direction of ground water flow off-site to the south-southeast towards the Town Well.

5.2 FACTORS AFFECTING MIGRATION

Factors which affect the migration of contaminants in ground water include the physical properties of the subsurface materials, hydrodynamic dispersion, sorption (adsorption and desorption) to/from soil particles, contaminant properties and degradation processes.

The physical hydrogeologic properties of the subsurface materials in the study area have been discussed in Section 3. The ground water zones are within the glacial outwash unit, which consists of coarse-grained sand and gravel materials. The coarse-grained and high permeability nature of the ground water zones result in relatively rapid movement of the contaminants.

VOC migration rates in the ground water are decreased by hydrodynamic dispersion. As contaminants (and ground water) travel through an aquifer, heterogeneity of flow through the soil pores creates dispersion, effectively causing the plume to spread out. Factors controlling dispersion include distance from the source, ground water velocity, aquifer thickness, porosity and soil type. It can be seen from the ground water sampling data that the plume is not being significantly dispersed within the aquifer. This is probably the result of the relatively high ground water flow rates.

The VOCs can also be adsorbed and attenuated by the soils. The soil sampling results from the borings drilled at the Signore

Facility, however, do not show high levels of VOCs in the soil. Therefore, the VOCs adsorbed to the soils from leaks and spills have probably been released slowly over time such that concentrations should continue to decline with time.

The types of contaminants also affect migration. As stated previously, TCE and TCA are the primary VOC contaminants from the Signore Facility. These constituents are moderately mobile and persistent in ground water. Table 26 presents the physical properties of the contaminants identified at the site. The concentrations detected would be indicative of dissolved concentrations. There is no evidence of the existence of a free product VOC plume, which would migrate under gravity and density influences.

Degradation of the VOC constituents would also affect contaminant migration, in that degradation causes a reduction in contaminant concentrations with movement through the ground water. The VOCs detected at the Signore Facility are susceptible to physical transformation and biodegradation by naturally occurring bacteria, where the VOCs are microbially and chemically transformed and degraded in the environment by reductive dechlorination, hydrolysis, oxidation, and microbial degradation. This has the effect of reducing the concentration of VOCs released to the environment.

TABLE 26

VOC PHYSICAL AND CHEMICAL CHARACTERISTICS

SIGNORE REMEDIAL INVESTIGATION REPORT
ELLICOTTVILLE, NEW YORK

Compound	Molecular Weight	Vapor Pressure mm	(°C)	Solubility in Water mg/l	(°C)	Octanol/Water Partition Coefficient
Benzene	78.12	95	(20)	1,800	(25)	2.13
Chloroethane	64.52	1,000	(20)	5,740	(20)	1.54
1,1-Dichloroethane	98.96	180	(25)	5,500	(20)	1.79
1,1-Dichloroethene	96.94	200	(14)	6,300	(20)	1.48
Ethylbenzene	106.20	7	(20)	206	(25)	3.15
Tetrachloroethene	165.80	14	(20)	150	(20)	2.88
Toluene	92.13	29	(25)	535	(25)	2.69
1,1,1-Trichloroethane	133.40	96	(20)	950	(20)	2.17
Trichloroethene	131.40	58	(20)	1,100	(20)	2.29
Vinyl Chloride	62.50	2,660	(25)	1	(25)	0.60

NOTE: Data from "Treatability Manual, Volume I", EPA-600/2-82-001A, September 1981

5.3 CONTAMINANT RECEPTORS

The potential receptors of contamination identified at the Signore Facility include ground water production wells, discharge to surface water bodies, discharge to air and discharge to soils.

5.3.1 Ground Water - As discussed in Section 3.3.3, the direction of ground water flow is south-southeast, paralleling State Route 219. Thus, the downgradient receptors of contaminated ground water are domestic water supply wells and the Town Well, shown on Plate 5. Each of the residences listed on Plate 5 have a water supply well; these wells are completed in the intermediate ground water zone. The Town Well, located 300 feet south of the inter-section of State Route 219 and Holiday Valley Road, has provided the water supply for the Town Water District; a new Town/Village water supply well to go on-line in early 1991 will relegate the existing Town Well to a backup supply. The Town Well was installed in 1982 and is reportedly 51.5 feet deep and equipped with 10 feet of 10-inch diameter screen placed between 41.5 and 51.5 feet (the intermediate ground water zone). The well produces intermittently, as needed, at a rate of about 400 gallons per minute.

In addition to the wells above, other potential downgradient receptors of contaminated ground water sampled include the two School wells, and two residential wells (R. Germain and F. Burleson). The semi-annual sampling of these wells, as part of the IRM Project, commenced on June 25, 1990. TCA was not detected in the wells with the exception of the main school well which had a TCA concentration of 2 ppb. TCE was detected in the main school well and in the Burleson and Germain residential wells with concentrations of 2 ppb at each location. TCE was not detected in the auxilary school well. Therefore, these wells are below MCL levels.

As stated in Section 1.4, the Interim Remedial Measures (IRM) project has been implemented to protect these ground water receptors from the VOC contamination. The IRM project has been completed with the connection of the residences with domestic wells to the Town water supply and installation of an interceptor well upgradient of the Town Well. Thus, the domestic water supply wells and the Town Well will no longer be receptors of the VOC contamination from the Signore Facility.

5.3.2 Surface Water - Plum Creek and Great Valley Creek are potential receptors of VOC contamination from discharge of contaminated ground water to the creeks. However, as discussed in Section 4.2.4, these creeks do not appear to have been impacted by contamination from the Signore Facility.

5.3.3 Air - Volatilization of VOCs into the atmosphere may occur where high levels of VOCs are present in the surface soils or where contaminated ground water discharges to the surface. There was no observed seeps of contaminated ground water at the surface and the surface water bodies did not show any impact. The soil sampling results, as discussed in Section 4.2.2, are summarized on Plate 9. As shown, the only surface soil samples with detectable VOC concentrations were the 0-2 feet samples from BH-9, with a TCA concentration of 3 ug/kg, and from BH-14, with a TCA concentration of 6 ug/kg. The surface soil samples from the other 12 borings were not analyzed because the soil screening results were all non-detectable. These results do not seem to indicate that there would be any degradation of ambient air quality.

5.3.4 Soils - Soils potentially impacted by VOCs include the surface and subsurface sediments at the Signore Facility. The results of the soil sampling are discussed in Section 4.2.2, with the results summarized in Table 13 and on Plate 9. As shown, VOC concentrations in the soil samples were all less than 25 ug/kg, except a xylene concentration of 73 ug/kg in the 2-4 feet sample from boring BH-3. Of the 14 total soil borings, the samples were all nondetectable in 8 of the borings, were all less than 5 ug/kg total VOCs in 2 of the borings, and no greater than 75 ug/kg total VOCs in the other 4 borings. As stated above, only two of the surface samples (borings BH-9 and BH-14) had even detectable concentrations. Thus, the potential for human contact with soils containing high levels of VOCs is minimal.

5.4 INTERIM REMEDIAL MEASURES

The RI results have shown that the only media impacted by VOC contamination is the ground water and that the potential receptors for the ground water contamination are the domestic water supply wells and the Town Well. While the RI Project was underway, the following Interim Remedial Measures were implemented. The Town of Ellicottville Water District was extended to include the area downgradient of the Signore Facility and the Town Water District water distribution system was extended into this area. Each of the residences shown on Plate 5 were connected to the Town water system. In addition, the Village and Town of Ellicottville have developed a new water supply well north of the Village, which will provide the water supply to the Town Water District. When this new well goes on-line, the existing Town Well will become a backup supply for the Town, to be used at times of peak water demand. To reduce VOC concentrations in the Town Well and to ensure that the contaminated ground water does not go any further downgradient, an interceptor well was installed 300 feet upgradient of the Town Well. This well will pump continuously to protect the Town Well and remove any VOC contaminants moving downgradient from the Signore Facility. In addition, a second interceptor well is planned for the downgradient boundary of the Signore Facility, which will reduce future off-site movement of VOCs from the Facility. Thus, the combination of these remedial measures will result in the minimization of further downgradient spread of VOC contaminated ground water, will reduce the concentration of ground water contaminants in the area between the Signore Facility and the Town Well and during the time period that ground water in this area is contaminated, will provide an uncontaminated source of water to the residences.

6.0 RISK ASSESSMENT SUMMARY

The human health evaluation process is a formal and integral part of a Remedial Investigation. The process of collecting and assessing human health risk information is adapted from well-established chemical risk assessment principles and procedures. Risk assessment is a continually evolving discipline which incorporates information gained from past experience and ongoing scientific research. The methodologies utilized in the risk assessment evaluation for the Signore RI Project are consistent with the U.S. Environmental Protection Agency's Office of Emergency and Remedial Response interim final risk assessment guidelines for conducting Superfund risk assessments (USEPA, December 1989).

The Signore Facility RI Project risk assessment has been performed by Environmental Standards, Inc. of Valley Forge, Pennsylvania. Their report is presented in Appendix S. This section presents a summary of Environmental Standards report, including the risk assessment process and the human health hazards associated with chemical compounds detected at the site.

6.1 PURPOSE

The objective of the human health evaluation risk assessment is to provide a reasonable estimation of the actual or potential (current or future) harm to public health caused by contamination from the Signore Facility under current conditions. The baseline risk assessment contributes to the site characterization and subsequent development, evaluation, and selection of appropriate remedial alternatives. The results of the risk assessment are used:

- to help determine whether additional response action is necessary at the site;
- to modify preliminary remediation goals; and
- to support selection of the most appropriate remedial alternative, including "no-further-action", where appropriate.

6.2 METHODOLOGY

The baseline risk assessment process involves four basic steps: data analysis; exposure assessment; toxicity assessment; and risk characterization. The analysis of data involves a detailed evaluation of the detections, concentrations, and extent of contaminants in all relevant environmental media (e.g., ground water, soil, sediments, etc.) and the identification of the chemical constituents present at the site that represent the focus of the risk assessment process. Justification for eliminating from the risk analysis chemicals that are detected at naturally occurring levels and which do not pose health hazards is provided in this initial step.

An exposure assessment is conducted to estimate the magnitude of actual and potential human exposures, the frequency and duration of these exposures, and the pathways by which humans are possibly exposed. In the exposure assessment, reasonable maximum estimates of exposures to chemicals are developed for both current and future conditions. This process involves analyzing contaminant releases (i.e., fate and transport), identifying exposed populations, identifying potential pathways of exposure, estimating the upper limits of exposure point concentrations for each pathway of concern, and estimating the reasonable maximum contaminant intakes for specific pathways.

The toxicity assessment component of the baseline risk assessment considers the types of adverse health effects associated with chemical exposures, the relationship between magnitude of exposure and adverse effects, and related uncertainties such as the weight of evidence of a particular chemical's potential carcinogenicity in humans.

Dose-response information is essential to characterizing health hazards. One fundamental principle of toxicology that cannot be overemphasized is that exposure to a toxic substance does not necessarily result in a toxic effect. One primary purpose of the toxicity assessment is to document exposure levels which are not anticipated to result in any adverse effects in any susceptible population.

Risk characterization summarizes and combines outputs of the exposure and toxicity assessments to characterize upper limits of risk. This step of the evaluation also compares predicted exposure concentrations (or the measured and predicted concentrations in specific environmental media) with applicable or relevant and appropriate regulatory requirements (e.g., State drinking water standards). The output of this analysis provides both quantitative and qualitative expressions of risk. To characterize the potential non-cancer effects, comparisons are made between projected intakes of chemical contaminants and toxicity values or guidelines developed by USEPA. To characterize the upper limit of potential carcinogenic effects, probabilities that an individual could develop cancer over a lifetime of exposure are estimated from projected reasonable/maximum exposures and chemical-specific upper-bound cancer potency estimates developed by USEPA's Carcinogen Assessment Group. Major assumptions, scientific judgments, and estimates of uncertainties embodied in the human health evaluation are documented.

6.3 SITE CHARACTERIZATION

Section 4.0 of this report presents the evaluation of the nature and extent of contamination within the study area, as characterized through ground water sampling from monitoring wells, residential wells and the Town Well, soil sampling, surface water and surface water sediment sampling, and sewer sampling. These samples were analyzed for TCL and TAL organic and inorganic constituents. The organic analyses also included searches for non-target compounds (up to 30 extraneous peaks). The analytical results have also undergone a rigorous data validation quality assurance review by

Environmental Standards to insure compliance, validity, and usability of the results; the data validation report is described in Section 4.3 and presented in Appendix R.

No continuing point sources or "hot spots" of contamination were identified as a result of the RI Project and previous sampling surveys. Contamination at levels of potential human health concern appears to be limited to the occurrence of volatile organic chemicals in ground water as demonstrated by sample results collected from monitoring wells and water supply wells. This includes the presence of volatile organic constituents in some residential well samples downgradient of the Signore Facility.

All analytical data obtained in the course of the remedial investigation were compiled, sorted by environmental medium, evaluated with respect to analytical qualifiers (including sample-specific minimum quantitation limits), analyzed statistically to generate upper 95 percent confidence limits of the average concentrations for each chemical in each medium, and examined in comparison to naturally occurring background levels in accordance with USEPA (December 1989) guidelines. Environmental media that were evaluated include ground water, soils, surface water and surface water sediments. Ground water was further evaluated by comparing on-site sample results to downgradient off-site sample results.

An interceptor well will be installed at the downgradient property boundary of the Signore Facility in early 1991 to preclude any further off-site release and transport of ground water contaminants. Accordingly, conditions of current or future ground water use are best represented by the upper limits of mean concentrations (or maximum concentrations) of chemicals detected in off-site downgradient monitoring wells. In addition, on-site ground water is not utilized for water supply purposes.

6.4 EXPOSURE ANALYSIS

The major concern from a human health standpoint is clearly posed by the presence in ground water of trace levels of volatile organic constituents that have been classified by the USEPA as probable human carcinogens. An Interim Remedial Measure has been completed to connect the private residences downgradient of the Signore Facility to the Town of Ellicottville municipal water supply; the final connections will be made as soon as the new Village/Town supply well begins pumping into the system, scheduled for January 1991. Once these connections are made, exposure from use of contaminated domestic well water will be eliminated. The baseline risk assessment, however, is based on the assumption that water containing the upper 95 percentile of the mean concentrations of contaminants detected in downgradient wells is consumed and utilized on a daily basis. Exposure pathways include ingestion, inhalation of volatile organics due to daily showering in an unventilated bathroom, and dermal absorption during bathing.

Other potential pathways initially considered in a screening risk analysis included incidental ingestion of soil and stream sediments, incidental ingestion of stream water and dermal exposure and percutaneous absorption of chemicals following direct contact of site surface soils or stream sediments. This preliminary risk analysis was performed on chemicals present to document that these pathways do not pose a potential health concern and to provide an additional basis for focusing the risk analysis on the chemicals that do represent the potential for concern. Preliminary risk analysis involved the use of highly conservative assumptions (or EPA-recommended default values) based on exposures to both children (non-carcinogenic effects) and adults (carcinogenic effects due to near-lifetime exposures). The results of this preliminary analysis revealed that the majority of the estimated total excess lifetime cancer risk was attributable to exposure to specific volatile organics as a result of long-term use of contaminated well water. Similarly, the majority of the total quantitative index for non-carcinogenic toxicity endpoints via all exposure pathways considered (i.e., total combined hazard indexes for all chemicals across all exposure scenarios) is due to the presence of chlorinated volatile organics and other elements in downgradient ground water.

Accordingly, the risk assessment is based on the following chemicals of potential concern that were identified in downgradient ground water:

- 1,1-dichloroethane
- 1,2-dichloroethene
- methylene chloride
- tetrachloroethene
- 1,1,1-trichloroethane
- trichloroethene
- iron
- lead
- manganese

The next step in the exposure assessment process involved quantification of the magnitude, frequency and duration for the exposure pathways and populations selected for detailed quantitative evaluation. This population is represented by residents (children and adults) downgradient of the Signore Facility who utilize contaminated ground water as a long-term source for potable and domestic purposes. Because these residents will be connected to the Town water supply, the exposure and risk analysis is based on a hypothetical scenario. This exposure scenario also assumes that the concentrations of the volatile organics present in downgradient ground water will remain constant indefinitely. Because the on-site interceptor well should preclude further off-site migrations of hydrologically mobile contaminants and result in aquifer restoration, this assumption is unrealistic. As a consequence, the risk assessment will dramatically overestimate actual risk, if any significant risks exist at all. Generally, exposure point concentrations of chemicals (i.e., levels in hypothetical tap water) were based not upon arithmetic average concentrations, but rather upon the upper limit of the 95-percent confidence interval around the mean concentrations, so as to produce an estimate of the reasonable maximum exposure. Intake factors were similarly selected so that the combination of all variables conservatively results in the maximum exposure that can reasonably be expected to occur under the assumed exposure scenarios. Exposure coefficients and related variables recommended in various USEPA guidance documents were generally utilized in this assessment.

6.5 TOXICITY AND RISK CHARACTERIZATION

Projected intakes for each exposure pathway and each chemical of concern were then compared to acceptable intake levels (risk reference doses, RfDs) for noncarcinogenic effects. RfDs have been developed by the USEPA for chronic (e.g., lifetime) and/or subchronic exposure to chemicals based on the most sensitive non-carcinogenic effects. For those chemicals with no RfD values, provisional values were developed using sound scientific principles adopted by the National Academy of Sciences and endorsed by the USEPA. The chronic RfD for a chemical is an estimate of a lifetime daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects. The potential for non-cancer health effects is evaluated by comparing an exposure level over a specified time period with the RfD derived by the USEPA for a similar exposure period. This ratio of exposure to toxicity is called the hazard quotient.

The non-cancer hazard quotient assumes that there is a threshold level of exposure (i.e., RfD) below which it is unlikely for even the most sensitive populations to experience adverse health effects. If the exposure level exceeds the threshold (i.e., the hazard quotient exceeds a value greater than 1.0), there may be concern for potential non-cancer health effects (the greater the value of the hazard quotient or hazard index above unity, the greater the level of concern for potential health impacts).

To assess the overall potential for non-cancer effects posed by multiple chemicals, a hazard index (HI) is derived by summing the individual hazard quotients. This approach assumes additivity of critical effects of multiple chemicals. This is appropriate only for compounds that induce the same effect by the same mechanism of action. Thus, this conservative approach may significantly overestimate the potential for adverse health impacts. This aspect of the hazard assessment as it relates to this RI Project is more fully discussed in the Risk Assessment Report in Appendix S.

For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a potential human carcinogen. The USEPA's Carcinogen Assessment Group has developed carcinogen potency factors (CPFs) for suspected and known human carcinogens which are used to convert daily intakes averaged over a lifetime of exposure directly to incremental risk. The CPF is generally expressed in units of risk per milligram chemical per kilogram body weight per day of exposure (i.e., risk units per mg/kg/day). The CPF or slope factor is the upper 95th percentile confidence limit of the extrapolation (slope) from high-dose animal data to very much lower doses in humans. The use of the upper limit produces a risk estimate that has a 95 percent probability of exceeding the actual risk, which may actually be zero. For exposures to multiple carcinogens, the upper limits of cancer risk are summed to derive a total cancer risk. It may be noted that additivity of cancer risk is recommended by the USEPA, however, it is not appropriate to sum upper limits of the risk to produce a realistic total probability.

Lead, iron and manganese were found in off-site downgradient wells at concentrations that exceed New York State ground water standards. In view of this, hazard quotients were determined (separately) for these inorganics parameters. However, the average and upper-bound concentrations of these constituents were lower in samples from on-site wells at the Signore Facility than in samples form the off-site downgradient well samples, indicating that these naturally-occurring constituents are apparently not site-related. Utilizing statistical analysis (one-sample student t-test), it was demonstrated that the off-site samples contained significantly higher concentrations of lead and manganese than were found in the on-site samples. For iron, there was no significant difference between the off-site and on-site ground water results. It should be emphasized that the ground water samples were not filtered, and therefore elevated concentrations of iron and other inorganics may be due to suspended insoluble fines present in the sampled water. Results for iron and other inorganics under these circumstances can vary widely from sample to sample (as appears to be the case) and provide a better reflection of suspended sediment content in monitoring wells rather than dissolved metals of toxicological concern.

Table 27 presents a summary of the hazard indices resulting from exposure to the site-related chemicals of potential concern in downgradient ground water in the event of its long-term domestic use. The combined hazard index is estimated to be about 0.04 based on conservative assumptions regarding exposure to site-related chemicals (VOCs) present in downgradient ground water. These findings indicate that no chemical hazards exist, other than a potential for a small oncogenic risk from the constituents in the ground water downgradient of the Signore Facility.

Table 28 presents a summary of the upper-bound lifetime cancer risks, respectively, resulting from exposure to the site-related chemicals of potential concern in downgradient ground water in the event of its long-term domestic use. These estimates of cancer risk are based on the assumption that residents will utilize over the long-term private wells located hydraulically downgradient of the site. In this exercise, exposure point concentrations were determined in accordance with USEPA guidelines by calculating the

TABLE 27

SUMMARY OF THE HAZARD INDICES FOR CHEMICALS FOUND IN DOWNGRADIENT OFF-SITE WELLS AT THE SIGNORE SITE

Chemical	Hazard Quotients		
	Ingestion	Inhalation	Dermal Exposure
Trichloroethene	1.9×10^{-2}	2.1×10^{-3}	1.15×10^{-9}
1,1,1-Trichloroethane	1.6×10^{-3}	3.7×10^{-4}	9.1×10^{-11}
Methylene chloride	4.5×10^{-3}	2.4×10^{-4}	1.68×10^{-10}
Tetrachloroethene	2.2×10^{-3}	2.3×10^{-3}	9.17×10^{-11}
1,1-Dichloroethane	3×10^{-4}	2.4×10^{-4}	1.64×10^{-11}
Total 1,2-Dichloroethene	2.4×10^{-3}	4×10^{-3}	1.28×10^{-10}
	Total = 0.03 Hazard Index	Total = 0.0093 Hazard Index	Total = 1.6×10^{-9} Hazard Index

TOTAL HAZARD INDEX FORM ALL EXPOSURE ROUTES = 0.039

TABLE 28

SUMMARY OF THE HAZARD INDICES FOR CHEMICALS FOUND IN DOWNGRADIENT OFF-SITE WELLS AT THE SIGNORE SITE

Chemical	Upper-bound Cancer Risk		
	Ingestion	Inhalation	Dermal Exposure
Trichloroethene	6.3×10^{-7}	7.8×10^{-7}	1.38×10^{-11}
1,1,1-Trichloroethane	NA	NA	NA
Methylene chloride	8.3×10^{-7}	1.2×10^{-6}	1.18×10^{-11}
Tetrachloroethene	4.4×10^{-7}	2.3×10^{-8}	1.02×10^{-11}
1,1-Dichloroethane	ND	ND	ND
Total 1,2-Dichloroethene	NA	NA	NA
	Total = 1.9×10^{-6} Cancer Risk	Total = 2.0×10^{-6} Cancer Risk	Total = 3.6×10^{-11} Cancer Risk

TOTAL CANCER RISK FROM ALL EXPOSURE ROUTES = 4×10^{-6}

95th percentile upper confidence limit on the current average concentrations in ground water samples and conservatively assuming steady-state conditions. In reality, processes of dispersion, advection, dilution and biodegradation will markedly attenuate the current levels of contamination in the absence of additional off-site releases.

Total excess lifetime cancer risk from daily long-term ingestion and inhalation of carcinogenic volatile organics from use of contaminated well water is estimated to be about 4×10^{-6}. That is, for one million individuals so exposed, there is a 95 percent probability that less than 4 cases of cancer would result during an entire lifetime. This estimated upper-bound risk estimate is near the lower end of the target risk range of between 1×10^{-6} and 1×10^{-5} stipulated in the National Contingency Plan for cleanup of Superfund sites. A more refined risk analysis involving fate considerations over time would, parenthetically, likely result in a total cancer risk estimate below 1×10^{-6}.

Table 29 presents a comparison of the average and upper 95th percentile concentrations of organic and inorganic parameters at concentrations above State standards. It is emphasized again that the elevated levels of lead, iron and manganese do not appear to be related to any contamination from the Signore Facility because the results are from unfiltered samples that may not be providing a reliable indication of metals dissolved in ground water. It is

TABLE 29

COMPARISON OF THE CONCENTRATIONS OF CHEMICALS OF CONCERN IDENTIFIED IN WELLS DOWNGRADIENT OF THE SIGNORE SITE WITH FEDERAL AND STATE STANDARDS

Chemical	Upper 95% Confidence Limit of Concentration in Downgradient Off-Site Wells (ug/L)	Average Concentration (ug/L)	MCL or Other Drinking Water Guideline[1] (ug/L)	NY State Ground Water Standard(s) (ug/L)
Trichloroethene	6.70	4.25	5 (MCL)	5
1,1,1-Trichloroethane	6.45	3.38	200 (MCL)	5
Methylene chloride	12.51	4.75	2000 (DWEL)	5
Tetrachloroethene	1.02	0.95	5 (MCL)	5
1,1-Dichloroethane	1.42	1.14	-	5
Total 1,2-Dichloroethene	1.14	1.05	100 (trans) (proposed MCL)	5
Lead[3]	105.09	56.59	50 (MCL)	25
Iron	108,211.2	54,366	300 (SMCL)[2]	300[2]
Manganese	8,505.38	3,971.36	50 (SMCL)[2]	300[2]

1. MCL = Maximum Contaminant Level

   DWEL = Drinking Water Equivalent Level

   SMCL = Secondary Maximum Contaminant Level

2. These values are not health-based criteria, but are based upon aesthetic quality (viz., taste, staining properties, etc.).

3. The concentrations of lead in the downgradient and on-site well samples were lower than the lead concentration in the upgradient well samples. In addition, ground water samples were not filtered and the amount of dissolved lead which is mobile in the geohydrosphere is not known. Suspended sediments may account for elevated lead, iron and manganese.

anticipated that the volatile organics present in downgradient ground water above State standards will be reduced below these standards after the on-site interceptor well and the Town Well interceptor well are operational.

7.0 SUMMARY AND CONCLUSIONS

This section summarizes the results of the RI Project conducted at the Signore Facility in Ellicottville, New York. The conclusions were based on data collected during the RI and previous investigations and presented in this report. Pertinent conclusions of the hydrogeologic characterization, contaminant characterization, evaluation of contaminant pathways and receptors and risk assessment are summarized below.

1. The aquifer in the Ellicottville area consists of the glacial outwash unit, encountered generally from a depth of 15 to 50 feet.

2. The conceptual hydrogeologic model of the study area for ground water monitoring purposes consists of three zones; the shallow zone consists of the upper sand and gravel in the outwash unit above a depth of 25 feet, the intermediate zone consists of the lower coarser-grained sand and gravel in the outwash unit from a depth of 25 to 50 feet, and the deep zone consists of the lower part of the outwash unit and the upper part of the lower, variable unit below a depth of 50 feet.

3. The ground water flow in the study area is generally south-southeast, paralleling State Route 219, with gradients ranging from about 0.001 to 0.007 ft/ft.

4. Hydraulic conductivities calculated from slug tests of the RI monitoring wells average 5 X 10^{-3} cm/sec (15 ft/day), which is much lower than the hydraulic conductivity calculated for the intermediate zone from the Town Well aquifer test, 2 X 10^{-1} cm/sec (400 ft/day). Single well slug tests commonly yield lower values than what is truly representative of the aquifer. Using the value from the aquifer test (and a representative effective porosity of 0.15 - 0.2), the ground water flow rate ranges from 2 to 20 ft/day.

5. Ground water has shown to be the only environmental media impacted by contamination from the Signore Facility. Results from sampling surface water, surface water sediment and sewer water sampling have shown that ground water contamination from the Signore Facility has not impacted surface waters of Plum Creek or Great Valley Creek or the municipal sanitary sewer.

The soil sampling results show low levels of the same volatile organics as in the ground water, probably indicating residual contamination that has already infiltrated to the ground water.

6. Volatile organics are the ground water contaminants of concern. Off-site samples show levels of TCE and TCA above MCLs and on-site samples show levels of TCE, TCA, 1,1-dichloroethane and 1,2-dichloroethene above MCLs.

7. On-site ground water contamination generally increases areally and with depth from north to south across the Signore Facility. Contamination is present in the shallow zone at well nests MW-4, MW-5, EW-1, MW-1 and MW-8, in the intermediate zone at well nests MW-4, EW-1, MW-1 and MW-9, and in the deep zone only at well nest MW-1. The highest concentrations, above 100 ug/l total volatile organics, were measured in wells MW-5S, EW-1.25, EW-1.50, MW-1S and MW-1I. Thus, on-site ground water contamination is present in the western and southern parts of the Signore Facility.

8. Off-site ground water contamination, with only TCE and TCA above MCLs, extends from the Signore Facility to the Town Well and is confined to the intermediate zone. Higher contaminant concentrations (TCE = 43 ug/l and TCA = 49 ug/l) were found in the wells on the west side of State Route 219, with the highest concentration immediately south of the Signore Facility. These TCE and TCA concentrations decrease to 6 ug/l and 4 ug/l, respectively, at the Town Well.

9. The source(s) of volatile organics contamination were leaks from floor drains, sumps, pits, underground tanks and the on-site septic system inside the building and infiltration from spills outside the building. The drains, sumps, pits and tanks have been closed or rerouted. All process and sanitary discharges were changed over from the on-site septic system to the municipal sewer system and the septic tanks are scheduled for closing in early 1991. There are no known continuing sources of volatile organics contamination at the Signore Facility and contamination present is from past leaks and spills. Thus, no source control measures can be implemented at the Signore Facility to lessen the contamination that is already present and conversely, the contamination should not worsen since no sources still exist.

10. The contaminant migration pathway is the movement of ground water. Leaks and spills would migrate vertically downward under the influence of gravity to the water table. Once in the saturated zone, contaminants would migrate by mechanical advection, with the concentration changes determined by hydrodynamic dispersion and chemical reactions, in the direction of ground water flow, to the south-southeast.

Through dispersion, the VOCs would migrate vertically downward through the saturated zone, moving from the shallow to the intermediate and deep ground water zones as the contaminants move away from the source. Migration would then continue in the direction of ground water flow, to the south-southeast.

11. The receptors of contaminated ground water downgradient of the Signore Facility are domestic water supply wells and the Town Well. Interim Remedial Measures have been (or soon will be) implemented to protect these ground water receptors from contamination. These measures include connection of downgradient residences to the Town water supply, installation of an interceptor well upgradient of the Town Well and installation of an interceptor well at the downgradient boundary of the Signore Facility. With these measures in place, there will no future downgradient contaminant receptors.

12. A human health evaluation risk assessment has concluded that lifetime exposure to the maximum levels of volatile organics ground water contamination found in the downgradient off-site wells has a non-cancer health risk with a combined hazard index of 0.04 (where 1.0 is the threshold for adverse health effects) and a cancer risk equal to 4×10^{-6} (less than 4 cases of cancer should result in a population of one million exposed over an entire lifetime). This risk assessment assumes continued exposure to the ground water contamination in the future which will not occur due to the implementation of the Interim Remedial Measures. Thus, the risk will be even lower than that identified above, if any risk at all.

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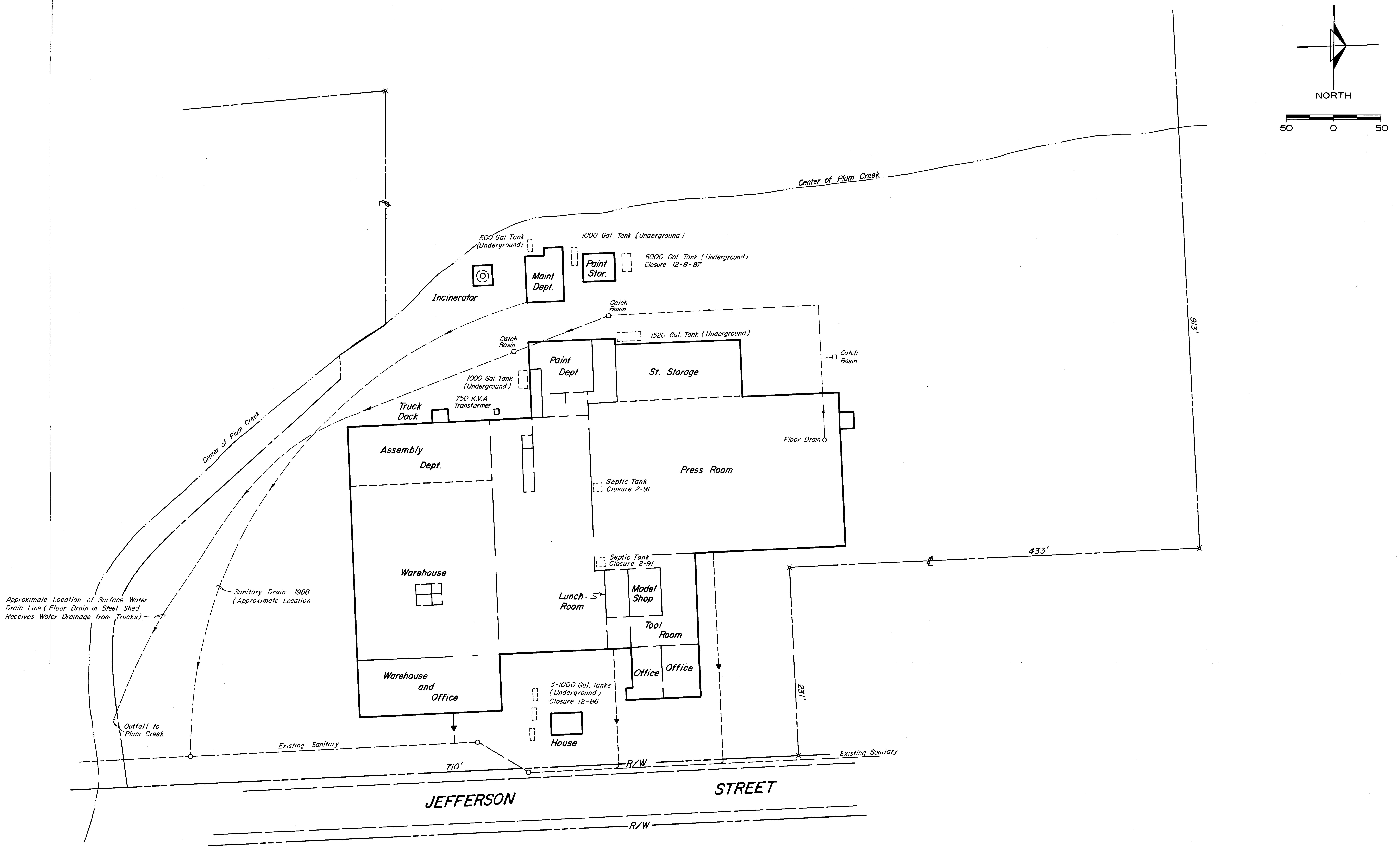
A

APPENDIX A

PLATES



JANUARY 1990

SIGNORE , INC.

ELLICOTTVILLE , NEW YORK

Plate 1A

FACILITY MAP

GROUND WATER ASSOCIATES, INC.
WESTERVILLE, OHIO

SIGNORE, INC.
ELLICOTTVILLE, NEW YORK

REMEDIAL INVESTIGATION REPORT

ON-SITE MONITORING WELL LOCATIONS

Plate 1 | January, 1991

LEGEND

S · Shallow
I · Intermediate
D · Deep
VD · Very Deep

LEGEND

○ IRM Monitoring Well
S=Shallow
I=Intermediate

● RI Monitoring Well

GROUND WATER ASSOCIATES, INC.
WESTERVILLE, OHIO

SIGNORE, INC.
ELLICOTTVILLE, NEW YORK

REMEDIAL INVESTIGATION REPORT

RI/IRM MONITORING WELL LOCATIONS AND CROSS SECTION LOCATION A-A'

January, 1991 | Plate 2

LEGEND

EW-6.50 ● 1518.03 Water Level Elevation (in feet) 9/10/90

— — → Direction of Ground Water Flow

——1514 Water Level Elevation Contour, feet

GROUND WATER ASSOCIATES, INC.
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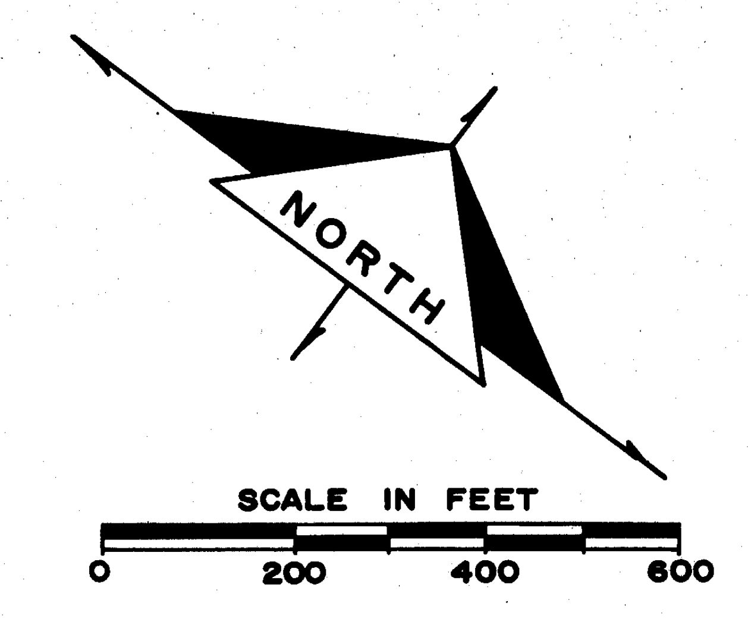
SIGNORE, INC.
ELLICOTTVILLE, NEW YORK

REMEDIAL INVESTIGATION REPORT

POTENTIOMETRIC SURFACE MAP

SHALLOW ZONE WELLS
9/10/90

January, 1991 | Plate 3



LEGEND

EW-6.50 ● 1518.03 Water Level Elevation (in feet) 9/10/90

—·—→ Direction of Ground Water Flow

——1514 Water Level Elevation Contour, feet

GROUND WATER ASSOCIATES, INC.
WESTERVILLE, OHIO

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REMEDIAL INVESTIGATION REPORT
POTENTIOMETRIC SURFACE MAP
INTERMEDIATE ZONE WELLS
9/10/90

January, 1991 | Plate 4

1 .	Woods
2 .	Wiechman
3 .	Geier
4 .	Walden
5 .	McIntosh
6 .	MacQuarrie
7 .	Hawkins
8 .	Manning
9 .	Whiting
11 .	Batterson
12 .	M. Fitzpatrick
13 .	Sirianni
14 .	Bielicki
15 .	Way
16 .	Fisher
17 .	Weast
18 .	Mergler
20 .	Miller
21 .	Fox
22 .	Dunbar
23 .	Gleockler
24 .	Dineen
25 .	Bowen
26 .	L. Fitzpatrick
27 .	Taylor
28 .	Northrup Development Corp.
29 .	Musall
30 .	Ruhland
31 .	Bickell
32 .	Fennell
33 .	Ludwick

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ELLICOTTVILLE, NEW YORK

REMEDIAL
INVESTIGATION REPORT

DOMESTIC WELL
SAMPLE LOCATIONS

January, 1991 | Plate 5

GROUND WATER ASSOCIATES, INC.
WESTERVILLE, OHIO

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ELLICOTTVILLE, NEW YORK

REMEDIAL INVESTIGATION REPORT

SOIL GAS SAMPLE LOCATIONS

Plate 6 | January, 1991

LEGEND

- × Grid Location
- ■ Soil Gas Sample Location (June 4-7, 1990)
- ☐ Soil Gas Sample Location (July 31 / Aug. 1, 1990)
- ✳ Pattern of small weathered peaks
- Pres. Present in water sample
- All Results in ppb (volume per volume basis)

TOL	Toluene
BEN	Benzene
XY	Xylene
TCE	Trichloroethene
1,1-DCA	1,1-Dichloroethane
1,1-DCE	1,1-Dichloroethene
CIS-1,2-DCE	Cis-1,2-Dichloroethene
TR-1,2-DCE	Trans-1,2-Dichloroethene
PCE	Tetrachloroethene
1,1,1-TCA	1,1,1-Trichloroethane

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REMEDIAL INVESTIGATION REPORT

SOIL BORING LOCATIONS

Plate 7 | January, 1991

LEGEND

△GV	Great Valley Creek Sample Locations
▲PC	Plum Creek Sample Locations
●SE	Sanitary Sewer Sample Locations

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REMEDIAL
INVESTIGATION REPORT
SURFACE WATER, SEDIMENT
AND SEWER SAMPLE
LOCATIONS

January, 1991 | Plate 8

9000868

SCALE IN FEET

0 50 75 100 125 150

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REMEDIAL INVESTIGATION REPORT

SOIL SAMPLING RESULTS

Plate 9 | January, 1991

LEGEND

BH-1
2'
4'
6'
ND
Concentration (Micrograms per Kilogram)
Sample Interval (Depth in Feet)

1,2-DCE	1,2-Dichloroethene
EBZ	Ethylbenzene
PCE	Tetrachloroethene
1,1,1-TCA	1,1,1-Trichloroethane
1,1,2-TCA	1,1,2-Trichloroethane
TCE	Trichloroethene
TOL	Toluene
XY	Total Xylenes

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WESTERVILLE, OHIO

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ELLICOTTVILLE, NEW YORK

REMEDIAL INVESTIGATION REPORT

ON-SITE GROUND WATER SAMPLING RESULTS

Plate 10	January, 1991

LEGEND

Shallow Zone Well Total V.O.C. Concentration

TCE=4
TCA=2 6.9
TCE=6
TCA=2 9 ● EW-5

Intermediate Zone Well Total V.O.C. Concentration

House

7 TCE=6
TCA=1

Total V.O.C. Concentration 3/24/87 Sample Date

TCE= Trichloroethene

TCA= 1,1,1 - Trichloroethane

All Concentrations in Micrograms per Liter.

GROUND WATER ASSOCIATES, INC.
WESTERVILLE, OHIO

SIGNORE, INC.
ELLICOTTVILLE, NEW YORK

REMEDIAL INVESTIGATION REPORT

OFF-SITE GROUND WATER SAMPLING RESULTS

January, 1991 | Plate 11

Prepared For:

Signore, Inc.
Ellicottville, New York

DRAFT

REMEDIAL INVESTIGATION
REPORT
SIGNORE FACILITY
ELLICOTTVILLE, NEW YORK

VOLUME 2 OF 2
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January 1991

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