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Prepared For:

Signore, Inc.
Ellicottville, New York

FEASIBILITY STUDY REPORT

SIGNORE FACILITY

ELLICOTTVILLE, NEW YORK

December 1991

Prepared By:

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

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1.0 **INTRODUCTION**

Signore, Inc. entered into Administrative Order on Consent #B9-0258-89-03 with the New York State Department of Environmental Conservation (NYSDEC) in 1989 and agreed to conduct a Remedial Investigation/Feasibility Study at their facility in Ellicottville, New York. As part of the Consent Order, Signore prepared an 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).

The Remedial Investigation (RI) project began in June 1990 with the objective 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. The Final RI Report for the Signore study area was submitted to the NYSDEC on April 29, 1991 (LGA, April 1991) and approved by the NYSDEC on May 29, 1991.

The Feasibility Study (FS), with the purpose to develop and evaluate remedial alternatives to mitigate risks to human health and the environment identified during the RI, was begun after approval of the RI according to the tasks identified in the RI/FS Work Plan (LGA, February 1990), including preparation of this report. This FS is consistent with the guidelines for conducting an RI/FS under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (USEPA, October 1988).

This report has been structured to present the results of the FS, according to the USEPA guidelines, in the following sections.

<u>Section 2.0 - Background Information</u> presents discussions of the description and history of the Signore Facility, previous remedial source control activities, the geologic setting of the study area, results of the RI and interim remedial measures undertaken to mitigate ground water contamination.

<u>Section 3.0 - Remedial Technologies Screening</u> presents the remedial action objectives for the FS, contaminant cleanup criteria and general response actions to meet the remedial action objectives.

<u>Section 4.0 - Identification and Screening of Process Options</u> presents the remedial technologies and process options associated with the general response actions, potentially applicable remedial technologies and process options from a preliminary screening based on implementability and selection of preferred process options from a secondary screening based on effectiveness, implementability and cost.

<u>Section 5.0 - Remedial Alternatives Development and Screening</u> presents the potential remedial alternatives for each remedial action objective determined from the selected process options and the selection of alternatives for detailed analysis based on effectiveness, implementability and cost.

<u>Section 6.0 - Remedial Alternatives Detailed Analysis</u> presents the detailed analysis of selected remedial alternatives for each remedial action objective based on overall protection, compliance with cleanup criteria, long-term effectiveness and permanence, reduction of toxicity, mobility and volume, short-term effectiveness, implementability, cost, State acceptance and community acceptance.

<u>Section 7.0 - Remedial Alternatives Recommendations</u> presents the remedial alternatives recommended for each remedial action objective.

2.0 BACKGROUND INFORMATION

This section of the report contains background information, including the setting, history and previous work completed at the Signore Facility to put the Feasibility Study evaluation into perspective.

2.1 SIGNORE FACILITY INFORMATION

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.

2.1.1 Site Description

The Signore, Inc. Facility, shown on 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 FS report involves a study area situated generally southeast of Signore, Inc., extending from the southern Facility boundary to the Town of Ellicottville municipal supply well (Town Well) and bounded on the east by the Railroad and on the west by the valley wall, as shown on Plate 2.

Physiographically, the site and study area are 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, which forms the southern border of the Signore Facility, flows into Great Valley Creek just southeast of the Facility.

2.1.2 **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.

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 exceeded the New York State Department of Health 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 was installed north of Town and went on-line in February 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 proposed strategy 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 for optimal placement of the interceptor well.

2.1.3 <u>Previous Source Control Remedial Activities</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 2.

As shown on Plate 2 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, adjacent 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, also 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 are presently disconnected from the emergency system so that no discharges can be made to these tanks. 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 RI field work. 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.

2.2 <u>GEOLOGIC SETTING</u>

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.

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 soil borings drilled and monitoring wells installed during the RI describe the following sequence of subsurface materials encountered in the Signore study area. 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.

2.3 RI REPORT RESULTS

As stated above, the Final RI Report for the Signore study area was submitted to the NYSDEC on April 29, 1991 (LGA, April 1991), outlining the nature, source, extent and source of contamination, contaminant pathways and receptors and assessment of contaminant risk. The findings of the RI are summarized below.

2.3.1 Hydrogeologic Characterization

The stratigraphic sequence of the upper 50 feet of the study area 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.

The hydrogeologic 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. Monitoring wells installed at the Signore Facility are completed in the shallow, intermediate and deep ground water zones and monitoring wells installed in the area between the Signore Facility and the Town Well are completed in the shallow and intermediate ground water zones.

Potentiometric surface maps for the shallow and intermediate ground water zones, shown in Plates 3 and 4, respectively, show that the ground water flow in both zones in the area from the Signore Facility to the Town Well is to the south-southeast, paralleling State Route 219. Using a value for hydraulic conductivity of 2×10^{-1} cm/sec, calculated from the Town Well aquifer test, a range of hydraulic gradients shown on the potentiometric surface maps and a value for effective porosity representative of a coarse sand and gravel, the calculated ground water flow rate in the study area is in the range from 2 to 20 feet per day.

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 approximately one 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 some areas 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.

2.3.2 **Nature, Extent and Source 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 analytical results of ground water samples collected from monitoring wells at the Signore Facility and in the area between the Signore Facility and the Town Well show elevated concentrations of volatile organics (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 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 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 State MCLs 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 VOCs, primarily TCE and TCA in the ground water.

The extent of VOC ground water contamination has been evaluated both at the Signore Facility, as shown on Plate 5, and downgradient of the Signore Facility, as shown on Plate 6. On-site, VOC concentrations increase areally and with depth from north to south across the site. 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 greatest concentration of VOCs, above 100 micrograms per liter (ug/l) total, were measured in the samples from wells MW-5S, EW-1.25, EW-1.50, MW-1S and MW-1I, in the western and southern parts of the Signore Facility. Downgradient of the Facility, VOC concentrations above MCL were found from the Signore boundary to the Town Well, but only in the intermediate zone. Off-site, the highest 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 6 ug/l and 4 ug/l for TCE and TCA, respectively immediately upgradient of the Town Well.

Various parts of the Signore Facility historically had used or stored solvents, adhesives, lubricants, cutting oils, cleaners, thinners and paints. The use of TCE as a degreaser was discontinued in the mid-1970's. These materials were potentially 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. Two septic tanks at the Facility were closed in February 1991.

The source(s) of VOC 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. As stated above, the drains, sumps, pits and tanks have been closed or rerouted and all process and sanitary discharges were changed over from the on-site septic system to the municipal sewer system. 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 active sources still exist.

2.3.3 **Contaminant Migration Pathways and Receptors**

The potential pathways that VOC contaminants could impact the environment 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. The RI results show that ground water is the only media contaminated by VOCs and thus migration of ground water is the pathway for migration of contaminants to the environment.

From the source areas at the Signore Facility, leaks and spills would 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 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.

The direction of ground water flow is south-southeast and thus, the downgradient receptors of contaminated ground water are domestic water supply wells and the Town Well. Each of the residences listed on Plate 6 have a water supply well; these wells are completed in the intermediate ground water zone. The Town Well was the primary water supply for the Town Water District, however a new

Town/Village well went on-line in February 1991 and the Town Well has become a backup supply for peak demands and emergencies. The Town Well is also completed in the intermediate ground water zone. In addition to the Town Well and the domestic wells between Signore and the Town Well, other potential downgradient receptors of contaminated ground water sampled include the two School wells, and two residential wells (R. Germain and F. Burleson). Semi-annual sampling of these wells has shown low levels of TCE in the main school well (now used as a backup) and the Burleson and Germain wells at 2 ug/l, below the State MCL of 5 ug/l. No VOCs have been detected in the school well currently used for water supply.

2.3.4 **Risk Assessment**

A baseline risk assessment was done to estimate the actual or potential harm to public health caused by contamination from the Signore Facility under baseline conditions (prior to any remedial measures). The risk assessment included an exposure analysis and a toxicity and risk characterization. The human health evaluation risk assessment concluded that lifetime exposure to the maximum levels of VOCs 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.

2.3.5 **RI Work Plan Tasks Not Performed**

The RI/FS Work Plan (LGA, February 1990) identified the tasks to be performed as part of the RI project. All of the tasks identified in the plan were completed except for the following: (1) Pumping Test Well Installation and Aquifer Testing; (2) Aquifer Analysis; and (3) Treatability Studies/Pilot Testing. The first two tasks involve installation, testing and data evaluation of a test well installed to evaluate the On-Site Interceptor Well to be installed as an Interim Remedial Measure. Based on the results of the Town Well Interceptor Well assessment and the results of the RI, it was decided that sufficient information existed to design the On-Site Interceptor Well System without any testing. The third task involves any testing that would be required to evaluate potential treatment options to mitigate contamination. Since VOCs are the contaminants of concern, the body of existing information is adequate to evaluate treatment options and therefore treatability studies and pilot testing were not warranted.

2.4 **INTERIM REMEDIAL MEASURES**

Because of TCE concentrations exceeding State MCL in the Town Well, Signore proposed a strategy for an Interim Remedial Measures (IRM) project (LGA, May 1990) to address low level TCE and TCA ground water contamination in the Town Well and residential domestic wells downgradient of the Signore Facility. The proposed IRM project was to consist of: (1) installation of an interceptor well upgradient of the Town well to reduce contaminant levels in the Town Well; (2) connection of residences with domestic wells south of the Signore site to the Town water distribution system; and (3) installation of an interceptor well at the Signore facility to reduce off-site contaminant migration. It was decided that the third interim measure, the on-site interceptor well, would be included in the RI/Fs work plan in order to use the RI results to for optimal placement of the interceptor well. The locations of the interim remedial measures are presented on Plate 7 and discussed below.

2.4.1 <u>Town Well Interceptor Well</u>

The objective of this interim measure is to intercept contaminants before they reach the Town Well by pumping ground water immediately upgradient of the Town Well. Evaluation of the Town Well Interceptor Well began with an assessment project. 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 this 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.

The interceptor well was designed to pump at 200-250 gallons per minute (gpm) to effectively capture contaminants before reaching the Town Well. The discharge from the interceptor well was designed to be discharged to a nearby stream, which is a tributary to Great Valley Creek. Treatment of the recovered ground water is not necessary because the discharge limits to surface water for TCE and TCA are 11 and 20 ug/l, respectively, which are higher than the current concentrations in the ground water, 6 and 4 ug/l, respectively. Construction of the Town Well Interceptor Well and Discharge System began in November 1990, after NYSDEC approval of the plans and specifications, and was completed in January 1991.

2.4.2 **Town Water District Water Line Extension**

The objective of this interim measure is to provide an uncontaminated drinking water source for the residences in the area between the Signore Facility and the Town Well, most of which have domestic wells with low level TCE and TCA contamination. In order to meet the objective, the Town Water District distribution line was extended down Donlen Drive and the homes along State Route 219 (Jefferson Street) and Donlen Drive were connected to the Town distribution system.

The Basis of Design Report for the Town Water Line Extension (Lozier, May 1990) was submitted for Agency review 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 homes were completed in December 1990. Connections inside the homes were not finished until after the new Village/Town water supply well went on-line in February 1991.

2.4.3 **<u>On-Site Interceptor Well</u>**

The objective of this interim measure is to prevent off-site migration of contamination from the Signore Facility by capturing ground water along the downgradient, southern property boundary. A Work Plan (LGA, March 1991) was developed to evaluate, design, install, test and document an on-site interceptor well system. The plan included preparation of a Basis of Design Report followed by Plans and Specifications.

The Basis of Design Report for the On-Site Interceptor Well System (LGA, May 1991) was submitted on May 3, 1991 and included the proposed conceptual design for the Interceptor Well System, consisting of an interceptor well designed to produce 175 to 250 gpm, a packed column air stripping tower capable of removing 99% of the anticipated maximum concentration of 180 ug/l of TCE from the ground water at a flow rate of up to 250 gpm and discharge piping to convey the effluent from the air stripping tower to Plum Creek.

The Basis of Design Report was approved by the NYSDEC on May 24, 1991.

Draft Plans and Specifications were prepared and submitted to the NYSDEC on June 17, 1991 and comments were received on July 8, 1991. The Final Plans and Specifications (Hydro Group, July 1991) were then submitted to the NYSDEC on July 27, 1991 and approved on July 31, 1991. Construction of the On-Site Interceptor Well System began in late October 1991 and is scheduled for completion and aquifer testing in January 1992.

3.0 REMEDIAL OBJECTIVES AND RESPONSE ACTIONS

This section presents the remedial objectives and the potential general response actions which will achieve these objectives for the remedial actions necessary to mitigate the ground water contamination identified from the Signore Facility. This is the first step in the process of identifying, assembling, screening and evaluting remedial alternatives.

3.1 STATEMENT OF PROBLEM

In order to develop objectives for evaluating remedial action alternatives, the "problem" needs to be defined; stating the environmental media impacted by contamination, the contaminants of concern, the contaminant migration pathways and the contaminant receptors. These statements of the problem are based on the conclusions of the RI Report (LGA, May 1991), as presented below.

- Ground water is the only environmental media impacted by contamination from the Signore Facility.
- Dissolved volatile organics (VOCs) in the ground water are the contaminants of concern; no free phase contamination is present. Off-site samples show levels of trichloroethene (TCE) and 1,1,1-trichloroethane (TCA) above New York State Maximum Contaminanat Levels (MCLs) and on-site samples show levels of TCE, TCA, 1,1-dichloroethane (DCA) and 1,2-dichloroethene (DCE) above MCLs.
- Dissolved VOC contaminants will migrate by advection/dispersion in the direction of ground water flow, to the south-southeast.

- The potential receptors of VOC contaminants in the ground water downgradient of the Signore Facility are the Town Well, domestic water supply wells located between Signore and the Town Well and other wells located further downgradient from the Town Well.

Additionally, the RI Report concluded that existing ground water contamination is due to historic leakage from closed storage and/or disposal facilities and/or past spills. Thus, source control measures will not be effective in mitigating ground water contamination. Also, the risk assessment has concluded that VOCs in the downgradient ground water have a non-cancer health risk with a combined hazard index below the threshold for adverse health effects and have a cancer health risk equal to only 4×10^{-6}. It should also be pointed out that Interim Remedial Measures have been (or soon will be) implemented to protect the 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 be no future contaminant receptors.

3.2 REMEDIAL ACTION OBJECTIVES

Remedial action objectives for mitigating the contaminated ground water impacted by the Signore Facility have been established to allow selection of the recommended remedial actions. These proposed objectives, which fall under the categories of protecting human health and protecting the environment, are listed below.

Human Health Protection

1. Provide water meeting State drinking water standards to residences located between Signore and the Town Well which have domestic wells affected or potentially affected by VOC contaminated ground water.

2. Reduce the concentration of VOC contaminants in the ground water at the Town Well to meet State drinking water standards.

3. Prevent VOC contaminanted ground water from moving downgradient beyond the Town Well.

Environmental Protection

4. Prevent VOC contaminanted ground water from moving downgradient beyond the Town Well.

5. Restore the aquifer between Signore and the Town Well by reducing VOC contaminant concentrations in the ground water between Signore and the Town Well to appropriate State standards.

6. Restore the aquifer beneath the Signore Facility by reducing VOC contaminant concentrations in the ground water beneath the Signore Facility to appropriate State standards.

These six objectives have been combined to create four remedial action objectives for mitigating ground water contamination from the Signore Facility. These four objectives are listed as (A), (B), (C) and (D) in Table 1.

3.3 **GENERAL RESPONSE ACTIONS**

General response actions are developed to describe general categories of remedial actions that will satisfy the remedial action objectives for each environmental media of interest. Because ground water is the only media impacted by contamination, only one set of general response actions has been developed. The types of general response actions potentially applicable for ground water remedial actions are listed below.

- No Action is lack of any remediation, i.e. natural attenuation of ground water contaminant levels.
- Institutional Actions are those actions which include controls on use of the ground water or provision of alternative water supply.
- Containment Actions are those actions which include creation of barriers to prevent ground water contaminant movement.
- Collection Actions are those actions which include extraction of the contaminated ground water.
- Treatment Actions are those actions which include removal of the contaminants from the ground water, including on-site physical, chemical and biological treatment and off-site treatment.
- Discharge Actions are those actions which include disposal of the treated or untreated ground water, including on-site and off-site discharge.

The above general response actions that may be applicable for each of the four remedial action objectives are shown in Table 2.

3.4 STATE STANDARDS, CRITERIA AND GUIDELINES

Applicable or relevent and appropriate New York State standards, criteria and guidelines (SCGs) are applied as the cleanup goals to meet the remedial action objectives. Because the baseline risk assessment has shown that there is little risk associated with exposure to the off-site ground water contaminant levels, there are no human health risk levels as targets for remediation. Therefore, the remedial action cleanup level goals will be New York State SCGs. Appendix A presents all of the SCGs that are potentially applicable to a contamiantion problem. These include New York State regulations and guidelines for:

- Department of Environmental Conservation
  - Division of Solid Waste
  - Division of Hazardous Substances Regulation
  - Division of Water
  - Division of Air
  - Division of Fish and Wildlife
  - Division of Regulatory Affairs
  - Division of Marine Resource
  - Division of Mineral Resources
- Department of Health
- Department of Labor
- Department of Agriculture and Markets
- Coastal Management

As stated above, ground water is the only media impacted. Therefore, SCGs which define ground water contaminant levels are applicable. In addition, treatment and discharge of contaminanted ground water are potential general response actions. Therefore, SCGs which define surface water quality standards for potential discharge and SCGs which define air quality standards for discharge from treatment processes are also applicable. Of the SCGs listed in Appendix A, the applicable SCGs are:

- Department of Health Maximum Contaminant Levels (MCLs) for Public Water Supplies (NYSDOH, January 1990).
- Department of Environmental Conservation Surface Water and Ground Water Classifications and Standards (NYSDEC, March 1986).
- Department of Environmental Conservation Air Discharge Standards (NYSDEC, September 1989).

The NYSDOH and NYSDEC water quality standards for ground water and surface water are presented in 6NYCRR Part 700-705, dated September 1, 1991. This defines State MCLs for ground water. The NYSDEC Division of Water has established discharge to surface water limits specifically for this project for discharge from the Town Well Interceptor Well and On-Site Interceptor Well. The NYSDEC Division of Air, Air Guide-1 establishes toxicity guidance values (AGCs) for constituents discharged to air. As stated in the RI Report (LGA, April 1991), the contaminants of concern for the Signore Facility consist of the following four volatile organics: trichloroethene (TCE); 1,1,1-trichloroethane (TCA); 1,1-dichloroethane (DCA); and 1,2-dichloroethene (DCE). The applicable ground water, surface water and discharge to air limits for these four volatile organics are listed below.

	Ground Water (ug/l)	Surface Water (ug/l)	Air (ug/m^3)
TCE	5	11	0.45
TCA	5	20	45,238
DCA	5	30	9,524
DCE	5	30	360

When applying these SCGs, the ground water standards will be considered the limits for protecting the Town Well and will be considered the goal for restoring the aquifer beneath Signore and between Signore and the Town Well, the surface water standards will be considered the limits for any discharges to surface water and the air standards will be considered the limits for any discharges to air from treatment processes.

3.5 REMEDIATION AREAS

The areal extent of VOC ground water contamination was evaluated both at the Signore Facility and downgradient of the Signore Facility in the RI Report (LGA, May 1991). The extent of contamination at the Signore Facility was determined from the ground water sampling results for the on-site monitoring wells and the extent of contamination downgradient from the Signore Facility was determined from the ground water sampling results for the off-site RI monitoring wells, the domestic water supply wells, the IRM monitoring wells and the Town Well.

Plate 5 presents a summary of the on-site ground water sampling results; shown are the results from the October 1990 samples from monitoring well nests EW-1 and EW-2 and the results from the June 1990 and January 1989 samples from the other 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 detected in the samples from wells MW-5S, EW-1.25, EW-1.50, MW-1S and MW-1I. In summary, ground water contamination is present on-site in the western and southern parts of the Signore Facility.

Plate 6 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.

3.6 DISCHARGE LIMITS

As part of the evaluation of remedial alternatives, discharges to surface water and air will be considered. These discharges must meet the limits presented in Section 3.4.

Discharges of treated or untreated contaminated ground water from interceptor wells must meet the surface water limits. As part of the Interim Remedial Measures, two interceptor wells have been installed, an off-site interceptor well immediately upgradient of the Town Well and an on-site interceptor well at the downgradient boundary of the Signore Facility. The concentration of VOCs in the ground water at the off-site interceptor well are very low; TCE at 6 ug/l and TCA at 4 ug/l. Because the discharge to surface water limits for TCE and TCA are 11 ug/l and 20 ug/l, respectively, recovered water from the off-site interceptor well will not require treatment before discharge to the local stream. The VOC concentrations in the ground water at the on-site interceptor well are approximately 180 ug/l for TCE, 160 ug/l for TCA, 100 ug/l for DCA and 80 ug/l for DCE. These concentrations are all above discharge to surface water limits and therefore, treatment of the recovered contaminated ground water will be required prior to discharge to the local stream.

Contaminated ground water from the on-site interceptor well will require treatment. Since one of the treatment options is air stripping (transfer of the contaminants from the water to the air), the need for treatment of the air discharge from an air stripper has been evaluated. This evaluation has been made by estimating the TCE emission rate (because TCE has by far the most stringent air discharge limit) from an air stripper assuming that 100% of the TCE is removed from the ground water and discharged to the air. Assuming a TCE concentration of 180 ug/l and a ground water recovery rate of 250 gallons per minute, the TCE emission rate will be:

*180 ug/l * 250 gpm (56,250 l/hr) = 10,125,000 ug/hr*

This rate is equal to 10.1 grams per hour or 0.022 pounds per hour (lbs/hr). The air concentration of TCE at this emission rate is calculated from the following equation, shown on Figure VII, page 28 of Air Guide - 1 (NYSDEC, Division of Air, September 1989).

$$C = 4218 * AER / He^{2.16}$$

where: C = air concentration, ug/m^3
AER = air emission rate, lbs/hr
He = effective stack height, ft

Assuming an effective stack height equal to 25 feet and a TCE air emission rate of 0.022 lbs/hr, the calculated TCE air concentration equals 0.089 ug/m^3. This concentration is less than the air discharge limit for TCE of 0.45 ug/m^3 and therefore no treatment of the discharged air from an air stripping treatment system at the on-site interceptor well would be required.

4.0 IDENTIFICATION AND SCREENING OF TECHNOLOGY TYPES AND PROCESS OPTIONS

This section presents the identification and preliminary screening of technology types and process options potentially applicable with the general response actions presented in Section 3.3. In this step of the remedial alternatives development process, the "universe" of potentially applicable technology types, which refer to the general categories of technologies, are identified. Next, the process options, which refer to the specific processes within each technology type, are identified. The applicable process options are selected from the results of a two-step screening process of the technology types and process options. The initial screening identifies potentially applicable process options and technology types based on implementability; process options and entire technology types that can not be effectively implemented at the site are thus eliminated. The potentially applicable process options are then screened by effectiveness, implementability and cost to select the preferred process options, which become components of the remedial alternatives.

4.1 TECHNOLOGIES AND PROCESS OPTIONS IDENTIFICATION

A description of the remedial technologies and process options identified for the various general response actions are presented below and summarized on Table 3.

4.1.1 **No Action**

This general response action involves no technologies or process options, and is used as a baseline comparison with other actions.

4.1.2 **Institutional Actions**

This general response action involves controls on use of ground water or provision of alternative supply. The following technology types have been identified.

Restricted Ground Water Use includes the following process option: Statutory/Deed Restriction, is the prohibition by stautory code or deed restriction of the installation of domestic water supply wells and pumping of ground water in the area between Signore and the Town Well.

Monitoring includes the following process option: Ground Water Monitoring, is a sampling program of the Town Well, domestic supply wells, monitoring wells and interceptor wells, undertaken to monitor the change in magnitude and extent of ground water contamination.

Alternative Water Supply includes the following process options: (1) Existing Municipal Water, consists of incorporation of the area between Signore and the Town Well into the Town Water District, extension of the Town water distribution system into the area and connection of the residences to the Town water line; (2)

New Municipal Well, consists of the creation of a new water district in the area between Signore and the Town Well, installing a municipal well with treatment and building a distribution line to connect the residences to the new well; and (3) New Individual Domestic Wells, consisting of the relocation and drilling of new domestic supply wells or deepening existing domestic supply wells in the area between Signore and the Town Well.

4.1.3 **Containment Actions**

This general response action involves creations of barriers to prevent ground water contaminant movement. The following technology types have been identified.

Capping includes the following process options to prevent infiltration of rainfall causing downward migration of contaminants to the ground water: (1) Clay and Soil, consisting of a compacted clay and soil cover over the contaminated ground surfaces; (2) Asphalt, consisting of a layer of asphalt and sealer over the contaminated ground surfaces; (3) Concrete, consisting of a concrete slab over the contaminated ground surfaces; and (4) Synthetic and Soil, consisting of compacted clay and synthetic liner covered with soil over the contaminated ground surfaces.

Vertical Physical Barrier includes the following process options installed to the bottom of the aquifer around the contaminated ground water area to prevent lateral movement of contamination: (1) Sheet Piling; (2) Slurry Wall, consisting of the installation of a trench backfilled with a soil-cement-bentonite slurry; and (3) Grout Curtain, consisting of pressure injection of grout into closely spaced drillholes.

Horizontal Physical Barrier includes the following process options installed below the contaminated area to prevent downward movement of contamination: (1) Liners, consisting of compacted clay and a synthetic membrane; and (2) Grout Injection, consisting of pressure injection of grout through closely spaced drillholes.

Hydraulic Control includes the following process option: extraction/injection barrier wells, consisting of extraction wells along the downgradient boundary to prevent off-site contaminant migration and injection of the extracted water upgradient of the contamination.

4.1.4 **Collection Actions**

This general response action involves extraction of contaminated ground water. The following technology types have been identified.

Extraction includes the following process options to extract contaminated ground water: (1) Extraction Wells, consisting of a vertical well(s); (2) Extraction/Injection Wells, consisting of a vertical extraction well and upgradient injection wells to recharge treated or untreated extracted ground water to enhance the extraction process by raising the hydraulic gradient and increasing ground water flow; and (3) Well Point System, consisting of a system of individual small diameter well points connected to a header system where a single pumping location extracts water from the header.

Drains includes the following process option: Interceptor Trench, consisting of horizontal perforated pipe in a trench backfilled with porous media with one or more vertical collection sumps to pump and extract the contaminated ground water.

4.1.5 **Treatment Actions**

This general response action involves removal of the contaminants from the ground water. The following technology types have been identified.

Physical Treatment includes the following process options where a mechanical process is involved in the removal of the contaminant from the ground water: (1) Air Stripping, consisting of volatilization of contaminants by mixing air with the contaminated water to promote mass transfer of the contaminants from water to air and includes aeration tanks, cascade aerators, spray basins and packed towers; (2) Steam Stripping, consisting of air stripping where either the water is heated or steam is used instead of air to promote mass transfer of compounds which do not readily strip at ambient temperatures; (3) Carbon Adsorption, consisting of adsorption of contaminants on to activated carbon by passing the contaminated ground water through a carbon column; (4) Floating Phase Separation, consisting of removal of a lighter than water free phase contaminant from the surface of the ground water; (5) Filtration, consisting of removal of suspended solid contaminants by passing the contaminated ground water through a filter; (6) Coagulation/Flocculation, consisting of separation of suspended solid contaminants by addition of a coagulant and then inducing flocculation to enhance the separation; and (7) Reverse Osmosis, consisting of removing dissolved contaminants by forcing the contaminated ground water under high pressure through a semi-permeable membrane.

Chemical Treatment includes the following process options where a chemical change is induced to remove contaminants from the ground water: (1) Ion Exchange, consisting of the removal of dissolved inorganic contaminants by exchanging one ion for another by passing the contaminated ground water across a resin bed; (2) Precipitation, consisting of chemical dissolution of inorganic contaminants by addition of chemicals or adjusting the pH; and (3) Oxidation, consisting of oxidation of the contaminants from the ground water using hydrogen peroxide, ozone or UV/ozone.

Biological Treatment includes the following process options where biodegradation is used to remove contaminants from the ground water: (1) Anaerobic Biological Treatment, consisting of mixing ground water with bacteria in an anaerobic (no oxygen) environment; (2) Aerobic Suspended Growth Reactor, consisting of mixing contaminated ground water with bacteria in an aerated lagoon or basin with a clarifier to remove the solids at the end of the treatment; and (3) Aerobic Fixed Film Reactor, consisting of passing contaminated ground water through an aerated reactor where the bacteria are grown on an inert media in the reactor.

Thermal Destruction includes the following process option: Incineration, consisting of oxidation of the contaminants by heating the contaminated ground water to a high temperature in the presence of oxygen in an incinerator.

In-Situ Treatment includes the following in-ground process options to remove contaminants from the ground water without extracting the ground water: (1) Vapor Recovery, consisting of removal of air from the vadose zone by suction from shallow vapor recovery probes and treatment of the recovered vapor; (2) Biological Degradation, consisting of recharging bacteria, oxygen and nutrients into the ground water through injection wells usually in conjunction with extraction wells to recirculate the process; and (3) Aeration, consisting of injecting air into the ground water to create in-ground air stripping.

Off-Site Treatment includes the following process options which involve disposal and treatment at an off-site facility: (1)

POTW, consisting of discharging contaminated ground water to the Village of Ellicottville sanitary sewer system for treatment at the municipal wastewater treatment plant; and (2) RCRA Facility, consisting of collecting contaminated ground water and transporting it to a permitted RCRA facility for treatment and disposal.

4.1.6 **Discharge Actions**

This general response action involves disposal of treated or untreated extracted ground water. The following technology types have been identified.

On-Site Discharge includes the following process options to dispose of the treated or untreated contaminated ground water on-site: (1) Local Stream, consisting of an outfall discharge to the closest stream to the ground water extraction point, with or without treatment; (2) Injection Well, consisting of recharging the contaminated ground water into the aquifer with or without treatment; and (3) Municipal Distribution System, consisting of discharging contaminated ground water after treatment to MCLs into the Town of Ellicottville distribution system.

Off-Site Discharge includes the following process options to dispose of the treated or untreated contaminated ground water off-site: (1) POTW, consisting of discharging contaminated ground water to the Village of Ellicottville sanitary sewer system for treatment at the municipal wastewater treatment plant; (2) Pipeline to Larger

Stream, consisting of discharging through a pipeline into Great Valley Creek; and (3) Deep Well Injection, consisting of collecting contaminated ground water and transporting it to a permitted deep well for disposal by injection.

4.2 PRELIMINARY IMPLEMENTABILITY SCREENING

After identification of the remedial technology types and process options, described above, the process options underwent a preliminary screening to eliminate those that are not applicable because they can not be effectively implemented at the site. The results of this preliminary screening are described below by general response action and summarized in Table 3.

4.2.1 No Action

This action is not applicable because Interim Remedial Measures have already been undertaken.

4.2.2 Institutional Actions

The Restricted Ground Water Use and Monitoring Remedial Technologies are not applicable by themselves because contamination is already present in the ground water above State MCLs and therefore some action must be undertaken. The Restricted Ground Water Use Technology is potentially applicable as part of the final alternatives to prevent future drilling of new wells in the are where the ground water is contaminated. Under the Alternative Water Supply Remedial Technology, the New Individual Domestic Wells

Process Option is not feasible because no suitable replacement locations are available on the individual properties affected and the wells can not be deepened because there is no lower reliable aquifer to produce from. The Existing Municipal Water and New Municipal Well Process Options are potentially applicable.

4.2.3 **Containment Actions**

None of the Containment Action Remedial Technologies are applicable. Capping is not applicable because covering the contaminated areas will not limit recharge to the aquifer and no source areas exist to cover and limit infiltration to the ground water. Vertical Physical Barriers are not feasible because there is no low permeability layer at a reasonable depth to tie into above the bedrock. Horizontal Physical Barriers are not applicable because no waste sources are present that can be controlled by placing a barrier beneath them. Hydraulic Control is not feasible because the high ground water flow rate requires some type of collection action and a hydraulic barrier will not be effective.

4.2.4 **Collection Actions**

Under the Extraction Remedial Technology, the Extraction Wells Process Option individually or in conjunction with injection wells, the Extraction/Injection Wells Process Option, are the preferred technology to remove ground water from a highly productive aquifer, such as the one in Ellicottville. Thus, the Drains Remedial Technology and the Well Point System Process Option under the

Extraction Remedial Technology are not the best technologies to remove ground water in this setting.

4.2.5 **Treatment Actions**

Under the Physical Treatment Remedial Technology, the Filtration, Coagulation/Flocculation and Reverse Osmosis Process Options are not applicable for the VOC contaminants of concern. The Steam Stripping Process Option is also not applicable because the VOCs of concern readily strip at ambient temperatures. The Floating Phase Separation Process Option is not applicable because there is no free phase contaminant plume present. Under the Chemical Treatment Remedial Technology, the Ion Exchange and Precipitation Process Options are not applicable for the VOC contaminants of concern. Under the Biological Treatment Remedial Technology, the Anaerobic Reactor Process Option is not applicable in ground water situations. The Thermal Destruction Remedial Technology is not feasible because an incinerator can not be constructed at the Signore Facility because of State siting requirements. Under the In-Situ Treatment Remedial Technology, the Aeration Process Option is not applicable because of the high ground water flow rate. The Off-Site Treatment Remedial Technologies are not feasible because the large flow of non-nutrient water creates treatment problems for the POTW Process Option and Signore's potential liability creates problems for the RCRA Facility Process Option. Thus, the potentially applicable process options are the Air Stripping and Carbon Adsorption Process Options under the Physical Treatment

Remedial Technology, the Oxidation Process Option under the Chemical Treatment Remedial Technology, the Aerobic Suspended Growth and Fixed Film Reactors Process Options under the Biological Treatment Technology and the Vapor Recovery and Biological Degradation Process Options under the In-Situ Treatment Technology.

4.2.6 **Discharge Actions**

None of the Off-Site Discharge Remedial Technologies are feasible; the POTW Process Option is not feasible because the large flow of non-nutrient water creates treatment problems, the Deep Well Injection Process Option is not feasible because of Signore's potential liability with off-site transport, and the Pipeline to Larger Stream Process Option is not applicable because the discharge limitations to Great Valley Creek are the same as a local stream discharge therefore there is no advantage to piping to Great Valley Creek. The Injection Well Process Option under the On-Site Discharge Remedial Technology is not applicable because injection of waste into a drinking water aquifer is not permitted. Potentially applicable process options are the Local Stream Discharge and Municipal Distribution System Process Options under the On-Site Discharge Remedial Technology.

4.3 **PROCESS OPTIONS EVALUATION**

The potentially applicable process options identified from the preliminary implementability screening have been evaluated to select the preferred process option(s) for each technology type on the basis of effectiveness, implementability and cost. The evaluation has been done for each Remedial Action Objective in order to select the process options that will be assembled for the remedial alternatives for each objective. The results of the process options evaluation are presented below by objective with summaries presented in Tables 4, 5, 6 and 7 for Remedial Action Objectives A through D, respectively.

4.3.1 **Objective A - Provide Water to Residences**

For this objective, the Extraction and On-Site Discharge Remedial Technologies do not meet the objectives because ground water collection and discharge are not required. For the Alternative Water Supply Remedial Technology, both the Existing Municipal Water and New Municipal Well Process Options are effective, however the new municipal well will need to be monitored to ensure the treated water is below MCLs. Both these process options have institutional requirements; to use existing municipal water the Town Water District must be extended to cover the area between Signore and Town Well and to use a new municipal well, a new water district must be formed to cover the same area. In addition, institutional control will be required to ensure that no one drills a new domestic well in the affected area. Under the treatment technologies, the biological treatments are not yet reliable for removing chlorinated VOCs from ground water, oxidation is not a best available technology for treating VOCs and vapor recovery is not an option at this location. Air stripping and carbon adsorption are effective technologies, air stripping and carbon adsorption are appropriate for treating a single new municipal well and carbon adsorption is appropriate for treating the individual domestic wells.

4.3.2 **Objective B - Protect Town Well/Prevent Downgradient Flow**

For this objective, the Alternative Water Supply Remedial Technology does not meet the objective of reducing the contaminant levels at the Town Well and preventing downgradient migration of contamination. For the Extraction Remedial Technology, the Extraction Wells Process Option is effective and implementable but the Extraction/Injection Wells Process Option is not effective because injection of water away from the source will hinder the recovery of contaminants and may cause contaminant migration in an undesirable direction. Under the treatment technologies, the biological treatments are not yet reliable for removing chlorinated VOCs from ground water, oxidation is not a best available technology for treating VOCs and vapor recovery is not an option at this location. Air stripping and carbon adsorption are both effective technologies and implementable. Under the discharge technologies, both discharge to a local stream and discharge to the municipal distribution system are effective and implementable process options.

4.3.3 **Objective C - Restore Aquifer Downgradient of Signore**

For this objective, the Alternative Water Supply Remedial

Technology does not meet the objective of restoring the aquifer between Signore and Town Well by reducing the contaminant levels. For the Extraction Remedial Technology, the Extraction Wells Process Option is effective and implementable but the Extraction/Injection Wells Process Option is not effective because injection of water away from the source will hinder the recovery of contaminants and may cause contaminant migration in an undesirable direction. Under the treatment technologies, the biological treatments are not yet reliable for removing chlorinated VOCs from ground water, oxidation is not a best available technology for treating VOCs and vapor recovery is not an option at this location. Air stripping and carbon adsorption are both effective technologies and implementable. Under the discharge technologies, both discharge to a local stream and discharge to the municipal distribution system are effective and implementable process options.

4.3.4 <u>Objective D - Restore Aquifer Beneath Signore</u>

For this objective, the Alternative Water Supply Remedial Technology does not meet the objective of restoring the aquifer beneath the Signore Facility by reducing the contaminant levels. For the Extraction Remedial Technology, the Extraction Wells and Extraction/Injection Wells Process Options are effective, however the injection well(s) will required a permit. Under the treatment technologies, the biological treatments are not yet reliable for removing chlorinated VOCs from ground water and oxidation is not a best available technology for treating VOCs. The vapor recovery will be effective only if removal of VOCs from the soil vapor in the vadose zone will reduce the concentrations of VOCs in the ground water to such an extent that the length of time required to extract ground water is greatly reduced. Given the low VOC concentrations in the water at the Signore Facility and that the lack of contaminant sources, vapor recovery is not expected to lessen the time required for ground water extraction. Air stripping and carbon adsorption are both effective technologies and implementable. Under the discharge technologies, both discharge to a local stream and discharge to the municipal distribution system are effective and implementable process options.

5.0 DEVELOPMENT AND SCREENING OF PRELIMINARY REMEDIAL ALTERNATIVES

This section of the report presents the preliminary remedial alternatives assembled for each of the Remedial Action Objectives from the process options identified as effective and implementable in the Process Options Evaluation. These preliminary remedial alternatives were then screened for effectiveness, implementability and cost in order to select the final remedial alternatives for detailed analysis.

5.1 PRELIMINARY REMEDIAL ALTERNATIVES ASSEMBLING

Because ground water is the only media impacted, all the remedial alternatives are specific to mitigating ground water contamination. However, four remedial action objectives have been defined which require assembling alternatives specific to each of the individual objectives.

In the first cut of alternatives development, the identified effective/implementable process options were grouped in as many ways possible to maximize the number of preliminary alternatives. These process options are listed below.

- Alternative water supply from Town Water District distribution system.
- Alternative water supply from new municipal well in newly formed district.

- Recover contaminated ground water from extraction wells.

- Recover contaminated ground water from extraction wells and inject treated water upgradient to enhance recovery efforts.

- Treat ground water from recovery wells, new municipal well or Town Well by air stripping.

- Treat ground water from recovery wells, new municipal well, Town Well or existing domestic wells with carbon adsorption.

- Discharge treated or untreated ground water from recovery wells into local stream.

- Discharge treated ground water from recovery wells or Town Well into Town Water District water distribution system.

For each objective, the above process options that are applicable were used to develop specific alternatives for each objective. Recovery and discharge options are not applicable for Objective A (Provide Water to Residences) and alternative water supply options are not applicable for Objective B (Protect Town Well/Prevent Downgradient Flow), Objective C (Restore Aquifer Downgradient of Signore) and Objective D (Restore Aquifer Beneath Signore).

5.2 PRELIMINARY REMEDIAL ALTERNATIVES DESCRIPTIONS

Each of the preliminary remedial alternatives developed are described below by Remedial Objective.

5.2.1 Objective A - Provide Water to Residences

The following three preliminary alternatives were identified for meeting the objective to provide water meeting State drinking water standards to the residences with domestic wells between Signore and the Town Well. In the area of concern, 33 residences along State Route 219 (Jefferson Street) and along Donlen Drive were supplied by private domestic wells. Each of the three alternatives will provide for immediate achievement of the objective because the current domestic well water supplies will be replaced by another water supply or by treated water. The process options screening for this objective is summarized in Table 4.

Alternative A-1 consists of extending the Town Water District water distribution system into the area between Signore and the Town Well and connecting the residences to the distribution system. The water distribution system currently extends into the area of concern with a 10-inch watermain along the east side of State Route 219. Specific elements of this alternative consist of the following.

- Extend the Town of Ellicottville Water District boundary to include the area of concern by vote of the Town Board. In order for Town to adopt a resolution, prepare a report, map and environmental impact assessment on the Water District extension. Also, apply to the NYSDEC for approval to extend the Water District. Additionally, institute restrictions on the future use of ground water by prohibiting drilling on new domestic wells in the impacted area.

- Prepare plans and specifications for the project for approval by the County Department of Health, NYSDOH and NYSDEC.

- Install a new watermain along Donlen Drive by connecting at the west end of Donlen Drive to the existing 10-inch watermain along State Route 219 and by connecting at the east end of Donlen Drive to the existing watermain in the Wildflower development, to the south.

- Make service connections to each of the 33 residences by tapping into the existing watermain along State Route 219 and the new watermain along Donlen Drive.

- Disconnect each of the 33 domestic wells from the plumbing in the residences.

Alternative A-2 consists of treating the ground water at each of the domestic residential wells by installing individual carbon adsorption units in each residence. With TCE and TCA concentrations in the domestic wells ranging from below MCL to 43 ug/l and 49 ug/l, respectively, the removal efficiencies required for these individual treatment units ranges up to 90%. This alternative will require monitoring of the domestic wells and periodic replacement of the carbon filters. However, this alternative will not require any permits or approvals from regulatory agencies.

Alternative A-3 consists of forming a new water district consisting of the affected area and the 33 residences, drilling a new municipal supply well for the new district and constructing a treatment and distribution system for the water. As stated above, the off-site ground water can have TCE and TCA concentrations ranging up to 43 ug/l and 49 ug/l, respectively, requiring removal efficiencies up to 90%. Specific elements of this alternative consist of the following.

- Form a separate water district under the Town of Ellicottville to include the area of concern by petition of the affected residences and by vote of the Town Board. In order for Town to adopt a resolution, prepare a report, map and environmental impact assessment on the Water District creation. Also, apply to the NYSDEC for approval to form a new Water District.

- Prepare plans and specifications for the project for approval by the County Department of Health, NYSDOH and NYSDEC.

- Install a new municipal supply well capable of producing 50 gpm within the boundaries of the new Water District.

- Construct a treatment unit for the municipal supply well consisting of a packed column air stripping tower or a granular activated carbon adsorption vessel.

- Construct a watermain from the treatment unit along State Route 219 and Donlen Drive with loops built in for safety.

- Make service connections to each of the 33 residences by tapping into the new watermains along State Route 219 and Donlen Drive.

- Disconnect each of the 33 domestic wells from the plumbing in the residences.

Thus, this alternative has two options, one with treatment by air stripping and the other with treatment by carbon adsorption.

5.2.2 Objective B - Protect Town Well/Prevent Downgradient Flow

The following two preliminary alternatives were identified for meeting the objective to reduce the VOC (TCE and TCA) contaminant concentrations in the Town Well to below State drinking water standards and to prevent VOC contaminants from migrating further downgradient beyond the Town Well. In order to meet the second part of the objective, continuous ground water pumpage will be needed at or near the Town Well. Therefore, the two alternatives presented accomplish this by pumping the Town Well or a new interceptor well upgradient of the Town Well. The process options screening for this objective is summarized in Table 5.

Alternative B-1 consists of installing an extraction (interceptor) well upgradient of the Town Well to intercept the VOC contaminants before they can reach the Town Well. The results of the Town Well Interceptor Well Assessment (LGA, August 1990) show that the optimal location for this interceptor well is 275 feet upgradient of the Town Well on the west side of State Route 219. In order to achieve a sufficient capture zone width, an optimal pumping rate of 200 to 250 gpm is required. Because of the location, which is in front of Holiday Valley Motel, there are spatial requirements for as much of the equipment as possible to be hidden, i.e. underground. The concentration of VOC contaminants near the Town Well are very low, TCE at 6 ug/l and TCA at 4 ug/l. Because the discharge to surface water limits for these VOC constituents are 11 ug/l and 20 ug/l, respectively, no treatment of the recovered ground water is required before discharge to a local stream. Specific elements of this alternative consist of the following.

- Obtain permission from the property owner, Holiday Valley, to construct on their property.

- Prepare plans and specifications for the project for approval by the NYSDEC.

- Install an extraction well capable of producing 200-250 gpm to a depth of 45 feet, the bottom of the coarser-grained portion of the aquifer.
- Construct a water line to discharge the recovered ground water to a local stream where it crosses under Holiday Valley Road, approximately 340 feet upgradient of the interceptor well.

- Install controls for automatic, continuous operation of the interceptor well.

- Prepare a discharge monitoring plan for sampling water from the interceptor well for approval by the NYSDEC.

<u>Alternative B-2</u> consists of pumping the Town Well continuously to act as an interceptor well with two options for discharge; discharge without treatment to the local stream where it crosses Holiday Valley Road about 800 feet upgradient of the Town Well, or treat the recovered ground water and discharge into the Town of Ellicottville distribution system. Because the Town Well is currently operating as a backup and peak water supply for the Town, controls would have to be installed so that on demand in the distribution system, the discharge from the Town Well would switch through the treatment system and into the water distribution system and at other times, when there is no demand on the Town Well, the discharge would switch over to the local stream. As stated above, the results of the Town Well Interceptor Well Assessment (LGA,

August 1990) show that an optimal pumping rate of 200 to 250 gpm is desired. The concentration of VOC contaminants in samples from the Town Well are very low, TCE at 6 ug/l and TCA at 4 ug/l. Because the discharge to surface water limits for these VOC constituents are 11 ug/l and 20 ug/l, respectively, no treatment of the recovered ground water being discharged to the local stream is required. Specific elements of this alternative consist of the following.

- Obtain permission from the property owner, Holiday Valley, to construct on their property.
- Prepare plans and specifications for the project for approval by the NYSDEC.
- Construct a water line to discharge the recovered ground water to a local stream where it crosses under Holiday Valley Road, approximately 800 feet upgradient of the Town Well.
- Install controls for automatic, continuous operation of the Town Well so that discharge goes to the local stream and on demand the discharge switches to through the treatment system and into the Town water distribution system.
- Construct a treatment unit for the Town Well consisting of a packed column air stripping tower or a granular activated carbon adsorption vessel.
- Prepare a discharge monitoring plan for sampling water from the Town Well for approval by the NYSDEC.

Thus, this alternative has two options, one with treatment by air stripping and the other with treatment by carbon adsorption.

The time frame in which meeting the objectives will occur depends on the alternative. With Alternative B-1, an unknown time period will be required for the ground water concentration of TCE produced from the Town Well to go from 6 ug/l to under 5 ug/l; TCA concentrations are already less than the MCL. With treatment of ground water produced from the Town Well, TCE concentrations of water discharged to the distribution system will immediately be less than the MCL. Both alternatives by extracting ground water will provide immediate control on downgradient migration of VOC contaminants beyond the Town Well.

5.2.3 <u>**Objective C - Restore Aquifer Downgradient of Signore**</u>

This objective, to restore the aquifer in the area between Signore and the Town Well by reducing the concentration of VOC contaminants to acceptable levels (MCLs as a goal), will be met by the selected alternatives for Objective B and Objective D. The process options screening for this objective is summarized in Table 6.

5.2.4 <u>**Objective D - Restore Aquifer Beneath Signore**</u>

The following three preliminary alternatives were identified for meeting the objective to restore the aquifer beneath the Signore Facility by reducing the concentration of VOC contaminants to acceptable levels (MCLs as a goal). Because source control measures will not be effective and because the ground water is already impacted, this objective will be met by continuous pumpage from an extraction well at the downgradient boundary of the

Facility. The Basis of Design Report for the On-Site Interceptor Well Interim Remedial Measure (LGA, May 1991) shows that the optimal location for this extraction well is along the southern edge of the Signore Facility, approximately 75 feet south of the monitoring well MW-1 cluster. In order to achieve a sufficient capture zone width, an optimal pumping rate of 175 to 250 gpm is required. Because of the location on the Signore Facility property, there are no spatial requirements. Ground water sampling results from the nearest monitoring wells show maximum VOC contaminant concentrations of 180 ug/l for TCE, 160 ug/l for TCA, 100 for DCA and 80 for DCE. Therefore, any discharge option will require treatment. The following removal efficiencies will be required to meet ground water limits (for discharge to injection wells or the Town water distribution system) and surface water limits (for discharge to Plum Creek).

VOC	Max. Grnd. Wtr. Conc. (ug/l)	Grnd. Water Limit (ug/l)	Removal Eff.	Surf. Water Limit (ug/l)	Removal Eff.
TCE	180	5	97%	11	94%
TCA	160	5	97%	20	88%
DCA	100	5	95%	30	70%
DCE	80	5	94%	30	63%

As stated previously, no treatment of the air discharges from an air stripping treatment system would be required. The alternatives presented below each consist of an extraction well and treatment system with different options for discharge. The process options screening for this objective is summarized in Table 7.

Alternative D-1 consists of installing an extraction (interceptor) well along the downgradient boundary of the Signore Facility, constructing a treatment system and discharging the treated ground water to a local stream, Plum Creek. Specific elements of this alternative consist of the following.

- Prepare plans and specifications for the project for approval by the NYSDEC.
- Install an extraction (interceptor) well capable of producing 175-250 gpm to a maximum depth of 75 feet, the bottom of the coarser-grained portion of the aquifer.
- Construct a treatment unit for the interceptor well consisting of a packed column air stripping tower or a granular activated carbon adsorption vessel.
- Construct a water line to discharge the treated ground water to Plum Creek, approximately 50 feet from the interceptor well.
- Install controls for automatic, continuous operation of the interceptor well/treatment system.
- Prepare a discharge monitoring plan for sampling effluent from the treatment system for approval by the NYSDEC.

Alternative D-2 consists of installing an extraction (interceptor) well along the downgradient boundary of the Signore Facility, constructing a treatment system and discharging the treated ground water into injection wells at the north, upgradient, end of the Facility to enhance the extraction process by raising the hydraulic gradient and increasing ground water flow. Specific elements of this alternative consist of the following.

- Prepare plans and specifications for the project for approval by the NYSDEC.

- Install an extraction (interceptor) well capable of producing 175-250 gpm to a maximum depth of 75 feet, the bottom of the coarser-grained portion of the aquifer.

- Construct a treatment unit for the interceptor well consisting of a packed column air stripping tower or a granular activated carbon adsorption vessel.

- Install at least two injection wells along the north end of the Signore Facility building each capable of recharging 100-150 gpm to maximum depths of 50 feet, the bottom of the coarser-grained portion of the aquifer.

- Construct a water line to discharge the treated ground water to the injection wells, approximately 1300 feet from the interceptor well.

- Install controls for automatic, continuous operation of the interceptor well/treatment/ injection system.

- Prepare a discharge monitoring plan for sampling effluent from the treatment system for approval by the NYSDEC.

<u>Alternative D-3</u> consists of installing an extraction (interceptor) well along the downgradient boundary of the Signore Facility, constructing a treatment system and discharging the treated ground water with two options for discharge; into the Town of Ellicottville water distribution system or to Plum Creek. Controls, valving and a booster pump would have to be installed so that on demand in the distribution system, the effluent from the treatment system could be sent into the water distribution system

and at other times, when there is no demand on Town distribution system, the discharge would switch over to Plum Creek. Specific elements of this alternative consist of the following.

- Prepare plans and specifications for the project for approval by the County Department of Health, NYSDOH and NYSDEC.
- Install an extraction (interceptor) well capable of producing 175-250 gpm to a maximum depth of 75 feet, the bottom of the coarser-grained portion of the aquifer.
- Construct a treatment unit for the interceptor well consisting of a packed column air stripping tower or a granular activated carbon adsorption vessel.
- Construct a water line to discharge the treated ground water to Plum Creek, approximately 50 feet from the interceptor well.
- Construct a water line with valving and a booster pump to the 10-inch watermain on the east side of State Route 219, approximately 250 feet from the interceptor well.
- Install controls for automatic, continuous operation of the interceptor well/treatment system so that discharge goes to Plum Creek and on demand the discharge switches to the Town water distribution system.
- Prepare a discharge monitoring plan for sampling effluent from the treatment system for approval by the NYSDEC.

The time required to meet the objective is unknown. The operation of the interceptor well system will have to be monitored by sampling on-site monitoring wells to evaluate the change in VOC concentrations in the ground water. These alternatives, presented above, are likely to require a lengthy time frame. However, operation of the interceptor well will prevent off-site migration of VOC contaminants which will aid in meeting Objective C, restoring the aquifer between Signore and the Town Well.

5.3 PRELIMINARY REMEDIAL ALTERNATIVES SCREENING

In summary, the preliminary remedial alternatives are listed below.

- Alternative A-1 - Extend Water District
- Alternative A-2 - Individual Carbon Treatment
- Alternative A-3 - New Water District/Municipal Well

- Alternative B-1 - Off-Site Interceptor Well
- Alternative B-2 - Town Well Treatment

- Alternative D-1 - Site Interceptor Well/Stream Discharge
- Alternative D-2 - Site Interceptor Well/Injection Well
- Alternative D-3 - Site Interceptor Well/System Discharge

The final remedial alternatives which undergo detailed analysis are selected from the above list of eight preliminary remedial alternatives on the basis of effectiveness and implementability. The USEPA (October 1988) recognizes cost as one of the criteria for screening of preliminary remedial alternatives but the NYSDEC (May 1990) does not.

5.3.1 Effectiveness Evaluation

The effectiveness of the preliminary remedial alternatives is evaluated based on the extent, both short-term and long-term, to which they will eliminate significant threats to public health and the environment and reduce toxicity, mobility and volume of hazardous wastes. The effectiveness of each of the preliminary alternatives are discussed below by Remedial Action Objective.

Objective A - Provide Water to Residences. Reducing the toxicity, mobility and volume of hazardous waste is not part of this objective; this objective is specifically for protection of human health. Alternatives A-1, A-2 and A-3 are equally effective, both short-term and long-term, in protecting human health.

Objective B - Protect Town Well/Prevent Downgradient Flow. Alternatives B-1 and B-2 are equally effective in the long-term in protecting human health, however Alternative B-2 (Town Well Treatment) will be more effective in the short-term in protecting human health. Alternatives B-1 and B-2 are equally effective, in both the short-term and long-term, in reducing the toxicity, mobility and volume of hazardous waste.

Objective D - Restore Aquifer Beneath Signore. Alternatives D-1, D-2 and D-3 are equally effective, in both the long-term and short-term, in protecting human health and the environment and in reducing the toxicity, mobility and volume of hazardous waste.

5.3.2 **Implementability Evaluation**

The implementability of the preliminary remedial alternatives is evaluated based on the technical and administrative feasibility of constructing, operating and maintaining a remedial action alternative. The implementability of each of the preliminary alternatives are discussed below by Remedial Action Objective.

Objective A - Provide Water to Residences. Alternatives A-1, A-2 and A-3 are all technically feasible to construct, operate and maintain, however there are significant differences in the administrative feasibilities. Alternatives A-1 (Extend Water District) and A-3 (New Water District) require statutory/regulatory actions; creation of an extension to the Town Water District for Alternative A-1, creation of a new water district for Alternative A-3 and approval by the NYSDEC for both alternatives. Alternative A-3 will also have significantly more operational and maintenance difficulties, such as what entity will operate the well and treatment/distribution system for the new water district. Alternative A-1 will have virtually no operation and maintenance, as the water line extension and domestic connections will be deeded to the Town Water District. Alternative A-2 (Individual Carbon Treatment) will have some operation and maintenance involved with monitoring the effectiveness of the carbon units to decide when to change.

Objective B - Protect Town Well/Prevent Downgradient Flow. Alternatives B-1 and B-2 are both technically and administratively feasible to construct, operate and maintain. Alternative B-2 (Treat Town Well), however, will require more "hands-on" operation, and thus, will be more difficult to operate.

Objective D - Restore Aquifer Beneath Signore. Alternatives D-1, D-2 and D-3 are technically feasible to construct, operate and maintain. Alternatives D-1 (Site Interceptor Well/Stream Discharge) and D-2 (Site Interceptor Well/Injection Wells) are administratively feasible to construct, operate and maintain, however Alternative D-2 will require approval from the NYSDEC to recharge the treated ground water back into the aquifer. Alternative D-3 (Site Interceptor Well/System Discharge) has significant administrative difficulties; approval will be required from the County and State Health Departments before discharging to the Town Water District distribution system and operationally it will be difficult to ensure that the treated water is discharged to the system at proper pressure without backing up into the Interceptor Well System.

5.3.3 **Final Alternatives Selection**

The final alternatives selected to undergo detailed analysis are listed below.

- Alternative A-1 - Extend Water District
- Alternative A-2 - Individual Carbon Treatment

- Alternative B-1 - Off-Site Interceptor Well
- Alternative B-2 - Town Well Treatment

- Alternative D-1 - Site Interceptor Well/Stream Discharge
- Alternative D-2 - Site Interceptor Well/Injection Well

Because of the significant administrative feasibility difficulties in implementing Alternative A-3 (New Water District) and

Alternative D-3 (Site Interceptor Well/Water System Discharge), they have been eliminated from further consideration.

6.0 **DETAILED ANALYSIS OF FINAL REMEDIAL ALTERNATIVES**

This section presents the detailed analysis of the final remedial alternatives selected in the previous section, which provides the rationale for selection of the preferred alternative. The procedure for performing this detailed analysis is described in detail in the NYSDEC guidance document entitled, "Selection of Remedial Actions at Inactive Hazardous Waste Sites" (NYSDEC, May 1990).

6.1 DETAILED ANALYSIS CRITERIA

The NYSDEC guidance document (NYSDEC, May 1990) presents seven criteria that are used to perform the detailed analysis of the remedial alternatives; these criteria are presented on Figure 2 and listed below.

Compliance With SCGs is used to determine how each alternative complies with applicable or relevant and appropriate New York State Standards, Criteria and Guidelines.

Protection of Human Health and the Environment provides a final check to assess whether each alternative meets the requirement that it is protective of human health and the environment.

Short-Term Effectiveness assesses the effects of each alternative on human health and the environment during the construction and implementation phase until remedial response objectives are met.

Long-Term Effectiveness and Permanence assesses the results of each alternative in terms of its permanence and quantity/nature of waste remaining after the remedial objectives have been met.

Reduction of Toxicity, Mobility and Volume assesses each alternative's use of treatment technologies that permanently and significantly reduce toxicity, mobility or volume of the hazardous wastes.

Implementability assesses the technical and administrative feasibility of implementing each alternative and the availability of various services and materials required during the implementation.

Cost assesses the cost of each alternative and includes the capital costs and operation and maintenance costs.

6.2 DETAILED ANALYSIS OF ALTERNATIVES

The detailed analysis of each of the selected final remedial alternatives was made using the criteria listed above. In addition, the NYSDEC guidance document presents tables to use to assign a numerical score to the analysis (NYSDEC, May 1990, Tables

5.2 - 5.7). Copies of these tables, which were filled out for each of the alternatives discussed below, are presented in Appendix A. The analysis of each alternative and the NYSDEC remedial scores are presented below.

6.2.1 **Alternative A-1 - Extend Water District**

This alternative, which is intended to meet Objective A (provide water meeting State drinking water standards to residences with domestic wells between Signore and Town Well), consists of extending the Town Water District water distribution system into the area between Signore and the Town Well and connecting the 33 residences in that area to the distribution system.

Compliance With SCGs. This alternative complies with the SCGs because the residences will be provided the Town municipal water supply which meets NYSDOH MCLs.

Protection of Human Health and the Environment. This alternative is fully protective of human health and the environment because the impacted domestic well water supplies are replaced with the Town water supply.

Short-Term Effectiveness. This alternative will have no human health or environmental impacts during construction and implementation. In addition, the objective will be achieved immediately after implementation because the impacted domestic well water supplies are replaced with the Town water supply.

<u>Long-Term Effectiveness and Permanence</u>. Because this alternative involves connection of the residences to the municipal water supply, it is considered permanent. Other alternatives will deal with the residual waste (the contaminated ground water remaining in the area between Signore and the Town Well) remaining after this alternative is implemented.

<u>Reduction of Toxicity, Mobility and Volume</u>. The objective of this alternative is not to reduce the hazardous wastes remaining in the ground water between Signore and the Town Well. As stated above, that is the subject of other alternatives.

<u>Implementability</u>. This alternative is technically feasible; there are no technical difficulties, the technology is reliable, no future remedial actions will be necessary and no monitoring of the effectiveness will be required. This alternative is also administratively feasible; prior to construction, however, the Town will have to approve extending the boundaries of the Water District to include the area and the County and State Health Departments will have to approve the plans and all necessary equipment, services and materials are readily available. In addition, the Town should place restrictions on future ground water use by prohibiting new domestic water wells.

Cost. The estimated capital and operations and maintenance costs for this alternative are presented in Appendix B.

6.2.2 **Alternative A-2 - Individual Carbon Treatment**

This alternative, which is intended to meet Objective A (provide water meeting State drinking water standards to residences with domestic wells between Signore and Town Well), consists of installing granular activated carbon adsorption units to treat the domestic well water in each of the 33 residences between Signore and the Town Well.

Compliance With SCGs. This alternative complies with the SCGs because the domestic wells will be individually treated to meet NYSDOH MCLs.

Protection of Human Health and the Environment. This alternative is fully protective of human health and the environment because the impacted domestic well water supplies are treated.

Short-Term Effectiveness. This alternative will have no human health or environmental impacts during construction and implementation. In addition, the objective will be achieved immediately after implementation because the impacted domestic well water supplies will be immediately treated.

Long-Term Effectiveness and Permanence. This alternative is not considered permanent because the individual residences will have their domestic water supply treated as an interim remedial measure while the contaminated ground water in the area between Signore and the Town Well is being restored, which is the objective of other alternatives.

Reduction of Toxicity, Mobility and Volume. The objective of this alternative is not to reduce the hazardous wastes remaining in the ground water between Signore and the Town Well. As stated above, that is the subject of other alternatives.

Implementability. This alternative is technically feasible; there are no technical difficulties, the technology is reliable, no future remedial actions will be necessary, however monitoring will be required to determine when the carbon treatment units should be changed. This alternative is also administratively feasible; no coordination with the regulatory agencies will be necessary prior to implementation and all necessary equipment, services and materials are readily available.

Cost. The estimated capital and operations and maintenance costs for this alternative are presented in Appendix B.

6.2.3 **Alternative B-1 - Off-Site Interceptor Well**

This alternative, which is intended to meet Objective B (reduce volatile organic contaminants in Town Well to below appropriate levels and prevent volatile organic contaminants from moving downgradient beyond Town Well), consists of installation of an extraction well upgradient of the Town Well and construction of discharge piping and controls to discharge the untreated recovered ground water to a nearby stream.

Compliance With SCGs. This alternative complies with the SCGs because the interceptor well is designed to capture contaminants before they can reach the Town Well, thus reducing the VOC concentrations to below NYSDOH MCLs. In addition, the discharged ground water will meet the VOC discharge limits to surface water.

Protection of Human Health and the Environment. This alternative is fully protective of human health and the environment because the Town Well is protected by the interceptor well capturing contaminants before they can reach the Town Well.

Short-Term Effectiveness. This alternative will have no human health or environmental impacts during construction and implementation. There will be an unknown amount of time required for the interceptor well to capture contaminants in the aquifer sufficiently to reduce the VOC contaminants in the ground water at the Town Well to below MCLs, therefore the objectives will not be immediately met.

Long-Term Effectiveness and Permanence. This alternative is not considered permanent. The interceptor well will continue to capture ground water contamination as a protection for the Town Well and to restore the aquifer between Signore and the Town Well. No residual wastes will remain after the remedial action objectives have been met because contaminant concentrations in the ground water will be reduced to below acceptable levels.

Reduction of Toxicity, Mobility and Volume. This remedial action is being implemented at the leading edge of the contamination, therefore no wastes will remain in the ground. No treatment is required because the recovered ground water meets surface water limits for discharge.

Implementability. This alternative is technically feasible; there are no technical difficulties, the technology is reliable, no future remedial actions will be necessary, however monitoring of the discharge will be required to ensure that surface water discharge limits are met and ground water monitoring will be required to ensure that the VOC contaminant concentrations at the Town Well are reduced to acceptable levels. This alternative is also administratively feasible; NYSDEC approval of the interceptor well and discharge system plans and specifications is required before construction and NYSDEC approval of the discharge plan is required before operation.

Cost. The estimated capital and operations and maintenance costs for this alternative are presented in Appendix B.

6.2.4 **Alternative B-2 - Town Well Treatment**

This alternative, which is intended to meet Objective B (reduce volatile organic contaminants in Town Well to below appropriate levels and prevent volatile organic contaminants from moving downgradient beyond Town Well), consists of pumping the Town Well as an interceptor well to prevent contaminants from moving downgradient and construction for two discharge options (choice of discharge options depends on the Town water distribution system demands); construction of discharge piping and controls to discharge untreated ground water from the Town Well to a nearby stream and construction of a packed column air stripper or granular activated carbon adsorption vessel treatment system with controls and piping to discharge into the Town municipal water distribution system.

Compliance With SCGs. This alternative complies with the SCGs because under the two discharge options, the recovered ground water from the Town Well will be treated before discharging to the Town distribution system or the recovered ground water, which already meets VOC discharge limits to surface water, will be discharged to the local stream.

Protection of Human Health and the Environment. This alternative is fully protective of human health and the environment because the water from the Town Well is treated prior to use as a municipal water source and, under continuous operation, the Town Well is preventing the further downgradient contaminant migration.

Short-Term Effectiveness. This alternative will have no human health or environmental impacts during construction and implementation. In addition, the objective will be achieved immediately after implementation because the recovered ground water from the Town Well is treated prior to use as a municipal water supply source, thus reducing the VOC contaminant concentrations to acceptable levels.

Long-Term Effectiveness and Permanence. This alternative is not considered permanent. The Town Well will continue to capture ground water contamination to restore the aquifer between Signore and the Town Well and the recovered ground water will continue to be treated prior to discharge to the Town distribution system as long as the VOC contaminant concentrations are above NYSDOH MCLs. No residual wastes will remain after the remedial action objectives have been met because contaminant concentrations in the ground water will be reduced to below acceptable levels.

Reduction of Toxicity, Mobility and Volume. This remedial action is being implemented downgradient of the source area and therefore no wastes will remain in the ground. For recovered ground water being discharged to the Town distribution system, treatment will be used which is not considered a destructive technology, however, air stripping and carbon adsorption are considered "Best Available Technologies" for treating VOCs in ground water. For recovered ground water being discharged to the local stream, no treatment is required because the recovered ground water meets surface water limits for discharge.

Implementability. This alternative is technically feasible; there are no technical difficulties, the technology is reliable, no future remedial actions will be necessary, however monitoring of the discharge will be required to ensure that surface water discharge limits are met and ground water monitoring will be required to ensure that the VOC contaminant concentrations at the Town Well are reduced to acceptable levels. This alternative is also administratively feasible; Cattaraugus County DOH, the Town of Ellicottville, NYSDEC and NYSDOH approval of the treatment and controls and discharge system plans and specifications are required before construction and NYSDEC approval of the discharge plan is required before operation.

Cost. The estimated capital and operations and maintenance costs for this alternative are presented in Appendix B.

6.2.5 **Alternative D-1 - Site Interceptor Well/Stream Discharge** This alternative, which is intended to meet Objective D (restore aquifer beneath Signore by reducing volatile organic contaminants to below appropriate levels), consists of installation of an extraction well along the downgradient Signore property boundary and construction a packed column air stripper or granular activated carbon adsorption vessel and discharge piping and controls to discharge the treated recovered ground water to Plum Creek.

Compliance With SCGs. This alternative complies with the SCGs because the interceptor well is designed to prevent off-site migration of VOC contaminants with the goal for the restoration of the aquifer beneath the Signore Facility to NYSDOH MCLs. In addition, the discharged ground water will meet the VOC discharge limits to surface water and the air discharged from treatment will meet air discharge limits.

Protection of Human Health and the Environment. This alternative is fully protective of human health and the environment because off-site migration of VOC contaminated ground water is being prevented and the recovered ground water is being treated prior to discharge to Plum Creek.

Short-Term Effectiveness. This alternative will have no human health or environmental impacts during construction and implementation. There will be an unknown amount of time required for the interceptor well to capture contaminants in the aquifer sufficiently to restore the aquifer beneath Signore by reducing the VOC contaminants in the ground water, therefore the objectives will not be immediately met.

Long-Term Effectiveness and Permanence. This alternative is not considered permanent. The on-site interceptor well will continue to capture ground water contamination to restore the aquifer beneath Signore as long as VOC contaminant concentrations in the ground water beneath the Facility are above State Drinking Water Standards and the recovered ground water will continue to be treated prior to discharge Plum Creek as long as the recovered ground water is above discharge limits to surface water. Some residual wastes will remain in the soil beneath the Signore Facility after the objectives have been met but these wastes will be at such levels that they will not be a continuing source of VOC ground water contamination.

Reduction of Toxicity, Mobility and Volume. This remedial action will result in residual wastes remaining in the ground that can not be removed by pumping but as stated above these wastes will be at such levels that they will not be a continuing source of VOC ground water contaminations. The recovered ground water will be treated by a method which is not considered a destructive technology, however, air stripping and carbon adsorption are considered "Best Available Technologies" for treating VOCs in ground water.

Implementability. This alternative is technically feasible; there are no technical difficulties, the technology is reliable, no future remedial actions will be necessary, however monitoring of the discharge will be required to ensure that surface water discharge limits are met and ground water monitoring will be required to ensure that the VOC contaminant concentrations are being reduced to acceptable levels. This alternative is also administratively feasible; NYSDEC approval of the plans and specifications for the interceptor well, treatment, controls and discharge system plans and specifications are required before construction and NYSDEC approval of the discharge plan is required before operation.

Cost. The estimated capital and operations and maintenance costs for this alternative are presented in Appendix B.

6.2.6 **Alternative D-2 - Site Interceptor Well/Injection Well**

This alternative, which is intended to meet Objective D (restore aquifer beneath Signore by reducing volatile organic contaminants to below appropriate levels), consists of installation of an extraction well along the downgradient Signore property boundary, installation of injection wells north of the Signore Facility and construction a packed column air stripper or granular activated carbon adsorption vessel and discharge piping and controls to discharge the treated recovered ground water to the injection wells.

Compliance With SCGs. This alternative complies with the SCGs because the interceptor well is designed to prevent off-site migration of VOC contaminants with the goal for the restoration of restoring the aquifer beneath the Signore Facility to NYSDOH MCLs. In addition, the discharged ground water will meet the VOC discharge limits to ground water and the air discharged from treatment will meet air discharge limits.

Protection of Human Health and the Environment. This alternative is fully protective of human health and the environment because off-site migration of VOC contaminated ground water is being prevented and the recovered ground water is being treated prior to discharge to the ground water.

Short-Term Effectiveness. This alternative will have no human health or environmental impacts during construction and implementation. There will be an unknown amount of time required for the interceptor well to capture contaminants in the aquifer sufficiently to restore the aquifer beneath Signore by reducing the VOC contaminants in the ground water, therefore the objectives will not be immediately met.

Long-Term Effectiveness and Permanence. This alternative is not considered permanent. The on-site interceptor well will continue to capture ground water contamination to restore the aquifer beneath Signore as long as VOC contaminant concentrations in the ground water beneath the Facility are above appropriate levels and the recovered ground water will continue to be treated prior to discharge to ground water. Some residual wastes will remain in the soil beneath the Signore Facility after the objectives have been met but these wastes will be at such levels that they will not be a continuing source of VOC ground water contamination.

Reduction of Toxicity, Mobility and Volume. This remedial action will result in residual wastes remaining in the ground that can not be removed by pumping but as stated above these wastes will be at such levels that they will not be a continuing source of VOC ground water contaminations. The recovered ground water will be treated by a method which is not considered a destructive technology, however, air stripping and carbon adsorption are considered "Best Available Technologies" for treating VOCs in ground water.

Implementability. This alternative is technically feasible, however there are technical difficulties with recharging treated ground water into the aquifer; the chemistry of the recharge water and the hydraulic dynamics of the aquifer must be thorougly evaluated to design the system. In addition, monitoring of the discharge will be required to ensure that ground water discharge limits are met and ground water monitoring will be required to ensure that the VOC contaminant concentrations are being reduced to acceptable levels. This alternative is also administratively feasible; NYSDEC approval of the plans and specifications for the interceptor well, treatment, controls and discharge system plans and specifications are required before construction and NYSDEC approval of the discharge plan is required before operation. Approval of this alternative will be more difficult because injection of treated water is not a favored option for the regulatory agencies.

Cost. The estimated capital and operations and maintenance costs for this alternative are presented in Appendix B.

6.3 DETAILED ANALYSIS SUMMARY

The NYSDEC scorings of the final remedial alternatives are presented in Table 8. When comparing the alternatives for each objective, Alternative A-1 (Extend Water District) outscored Alternative A-2 (Individual Carbon Treatment). Alternative B-1 (Off-Site Interceptor Well) and Alternative B-2 (Town Well Treatment) have nearly identical scores and their costs are similar. Also, Alternative D-1 (Site Interceptor Well/Stream Discharge) and Alternative D-2 (Site Interceptor Well/Injection Well) have nearly identical scores, however the costs for Alternative D-2 are significantly higher.

7.0 REMEDIAL ALTERNATIVES RECOMMENDATIONS

As a result of the detailed analysis of the final remedial alternatives presented in Section 6.0, preferred remedial alternatives are recommended for each objective.

For Objective A, Provide Water to Residences, Alternative A-1, Extend Water District, is recommended over Alternative A-2, Individual Carbon Treatment, because connection of the residences to the Town water distribution system is a permanent measure to ensure a supply of water meeting State standards. Individual treatment is considered an interim measure that would require monitoring to determine frequency of change of the carbon filters to ensure proper treatment of the domestic water supply wells. Additionally, Alternative A-1 scored substantially higher than Alternative A-2 in the NYSDEC scoring for detailed analysis of remedial alternatives.

For Objective B, Protect Town Well/Prevent Downgradient Flow, Alternative B-1, Off-Site Interceptor Well, and Alternative B-2, Town Well Treatment, are equally ranked in the NYSDEC scoring for detailed analysis of remedial alternatives. Alternative B-2 would ensure immediate compliance of the Town Well with NYSDOH MCLs through treatment but operation with two different discharge options would be more difficult. The discharge options are required because the Town Well would need to be operated continuously to prevent downgradient migration of any VOC contaminants and the Town water distribution system demand does not require continuous operation. The interceptor well with discharge to the local stream would, thus be a simpler operation. Additionally, treatment of the Town Well was one of the options reviewed during development of the Interim Remedial Measures project but the Town of Ellicottville did not want a treatment system for the well. The Town's preferred option was an upgradient interceptor well.

For Objective D, Restore Aquifer Beneath Signore, Alternative D-1, Site Interceptor Well/Stream Discharge, is recommended over Alternative D-2, Site Interceptor Well/Injection Well, despite the close ranking in the NYSDEC scoring for detailed analysis of remedial alternatives. Both alternatives consist of an interceptor well and treatment system. The differences are in the method of discharge. The discharge of treated recovered ground water into injection wells upgradient of the Signore Facility buildings will required more "hands-on" operation and more maintenance in the form of injection well redevelopment than discharge to Plum Creek. In addition, the advantage of injecting water upgradient of an extraction well, which is to raise the hydraulic gradient and thus increase the flow toward the extraction well, will not be effective in this hydrogeologic setting. The hydraulic conductivity of the aquifer beneath Signore is so high that no substantial increase in hydraulic gradient will be created and thus no substantial increase in ground water flow towards the extraction well will occur. Under Alternative D-1, the recovered ground water from the on-site extraction well should be treated by air stripping with a packed column stripping tower. As shown in Appendix B, the overall lower operations and maintenance costs for the stripping tower make it the preferred treatment over carbon adsorption, given the high ground water recovery rates. Additionally, the relatively low influent VOC contaminant concentrations are anticipated to result in air discharges below State standards, thus making it unnecessary to treat the off-gas from the stripper. Treatment by carbon adsorption will require that the carbon be replaced periodically from the carbon treatment unit; this carbon will have to be transported off-site for disposal, destruction or regeneration.

Objective C, Restore Aquifer Between Signore and Town Well, will be met by implementation of the recommended alternatives for Objectives B and D, the interceptor well system upgradient of the Town Well and the on-site interceptor well/treatment system at the downgradient boundary of the Signore Facility.

Of the three recommended remedial alternatives, the extension of the Town water distribution system and the off-site interceptor well are completed and in operation. The on-site interceptor well system is scheduled for completion in January 1992. Thus, it is the conclusion of the FS Report that no additional remedial measures are needed at this time.

8.0 REFERENCES

Dames and Moore, June 1987a, Report on Oil and Hazardous Material Site Evaluation, American Locker Group, Inc., Signore Division, Ellicottville, New York: prepared for Kirkpatrick & Lockhart, Pittsburgh, Pennsylvania.

Dames & Moore, June 1987b, Report on Ground Water Study, American Locker Group,Inc., Signore Division, Ellicottville, New York: prepared for Kirkpatrick & Lockhart, Pittsburgh, Pennsylvania.

Dames and Moore, June 1987c, Report on Water Supply Well Sampling and Analysis, Ellicottville, New York: prepared for the Cattaraugus County Department of Health, Olean, New York.

Ground Water Associates, Inc., November 9, 1987, Letter Report on Ground Water Sampling Results (9/23/87), Ellicottville Signore Plant: prepared for American Locker Group, Inc., Jamestown, New York.

Ground Water Associates, Inc., December 21, 1987, Letter Report on Sampling Results MW-5S: prepared for American Locker Group, Inc., Jamestown, New York.

Ground Water Associates, Inc., June 21, 1989, Letter Report on Ground Water Sampling Results, Ellicottville, New York: prepared for the Cattaraugus County Department of Health, Olean, New York.

Hydro Group, Inc., October 1990, Specifications for the Installation of an Interceptor Well and Pumping System, Interim Remediation Project, Signore, Inc., Ellicottville, New York: prepared for Lozier/Ground Water Associates and Signore, Inc.

Hydro Group, Inc., July 1991, Specifications for the On-Site Interceptor Well System, Signore, Inc. Ellicottville, New York: prepared for Lozier/Ground Water Associates and Signore, Inc.

Lozier Architects/Engineers, May 1990, Basis of Design Report for the Public Water Supply Connections, Interim Remedial Measures, Signore Site, Ellicottville, New York: prepared for Signore, Inc., Ellicottville, New York.

Lozier Architects/Engineers, July 1990, Contract Documents Including Bidding and Contract Requirements for the Construction of Ellicottville Town Water Line Extension: prepared for Lozier/Ground Water Associates and Signore, Inc.

Lozier/Ground Water Associates, February 1990, Work Plan, Remedial Investigation and Feasibility Study, Signore Site, Ellicottville, New York: prepared for Signore, Inc., Ellicottville, New York.

Lozier/Ground Water Associates, May 1990, Work Plan, Interim Remedial Measures, Signore Site, Ellicottville, New York: prepared for Signore, Inc., Ellicottville, New York.

Lozier/Ground Water Associates, August 1990, Interceptor Well Assessment, Signore, Inc. IRM Project, Ellicottville, New York: prepared for Signore, Inc., Ellicottville, New York.

Lozier/Ground Water Associates, March 1991, Work Plan, On-Site Interceptor Well, Signore IRM Project, Ellicottville, New York: prepared for Signore, Inc., Ellicottville, New York.

Lozier/Ground Water Associates, April 1991, Remedial Investigation Report, Signore Facility, Ellicottville, New York, 2 volumes: prepared for Signore, Inc., Ellicottville, New York.

Lozier/Ground Water Associates, May 1991, Basis of Design Report, On-Site Interceptor Well System, Signore RI/FS Project, Ellicottville, New York: prepared for Signore, Inc., Ellicottville, New York.

Malcolm Pirnie, Inc., February 1989, Water Supply Evaluation, Town of Ellicottville, New York, Village of Ellicottville, New York: prepared for the Town of Ellicottville, New York.

Malcolm Pirnie, Inc., January 1990, Water Supply Plan, Town of Ellicottville, New York, Village of Ellicottville, New York: prepared for the Town of Ellicottville, New York.

New York State Department of Environmental Conservation, March 1986, New York State Codes, Rules and Regulations, Title 6, Chapter X, Parts 700-705.

New York State Department of Environmental Conservation, Division of Air, September 1989, New York State Air Guide - 1, Guidelines for the Control of Toxic Ambient Air Contaminants.

New York State Department of Environmental Conservation, May 1990, Technical and Administrative Guidance Memorandum for the Selection of Remedial Actions at Inactive Hazardous Waste Sites, NYSDEC Publication HWR-90-4030.

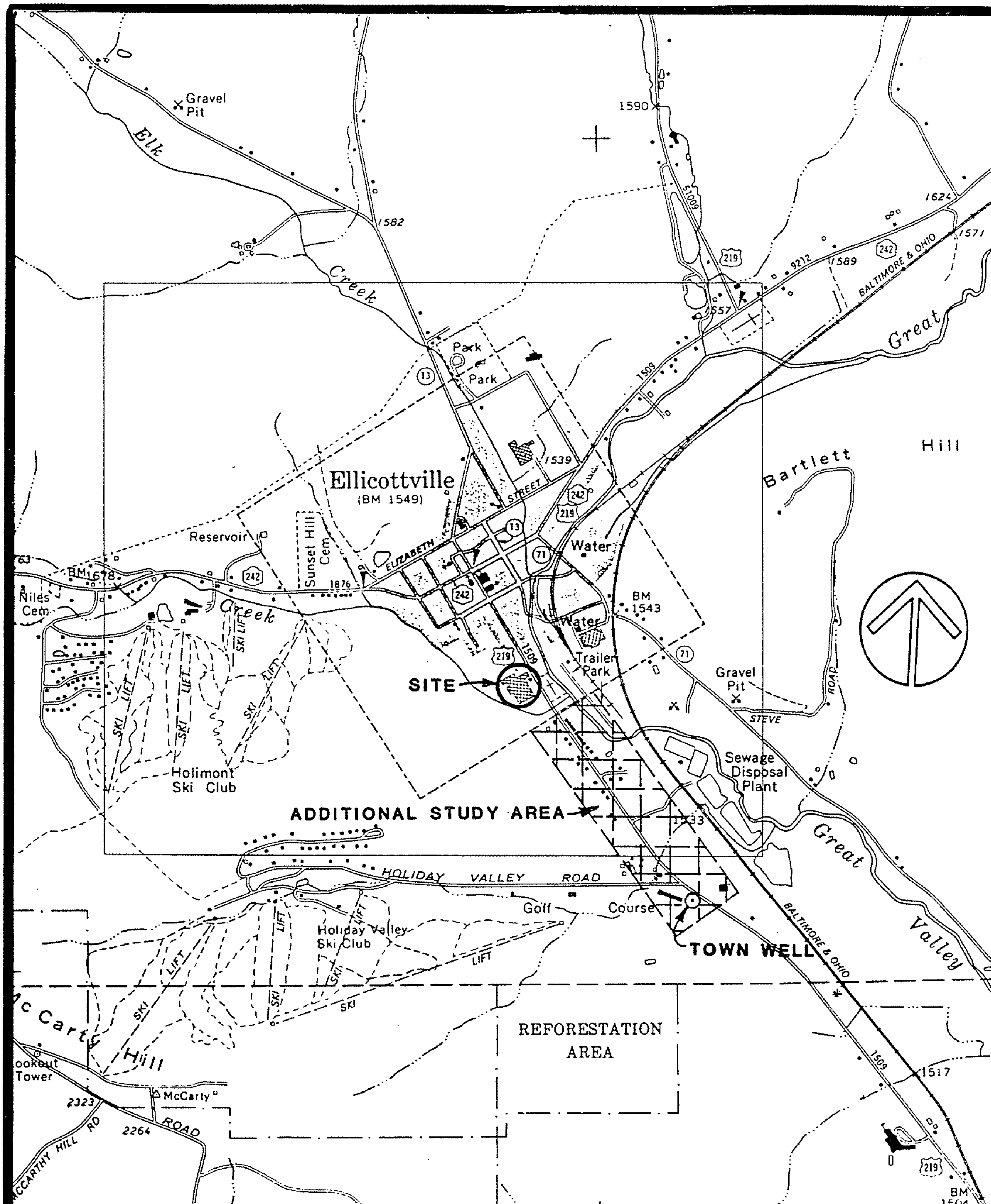
New York State Department of Health, January 1990, Public Health Law 225, Chapter I - State Sanitary Code, Part 5 - Drinking Water Supplies, Subpart 5-1 - Public Water Supplies.

U. S. Environmental Protection Agency, October 1988, Guidance For Conducting Remedial Investigation and Feasibility Studies Under CERCLA (Interim Final): OSWER Directive 9335.3-01, Office of Emergency and Remedial Response, U. S. Environmental Protection Agency, Washington, D.C.

U. S. Environmental Protection Agency, December 1989, Risk Assessment Guidance for Superfund, Volume I., Human Health Evaluation Manual (Part A), (Interim Final): EPA 540/1-89/002, Office of Emergency and Remedial Response, U. S. Environmental Protection Agency, Washington, D.C.

FIGURES

FIGURES



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

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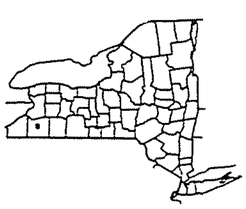

QUADRANGLE LOCATION

Ellicottville, New York

ELLICOTTVILLE QUADRANGLE

SECOND EDITION - 1975

FIGURE 1
STUDY AREA
LOCATION MAP

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS, CRITERIA AND GUIDELINES (SCGs)(10)

- °Compliance With Contaminant-Specific SCGs
- °Compliance With Action-Specific SCGs
- °Compliance With Location-Specific SCGs

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT (20)

- °Environmental Impacts
- °Transport of Hazardous Materials
- °Health Impacts

SHORT-TERM EFFECTIVENESS (10)

- °Protection of Community During Remedial Actions
- °Protection of Workers During Remedial Actions
- °Environmental Impacts
- °Time Until Remedial Action Objectives Are Achieved

LONG-TERM EFFECTIVENESS & PERMANENCE (15)

- °Magnitude of Residual Risk
- °Adequacy of Controls
- °Reliability of Controls

REDUCTION OF TOXICITY, MOBILITY AND VOLUME (15)

- °Treatment Process Used and Materials Treated
- °Amount of Hazardous Materials Destroyed or Treated
- °Degree of Expected Reductions in Toxicity, Mobility and Volume
- °Degree to Which Treatment is Irreversible
- °Type and Quantity of Hazardous Residuals Remaining After Treatment

IMPLEMENTABILITY (15)

- °Ability to Construct and Operate the Technology
- °Reliability of the Technology Based on its Acceptable Demonstrations
- °Ease of Undertaking Additional Remedial Actions, if Necessary
- °Ability to Monitor Effectiveness of Remedy
- °Availability of Necessary Equipment and Specialists
- °Timing of New Technology Under Consideration

COST (15)

- °Immediate Capital Costs
- °Operating and Maintenanc Costs
- °Future Capital Costs
- °Cost to Future Land Use
- °Present Worth Cost

FIGURE 2

REMEDIAL ALTERNATIVES DETAILED ANALYSIS CRITERIA

SIGNORE FEASIBILITY STUDY REPORT
ELLICOTTVILLE, NEW YORK

TABLES

TABLES

TABLE 1

REMEDIAL ACTION OBJECTIVES

SIGNORE FEASIBILITY STUDY REPORT
ELLICOTTVILLE, NEW YORK

(A) Provide water meeting State drinking water standards to residences with domestic wells between Signore and Town Well.

(B) Reduce volatile organic contaminants in Town Well to below appropriate levels and prevent volatile organic contaminants from moving downgradient beyond Town Well.

(C) Restore aquifer between Signore and Town Well by reducing volatile organic contaminants to below appropriate levels.

(D) Restore aquifer beneath Signore by reducing volatile organic contaminants to below appropriate levels.

TABLE 2

GENERAL RESPONSE ACTIONS

SIGNORE FEASIBILITY STUDY REPORT
ELLICOTTVILLE, NEW YORK

	Remedial Action Objectives			
	(A)	(B)	(C)	(D)
No Action	•	•	•	•
Institutional Actions	•	•		
Containment Actions				•
Collection Actions	•	•	•	•
Treatment Actions	•	•	•	•
Discharge Actions	•	•	•	•

NOTE: "•" - indicates potentially appropriate general response action for the remedial action objective

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Objective A - provide uncontaminated potable water to residences with domestic wells between Signore and Town Well

Objective B - protect Town Well and prevent contaminants from moving downgradient beyond Town Well

Objective C - restore aquifer between Signore and Town Well

Objective D - restore aquifer beneath Signore

TABLE 3

REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS DESCRIPTIONS
SIGNORE FEASIBILITY STUDY REPORT
ELLICOTTVILLE, NEW YORK

General Response Actions	Remedial Technology	Process Options	Description	Preliminary Implementability Screening Comments
No Action	None	None	No action.	Not applicable, Interim Remedial Measures already in place.
Institutional	Restricted Ground Water Use	Statutory/Deed Restrictions	Statutory code or deed restrictions prohibiting wells in area between Signore and Town Well.	Potentially applicable to prevent new wells being drilled in contaminated area.
	Monitoring	Ground Water Monitoring	On-going sampling of monitoring, domestic, municipal and interceptor wells.	Not applicable, contamination already present in aquifer.
	Alternative Water Supply	Existing Municipal Water	Connect residences in area between Signore and Town Well to Town distribution system.	Potentially applicable.
		New Municipal Well	Install new well with treatment and build distribution line to residences in affected area.	Potentially applicable.
		New Individual Domestic Wells	Relocate or deepen individual domestic wells in affected area.	Not feasible, no suitable replacement locations and can not deepen wells.
Containment	Capping	Clay and Soil	Install compacted clay covered with soil over contaminated areas.	Not applicable, capping will not limit recharge to aquifer.
		Asphalt	Apply layer of asphalt and sealer over contaminated areas.	Not applicable, capping will not limit recharge to aquifer.
		Concrete	Install concrete slab over contaminated areas.	Not applicable, capping will not limit recharge to aquifer.
		Synthetic and Soil	Install compacted clay and synthetic membrane covered with soil over contaminated areas.	Not applicable, capping will not limit recharge to aquifer.
	Vertical Physical Barrier	Sheet Piling	Install sheet piling around ground water contaminated area to total depth of contamination.	Not feasible, nothing to tie barrier into above bedrock, which is greater than 75 ft.
		Slurry Wall	Install trench backfilled with soil/cement/bentonite slurry around and to total depth of contam.	Not feasible, nothing to tie barrier into above bedrock, which is greater than 75 ft.
		Grout Curtain	Pressure injection of grout in pattern of drilled holes around and to total depth of contamination.	Not feasible, nothing to tie barrier into above bedrock, which is greater than 75 ft.

TABLE 3 (cont.)

REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS DESCRIPTIONS
SIGNORE FEASIBILITY STUDY REPORT
ELLICOTTVILLE, NEW YORK

General Response Actions	Remedial Technology	Process Options	Description	Preliminary Implementability Screening Comments
Containment	Horizontal Physical Barrier	Liners	Install compacted clay and synthetic membrane underneath contamination.	Not applicable, no waste source to be controlled with horizontal barrier.
		Grout Injection	Pressure injection of grout at depth through closely spaced drillholes below contamination.	Not applicable, no waste source to be controlled with horizontal barrier.
	Hydraulic Control	Barrier Extraction Injection Wells	Extract from barrier extraction wells and inject into upgradient injection wells.	Not feasible, aquifer flow rate too large to control hydraulically.
Collection	Extraction	Extraction Wells	Extract contaminated water from vertical wells.	Potentially applicable.
		Extraction Injection Wells	Extract from barrier extraction wells and inject into upgradient injection wells.	Potentially applicable.
		Well Point System	Extract contamination from a header system connected to a system of individual well points.	Not applicable, not best technology to extract from high production aquifer.
	Drains	Interceptor Trench	Extract contamination from perforated pipe installed in trench backfilled with porous media.	Not applicable, not best technology to extract from high production aquifer.
Treatment	Physical Treatment	Air Stripping	Volatilization of contaminants by mixing air with water to promote mass transfer from water to air.	Potentially applicable.
		Steam Stripping	Air stripping where volatilization enhanced by pre-heating water or injecting steam.	Not applicable, contaminants of concern readily strip without heat.
		Carbon Adsorption	Adsorption of contaminants onto activated carbon by passing water through carbon column.	Potentially applicable.
		Floating Phase Separation	Gravity separation of free phase contamination from surface of ground water.	Not applicable, no free phase contamination present.
		Filtration	Removal of suspended solid contaminants by passing water through filter.	Not applicable for contaminants of concern.
		Coagulation/ Flocculation	Separation of suspended solid contaminants by addition of coagulants followed by flocculation.	Not applicable for contaminants of concern.

TABLE 3 (cont.)

REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS DESCRIPTIONS
SIGNORE FEASIBILITY STUDY REPORT
ELLICOTTVILLE, NEW YORK

General Response Actions	Remedial Technology	Process Options	Description	Preliminary Implementability Screening Comments
Treatment	Physical Treatment	Reverse Osmosis	Removal of dissolved contaminants by high pressure passage of water through semi-permeable membrane.	Not applicable for contaminants of concern.
	Chemical Treatment	Ion Exchange	Removal of dissolved contaminants by exchanging one ion for another by passing water over resin bed.	Not applicable for contaminants of concern.
		Precipitation	Chemical dissolution of contaminants by addition of chemicals and/or adjustment of pH.	Not applicable for contaminants of concern.
		Oxidation	Oxidation of contaminants using hydrogen peroxide, ozone or ozone/UV.	Potentially applicable.
	Biological Treatment	Anaerobic Reactor	Degradation of contaminants using bacteria in an anaerobic environment.	Not applicable for ground water remedial systems.
		Aerobic Suspended Growth Reactor	Degradation of contaminants using bacteria mixed with water in aerated lagoon/basin with clarifier.	Potentially applicable.
		Aerobic Fixed Film Reactor	Degradation of contaminants by passing water across bacteria grown on fixed film in aerated reactor.	Potentially applicable.
	Thermal Destruction	Incineration	Oxidation of contamiants by heating water to high temperature in presence of oxygen.	Not feasible, can not construct on-site incinerator.
	In-Situ Treatment	Vapor Recovery	Physical removal of air in vadose zone followed by carbon adsorption treatment of vapor.	Potentially applicable.
		Biological Degradation	Degradation of contaminants in ground by injection of bacteria, oxygen and nutrients into ground wtr.	Potentially applicable.
		Aeration	Stripping of contaminants in ground by injection of air into ground water.	Not applicable for contaminants of concern.
	Off-Site Treatment	POTW	Contaminated water discharged to local POTW for treatment.	Not feasible, large flow of non-nutrient water creates POTW operational problems.
		RCRA Facility	Contaminanted water collected and transported to permitted RCRA facility for treatment.	Not feasible, liablility problems associated with off-site transport.
Discharge	On-Site Discharge	Local Stream	Contaminated water, before or after treatment, discharged to adjacent stream.	Potentially applicable.

TABLE 3 (cont.)

REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS DESCRIPTIONS
SIGNORE FEASIBILITY STUDY REPORT
ELLICOTTVILLE, NEW YORK

General Response Actions	Remedial Technology	Process Options	Description	Preliminary Implementability Screening Comments
Discharge	On-Site Discharge	Injection Well	Contaminated water, before or after treatment, recharged to aquifer.	Not applicable, injection into drinking water aquifer contrary to regulations.
		Municipal Dist. System	Contaminated water, after treatment, discharged into municipal distribution system.	Potentially applicable.
	Off-Site Discharge	POTW	Contaminated water, before or after treatment, discharged to local POTW.	Not feasible, large flow of non-nutrient water creates POTW operational problems.
		Pipeline to Larger Stream	Contaminated water, before, or after treatment, discharged through pipe to Great Valley Creek.	Not applicable, piping to Great Valley Creek no advantage over local stream.
		Deep Well Injection	Contaminated water, before or after treatment, transported to permitted deep well for discharge.	Not feasible, liablility problems associated with off-site transport.

TABLE 4

PROCESS OPTIONS SCREENING, OBJECTIVE A - PROVIDE WATER TO RESIDENCES
SIGNORE FEASIBILITY STUDY REPORT
ELLICOTTVILLE, NEW YORK

General Response Actions	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
Institutional	Alternative Water Supply	Existing Municipal Water	Effective and reliable.	Requires Water District extension and deed of water line.	High captial, low O&M.
		New Municipal Well	Effective, treatment must be monitored to ensure < MCLs.	Requires formation of new Water District.	Very high capital, high O&M.
Collection	Extraction	Extraction Wells	Does not meet objective.	Does not meet objective.	High capital, moderate O&M.
		Extraction Injection Wells	Does not meet objective.	Does not meet objective.	High capital, high O&M.
Treatment	Physical Treatment	Air Stripping	Effective for removing contaminants.	Appropriate for treating new municipal well.	High capital, low O&M.
		Carbon Adsorption	Effective for removing contaminants.	Appropriate for treating individual domestic wells.	High capital, moderate O&M.
	Chemical Treatment	Oxidation	Not best available technology for VOCs.	Implementable.	High capital, high O&M.
	Biological Treatment	Aerobic Fixed Film Reactor	Unreliable for removing chlorinated solvents.	Implementable.	High capital, high O&M.
	In-Situ Treatment	Vapor Recovery	Unreliable for removing low levels of dissolved VOCs.	Contaminated area too large to implement system.	High capital, moderate O&M.
		Biological Degradation	Unreliable for removing chlorinated solvents.	Contaminated area too large to implement system.	High capital, high O&M.
Discharge	On-Site Discharge	Local Stream	Does not meet objective.	Does not meet objective.	Moderate capital, low O&M.
		Municipal Dist. System	Does not meet objective.	Does not meet objective.	Moderate capital, low O&M.

TABLE 5

PROCESS OPTIONS SCREENING, OBJECTIVE B - PROTECT TOWN WELL/PREVENT DOWNGRADIENT MOVEMENT
SIGNORE FEASIBILITY STUDY REPORT
ELLICOTTVILLE, NEW YORK

General Response Actions	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
Institutional	Alternative Water Supply	Existing Municipal Water	Does not meet objective.	Does not meet objective.	High captial, low O&M.
		New Municipal Well	Does not meet objective.	Does not meet objective.	Very high capital, high O&M.
Collection	Extraction	Extraction Wells	Effective for controlling ground water movement.	Implementable.	High capital, moderate O&M.
		Extraction Injection Wells	Ineffective at leading edge of contamination.	Requires permit for injection to aquifer.	High capital, high O&M.
Treatment	Physical Treatment	Air Stripping	Effective for removing contaminants.	Implementable.	High capital, low O&M.
		Carbon Adsorption	Effective for removing contaminants.	Implementable.	High capital, moderate O&M.
	Chemical Treatment	Oxidation	Not best available technology for VOCs.	Implementable.	High capital, high O&M.
	Biological Treatment	Aerobic Fixed Film Reactor	Unreliable for removing chlorinated solvents.	Implementable.	High capital, high O&M.
	In-Situ Treatment	Vapor Recovery	Unreliable for removing low levels of dissolved VOCs.	Contaminated area too large to implement system.	High capital, moderate O&M.
		Biological Degradation	Unreliable for removing chlorinated solvents.	Contaminated area too large to implement system.	High capital, high O&M.
Discharge	On-Site Discharge	Local Stream	Effective for discharge of treated or untreated water.	Implementable.	Moderate capital, low O&M.
		Municipal Dist. System	Effective for discharge of treated water.	Implementable.	Moderate capital, low O&M.

TABLE 6

PROCESS OPTIONS SCREENING, OBJECTIVE C - RESTORE AQUIFER BETWEEN SIGNORE AND TOWN WELL
SIGNORE FEASIBILITY STUDY REPORT
ELLICOTTVILLE, NEW YORK

General Response Actions	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
Institutional	Alternative Water Supply	Existing Municipal Water	Does not meet objective.	Does not meet objective.	High captial, low O&M.
		New Municipal Well	Does not meet objective.	Does not meet objective.	Very high capital, high O&M.
Collection	Extraction	Extraction Wells	Effective for controlling ground water movement.	Implementable.	High capital, moderate O&M.
		Extraction Injection Wells	Effective in enhancing ground water flow to extraction well.	Requires permit for injection to aquifer.	High capital, high O&M.
Treatment	Physical Treatment	Air Stripping	Effective for removing contaminants.	Implementable.	High capital, low O&M.
		Carbon Adsorption	Effective for removing contaminants.	Implementable.	High capital, moderate O&M.
	Chemical Treatment	Oxidation	Not best available technology for VOCs.	Implementable.	High capital, high O&M.
	Biological Treatment	Aerobic Fixed Film Reactor	Unreliable for removing chlorinated solvents.	Implementable.	High capital, high O&M.
	In-Situ Treatment	Vapor Recovery	Unreliable for removing low levels of dissolved VOCs.	Implementable.	High capital, moderate O&M.
		Biological Degradation	Unreliable for removing chlorinated solvents.	Implementable.	High capital, high O&M.
Discharge	On-Site Discharge	Local Stream	Effective for discharge of treated or untreated water.	Implementable.	Moderate capital, low O&M.
		Municipal Dist. System	Effective for discharge of treated water.	Implementable.	Moderate capital, low O&M.

TABLE 7

PROCESS OPTIONS SCREENING, OBJECTIVE D - RESTORE AQUIFER BENEATH SIGNORE
SIGNORE FEASIBILITY STUDY REPORT
ELLICOTTVILLE, NEW YORK

General Response Actions	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
Institutional	Alternative Water Supply	Existing Municipal Water	Does not meet objective.	Does not meet objective.	High captial, low O&M.
		New Municipal Well	Does not meet objective.	Does not meet objective.	Very high capital, high O&M.
Collection	Extraction	Extraction Wells	Effective for controlling ground water movement.	Implementable.	High capital, moderate O&M.
		Extraction Injection Wells	Effective in enhancing ground water flow to extraction well.	Requires permit for injection to aquifer.	High capital, high O&M.
Treatment	Physical Treatment	Air Stripping	Effective for removing contaminants.	Implementable.	High capital, low O&M.
		Carbon Adsorption	Effective for removing contaminants.	Implementable.	High capital, moderate O&M.
	Chemical Treatment	Oxidation	Not best available technology for VOCs.	Implementable.	High capital, high O&M.
	Biological Treatment	Aerobic Fixed Film Reactor	Unreliable for removing chlorinated solvents.	Implementable.	High capital, high O&M.
	In-Situ Treatment	Vapor Recovery	Unreliable for removing low levels of dissolved VOCs.	Implementable.	High capital, moderate O&M.
		Biological Degradation	Unreliable for removing chlorinated solvents.	Implementable.	High capital, high O&M.
Discharge	On-Site Discharge	Local Stream	Effective for discharge of treated or untreated water.	Implementable.	Moderate capital, low O&M.
		Municipal Dist. System	Effective for discharge of treated water.	Implementable.	Moderate capital, low O&M.

TABLE 8

FINAL ALTERNATIVES DETAILED ANALYSIS SCORING

SIGNORE FEASIBILITY STUDY REPORT
ELLICOTTVILLE, NEW YORK

		Final Remedial Alternatives					
		A-1	A-2	B-1	B-2	D-1	D-2
Compliance With SCGs							
1.	Compliance with chemical specific SCGs	4	4	4	4	4	4
2.	Compliance with action specific SCGs	3	3	3	3	3	3
3.	Compliance with location specific SCGs	3	3	3	3	3	3
SUBTOTAL		10	10	10	10	10	10
Protection of Health/Environment							
1.	Use of site after remediation	20	20	20	20	20	20
2.	Health and environ. exposure after remediation	-	-	-	-	-	-
3.	Residual public health risks after remediation	-	-	-	-	-	-
4.	Residual environmental risks after remediation	-	-	-	-	-	-
SUBTOTAL		20	20	20	20	20	20
Short-Term Effectiveness							
1.	Protection of community during remedial actions	4	4	4	4	4	4
2.	Environmental impacts	4	4	4	4	4	4
3.	Time to implement remedial action.						
	a.	1	1	1	1	1	1
	b.	1	1	0	1	0	0
SUBTOTAL		10	10	9	10	9	9

TABLE 8 (cont.)

FINAL ALTERNATIVES DETAILED ANALYSIS SCORING

SIGNORE FEASIBILITY STUDY REPORT
ELLICOTTVILLE, NEW YORK

		Final Remedial Alternatives					
		A-1	A-2	B-1	B-2	D-1	D-2
Long-Term Effectiveness							
1.	Type of destructive treatment	3	3	3	3	3	3
2.	Permanence of remedial alternative	3	0	0	0	0	0
3.	Lifetime of remedial actions	3	3	3	3	3	3
4.	Quantity and nature of residuals						
	i)	3	0	3	3	2	2
	ii)	2	2	2	2	0	0
	iii)	-	-	-	-	1	1
	iv)	-	-	-	-	1	1
5.	Adequacy and reliabilty of controls						
	i)	1	0	0	0	0	0
	ii)	1	1	1	1	1	1
	iii)	-	-	-	-	-	-
	iv)	2	1	1	1	0	0
SUBTOTAL		15	10	13	13	11	11
Reduction of Toxicity							
1.	Volume of waste reduced						
	i)	8	0	4	4	6	6
	ii)	2	0	2	2	2	2
	iii)	-	-	-	-	-	-
2.	Reduction in waste mobility						
	i)	-	0	2	2	1	1
	ii)	-	0	0	0	0	0
3.	Irreversibility of method	5	5	5	5	5	5
SUBTOTAL		15	5	13	13	14	14

TABLE 8 (cont.)

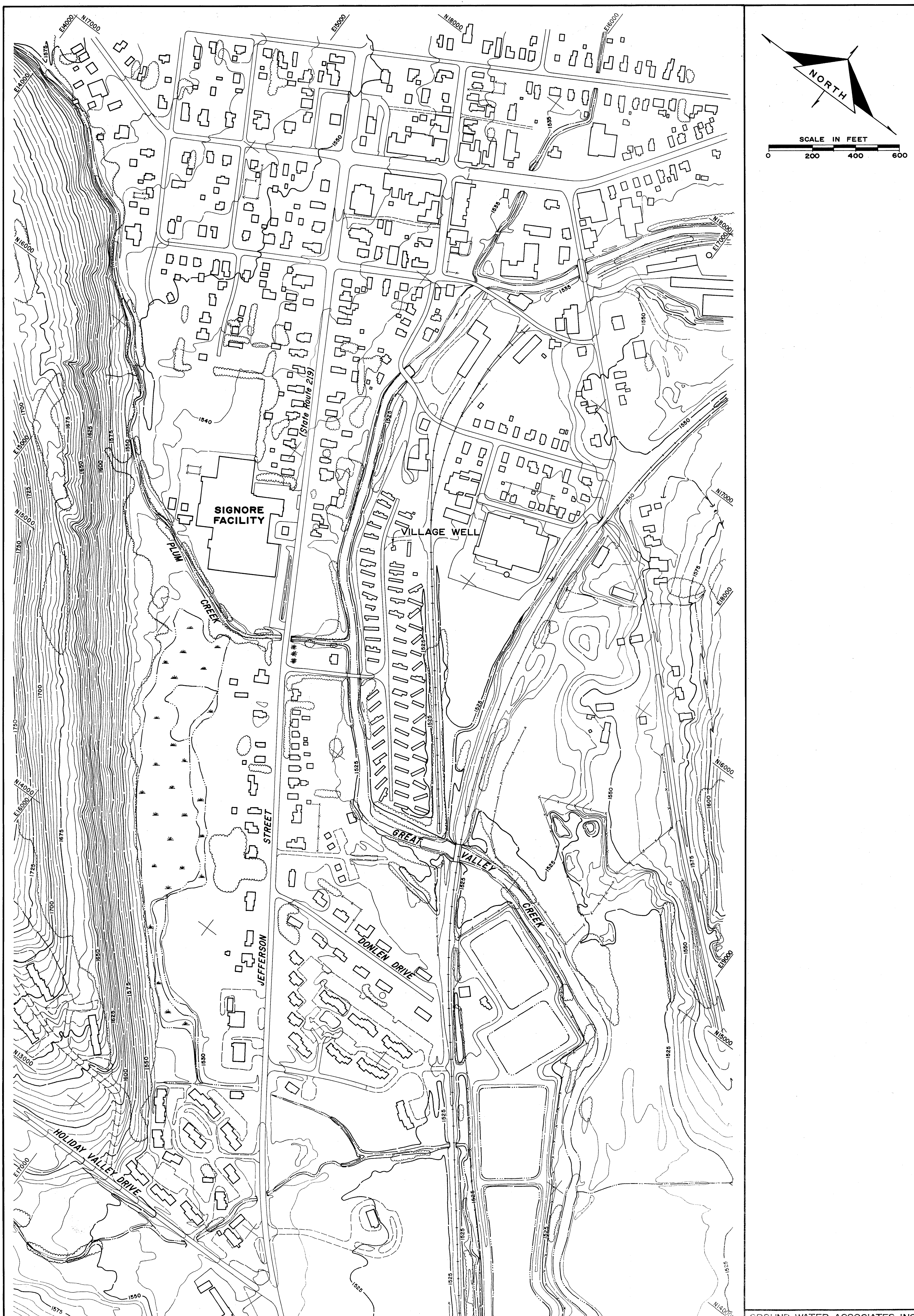
FINAL ALTERNATIVES DETAILED ANALYSIS SCORING

SIGNORE FEASIBILITY STUDY REPORT
ELLICOTTVILLE, NEW YORK

	Final Remedial Alternatives					
	A-1	A-2	B-1	B-2	D-1	D-2
Implementability						
1. Technical Feasibility						
a. ability to construct	3	3	3	3	3	2
b. reliability	3	3	3	3	3	2
c. delays	2	2	2	2	2	2
d. additional actions	2	2	2	2	2	2
2. Administrative Feasibility						
a. agency coordination	0	2	1	0	1	0
3. Availability of Services and Materials						
a. technologies						
- commercially avail.	1	1	1	1	1	1
- available vendors	1	1	1	1	1	1
b. equipment/specialists	1	1	1	0	1	0
SUBTOTAL	13	15	14	12	14	12
TOTAL SCORE FOR ALTERNATIVE	83	70	79	78	78	76

PLATES

PLATES



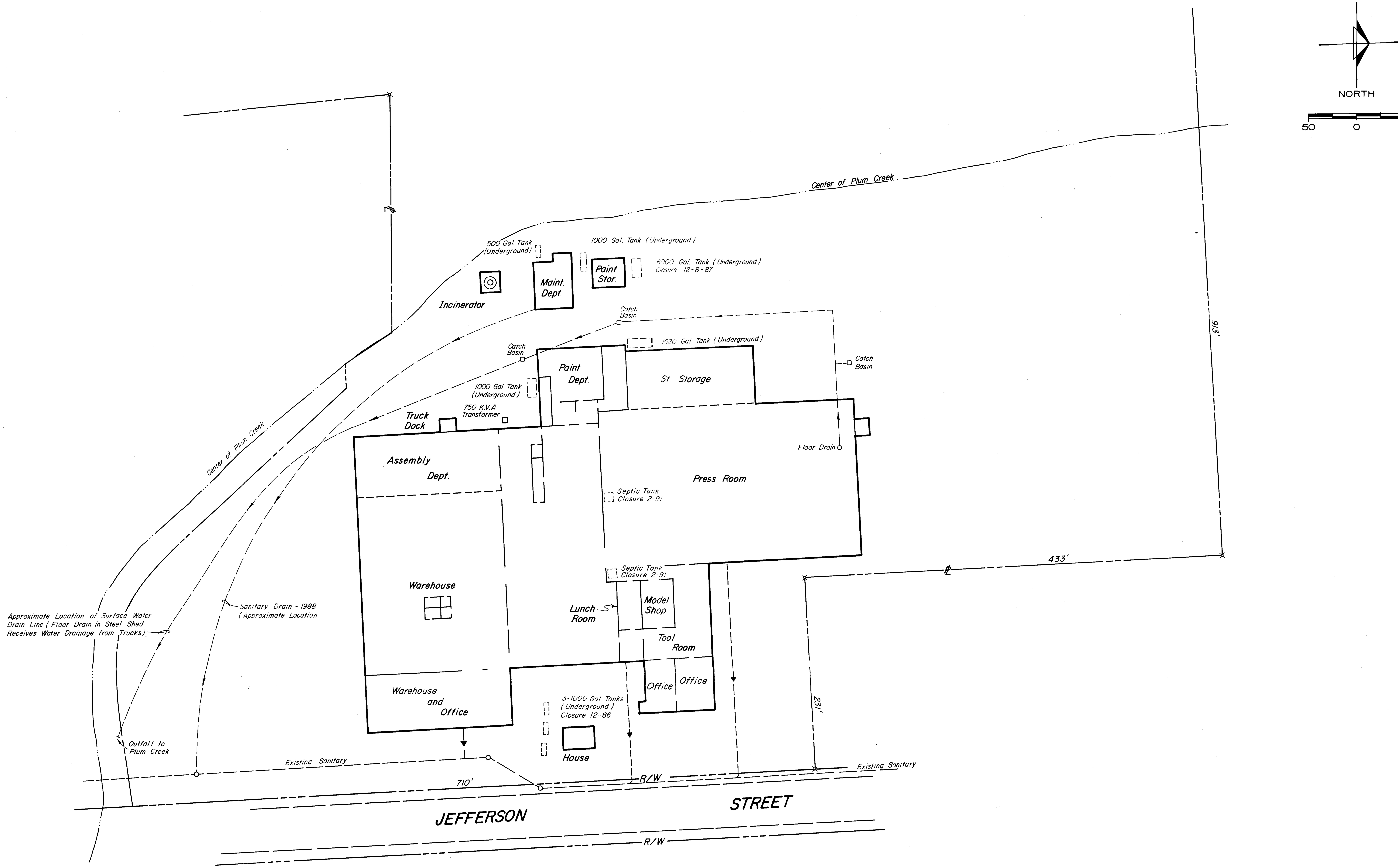
GROUND WATER ASSOCIATES, INC.
WESTERVILLE, OHIO

SIGNORE, INC.
ELLICOTTVILLE, NEW YORK

REMEDIAL INVESTIGATION REPORT

STUDY AREA LOCATION MAP

January, 1991 | Plate 1



JANUARY 1990

SIGNORE, INC.

ELLICOTTVILLE, NEW YORK

Plate 2

FACILITY MAP

9000505

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

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

SIGNORE, INC.
ELLICOTTVILLE, NEW YORK

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

January, 1991 | Plate 4

TENNIS COURTS
MW-12
NS
NS
ND
MW-2
MW-4
TCE=53
TCA=15
85.5
TCE=11
TCA=1.4
13.4
NS
TCE=27
TCA=10
44
NS
NS
MW-11
TCE=ND
TCA=2.0
3.4
NS
NS
(State Route 219)
MW-10
NS
NS
ND
ND
MW-5
TCE=150
TCA=ND
250
TCE=ND
TCA=1.4
1.4
ND
TCE=100
TCA=99
231
NS
TCE=ND
TCA=ND
3
MW-6
TCE=ND
TCA=ND
ND
NS
NS
ND
NS
ND
JEFFERSON STREET
PLUM CREEK
MW-9
TCE=ND
TCA=ND
0.9
TCE=20
TCA=ND
23.7
NS
TCE=28
TCA=10
ND
41
NS
EW-1
TCE=180
TCA=84
343
TCE=65
TCA=160
252
MW-1
TCE=1.2
TCA=ND
73.5
TCE=110
TCA=19
288.8
NS
TCE=1
TCA=ND
102
TCE=55
TCA=6
219.7
TCE=25
TCA=38
75
MW-8
ND
TCE=0.5
TCA=ND
0.5
NS
TCE=19
TCA=5
28
NS
NS
EW-2
ND
TCE=1
TCA=ND
1
NORTH
SCALE IN FEET
0 50 75 100 125 150
LEGEND
Sampled 1/89
Sampled 6/90
Sampled 10/90
- Shallow Zone
- Intermediate Zone
- Deep Zone
- Very Deep Zone
343 - Total Volatiles Concentration
- Zone Not Installed at this Cluster
NS - Not Sampled
ND - Not Detected
TCE - Trichoroethene
TCA - 1,1,1 - Trichoroethane
All concentrations in Micrograms per Liter
GROUND WATER ASSOCIATES, INC.
WESTERVILLE, OHIO
SIGNORE, INC.
ELLICOTTVILLE, NEW YORK
REMEDIAL INVESTIGATION REPORT
ON-SITE GROUND WATER SAMPLING RESULTS
Plate 5
January, 1991

LEGEND

Shallow Zone Well Total V.O.C. Concentration

TCE=4, TCA=2 — 6.9 — EW-5

TCE=6, TCA=2 — 9

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 6

GROUND WATER ASSOCIATES, INC.
WESTERVILLE, OHIO

SIGNORE, INC.
ELLICOTTVILLE, NEW YORK

REMEDIAL INVESTIGATION REPORT

INTERIM REMEDIAL MEASURES

August, 1991 | Plate 7

APPENDICES

APPENDICES

APPENDIX A

APPENDIX A

NEW YORK STATE

STANDARDS, CRITERIA AND GUIDELINES

NEW YORK STATE STANDARDS, CRITERIA AND GUIDELINES

New York State Department of Environmental Conservation

- Division of Solid Waste

  - 6 NYCRR Part 360 - Solid Waste Management Facilities (revised December 31, 1988)

- Division of Hazardous Substances Regulation

  - Description of Difference - EPA/State Regulations
  - 6 NYCRR Part 364 - Waste Transporter Permits (revised December 31, 1986)
  - 6 NYCRR Part 370 - Hazardous Waste Management System: General (revised December 25, 1988)
    - Part 371 - Identification and Listing of Hazardous wastes (revised December 25, 1988)
    - Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities (revised December 25, 1988)
  - 6 NYCRR Subpart 373-1 Hazardous Waste Treatment, Storage and Disposal Facility Permitting Requirements (revised December 25, 1988)
    - 373-2 Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities (revised December 25, 1988)
    - 373-3 Interim Status Standards for Owners and Operators of Hazardous Waste Facilities (revised December 25,, 1988)
  - 6 NYCRR Part 374 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities (revised December 25, 1988)

- Division of Water

  - 6 NYCRR Part 703 - NYSDEC Groundwater Quality Regulation
  - 6 NYCRR Part 750 - 757 - Implementation of NPDES Program in NYS
  - 6 NYCRR Parts 701, 702 - 704 - Surface Water Quality Standards

New York State Department of Environmental Conservation (cont.)

- 6 NYCRR Part 701.15(d) and (e) Empowers DEC to Apply and Enforce Guidance where there are no Promulgated Standards

- Technical and Operations Guidance Series (TOGS)

1.1.1; April 1, 1987	Ambient Water Quality Standards and Guidance Values
1.2.1; May 19, 1987	Industrial SPDES Permit Drafting Strategy for Surface Waters
1.3.1; May 22, 1987	Waste Assimilative Capacity Analysis and Allocation for Setting Water Quality Based Effluent Limits
1.3.2; May 1, 1989	Toxicity Testing in the SPDES Permit Program
1.3.4; April 1, 1987	BPJ Methodologies
1.3.4.a; November 3, 1988	Analytical Detectability and Quantitation Guidelines for Selected Environmental Parameters
1.3.7; December 30, 1988	Analytical Detectability and Quantitation Guidelines for Selected Environmental Parameters
2.1.2; April 1, 1988	Underground Injection/ Recirculation (UIR) at Groundwater Remediation Sites
2.1.3; April 1, 1987	Primary and Principal Aquifer Determinations

• Division of Air

- 6 NYCRR Part 200 (2006) - General Provisions
- 6 NYCRR Part 201 - Permits and Certificates
- 6 NYCRR Part 211 (211.1) - General Provisions
- 6 NYCRR Part 212 - General Process Emission Sources
- 6 NYCRR Part 257 - Air Quality Standards
- Air Guide 1 - Guidelines for the Control of Toxic Ambient Air Contaminants

• Division of Fish and Wildlife

- 6 NYCRR Part 608 - Use and Protection of Waters
- 6 NYCRR Part 662 - Freshwater Wetlands - Interim Permits
  663 - Freshwater Wetlands Permit Requirements

New York State Department of Environmental Conservation (cont.)

664 - Freshwater Wetlands Maps and Classifications
665 - Local Government Implementation of the Freshwater Wetlands Act and Statewide Minimum Land - Use Regulations for Freshwater Wetlands

- 6 NYCRR Part 182 - Endangered and Threatened Species of Fish and Wildlife
- ECL Article 24 and Article 71, Title 23 - Freshwater Wetlands Act

- Division of Regulatory Affairs
  - 6 NYCRR part 361 - Siting of Industrial Hazardous Waste Facilities
  - Article 27, Title II of the ECL - Industrial Siting Hazardous Waste Facilities
  - 6 NYCRR Part 621 - Uniform Procedures
  - 6 NYCRR Part 624 - Permit Hearing Procedures

- Division of Marine Resource
  - Chapter 10 of 6 NYCRR Part 661 Tidal Wetlands - Land Use Regulations

- Division of Mineral Resources
  - 6 NYCRR Part 420 - General
    421 - Permits
    422 - Mined Land - Use Plan
    423 - Reclamation Bond
    424 - Enforcement
    425 - Civil Penalties
    426 - Hearings
  - Title 27 - NYS mined Land Reclamation Law

New York State Department of Health

- NYSDOH PWS 68 Blending Policy for Use of Sources of Drinking Water
- NYSDOH PWS 69 Organic Chemical Action Steps for Drinking Water
- NYSDOH PWS 152 Procedure for Handling Community Water System Emergencies
- NYSDOH PWS 160 Public Notification of Organic Chemical Incidents Regarding Public Water Supplies

New York State Department of Health (cont.)

- The 10 ppt criterion for 2,3,7,8 - TODD in fish flesh
- The Binghamton State Office Building cleanup criteria for PCDDs, PCDFs and PCBs
- Part 5 of the State Sanitary Code, Drinking Water Supplies
- Part 170 of Title 10 of the NYCRR, Water Supply Sources
- Appendix 5-A of Part 5 of the State Sanitary Code (Recommended Standards for Water Works)
- NYSDOH Interim Report on Point-of-Use Activated Carbon Treatment Systems
- Part 16 draft limits on the disposal of radioactive materials into sewer systems
- Criteria for the development of health advisories for sport fish consumption
- Tolerance levels for EDB in food

New York State Department of Labor

- 12 NYCRR 50 - Lasers
- 12 NYCRR 38 - Ionizing Radiation Protection

New York State Department of Agriculture and Markets

Coastal Management

- Part 600 - Department of State, Waterfront Revitalization and Coastal Resources Act
- State Coastal Policies
- State Consistency Process
- NYS Coastal Policies
- NYS Coastal Management Program
- Federal Register, June 25, 1979 - part V - Department of Commerce - Federal Consistency Regulations

APPENDIX B

APPENDIX B

REMEDIAL ALTERNATIVES DETAILED ANALYSIS

NYSDEC SCORING SHEETS

APPENDIX B-1

ALTERNATIVE A-1 - EXTEND WATER DISTRICT

Table 5.2

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)

(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs	Meets chemical specific SCGs such as groundwater standards	Yes	X	4
		No	___	0
2. Compliance with action-specific SCGs	Meets SCGs such as technology standards for incineration or landfill	Yes	X	3
		No	___	0
3. Compliance with location-specific SCGs	Meets location-specific SCGs such as Freshwater Wetlands Act	Yes	X	3
		No	___	0

TOTAL (Maximum = 10)

Table 5.3

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. **(If answer is yes, go to the end of the Table.)**	**Yes**	X	20
		No	___	0
TOTAL (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	**Yes**	___	3
		No	___	0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	**Yes**	___	4
		No	___	0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	**Yes**	___	3
		No	___	0
Subtotal (maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	**$\leq$ 1 in 1,000,000**	___	5
	ii) Health risk	**$\leq$ 1 in 100,000**	___	2
Subtotal (maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable		___	5
	ii) Slightly greater than acceptable		___	3
	iii) Significant risk still exists		___	0
Subtotal (maximum = 5)				
TOTAL (maximum = 20)				

Table 5.4

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	° Are there significant short-term risks to the community that must be addressed? **(If answer is no, go to Factor 2.)**	Yes	___	0
		No	X	4
	° Can the risk be easily controlled?	Yes	___	1
		No	___	0
	° Does the mitigative effort to control risk impact the community life-style?	Yes	___	0
		No	___	2
Subtotal (maximum = 4)				
2. Environmental Impacts	° Are there significant short-term risks to the environment that must be addressed? **(If answer is no, go to Factor 3.)**	Yes	___	0
		No	X	4
	° Are the available mitigative measures reliable to minimize potential impacts?	Yes	___	3
		No	___	0
Subtotal (maximum = 4)				
3. Time to implement the remedy.	° What is the required time to implement the remedy?	≤ 2yr.	X	1
		> 2yr.	___	0
	° Required duration of the mitigative effort to control short-term risk.	≤ 2yr.	X	1
		> 2yr.	___	0
Subtotal (maximum = 2)				
TOTAL (maximum = 10)				

Table 5.5

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. On-site or off-site treatment or land disposal	° On-site treatment*		(3)
	° Off-site treatment*		1
	° On-site or off-site land disposal		0
Subtotal (maximum = 3)			
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes			
2. Permanence of the remedial alternative.	° Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). **(If answer is yes, go to Factor 4.)**	**Yes** X	3
		No ___	0
Subtotal (maximum = 3)			
3. Lifetime of remedial actions.	° Expected lifetime or duration of of effectiveness of the remedy.	25-30yr. X	3
		20-25yr. ___	2
		15-20yr. ___	1
		< 15yr. ___	0
Subtotal (maximum = 3)			
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None** X	3
		≤ 25% ___	2
		25-50% ___	1
		≥ 50% ___	0
	ii) Is there treated residual left at the site? **(If answer is no, go to Factor 5.)**	Yes ___	0
		No X	2
	iii) Is the treated residual toxic?	Yes ___	0
		No ___	1
	iv) Is the treated residual mobile?	Yes ___	0
		No ___	1
Subtotal (maximum = 5)			

Table 5.5 (cont'd)

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	< 5yr. X	1
		> 5yr. ___	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? **(If answer is no, go to "iv")**	Yes ___	0
		No X	1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident ___	1
		Somewhat to not confident ___	0
	iv) Relative degree of long-term monitoring required **(compare with other remedial alternatives)**	Minimum X	2
		Moderate ___	1
		Extensive ___	0
Subtotal (maximum = 4)			
TOTAL (maximum = 15)			

Table 5.6
REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). **If Factor 1 is not applicable, go to Factor 2.**	i) Quantity of hazardous waste destroyed or treated. **Immobilization technologies do not score under Factor 1.**	99-100%	X	8
		90-99%	____	7
		80-90%	____	6
		60-80%	____	4
		40-60%	____	2
		20-40%	____	1
		< 20%	____	0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i)? **If answer is no, go to Factor 2**	Yes	____	0
		No	X	2
Subtotal (maximum = 10) If subtotal = 10, go to Factor 3	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal	____	0
		On-site land disposal	____	1
		Off-site destruction or treatment	____	2
2. Reduction in mobility of hazardous waste. **If Factor 2 is not applicable, go to Factor 3**	i) Quality of Available Wastes Immobilized After Destruction/Treatment	90-100%	____	2
		60-90%	____	1
		< 60%	____	0
	ii) Method of Immobilization			
	- Reduced mobility by containment		____	0
	- Reduced mobility by alternative treatment technologies		____	3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste	Completely irreversible		X	5
	Irreversible for most of the hazardous waste constituents.		____	3
	Irreversible for only some of the hazardous waste constituents		____	2
	Reversible for most of the hazardous waste constituents.		____	0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)				

Table 5.7

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		X	3
	ii) Somewhat difficult to construct. No uncertainties in construction.		___	2
	iii) Very difficult to construct and/or significant uncertainties in construction.		___	1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		X	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		___	2
c. Schedule of delays due to technical problems.	i) Unlikely		X	2
	ii) Somewhat likely		___	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.		X	2
	ii) Some future remedial actions may be necessary.		___	1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.		___	2
	ii) Required coordination is normal.		___	1
	iii) Extensive coordination is required.		X	0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	X	1
		No	___	0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	X	1
		No	___	0

Table 5.7 (cont'd)

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes** X **No** ___	1 0

Subtotal (maximum = 3)

TOTAL (maximum = 15)

APPENDIX B-2

ALTERNATIVE A-2 - INDIVIDUAL CARBON TREATMENT

Table 5.2

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)

(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs	Meets chemical specific SCGs such as groundwater standards	Yes	X	4
		No	___	0
2. Compliance with action-specific SCGs	Meets SCGs such as technology standards for incineration or landfill	Yes	X	3
		No	___	0
3. Compliance with location-specific SCGs	Meets location-specific SCGs such as Freshwater Wetlands Act	Yes	X	3
		No	___	0
TOTAL (Maximum = 10)				

Table 5.3

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. **(If answer is yes, go to the end of the Table.)**	**Yes**	X	20
		No	___	0
TOTAL (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	**Yes**	___	3
		No	___	0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	**Yes**	___	4
		No	___	0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	**Yes**	___	3
		No	___	0
Subtotal (maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	≤ 1 in 1,000,000	___	5
	ii) Health risk	≤ 1 in 100,000	___	2
Subtotal (maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable		___	5
	ii) Slightly greater than acceptable		___	3
	iii) Significant risk still exists		___	0
Subtotal (maximum = 5)				
TOTAL (maximum = 20)				

Table 5.4

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	° Are there significant short-term risks to the community that must be addressed? **(If answer is no, go to Factor 2.)**	Yes	___	0
		No	X	4
	° Can the risk be easily controlled?	Yes	___	1
		No	___	0
	° Does the mitigative effort to control risk impact the community life-style?	Yes	___	0
		No	___	2
Subtotal (maximum = 4)				
2. Environmental Impacts	° Are there significant short-term risks to the environment that must be addressed? **(If answer is no, go to Factor 3.)**	Yes	___	0
		No	X	4
	° Are the available mitigative measures reliable to minimize potential impacts?	Yes	___	3
		No	___	0
Subtotal (maximum = 4)				
3. Time to implement the remedy.	° What is the required time to implement the remedy?	≤ 2yr.	X	1
		> 2yr.	___	0
	° Required duration of the mitigative effort to control short-term risk.	≤ 2yr.	X	1
		> 2yr.	___	0
Subtotal (maximum = 2)				
TOTAL (maximum = 10)				

Table 5.5

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. On-site or off-site treatment or land disposal	° On-site treatment*		(3)
	° Off-site treatment*		1
	° On-site or off-site land disposal		0
Subtotal (maximum = 3)			
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes			
2. Permanence of the remedial alternative.	° Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). **(If answer is yes, go to Factor 4.)**	Yes ___	3
		No X	0
Subtotal (maximum = 3)			
3. Lifetime of remedial actions.	° Expected lifetime or duration of of effectiveness of the remedy.	25-30yr. X	3
		20-25yr. ___	2
		15-20yr. ___	1
		< 15yr. ___	0
Subtotal (maximum = 3)			
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None ___	3
		≤ 25% ___	2
		25-50% ___	1
		≥ 50% X	0
	ii) Is there treated residual left at the site? **(If answer is no, go to Factor 5.)**	Yes ___	0
		No X	2
	iii) Is the treated residual toxic?	Yes ___	0
		No ___	1
	iv) Is the treated residual mobile?	Yes ___	0
		No ___	1
Subtotal (maximum = 5)			

Table 5.5 (cont'd)

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	< 5yr. ___	1
		> 5yr. _X_	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv")	Yes ___	0
		No _X_	1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident ___	1
		Somewhat to not confident ___	0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)	Minimum ___	2
		Moderate _X_	1
		Extensive ___	0

Subtotal (maximum = 4)

TOTAL (maximum = 15)

Table 5.6
REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). **If Factor 1 is not applicable, go to Factor 2.**	i) Quantity of hazardous waste destroyed or treated. **Immobilization technologies do not score under Factor 1.**	99-100%	___	8
		90-99%	___	7
		80-90%	___	6
		60-80%	___	4
		40-60%	___	2
		20-40%	___	1
		< 20%	X	0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i)? **If answer is no, go to Factor 2**	Yes	X	0
		No	___	2
Subtotal (maximum = 10) If subtotal = 10, go to Factor 3	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal	___	0
		On-site land disposal	___	1
		Off-site destruction or treatment	___	2
2. Reduction in mobility of hazardous waste. **If Factor 2 is not applicable, go to Factor 3**	i) Quality of Available Wastes Immobilized After Destruction/ Treatment	90-100%	___	2
		60-90%	___	1
		< 60%	X	0
	ii) Method of Immobilization			
	- Reduced mobility by containment		X	0
	- Reduced mobility by alternative treatment technologies		___	3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste	Completely irreversible		X	5
	Irreversible for most of the hazardous waste constituents.		___	3
	Irreversible for only some of the hazardous waste constituents		___	2
	Reversible for most of the hazardous waste constituents.		___	0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)				

Table 5.7

IMPLEMENTABILITY
(Relative Weight = 15)

nalysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		X	3
	ii) Somewhat difficult to construct. No uncertainties in construction.		___	2
	iii) Very difficult to construct and/or significant uncertainties in construction.		___	1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		X	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		___	2
c. Schedule of delays due to technical problems.	i) Unlikely		X	2
	ii) Somewhat likely		___	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.		X	2
	ii) Some future remedial actions may be necessary.		___	1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.		X	2
	ii) Required coordination is normal.		___	1
	iii) Extensive coordination is required.		___	0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	X	1
		No	___	0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	X	1
		No	___	0

Table 5.7 (cont'd)

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes** X **No** ___	1 0

Subtotal (maximum = 3)

TOTAL (maximum = 15)

APPENDIX B-3

ALTERNATIVE B-1 - OFF-SITE INTERCEPTOR WELL

Table 5.2

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)

(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs	Meets chemical specific SCGs such as groundwater standards	Yes	X	4
		No		0
2. Compliance with action-specific SCGs	Meets SCGs such as technology standards for inc'neration or landfill	Yes	X	3
		No		0
3. Compliance with location-specific SCGs	Meets location-specific SCGs such as Freshwater Wetlands Act	Yes	X	3
		No		0
TOTAL (Maximum = 10)				

Table 5.3

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. **(If answer is yes, go to the end of the Table.)**	**Yes**	X	20
		No	___	0
TOTAL (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	**Yes**	___	3
		No	___	0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	**Yes**	___	4
		No	___	0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	**Yes**	___	3
		No	___	0
Subtotal (maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	**≤ 1 in 1,000,000**	___	5
	ii) Health risk	**≤ 1 in 100,000**	___	2
Subtotal (maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable		___	5
	ii) Slightly greater than acceptable		___	3
	iii) Significant risk still exists		___	0
Subtotal (maximum = 5)				
TOTAL (maximum = 20)				

Table 5.4

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	° Are there significant short-term risks to the community that must be addressed? **(If answer is no, go to Factor 2.)**	Yes	___	0
		No	X	4
	° Can the risk be easily controlled?	Yes	___	1
		No	___	0
	° Does the mitigative effort to control risk impact the community life-style?	Yes	___	0
		No	___	2
Subtotal (maximum = 4)				
2. Environmental Impacts	° Are there significant short-term risks to the environment that must be addressed? **(If answer is no, go to Factor 3.)**	Yes	___	0
		No	X	4
	° Are the available mitigative measures reliable to minimize potential impacts?	Yes	___	3
		No	___	0
Subtotal (maximum = 4)				
3. Time to implement the remedy.	° What is the required time to implement the remedy?	≤ 2yr.	X	1
		> 2yr.	___	0
	° Required duration of the mitigative effort to control short-term risk.	≤ 2yr.	___	1
		> 2yr.	X	0
Subtotal (maximum = 2)				
TOTAL (maximum = 10)				

Table 5.5

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. On-site or off-site treatment or land disposal	° On-site treatment*		③
	° Off-site treatment*		1
	° On-site or off-site land disposal		0
Subtotal (maximum = 3)			
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes			
2. Permanence of the remedial alternative.	° Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). **(If answer is yes, go to Factor 4.)**	Yes ___	3
		No X	0
Subtotal (maximum = 3)			
3. Lifetime of remedial actions.	° Expected lifetime or duration of of effectiveness of the remedy.	25-30yr. X	3
		20-25yr. ___	2
		15-20yr. ___	1
		< 15yr. ___	0
Subtotal (maximum = 3)			
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None X	3
		≤ 25% ___	2
		25-50% ___	1
		≥ 50% ___	0
	ii) Is there treated residual left at the site? **(If answer is no, go to Factor 5.)**	Yes ___	0
		No X	2
	iii) Is the treated residual toxic?	Yes ___	0
		No ___	1
	iv) Is the treated residual mobile?	Yes ___	0
		No ___	1
Subtotal (maximum = 5)			

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	< 5yr. ___	1
		> 5yr. _X_	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? **(If answer is no, go to "iv")**	Yes ___	0
		No _X_	1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident ___	1
		Somewhat to not confident ___	0
	iv) Relative degree of long-term monitoring required **(compare with other remedial alternatives)**	Minimum ___	2
		Moderate _X_	1
		Extensive ___	0

Subtotal (maximum = 4)

TOTAL (maximum = 15)

Table 5.6
REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). **If Factor 1 is not applicable, go to Factor 2.**	i) Quantity of hazardous waste destroyed or treated. **Immobilization technologies do not score under Factor 1.**	99-100% ____	8
		90-99% ____	7
		80-90% ____	6
		60-80% X	4
		40-60% ____	2
		20-40% ____	1
		< 20% ____	0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i)? **If answer is no, go to Factor 2**	Yes ____	0
		No X	2
Subtotal (maximum = 10) If subtotal = 10, go to Factor 3	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal ____	0
		On-site land disposal ____	1
		Off-site destruction or treatment ____	2
2. Reduction in mobility of hazardous waste. **If Factor 2 is not applicable, go to Factor 3**	i) Quality of Available Wastes Immobilized After Destruction/ Treatment	90-100% X	2
		60-90% ____	1
		< 60% ____	0
	ii) Method of Immobilization		
	- Reduced mobility by containment	X	0
	- Reduced mobility by alternative treatment technologies	____	3
Subtotal (maximum = 5)			
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste	Completely irreversible	X	5
	Irreversible for most of the hazardous waste constituents.	____	3
	Irreversible for only some of the hazardous waste constituents	____	2
	Reversible for most of the hazardous waste constituents.	____	0
Subtotal (maximum = 5)			
TOTAL (maximum = 15)			

Table 5.7

IMPLEMENTABILITY
(Relative Weight = 15)

nalysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. Technical Feasibility			
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.	X	3
	ii) Somewhat difficult to construct. No uncertainties in construction.	___	2
	iii) Very difficult to construct and/or significant uncertainties in construction.	___	1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.	X	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.	___	2
c. Schedule of delays due to technical problems.	i) Unlikely	X	2
	ii) Somewhat likely	___	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.	X	2
	ii) Some future remedial actions may be necessary.	___	1
Subtotal (maximum = 10)			
2. Administrative Feasibility			
a. Coordination with other agencies.	i) Minimal coordination is required.	___	2
	ii) Required coordination is normal.	X	1
	iii) Extensive coordination is required.	___	0
Subtotal (maximum = 2)			
3. Availability of Services and Materials			
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes** X **No** ___	1 0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes** X **No** ___	1 0

Table 5.7 (cont'd)

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes	X	1
		No	___	0

Subtotal (maximum = 3)

TOTAL (maximum = 15)

APPENDIX B-4

ALTERNATIVE B-2 - TOWN WELL TREATMENT

Table 5.2

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)

(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs	Meets chemical specific SCGs such as groundwater standards	Yes	X	4
		No		0
2. Compliance with action-specific SCGs	Meets SCGs such as technology standards for incineration or landfill	Yes	X	3
		No		0
3. Compliance with location-specific SCGs	Meets location-specific SCGs such as Freshwater Wetlands Act	Yes	X	3
		No		0
TOTAL (Maximum = 10)				

Table 5.3

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. **(If answer is yes, go to the end of the Table.)**	**Yes**	X	20
		No	___	0
TOTAL (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	**Yes**	___	3
		No	___	0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	**Yes**	___	4
		No	___	0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	**Yes**	___	3
		No	___	0
Subtotal (maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	**≤ 1 in 1,000,000**	___	5
	ii) Health risk	**≤ 1 in 100,000**	___	2
Subtotal (maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable		___	5
	ii) Slightly greater than acceptable		___	3
	iii) Significant risk still exists		___	0
Subtotal (maximum = 5)				
TOTAL (maximum = 20)				

Table 5.4

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	° Are there significant short-term risks to the community that must be addressed? **(If answer is no, go to Factor 2.)**	Yes	___	0
		No	X	4
	° Can the risk be easily controlled?	Yes	___	1
		No	___	0
	° Does the mitigative effort to control risk impact the community life-style?	Yes	___	0
		No	___	2
Subtotal (maximum = 4)				
2. Environmental Impacts	° Are there significant short-term risks to the environment that must be addressed? **(If answer is no, go to Factor 3.)**	Yes	___	0
		No	X	4
	° Are the available mitigative measures reliable to minimize potential impacts?	Yes	___	3
		No	___	0
Subtotal (maximum = 4)				
3. Time to implement the remedy.	° What is the required time to implement the remedy?	≤ 2yr.	X	1
		> 2yr.	___	0
	° Required duration of the mitigative effort to control short-term risk.	≤ 2yr.	X	1
		> 2yr.	___	0
Subtotal (maximum = 2)				
TOTAL (maximum = 10)				

Table 5.5

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

nalysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. On-site or off-site treatment or land disposal	° On-site treatment*		③
	° Off-site treatment*		1
	° On-site or off-site land disposal		0
Subtotal (maximum = 3)			
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes			
2. Permanence of the remedial alternative.	° Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). **(If answer is yes, go to Factor 4.)**	Yes ___	3
		No X	0
Subtotal (maximum = 3)			
3. Lifetime of remedial actions.	° Expected lifetime or duration of of effectiveness of the remedy.	25-30yr. X	3
		20-25yr. ___	2
		15-20yr. ___	1
		< 15yr. ___	0
Subtotal (maximum = 3)			
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None X	3
		≤ 25% ___	2
		25-50% ___	1
		≥ 50% ___	0
	ii) Is there treated residual left at the site? **(If answer is no, go to Factor 5.)**	Yes ___	0
		No X	2
	iii) Is the treated residual toxic?	Yes ___	0
		No ___	1
	iv) Is the treated residual mobile?	Yes ___	0
		No ___	1
Subtotal (maximum = 5)			

Table 5.5 (cont'd)

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

nalysis Factor	Basis for Evaluation During Detailed Analysis		Score
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	< 5yr. ___	1
		> 5yr. X	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? **(If answer is no, go to "iv")**	Yes ___	0
		No X	1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident ___	1
		Somewhat to not confident ___	0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)	Minimum ___	2
		Moderate X	1
		Extensive ___	0
Subtotal (maximum = 4)			
TOTAL (maximum = 15)			

Table 5.6
REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). **If Factor 1 is not applicable, go to Factor 2.**	i) Quantity of hazardous waste destroyed or treated. **Immobilization technologies do not score under Factor 1.**	99-100%	____	8
		90-99%	____	7
		80-90%	____	6
		60-80%	X	4
		40-60%	____	2
		20-40%	____	1
		< 20%	____	0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i)? **If answer is no, go to Factor 2**	Yes	____	0
		No	X	2
Subtotal (maximum = 10) If subtotal = 10, go to Factor 3	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal	____	0
		On-site land disposal	____	1
		Off-site destruction or treatment	____	2
2. Reduction in mobility of hazardous waste. **If Factor 2 is not applicable, go to Factor 3**	i) Quality of Available Wastes Immobilized After Destruction/ Treatment	90-100%	X	2
		60-90%	____	1
		< 60%	____	0
	ii) Method of Immobilization			
	- Reduced mobility by containment		X	0
	- Reduced mobility by alternative treatment technologies		____	3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste	Completely irreversible		X	5
	Irreversible for most of the hazardous waste constituents.		____	3
	Irreversible for only some of the hazardous waste constituents		____	2
	Reversible for most of the hazardous waste constituents.		____	0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)				

Table 5.7

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		X	3
	ii) Somewhat difficult to construct. No uncertainties in construction.		___	2
	iii) Very difficult to construct and/or significant uncertainties in construction.		___	1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		X	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		___	2
c. Schedule of delays due to technical problems.	i) Unlikely		X	2
	ii) Somewhat likely		___	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.		X	2
	ii) Some future remedial actions may be necessary.		___	1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.		___	2
	ii) Required coordination is normal.		___	1
	iii) Extensive coordination is required.		X	0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	X	1
		No	___	0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	X	1
		No	___	0

Table 5.7 (cont'd)

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes	___	1
		No	X	0

Subtotal (maximum = 3)

TOTAL (maximum = 15)

APPENDIX B-5

ALTERNATIVE D-1 - SITE INTERCEPTOR WELL/STREAM DISCHARGE

Table 5.2

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)

(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs	Meets chemical specific SCGs such as groundwater standards	**Yes**	X	4
		No	___	0
2. Compliance with action-specific SCGs	Meets SCGs such as technology standards for incineration or landfill	**Yes**	X	3
		No	___	0
3. Compliance with location-specific SCGs	Meets location-specific SCGs such as Freshwater Wetlands Act	**Yes**	X	3
		No	___	0

TOTAL (Maximum = 10)

Table 5.3

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. **(If answer is yes, go to the end of the Table.)**	**Yes**	X	20
		No	___	0
TOTAL (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	**Yes**	___	3
		No	___	0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	**Yes**	___	4
		No	___	0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	**Yes**	___	3
		No	___	0
Subtotal (maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	**$\leq$ 1 in 1,000,000**	___	5
	ii) Health risk	**$\leq$ 1 in 100,000**	___	2
Subtotal (maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable		___	5
	ii) Slightly greater than acceptable		___	3
	iii) Significant risk still exists		___	0
Subtotal (maximum = 5)				
TOTAL (maximum = 20)				

Table 5.4

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	° Are there significant short-term risks to the community that must be addressed? **(If answer is no, go to Factor 2.)**	Yes	___	0
		No	X	4
	° Can the risk be easily controlled?	Yes	___	1
		No	___	0
	° Does the mitigative effort to control risk impact the community life-style?	Yes	___	0
		No	___	2
Subtotal (maximum = 4)				
2. Environmental Impacts	° Are there significant short-term risks to the environment that must be addressed? **(If answer is no, go to Factor 3.)**	Yes	___	0
		No	X	4
	° Are the available mitigative measures reliable to minimize potential impacts?	Yes	___	3
		No	___	0
Subtotal (maximum = 4)				
3. Time to implement the remedy.	° What is the required time to implement the remedy?	$\leq$ 2yr.	X	1
		$>$ 2yr.	___	0
	° Required duration of the mitigative effort to control short-term risk.	$\leq$ 2yr.	___	1
		$>$ 2yr.	X	0
Subtotal (maximum = 2)				
TOTAL (maximum = 10)				

Table 5.5

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

.nalysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. On-site or off-site treatment or land disposal	° On-site treatment*			(3)
	° Off-site treatment*			1
	° On-site or off-site land disposal			0
Subtotal (maximum = 3)				
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes				
2. Permanence of the remedial alternative.	° Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). **(If answer is yes, go to Factor 4.)**	Yes	___	3
		No	X	0
Subtotal (maximum = 3)				
3. Lifetime of remedial actions.	° Expected lifetime or duration of of effectiveness of the remedy.	25-30yr.	X	3
		20-25yr.	___	2
		15-20yr.	___	1
		< 15yr.	___	0
Subtotal (maximum = 3)				
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None	___	3
		≤ 25%	X	2
		25-50%	___	1
		≥ 50%	___	0
	ii) Is there treated residual left at the site? **(If answer is no, go to Factor 5.)**	Yes	X	0
		No	___	2
	iii) Is the treated residual toxic?	Yes	___	0
		No	X	1
	iv) Is the treated residual mobile?	Yes	___	0
		No	X	1
Subtotal (maximum = 5)				

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	< 5yr. ___	1
		> 5yr. _X_	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? **(If answer is no, go to "iv")**	Yes ___	0
		No _X_	1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident ___	1
		Somewhat to not confident ___	0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)	Minimum ___	2
		Moderate ___	1
		Extensive _X_	0
Subtotal (maximum = 4)			
TOTAL (maximum = 15)			

Table 5.6
REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Relative Weight = 15)

Analysis Factor		Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). **If Factor 1 is not applicable, go to Factor 2.**	i)	Quantity of hazardous waste destroyed or treated. **Immobilization technologies do not score under Factor 1.**	99-100%	___	8
			90-99%	___	7
			80-90%	X	6
			60-80%	___	4
			40-60%	___	2
			20-40%	___	1
			< 20%	___	0
	ii)	Are there untreated or concentrated hazardous waste produced as a result of (i)? **If answer is no, go to Factor 2**	Yes	___	0
			No	X	2
Subtotal (maximum = 10) If subtotal = 10, go to Factor 3	iii)	After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal	___	0
			On-site land disposal	___	1
			Off-site destruction or treatment	___	2
2. Reduction in mobility of hazardous waste. **If Factor 2 is not applicable, go to Factor 3**	i)	Quality of Available Wastes Immobilized After Destruction/ Treatment	90-100%	___	2
			60-90%	X	1
			< 60%	___	0
	ii)	Method of Immobilization			
		- Reduced mobility by containment		X	0
		- Reduced mobility by alternative treatment technologies		___	3
Subtotal (maximum = 5)					
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste		Completely irreversible		X	5
		Irreversible for most of the hazardous waste constituents.		___	3
		Irreversible for only some of the hazardous waste constituents		___	2
		Reversible for most of the hazardous waste constituents.		___	0
Subtotal (maximum = 5)					
TOTAL (maximum = 15)					

Table 5.7

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. Technical Feasibility			
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.	X	3
	ii) Somewhat difficult to construct. No uncertainties in construction.	___	2
	iii) Very difficult to construct and/or significant uncertainties in construction.	___	1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.	X	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.	___	2
c. Schedule of delays due to technical problems.	i) Unlikely	X	2
	ii) Somewhat likely	___	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.	X	2
	ii) Some future remedial actions may be necessary.	___	1
Subtotal (maximum = 10)			
2. Administrative Feasibility			
a. Coordination with other agencies.	i) Minimal coordination is required.	___	2
	ii) Required coordination is normal.	X	1
	iii) Extensive coordination is required.	___	0
Subtotal (maximum = 2)			
3. Availability of Services and Materials			
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes** X	1
		No ___	0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes** X	1
		No ___	0

Table 5.7 (cont'd)

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes	X	1
		No		0

Subtotal (maximum = 3)

TOTAL (maximum = 15)

APPENDIX B-6

ALTERNATIVE D-2 - SITE INTERCEPTOR WELL/INJECTION WELL

Table 5.2

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)

(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs	Meets chemical specific SCGs such as groundwater standards	Yes	X	4
		No		0
2. Compliance with action-specific SCGs	Meets SCGs such as technology standards for incineration or landfill	Yes	X	3
		No		0
3. Compliance with location-specific SCGs	Meets location-specific SCGs such as Freshwater Wetlands Act	Yes	X	3
		No		0

TOTAL (Maximum = 10)

Table 5.3

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. **(If answer is yes, go to the end of the Table.)**	**Yes**	X	20
		No	___	0
TOTAL (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	**Yes**	___	3
		No	___	0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	**Yes**	___	4
		No	___	0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	**Yes**	___	3
		No	___	0
Subtotal (maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	**≤ 1 in 1,000,000**	___	5
	ii) Health risk	**≤ 1 in 100,000**	___	2
Subtotal (maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable		___	5
	ii) Slightly greater than acceptable		___	3
	iii) Significant risk still exists		___	0
Subtotal (maximum = 5)				
TOTAL (maximum = 20)				

Table 5.4

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	° Are there significant short-term risks to the community that must be addressed? **(If answer is no, go to Factor 2.)**	Yes No	___ _X_	0 4
	° Can the risk be easily controlled?	Yes No	___ ___	1 0
	° Does the mitigative effort to control risk impact the community life-style?	Yes No	___ ___	0 2
Subtotal (maximum = 4)				
2. Environmental Impacts	° Are there significant short-term risks to the environment that must be addressed? **(If answer is no, go to Factor 3.)**	Yes No	___ _X_	0 4
	° Are the available mitigative measures reliable to minimize potential impacts?	Yes No	___ ___	3 0
Subtotal (maximum = 4)				
3. Time to implement the remedy.	° What is the required time to implement the remedy?	≤ 2yr. > 2yr.	_X_ ___	1 0
	° Required duration of the mitigative effort to control short-term risk.	≤ 2yr. > 2yr.	___ _X_	1 0
Subtotal (maximum = 2)				
TOTAL (maximum = 10)				

Table 5.5

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. On-site or off-site treatment or land disposal	° On-site treatment*		(3)
	° Off-site treatment*		1
	° On-site or off-site land disposal		0
Subtotal (maximum = 3)			
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes			
2. Permanence of the remedial alternative.	° Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). **(If answer is yes, go to Factor 4.)**	Yes ____	3
		No X	0
Subtotal (maximum = 3)			
3. Lifetime of remedial actions.	° Expected lifetime or duration of of effectiveness of the remedy.	25-30yr. X	3
		20-25yr. ____	2
		15-20yr. ____	1
		< 15yr. ____	0
Subtotal (maximum = 3)			
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None ____	3
		≤ 25% X	2
		25-50% ____	1
		≥ 50% ____	0
	ii) Is there treated residual left at the site? **(If answer is no, go to Factor 5.)**	Yes X	0
		No ____	2
	iii) Is the treated residual toxic?	Yes ____	0
		No X	1
	iv) Is the treated residual mobile?	Yes ____	0
		No X	1
Subtotal (maximum = 5)			

Table 5.5 (cont'd)

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
5. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	< 5yr.	___	1
		> 5yr.	X	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? **(If answer is no, go to "iv")**	Yes	___	0
		No	X	1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident	___	1
		Somewhat to not confident	___	0
	iv) Relative degree of long-term monitoring required **(compare with other remedial alternatives)**	Minimum	___	2
		Moderate	___	1
		Extensive	X	0

Subtotal (maximum = 4)

TOTAL (maximum = 15)

Table 5.6
REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). **If Factor 1 is not applicable, go to Factor 2.**	i) Quantity of hazardous waste destroyed or treated. **Immobilization technologies do not score under Factor 1.**	99-100%	___	8
		90-99%	___	7
		80-90%	X	6
		60-80%	___	4
		40-60%	___	2
		20-40%	___	1
		< 20%	___	0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i)? **If answer is no, go to Factor 2**	Yes	___	0
		No	X	2
Subtotal (maximum = 10) **If subtotal = 10, go to Factor 3**	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal	___	0
		On-site land disposal	___	1
		Off-site destruction or treatment	___	2
2. Reduction in mobility of hazardous waste. **If Factor 2 is not applicable, go to Factor 3**	i) Quality of Available Wastes Immobilized After Destruction/ Treatment	90-100%	___	2
		60-90%	X	1
		< 60%	___	0
	ii) Method of Immobilization			
	- Reduced mobility by containment		X	0
	- Reduced mobility by alternative treatment technologies		___	3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste	Completely irreversible		X	5
	Irreversible for most of the hazardous waste constituents.		___	3
	Irreversible for only some of the hazardous waste constituents		___	2
	Reversible for most of the hazardous waste constituents.		___	0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)				

Table 5.7

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
1. Technical Feasibility			
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.	___	3
	ii) Somewhat difficult to construct. No uncertainties in construction.	X	2
	iii) Very difficult to construct and/or significant uncertainties in construction.	___	1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.	___	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.	X	2
c. Schedule of delays due to technical problems.	i) Unlikely	X	2
	ii) Somewhat likely	___	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.	X	2
	ii) Some future remedial actions may be necessary.	___	1
Subtotal (maximum = 10)			
2. Administrative Feasibility			
a. Coordination with other agencies.	i) Minimal coordination is required.	___	2
	ii) Required coordination is normal.	___	1
	iii) Extensive coordination is required.	X	0
Subtotal (maximum = 2)			
3. Availability of Services and Materials			
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	Yes X	1
		No ___	0
	ii) Will more than one vendor be available to provide a competitive bid?	Yes X	1
		No ___	0

IMPLEMENTABILITY
(Relative Weight = 15)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes**	___	1
		No	X	0

Subtotal (maximum = 3)

TOTAL (maximum = 15)

APPENDIX C

APPENDIX C

REMEDIAL ALTERNATIVES

CAPITAL AND OPERATIONS AND MAINTENANCE COST ESTIMATES

APPENDIX C-1

ALTERNATIVE A-1 - EXTEND WATER DISTRICT

COST ESTIMATE

ALTERNATIVE A-1

EXTEND WATER DISTRICT

CAPITAL COSTS

Construction.................................$	121,000.00
Engineering..................................$	25,000.00
Subtotal.....................................$	146,000.00

ANNUAL OPERATIONS AND MAINTENANCE COSTS

Operations and Maintenance...................$	7,000.00
Monitoring...................................$	0.00
Subtotal (per year)..........................$	7,000.00

NET PRESENT WORTH (30 years @ 5%)

Capital Costs................................$	146,000.00
30 years O&M, present worth..................$	107,800.00
TOTAL..$	253,800.00

APPENDIX C-2

ALTERNATIVE A-2 - INDIVIDUAL CARBON TREATMENT

COST ESTIMATE

ALTERNATIVE A-2

INDIVIDUAL CARBON TREATMENT

CAPITAL COSTS

Carbon Units & Connections	$	82,500.00
Engineering	$	15,000.00
Subtotal	$	97,500.00

ANNUAL OPERATIONS AND MAINTENANCE COSTS

Operations and Maintenance	$	10,000.00
Monitoring	$	30,000.00
Subtotal (per year)	$	40,000.00

NET PRESENT WORTH (30 years @ 5%)

Capital Costs	$	97,500.00
30 years O&M, present worth	$	616,000.00
TOTAL	$	713,500.00

APPENDIX C-3

ALTERNATIVE B-1 - OFF-SITE INTERCEPTOR WELL

COST ESTIMATE

ALTERNATIVE B-1

OFF-SITE INTERCEPTOR WELL

CAPITAL COSTS

Drilling Contractor............................	$ 45,000.00
Construction...................................	$ 16,000.00
Engineering....................................	$ 15,000.00
Subtotal.......................................	$ 76,000.00

ANNUAL OPERATIONS AND MAINTENANCE COSTS

Operations and Maintenance.....................	$ 10,000.00
Monitoring.....................................	$ 15,000.00
Subtotal (per year)............................	$ 25,000.00

NET PRESENT WORTH (30 years @ 5%)

Capital Costs..................................	$ 76,000.00
30 years O&M, present worth....................	$ 385,000.00
TOTAL..	$ 461,000.00

APPENDIX C-4

ALTERNATIVE B-2 - TOWN WELL TREATMENT

COST ESTIMATE

ALTERNATIVE B-2

TOWN WELL TREATMENT

CAPITAL COSTS

Treatment System	$	150,000.00
Construction	$	150,000.00
Engineering	$	75,000.00
Subtotal	$	375,000.00

ANNUAL OPERATIONS AND MAINTENANCE COSTS

Operations and Maintenance	$	20,000.00
Monitoring	$	5,000.00
Subtotal (per year)	$	25,000.00

NET PRESENT WORTH (30 years @ 5%)

Capital Costs	$	375,000.00
30 years O&M, present worth	$	385,000.00
TOTAL	$	760,000.00

APPENDIX C-5

ALTERNATIVE D-1 - SITE INTERCEPTOR WELL/STREAM DISCHARGE

COST ESTIMATE

ALTERNATIVE D-1

SITE INTERCEPTOR WELL/STREAM DISCHARGE

CAPITAL COSTS

Drilling Contractor	$	45,000.00
Treatment System	$	35,000.00
Construction	$	30,000.00
Engineering	$	27,500.00
Subtotal	$	137,500.00

ANNUAL OPERATIONS AND MAINTENANCE COSTS

Operations and Maintenance	$	12,500.00
Monitoring	$	30,000.00
Subtotal (per year)	$	42,500.00

NET PRESENT WORTH (30 years @ 5%)

Capital Costs	$	137,500.00
30 years O&M, present worth	$	654,500.00
TOTAL	$	792,000.00

APPENDIX C-6

ALTERNATIVE D-2 - SITE INTERCEPTOR WELL/INJECTION WELL

COST ESTIMATE

ALTERNATIVE D-2

SITE INTERCEPTOR WELL/INJECTION WELL

CAPITAL COSTS

Drilling Contractor	$	105,000.00
Treatment System	$	35,000.00
Construction	$	60,000.00
Engineering	$	50,000.00
Subtotal	$	250,000.00

ANNUAL OPERATIONS AND MAINTENANCE COSTS

Operations and Maintenance	$	20,000.00
Monitoring	$	35,000.00
Subtotal (per year)	$	55,000.00

NET PRESENT WORTH (30 years @ 5%)

Capital Costs	$	250,000.00
30 years O&M, present worth	$	847,000.00
TOTAL	$	1,097,000.00