REMEDIATION SYSTEM EVALUATION

CLAREMONT POLYCHEMICAL SUPERFUND SITE
OLD BETHPAGE, NEW YORK

Report of the Remediation System Evaluation,
Site Visit Conducted at the Claremont Polychemical Superfund Site
June 26-27, 2001

Final Report
March 7, 2002

US Army
Corps of Engineers

US Environmental
Protection Agency

EXECUTIVE SUMMARY

The Claremont Polychemical Superfund Site, located in a light industrial area of Old Bethpage, Nassau County, New York, is approximately 10 acres in area. The site addresses contamination stemming from the operations of a former manufacturer of pigments for plastics, inks, coated metallic tanks, and vinyl stabilizers. Leaking drums of hazardous chemicals, primarily volatile organic compounds (VOCs) were discovered by the Nassau County Health Department (NCHD) in 1979, and soil and groundwater contamination beneath the site were discovered in 1980. A series of remedial actions by the property owners began later that year, but subsequent investigations revealed additional contamination. The site was placed on the National Priorities list in June 1986.

Two Records of Decision (RODs) were issued documenting the selection of several distinct remedial actions for the Claremont Site. The first ROD addresses the contamination of soil and groundwater. The second ROD addresses the removal of wastes found in drums, storage tanks, and treatment basins. The excavation and on-site treatment of contaminated soil under the first ROD was completed in March 1997. The removal of wastes specified in the second ROD was completed in 1990.

The groundwater treatment portion of the first ROD involves two phases. The first phase, which addresses the contaminated groundwater on the Claremont property with a pump-and treat system, began in February 2000. The second phase, which involves extraction and treatment of the contaminated groundwater that has migrated beyond the Claremont property boundary, was to originally involve the installation of an additional extraction and treatment system. However, a September 2000 Explanation of Significant Differences (ESD) acknowledged that contaminated groundwater has migrated from the Claremont property to another nearby Superfund site, namely the Old Bethpage Landfill (OBL) Site. The OBL groundwater treatment system has been treating contaminated groundwater which migrated from the Claremont Site. The Town of Oyster Bay (TOB) is the potentially responsible party for the OBL Site and is responsible for operating the OBL groundwater treatment system pursuant to an enforcement agreement with the New York State Department of Environmental Conservation (NYSDEC). The ESD also acknowledged that three (3) extraction wells associated with the OBL treatment system captured the groundwater plume emanating from the Claremont property (note: the Claremont site managers report that these wells are no longer capturing OBL contamination and would otherwise be decommissioned) and stipulated that these OBL extraction wells could operate in lieu of installing and operating the additional extraction and treatment system originally specified in the Claremont ROD.

The differences highlighted by the ESD are being implemented through a cooperative agreement with NYSDEC and EPA to provide funding for the long-term response action related to the cleanup of the groundwater plume. In addition, NYSDEC is planning to enter into a separate agreement with the TOB for the implementation of this effort. EPA and NYSDEC will reimburse the Town of Oyster Bay 60% of the OBL operating costs for up to 10 years, or until remedial action goals are achieved, whichever occurs first. In the opinion of site managers, the Claremont Site has received the benefit of the OBL system's treatment of the contaminated groundwater for several years, and in the opinion of site managers, it would be fair, equitable, and reasonable to pay for the costs of this treatment. In the opinion of site managers, it is more cost-effective to continue to use the OBL Site's treatment system in the future than to construct a new treatment facility.

This Remediation System Evaluation (RSE) report focuses primarily on the onsite Claremont pump-and-treat system but also considers, to some degree, the efficiency and cost-effectiveness of the OBL treatment system, as these factors influence the second phase of the Claremont groundwater remedy. However, the RSE team did not visit the OBL treatment plant or meet with the managers of that system.

In general, the RSE team found a well-operated system. For example, after recognizing consistently low influent iron and manganese concentrations, the plant operators discontinued metals removal treatment to reduce the use of oxidizing chemicals and the associated hazards. The RSE team suggests the following recommendations to improve system effectiveness:

- The depths-to-water in the monitoring wells are measured quarterly. These measurements should be converted to water levels by subtracting the depths-to-water from the reference points of the measurements (i.e., the elevations of the tops of the well casings).

- The process data and the quarterly aquifer data should be analyzed and the results and conclusions should be reported (including an interpretation of the results with respect to progress toward remediation goals).

- The Claremont VOC plume should be more thoroughly delineated, potentially through sharing data with nearby sites, and the capture zone should be analyzed, potentially through development and use of a groundwater flow model.

These recommendations might require approximately $76,000 in capital costs and might increase annual costs by approximately $37,000 per year.

Recommendations to reduce life-cycle costs include the following:

- The unused metals removal system should be removed and the associated process monitoring and labor should be eliminated. This would likely require an estimated capital investment of approximately $500,000 to restructure the plant but would likely result in an estimated potential savings of approximately $248,000 per year.

- The treatment system can also be simplified by eliminating the liquid phase carbon treatment because the air stripper alone is capable of meeting the discharge requirements. Removing or bypassing the units would likely require approximately $25,000 in capital costs; however, approximately $23,000 per year could potentially be saved.

- Even if the treatment system is not simplified by removing the metals treatment system or the liquid phase carbon, excess process monitoring chould be eliminated resulting in estimated potential savings of approximately $5,000 per year.

- The pH discharge requirement should be relaxed so that the treatment process is not required to increase the pH of the extracted water above natural background levels. This potentially would lead to estimated savings of approximately $24,000 per year in chemical and supply costs and would eliminate hazards associated with the transport and handling of caustic and acid.

- If the resulting risks associated with air emissions are sufficiently low, the vapor phase carbon treatment could be eliminated if approved by NYSDEC and considered appropriate by US EPA. Removing the vapor phase carbon treatment would result in estimated potential savings of $5,000 per year in utilities because operation of an offgas blower and a heater would not longer be required. Additional, but unquantified, savings would arise as future carbon replacement would not be required. Site managers indicate that data from the monitoring of the influent and effluent of the vapor phase carbon unit will determine if the vapor phase carbon unit can be eliminated.

- Finally, given that a portion of the operation costs of the OBL pump-and-treat system will be incurred by the Claremont Site in exchange for the OBL system extracting and treating Claremont-related contamination, the OBL treatment system should be optimized to determine if operation costs can be reduced. Estimated potential cost savings from an RSE for the OBL system have not been quantified.

Implementing the recommendations to reduce costs would require initial investments, but savings from operations and maintenance could offset these initial investments as well as the costs associated with recommendations for enhanced system effectiveness and technical improvement.

An approach to implementing these recommendations is provided in Section 6.6, and a summary of recommendations, including estimated costs and/or savings associated with those recommendations is presented in Section 7.0 of the report.

PREFACE

This report was prepared as part of a project conducted by the United States Environmental Protection Agency (USEPA) Technology Innovation Office (TIO) and Office of Emergency and Remedial Response (OERR). The objective of this project is to conduct Remediation System Evaluations (RSEs) of pump-and-treat systems at Superfund sites that are "Fund-lead" (i.e., financed by USEPA). RSEs are to be conducted for up to two systems in each EPA Region with the exception of Regions 4 and 5, which already had similar evaluations in a pilot project.

The following organizations are implementing this project.

Organization	Key Contact	Contact Information
USEPA Technology Innovation Office (USEPA TIO)	Kathy Yager	11 Technology Drive (ECA/OEME) North Chelmsford, MA 01863 phone: 617-918-8362 fax: 617-918-8427 yager.kathleen@epa.gov
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GeoTrans, Inc. (Contractor to USEPA TIO)	Doug Sutton	GeoTrans, Inc. 2 Paragon Way Freehold, NJ 07728 (732) 409-0344 Fax: (732) 409-3020 dsutton@geotransinc.com
Army Corp of Engineers: Hazardous, Toxic, and Radioactive Waste Center of Expertise (USACE HTRW CX)	Dave Becker	12565 W. Center Road Omaha, NE 68144-3869 (402) 697-2655 Fax: (402) 691-2673 dave.j.becker@nwd02.usace.army.mil

The project team is grateful for the help provided by the following EPA Project Liaisons.

Region 1	Darryl Luce and Larry Brill	**Region 6**	Vincent Malott
Region 2	Diana Cutt	**Region 7**	Mary Peterson
Region 3	Kathy Davies	**Region 8**	Armando Saenz and Richard Muza
Region 4	Kay Wischkaemper	**Region 9**	Herb Levine
Region 5	Dion Novak	**Region 10**	Bernie Zavala

They were vital in selecting the Fund-lead P&T systems to be evaluated and facilitating communication between the project team and the Remedial Project Managers (RPM's).

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1.0 INTRODUCTION

1.1 PURPOSE

In the *OSWER Directive No. 9200.0-33, Transmittal of Final FY00 - FY01 Superfund Reforms Strategy, dated July 7,2000*, the Office of Solid Waste and Emergency Response outlined a commitment to optimize Fund-lead pump-and-treat systems. To fulfill this commitment, the US Environmental Protection Agency (USEPA) Technology Innovation Office (TIO) and Office of Emergency and Remedial Response (OERR), through a nationwide project, is assisting the ten EPA Regions in evaluating their Fund-lead operating pump-and-treat systems. This nationwide project is a continuation of a demonstration project in which the Fund-lead pump-and-treat systems in Regions 4 and 5 were screened and two sites from each of the two Regions were evaluated. It is also part of a larger effort by TIO to provide USEPA Regions with various means for optimization, including screening tools for identifying sites likely to benefit from optimization and computer modeling optimization tools for pump and treat systems.

This nationwide project identifies all Fund-lead pump-and-treat systems in EPA Regions 1 through 3 and 6 through 10, collects and reports baseline cost and performance data, and evaluates up to two sites per Region. The site evaluations are conducted by EPA-TIO contractors, GeoTrans, Inc. and the United States Army Corps of Engineers (USACE), using a process called a Remediation System Evaluation (RSE), which was developed by USACE. The RSE process is meant to evaluate performance and effectiveness (as required under the NCP, i.e., and “five-year" review), identify cost savings through changes in operation and technology, assure clear and realistic remediation goals and an exit strategy, and verify adequate maintenance of Government owned equipment.

The Claremont Polychemical Superfund Site was chosen based on initial screening of the pump-and-treat systems managed by USEPA Region 2 as well as discussions with the EPA Remedal Project Manager for the site and the Superfund Reform Initiative Project Liaison for that Region. This site has high operation costs relative to the cost of an RSE and a long projected operating life. This report provides a brief background on the site and current operations, a summary of the observations made during a site visit, and recommendations for changes and additional studies. The cost impacts of the recommendations are also discussed.

A report on the overall results from the RSEs conducted for this system and other Fund-lead P&T systems throughout the nation will also be prepared and will identify lessons learned and typical costs savings.

1.2 TEAM COMPOSITION

The team conducting the RSE consisted of the following individuals:

Rob Greenwald, Hydrogeologist, GeoTrans, Inc.
Ed Mead, Chemical Engineer, USACE HTRW CX
Peter Rich, Civil and Environmental Engineer, GeoTrans, Inc.
Doug Sutton, Water Resources Engineer, GeoTrans, Inc.

1.3 DOCUMENTS REVIEWED

Author	Date	Title/Description
US EPA	8/1990	Superfund Proposed Plan, Claremont Polychemical Site, Old Bethpage, Nassau County, New York
US EPA	9/28/1990	Record of Decision, Claremont Polychemical Site, Old Bethpage, New York
Rust Environmental & Infrastructure	5/3/1994	Operable Unit 1, Phase I Design, Claremont Polychemical Corp. Superfund Site, Old Bethpage, New York, Vol. 1-6.
Rust Environmental & Infrastructure	8/30/1994	100% Final Design Submittal, Phase 1 Remedial Design Plans, Claremont Polychemical Corp., Old Bethpage, New York
Lockwood, Kessler & Bartlett, Inc.	8/1997	Report on the Extent of the Capture and Treatment of the Claremont Site Plume
NYSDEC	1998	Final Effluent Limitations and Monitoring Requirements for 1/1/1998 through 12/31/2002, Claremont Polychemical Superfund Site
US EPA	9/2000	Explanation of Significant Differences, Claremont Polychemical Corporation Superfund Site, Town of Oyster Bay, Nassau County, New York
Lockwood, Kessler & Bartlett, Inc.	12/2000	2000 Third Quarter Report, Old Bethpage Solid Waste Disposal Complex Groundwater Treatment Facility
Lockwood, Kessler & Bartlett, Inc.	1/2001	2000 Fourth Quarter Report, Old Bethpage Solid Waste Disposal Complex Groundwater Treatment Facility
Severn Trent Services	2/27/2001	Analytical Results of Process Monitoring Samples Received 2/13/2001 through 2/16/2001.
Severn Trent Services	2/28/2001	Analytical Results of Aquifer Monitoring Samples Received 2/8/2001 through 2/9/2001
Lockwood, Kessler & Bartlett, Inc.	3/2001	2000 Annual Report, Old Bethpage Solid Waste Disposal Complex Groundwater Treatment Facility

1.4 PERSONS CONTACTED

The following individuals were present for the site visit:

Rob Alvey, Hydrogeologist, EPA Region 2
Shewen Bian, USACE, New York District
Bob Burns, Plant Operator, URS
Maria Jon, RPM, EPA Region 2
Diana Cutt, Project Liaison, EPA Region 2
James Jackson, Plant Operator, URS
Samy Said, Project Manager, USACE New York District
Ken Sullivan, Project Manager, URS

1.5 SITE LOCATION, HISTORY, AND CHARACTERISTICS

1.5.1 LOCATION

The Claremont Polychemical Superfund Site is approximately 10 acres in area and is located in a light industrial area of Old Bethpage, New York. The remedy at the site addresses contamination from volatile organic compounds (VOCs) resulting from the operations of the Claremont Polychemical Company, which manufactured pigments for plastics, dyes and other materials between 1966 and 1980. The Claremont Polychemical Site is bordered to the south and southeast by the Bethpage State Park and a golf course, to the east by the State University of New York- Farmingdale Campus, and to the north by a commericial and light industrial area. To the west, the Claremont Polychemical Site is bordered by the Oyster Bay Solid Waste Disposal Complex (Old Bethpage Landfill), which is a Superfund Site with the Town of Oyster Bay as the responsible party. The Nassau County Fireman's Training center, which has also contributed to soil and groundwater contamination in the area, is located approximately 500 feet south of the OBL site. Figure 1-1 shows the location of the site and the area surrounding it.

Two Records of Decision (RODs) were issued documenting the selection of several distinct remedial actions for the Claremont Site. The first ROD addresses the contamination of soil and groundwater. The second ROD addresses the removal of wastes found in drums, storage tanks, and treatment basins. The excavation and on-site treatment of contaminated soil under the first ROD was completed in March 1997. The removal of wastes specified in the second ROD was completed in 1990.

The groundwater treatment portion of the first ROD involves two phases. The first phase, which addresses the contaminated groundwater on the Claremont property with a pump-and treat system, began in February 2000. The second phase, which involves extraction and treatment of the contaminated groundwater that has migrated beyond the Claremont property boundary, was to originally involve the installation of an additional extraction and treatment system. However, a September 2000 Explanation of Significant Differences (ESD) acknowledged that contaminated groundwater has migrated from the Claremont property to another nearby Superfund site, namely the Old Bethpage Landfill (OBL) Site. The OBL groundwater treatment system has been treating contaminated groundwater which migrated from the Claremont Site. The Town of Oyster Bay (TOB) is the potentially responsible party for the OBL Site and is responsible for operating the OBL groundwater treatment system pursuant to an enforcement agreement with the New York State Department of Environmental Conservation (NYSDEC). The ESD also acknowledged that three (3) extraction wells associated with the OBL treatment system captured the groundwater plume emanating from the Claremont property (note: the Claremont site managers report that, these wells are no longer capturing OBL contamination and would otherwise be decommissioned) and stipulated that these OBL extraction wells could operate in lieu of installing and operating the additional extraction and treatment system originally specified in the Claremont ROD.

The differences highlighted by the ESD are being implemented through a cooperative agreement with NYSDEC and EPA to provide funding for the long-term response action related to the cleanup of the groundwater plume. In addition, NYSDEC is planning to enter into a separate agreement with the TOB for the implementation of this effort. EPA and NYSDEC will reimburse the Town of Oyster Bay 60% of the OBL operating costs for up to 10 years, or until remedial action goals are achieved, whichever occurs first. In the opinion of site managers, the Claremont Site has received the benefit of the OBL system's treatment of the contaminated groundwater for several years, and in the opinion of site managers, it would be fair, equitable, and reasonable to pay for the costs of this treatment. In the opinion of site managers, it is more cost-effective to continue to use the OBL Site's treatment system in the future than to construct a new treatment facility. The estimated cost to EPA for over this 10-year period for these reimbursements is expected to be approximately $12 million.

Figure 1-2 shows both the Old Bethpage Landfill Site and extraction wells and the Claremont Site extraction, monitoring, and reinjection wells.

1.5.2 POTENTIAL SOURCES

The principle wastes generated in the production of pigments at the Claremont Polychemical facility consisted of volatile organic compounds (VOCs) such as tetrachloroethylene (PCE), trichloroethylene (TCE), resins, and mineral spirits. Contaminated soil and groundwater likely resulted from daily operations and from leaks in chemical drums, storage tanks, and treatment basins. Leaking drums containing hazardous chemicals were first discovered by the Nassau County Health Department (NCHD) in 1979. The drums were removed or their contents reused by 1980, and the property owners excavated a 75-foot by 75-foot area of contaminated soil east of the process building to a depth of 10 feet. Figure 1-3 shows the Claremont Site layout, identifies the former spill area, and notes the location of nearby wells.

An EPA Remedial Investigation conducted in 1988 revealed extensive soil and groundwater contamination. The highest PCE concentration in soil was 26,000 ppb and was found in an identified spill area to the east of the process building. Other site-related contaminants found in the soil included acetone, 2-butanone, 4-methyl-2-pentanone, xylenes, toluene, dicholorethylene (DCE), and trichloroethylene (TCE). Polyaromatic hydrocarbons, pthalates, and pesticides were also discovered in subsurface soils; however, PCE is listed as the only chemical of concern in the soil in the ROD due to its ability to leach into the groundwater. In this 1988 Remedial Investigation concentrations of all contaminants was found to decrease significantly with depth. However, more recent data suggest an increase in TCE concentration with depth approximately 50 feet to the east of the identified spill area.

The stabilization and removal of waste under OU2 was completed in 1990, and the excavation and onsite treatment of soil was completed by March 1997. Additional soil contamination beneath the chemical process building, however, was discovered during building decontamination. EPA is currently evaluating options to address this contaminated soil.

1.5.3 HYDROGEOLOGIC SETTING

The Cretaceous Magothy Formation, a sole-source aquifer for central Long Island, underlies the Claremont Polychemical site. Near the Claremont Site, this formation extends approximately 300 feet below ground surface (bgs) and consists of well-stratified unconsolidated sand, silt, and clay. The silt and clay content dominates the northwestern portion of the site and the proportion of sand increases toward the southern boundary of the site. The water table is typically at 65 to 70 feet bgs and groundwater flows to the south-southeast. Thus, the Old Bethpage Landfill lies upgradient of the Claremont Site, and the golf course and Bethpage State Park lie downgradient of the Claremont Site.

A number of extraction wells exist in the area which complicates the hydrogeology. The Claremont Polychemical Site has three extraction wells that collectively pump approximately 325 gpm on average. The Old Bethpage Landfill Site has five extraction wells that collectively pump approximately 1,000 gpm. The Fireman training center also has a pump-and-treat system, and the golf course uses water for irrigation. Municipal water supply wells exist over 3,500 feet to the north.

1.5.4 DESCRIPTION OF GROUND WATER PLUME

The Remedial Investigation (1989) identified PCE as the groundwater contaminant with the greatest areal extent. Samples from that investigation showed migration of PCE 2,100 feet to the southeast of the site and the highest concentrations (1,300 ppb) occurred at the property boundary. The plume was estimated to be approximately 800 feet wide. Trans 1,2 DCE (830 ppb), TCE (260 ppb), and other contaminants were also found in the groundwater in concentrations exceeding the maximum contaminant levels (MCLs).

Subsequent analyses found increases in the groundwater PCE concentration. In a 1992 sampling event, well SW2 had a PCE concentration of 3,400 ppb and well EW-2A had a concentration of 2,200 ppb. The highest concentrations were found at an elevation of approximately 60 feet above mean sea level (60 feet MSL), which is just below the water table. Contamination, however, extends much deeper. The ROD estimated the PCE plume extended approximately 164 feet below ground surface (bgs) which translates to an elevation near sea level (0 feet MSL). As of February 2001, the highest concentration of PCE in groundwater was 4,200 ppb (measured in SW-1). PCE concentrations in other sampled wells did not exceed 400 ppb. This same sampling event also revealed a TCE concentration of 4,200 ppb in well EW-4C located approximately 50 feet to the east of the identified spill area. A plume map with recent site-related data has not been developed as part of the site activities.

2.0 SYSTEM DESCRIPTION

2.1 SYSTEM OVERVIEW

The Claremont Polychemical Site pump-and-treat system (first phase of the groundwater remedy) became operational and functional in February 2000 consists of an extraction system, above-ground treatment, and a reinjection system. On average the extraction system, which consists of three extraction wells, pumps approximately 325 gpm of groundwater to the treatment system. The combined influent concentration for PCE and TCE from the February 2001 sampling event was 640 ug/L. With this average flow rate and influent concentration, that treatment plant removes approximately 2.5 pounds of PCE and TCE (combined) from the extracted groundwater each day.

$$\frac{325\text{ gallons}}{\text{minute}} \times \frac{640\text{ ug (PCE \& TCE)}}{\text{liter}} \times \frac{3.785\text{ liters}}{\text{gallon}} \times \frac{1440\text{ minutes}}{\text{day}} \times \frac{2.2\text{ lbs}}{1 \times 10^{9}\text{ ug}} = \frac{2.5\text{ lbs}}{\text{day}}$$

As specified in the September 2000 Explanation of Significant Differences (ESD) for the Claremont Polychemical site, the second phase of the groundwater extraction and treatment will involve extraction of water from recovery wells RW-3, RW-4, and RW-5 of the Old Bethpage Landfill Site and treatment of that water at the OBL treatment facility.

2.2 EXTRACTION SYSTEMS

2.2.1 CLAREMONT POLYCHEMICAL SITE EXTRACTION SYSTEM

The Claremont extraction system consists of three extraction wells approximately 150 feet apart south of the site oriented in a southwest-northeast line. The pumps in the wells are controlled by the level in the equalization tank and are turned on and off simultaneously. Although each well is capable of pumping up to 200 gpm individually, when they are all on, EW-1, EW-2, and EW-3 respectively extract 190 gpm, 188 gpm, and 175 gpm for a total of approximately 553 gpm. Because the wells are off part of the time as controlled by the level in the equalization tank, the average flow rate over the course of a month is approximately 325 gpm. This average flow rate translates to approximately 470,000 gallons per day which is very close to the onsite remedy goal of treating 500,000 gallons per day.

2.2.2 OLD BETHPAGE LANDFILL SITE EXTRACTION SYSTEM

According to the documents reviewed by the RSE team, the Old Bethpage Landfill Extraction System consists of five recovery wells located downgradient of the Claremont Site in Bethpage State Park. The wells are connected to a treatment system via a common transmission line and are designed to extract approximately 1.5 million gallons per day (approximately 1,050 gpm). Based on hourly logs of the flow rates of each recovery well, it appears that wells RW-3 and RW-5 were not operational for a significant portion of the third and fourth quarters of 2000. With these two wells down, RW-1, RW-2, and RW-4 pumped approximately 250 gpm, 260 gpm, and 245 gpm, respectively, for a total of approximately 755 gpm or 1.1 million gallons per day. With only RW-5 down, total system flow increased to approximately 875 gpm or 1.25 million gallons per day. Based on these flow rates, it is reasonable to assume that pumping from RW-3, RW-4, and RW-5 as part of the Claremont remedy could be as high as approximately 200 gpm from each of the three wells for a total of 600 gpm or 860,000 gallons per day. Given that the Claremont ROD requires pumping of offsite at 500,000 gpd, these three wells should meet this requirement.

2.3 TREATMENT SYSTEMS

2.3.1 CLAREMONT POLYCHEMICAL SITE TREATMENT SYSTEM

Water from the extraction system enters a 60,000 gallon equalization tank situated adjacent to the treatment building. Water from the equalization tank flows through two parallel metals-removal trains that are each rated for 250 gpm. Each train includes a reaction tank, a flocculation tank, a clarifier, and a filter and is followed by air-stripper feed tanks. These feed tanks send the water through a single packed-tower air stripper rated at an average rate of 500 gpm and then through parallel liquid phase carbon units each rated at 250 gpm. The air emissions from the air stripper are treated with vapor phase carbon. In addition to removing metals and VOCs from the extracted water, the treatment system also raises the pH of the extracted water from pH 5, which is the background pH for groundwater in the area, to between pH 6.5 and 8.5. The treated water is then transferred to treated-water storage tanks before it is reinjected to the subsurface through four reinjection wells located on the SUNY Farmingdale property (see Figure 1-2).

After the first nine months of operation the addition of oxidizing chemicals (potassium permanganate) to the metals removal system was discontinued as the influent to the plant already met discharge standards for metals. Water continues to flow through this system and caustic is still added to raise the pH.

2.3.2 OLD BETHPAGE LANDFILL SITE TREATMENT SYSTEM

Extracted water from all of the Old Bethpage Landfill recovery wells is treated in a single treatment facility that consists of a packed tower air stripper. Based on hourly logs, water flows through the air stripper at approximately 1,300 gpm and a blower provides approximately 8,000 standard cubic feet of air per minute (scfm). The treated water is discharged into recharge basins and the offgas from the air stripper exits through a stack. Chemical addition is used to reduce metals fouling of the air stripper.

2.4 MONITORING SYSTEMS

2.4.1 CLAREMONT POLYCHEMICAL SITE MONITORING SYSTEM

Thirteen monitoring wells of various depths are sampled and analyzed for VOCs and inorganics quarterly. All of these wells are either on or adjacent to the site and do not address the extended plume. The depths to water in each of these wells is also recorded quarterly. The elevations of the tops of the well casings, however, are not used to convert these measurements to water levels so potentiometric surface maps have not been generated.

During the first twelve weeks of operation, samples were collected weekly between each of the treatment train processes. Since the end of that initial period of operation, the samples between each process have been collected quarterly. The influent and effluent, however, are still sampled weekly for VOCs and monthly for metals and base-neutral-acid extractables as required by NYSDEC. The plant operator regularly samples the effluent of the vapor phase carbon with a photoionization detector (PID).

2.4.2 OLD BETHPAGE LANDFILL SITE MONITORING SYSTEM

The monitoring program for the Old Bethpage Landfill Site consists of the following:

- Water levels are measured quarterly from 54 wells in the area.
- Groundwater quality, including analysis for VOCs and inorganics, are measured quarterly from approximately 15 wells.
- Ambient air and soil-gas are measured up and down wind of the plant annually.
- Three samples from the influent and effluent and one sample from each well are collected weekly and analyzed for VOCs and inorganics such as ionization potential, manganese, and dissolved oxygen.
- Onsite staff monitor on an hourly basis, the flow rate from each of the wells, the flow rates of water and air through the air stripper, and the air pressure drop across the air stripper.
- The offgas of the air stripper is determined by calculating a mass balance based on concentrations of extracted and treated groundwater and flow rates.
- Monthly samples of the influent and effluent are sent to an offsite certified laboratory for analysis for the monthly State Pollution Discharge Elimination System (SPDES) reports. The effluent samples are analyzed for both organics and inorganics and the influent is only analyzed for organics.

3.0 SYSTEM OBJECTIVES, PERFORMANCE AND CLOSURE CRITERIA

3.1 CURRENT SYSTEM OBJECTIVES AND CLOSURE CRITERIA

The ROD stipulates that the overall remedy is "to reduce the concentrations of contaminants in various media and structures at the Site to levels which are protective of human health and the environment." Specifically referring to remediation of groundwater, the ROD states that "extraction and treatment of the contaminated groundwater will contain the migration of the plume and, in time, will achieve federal and state standards for the volatile organic compounds." The selected groundwater remedy involves pumping, pre-treatment, air stripping, carbon adsorption, and reinjection of groundwater. The pumping is to occur both at the site boundary and downgradient to address the extended plume. Collectively, the onsite and offsite wells are to pump approximately 1 million gallons per day or almost 700 gpm. The September 2000 ESD stipulates that the offsite pumping and the treatment of the associated water would be accomplished through operation of recovery wells RW-3, RW-4, and RW-5 of the Old Bethpage Landfill Site.

Both the ROD and ESD estimate that pumping from onsite and offsite wells will continue for 10 years at which point pumping from the offsite wells could be discontinued and pumping from onsite wells would continue for another 6 years.

3.2 TREATMENT PLANT OPERATION GOALS

The treatment system at the Claremont Polychemical Site has a goal of treating and reinjecting 500,000 gallons per day. Treated water must comply with both the Federal maximum contaminant levels (MCLs) and the New York State Groundwater Quality Standards for the contaminants of concern. The air emissions from the vapor phase carbon must also meet State standards.

3.3 ACTION LEVELS

The effluent limitations and monitoring requirements for the treated water specify weekly sampling for pH, PCE, TCE, and cis-1,2 DCE and monthly sampling for other VOCs, BNAs, or inorganics. The discharge limit for PCE, TCE, and cis-1,2 DCE is 5 ug/L (ppb) for each contaminant, and although background water in the area is pH 5, the permit requires the plant effluent is pH 6.5 to 8.5. Given that the treatment plant was designed and originally operated to remove metals such as iron and manganese, it is pertinent to note that the discharge limit for each of those metals is 600 ug/L. The combined concentration for iron and manganese may not exceed 1,000 ug/L.

4.0 FINDINGS AND OBSERVATIONS FROM THE RSE SITE VISIT

4.1 FINDINGS

The RSE team found a well-operated treatment plant. The observations and recommendations given below are not intended to imply a deficiency in the work of the designers, operators, or site managers but are offered as constructive suggestions in the best interest of the EPA and the public. These recommendations obviously have the benefit of the operational data unavailable to the original designers.

4.2 SUBSURFACE PERFORMANCE AND RESPONSE

4.2.1 WATER LEVELS

The depth to water is measured quarterly from thirteen wells; however, these have not been converted to water levels or a potentiometric surface map since plant operation began. The depth to the water from these thirteen wells varies between 67 feet bgs and 98 feet bgs depending on the location and depth of the well. The depth to water in each of the wells in the EW-1 cluster is approximately 67 feet bgs, and the depth to water in the EW-4 cluster is approximately 98 feet bgs.

4.2.2 CAPTURE ZONES

The capture zones of the extraction wells cannot effectively be evaluated without reliable water-level maps or without consistent monitoring of contaminants in downgradient wells. Because reliable water level measurements have not been interpreted and downgradient monitoring of the contaminants is not conducted as part of site activities, the actual capture of site-related contaminants are not known. However, aquifer sampling conducted as part of the Old Bethpage Landfill Site suggests decreasing concentrations of PCE downgradient of the Claremont Site. PCE concentrations in MW-8A, located immediately downgradient of the Claremont extraction system, had concentrations above 200 ppb in January and April 2000 (prior to and shortly after the beginning of operation) but 40 ppb in July 2000 and 26 ppb in October 2000.

4.2.3 CONTAMINANT LEVELS

As stated previously, concentrations in the extended Claremont plume appear to have significantly decreased during 2000 as determined by the sampling associated with the Old Bethpage Landfill Site. VOC concentrations on the Claremont Site continue to be high according to the February 2001 aquifer sampling conducted by the Claremont Site operators. EW-1A had a PCE concentration of 380 ppb and SW1 had a PCE concentration of 4,200 ppb. This latter concentration exceeds by two to three orders of magnitude the PCE concentration measured from the same well one year earlier. In addition, EW-4C, which screens approximately 5 to 15 feet MSL (160 feet bgs), had a TCE concentration of 4,200 ppb. This well typically has had higher values of TCE compared to the rest of the site or compared to shallower depths in the same location, and this value of 4,200 ppb is higher than previous values in documents reviewed by the RSE team. This increase suggests the migration of contamination or a potential deep source of dissolved phase TCE.

4.3 COMPONENT PERFORMANCE

The following subsections describe the component performance of the Claremont Polychemical pump-and-treat system. The performance of the components of the Old Bethpage Landfill pump-and-treat system were not reviewed as part of this RSE.

4.3.1 EXTRACTION WELLS AND PUMPS

The three extraction wells are screened from approximately 60 feet MSL (just below the water table) to -30 feet MSL and are outfitted with 10 horsepower pumps each capable of providing 200 gpm. The extraction pumps are turned on and off simultaneously based on the level of water in the equalization tank. Flow is typically limited by what the treatment system can accommodate rather than what the extraction wells can produce.

4.3.2 EQUALIZATION TANK

The equalization tank can hold 60,000 gallons and is typically set to operate between 60% and 90% full. When the level exceeds 90%, the extraction wells are shut down, and when the level falls below 60%, the extraction wells are restarted. When this tank is 90% full, it allows for approximately 20 minutes of influent if the rest of the treatment plant is shut down.

4.3.3 METALS REMOVAL SYSTEM AND PH ADJUSTMENT

The metals removal system consists of two parallel trains that each have a reaction tank, flocculation tank, clarifier, and sand filter. By design metals are removed by the addition of caustic and potassium permanganate that result in the formation of manganese and iron hydroxide which precipitate out of solution. This process also increases the pH to meet the discharge limit of pH 6.5 to 8.5. After the first two months of operation, the concentrations of the influent iron and manganese dropped below the discharge limits suggesting the possibility of discontinuing the metals removal system. After nine months of operation, the metals removal system was discontinued allowing water to flow through the associated tanks untreated. The influent metals concentrations continue to meet the discharge requirements; however, to meet the pH requirement, caustic is still added to increase the pH. Minimal sludge has been recovered, so the associated filter press has remained unused.

4.3.4 AIR STRIPPER FEED TANK, AIR STRIPPER, AND BLOWER

Both metals removal trains are followed by air stripper feed tanks that send water to a single air stripper. The air stripper is designed to treat 500 gpm and is provided with air from a 20 horsepower blower operating across a pressure equivalent to 11 inches of water. The air stripper is operated in a semi-batch mode, and at times, flow sent from the feed tanks through the air stripper exceeds 800 gpm.

4.3.5 LIQUID GRANULAR ACTIVATED CARBON UNITS

Two 15,000-pound granular activated carbon (GAC) units, each rated to a capacity of 250 gpm, are aligned in parallel to polish the effluent water from the air stripper. The units are backwashed every few weeks due to an increase in pressure across the units. Although the stripper typically meets the discharge requirements without the need for subsequent carbon polishing, the plant operators found that the carbon effluent had a concentration of 15 ug/L of PCE in June 2001. The breakthrough of the liquid GAC vessels was due to the carbon being spent as per the expected design time frame of 1.5 to two years. As a result of this PCE breakthrough of the GAC units, the units were scheduled for replacement in early July 2001.

4.3.6 VAPOR GAC UNITS

Two vapor phase GAC units are available to treat the offgas from the air stripper. Currently, only one of the 10,000-pound units is used and breakthrough has not been detected by routine sampling of the effluent with a PID. Influent concentration to this unit is not sampled.

4.3.7 REINJECTION WELLS

Water from the carbon polishers are stored in two 60,000-gallon vessels before reinjection to the subsurface. Four reinjection wells fed by a single pump are used to reinject the treated water into the subsurface. The wells, located on the adjacent SUNY Farmingdale campus, have high-level alarms and are regularly gauged.

4.3.8 CONTROLS

The plant is manned by two operators working 40 to 50-hour weeks, and an autodialer is installed to contact the operators in case of plant alarms. The operators typically responds to alarms within 30 minutes.

4.4 COMPONENTS OR PROCESSES THAT ACCOUNT FOR MAJORITY OF MONTHLY COSTS

The U.S. Army Corps of Engineers (USACE), New York District, provides oversight for plant operations, and a private contractor operates the plant. The contractor bills USACE based on the number of gallons treated. The rate for the second year of operation is $4.14 per 1,000 gallons treated, and the expected volume of treated water is 165 million gallons. This translates to an estimated cost of approximately $680,000 for the year without USACE oversight, which brings the total cost of $740,000 for the year. For operation of the Old Bethpage wells, EPA has agreed to reimburse 60% of the operation that facility's costs on a monthly basis. EPA currently estimates its costs will be approximately $12 million over 10 years, or approximately $1.2 million per year. Thus, the total cost to EPA for operating both phases of the groundwater remediation is approximately $2 million per year.

The estimated breakdown of the approximate monthly operation and maintenance costs for the Claremont Site (excluding the OBL system) are summarized in the following table.

Operator labor (45 hours per week) × 2	$27,000
Analytical (process water and air)	$6,250
Analytical (monitoring wells)	$3,750
Sampling supplies	$2,000
Liquid GAC (replacement and disposal)	$1,700
Chemicals	$2,000
Electric	$7,000
Gas (heat)	$1,000
	$50,700 per month

A monthly cost of almost $51,000 is approximately $6,000 less than the monthly cost derived from dividing the expected annual cost of $680,000 by 12 months (approximately $57,000 per month). This $6,000 per month is likely allocated to project management, overhead, and profit.

4.4.1 UTILITIES

The cost of utilities is predominantly electricity used to operate the 20-horsepower blower for the air stripper, the transfer pumps within the facility, and the three 10-horsepower pumps in the extraction wells. This cost estimate is based on review of the monthly electric bills.

4.4.2 NON-UTILITY CONSUMABLES AND DISPOSAL COSTS

Caustic and acid are used onsite for adjustment of the pH. Potassium permanganate is no longer required as metals removal has been discontinued. The majority of the chemical costs are associated with the caustic as acid is only used to lower the pH in rare instances when caustic is added in excess. The cost estimate for the chemicals was provided by the plant operator. The cost of sampling supplies was estimated by the RSE team based on the approximate number of collected samples (10 per month plus 15 per quarter translates to approximately 15 per month). The estimated cost of carbon replacement was calculated using the replacement cost provided by the plant operator (approximately $30,000 for both units), dividing by the approximate 1.5 years the plant has been operating, and dividing the result by 12 months.

4.4.3 LABOR

Two plant operators staff the treatment facility between 6:30 AM and 3:30 PM on weekdays. Less than once per month, additional visits to the site are required in response to the plant autodialer. The estimated costs are based on 45 hours per week for each operator at approximately $75 per hour, estimated by the RSE team.

4.4.4 CHEMICAL ANALYSIS

Chemical analysis is required for both process monitoring and aquifer monitoring. These estimated costs assume approximately $250 total for inorganic and VOC analyses of each sample.

4.5 RECURRING PROBLEMS OR ISSUES

The plant operators and site managers did not mention any recurring problems or issues. The plant operators, however, were recently notified that young adults were tampering with the reinjection wells located on the adjacent SUNY Farmingdale campus.

4.6 REGULATORY COMPLIANCE

The plant continually meets all of the discharge requirements.

4.7 Treatment Process Excursions and Upsets, Accidental Contaminant/Reagent Releases

The RSE team found no record of accidental contaminant or reagent releases.

4.8 Safety Record

According to the plant operators, only one accident has occurred during operation of the plant. It occurred during the original shake-down period and involved a worker being sprayed with concentrated hydrochloric acid. The worker was wearing the required safety equipment which mitigated injury.

5.0 EFFECTIVENESS OF THE SYSTEM TO PROTECT HUMAN HEALTH AND THE ENVIRONMENT

5.1 GROUND WATER

Although not demonstrated in a formal capture zone analysis, the Claremont and the Old Bethpage Landfill remedies appear to collectively contain the majority of the contamination from the Claremont Site. Public or private use of groundwater in the area does exist. The golf course located to the southeast of the site uses groundwater for irrigation and this water may be impacted from site-related contamination. The closest water supply wells are approximately 3,500 feet to the north and are not impacted by site-related contamination.

5.2 SURFACE WATER

There is no permanent surface water bodies within a mile of the site in any direction.

5.3 AIR

Approximately 2.5 pounds of VOCs, primarily PCE, are removed from groundwater daily (mostly via the air stripper) and the large majority of this is stored in vapor phase or liquid phase carbon units. A very small fraction is lost to the ambient air as the process water travels through the discontinued metals removal system as it is open to the air. Because a slight vacuum is maintained in the treatment plant this minimal amount of VOCs in the building air is released to the atmosphere and diluted. Thus, the area's air quality is not significantly impacted by operation of the pump-and-treat system.

5.4 SOILS

At the time of the RSE site visit, surface soils did not appear to be affected by VOC contamination. Additional subsurface VOC contamination was detected, however, during a recent investigation of the former process building.

5.5 WETLANDS AND SEDIMENTS

There are no wetlands or surface water sediments within a mile of the site in any direction.

6.0 RECOMMENDATIONS

6.1 RECOMMENDED STUDIES TO ENSURE EFFECTIVENESS

6.1.1 CONVERT DEPTHS-TO-WATER TO WATER LEVELS

As part of their scope of work, the plant operators measure the depth-to-water in each of the monitoring wells on a quarterly basis. These measurements, however, are not converted to water levels, which are crucial for understanding groundwater flow near the site. The necessary conversion can easily be accomplished by subtracting the depths-to-water from the point of measurement, typically the elevations of the tops of the well casings. Once these water-level measurements are obtained, potentiometric surface maps can be generated and hydraulic models can be calibrated. Thus, it is recommended that the plant operators or site managers convert the depths-to-water to water level measurements. The elevations for the tops of the well casings and other well-construction details are readily available as they were shared with the RSE team for a number the monitoring wells (the EW series including EW-1A, B, C; EW-2A,B,C; etc.). If the equivalent information for SW1, SW2, DW1, and DW2 is not available, a survey crew should be hired to determine the elevations of the tops of the casings and the screened intervals for these wells. The costs of these evaluations should be less than $2,000 per year. Capital costs for surveying should be less than $1,000, if required. Subsequent to the RSE site visit, USACE has been tasked with providing quarterly monitoring reports incorporating this recommendation, and a draft annual report has been submitted.

6.1.2 ANALYZE AQUIFER AND OPERATIONS DATA AND REPORT RESULTS AND CONCLUSIONS

At the time of the RSE visit, water quality samples from multiple locations in the treatment process train and from monitoring wells were being collected quarterly and analyzed for VOCs and inorganics, but the resulting data were not evaluated or reported to the EPA or USACE site manager. Thus, the site managers did not have the information readily available to continually evaluate the progress of the remedy or any opportunities for improvement. During the RSE site visit, the EPA and USACE site managers, in addition to the contractors, acknowledged that data analysis and reporting was not part of the scope of work for the contractor. Subsequent to the RSE site visit, USACE has been tasked with providing quarterly monitoring reports, and a draft annual report has been submitted.

Although some of the process monitoring associated with the unused metals removal system may be unnecessary to evaluate the effectiveness of the treatment plant, the weekly influent and effluent VOC and metals concentrations should be compared to the discharge standards and provided to the site managers for review. Any discrepancies between the effluent concentrations and the discharge standards should be highlighted. In addition, the trend in the blended influent concentration should be plotted so the site managers can continually evaluate the amount of mass currently extracted from the subsurface or expected to be extracted from the subsurface in the near future. This will help site managers determine the effectiveness of the current remedy and evaluate the potential for new technologies as they arise.

The results of the quarterly aquifer water quality monitoring and water level measurements also require interpretation. Such analysis may include plotting plume maps and potentiometric surface maps and evaluating changes in these maps with each sampling event. This analysis is a crucial element of evaluating the degree of containment of the contaminants and the progress of the cleanup. Furthermore, the persistence or rise in contaminant concentrations in some monitoring wells may indicate the presence of additional contaminant sources.

A more complete analysis of data should include data sharing between the Claremont Site and the Old Bethpage Landfill Site. As the two extraction systems and monitoring systems address the same region, more comprehensive plume maps and potentiometric surfaces could be generated if the data from both sites are shared. This sharing of data is more relevant given the partial use of the Old Bethpage Landfill Site as the second phase of the groundwater remedy.

The recommended data sharing and analysis would occur quarterly and would involve a few pages of summarizing text as well as relevant tables and figures (including plume and potentiometric surface maps). An initial cost of approximately $25,000 will be required for developing the template for the report, generating the CADD drawings to be used with the figures, and analyzing past depth-to-water and water quality samples. In addition, interpreting data on a quarterly basis and generating the accompanying reports will likely cost $15,000 per year.

6.1.3 DEVELOP GROUNDWATER FLOW MODEL

The above recommendation for quarterly data analysis and reporting should incorporate continual evaluation of the plume extent and capture zones. However, analysis of the present monitoring points for the Claremont Site alone may not be sufficient for these evaluations. Additional water quality data from the Old Bethpage Landfill may provide the necessary information to determine the extent of the VOC plume, and specifically the PCE and TCE plumes associated with the Claremont Site. Given the complexity of the subsurface water use in the area (pumping from the golf course and from the remedies at the Claremont Polychemical Site, Old Bethpage Landfill Site, and Fireman's Training Center Site) and the presence of multiple plumes, the development of groundwater flow model may be warranted to analyze the capture zone and improve the understanding of contaminant transport at the site.

If the domain of the model is sufficiently large, the hydraulic analyses it allows could also aid in evaluating and potentially optimizing capture zones of other groundwater remediation sites in the area, primarily the Old Bethpage Landfill Site and the Fireman's Training Center Site. In addition, if future monitoring or extraction points are required for better resolution of the plume or the capture zone, lessons learned from the model would help in identifying the preferred locations for these points. Funding for such a model could potentially be shared among the three parties if the proper agreement were in place. The site managers should check for an existing model (perhaps developed for the Old Bethpage Landfill Site). If such a model is already developed and is of sufficient size and accuracy, an agreement to use and/or adapt this model may prove more cost effective. A caveat may be required stating that the modeling or the results would not be used to alter the agreement between the EPA and the Town of Oyster Bay regarding the partial use of the Old Bethpage Landfill Site for the second phase of the Claremont Site groundwater remedy. The recommended modeling effort may require $50,000 in capital costs for model development and $20,000 in annual costs for future updates based on comparison of model results to water level measurements over time.

6.2 RECOMMENDED CHANGES TO REDUCE COSTS

6.2.1 ELIMINATE METALS REMOVAL SYSTEM

Although the current operation of the plant does not include the addition of chemicals for metals removal, the process water still travels through the two parallel metals removal trains. The use of these trains requires onsite operators for maintenance and housekeeping and electricity for the feed pumps that transfer water from the equalization tank through the trains. In addition, samples are collected quarterly of the process water from five locations in the metals removal system (two samples for each of the parallel trains and one from the influent to the air stripper). If the metals removal system were bypassed or removed, the costs associated with these three factors could be significantly reduced or eliminated. Without the metals removal systems in place, the treatment facility is reduced to an air stripper with liquid phase carbon for polishing and vapor phase carbon for the offgas. Such a system could operate unattended with weekly site visits by an operator to check and maintain the system. As the plant operators currently conduct the quarterly sampling events, labor for the reduced or simplified system should account for these sampling events. On average, the monthly cost of labor could be reduced from the estimated $27,000 for the current system to approximately $7,500 for a simplified system. In addition, a cost reduction of $750 per month for electricity would be realized as two fewer 5-horsepower transfer pumps would be required. Reducing the associated process monitoring may save up to $5,000 per year in analytical costs. Substantial capital costs would be required for bypassing the metals system or removing it from the treatment facility. Excluding internal costs associated with scoping and contracting the work, the RSE team estimates that this work may require $500,000. This capital cost, however, would be compensated by savings of approximately $248,000 per year.

6.2.2 SIMPLIFY REMAINING TREATMENT PROCESS TRAIN

The air stripper is designed to treat 500 gpm, however, because the system operates in a semi-batch mode, it operates intermittently at flows up to 800 gpm or more. As this temporary flow is higher than the designed capacity, the air stripper at times is likely not operating at its peak efficiency. Despite repeated samples showing the air stripper effluent below discharge standards the plant operators recently detected water with 15 ppb of PCE exiting the liquid carbon vessels. Decreased efficiency and reduced mass removal during periodic flows of 800 gpm or higher through the air stripper coupled with fouling of the carbon could potentially explain these unexpected high readings of the carbon effluent. It should be noted that although effluent from the carbon units had a one-time PCE concentration of 15 ppb, this water was diluted below the discharge limits in the treated-water storage tanks before reinjection to the subsurface.

On average, the air stripper alone has proven to effectively reduce contaminant concentrations to below discharge limits, and in general, air strippers, when used within specifications, effectively and reliably treat water to below discharge limits. During the first three months of plant operation the influent combined concentration of PCE and TCE to the air stripper ranged from 700 ppb to 910 ppb and the concentration exiting the air stripper and entering one train of the liquid phase carbon polishers ranged from 1.4 ppb to 6 ppb (2 ppb of PCE and 4 ppb of TCE). It should be noted that the higher effluent levels did not correspond with the higher influent levels. That is, high influent concentrations (910 ppb) often showed low effluent concentrations (1.4 ppb). The higher effluent levels may have corresponded to periods when the air stripper was operated above its designed flow. The February 2001 process monitoring results indicate that the combined PCE and TCE influent concentration to the air stripper was 440 ppb and the analogous effluent concentration from the air stripper was estimated at 1 ppb. Thus, during multiple sampling events the air stripper alone met discharge requirements and the process water did not require polishing with GAC.

Resetting the air stripper feed pumps to ensure flow through the air stripper meets the design specifications should allow the air stripper to reliably meet discharge requirements without the aid of carbon polishing. Thus, replacement of the carbon vessels can potentially be discontinued without comprising system effectiveness for annual savings approximating $1,700 per month. In addition, with the carbon treatment discontinued, four process monitoring points could be removed or replaced by a single monitoring point. That is, the influent and effluent of each carbon vessel could be eliminated and a single monitoring point could be used to sample the effluent of the air stripper before it blends with the water in the treated-water storage tanks. The net elimination of three process monitoring points could save up to $3,000 per year. Thus, annual cost savings from eliminating the carbon polishing could amount to approximately $23,000 per year ($1,700 × 12 months/year +$3,000/year). A further significant advantage of eliminating the carbon is that there would be a reduction in labor hours as backwashing the carbon would no longer be necessary. Excluding internal EPA costs for scoping and contracting the work, repiping the system may cost approximately $25,000.

6.2.3 ELIMINATE UNNECESSARY PROCESS MONITORING

Even if the treatment system remains unchanged, five process monitoring points (two from each of the metals removal trains and one from the air stripper feed tank) could be eliminated. As the metals removal system no longer operates, these monitoring points provide no information necessary for effective operation of the plant. Elimination of these five process monitoring points would reduce the number of samples per year by 20 and could possibly save up to $5,000 per year.

6.2.4 ATTEMPT TO ELIMINATE DISCHARGE REQUIREMENT FOR PH

The groundwater in the region around the Claremont Polychemical Site is approximately pH 5 to 5.5. However, the current discharge permit requires plant effluent to have pH 6.5 to 8.5. Thus, significant expense and potential hazards associated with transporting and using acid and caustic are associated with changing the extracted groundwater pH from its background value. In addition, adjusting the pH is actually detrimental as it contributes to the addition of sodium and chloride to the water. This expense and the potential hazards could be eliminated if the discharge requirement for pH is relaxed by NYSDEC, and this should be requested. An annual savings of $24,000 per year in chemicals alone is expected if approval is granted by NYSDEC.

6.2.5 CONSIDER REMOVAL OF THE VAPOR PHASE CARBON TREATMENT

Approximately 2.5 pounds of combined TCE and PCE are removed from the groundwater via the air stripper. Thus, approximately 2.5 pounds of these contaminants would enter the atmosphere in the absence of vapor phase carbon treatment. If the risks associated with this emission level are sufficiently low the vapor phase carbon treatment could be eliminated if allowed by NYSDEC and considered appropriate by US EPA. In addition to eliminating potential replacement of this carbon (cost savings not estimated), it also eliminates the need for the offgas blower and heater which could translate to annual savings of up to $5,000 per year. Site managers indicate that data from the monitoring of the influent and effluent of the vapor phase carbon unit will determine if the vapor phase carbon unit can be eliminated

6.2.6 OPTIMIZE TREATMENT FACILITY AT THE OLD BETHPAGE LANDFILL SITE

A substantial cost savings to both EPA and the Town of Oyster Bay would likely result from optimization of the Old Bethpage Landfill Site treatment facility. Current estimates by EPA suggest that reimbursing the Town of Oyster Bay for 60% of the OBL operating costs will cost EPA approximately $1.2 million per year. This suggests that the annual operating costs for the OBL facility are approximately $2 million per year. In reading the annual and quarterly reports for the OBL treatment facility, the RSE team identified a number of potential cost-reducing opportunities but cannot confirm these opportunities or quantify the savings without visiting the facility and interviewing the operators. The most significant cost-reducing opportunities may include reductions to onsite labor. For example, the RSE team noted that the system is staffed 24 hours per day in order to record hourly flow and pressures through the air stripper. As air strippers typically operate unattended with only weekly visits, this 24-hour staffing appears excessive. In addition, 11 VOC samples are analyzed per week at onsite laboratory while the State only requires one monthly influent and effluent result. The required number of VOC samples could likely be sent to an offsite laboratory for analysis at a lower expense than the costs required for maintaining and operating the onsite laboratory.

Due to the potential for cost savings to EPA and other parties involved with the OBL system, the RSE team recommends an optimization evaluation of the Old Bethpage Landfill treatment facility. Estimated potential cost savings from an RSE for the OBL system have not been quantified.

6.3 MODIFICATIONS INTENDED FOR TECHNICAL IMPROVEMENT

6.3.1 REPLACE THE FAULTY INFLUENT FLOW METERS

The influent flow meters have lasted less than two years. The expected lifetime of these meters is much longer than two years, suggesting they should be replaced by the manufacturer at no additional cost. Site managers indicate the faulty influent meters were replaced subsequent to the RSE visit.

6.3.2 MONITOR VAPOR PHASE CARBON UNIT INFLUENT WITH A PID

Currently, the plant operator measures the concentration of the vapor phase carbon effluent with a PID and does not measured the influent concentration. VOCs have not yet been detected in the effluent of the operational unit; however, the PID may not be able to detect even the influent concentration. A PID measurement of the vapor phase carbon influent would serve as a scientific control for the measurement of the effluent. If no discernible difference is apparent between the influent and effluent measurements, the operators will be unable to determine the appropriate time to replace the vapor phase carbon or to switch which vessel is being used.

The treatment plant removes approximately 2.5 pounds of VOCs per day. Given a design flow rate for the air stripper of approximately 2,700 cubic feet per minute this translates to a VOC concentration of approximately 2 ppm in the air stripper offgas or vapor phase carbon influent. A well calibrated PID should be able to detect this concentration. If the PID cannot adequately detect this influent concentration and the vapor phase carbon treatment is not eliminated from the treatment train (Section 6.2.5) the PID should be recalibrated or samples of the influent and effluent may need to be periodically analyzed in an offsite lab.

6.3.3 DETERMINE CAUSE OF THE PRESSURE BUILDUP OF THE LIQUID PHASE CARBON UNITS

If the liquid phase carbon treatment is not eliminated (Section 6.2.2), the liquid phase carbon units should be analyzed to determine the cause of the pressure buildup. It may be chemical or biological fouling. A possible source of chemical fouling may arise when the pH rises through the air stripper causing metals in the water to become insoluble and precipitate thereby partially plugging the liquid phase carbon units. To determine what fraction of the material is biomass, the backwash should be analyzed for total suspended solids (TSS) and volatile suspended solids (VSS). If it is a chemical precipitate, lowering the pH as it leaves the stripper may correct this problem. To estimate how much to lower the pH and to determine the potential for chemical and biological precipitates to form, a complete cation/anion analysis should be done for the water entering the carbon units. The analysis should include the following parameters: pH, carbon dioxide, oxidation reduction potential, total dissolved solids, total suspended solids, total organic carbon, dissolved oxygen, common anions (chloride, fluoride, nitrite, nitrate, sulfite, sulfate, bicarbonate, carbonate), common cations (calcium, magnesium, manganese, potassium, ferric iron, ferrous iron). This should not cost more than $200 to $300.

6.4 MODIFICATIONS INTENDED TO GAIN SITE CLOSE-OUT

6.4.1 BASED ON AQUIFER DATA CONSIDER APPROACHES TO ADDRESS HOT SPOT WELLS

The site managers may find it beneficial to address the contamination "hot spots" after further analysis of the groundwater quality monitoring data, water-level measurements (and associated potentiometric surface maps), and potential groundwater modeling studies. Primarily, the "hot spots" refer to the 4,200 ppb PCE concentration detected in SW1 and the 4,200 ppb TCE concentration detected in EW-4C during the February 2001 sampling event. Although these hot spots may be captured by the current extraction system they are located over 200 feet from the nearest extraction well. Thus, a substantial amount of time will be required to transport the contamination from either of these locations to the extraction system. Furthermore, if sources of VOCs remain in either of these locations, it will significantly increase the duration of the remedy. Further analysis of the aquifer data and the trends of the concentrations in these two wells will help indicate the appropriate remedy which may involve temporary or long-term pumping from these wells or in situ treatment.

6.5 DONATE UNUSED EQUIPMENT

The filter press has not been used and could be transferred to another Fund-lead pump-and-treat system. Also, if the recommendations in Section 6.2 are implemented additional equipment may be unused at this site. If the specifications of the unused equipment meets the specifications of the equipment needed at other Fund-lead sites, the unused equipment should be transferred to those sites to reduce overall expense to US EPA.

USACE operates a program to help relocate unused equipment associated with Fund-lead groundwater remedies to sites where the equipment is needed, and the site managers are encouraged to contact the program. The contact person is Lindsey Lien who can be reached via the following contact information.

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6.6 SUGGESTED APPROACH TO IMPLEMENTATION

Because some of the above recommendations may be contingent on the successful implementation of other recommendations, consideration should be given to the order in which the recommendations are pursued. Of primary importance are the recommendations to ensure effectiveness. Converting the depths-to-water to water levels (6.1.1) should occur immediately. Once this has been achieved, analyzing aquifer and operations data (6.1.2) along with delineating the plume and analyzing the capture zone (6.1.3) can be pursued. Other recommendations that can be implemented immediately without conflicting with the recommendations from 6.1 include eliminating excess process monitoring (6.2.3), attempting to eliminate or relax the discharge requirement for pH (6.2.4), and optimizing the Old Bethpage Landfill treatment system (6.2.6). The recommendations for technical improvement (6.3.1 through 6.3.2) are low cost and can also happen immediately.

The other recommendations for cost reduction (6.2.1, 6.2.2, and 6.2.5) and the recommendation to help gain site closeout (6.4.1) should be considered after adequate data interpretation and a capture zone analysis have occurred (6.1.1, 6.1.2, and 6.1.3). These recommendations to ensure effectiveness may reveal additional data about the contamination "hot spots" and may also require increased pumping or additional wells. However, once effectiveness is ensured and strategies for addressing the "hot spots" have been considered and evaluated, recommendation 6.2.1 should take precedence followed by 6.2.2 and possibly 6.2.5. If substantial delays are expected in implementing the effectiveness recommendations (6.1), it may be cost-effective to implement recommendations 6.2.1 and 6.2.2 immediately, with appropriate engineering solutions to address potential future re-use of the bypassed components.

Although the liquid phase carbon units may eventually be eliminated, determining the cause of pressure buildup in those units (6.3.3) is inexpensive and may save significant money in the future.

7.0 SUMMARY

In general, the RSE team found a well-operated treatment system. The observations and recommendations mentioned are not intended to imply a deficiency in the work of either the designers or operators but are offered as constructive suggestions in the best interest of the EPA and the public. These recommendations have the obvious benefit of the operational data unavailable to the original designers.

Several recommendations are made to enhance system effectiveness, reduce future operations and maintenance costs, improve technical operation, and gain site close out. The recommendations to enhance effectiveness include converting depth-to-water measurements to water-level measurements, analyzing quarterly the collected aquifer and process data, delineating the plume in conjunction with data from the Old Bethpage Landfill Site, and analyzing the capture zone (perhaps with the aid of groundwater modeling). Recommendations to reduce costs include removing or bypassing the unused metals removal system and reducing the associated labor, eliminating liquid phase carbon polishing for volatile organic compounds, attempting to relax the pH discharge requirement, eliminating unnecessary process monitoring, investigating potential elimination of the treatment for the air stripper offgas, and optimizing the above-ground treatment facility of the Old Bethpage Landfill Site which is partially funded with money from the Claremont Polychemical Site. Recommendations for technical improvement include replacing faulty influent flow meters and improving the monitoring program for the air stripper offgas treatment (if it is not eliminated), and determining the fouling cause of the liquid phase carbon units (if they are not eliminated). Finally, recommendations regarding site closure include addressing "hot spots" of contamination after interpretation of aquifer sampling data.

The table below itemizes all of the recommendations and provides feasibility-study level estimates for costs (or cost savings) and reasons for each one. Details of the recommendations and the derivation of the cost estimates are provided in Section 6.0.

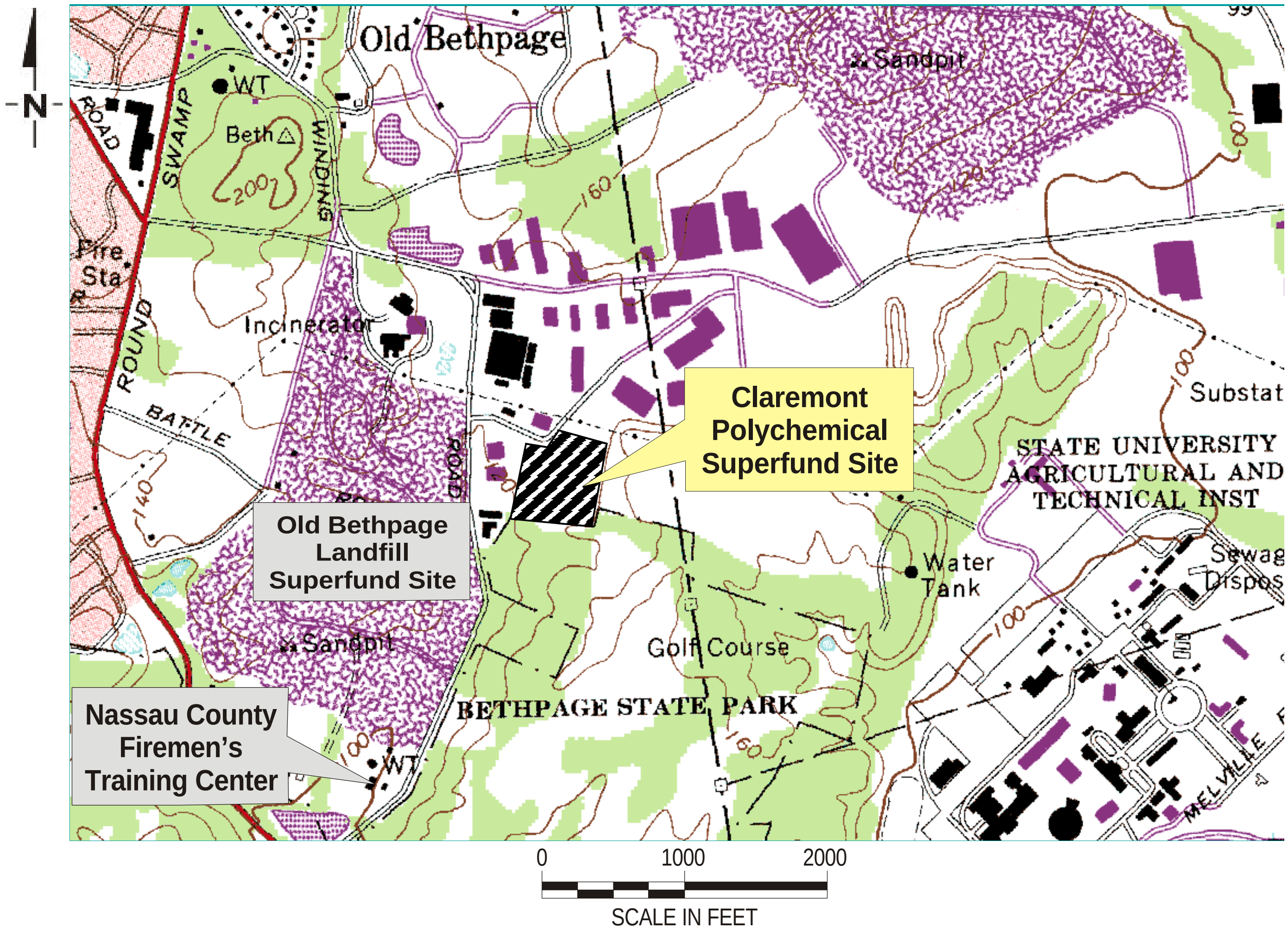
Table 7-1. Cost Summary Table

Recommendation	Reason	Estimated Change in Capital Costs	Estimated Change in Annual Costs	Estimated Change in Lifecycle Costs *	Estimated Change in Lifecycle Costs **
6.1.1 Convert depths-to-water to water levels, survey if necessary	Effectiveness	$1,000	$2,000	$61,000	$33,000
6.1.2 Interpret process data and quarterly aquifer data, report results	Effectiveness	$25,000	$15,000	$475,000	$267,000
6.1.3 Delineate plumes and analyze capture zone (potentially with groundwater modeling)	Effectiveness	$50,000	$20,000	$650,000	$372,000
6.2.1 Eliminate unused metals removal system	Cost Reduction	$500,000	($248,000)	($6,940,000)	($3,496,000)
6.2.2 Simplify system	Cost Reduction	$25,000	($23,000)	($665,000)	($346,000)
6.2.3 Eliminate unnecessary process monitoring (also included in 6.2.1)	Cost reduction	$0	($5,000)	($150,000)	($81,000)
6.2.4 Attempt to relax pH discharge standard	Cost reduction	$0	($24,000)	($720,000)	($387,000)
6.2.5 Investigate eliminating the vapor phase carbon treatment (redundant if 6.2.2 is implemented)	Cost reduction	$0	($5,000)	($150,000)	($81,000)
6.2.6 Optimize above-ground treatment facility of the Old Bethpage Landfill Site	Cost reduction	Not quantified	Not quantified	Not quantified	Not quantified
6.3.1 Replace faulty influent flowmeters (under warranty)	Technical improvement	$0	$0	$0	$0
6.3.2 Sample with a PID influent as well as effluent for vapor phase carbon unit	Technical improvement	$0	$0	$0	$0
6.3.3 Determine the cause of the pressure buildup of the liquid phase carbon units	Technical improvement	$300	$0	$300	$300
6.4.1 Address "hot spot" contamination after analysis of aquifer data	Gain site closeout	Not quantified	Not quantified	Not quantified	Not quantified
Total		$601,300	($258,000)[1]	($7,138,700)[1]	($3,556,700)[1]

Costs in parentheses imply cost reductions.
* assumes 30 years of operation with a discount rate of 0% (i.e., no discounting)
** assumes 30 years of operation with a discount rate of 5% and no discounting in the first year
[1] Total cost savings do not account for the costs associated with 6.2.3 and 6.2.5, because the costs associated with those two recommendations are included in 6.2.1 and 6.2.2, respectively.

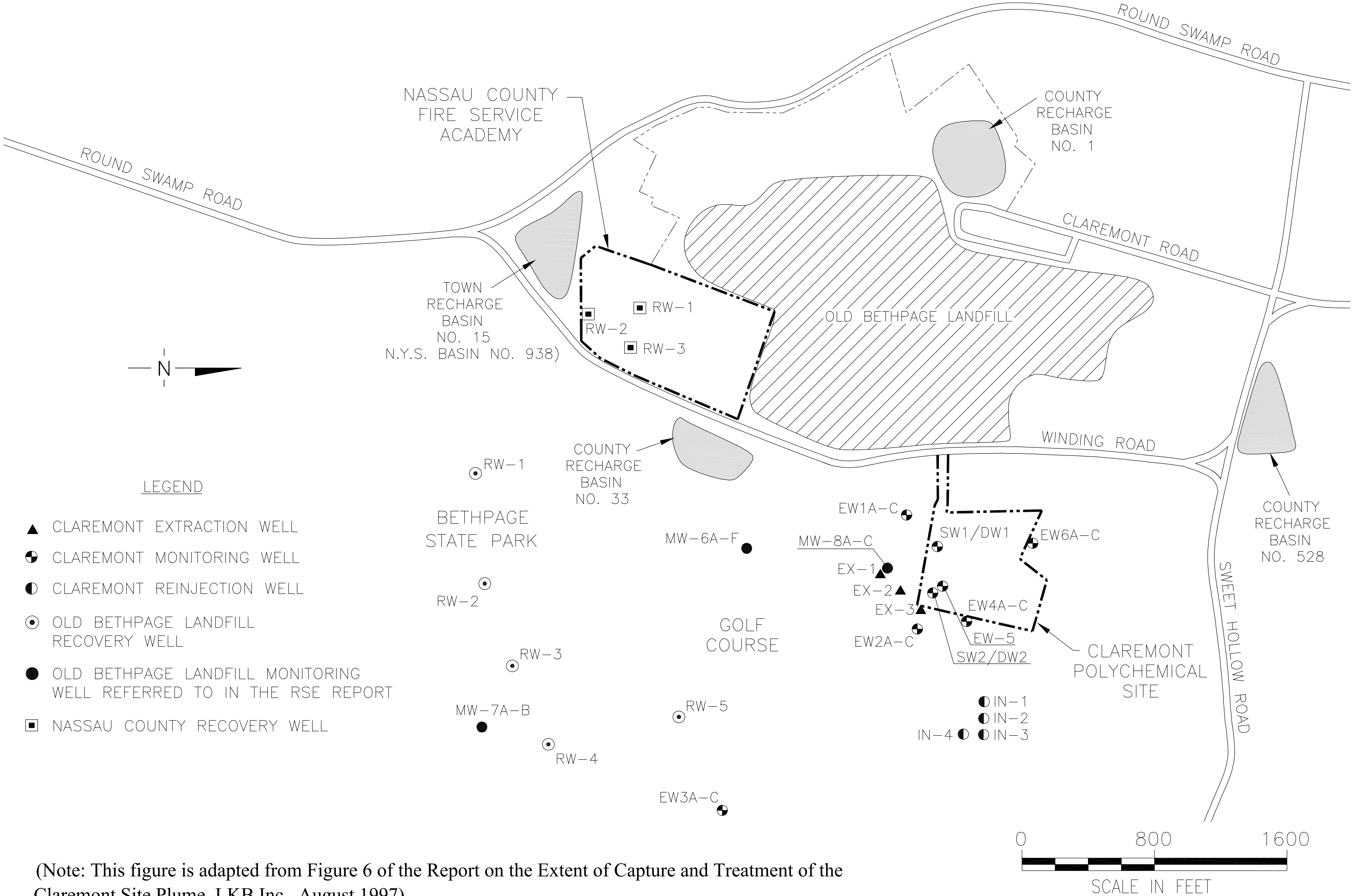
FIGURES

FIGURE 1-1: THE CLAREMONT POLYCHEMICAL SUPERFUND SITE AND THE SURROUNDING AREA.



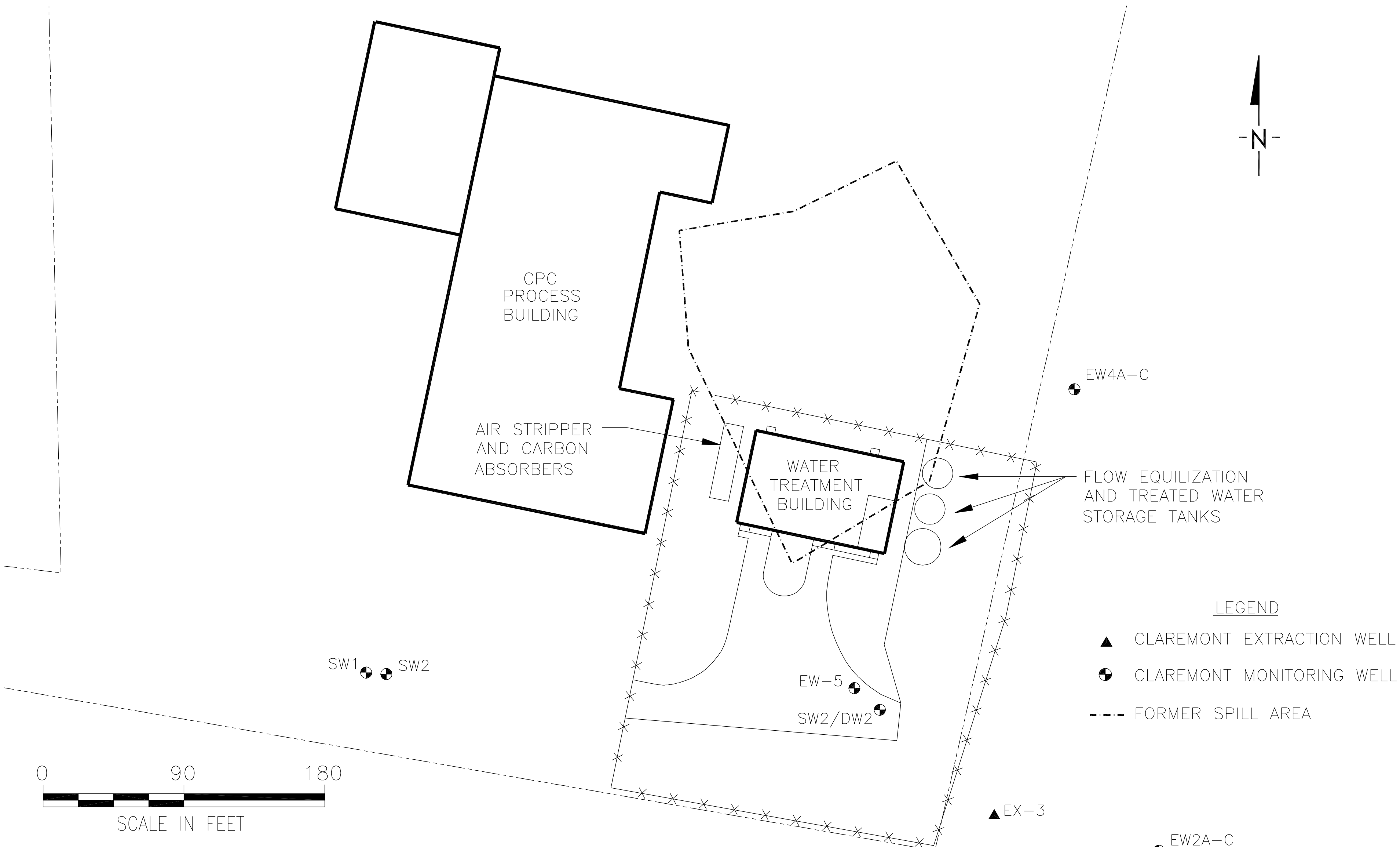
(Note: This figure is adapted from the USGS topographic map, Huntington Quadrangle, 7.5 minute series.)

FIGURE 1-2. SELECT WELL LOCATIONS FOR THE OLD BETHPAGE LANFILL SUPERFUND SITE, THE NASSAU COUNTY TRAINING CENTER, AND THE CLAREMONT POLYCHEMICAL SUPERFUND SITE.



(Note: This figure is adapted from Figure 6 of the Report on the Extent of Capture and Treatment of the Claremont Site Plume, LKB Inc., August 1997).

FIGURE 1-3. THE CLAREMONT POLYCHEMICAL SITE INCLUDING SELECT WELLS, SITE BUILDINGS, AND THE FORMER SPILL AREA.



(Note: This figure is adapted from drawings 03-CR-3 and 03-CR-5 from the 100% Final Design Submittal, Phase 1 Remedial Design Plans, Claremont Polychemical Corp., Old Bethpage, New York, U.S. Army Corps of Engineers, Kansas City District, 1994).