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INTERIM REMEDIAL INVESTIGATION REPORT

FORMER POWEREX, INC. FACILITY
SITE CODE 7-06-006
AUBURN, NEW YORK

Volume 1 of 4
Summary Report

Prepared for:

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Date:

January 5, 1995

Division of The Standard Engineering Corporation, Albany, New York

CERTIFICATION

This Interim Remedial Investigation Report provides a presentation of the methodologies used and the data collected by Dunn Engineering Company (DUNN) pursuant to the Remedial Investigation/Feasibility Study Work Plan approved by the New York State Department of Environmental Conservation (DEC) on March 31, 1993. This report also provides a presentation of the methodologies used and the data collected by DUNN for the investigative activities described in the Laboratory Waste Solvent Tanks Interim Remedial Measure Work Plan approved by the DEC on October 20, 1993. It is my belief that based on the available information, the activities undertaken were performed in full compliance with the DEC-approved work plans, unless otherwise approved by the DEC and/or presented in this report.

DUNN ENGINEERING COMPANY

By:________________________
Gary T. Kerzic, P.E.
Manager, Environmental Engineering

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EXECUTIVE SUMMARY

Purpose

This report summarizes the methods used and results obtained to date for the ongoing investigation being performed at the former Powerex, Inc. facility (the site) located on West Genesee Street in Auburn, New York. The General Electric Company (GE) retained Dunn Engineering Company (DUNN), now a division of Rust Environment and Infrastructure, Inc., to perform this work. A Remedial Investigation/Feasibility Study (RI/FS) Work Plan was developed by DUNN and approved by the New York State Department of Environmental Conservation (DEC) on March 31, 1993. The work plan was developed to serve as a scope and procedural outline of the field activities to be performed during the RI and the evaluation of remedial technologies and alternatives during the FS. The intent of this Interim RI Report is to present the results of the studies performed to date. Additional results obtained during ongoing investigative activities will be presented in the Final RI Report.

Site History and Background

The site is 55.4 acres in size and straddles the boundary between the Town of Aurelius and the City of Auburn in Cayuga County, New York (see Figure 1.1). The site was farm land before GE purchased it in 1951 and constructed a manufacturing plant. GE manufactured a variety of electrical components, including radar equipment, printed circuit boards for high-fidelity equipment, and, beginning in 1959 or 1960, high-voltage semiconductors.

The site was acquired by Powerex, Inc. (Powerex) in January 1986. Powerex continued the manufacture of high-voltage semiconductors until May 1990 when the plant was closed. GE repurchased the site in November 1990, largely to facilitate the remedial activities. To date, the plant remains inactive.

Previous Investigations

GE retained Dunn Geoscience Corporation in late 1985 to perform a limited Phase I investigation to determine the vertical extent of contaminants in subsurface soils beneath the North Evaporation Pit. Additional details are presented in the Phase I Hydrogeologic Investigation Report dated February 10, 1986.

In November 1989, Dunn Geoscience Corporation proceeded with a Phase II investigation to obtain a general understanding of hydrogeologic conditions and to make a preliminary assessment of the nature and extent of contaminants, primarily volatile organic compounds (VOCs), in groundwater in the vicinity of the North Evaporation Pit. The Phase II investigation was summarized in the Phase II Hydrogeologic/Subsurface Contamination Investigation Report dated July 3, 1987.

Based on information obtained during the previous investigative activities, the site was formally added to the New York State Department of Environmental Conservation's (DEC's) Registry of Inactive Hazardous Waste Disposal Sites in October 1987 as a Class 2 site.

Dunn Geoscience Corporation initiated a Phase III investigation in August 1987. The objective and scoping of this investigation was to obtain a more thorough understanding of hydrogeologic conditions in the overburden soils and shallow bedrock, further define the extent of VOCs in groundwater and determine whether VOCs were present in surface water at the site. The results of the above investigation are presented in the Phase III Hydrogeologic/Subsurface Contamination Investigation Report dated May 1988.

Dunn Geoscience Corporation initiated a Phase IV investigation in August 1988 to better define the three-dimensional extent of VOCs with the bedrock groundwater system. Investigation activities were also expanded to develop a better understanding of the nature and extent of VOCs in surface water and to determine the extent of contaminated subsurface soils in the immediate vicinity of the North Evaporation Pit and the purported West Evaporation Pit. Investigation activities are detailed and summarized in the Phase IV Subsurface Investigation Report prepared by Dunn Corporation in September 13, 1991.

Scope of Remedial Investigation

As defined in the approved RI/FS Work Plan, the primary objective of the RI is to develop additional data necessary for the development and evaluation of remedial alternatives during the FS for media of concern. These objectives have been achieved for some media, notably surface water and shallow bedrock groundwater, but additional investigative activities are required to develop a better understanding of the deep bedrock groundwater system.

Field activities associated with the RI were initiated in May 1993. Field activities conducted to date have included:

- Inspection of the existing groundwater monitoring network to assess the current condition of existing micro-wells, piezometers, and monitoring wells;
- Collection of water-level data on a monthly basis over a specified period of time to assess current conditions of groundwater flow in and between the various hydrogeologic units;
- Collection of surface water samples from selected locations to confirm prior analytical results for VOCs, acquire information for other analytes, and assess background surface water quality;
- Installation of additional overburden monitoring wells in the vicinity of suspected source areas and the fringe of the overburden contaminant plume for potential use in long-term monitoring;
- Collection of subsurface soil samples near the purported West Evaporation Pit for VOC analysis;

- Installation of a monitoring well in the vicinity of the purported West Evaporation Pit to assess groundwater conditions within the shallow bedrock hydrogeologic unit;

- Collection of one round of groundwater samples from all newly-installed wells and selected existing wells for subsequent analysis for VOCs, and analysis of selected samples for various Target Compound List (TCL) and Target Analyte List (TAL) parameters to assess current groundwater conditions, confirm results from previous investigations and assess background groundwater quality;

- Installation of a pumping well and observation well system within the shallow bedrock hydrogeologic unit for the purpose of performing pump tests;

- Performance of a step-rate pumping test to better characterize the shallow bedrock hydrogeologic unit, determine its response to pumping and collect groundwater samples for analysis of VOCs, methanol and selected inorganic parameters;

- Performance of additional hydraulic conductivity testing in four newly-installed overburden monitoring wells and six newly-installed shallow bedrock monitoring and/or observation wells; and

- Performance of a biodegradation study by Beak Consultants, Ltd. (Beak) of Guelph, Ontario, Canada to evaluate the microbial processes occurring within the shallow bedrock hydrogeologic unit.

All of the above tasks have been completed and are addressed herein.

Recommendations were also made to improve the groundwater monitoring system by the abandonment, reconstruction and replacement of certain existing monitoring wells. These recommendations were based upon results of the monitoring network inspection, water-level measurements, and a review of well construction details. Following DEC approval, these recommendations were implemented.

Based on analytical results obtained from the initial sampling activities, five deep bedrock monitoring wells were found to exceed existing ambient groundwater standards. These wells, along with the associated shallow bedrock monitoring wells, were resampled a few months after completing the well abandonment, reconstruction and replacement activities.

An Interim Remedial Measure (IRM) was also performed which involved the excavation and removal of the two underground Laboratory Waste Solvent Tanks located on the east side of the plant building. The IRM was conducted pursuant to the approved Laboratory Waste Solvent Tanks Interim Remedial Measure Work Plan dated September 27, 1993, as revised. The extent of soil and groundwater contamination surrounding these tanks was also investigated. Field activities associated with the IRM were initiated in February 1994 and included excavation, cleaning, decontamination and proper disposal of the tanks and associated piping.

During removal of the two Laboratory Waste Solvent Tanks, soil samples were obtained from the floor and walls of the excavations and from the stockpiled soils. Analytical results indicated that VOCs, notably trichloroethene (TCE), 1,2-dichloroethene (1,2-DCE) and vinyl chloride, were present in the subsurface soils in the immediate vicinity of the tanks at concentrations which triggered the contingent investigative tasks which were included in the Laboratory Waste Solvent Tanks IRM Work Plan. Thus, in accordance with the work plan, the stockpiled soils were returned to the excavations and investigative work was performed, including the following:

- Installation of 22 soil borings around the two Laboratory Waste Solvent Tanks;
- Field screening of over 200 subsurface soil samples from the borings using a headspace method with two portable gas chromatographs (GCs);
- Laboratory analyses of 44 subsurface soil samples for confirmational purposes;
- Installation of an overburden and shallow bedrock monitoring well in the immediate vicinity of each of the two Laboratory Waste Solvent Tanks; and
- Collection of two rounds of groundwater samples from the newly-installed monitoring wells for laboratory analysis.

Geology

The site is underlain by 5 to 25 feet of overburden materials which are generally fine-grained and of low permeability. The average thickness is about 15 feet, with 8 feet of glaciolacustrine silts and clays overlaying 7 feet of glacial till. The contact between the overburden and the bedrock is irregular with a relief of about 15 feet.

A thick sequence of carbonate bedrock strata was observed beneath the overburden materials. These strata dip gently to the south at approximately 35 feet per mile. Across the site, approximately 10 feet of change occurs in the elevation of the bedrock strata in a north-south direction. The upper portion of bedrock (i.e., approximately 45 feet) is composed of limestones of the Onondaga and Manlius Formations separated by a thin, intervening remnant of the Oriskany Formation. The deepest bedrock encountered is composed of dolomites of the Rondout, Cobleskill and Bertie Formations which have a total thickness of approximately 120 feet.

Hydrology

With respect to surface water, the drainage ditch flowing northwest from the plant building receives flow from various storm sewer pipes, the drainage ditch running east-west immediately north of the plant building and direct groundwater discharge during wet portions of the year. The mean flow rate in the drainage ditch is approximately 39.6 gallons per minute (gpm) based on measurements at the weir in the on-site trap dam present in the drainage ditch. However, flow in the drainage ditch is "flashy" due to storm water discharge from parking lots, roofs and other impermeable surfaces. Flow exceeds 100 gpm about 10 percent (%) of the time, and exceeds

500 gpm about 0.85% of the time. Surface water flow downstream from the site appears to enter the groundwater regime at a number of swallets located in the stream channel to the northwest. Some surface water flow to Crane Brook appears to occur on an occasional basis during extreme high-flow conditions.

Hydrogeology

A conceptual model of the hydrogeologic system was developed and consists of three units: the overburden materials, shallow bedrock (i.e., Onondaga, Oriskany and Manlius Formations) and deep bedrock (i.e., Rondout, Cobleskill and Bertie Formations). Downward hydraulic gradients exist throughout but are particularly strong between the shallow and deep bedrock units, and water-level differences in excess of 40 feet have been observed at some times.

Overburden groundwater flow tends to be directed toward natural surface water bodies except at or near the plant building. Proximate to the plant building, overburden groundwater flows in three ways: to the east-west running drainage ditch north of the plant building; toward storm sewer drains; and/or inward to the plant building. During the RI, the average linear velocity of groundwater flow was calculated as ranging from 0.01 to 0.31 feet per day (feet/day) in the field west of the plant building and from 0.02 to 0.62 feet/day north of the plant building.

Water-level measurements showed that water levels in the shallow bedrock hydrogeologic unit declined substantially during the RI. However, although the water levels declined, the pattern of groundwater flow did not change significantly and is similar to those presented in the Phase IV investigation report. A groundwater divide occurs at the site, although it is somewhat less pronounced during the dry periods than during wet periods. As a result of this divide, groundwater flow within the shallow bedrock unit is believed to be to the northwest and northeast from the plant building. Groundwater flow occurs along individual bedding planes and fractures. The generalized rate of groundwater flow was approximately 5.1 feet/day. This calculation is similar to that reported in previous investigations.

Water levels obtained from deep bedrock wells during the Phase IV investigation and the RI are significantly lower than the elevations of nearby streams. Thus, it appears that groundwater flow in the deep bedrock hydrogeologic unit is toward a more distant, regional discharge zone. Attempts to contour the piezometric surface of this unit have not been successful due to the relatively low hydraulic gradient and anomalous water levels obtained in a few of the deep bedrock wells. Additional activities are planned during the ongoing RI to develop a better understanding of the deep bedrock groundwater system.

Contaminants in Surface Water

During the RI, surface water samples were collected from various locations to confirm prior analytical results for VOCs, acquire information for analytes other than VOCs and collect information to enable comparison of surface water quality at the site with background conditions. VOCs were detected in surface water samples collected at and downstream from the site. The analytical data indicate that surface water at locations SW-G, SW-CP and SW-Q exhibit concentrations of TCE in excess of New York State's guidance values for Class C waters. VOCs were not detected in the two background surface water samples.

Bis (2-ethylhexyl) phthalate was detected at very low concentrations in all of the samples analyzed, including the two background samples, and its detection is attributed to laboratory and/or sampling artifacts. No other semi-volatile organic compounds (SVOCs) were detected in the surface water samples.

No pesticides, polychlorinated biphenyls (PCBs) or cyanide were detected in any of the samples.

Several naturally-occurring metals were detected in the surface water samples. However, they were present at higher concentrations at the background locations than at the site. The occurrence of these metals is, therefore, not related to the site.

Contaminants in Overburden Soils and Groundwater

VOCs were identified as the dominant, if not the only, contaminants of potential concern in overburden soils and groundwater at the site. VOCs were detected in these media in the vicinity of the North Evaporation Pit, purported West Evaporation Pit, Waste Solvent Tank area and at the Laboratory Wast Solvent Tanks. However, the lateral extent of VOCs in the overburden soils and groundwater in these areas is relatively limited, and off-site migration does not appear to have occurred in the overburden hydrogeologic unit.

In the primary source areas (i.e., North Evaporation Pit, purported West Evaporation Pit and Waste Solvent Tank area), New York State's groundwater standards were exceeded for TCE, 1,2-DCE, 1,1-dichloroethene (1,1-DCE), 1,1-dichloroethane (1,1-DCA), vinyl chloride, acetone, toluene, ethylbenzene and xylenes in one or more of the overburden monitoring wells sampled. The groundwater standards for tetrachloroethene (PCE), 1,1,1-trichloroethane (TCA) and methylene chloride were also exceeded in the overburden groundwater at the Waste Solvent Tank area. Groundwater samples from some wells exhibited VOC concentrations exceeding the groundwater standards by several orders of magnitude. The concentration of TCE was sufficiently high to suggest the possible presence of NAPL, although no NAPL was actually observed in any of the wells sampled during the RI. At the two Laboratory Waste Solvent Tanks, overburden groundwater samples exceeded New York State's groundwater standards for TCE, 1,2-DCE, 1,1-DCE and vinyl chloride, but the concentrations were much lower than in the primary source areas.

Only a few SVOCs were detected in samples collected from overburden monitoring wells. New York State's groundwater standards for phenol, 1,2-dichlorobenzene and 2-methlyphenol were exceeded in one or two wells only. These data indicate that SVOCs, although they do occur at low concentrations in overburden groundwater in the immediate vicinity of the primary source areas, are not a significant concern at the site.

No pesticides, PCBs or cyanide were detected during the RI in groundwater samples collected from the overburden monitoring wells.

The only inorganic parameters that were detected in unfiltered groundwater samples from one or more of the overburden monitoring wells at concentrations that exceeded New York State's groundwater standards and/or guidance values were chromium, copper, iron, lead, magnesium, manganese, and zinc. However, except for copper, each of these metals was also detected in the background well. Moreover, results from the background well also exceeded New York State's groundwater standards and/or guidance values for iron, manganese and magnesium.

Filtered groundwater samples were also obtained during the RI to evaluate the impact of suspended sediment in the samples on the total metals concentrations. For wells at the site, the only dissolved metals that exceeded the standards and/or guidance values were for iron, magnesium and manganese. The concentration of dissolved magnesium also exceeded the guidance value in the background well. It was concluded that metals are not a significant concern in the overburden groundwater and that the chromium, copper, lead and zinc detected in the unfiltered samples are primarily associated with sample turbidity.

Contaminants in Shallow Bedrock Groundwater

Elevated concentrations of certain VOCs were found in the shallow bedrock hydrogeologic unit, notably TCE, 1,2-DCE, vinyl chloride, acetone, toluene, xylenes, PCE, TCA and methylene chloride. The concentration of these VOCs exceed New York State's groundwater standards and/or guidance values in one or more shallow bedrock wells. However, the concentration of VOCs did not exceed the standards or guidance values in 14 of the 27 shallow bedrock wells sampled and analyzed during the RI.

The highest concentrations of TCE were in shallow bedrock monitoring wells located near the primary source areas (i.e., North Evaporation Pit, purported West Evaporation Pit and Waste Solvent Tank Area). Acetone and methanol were generally found to occur in these same areas. The concentrations of TCE in two wells are sufficiently high to be indicative of the potential presence of NAPL. However, the TCE concentrations attenuate rapidly with increasing distance downgradient from the source areas; in general, TCE was not detected in shallow bedrock wells located only 300 to 500 feet from the primary source areas. TCE was also detected in the shallow bedrock groundwater of the two Laboratory Waste Solvent Tanks.

1,2-DCE and vinyl chloride, by-products of the biodegradation of TCE, were the two most frequently detected VOCs in the shallow bedrock groundwater. The distributions of these two compounds are more extensive and continuous than the distribution of TCE. 1,2-DCE and vinyl chloride appear to migrate away from the primary source areas in the shallow bedrock unit. These VOCs are detected in off-site areas to the northwest and to the northeast of the primary source areas. 1,2-DCE and vinyl chloride are also present in the shallow bedrock unit at the two Laboratory Waste Solvent Tanks.

The analytical data indicate that the areal extent and concentrations of toluene and xylenes in the shallow bedrock unit are considerably less than those of either 1,2-DCE, or vinyl chloride The occurrence of these VOCs in the shallow bedrock unit is restricted primarily to the immediate vicinity of the North Evaporation Pit and Waste Solvent Tank. The extent of methylene chloride, PCE and TCA in the shallow bedrock unit appears to be limited to the Waste Solvent Tank area.

None of these VOCs occur beyond the site boundary at concentrations exceeding New York State's groundwater standards.

SVOCs were detected in concentrations exceeding New York State's groundwater standards in only two of the shallow bedrock wells sampled and analyzed during the RI (i.e., wells DGC-8B and DGC-9B). These wells are located in the immediate vicinity of the North Evaporation Pit and Waste Solvent Tank area, respectively. SVOCs were not detected in the other shallow bedrock wells sampled and analyzed during the RI. Thus, it was concluded that the groundwater quality in this unit has not been significantly impacted by SVOCs, and the extent of any site-related SVOCs appears to be very limited.

No PCBs were detected in samples collected from the shallow bedrock monitoring wells. Very low concentrations of three pesticides (i.e., heptachlor epoxide, alpha-chlordane and 4,4'-DDT) were detected in well DGC-8B and/or DGC-9B. These detections, however, were all qualified during data validation. No other pesticides were detected in these two wells, nor were any pesticides detected in the other shallow bedrock wells sampled and analyzed during the RI.

Cyanide was detected in two of the shallow bedrock wells sampled and analyzed during the RI, including the background well. The reported concentrations were well below New York State's groundwater standard.

Unfiltered shallow groundwater samples were collected during the RI and analyzed for metals. The results for arsenic, barium, beryllium, chromium, copper, iron, lead, magnesium, manganese, sodium and zinc exceeded New York State's groundwater standards and/or guidance values in one or more of the samples analyzed. However, except for lead, all of these metals were detected in the background well, and the results for the background well also exceeded New York State's groundwater standards and/or guidance values for iron, magnesium and sodium.

Filtered groundwater samples were also collected and analyzed during the RI to evaluate the impact of suspended sediment in the samples on the total metals concentrations. The results for barium, manganese and sodium exceeded New York State's groundwater standards and/or guidance values in one non-background well each. The standards and/or guidance values were exceeded for iron and magnesium in more than one non-background well. The concentration of dissolved magnesium and sodium in the background well also exceeded New York State's groundwater standards and/or guidance values. Arsenic, beryllium, chromium, copper, lead and zinc detected in the unfiltered samples are likely attributable to suspended matter in the samples. The inorganic analytical data indicate that metals are not a significant concern in the shallow bedrock groundwater system.

Contaminants in Deep Bedrock Groundwater

Analytical results obtained from deep bedrock wells during the RI are generally consistent with data obtained during the Phase IV investigation. With the exception of an anomalous detection of carbon disulfide at 25 micrograms per liter (ug/l) in well B-8D, 1,2-DCE and vinyl chloride were the only VOCs detected in the deep bedrock groundwater system. Moreover, these VOCs were detected above New York State's groundwater standards in only five of the 17 deep bedrock wells sampled during the RI (i.e., wells B-8D, B-9D, B-20D, B-24D and B-26D). The maximum concentrations of these VOCs were 12 and 34 ug/l, respectively. During previous investigations, 1,2-DCE and vinyl chloride exceeded New York State's groundwater standards in six deep bedrock wells, and their maximum concentrations were somewhat higher (i.e., 34 and 53 ug/l, respectively).

1,2-DCE and vinyl chloride may potentially be migrating into the deep bedrock groundwater from the overlying shallow bedrock groundwater, resulting in low concentration of these compounds in the deep bedrock. Although the vertical permeability of the shallow bedrock unit may be 250 to 500 times lower than its horizontal permeability, water-level data collected during both the Phase IV investigation and the RI indicate that large hydraulic head differences exist between the shallow and deep bedrock units. These gradients suggest a potential for downward flow of groundwater, which in turn might explain why the distribution of VOCs in the deep bedrock unit mimics that observed in the shallow bedrock unit.

Other potential sources of the VOCs in the deep bedrock unit include temporary interconnection of the shallow and deep bedrock units during drilling, and less significant connection of the shallow and deep bedrock units resulting from aspects of well construction. In this regard, numerous monitoring wells were permanently abandoned during the RI to help ensure that such connections are not present.

The five deep bedrock monitoring wells which showed VOC concentrations above New York State's groundwater standards were resampled several months after the well abandonment activities were performed to assess the impact, if any, of that work. The concentration of 1,2-DCE and vinyl chloride declined somewhat, perhaps as a result of the well abandonment activities. The maximum concentrations of these VOCs were 4.9 and 11 ug/l, respectively. Moreover, the detections of 1,2-DCE were all below New York State's groundwater standard. Additional well installation and sampling is planned during the ongoing RI to further assess concentration trends and develop a better understanding of the deep bedrock groundwater system.

With respect to the other analytes, groundwater samples collected from the deep bedrock monitoring wells demonstrated no detectable concentrations of SVOCs, with one exception. Di-n-butylphthalate was detected at a very low concentration in a background well. This detection was attributed to laboratory and/or sampling artifacts, but was, nevertheless, well below the New York State's groundwater standard. In addition, no pesticides, PCBs or cyanide were detected from groundwater samples collected from the deep bedrock wells.

Several inorganic parameters were detected in deep groundwater samples collected during the RI. The results for iron, magnesium, manganese and sodium exceeded New York State's groundwater standards and/or guidance values in the background wells. Results from deep bedrock well B-8D, located on-site within the area of the shallow bedrock contaminant plume, exceeded standards and/or guidance values only for iron and magnesium. In fact, the metals concentrations in this well were generally lower than the maximum concentrations detected in the two background wells. Based on these data, the metals detected in the deep bedrock wells are not related to the site.

1.0 INTRODUCTION

1.1 Purpose

This report summarizes the methods used and results obtained to date for the ongoing investigation being performed at the former Powerex, Inc. facility (the site) located on West Genesee Street in Auburn, New York. The General Electric Company (GE) retained Dunn Engineering Company (DUNN), now a division of Rust Environment and Infrastructure, Inc., to perform this work. A Remedial Investigation/Feasibility Study (RI/FS) Work Plan was developed by DUNN and approved by the New York State Department of Environmental Conservation (DEC) on March 31, 1993. The work plan was developed to serve as a scope and procedural outline for the field activities to be performed during the RI and the evaluation of remedial technologies and alternatives during the FS. The intent of this Interim RI Report is to present the results of the studies performed to date. Results obtained during future investigative activities will be presented in a Final RI Report.

As part of the RI/FS Work Plan, a RI Field Health and Safety Plan (FHSP), a RI Sampling and Analysis Plan (SAP) and a RI/FS Citizen Participation Plan (CPP) were developed by DUNN. Although bound separately, these documents were also reviewed and, as appropriate, approved by the DEC prior to the initiation of field activities for use with the actual RI/FS Work Plan. The site-specific FHSP was prepared to ensure the health and safety of workers and the immediate community during performance of the RI. The SAP defined data quality objectives (DQOs) and detailed specific sampling procedures and analytical protocols to ensure that the data collected during the RI would be of sufficient quantity and quality to support the FS. The SAP contained both a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP). The CPP outlined some of the activities which would ensure adequate involvement of the community in the remedial process.

An Interim Remedial Measure (IRM) was also performed which involved the excavation and removal of the two Laboratory Waste Solvent Tanks located on the east side of the plant building. The Laboratory Waste Solvent Tanks IRM Work Plan and Laboratory Waste Solvent Tanks IRM FHSP were developed and, as appropriate, approved by the DEC in advance of this work. The Laboratory Waste Solvent Tanks IRM and associated findings are discussed in Section 3.0 of this Interim RI Report.

1.2 Project Scope

The tasks that were to be performed during the RI are detailed in the RI/FS Work Plan. The following activities were proposed:

- Inspect the existing monitoring network to assess the current condition of all existing micro-wells, piezometers, and monitoring wells;
- Collect water-level data on a monthly basis over a specified period of time to assess current conditions of groundwater flow in and between the various hydrogeologic units;

- Obtain surface water samples from selected locations to confirm prior analytical results for volatile organic compounds (VOCs), acquire information for other analytes, and assess background conditions;

- Install additional overburden monitoring wells in the vicinity of suspected source areas and the fringe of the overburden contaminant plume for potential use in long-term monitoring;

- Collect subsurface soil samples near the purported West Evaporation Pit for VOC analysis;

- Install a monitoring well in the vicinity of the purported West Evaporation Pit to assess groundwater conditions within the shallow bedrock hydrogeologic unit;

- Perform additional hydraulic conductivity testing;

- Obtain one round of groundwater samples from all newly-installed wells and selected existing wells for subsequent analysis for VOCs, and analysis of selected samples for various Target Compound List (TCL) and Target Analyte List (TAL) parameters to assess current groundwater conditions and confirm results from previous investigations;

- Install a pumping well and observation well system within the shallow bedrock hydrogeologic unit for the purpose of performing pump tests;

- Perform a step-drawdown and/or constant rate pumping test to better characterize the shallow bedrock hydrogeologic unit and determine its response to pumping; and

- Collect groundwater samples for VOC and methanol analysis at the beginning of the pumping test(s) and at the conclusion of each step; analyze the final step for selected inorganic and physical parameters.

All of the above tasks have been completed and are addressed herein.

Recommendations were also made for the abandonment, reconstruction and replacement of existing monitoring wells. These recommendations were based upon results of previous RI tasks, including the monitoring network inspection, water-level measurements, and a review of well construction details. Following DEC approval, these recommendations were implemented.

Based on analytical results obtained from the initial sampling activities, five deep bedrock monitoring wells were found to exceed groundwater standards. Therefore, pursuant to the RI/FS Work Plan, these wells, along with the associated shallow bedrock monitoring wells, were resampled a few months after completing the well abandonment, reconstruction and replacement activities discussed above. VOCs were again detected, albeit at lower concentrations, and additional investigative activities are to be performed to develop a better understanding of the deep bedrock groundwater system.

In addition to the above activities, the RI has included a biodegradation study performed by Beak Consultants, Ltd. (Beak) of Guelph, Ontario, Canada. This included various special analyses conducted on subsurface soil and groundwater samples. The results of the biodegradation study are presented in a separate report.

1.3 Site History

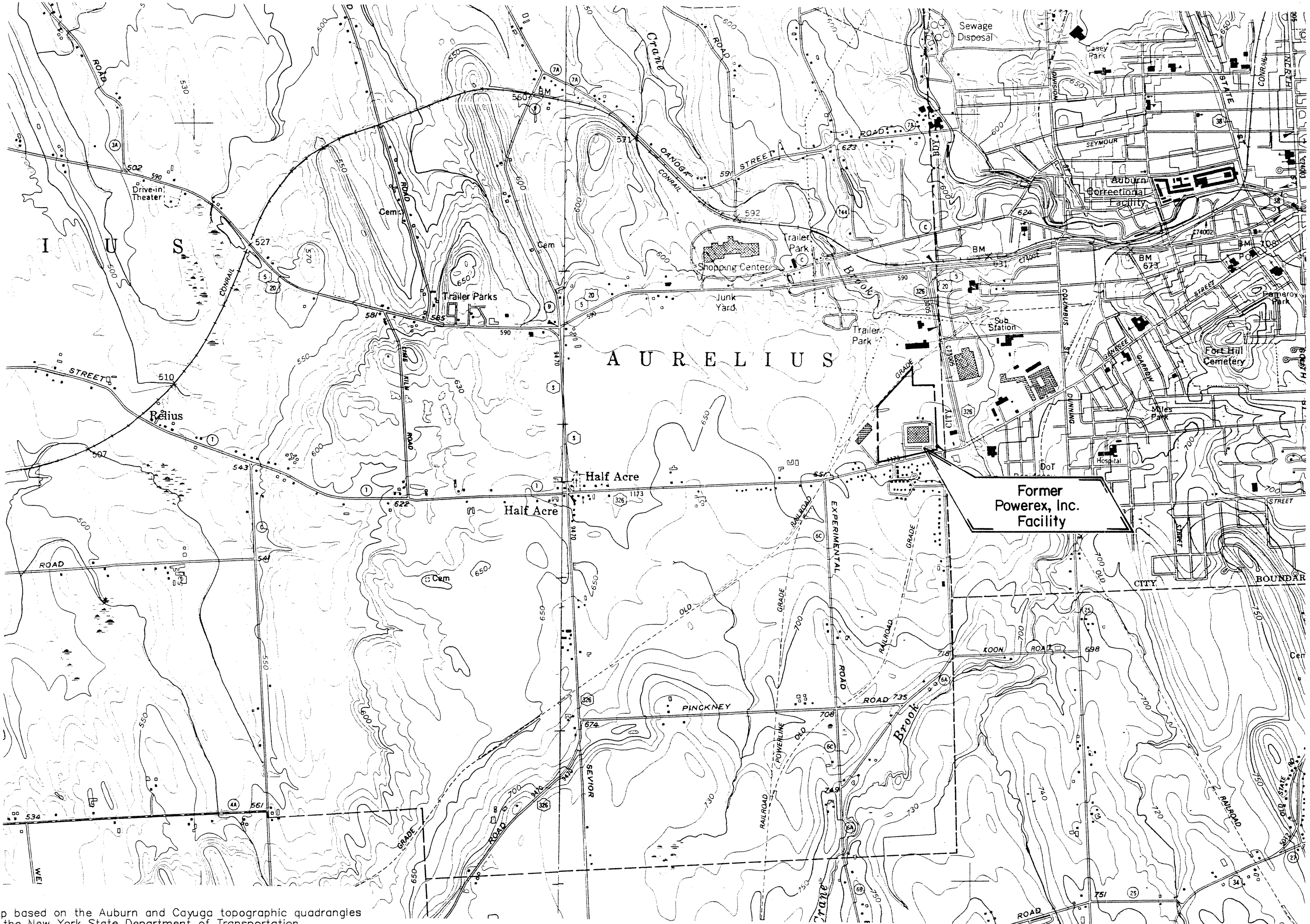
The site is 55.4 acres in size and straddles the boundary between the Town of Aurelius and the City of Auburn in Cayuga County, New York (Figure 1.1). The site was farm land before GE purchased it in 1951 and constructed a manufacturing plant. GE manufactured a variety of electrical components, including radar equipment, printed circuit boards for high-fidelity equipment, and, beginning in 1959 or 1960, high-voltage semiconductors.

The site was acquired by Powerex, Inc. (Powerex) in January 1986. Powerex continued the manufacture of high-voltage semiconductors until May 1990 when the plant was closed. GE repurchased the site in November 1990, largely to facilitate the remedial activities. To date, the plant remains inactive.

1.4 Past Waste Solvent Handling Practices

Disposal of waste solvents reportedly occurred at the site in one or two unlined evaporation pits. Based on interviews with former employees, an evaporation pit may have been located in the field just west of the plant building. Based on various accounts, this so-called West Evaporation Pit was an unlined excavation, one to two feet in depth and 25 to 100 feet square. An unknown quantity of waste solvents was purportedly disposed in this pit and acetone may have been used to ignite fires in the pit in an effort to burn off ponded liquids. The practice of burning was apparently discontinued and the pit abandoned in 1962 during construction of a two-story plant addition. The purported West Evaporation Pit was reportedly closed by bulldozing. However, although VOCs have been detected in overburden soils and groundwater in the field west of the plant building, the exact location, dimensions and history of the West Evaporation Pit remain unknown. Aerial photography clearly indicates that an evaporation pit was not present in this field in July 1954. Additionally, there is no visible expression of a former evaporation pit in aerial photographs obtained in June 1963. A series of 49 test pits performed in November 1989 also failed to locate any signs of the purported West Evaporation Pit.

The second evaporation pit was located immediately north of the northwest corner of the plant building. Both the location and dimensions of this so-called North Evaporation Pit are known based on its continued topographic expression and its obvious expression on available aerial photographs. This pit was rectangular, approximately 30 by 40 feet in size, and was about one-foot deep with a low, discontinuous earthen berm. Reports indicate that use of the North Evaporation Pit began in 1962 or 1963 after the purported West Evaporation Pit was abandoned. However, the North Evaporation Pit is not obviously expressed on the June 1963 aerial photographs. The North Evaporation Pit is clearly evident, although not necessarily still in use,



Map based on the Auburn and Cayuga topographic quadrangles of the New York State Department of Transportation.

SITE LOCATION MAP

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

DWG. No. 35126-36
SCALE 1"=2000'
FIGURE No. 1.1

DUNN ENGINEERING COMPANY
DIVISION OF **RUST** ENVIRONMENT & INFRASTRUCTURE

PROJECT No. 35126.017
DATE 9/94

on the next available aerial photographs in March 1973. During its use, the North Evaporation Pit received an unknown quantity of waste solvents which were gravity fed to the pit through pipes from the Drum Storage Building located on the north side of the two-story plant addition. Use of the North Evaporation Pit was reportedly discontinued when the so-called Waste Solvent Tank was installed in 1966 or 1967.

The Waste Solvent Tank is a 21,000-gallon underground concrete tank constructed in 1966 or 1967 and located immediately north of the northwest corner of the plant building. Waste solvents were routinely removed from the tank and transported off-site for reclamation or disposal. Powerex discontinued use of the Waste Solvent Tank in August 1988, at which time waste solvents were stored in 55-gallon drums pending transport for off-site reclamation or disposal. Powerex closed the Waste Solvent Tank in December 1988 in accordance with a closure plan approved by the DEC.

Waste solvents were reportedly also stored in two small underground tanks located along the east side of the plant building. These so-called Laboratory Waste Solvent Tanks were apparently installed in 1960 and were reportedly used to collect various waste solvents which were gravity fed via underground piping from the engineering laboratory located just inside the east wall of the plant. The tanks were reportedly emptied periodically by pumping their contents into 55-gallon drums which were subsequently taken to the Drum Storage Building and emptied into the drain leading to the North Evaporation Pit. Use of the two tanks was reportedly discontinued in 1966 to 1967 when the Waste Solvent Tank and the drain lines which connected it to the engineering laboratory were installed. These tanks were removed in February 1994 as part of an IRM.

1.5 Previous Investigations

Investigation of subsurface environmental conditions at the site began in June 1979 when GE obtained two samples of shallow soil from within the North Evaporation Pit, along with a control sample. These samples were analyzed for selected metals. Copper, tin and zinc detected in the soil sample obtained from 0.0 to 0.5 feet deep were slightly elevated relative to the control sample. Copper, tin and zinc were also detected in the soil sample obtained from 0.5 to 1.0 feet deep, but the concentrations were not elevated relative to the control sample. No other metals were detected in these samples.

The shallow soil within the North Evaporation Pit was sampled again in May 1985. These samples were obtained at depths of 1.5, 2.0 and 3.0 feet and analyzed for copper, tin, zinc and trichloroethene (TCE). No tin was detected; copper and zinc were detected but attenuated rapidly with increasing depth. TCE was detected in each of the samples with higher concentrations reported with increasing depth.

GE then retained Dunn Geoscience Corporation to perform a limited Phase I investigation to determine the vertical extent of contaminants in subsurface soils beneath the North Evaporation Pit. This investigation was initiated in December 1985 and consisted of drilling two test borings, located directly within the pit, to the top of bedrock. Split spoon samples were obtained continuously in both test borings and were subsequently analyzed for VOCs by United States

Environmental Protection Agency (EPA) Method 8240, methanol and selected metals (i.e., copper, tin, and zinc).

VOCs were detected in all of the soil samples collected during the Phase I investigation, extending from the ground surface to the top of bedrock at about 15 feet below grade. TCE, xylenes and acetone were consistently detected, with maximum reported concentrations of 4,400 6,700, and 2,800 milligrams per kilogram (mg/kg), respectively. Detection of ethylbenzene and toluene was also common. Total VOCs within the overburden soils ranged from 160 to 10,800 mg/kg. Additionally, methanol was also routinely detected, with a maximum reported concentration of 827 mg/kg. With the exception of one shallow soil sample, the concentrations of copper, tin and zinc were relatively uniform with depth. Additional details are presented in the Phase I Hydrogeologic Investigation Report prepared by Dunn Geoscience Corporation in February 1986.

Dunn Geoscience Corporation proceeded with a Phase II investigation in early November 1986 to obtain a general understanding of hydrogeologic conditions and make a preliminary assessment of the nature and extent of contaminants, primarily VOCs, in groundwater in the vicinity of the North Evaporation Pit. Field activities associated with this investigation included the following:

- Analysis of 36 soil gas samples for VOCs using a portable gas chromatograph (GC);
- Installation of 20 micro-wells (i.e., small-diameter driven points) within the overburden soils at 16 locations;
- Drilling and installation of eight monitoring wells at five locations, four wells in the overburden soils and four wells in the shallow bedrock;
- In-situ hydraulic conductivity testing of the monitoring wells;
- Measurement of water levels within the micro-wells and monitoring wells on four separate occasions;
- Analysis of groundwater samples collected from the micro-wells for VOCs using a headspace method with a portable GC; and, subsequently,
- Analysis of groundwater samples from the monitoring wells and selected micro-wells for VOCs by EPA Method 624, with analysis of certain groundwater samples for methanol, semi-volatile organic compounds (semi-VOCs) by EPA Method 625 and selected metals (i.e., copper, tin, and zinc).

The Phase II investigation is detailed in the Phase II Hydrogeologic/Subsurface Contamination Investigation Report prepared by Dunn Geoscience Corporation in July 1987. VOCs were detected in groundwater samples from both the overburden soils and shallow bedrock, the latter being limestone of the Onondaga Formation. The primary VOCs detected in groundwater samples were TCE and its associated degradation products [total-1, 2-dichloroethene (total-1,2-DCE) and vinyl chloride] and acetone. Trace concentrations of two semi-VOCs were detected in the groundwater samples but were also detected in the trip blank. Tin was not detected in any of the groundwater samples. Copper was detected at a very low concentration in one sample. Zinc was detected at low concentrations in two groundwater samples, with the highest concentration detected in an upgradient well.

As a result of the above activities, it was determined that the extent of VOCs within the overburden soils had been defined to the north and northwest of the North Evaporation Pit, but additional delineation was necessary in the remaining directions. In particular, based on analytical results from one micro-well, an alternate source of VOCs appeared to exist in the field west of the plant building.

The site was formally added to DEC's Registry of Inactive Hazardous Waste Disposal Sites in October 1987 based on information obtained during the investigative activities described above. The DEC designated the site as a Class 2 with a site code of 7-06-006.

Dunn Geoscience Corporation initiated a third phase of investigation in August 1987. The purpose of the Phase III investigation was to obtain a more thorough understanding of hydrogeologic conditions in the overburden soils and shallow bedrock, further define the extent of VOCs in groundwater and determine whether VOCs were present in surface water at the site. Field activities performed during this phase included the following;

- Analysis of 63 additional soil gas samples for VOCs using a portable GC;
- Installation of an additional 19 micro-wells within the overburden soils at 15 new locations;
- Drilling and installation of an additional seven monitoring wells at six new locations, one well in the overburden soils and six wells in the shallow bedrock;
- Installation of one piezometer in the overburden soils;
- In-situ hydraulic conductivity testing of the new monitoring wells and piezometer;
- Measurement of water levels within the micro-wells, monitoring wells and piezometer on a weekly or biweekly basis for a five-month period;
- Analysis of three surface water samples obtained from the storm sewer and drainage ditch for VOCs by EPA Method 624;
- Analysis of groundwater samples from the new micro-wells for VOCs using a headspace method with a portable GC; and, subsequently,

- Analysis of groundwater samples from all of the monitoring wells and 15 selected micro-wells for VOCs by EPA Method 624.

The results of the above investigation are presented the Phase III Hydrogeologic/Subsurface Contamination Investigation Report prepared by Dunn Geoscience Corporation in May 1988. The extent of VOCs within overburden groundwater was adequately defined in the vicinity of the North Evaporation Pit, purported West Evaporation Pit and the Waste Solvent Tank. VOCs were again detected in the shallow bedrock but their lateral and vertical extent was not yet adequately defined. VOCs, primarily TCE and trans-1-2-dichloroethene (trans-1,2-DCE) [suspected actually to have been cis-1,2-dichloroethene (cis-1,2-DCE)], were also detected in surface water samples collected in the storm sewer and drainage ditch.

Dunn Geoscience Corporation initiated a Phase IV investigation in August 1988, the primary purpose of which was to better define the three-dimensional extent of VOCs within the bedrock groundwater. The Phase IV investigation was subsequently expanded to develop a more thorough understanding of the nature and extent of VOCs in surface water and to determine the extent of highly contaminated subsurface soils in the vicinity of the North Evaporation Pit and, if located, the purported West Evaporation Pit. This investigation is detailed, along with summarized results of previous investigative phases, in the Phase IV Subsurface Investigation Report prepared by Dunn Geoscience Corporation in September 1991.

The Phase IV investigation of conditions within the bedrock was quite extensive. Some of the field activities were:

- Geologic reconnaissance of outcrops in the vicinity of the site, including the mapping of joints in one nearby outcrop;
- Bedrock coring at an upgradient location to a depth of approximately 100 feet below grade;
- Drilling of 49 bedrock boreholes at 29 locations, including deep (i.e., 100 feet or more below grade) boreholes at 26 locations;
- Analyses of 126 groundwater samples obtained during bedrock drilling for VOCs using a headspace method with a portable GC, and four such samples for VOCs by EPA Method 624;
- Measurement of vertical flow within the deep bedrock boreholes using a prototype borehole flow meter;
- Installation of 47 new bedrock monitoring wells, two overburden monitoring wells and 11 overburden piezometers;
- In-situ hydraulic conductivity testing of the new monitoring wells;

- Routine measurements of water levels in the numerous micro-wells, monitoring wells and piezometers over a period in excess of 22 months;

- Continuous monitoring of water levels in selected monitoring wells during ten time periods using pressure transducers and associated data loggers;

- Analysis of 105 groundwater samples, obtained from various monitoring wells and piezometers on several dates, for VOCs using a headspace method with a portable GC;

- Analysis of 23 groundwater samples obtained from various monitoring wells on several dates for VOCs by EPA Methods 524 or 624; and

- Analyses of groundwater samples obtained from 111 micro-wells, monitoring wells and piezometers during one extensive sampling event for VOCs by EPA Method 8240, with the additional analysis of 16 groundwater samples for semi-VOCs, pesticides, polychlorinated biphenyls (PCBs), cyanide and metals.

During the Phase IV investigation, analysis of groundwater samples indicated the presence of VOCs in the shallow bedrock on Mr. James Wait's property located just northwest of the site. A soil boring program was then initiated to assess whether VOCs were present in the overburden soils. Soil samples were collected during the drilling of 10 soil borings in the vicinity of well locations B-26, B-27 and B-28 on Mr. Wait's property. A total of 21 samples of overburden soils were analyzed for VOCs by EPA Method 8240.

Phase IV investigation activities associated with the nature and extent of VOCs in surface water included the following:

- Determination of the source(s) of surface water flow in the drainage ditch, which extends northwest from the plant building to the site boundary, by "mapping" the various inputs, which are primarily storm sewer drains;

- Routine measurement of flow within the drainage ditch over a period in excess of 22 months using the on-site weir;

- Continuous monitoring of flow within the drainage ditch during seven time periods (i.e., over 230 days total) using a pressure transducer and associated data logger;

- Analysis of 338 surface water samples obtained on various dates from several locations both on- and off-site for VOCs using a headspace method with a portable GC;

- Analyses of five surface water sediment samples collected near the site boundary for VOCs by EPA Method 624; and

- Analyses of 16 surface water samples obtained on three dates from several on- and off-site locations for VOCs by EPA Methods 624 or 8240.

In addition to the above, the following field activities were also performed during the Phase IV investigation to obtain information regarding the extent of contaminated subsurface soils in the immediate vicinity of the North Evaporation Pit and purported West Evaporation Pit:

- Performance of one test pit within the North Evaporation Pit and another test pit outside, but in the vicinity of, the North Evaporation Pit;

- Performance of 49 test pits in an attempt to locate the purported West Evaporation Pit;

- Drilling of 11 soil borings in the immediate vicinity of the North Evaporation Pit;

- Analyses of 55 samples of overburden soils from the test pits and soil borings for VOCs by EPA Method 8240;

- Analyses of three overburden soil samples from the test pits and soil borings for semi-VOCs, metals and cyanide and one overburden soil sample from a test pit for pesticides and polychlorinated biphenyls (PCBs); and

- Determination of permeability, total porosity and bulk density from two Shelby tube samples obtained from soil borings in the vicinity of the North Evaporation Pit.

1.6 Hydrogeologic Setting

Based on data collected during these investigations, the site was found to be underlain by 10 to 22 feet of overburden soils which are generally fine-grained and of low permeability. The average thickness is about 15 feet, with 8 feet of glaciolacustrine silts and clays overlying 7 feet of glacial till. The contact between the overburden soils and the bedrock was found to be irregular with a relief of about 15 feet.

A thick sequence of carbonate strata was found to underlie the overburden soils at the site. The sequence dips gently to the south at approximately 35 feet per mile (feet/mile). The upper portion (i.e., approximately 45 feet) was found to be composed of limestones of the Onondaga and Manlius Formations and a thin (i.e., few inches) intervening remnant of the Oriskany Formation. The Moorehouse Member of the Onondaga Formation underlies the overburden soils at the site, and is in turn underlain by the Nedrow and Edgecliff Members. The lower portion of the sequence of carbonate strata at the site was found to be composed of dolomites of the Rondout, Cobleskill and Bertie Formations, which have a total thickness of approximately 120 feet. Bedrock drilling during the Phase IV investigation extended into the Bertie Formation at some locations, but did not fully penetrate this unit. Although not investigated, the Bertie Formation is underlain by a thick sequence of shale comprising the Camillus Formation.

A conceptual model of the groundwater flow system was developed during the Phase IV investigation and consists of three hydrogeologic units: the overburden, shallow bedrock (i.e., Onondaga, Oriskany and Manlius Formations) and deep bedrock (i.e., Rondout, Cobleskill and Bertie Formations). Downward hydraulic gradients exist throughout but are particularly strong between the shallow and deep bedrock units, with water-level differences in excess of 40 feet observed during dry periods of the year.

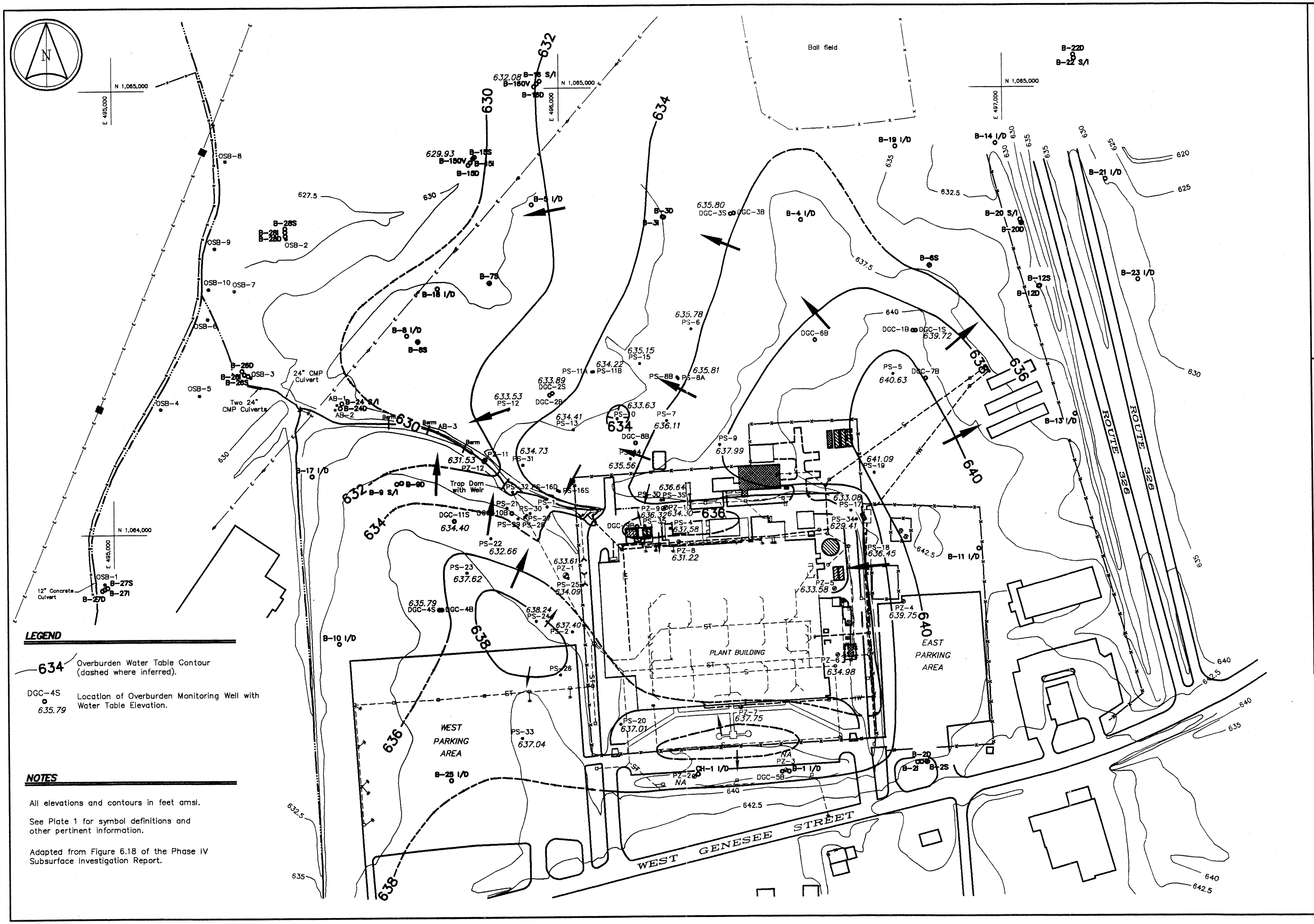
Groundwater in the overburden hydrogeologic unit occurs just below ground surface during the late fall, winter and early spring. However, the water table is "wicked" down by evapotranspiration during the growing season and significant desaturation of the overburden soils occurs. Recharge to the overburden occurs as a result of precipitation events.

Figure 1.2 shows the water-table contour map based on water-level measurements obtained during the Phase IV investigation on February 13, 1990 (adapted from Figure 6.18 of the Phase IV Subsurface Investigation Report). Groundwater flow was found to be directed toward local discharge zones including various subsurface storm sewer drains, the on-site drainage ditch and streams located off-site to the northwest and east.

Inward flow toward the plant building was also noted and was believed to be due, in part, to underlying storm sewer drains. A temporally persistent water-table divide occurs immediately east of the plant building, oriented in a north-south direction. Source areas such as the North Evaporation Pit, purported West Evaporation Pit and the Waste Solvent Tank area occur on the western side of this divide and groundwater flow from these areas was found to be generally to the northwest. Rates of horizontal groundwater flow were estimated to range up to 0.5 feet per day (feet/day).

Groundwater flow in the shallow bedrock hydrogeologic unit was found to be directed to local discharge zones including the streams located off-site to the northwest and east. The contour map of the piezometric surface based on water-level measurements obtained during the Phase IV investigation on February 13, 1990 is shown in Figure 1.3 (adapted from Figure 6.23 of the Phase IV Subsurface Investigation Report). A north-south trending divide occurs in the piezometric surface in the eastern portion of the site. The North Evaporation Pit, purported West Evaporation Pit and the Waste Solvent Tank area are located west of the piezometric surface divide and shallow bedrock groundwater flow from these areas was found to be generally directed toward the northwest. Shallow bedrock groundwater flow may be directed toward the "swallets" which are located approximately 2000 feet northwest of the plant building and into which surface water flow in the stream to the northwest of the site flows.

Flow in the shallow bedrock is believed to be primarily along bedding planes, which may be widened somewhat by solution. The horizontal permeability of the shallow bedrock was calculated to be 250 to 500 times the vertical permeability, which was calculated to be about 5×10^{-6} centimeters per second (cm/sec). Horizontal flow velocities were estimated at up to 4.4 feet/day, an order of magnitude or more greater than those in the overburden unit.



LEGEND

634 Overburden Water Table Contour (dashed where inferred).

DGC-4S ○ 635.79 Location of Overburden Monitoring Well with Water Table Elevation.

NOTES

All elevations and contours in feet amsl.

See Plate 1 for symbol definitions and other pertinent information.

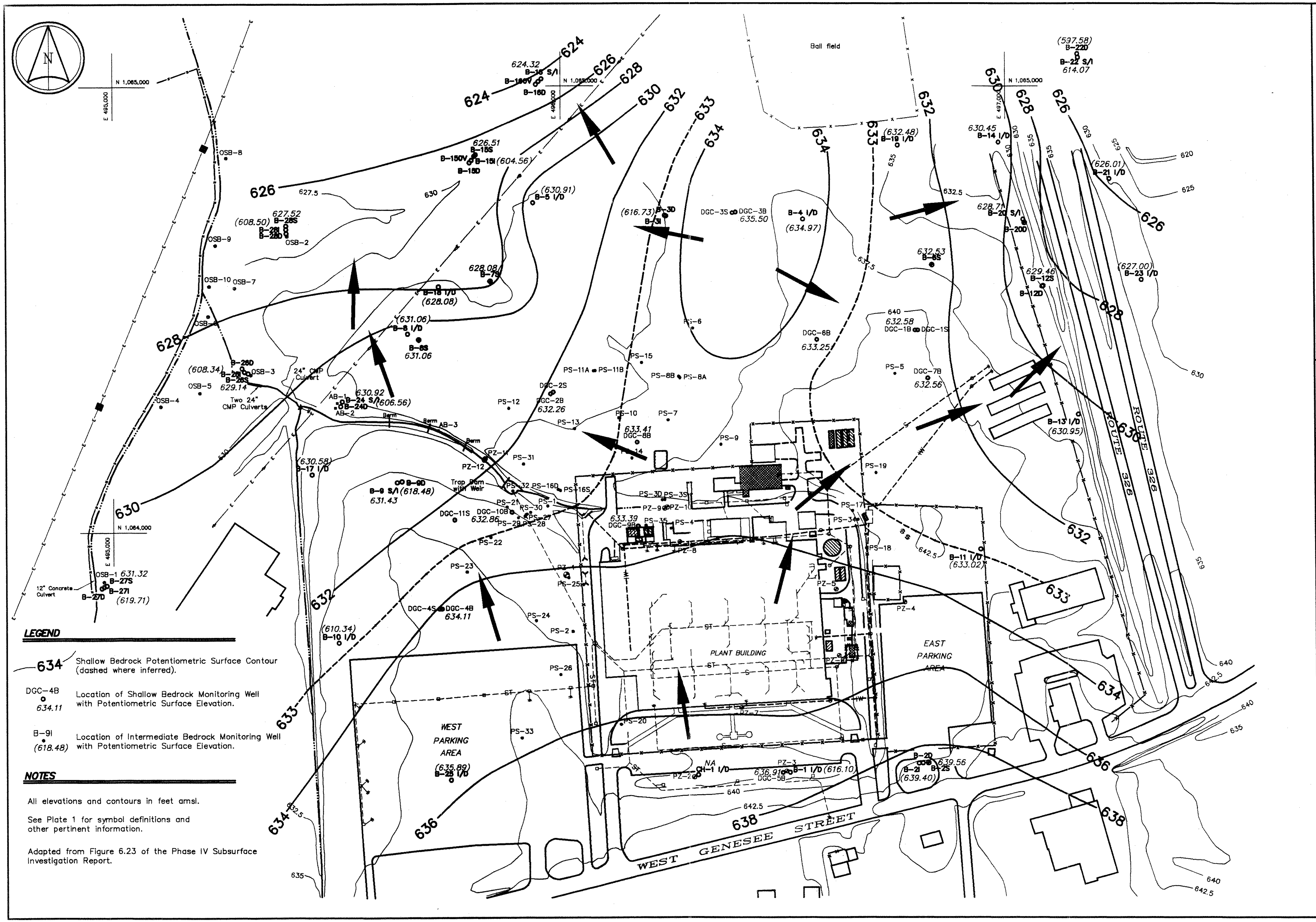
Adapted from Figure 6.18 of the Phase IV Subsurface Investigation Report.

WATER-TABLE MAP FOR THE
OVERBURDEN GROUNDWATER ON FEBRUARY 13, 1990

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT No. 35126.017	DATE 10/31/90	DWG. No. B8784_23	SCALE 1"=200'	FIGURE No. 1.2



LEGEND

634 Shallow Bedrock Potentiometric Surface Contour (dashed where inferred).

DGC-4B 634.11 Location of Shallow Bedrock Monitoring Well with Potentiometric Surface Elevation.

B-9I (618.48) Location of Intermediate Bedrock Monitoring Well with Potentiometric Surface Elevation.

NOTES

All elevations and contours in feet amsl.

See Plate 1 for symbol definitions and other pertinent information.

Adapted from Figure 6.23 of the Phase IV Subsurface Investigation Report.

POTENTIOMETRIC SURFACE MAP FOR THE SHALLOW BEDROCK GROUNDWATER ON FEBRUARY 13, 1990

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

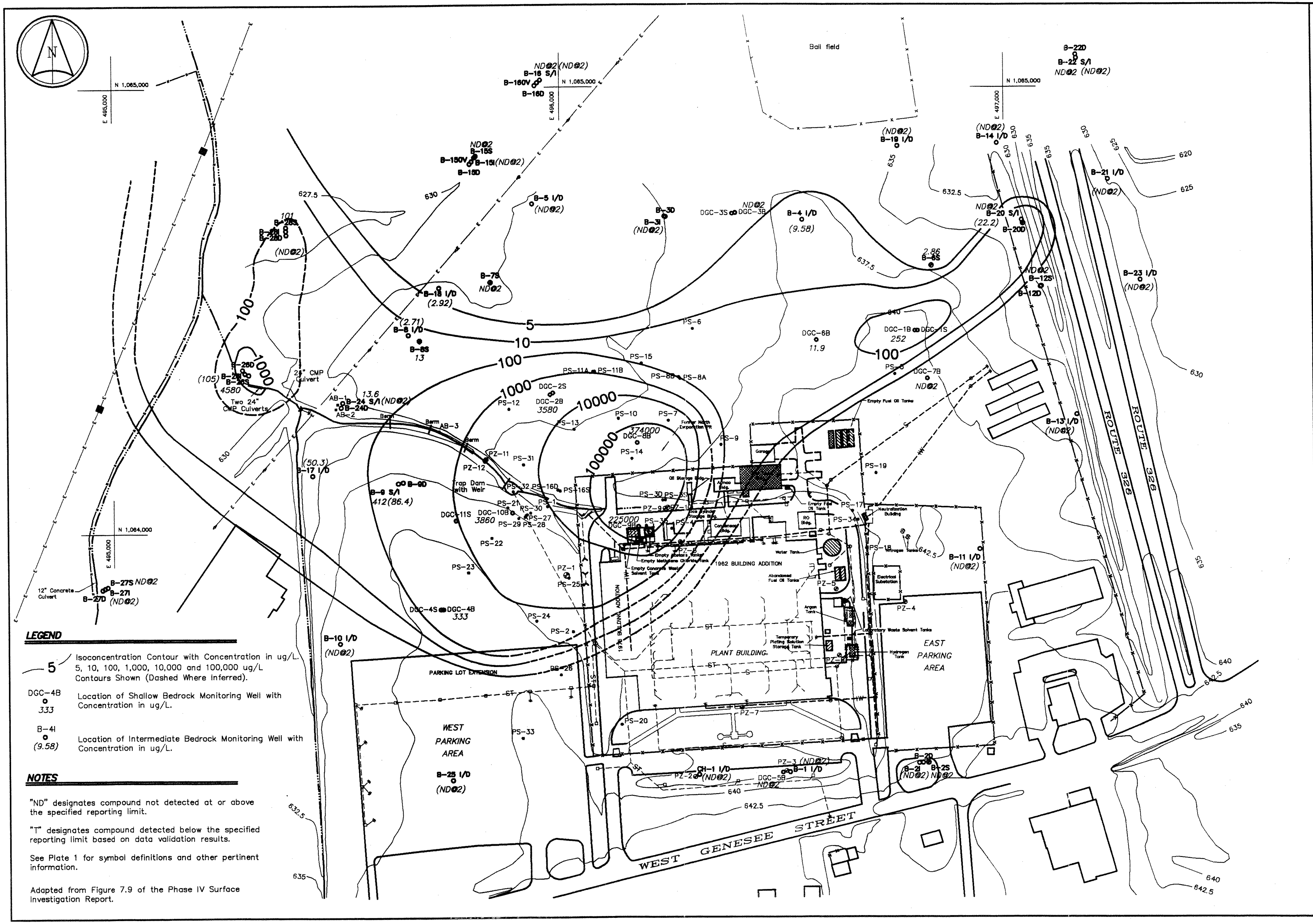
DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT No. 35126.017
DATE 10/31/90
DWG. No. B8784_18
SCALE 1"=200'
FIGURE No. 1.3

1,2-DCE and vinyl chloride were the only VOCs detected in laboratory analyses of deep bedrock groundwater samples during the previous investigations. However, the distribution of these VOCs in the deep bedrock hydrogeologic unit was found to mimic the distribution of VOCs observed in the shallow bedrock groundwater as shown in Figure 1.6 (adapted from Figure 7.15 of the Phase IV Subsurface Investigation Report). While only one round of analytical results were available, potential sources of the VOCs observed in the deep bedrock groundwater included leakage from the overlying shallow bedrock unit due to the natural downward hydraulic gradients, temporary connection of the shallow and deep bedrock units during drilling and/or less significant connection of the shallow and deep bedrock units resulting from aspects of well construction. Additionally, it was believed that surface water with VOCs could also be entering the deep bedrock groundwater regime.

With respect to surface water, the storm sewer drains and the drainage ditch flowing northwest from the plant building were found to receive groundwater discharge from the overburden hydrogeologic unit during wet portions of the year. In certain areas of the site, this groundwater is contaminated and results in detectable VOCs in the surface water. VOCs were detected in the drainage ditch at the site boundary and in the off-site stream into which the drainage ditch flows. The principle VOCs detected in these locations were TCE and 1,2-DCE. A pipe was uncovered at the northwest boundary of the site by contractors of the adjacent property owners in April 1990. This pipe appears to be an abandoned agricultural drainage pipe. Sampling was performed and TCE, cis-1,2-DCE and acetone were reported.

Surface water samples analyzed using a headspace method with a portable GC showed that TCE and 1,2-DCE occurred in the storm sewer drains located in the northeast corner of the west parking lot and the field west of the plant building. Flow from the storm sewer drain which runs along the back of the plant building, adjacent to the Waste Solvent Tank, also appeared to contain PCE, TCA, and xylenes in addition to TCE and 1,2-DCE. TCE, 1,2-DCE, and PCE were also found in the drainage running behind the plant building. Storm water flow from the south and east side of the plant building and from roof drains appeared to be free of VOCs.



LEGEND

5 — Isoconcentration Contour with Concentration in ug/L. 5, 10, 100, 1,000, 10,000 and 100,000 ug/L Contours Shown (Dashed Where Inferred).

DGC-4B
○
333 — Location of Shallow Bedrock Monitoring Well with Concentration in ug/L.

B-4I
○
(9.58) — Location of Intermediate Bedrock Monitoring Well with Concentration in ug/L.

NOTES

"ND" designates compound not detected at or above the specified reporting limit.

"T" designates compound detected below the specified reporting limit based on data validation results.

See Plate 1 for symbol definitions and other pertinent information.

Adapted from Figure 7.9 of the Phase IV Surface Investigation Report.

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

ISOCONCENTRATION CONTOUR MAP SHOWING THE
DISTRIBUTION OF 1,2,-DCE IN THE SHALLOW
BEDROCK GROUNDWATER

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

PROJECT No. 35126.017	DATE 10/18/90	DWG. No. B8784_9	SCALE 1"=200'	FIGURE No. 1.5

Groundwater flow in the deep bedrock hydrogeologic unit is believed to be toward a regional discharge zone, probably located below the Onondaga Escarpment a few miles to the north, northwest or west of the site. The deep bedrock unit receives some recharge from the overlying shallow bedrock unit by natural leakage resulting from the downward hydraulic gradients. However, the deep bedrock was found to also receive localized recharge due to sinking streams, two of which occur within a mile of the site. Water levels in the deep bedrock hydrogeologic unit fluctuate dramatically after precipitation and snow melt events due to this recharge.

1.7 Nature and Extent of Contamination

VOCs were found to be the dominant, if not the only, constituents of concern at the site based upon analytical results obtained during the previous investigations for VOCs, semi-VOCs, pesticides, PCBs, cyanide and metals. With respect to overburden soils and groundwater, the primary VOCs were found to be TCE and its degradation products (1,2-DCE and vinyl chloride), acetone, toluene, and xylenes. In addition, methylene chloride, tetrachloroethene (PCE) and 1,1,1-trichloroethane (TCA) occur in very localized areas.

Figure 1.4 shows the distribution of TCE in overburden groundwater based on data obtained during the Phase IV investigation (adapted from Figure 7.1 of the Phase IV Subsurface Investigation Report). The distribution of 1,2-DCE was found to be only slightly more extensive and the distribution of the remaining VOCs was found to be similar or less extensive.

As shown in Figure 1.4, the sources of the VOCs appear to be the North Evaporation Pit, purported West Evaporation Pit, Waste Solvent Tank area and, to a lesser degree, the northernmost of the two Laboratory Waste Solvent Tanks. The lateral migration of VOCs from these areas was found to be limited and off-site migration did not appear to have occurred within the overburden soils.

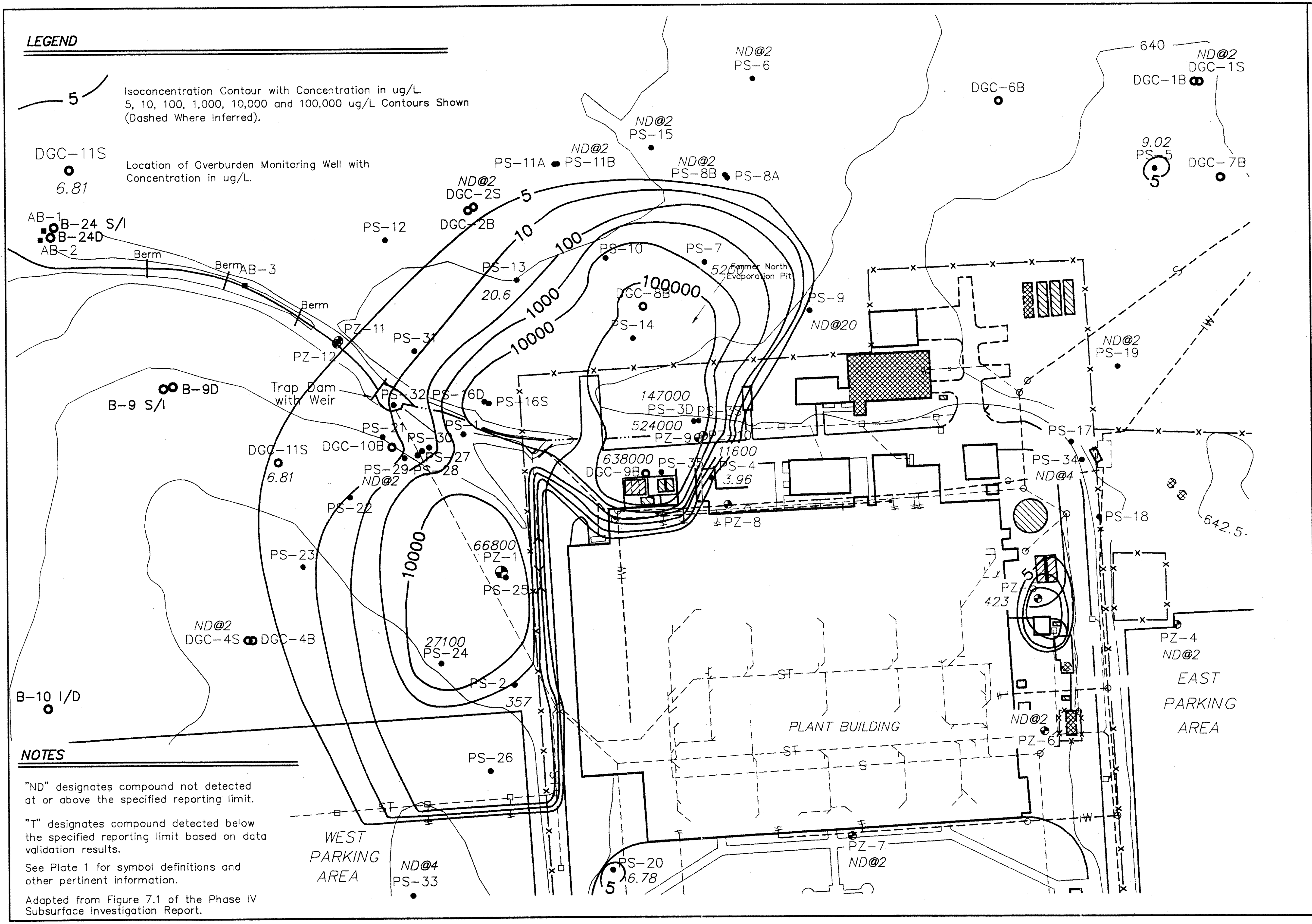
Elevated concentrations of certain VOCs and methanol were also found in the shallow bedrock groundwater. TCE and its associated degradation products (1,2-DCE and vinyl chloride), acetone, toluene, xylenes and methanol were detected in the vicinity of the North Evaporation Pit and Waste Solvent Tank. In addition, methylene chloride was found to be present in the shallow bedrock groundwater at the Waste Solvent Tank area. PCE and TCA were not reported in any of the shallow bedrock groundwater samples. Although no shallow bedrock monitoring wells existed in the immediate vicinity of the purported West Evaporation Pit, conditions were expected to be similar to those found in the vicinity of the North Evaporation Pit.

The distribution of VOCs in the shallow bedrock groundwater appeared to be greatest for 1,2-DCE and vinyl chloride. Figure 1.5 shows the distribution of 1,2-DCE in the shallow bedrock groundwater (adapted from Figure 7.9 of the Phase IV Subsurface Investigation Report). VOCs appeared to emanate from the North Evaporation Pit, purported West Evaporation Pit and Waste Solvent Tank area and extend beyond the site boundary to the west-northwest and to the east-northeast.

LEGEND

Isoconcentration Contour with Concentration in ug/L.
5, 10, 100, 1,000, 10,000 and 100,000 ug/L Contours Shown
(Dashed Where Inferred).

Location of Overburden Monitoring Well with
Concentration in ug/L.



NOTES

"ND" designates compound not detected at or above the specified reporting limit.

"T" designates compound detected below the specified reporting limit based on data validation results.

See Plate 1 for symbol definitions and other pertinent information.

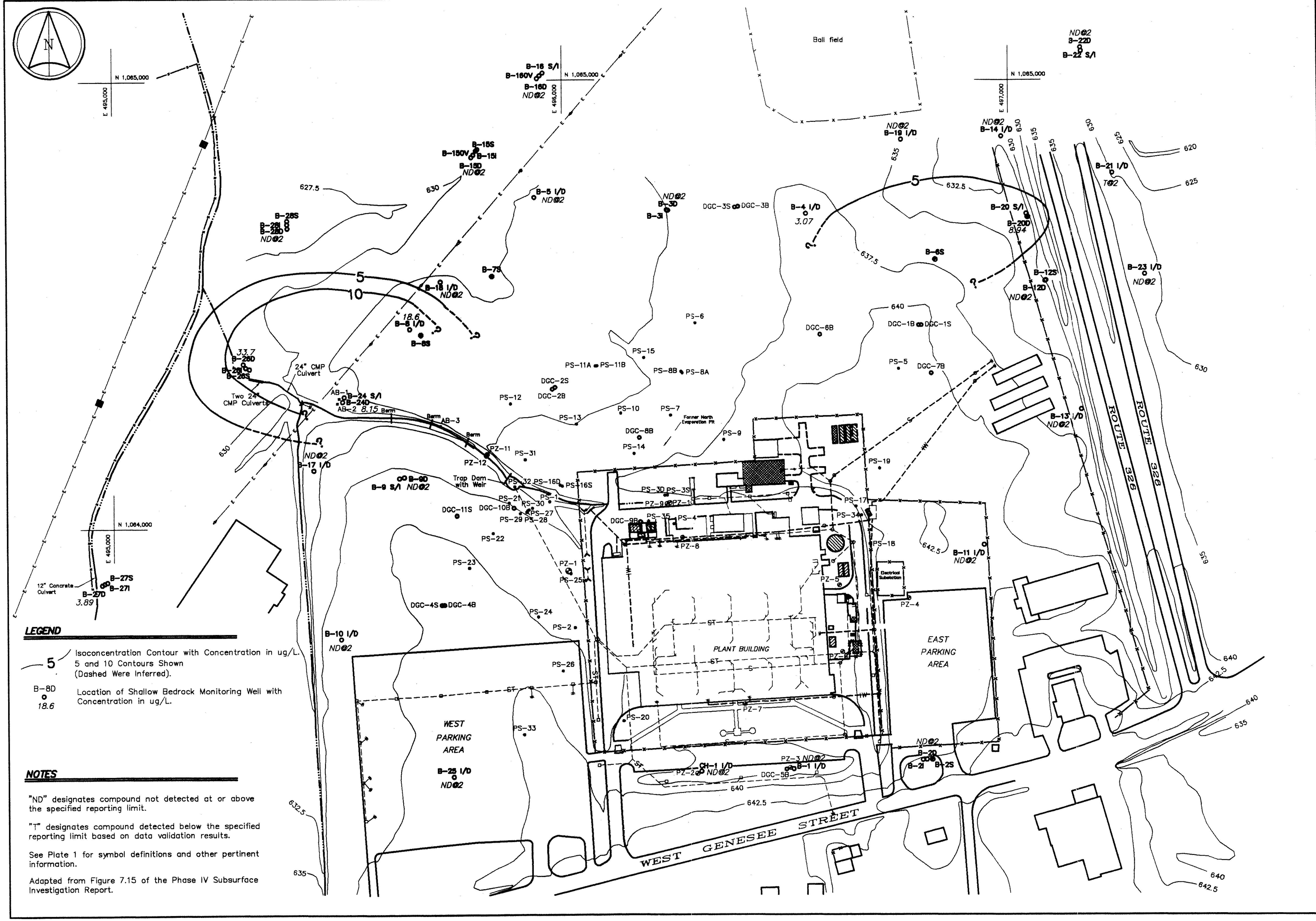
Adapted from Figure 7.1 of the Phase IV Subsurface Investigation Report.

ISOCONCENTRATION CONTOUR MAP SHOWING THE DISTRIBUTION OF TCE IN THE OVERBURDEN GROUNDWATER

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT No. 35126.017	DATE 10/18/90	DWG. No. B8784_1	SCALE 1"=100'	FIGURE No. 1.4



LEGEND

5 — Isoconcentration Contour with Concentration in ug/L. 5 and 10 Contours Shown (Dashed Were Inferred).

B-8D 18.6 — Location of Shallow Bedrock Monitoring Well with Concentration in ug/L.

NOTES

"ND" designates compound not detected at or above the specified reporting limit.

"T" designates compound detected below the specified reporting limit based on data validation results.

See Plate 1 for symbol definitions and other pertinent information.

Adapted from Figure 7.15 of the Phase IV Subsurface Investigation Report.

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

ISOCONCENTRATION CONTOUR MAP SHOWING THE
GENERAL DISTRIBUTION OF 1,2-DCE IN THE DEEP
BEDROCK GROUNDWATER

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

PROJECT No. 35126.017	DATE 4/94	DWG. No. B8784_13	SCALE 1"=200'	FIGURE No. 1.6

2.0 SITE INVESTIGATION

2.1 General

Activities associated with the RI are described in the RI/FS Work Plan and were begun in May 1993. Techniques and methods specified in the approved work plan were used as the basis for performing all field investigations and laboratory testing. The RI activities which have been performed thus far include the following:

- Inspection of the existing network of monitoring wells;
- Collection of water-level measurements on a monthly basis for four months;
- Collection of surface water samples from selected locations;
- Installation of additional overburden and shallow bedrock monitoring wells and the collection of subsurface soil samples;
- Collection of groundwater samples from newly-installed monitoring wells and many of the existing monitoring wells;
- Performance of pumping tests in the shallow bedrock unit, after the installation of a pumping well and several observation wells;
- Abandonment, replacement and/or reconstruction of selected monitoring wells; and
- Performance of a biodegradation study.

These and other activities performed to date during the RI are described in more detail below.

2.2 Task 1A - Monitoring Network Inspection

The existing groundwater monitoring network was inspected to assess the current conditions of the micro-wells, piezometers and monitoring wells installed during previous investigations, the locations of which are shown on Plate 1. The inspection was performed on May 4 and June 2, 1993, in conjunction with the monthly water-level measurements discussed in Section 2.3. The integrity of protective casings and surface seals was documented on a field inspection form, as was any other damage. Total depth measurements were also obtained during the inspection and was compared to the well depths recorded at the time of installation to determine the degree of siltation or the presence of obstructions. Field inspection forms documenting the results of the inspection are located in Appendices A.1 and A.2.

The purpose of the monitoring network inspection was to determine which wells could continue to be used and to make recommendations for any needed maintenance activity. Wells of questionable integrity were repaired or reconstructed during the well abandonment program, as outlined in Section 2.10.

2.3 Task 1B - Water-Level Measurements

An extensive water-level database was developed during previous phases of investigation at the site. However, the most recent round of water levels from these investigations was collected in May 1990. Therefore, several rounds of water-level measurements were obtained during the RI from all accessible wells to assess current conditions and also to acquire hydrologic information from the additional wells installed during the RI. Water levels were collected on a monthly basis from May to August 1993 (i.e., May 4, June 2, July 1, August 9, 1993). All water-level data were converted to water-level elevations with respect to mean sea level using the surveyed elevations of the measuring points. During each round, the depth of water flowing through the on-site weir was also measured.

To determine whether there were any variations in water levels during the time required to perform a complete round of measurements, water levels were obtained from well cluster B-15 at the beginning and end of each round. In order to minimize the potential amount of change in water levels which could occur during each round, the measurements were collected during a single day. In addition, water-level measurement rounds were not performed during or immediately after (i.e., within two days) a significant precipitation event (i.e., greater than 0.25 to 0.50 inches).

Water-level measurements at the site were performed in accordance with the procedures detailed in the approved RI/FS Work Plan. A water-level measurement form was completed for each round, and the resultant forms are presented in Appendices B.1 through B.4. The form was modified throughout the RI as new monitoring wells were installed.

2.4 Task 1C - Surface Water Sampling

2.4.1 Sample Locations

Surface water samples were obtained during the RI to confirm prior analytical results for VOCs, acquire information for other analytes, and compare surface water conditions at and downstream from the site to background conditions. Surface water sampling was attempted on May 3, 4 and 5, 1993, but was aborted due to the lack of flow at sampling locations SW-C and SW-CP. A decision was then made with the DEC to conduct the sampling after a precipitation event. The surface water samples were then collected on June 8, 1993. However, a surface water sample could not be collected from sampling location SW-C due to the lack of surface water flow at that location even after the precipitation event.

A total of six grab samples were collected. Three of the samples were collected from locations sampled during the Phase IV investigation (i.e., SW-CP, SW-G and SW-Q). A fourth sample was a blind duplicate sample designated X-1 and was collected from sampling location SW-Q. The remaining two samples were obtained from the drainage ditch at the southwestern corner of the site and the stream next to monitoring well cluster B-27. These sampling locations are designated SW-S and SW-T, respectively, and are considered representative of background conditions. Table 2.1 lists and describes the surface water sampling locations, which are also presented on Plate 1.

2.4.2 Sample Collection and Analyses

Surface water sampling was conducted in accordance with the procedures outlined in the approved RI/FS Work Plan. The surface water samples obtained at sampling locations SW-G, SW-S and SW-T were analyzed for TCL organic parameters and TAL inorganic parameters using procedures in EPA's Contract Laboratory Program (CLP) and in accordance with the DEC's Analytical Services Protocol (ASP). The surface water samples collected at sampling locations SW-CP and SW-Q, including the blind duplicate sample X-1, were analyzed for TCL volatiles using ASP/CLP Method 91-1.

All analyses of surface water samples were performed by Recra Environmental, Inc. (Recra) of Amherst, New York. Analytical data were validated by DUNN, as discussed in Section 2.13. The validated analytical data packages are presented in Appendix I. Results of the surface water sampling are discussed further in Section 7.2.

2.5 Task 1D - Installation of Additional Monitoring Wells

As part of the RI, soil borings were drilled for the installation of five additional overburden monitoring wells and one additional shallow bedrock monitoring well. All of the drilling and well installation activities were performed by Parratt-Wolff, Inc. (Parratt-Wolff) of East Syracuse, New York, under the supervision of DUNN personnel.

2.5.1 Overburden

Five monitoring wells (i.e., DGC-8S, DGC-9S, DGC-12S, DGC-12I and DGC-13S) were installed during the RI to further define the contaminant plume in the overburden and for use in long-term monitoring, as necessary. Four of these wells were installed in suspected source areas. Monitoring well DGC-8S was installed near the North Evaporation Pit on June 4, 1993 adjacent to shallow bedrock monitoring well DGC-8B. Well DGC-9S was installed on June 3, 1993 at the northwest corner of the closed Waste Solvent Tank, near shallow bedrock well DGC-9B. Monitoring wells DGC-12S and DGC-12I were installed on June 3 and 7, 1993, respectively, and are located near the purported West Evaporation Pit between micro-wells PS-24 and PS-25. A second overburden monitoring well was installed at this location because, in drilling shallow bedrock well DGC-12B after installation of well DGC-12S, refusal was encountered 7-feet deeper than for well DGC-12S. The fifth overburden monitoring well was installed along the fringe of the overburden contaminant plume adjacent to micro-wells PS-8A and PS-8B. This well was installed on June 3, 1993 and is designated DGC-13S. Plate 1 shows the locations of these wells.

To install the overburden monitoring wells, hollow-stem augers were advanced to the top of bedrock. Subsurface soil samples were obtained during drilling using a split-spoon sampler according to American Society for Testing Materials (ASTM) Method D-1586 in advance of the

Table 2.1
Surface Water Sampling Locations
Former Powerex, Inc. Facility
Auburn, New York

Sampling Location	Description
SW-G	Four feet upstream from the weir of the trap dam; upstream from sampling location SW-C; flow intermittent.
SW-C	Drainage ditch immediately prior to site boundary; downstream from sampling location SW-G and upstream from sampling location SW-Q; flow intermittent.
SW-CP	Discharge from 6-inch metal pipe in drainage ditch near site boundary; pipe uncovered in April 1990 and believed to be abandoned agricultural drainage line; upstream from sampling location SW-Q; flow intermittent.
SW-Q	Stream on Mr. Wait's property along south side of main pasture; downstream from sampling locations SW-C, SW-CP, SW-S and SW-T.
SW-S	Drainage ditch at southwest corner of site just north of West Genesee Street; upstream from sampling location SW-Q; background location.
SW-T	Stream on Mr. Wait's property along south side of main pasture; upstream from sampling location SW-Q; background location.
X-1	Blind duplicate sample, collected at sampling location SW-Q.

Note:

1. A list of other sampling locations used during previous investigations at the site may be found in Table 4.19 of the Phase IV Subsurface Investigation Report.

hollow-stem augers. Samples were collected continuously during the drilling of well DGC-12S, but were collected at a standard 5-foot interval elsewhere.

The soil samples were collected and described by DUNN personnel using the Modified Burmister and Unified Soil Classification Systems described in Appendix C.1. Boring logs describing the subsurface materials encountered in each boring were prepared and are presented in Appendix C.3, and some of the drilling information is summarized in Table 2.2. Representative subsamples were field screened for organic vapors using a portable photoionization detector (PID), and the results of this screening are also presented on the boring logs.

Three subsurface soil samples were collected during the drilling of monitoring well DGC-12I. These samples were analyzed for TCL volatiles by ASP/CLP Method 91-1. Sample collection was performed in accordance with the methods outlined in the approved RI/FS Work Plan. The analytical results were validated by DUNN and are presented in Appendix J. These data are discussed in Section 7.3.

Each overburden monitoring well was constructed through the hollow-stem augers immediately following drilling. Monitoring wells DGC-8S, DGC-9S, DGC-12S and DGC-12I were constructed with 2-inch inside diameter (ID), stainless-steel well screen flush-threaded into stainless-steel riser pipe. Well DGC-13S was constructed of 2-inch ID, schedule 40 polyvinyl chloride (PVC) riser pipe flush-threaded into slotted well screen of the same material. The screens were all No. 10 slot (i.e., 0.010 inch), the length of which varied based on the depth to bedrock and required construction details at each location. The base of each well was equipped with threaded bottom-plugs, while the top of each well was equipped with a vented cap.

To construct each well, the well was lowered inside the augers. Sand was then gradually introduced as the augers were withdrawn to form a sand pack. The sand was a clean, graded silica sand sized to match the well screen (i.e., Morie Grade 0 or equivalent) and was placed to extend above the well screen. A bentonite pellet seal at least 2-feet thick was then placed above the sand pack. The annular space was then filled via a tremie pipe to within 3-feet of grade with a thick cement-bentonite grout as the augers were being completely removed. With the exception of well DGC-9S, a lockable protective steel casing was installed over the riser pipe and cemented into place. A curb box was installed at well DGC-9S. Well construction details are presented in Appendix D.1 and are summarized in Table 2.3.

2.5.2 Shallow Bedrock

Pursuant to the approved work plan, monitoring well DGC-12B was installed adjacent to overburden monitoring wells DGC-12S and DGC-12I to assess groundwater characteristics in the shallow bedrock near the purported West Evaporation Pit. Installation of this well was performed from June 7 to 10, 1993. To construct this well, hollow-stem augers were advanced to the overburden-bedrock interface. A cement-bentonite grout was tremied into the augers which were then removed. A 5-inch ID iron casing was lowered into the borehole and tapped into place. Some, but not all, of the grout under the casing was pumped out and the remaining grout was allowed to cure for 24 hours. Bedrock drilling was then performed using a 4 1/2-inch

Table 2.2
Drilling Information for Overburden Wells

Former Powerex, Inc. Facility
Auburn, New York

Location	Current Designation	Installation Dates Started	Installation Dates Finished	Ground Elevation	Boring Depth	Elevation of Bottom
DGC-8	DGC-8S	04 Jun 93	04 Jun 93	636.9	13.9	623.0
DGC-9	DGC-9S	03 Jun 93	03 Jun 93	636.8	20.1	616.7
DGC-12	DGC-12S	03 Jun 93	03 Jun 93	637.6	10.0	627.6
	DGC-12I	07 Jun 93	07 Jun 93	637.5	17.0	620.5
DGC-13	DGC-13S	03 Jun 93	03 Jun 93	636.1	8.8	627.3
DGC-14	DGC-14S	30 Mar 94	30 Mar 94	637.8	16.0	621.8
DGC-15	DGC-15S	11 Apr 94	11 Apr 94	637.7	16.2	621.5

Notes:

1. All depths in feet below grade.
2. All elevations in feet above mean sea level.
3. Borings for wells DGC-14S and DGC-15S drilled as part of Laboratory Waste Solvent Tanks IRM.

Table 2.3
Well Construction Details for Overburden Wells

Former Powerex, Inc. Facility
Auburn, New York

						Screen Information				Sand Pack Information			
	Current	Installation Dates		Ground		Depth		Elevation		Depth		Elevation	
Location	Designation	Started	Finished	Elevation	Length	Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom
DGC-8	DGC-8S	04 Jun 93	04 Jun 93	636.9	5.0	8.7	13.7	628.2	623.2	7.0	13.9	629.9	623.0
DGC-9	DGC-9S	03 Jun 93	03 Jun 93	636.8	10.0	8.9	18.9	627.9	617.9	7.5	20.1	629.3	616.7
DGC-12	DGC-12S	03 Jun 93	03 Jun 93	637.6	5.0	5.0	10.0	632.6	627.6	4.0	10.0	633.9	627.6
	DGC-12I	07 Jun 93	07 Jun 93	637.5	5.0	12.0	17.0	625.5	620.5	10.0	17.0	627.5	620.5
DGC-13	DGC-13S	03 Jun 93	03 Jun 93	636.1	3.5	5.3	8.8	630.8	627.3	4.7	8.8	631.4	627.3
DGC-14	DGC-14S	30 Mar 94	30 Mar 94	637.8	10.0	6.0	16.0	631.8	621.8	4.0	16.0	633.8	621.8
DGC-15	DGC-15S	11 Apr 94	11 Apr 94	632.7	10.0	6.0	16.0	631.7	621.7	4.0	16.2	633.7	621.5

Notes:
1. All depths in feet below grade.
2. All lengths in feet.
3. All elevations in feet above mean sea level.
4. Wells DGC-14S and DGC-15S installed as part of Laboratory Waste Solvent Tanks IRM.

outside diameter (OD) tri-cone roller bit using an air rotary drilling method. Table 2.4 summarizes some of the drilling information. The boring log is presented in Appendix C.4.

Monitoring well DGC-12B was constructed with 2-inch ID, No. 10 slot (i.e., 0.010 inch) stainless-steel screen and stainless-steel riser pipe installed into the bedrock borehole. The base of the well was equipped with a threaded bottom plug. A 10-foot length of screen was used and was placed in a sand pack extending from 1.2-feet below to 1.8-feet above the screen. The annular space was grouted after a 2.4-feet thick bentonite pellet seal was placed on top of the sand pack. The sand pack, bentonite pellets and grout were all tremied into place. A vented cap was placed in the riser and a lockable well cover and lock were installed on the casing. Well construction details are provided in Appendix D.2 and are summarized in Table 2.5.

2.5.3 Well Development

Each newly-constructed monitoring well was developed to (a) remove fine-grained materials from the sand pack and formation, (b) reduce the turbidity of groundwater samples, and (c) increase the yield of the well to reduce the potential of the well yielding an insufficient volume of water during groundwater sampling. The monitoring wells were each developed as soon as possible, but not less than 24 hours after the completion of well installation activities. The well development procedures were as presented in the approved RI/FS Work Plan.

Well development was continued until the turbidity goal of less than or equal to 50 Nephelometric Turbidity Units (NTUs) was achieved. If this goal could not be achieved, development was continued until an amount of groundwater equivalent to 10 well volumes was removed. Field parameters, such as temperature, pH, specific conductivity, and turbidity, were measured incrementally during well development. The procedures used to obtain these measurements were as specified in the approved work plan.

Monitoring wells DGC-8S, DGC-8B, DGC-9S, DGC-12S, DGC-12I, DGC-12B and DGC-13S were developed between June 22 and 30, 1993. Replacement monitoring wells B-9SR, B-17SR and B-24SR, discussed in Section 2.10.5, were developed on February 23, 1994. Reconstructed monitoring well B-1D, discussed in Section 2.10.4, was developed on April 12 and 13, 1994. Well development information and associated field parameter measurements are presented in Appendix F.

2.6 Task 1E - In-Situ Hydraulic Conductivity Testing

Numerous in-situ hydraulic conductivity tests, also known as slug or bail tests, were performed during previous investigations to assist in the hydraulic characterization of the overburden, shallow bedrock and deep bedrock hydrologic units. These tests were also performed during the RI on the newly-installed wells. Specifically, slug tests were performed by DUNN on July 22 to 23, 1993 in overburden monitoring wells DGC-8S, DGC-9S, DGC-12S and DGC-12I, shallow bedrock monitoring well DGC-12B and shallow bedrock observation wells OW-1, OW-2, OW-3, OW-4 and OW-5. Results of the hydraulic conductivity testing are presented in Appendix G and discussed in Section 6.4.

Table 2.4
Drilling Information for Shallow Bedrock Wells
Former Powerex, Inc. Facility
Auburn, New York

Location	Current Designation	Ground Elevation	Bedrock Information		Overburden Casing Information		Bedrock Drilling Information		Bedrock Borehole Diameter	Borehole Total Depth
			Depth	Elevation	Date Installed	Depth	Date Started	Date Finished		
DGC-12	DGC-12B	637.8	16.3	621.5	07 Jun 93	17.0	08 Jun 93	08 Jun 93	4.0	31.2
DGC-14	DGC-14B	637.3	15.5	621.8	14 Jan 94	16.5	15 Jun 94	15 Jun 94	4.5	40.5
DGC-15	DGC-15B	637.8	20.5	617.3	15 Jan 94	21.5	16 Jun 94	16 Jun 94	4.5	42.0
OW-1	OW-1	637.4	14.4	623.0	08 Jun 93	14.9	09 Jun 93	15 Jun 93	4.3	34.3
OW-2	OW-2	635.8	9.0	626.8	09 Jun 93	9.6	11 Sep 93	14 Jun 93	4.3	34.3
OW-3	OW-3	637.5	15.0	622.5	08 Jun 93	16.3	09 Jun 93	15 Jun 93	4.3	34.3
OW-4	OW-4	637.5	17.0	620.5	09 Jun 93	18.0	11 Jun 93	15 Jun 93	4.3	34.3
OW-5	OW-5	637.8	19.0	618.8	08 Jun 93	19.5	09 Jun 93	16 Jun 93	4.3	34.3
PW-1	PW-1	637.3	14.0	623.3	17 Jun 93	14.1	16 Jun 93	28 Jun 93	10.0	39.0
B-9	B-9SR	636.1	18.4	617.7	14 Feb 94	18.8	15 Feb 94	18 Feb 94	4.5	37.8
B-17	B-17SR	632.7	12.4	620.3	14 Feb 94	13.4	15 Feb 94	17 Feb 94	4.3	35.3
B-24	B-24SR	631.5	15.8	615.7	15 Feb 94	16.3	16 Feb 94	21 Feb 94	4.3	32.0

Notes:

1. All depths in feet below grade.
2. All elevations in feet above mean sea level.
3. All diameters in inches.
4. Borings for wells DGC-14B and DGC-15B were performed for Laboratory Waste Solvent Tanks IRM.

Table 2.5
Well Construction Details for Shallow Bedrock Wells
Former Powerex, Inc. Facility
Auburn, New York

					Screen or Open Hole Information						Sand Pack Information			
	Current	Installation Dates		Ground			Depth		Elevation		Depth		Elevation	
Location	Designation	Started	Finished	Elevation	Length	Diameter	Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom
DGC-12	DGC-12B	07 Jun 93	10 Jun 93	637.8	10.0	2.0	20.0	30.0	617.8	607.8	18.2	31.2	619.9	606.6
DGC-14	DGC-14B	14 Jun 94	15 Jun 94	637.3	24.0	4.5	16.5	40.5	620.8	596.8	NA	NA	NA	NA
DGC-15	DGC-15B	15 Jun 94	16 Jun 94	637.8	20.5	4.5	21.5	42.0	616.3	595.8	NA	NA	NA	NA
OW-1	OW-1	08 Jun 93	15 Jun 93	637.4	19.4	3.9	14.9	34.3	622.5	603.1	NA	NA	NA	NA
OW-2	OW-2	09 Jun 93	14 Jun 93	635.8	24.7	3.9	9.6	34.3	626.2	601.5	NA	NA	NA	NA
OW-3	OW-3	08 Jun 93	15 Jun 93	637.5	18.0	3.9	16.3	34.3	621.2	603.2	NA	NA	NA	NA
OW-4	OW-4	09 Jun 93	16 Jun 93	637.5	16.3	3.9	18.0	34.3	619.5	603.2	NA	NA	NA	NA
OW-5	OW-5	08 Jun 93	16 Jun 93	637.8	14.8	3.9	19.5	34.3	618.3	603.5	NA	NA	NA	NA
PW-1	PW-1	16 Jun 93	28 Jun 93	637.3	15.0	8.0	23.5	38.5	613.8	598.8	17.5	39.0	619.8	598.3
B-9	B-9SR	15 Feb 94	18 Feb 94	636.1	19.0	3.9	18.8	37.8	617.3	598.3	NA	NA	NA	NA
B-17	B-17SR	15 Feb 94	17 Feb 94	632.7	21.9	3.9	13.4	35.3	619.3	597.4	NA	NA	NA	NA
B-24	B-24SR	16 Feb 94	21 Feb 94	631.5	15.7	3.9	16.3	32.0	615.2	599.5	NA	NA	NA	NA

Notes:
1. All depths in feet below grade.
2. All lengths in feet.
3. All diameters in inches.
4. All elevations in feet above mean sea level.
5. "NA" designates not applicable.
6. Wells DGC-14B and DGC-15B were installed for Laboratory Waste Solvent Tanks IRM.

All of the tests performed during the RI were slug tests. These tests were generally performed in the 2-inch ID wells by introducing 1 gallon of distilled water and in the 5-inch ID wells by introducing 2 1/2 gallons of distilled water. Water-level recovery was electronically recorded using an In-Situ, Inc. Hermit Model SE 1000C data logger and an associated transducer. Prior to initiating each test, the transducer was lowered into the well approximately 3 to 5 feet below the static water level and secured by clamping the cable to the protective casing. With one exception, two tests were performed in all wells. Only one test was performed on overburden well DGC-12S due to the slow rate of water-level recovery (75% recovery measured over a 14 hour period). The water-level recovery data collected during the RI are presented in Appendix G.

Interpretation of the water-level recovery data from the in-situ hydraulic conductivity tests was performed using the Hvorslev (1951) method and, as applicable, the Bouwer and Rice (1976) method. The principal behind Hvorslev's method is that water-level recovery theoretically follows an exponential decline. If normalized to the amount of the initial perturbation, the water-level recovery data will show a straight-line relationship on a semi-log plot. The horizontal hydraulic conductivity (K) can then be calculated as follows:

$$K = [r^2 \ln(L/R)]/2LT_0$$

where:

r = effective radius of "riser" in which water-level fluctuations occur;
L = well screen or sand pack length, as appropriate;
R = radius of well screen or open section; and
T_0 = Hvorslev's basic time lag.

Hvorslev's basic time lag (T_0) is the time required for complete recovery if the original rate of recovery could be maintained. It can also be considered as the time required to reduce the amount of unrecovered head at any given time after an instantaneous perturbation to 37% of its value at that time.

The computer program used to calculate horizontal hydraulic conductivity by the Hvorslev method utilizes linear regression techniques applied to normalized water-level recovery data after logarithmic transformation as follows:

$$\ln (H-h/H-H_0) = b_0 + b_1 t$$

where:

H = head at equilibrium (static) conditions;
h = head at time t;
H_0 = initially perturbed head;
b_0 = intercept of y- (time-) axis;
b_1 = slope of best-fit line; and
t = time.

This methodology results in a quantitative and objective "forcing" of a straight line to the water-level recovery data. The slope (b_1) and y-intercept (b_0) of this line can be used to find T_0 and then K. The goodness of fit can be assessed using various statistical properties [i.e., the coefficient of determination (R^2) and assessment of residuals].

Hvorslev's method assumes that the aquifer tested is homogeneous. Additionally, application of the above equations to bedrock wells assumes that sufficient joints and bedding planes intersect the intake so as to behave like a porous medium with Darcian flow conditions.

The principle behind the Bouwer and Rice (1976) method is also based on a straight-line relationship between a plot of logarithmically-transformed water-level recovery data versus time. The horizontal hydraulic conductivity (K_h) is calculated as follows:

$$K_h = [r_c^2 \ln (R_e/r_w)/(2Lt)] \ln[(H-h)/h-H_0)]$$

where:

r_c = effective radius of the well casing within which the water-level fluctuations occur;
r_w = radius of the borehole;
L = length of the well screen or sand pack, as appropriate;
t = time since initial perturbation of head in well;
h = head in well at any given time;
H_0 = head in well at time 0;
H = static elevation of the piezometric surface; and
R_e = equivalent radial distance over which the instantaneous slug ($H-H_0$), is dissipated.

The computer program used to calculate horizontal hydraulic conductivity by this method also utilizes linear regression techniques applied to the water-level recovery data after logarithmic transformation. Similar assumptions also apply.

2.7 Task 1F - Surveying

Each of the newly-installed monitoring wells were surveyed for horizontal and vertical control and were incorporated into existing site maps. Monitoring wells, and the pumping well and associated observation wells, were surveyed to the nearest 0.01 feet at the top of each well casing, if applicable, and top of protective steel casing. Ground surface at each location was surveyed to the nearest 0.1 feet.

Site benchmarks were used to establish horizontal and vertical control. They were established in reference to benchmark T35 developed by the United States Geological Survey in 1932. The published elevation of this benchmark is 631.37 feet above mean sea level (amsl). This benchmark is a standard bronze disk and the location is described as follows:

> at Auburn, Cayuga County, on the New York Central Railroad, about 0.5 miles west of the Monroe Street Station and the crossing of the Lehigh Valley Railroad,

about 0.3 mile west of milepost 27, at bridge A-26, and in the top of the northeast headwall of the north abutment.

Elevations were surveyed with a Berger NA2 self-leveling instrument and a rod graduated to 0.01 feet, held plum by means of a hand level. Locations were surveyed using electronic distance measuring (EDM) equipment (i.e., a Lietz SET4). Each location was assigned northing and easting values based on the New York State Plane Coordinate System.

Monitoring wells DGC-8S, DGC-9S, DGC-12S, DGC-12I, DGC-12B and DGC-13S were surveyed on June 30, 1993. Pumping well PW-1 and observation wells OW-1, OW-2, OW-3, OW-4 and OW-5 were also surveyed on this date. On April 25 through 28, 1994, the soil borings and overburden monitoring wells associated with the Laboratory Waste Solvent Tanks IRM were surveyed. Piezometers PZ-2 and PZ-3 and monitoring wells B-1D, B-2S, B-2D and DGC-5B, all of which were extended above-grade, were also surveyed on these dates to obtain new measuring point information. Replacement wells B-9SR, B-17SR and B-24SR were also surveyed during this period. Monitoring wells DGC-14B and DGC-15B were surveyed on June 29, 1994. Survey information obtained during the RI is provided in Table 2.6, including survey information associated with the Laboratory Waste Solvent Tanks IRM.

2.8 Task 1G - Groundwater Sampling

Groundwater samples were obtained from selected monitoring wells to confirm results collected during previous investigative activities, collect analytical results from newly-installed wells and provide a "snapshot" of current conditions. This sampling was performed by DUNN on July 12 to 21, 1993 using procedures presented in the approved RI/FS Work Plan. The completed well sampling records are included in Appendix K.1. Both the wells sampled and the analyses performed during the RI are discussed below. A summary of the analytical results is presented in Section 7.4. Information concerning groundwater sampling performed as part of the Laboratory Waste Solvent Tanks IRM is provided in Section 3.5.

2.8.1 Overburden Monitoring Wells

Groundwater samples were obtained from selected overburden monitoring wells to confirm the nature and extent of the contaminant plume in this unit. These samples were obtained on July 12 to 16, 1993 from wells B-16OV, DGC-2S, DGC-4S, DGC-8S, DGC-9S, DGC-12S, DGC-12I and DGC-13S. An insufficient amount of groundwater prevented collecting a sample at well DGC-11S. Additionally, due to breakage of a sample during transport, well DGC-2S was resampled on July 21, 1993.

The groundwater samples from wells B-16OV, DGC-2S and DGC-8S were analyzed for TCL/TAL parameters using methods defined in the DEC's ASP. Samples from wells DGC-4S, DGC-9S, DGC-12S, DGC-12I and DGC-13S were analyzed for TCL volatiles by ASP/CLP Method 91-1. Validated analytical results are presented in Appendices K.2 through K.5 and are discussed in Section 7.4. Results of other analyses are presented in Appendix K.6.

Table 2.6
Surveyed Elevations
Former Powerex, Inc. Facility
Auburn, New York

Current Designation	Ground Elevation	Steel Elevation	MP Elevation	Date Surveyed
B-1D	637.3	639.62	639.31	27 Apr 94
B-2S	643.3	645.44	645.29	27 Apr 94
B-2D	643.1	645.09	644.87	27 Apr 94
B-3D	635.5	635.99	635.84	28 Apr 94
B-9SR	636.1	637.76	637.76	28 Apr 94
B-17SR	632.7	634.14	634.14	28 Apr 94
B-24SR	631.5	633.23	633.23	28 Apr 94
DGC-1S	640.4	642.88	642.42	28 Apr 94
DGC-1B	640.5	643.24	642.40	28 Apr 94
DGC-2S	634.6	636.91	636.12	28 Apr 94
DGC-2B	634.3	635.94	635.77	28 Apr 94
DGC-3S	637.2	640.21	639.39	25 Apr 94
DGC-3B	637.2	639.88	638.80	25 Apr 94
DGC-4S	638.6	641.37	640.47	28 Apr 94
DGC-4B	638.8	641.46	640.73	28 Apr 94
DGC-5B	637.4	639.81	639.62	27 Apr 94
DGC-6B	638.9	641.73	641.18	25 Apr 94
DGC-7B	641.3	643.44	643.42	28 Apr 94
DGC-8S	636.9	638.37	638.21	30 Jun 93
DGC-8B	637.0	639.47	639.10	28 Apr 94
DGC-9S	636.8	636.79	636.15	30 Jun 93
DGC-9B	637.0	636.95	636.19	30 Jun 93
DGC-12S	637.6	639.99	639.73	30 Jun 93
DGC-12I	637.5	639.52	639.43	30 Jun 93
DGC-12B	637.8	639.29	639.01	30 Jun 93
DGC-13S	636.1	638.31	638.03	30 Jun 93
DGC-14S	637.8	640.20	639.56	27 Apr 94
DGC-14B	637.3	638.37	638.37	29 Jun 94
DGC-15S	637.7	639.61	639.33	27 Apr 94
DGC-15B	637.8	639.38	639.38	29 Jun 94
OW-1	637.4	639.14	639.14	30 Jun 93
OW-2	635.8	637.77	637.77	30 Jun 93
OW-3	637.5	638.73	638.73	30 Jun 93
OW-4	637.5	638.78	638.78	30 Jun 93
OW-5	637.8	639.32	639.32	30 Jun 93
PW-1	637.3	639.98	639.69	30 Jun 93
PZ-2	637.2	639.23	639.13	27 Apr 94
PZ-3	637.3	639.75	639.62	27 Apr 94
PZ-5	637.8	NA	639.94	09 Nov 87
PZ-6	638.0	NA	640.04	09 Nov 87

Table 2.6 (Continued)
Surveyed Elevations
Former Powerex, Inc. Facility
Auburn, New York

Current Designation	Ground Elevation	Steel Elevation	MP Elevation	Date Surveyed
TB-1-TS	637.8	NA	NA	26 Apr 94
TB-2-TS	637.6	NA	NA	26 Apr 94
TB-3-TS	637.8	NA	NA	26 Apr 94
TB-4-TS	637.7	NA	NA	26 Apr 94
TB-5-TS	637.6	NA	NA	26 Apr 94
TB-6-TS	637.7	NA	NA	26 Apr 94
TB-7-TS	637.8	NA	NA	26 Apr 94
TB-8-TS	637.9	NA	NA	26 Apr 94
TB-9-TS	637.2	NA	NA	26 Apr 94
TB-11-TS	638.1	NA	NA	26 Apr 94
TB-12-TS	637.9	NA	NA	26 Apr 94
TB-12A-TS	638.0	NA	NA	26 Apr 94
TB-1-TN (DGC-14S)	637.8	NA	NA	26 Apr 94
TB-2-TN	637.3	NA	NA	26 Apr 94
TB-3-TN	637.8	NA	NA	26 Apr 94
TB-4-TN	637.6	NA	NA	26 Apr 94
TB-5-TN	637.5	NA	NA	26 Apr 94
TB-6-TN	637.1	NA	NA	26 Apr 94
TB-7-TN	637.1	NA	NA	26 Apr 94
TB-8-TN	638.2	NA	NA	26 Apr 94
TB-9-TN	637.2	NA	NA	26 Apr 94
TB-10-TN	637.8	NA	NA	26 Apr 94

Notes:
1. "NA" designates measurement not applicable.
2. "MP" designates measuring point of monitoring well or piezometer.

Both filtered and unfiltered samples were originally collected at wells B-16OV, DGC-2S and DGC-8S for analysis of TAL metals. However, the laboratory failed to analyze the filtered samples from those wells in which TAL metals were found to occur in the unfiltered samples at concentrations greater than New York State's groundwater standards. Therefore, wells B-160V, DGC-2S and DGC-8S were resampled on September 27 to 29, 1993. The well sampling records are presented in Appendix L.1. During this resampling event, the laboratory was again instructed to analyze the filtered samples for TAL metals (a) if the results from the corresponding unfiltered samples were found to exceed New York State's groundwater standards, or (b) if the turbidity of a groundwater sample exceeded 50 NTUs. The validated analytical results from this sampling effort are presented in Appendix L.2 and are discussed in Section 7.4.

2.8.2 Shallow Bedrock Monitoring Wells

Groundwater samples were also obtained from selected wells to confirm the nature and extent of the contaminant plume in the shallow bedrock unit. These samples were obtained on July 12 to 20, 1993. The samples from wells B-2S, B-8S, B-25I, B-27S, DGC-8B and DGC-9B were analyzed for TCL/TAL parameters using methods defined in the DEC's ASP. Samples obtained from wells B-7S, B-9S, B-10I, B-13I, B-14I, B-15S, B-17I, B-19I, B-20S, B-20I, B-21I, B-23I, B-24S, B-26S, B-28S, DGC-1B, DGC-2B, DGC-3B, DGC-4B, DGC-5B, DGC-10B and DGC-12B were analyzed for TCL volatiles by ASP/CLP Method 91-1. Due to breakage of a few samples during transport to the laboratory, wells B-8S, B-15S and B-27S were resampled on July 21, 1993. Validated analytical results are presented in Appendices K.2 through K.5, and the results of other miscellaneous analyses are presented in Appendix K.6. These results are discussed in Section 7.5.

As previously discussed, due to a laboratory error, filtered and unfiltered samples were recollected from wells B-8S, B-25I, B-27S, DGC-8B and DGC-9B on September 27 to 29,1993 for analysis of TAL metals. A summary of the analytical results from this sampling effort are presented and discussed in Section 7.5. Well sampling records and validated analytical data are presented in Appendices L.1 and L.2, respectively.

2.8.3 Deep Bedrock Monitoring Wells

Groundwater samples were obtained from selected deep bedrock wells to confirm the nature and extent of contaminants in this unit. These samples were obtained on July 13 to 20, 1993 from wells B-2D, B-8D, B-9D, B-10D, B-13D, B-14D, B-15D, B-17D, B-19D, B-20D, B-21D, B-23D, B-24D, B-25D, B-26D, B-27D and B-28D. A few samples were broken during transport to the laboratory. Thus, wells B-13D, B-20D and B-26D were resampled on July 21, 1993. The samples from wells B-8D, B-13D and B-25D were analyzed for TCL/TAL parameters using methods defined in the DEC's ASP. The remaining samples were analyzed for TCL volatiles by ASP/CLP Method 91-1. Validated analytical results are presented in Appendices K.2 through K.5 and are discussed in Section 7.6. The results of other laboratory analyses are presented in Appendix K.6.

Due to a laboratory error, filtered and unfiltered samples had to be recollected from wells B-8D, B-13D and B-25D on September 27 to 29,1993. Well sampling records and validated analytical data associated with this resampling are presented in Appendix L.1 and L.2, respectively.

2.9 Task 1H - Shallow Bedrock Pumping Test(s)

Following the completion of groundwater sampling, pumping tests were performed in an effort to better characterize the shallow bedrock hydrogeologic unit and determine its response to pumping. A step-rate pumping test was first performed in the area of the North Evaporation Pit. Performance of this test required the installation of a pumping well (designated PW-1) in the shallow bedrock, and also five shallow bedrock observation wells (designated OW-1, OW-2, OW-3, OW-4, OW-5) needed to monitor water-levels during the test. The step-rate pumping test was performed near the North Evaporation Pit in order to avoid any negative impact on the existing distribution of contaminants. Groundwater samples were also obtained during the step-rate pumping test in order to assess possible changes in contaminant concentrations under pumping conditions.

Two short-term pumping tests were also conducted. One of these tests was performed using existing shallow bedrock monitoring well DGC-9B, located near the closed Waste Solvent Tank. The other test was performed in shallow bedrock monitoring well DGC-12B, installed during the RI in the general area of the purported West Evaporation Pit.

The step-rate and short-term pumping tests are described below. Based on the results of these tests, which indicate that the shallow bedrock unit has a relatively low yield, the contingent constant-rate pumping test was not performed.

2.9.1 Installation of Pumping Well

Pumping well PW-1 was installed during the RI in the vicinity of the North Evaporation Pit for the purpose of conducting pumping tests in the shallow bedrock unit. The drilling and installation of pumping well PW-1 were performed from June 16 to 28, 1993 by Kincaid Drilling Company (Kincaid) of Syracuse, New York. The well was installed about 35 feet from well DGC-8B at an azimuth of approximately 165 degrees (^{0}), as shown in Plate 1. This orientation was determined based upon an analysis of joints measured in a two-dimensional outcrop in the streambed of Crane Brook north of the site.

Initially, 6¼-inch ID hollow-stem augers were used to advance the boring through the overburden. This drilling procedure was, however, discontinued and the boring was advanced to the overburden-bedrock interface using cable tool drilling techniques. A 10-inch ID iron casing was then tapped into place and grouted into the bedrock following methods detailed in the approved RI/FS Work Plan. Once the grout had cured for at least 24 hours, bedrock drilling was performed using a 10-inch OD tri-cone roller bit using an air rotary drilling method. Information obtained from corehole CH-1 was used to guide the bedrock drilling, which continued for 25 feet. This ensured that the pumping well would be within, but not fully penetrate, the Edgecliff Member of the Onondaga Formation. A boring log is presented in Appendix C.5.

The pumping well was constructed with 8-inch ID stainless-steel well screen flush-threaded into 8-inch ID stainless-steel riser pipe. A 15-foot length of No. 20 slot (0.020 inch) screen was used. A gravel pack consisting of Morie Grade 2 sand was placed from 0.5 feet below the bottom of the screen to 5 feet above the top of the well screen. A 1 foot thick layer of Morie Grades 1 and 0 sand was then placed at the top of the sand pack to act as a "choke" before adding the bentonite seal. The pumping well was completed with a 2-foot thick bentonite pellet seal and grouted to the surface following procedures outlined in the approved RI/FS Work Plan. A lockable cover and lock were installed on the iron casing upon completion of the well. Drilling and well installation information is presented in Tables 2.4 and 2.5, respectively. Well completion details for the pumping well are presented in Appendix D.3.

2.9.2 Development of Pumping Well

In accordance with the approved work plan, pumping well PW-1 was developed to remove finer fractions in the formation and gravel pack and thus ensure the maximum efficiency of the well. This development was performed by Kincaid on June 29 and 30, 1993. Development of the pumping well was initially accomplished by mechanical surging using a surge block device, followed by pumping using a lift pump. Development continued until the pumped water was relatively clear and sand-free. Although not required by the work plan, a turbidity of less than 50 NTUs was achieved. A well development log is provided in Appendix F.4.

2.9.3 Installation of Observation Wells

Five shallow bedrock observation wells were installed to facilitate monitoring of water levels during the step-rate pumping test. The location of these wells, designated OW-1 through OW-5, are shown on Plate 1. Wells OW-1 and OW-2 were installed at distances of 15 and 100 feet from the pumping well at an azimuth of 345^0. Wells OW-3, OW-4 and OW-5 were installed at distances of 15, 35 and 100 feet from the pumping well at an azimuth of 210^0. As discussed previously, these orientations were based upon the results of bedrock joint analysis.

The observation wells were drilled and installed on June 8 to 16, 1993 by Parratt-Wolff in accordance with methods detailed in the approved RI/FS Work Plan. Hollow-stem augers were used to drill down to the top of bedrock, and a 5-inch ID iron casing was grouted into place for use as a protective casing. The grout was allowed to cure for a minimum of 24 hours. Bedrock drilling involved the use of a 4-inch OD tri-cone roller bit. The length of bedrock drilling ranged between 14.8 and 24.7 feet, with all of the bedrock drilling being confined to the Moorehouse and Nedrow Members of the Onondaga Formation. Each of the shallow bedrock observation wells were completed as open holes. A lockable well cover and lock was installed on each of the protective casings upon completion of drilling activities.

Boring logs and well completion details for the five observation wells are presented in Appendices C.6 and D.4, respectively. Drilling and well installation information are also summarized on Tables 2.4 and 2.5, respectively.

2.9.4 In-Situ Hydraulic Conductivity Testing

The observation wells installed for use during the pumping test on well PW-1 were hydraulically tested to obtain additional hydraulic conductivity estimates of the shallow bedrock unit. The testing was performed in-situ by conducting slug tests. Additional information regarding this testing is provided in Section 2.6. Test results are provided in Appendix G.3 and are discussed in Section 6.4.

2.9.5 Step-Drawdown Pumping Test of Well PW-1

As part of the RI, a step-rate pumping test was performed in pumping well PW-1. Activities associated with this test began on August 27, 1993 when a submersible pump was set in the pumping well. Pre-test monitoring of water levels then began on August 30, 1993. The step-rate pumping test was initiated on August 31, 1993. An initial pumping rate of about 1.5 gallons per minute (gpm) was used for the first step. However, after less than 50 minutes of pumping, the drawdown in the well PW-1 exceeded 10.0 feet, and the test was aborted. Pre-test monitoring continued and the testing of pumping well PW-1 was resumed on September 1, 1993. Three steps of pumping were then completed, each 120 minutes in duration, at rates of 0.5, 0.75 and 1.25 gpm.

Water levels in pumping well PW-1, observation wells OW-1 through OW-5 and monitoring well DGC-8B were measured using pressure transducers and a HERMIT Model 2000 data logger manufactured by In-Situ, Inc. Manual water-level measurements were also obtained periodically from these wells for quality control purposes. Water-level measurements were also periodically obtained from monitoring wells DGC-2S, DGC-2B, DGC-4S, DGC-4B, DGC-8S, DGC-9S, DGC-9B, and DGC-10B. These water-level data were collected from before the pumping test began, through the pumping period, to until the water levels recovered after pumping. The water-level data which were collected are presented in Appendix H.1 and are discussed in Section 6.3. Water-level data collected during the step-drawdown test on well PW-1 are presented in Appendix H.1.1. Time versus depth-to-water graphs and time versus elevation graphs are presented in Appendices H.1.2 and H.1.3, respectively. In addition, time versus drawdown graphs and time versus barometric pressure graphs produced from the step-rate pumping test are presented in Appendices H.1.4 and H.1.5, respectively.

Groundwater samples were also collected during the step-rate pumping test. Specifically, samples were obtained at the beginning of the test and at the conclusion of the second and third steps. These samples were analyzed for TCL volatiles by ASP/CLP Method 91-1 and methanol. The final sample was also analyzed for total organic carbon and a number of inorganic parameters. Sample collection procedures were outlined in the approved RI/FS Work Plan. Results of these analyses are presented in Appendix N.

2.9.6 Short-Term Pumping Tests of Wells DGC-9B and DGC-12B

Although not required by the work plan, short-term pumping tests were also performed on monitoring wells DGC-9B and DGC-12B to assess the response of the shallow bedrock unit in the vicinity of the closed Waste Solvent Tank and purported West Evaporation Pit, respectively.

An initial water-level measurement was obtained at each of these wells. A submersible pump was then used to remove groundwater from monitoring well DGC-9B. The pumping rate was then adjusted, the objective being to match the pumping rate to the recovery rate of the well. Recovery of well DGC-9B was very slow, and the pump had to be throttled down to 0.07 gpm. Even this low rate could not be maintained, and pumping was discontinued after approximately 14 minutes. Two additional pumping periods of 3.5 minutes and 6.0 minutes were also performed. During this short-term pumping test, manual water-level measurements were collected at monitoring well DGC-9B. Some water-level measurements were also obtained from nearby overburden monitoring well DGC-9S.

In a similar fashion, a short-term pump test was also performed on shallow bedrock monitoring well DGC-12B. This test lasted 68 minutes, and a constant pumping rate of approximately 1.2 gpm was maintained for about 62 minutes. During this test, water-level measurements were obtained at well DGC-12B. Water-level measurements were also collected at wells DGC-12S and DGC-12I during the test to determine if there was any influence on these nearby overburden monitoring wells.

Data collected during the short-term pumping tests are presented in Appendices H.2 and H.3. The results are discussed in Section 6.3.

2.10 Task 1I - Monitoring Well Abandonment

Pursuant to the approved RI/FS Work Plan, recommendations were formulated for the abandonment, reconstruction and/or replacement of selected existing monitoring wells. These recommendations were presented to the DEC in a January 5, 1994 letter and were based upon a review of well construction details and the results of the monitoring network inspection, water-level measurements and groundwater analyses. Comments were received from the DEC and the recommendations were revised accordingly and resubmitted in a January 21, 1994 letter. After approval by the DEC on January 25, 1994, the recommendations were implemented. Both the revised recommendations and the DEC's approval letter are included in Appendix E.1.

The well abandonment activities included the permanent abandonment of four open bedrock boreholes, 10 open annular spaces and five other monitoring well pairs. These activities also included the reconstruction of one well, the installation of three replacement wells and miscellaneous maintenance of the monitoring well network. These activities are discussed below.

2.10.1 Abandonment of Open Bedrock Boreholes

Previous investigations at the site resulted in the installation of several monitoring wells consisting of open bedrock boreholes. On January 27 to February 15, 1994, Parratt-Wolff, under the supervision of DUNN personnel, permanently abandoned wells B-2I, B-3I, B-12S and B-12D. Revised well construction details are provided in Appendix E.2.1.

Monitoring wells B-2I, B-3I, B-12S and B-12D were each abandoned by pumping a cement-bentonite grout directly to the bottom of the open bedrock borehole using a tremie pipe.

The grout material consisted of Type 1 Portland cement mixed with powdered bentonite, prepared using 6 to 7 gallons of water and 3.5 to 4.0 pounds of powdered bentonite for each 94-pound bag of cement. The grout was introduced until the borehole was filled to within 5 feet from the ground surface. The tremie pipe was then removed and grout was added if the level of grout dropped significantly. After the grout cured for a minimum of 24 hours, the overburden casing was cut off at a depth of 3 to 5 feet below grade and removed. The hole was then backfilled with clean fill, with "Caution" tape being placed approximately 12 inches below the ground surface.

2.10.2 Abandonment of Open Annular Spaces

There are numerous locations where two monitoring wells were installed within a single bedrock borehole during the Phase IV investigation. At each location, a deep bedrock well was constructed using well screen material placed in a sand pack with an overlying bentonite pellet seal. A layer of sand was then placed on the seal to minimize swelling and reduce turbidity. The annular space above the seal and sand layer was then left open to monitor the shallow bedrock.

Under the supervision of DUNN personnel, Parratt-Wolff permanently abandoned the open annular spaces for wells B-4I, B-5I, B-8I, B-13I, B-17I, B-18I, B-19I, B-21I, B-22S, and B-23I. These wells were abandoned by filling the open annular spaces to the ground surface with a cement-bentonite grout mixture prepared as described above. A tremie pipe was used to place the grout into the bottom of each well. The tremie pipe was then removed, and grout was added if the level of grout within the annular space was observed to drop significantly. Revised well completion details are provided in Appendix E.2.2. Wells B-10I, B-16S, B-20S and B-25I are the only open annular spaces which remained at the conclusion of the well abandonment activities.

2.10.3 Abandonment of Other Wells

Monitoring wells B-9S, B-9I, B-11I, B-11D, B-14I, B-14D, B-24S, B-24I, CH-1I and CH-1D were also abandoned. The shallower well at each of these locations was an open annular space, while the deeper one was a screened well placed within the same borehole. At each of these locations an attempt was made to remove the deeper screened well from the borehole by pulling on it using the hydraulics of the drill rig. This procedure was successful at only one location (i.e., well location B-14). Regardless, boreholes were then overdrilled to ream out any remaining well construction materials. Overdrilling was performed using either a 4-inch or 4 1/2-inch OD tri-cone roller bit utilizing a wash rotary drilling method. The reamed out boreholes were then permanently abandoned by pumping a cement-bentonite grout, prepared as described previously, directly to the bottom of the open borehole using a tremie pipe. The grout was introduced until the borehole was filled to within 5 feet from the ground surface. The tremie pipe was then removed and grout was added if the level of grout dropped significantly. After the grout cured for a minimum of 24 hours, the overburden casing was cut off at a depth of 3 to 5 feet below grade and removed. The hole was then backfilled with clean fill, with "Caution" tape being placed approximately 12 inches below the ground surface. Revised well construction details for monitoring wells CH-1I, CH-1D, B-9S, B-9I, B-11I, B-11D, B-14I, B-14D, B-24S and B-24I are presented in Appendix E.2.3.

2.10.4 Reconstruction of Monitoring Wells

The approved well abandonment plan included the permanent abandonment of monitoring wells B-1I and B-1D, which had been installed in a single bedrock borehole. This plan also included the permanent abandonment of monitoring well CH-1I, consisting of an open annular space, with the deeper screened well (i.e., well CH-1D) being retained in the monitoring well network. However, the annular space of well CH-1I was too tight to allow for proper grouting. Therefore, with DEC's approval, wells CH-1I and CH-1D were both permanently abandoned and monitoring well B-1D was reconstructed rather than being permanently abandoned.

To reconstruct well B-1D, the well screen and riser were first removed from the borehole by pulling on the riser using the hydraulics of the drill rig. The remaining well construction materials were then reamed out by overdrilling the borehole with a 4-inch OD tri-cone roller bit using a wash rotary drilling method. Monitoring well B-1D was then reconstructed by installing a 2-inch ID PVC well screen and riser pipe into the reamed-out borehole. A 30-foot section of Grade 10 slot (i.e., 0.010-inch) well screen was used. A sand pack consisting of Morie Grade 0 sand was also placed and extended from 6.1 feet below to 3.3 feet above the well screen. A 7.8 feet thick bentonite pellet seal was placed on top of the sand pack and the annular space was then grouted using a cement-bentonite mixture prepared as described previously. This grout was emplaced from the bottom of the annular space using a tremie pipe. After removal of the tremie pipe, the annular space was topped off with grout. The well was then capped and locked, allowing the grout to cure. A revised construction detail for well B-1D, including the abandonment of well B-1I, is provided in Appendix E.3.

Monitoring well B-1D was developed on April 12 and 13, 1994 in accordance with the procedures detailed in the approved RI/FS Work Plan. Additional information is provided on the well development log in Appendix F.3.

2.10.5 Replacement of Selected Monitoring Wells

The approved well abandonment plan also included the replacement of monitoring wells open only within the shallow bedrock hydrogeologic unit at locations B-9, B-17 and B-24. Drilling and well installation procedures were followed in accordance with the approved RI/FS Work Plan. These activities are briefly described below.

The replacement monitoring wells (i.e., B-9SR, B-17SR and B-24SR) were constructed as open holes. To construct each new replacement well, 4 1/4-inch ID hollow-stem augers were advanced to the overburden-bedrock interface which was determined by prolonged grinding of the augers. A cement-bentonite grout was tremied into the augers which were then removed leaving an approximately 8 1/4-inch OD borehole, within which a 5-inch ID iron casing was lowered to the top of bedrock and, as necessary, tapped into place with a mallet or light weight. This casing became the protective casing once each well was completed, and was fitted with a locking cap. Some, but not all, of the grout inside the casing was pumped out and the remaining grout in the annulus and at the base of the casing was allowed to cure for 24 hours. Bedrock drilling was performed using a 3 7/8-inch OD tri-cone roller bit using the air rotary method. Bedrock drilling at each location extended through the Moorehouse and Nedrow Members of the

Onondaga Formation and into, but not fully penetrating, the Edgecliff Member of the Onondaga Formation.

Boring logs and well completion details for the shallow bedrock replacement monitoring wells B-9SR, B-17SR and B-24SR are presented in Appendices C.4 and D.2, respectively. Drilling and well installation information are also summarized on Tables 2.4 and 2.5. Well development information and associated field parameter measurements are presented in Appendix F.2.

2.10.6 Miscellaneous Maintenance of Monitoring Well Network

Miscellaneous maintenance of the monitoring well network, and completion of some well abandonment activities, was performed on April 27 and 28, 1994. Damaged well caps were replaced at wells B-9D, B-13D and B-24D. Damaged cement collars were repaired at wells DGC-1S, DGC-1B, DGC-3B and DGC-7B. Extensions were also added to some of the flush-mounted monitoring wells located in the lawn in front of the plant building and eastern parking lot. In accordance with the approved well abandonment plan, the protective casings of monitoring wells B-1D, B-2S, B-2D and DGC-5B and piezometers PZ-2 and PZ-3 were extended upward. The revised well construction details for most of these wells are provided in Appendix E.4. However, the revised well construction detail for well B-1D is provided in Appendix E.3. Other remaining well abandonment activities were also completed on April 27 and 28, 1994. These included topping off grout, as needed, below-grade removal of some protective casings, and backfilling of these areas with clean fill.

2.11 Task 1J - Resampling of Selected Deep Bedrock Monitoring Wells

Based on validated analytical results, VOCs associated with the site were detected above New York State's groundwater standards in five of the 17 deep bedrock monitoring wells which were sampled during the RI. Pursuant to the approved work plan, these five wells were resampled. Samples were obtained on June 13 and 14, 1994 from deep bedrock monitoring wells B-8D, B-9D, B-20D, B-24D and B-26D and were analyzed for VOCs by EPA Method 8010 with ASP Category B deliverables. The well sampling records are presented in Appendix M.1. Validated analytical results are presented in Appendix M.2 and are discussed in Section 7.6.

Although not required by the RI/FS Work Plan, several shallow bedrock monitoring wells were also sampled in conjunction with the resampling of selected deep bedrock wells. Groundwater samples were obtained from wells B-8S, B-20S, B-20I and B-26S. Samples were also obtained from replacement wells B-9SR, B-17SR and B-24SR. The well sampling records are presented in Appendix M.1. All of these samples were analyzed for VOCs by EPA Method 8010 with ASP Category B deliverables, and the validated analytical results are presented in Appendix M.2.

2.12 Task 1L - Biodegradation Study

There is evidence that the VOCs at the site are being biodegraded. The presence of biotransformation-products, such as cis-1,2-DCE and vinyl chloride, is strong evidence that TCE is being anaerobically biodegraded. The detection of methane in groundwater samples and the headspace of monitoring wells during previous investigations, if biologically produced, is also evidence that methanogenic bacteria are present. Anaerobic biodegradation of chlorinated VOCs to non-toxic ethene and ethane can be accomplished by methanogenic (methane-producing) bacteria that are growing on other usable growth substrates such as methanol (Freedman and Gossett, 1989; Major et al., 1991, deBruin et al., 1992). The available analytical results suggested that subsurface conditions at the site might be fostering the complete dechlorination or mineralization of the VOCs and that various microbial activities might be influencing the subsurface areal extent of VOCs and their breakdown products.

As part of the RI, a biodegradation study was performed by Beak Consultants, Ltd. (Beak) of Guelph, Ontario, Canada to evaluate the microbial processes occurring within the shallow bedrock hydrologic unit. As detailed in the work plan, the objectives of this study were to (a) determine whether and where biodegradation of the VOCs is occurring at the site and determine whether the process is proceeding to completion (i.e., to non-toxic end-products) and whether biodegradation could play a role in the overall remedial program for the site and (b) determine how the microbial biomass, composition and activity at the site are responding to the presence of the VOCs.

The above objectives were accomplished through the collection of subsurface soil and groundwater samples for analyses of selected geochemical and microbiological parameters. The subsurface soil samples were obtained on June 2, 1993 from borings performed at well clusters DGC-2, DGC-4, DGC-11, DGC-12 and B-16. Although Beak collected the actual samples, these borings were performed by Parratt-Wolff under the supervision of DUNN personnel. The soil boring logs are included in Appendix C.2.

The groundwater samples collected for the biodegradation study by Beak were obtained on July 12 to 21, 1993, in conjunction with DUNN's sampling activities, which are discussed in Section 2.8. Samples were obtained from 20 monitoring wells, including two overburden wells (i.e., B-16OV and DGC-2S), 13 shallow bedrock wells (B-2S, B-7S, B-8S, B-15S, B-27S, B-28S, DGC-1B, DGC-2B, DGC-3B, DGC-4B, DGC-5B, DGC-8B and DGC-10B) and five deep bedrock wells (B-9D, B-13D, B-20D, B-25D and B-26D). Well sampling records are provided in Appendix K.1. Well DGC-11S was also to be sampled but was dry during the period when groundwater samples were being collected.

The subsurface soil samples were analyzed for phospholipid fatty acids (PLFAs) to determine the mass, composition and nutritional status of the microbial populations within the samples. The groundwater samples were also analyzed for PLFAs, and were also analyzed for unique geochemical parameters such as volatile fatty acids (i.e., acetic acid), one-carbon to four-carbon gases (i.e., methane, ethane and ethene), oxygenates (i.e., methanol and acetone) and methane isotopes to provide an understanding of which microorganisms are active at the site.

A complete description of the sampling and analytical methods used for the biodegradation study is presented in a separate report prepared by Beak. This report also presents the results of the biodegradation study, which demonstrates that (a) an active and diverse anaerobic microbial community, consisting of sulfate-reducing, methanogenic and acetogenic bacteria, has been established at the site as being maintained by acetone and methanol and (b) the anaerobic microbial community is affecting the distribution and migration of TCE, its biodegradation products and other parameters at the site.

2.13 Task 1M - Data Validation

Validation of the TCL/TAL analytical results and the EPA Method 8010 analytical data was performed in accordance with EPA Region II validation guidelines, modified as appropriate for the DEC's ASP. This validation was performed by DUNN personnel meeting the qualifications of the DEC for data validators.

The data validation included review and evaluation of all laboratory deliverables. The basic review covered sample request forms, chain-of-custody forms, methodology summaries, laboratory chronicles, and items listed below:

Volatile and Semi-Volatile Organics

- Deliverable requirements
- Case narrative
- Holding times
- Surrogate recoveries and summary
- Method blank summary and data
- Gas chromatograph/mass spectrometry (GC/MS) tuning and mass calibration
- Organic analysis data sheets (Form 1)
- Quantitation reports
- Mass spectral data
- Mass spectral library search for tentatively identified compounds (TICs)
- Initial calibration data
- Continuing calibration data
- Internal standard areas and retention times

Pesticides/PCBs

- Case narrative
- Deliverable requirements
- Holding times and sample preparation
- Surrogate recoveries and summary (Form 2)
- Matrix spike blank/matrix spike/matrix spike duplicate recoveries and summary (Form 3)
- Instrument and method blanks and summary (Form 4C)
- Pesticide initial calibration
- Pesticide analyte resolution check summary (Form 6G) and data
- Pesticide calibration verification summaries (Form 7D and 7E) and data
- Pesticide analytical sequence (Form 8D) and data
- Pesticide clean-up procedure QA/QC (Forms 9A and 9B)
- Pesticide identification and summaries of single and multi-component analytes (Forms 10A and 10B) and data
- Pesticide analysis data sheet (Form 1D) and data

Inorganics (Metals/Cyanide)

- Case narrative
- Deliverable requirements
- Holding times and sample preparation
- Instrumentation calibrations
- Inductively coupled plasma (ICP) interference check samples
- Matrix spike recoveries
- Duplicate sample analyses
- Laboratory control samples
- ICP serial dilution data
- Furnace atomic absorption (AA) QC
- Contract required detection limit (CRDL) standard for AA and ICP
- Method of standard additions (MSA)

For samples analyzed following EPA Method 8010, the laboratory was required to provide ASP Category B deliverables to enable proper data validation, including site-specific matrix spike and matrix spike duplicate samples. For other analyses which were performed (i.e., methanol, miscellaneous inorganics), formal data validation was not performed.

2.14 Decontamination Procedures

Decontamination procedures were conducted in accordance with the approved RI/FS Work Plan in order to minimize the potential for compromising data validity by reducing the possibility of cross-contamination. Non-disposable equipment used during the investigative activities was decontaminated prior to and after the investigative activities. Disposable sampling equipment was containerized after use for subsequent treatment and/or disposal off-site. More detailed equipment decontamination procedures implemented as part of this work are presented in the work plan.

The drilling program also included decontamination procedures to ensure that possible contaminants were not introduced or transferred across the site. A decontamination pad was constructed near the garage near the northeast corner of the plant building. Prior to drilling the first boring, the equipment used in drilling and well installation was cleaned to remove possible contaminants. The cleaning process involved the use of a high-pressure stream cleaner. Potable water from the City of Auburn's public water supply was used for decontamination of all equipment. All equipment which came in contact with the soil, as well as water tanks, drill tools, iron casings, pumps and hoses, underwent the initial cleaning procedures. All screen, riser pipe, top caps and bottom plugs were also decontaminated and sealed in plastic before beginning drilling at the first location. While working at the site, the drilling equipment was also decontaminated between locations to prevent cross-contamination. Finally, the drill rig, drilling tools and equipment were decontaminated before leaving the site at the completion of the drilling and well installation activities.

2.15 Handling of Investigation - Derived Wastes

Wastes resulting from the above investigative activities were handled in accordance with the approved RI/FS Work Plan. Solids which settled out of the groundwater produced during the drilling, development and sampling of monitoring wells were containerized. Personal protective equipment (PPE) and other associated debris (i.e., disposable sampling equipment) were managed separately but in a similar manner. Decontamination fluids were also containerized. Drill cuttings from the soil borings and monitoring wells were spread on the ground surface and covered by a minimum of 6 inches of clean fill. In accordance with the approved RI/FS Work Plan, groundwater produced during the development and sampling of the overburden wells was discharged onto the ground surface and allowed to infiltrate. However, at several well locations, groundwater was containerized in 55-gallon drums due to the potential of run-off to surface water. Groundwater produced during the development, pumping and sampling of the shallow and deep bedrock wells was containerized. All of the containerized aqueous wastes resulting from the investigative activities performed during the RI have been transported off-site for treatment and/or disposal at a permitted facility. The containerized non-aqueous wastes are temporarily stored in the garage at the site and, in accordance with the work plan, will be transported off-site for proper treatment and/or disposal at the conclusion of field activities.

3.0 INVESTIGATIVE ACTIVITIES ASSOCIATED WITH THE LABORATORY WASTE SOLVENT TANKS IRM

3.1 General

The two underground Laboratory Waste Solvent Tanks located on the east side of the plant building were removed as part of an IRM in February 1994. This IRM was performed by OBG Technical Services, Inc. under the oversight of DUNN. In addition to the tanks, the tank contents and associated piping were also removed. The Laboratory Waste Solvent Tanks IRM is documented in a separate Certification Report.

During removal of the two Laboratory Waste Solvent Tanks, soil samples were obtained from the floor and walls of the excavations and from the stockpiled soils. Analytical results indicated that VOCs, notably TCE, 1,2-DCE and vinyl chloride, were present in the subsurface soils in the immediate vicinity of the tanks at concentrations which triggered the contingent investigative tasks which were included in the Laboratory Waste Solvent Tanks IRM Work Plan. Thus, in accordance with the work plan, the stockpiled soils were returned to the excavations and the investigative work was performed.

The contingent investigative tasks included in the approved Laboratory Waste Solvent Tanks IRM Work Plan were performed to determine the nature and extent of contamination resulting from past practices at the two tanks. The activities which were performed included the following:

- Installation of a total of 22 soil borings;
- Field screening of over 200 subsurface soil samples using a headspace method with two portable GCs;
- Laboratory analyses of 44 subsurface soil samples for confirmational purposes;
- Installation of an overburden and shallow bedrock monitoring well in the immediate vicinity of each of the two Laboratory Waste Solvent Tanks; and
- Collection of groundwater samples on two occasions from the newly-installed monitoring wells for laboratory analysis.

These and other activities are described below.

3.2 Task 4A - Soil Borings

3.2.1 Drilling Program

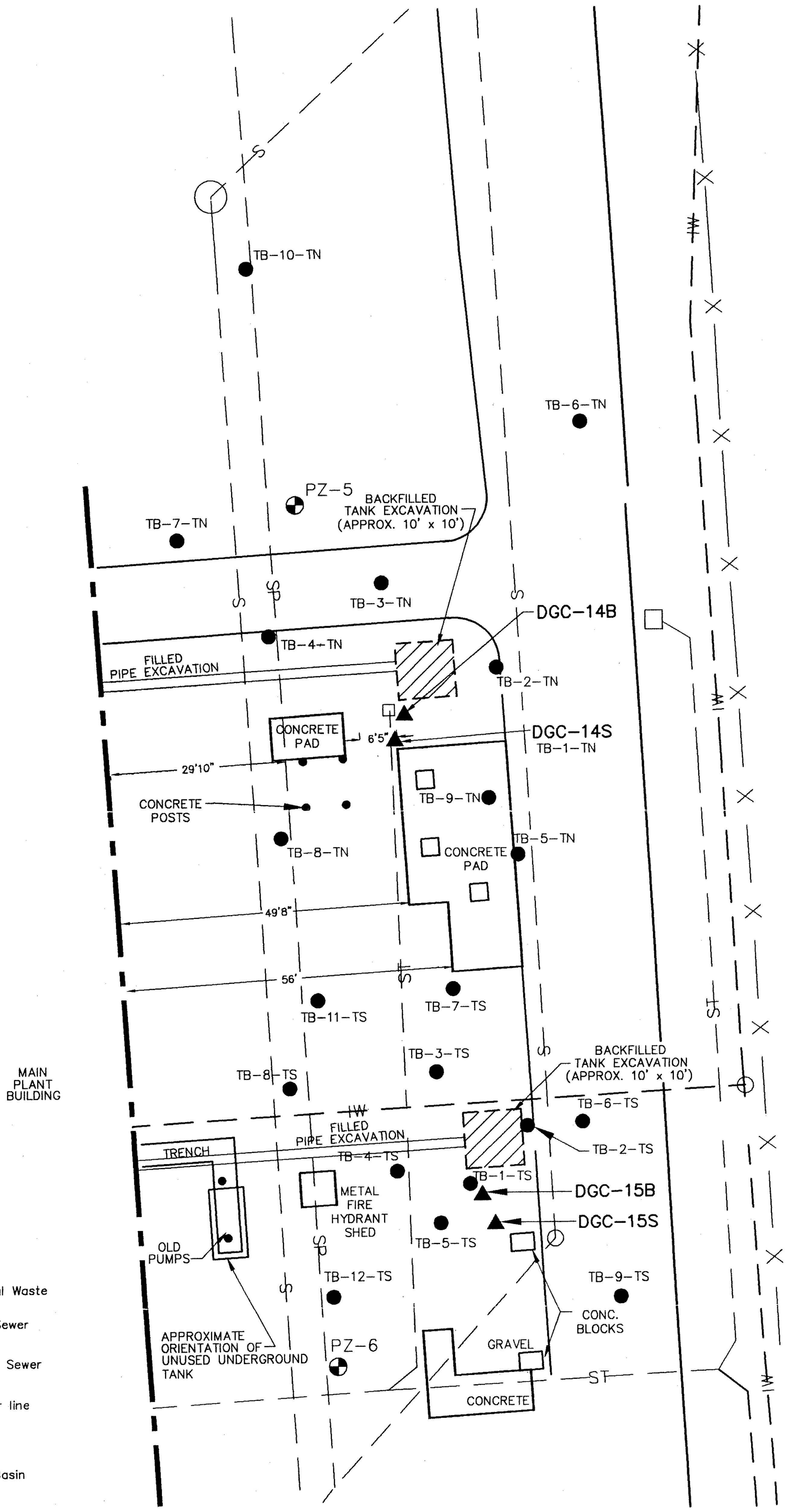
The drilling program at the Laboratory Waste Solvent Tanks consisted of a total of 22 soil borings, as shown on Figure 3.1. At each boring, split-spoon samples were collected on a continuous basis. All borings were advanced to bedrock. Soil samples were obtained in advance of the hollow-stem augers utilizing a split-spoon sampler according to ASTM Method D-1586 using the procedures presented in the approved Laboratory Waste Solvent Tanks IRM Work Plan. Each soil sample was described by the supervising geologist using the Modified Burmister and Unified Soil Classification Systems. Boring logs describing the subsurface materials encountered in each boring were prepared and are provided in Appendix C.7.

Portions of each split-spoon sample were jarred for headspace analysis using portable GCs calibrated for specific VOCs. Section 3.2.2 presents a detailed discussion of the methods used to conduct the portable GC analyses. A total of over 200 analyses were performed with the portable GCs during the soil boring program. The results are presented in Appendix O and are discussed in Section 7.3.

To confirm the results obtained using the portable GCs, two or three soil samples from each boring were sent to a laboratory for analysis of VOCs by ASP/CLP Method 91-1. A total of 44 soil samples were submitted for laboratory analysis. The soil sampling protocols and other related procedures in the approved work plan were followed. The samples which were submitted to the laboratory were selected based on the portable GC results but were typically samples with the highest headspace response and/or the last split-spoon sample collected prior to encountering bedrock. For quality control purposes, and as sample volumes permitted, blind duplicate samples were obtained at a frequency of at least 5%. Trip blanks were also utilized at a frequency of no less than one in 20. The validated analytical results are presented in Appendix P and are discussed in Section 7.3.

The Laboratory Waste Solvent Tanks IRM Work Plan outlined the rationale for locating the soil borings to be performed. Generally, soil borings were to be performed in a radial pattern outward from each tank until the presence of total chlorinated VOCs was estimated to be less then 1 mg/kg using results from the portable GCs. The general scheme presented in the work plan was followed as closely as possible. However, snow piles, underground and overhead utilities and soil stockpiles prevented locating all of the borings at the planned azimuths and/or radial distances precisely.

The first four soil borings performed at the northern tank were installed at a radial distance of about 20 feet (i.e., borings TB-1-TN through TB-4-TN). All four borings were estimated to contain total chlorinated VOCs in excess of 1 mg/kg. Therefore, a second ring of soil borings was drilled (i.e., borings TB-5-TN through TB-8-TN), this being at a radial distance of about 40 feet and at azimuths 45° skewed. Of these, only boring TB-7-TN indicated greater than 1 mg/kg total chlorinated VOCs. This soil boring was located northwest of the northern tank (see Figure 3.1). Pursuant to the work plan, the next ring of borings was to be drilled at a radial distance of 70 feet, again at azimuths skewed by 45°. One boring would have been located inside the main plant building and, therefore, was not completed. The other boring, TB-10-TN, was drilled north of the northern Laboratory Waste Solvent Tank and was estimated to have less than 1 mg/kg total chlorinated VOCs. Soil borings were not performed south and east of the tank at a radial distance of 70 feet because the soil samples collected from borings TB-5-TN, TB-6-TN and TB-8-TN were estimated to have less than 1 mg/kg total chlorinated VOCs. However, an additional soil boring, TB-9-TN, was drilled along the same azimuth as TB-5-TN but was 10 feet closer to



LEGEND

IW — —	Industrial Waste Sewer
ST — —	Storm Sewer
S — —	Sanitary Sewer
SP — —	Sprinkler line
X———X	Fence
☐	Catch Basin
○	Manhole
⊕ PZ-5	Piezometer
●	Completed Test Boring
▲	Monitoring Wells

DUNN ENGINEERING COMPANY

DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

LABORATORY WASTE SOLVENT TANK
BORING PROGRAM

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

PROJECT No. 35126.017 | DATE 6/2/94 | DWG. No. B8784_26 | SCALE 1"=20' | FIGURE No. 3.1

the northern tank. Results from this boring also showed less than 1 mg/kg total chlorinated VOCs.

At the southern tank, an initial ring of four soil borings was drilled at a radial distance of only about 10 feet from the excavation (i.e., borings TB-1-TS through TB-4-TS). All four of these borings were estimated to exceed 1 mg/kg total chlorinated VOCs. Therefore, a second ring of borings was performed at a radial distance of about 20 feet (i.e., borings TB-5-TS through TB-8-TS). Total chlorinated VOCs in borings TB-5-TS and TB-8-TS were estimated to exceed 1 mg/kg. These borings were located south and west of the southern tank, respectively. Borings TB-6-TS and TB-7-TS to the east and north of the tank, respectively, were estimated to have less than 1 mg/kg total chlorinated VOCs. A partial ring of soil borings was then initiated at a radial distance of about 40 feet from the excavation (i.e., borings TB-9-TS, TB-11-TS and TB-12-TS). All soil samples obtained from these borings were estimated to have less than 1 mg/kg total chlorinated VOCs. The soil boring to be designated as TB-10-TS was not performed because the soil samples collected from borings TB-6-TS and TB-7-TS were estimated to have less than 1 mg/kg total chlorinated VOCs.

3.2.2 Field Screening of Subsurface Soil Samples

Two Photovac Model 10S70 portable GCs were used to screen the subsurface soil samples generated during the drilling program. The portable GCs were each equipped with a PID and an on-board computer.

A portable GC generates quantitative data specific to each compound by analyzing gaseous samples injected into the instrument. The samples flow through a chromatographic column prior to reaching the PID and the travel time through this column to the detector is different for the various VOCs. A strip chart record of detector response versus time from sample injection is obtained during each analysis. The presence of VOCs in the sample is manifested as peaks on the strip chart record.

Two parameters were automatically measured for each peak observed during an analysis. The first parameter was the elapsed time from sample injection to the occurrence of the peak, otherwise known as the retention time. Each VOC has a characteristic retention time by which it can be tentatively identified. The second parameter was the area under the peak, which is integrated automatically by the on-board computer. This area is proportional to the concentration of the VOC in the sample. The actual concentration can be calculated by direct comparison with a standard of known concentration.

Prior to the start of field activities, the two portable GCs were calibrated to recognize the characteristic retention times of several site-specific VOCs and convert the peak areas into concentrations for those compounds. The site-specific VOCs used for this project were trans-1,2-DCE, cis-1,2-DCE, benzene, TCE, toluene, PCE, ethylbenzene, m- and p-xylenes (coeluting isomers) and o-xylene. Calibration standards were analyzed at the beginning of each day and at a minimum frequency of one per five samples during each day.

Stock and working standards were prepared. Pure product of each target compound was added using a 10 microliter (ul) syringe to a previously-tared 10-milliliter (ml) volumetric flask half filled with reagent-grade methanol. Care was taken to insure that the compound was added directly into the methanol and not on the sides of the volumetric flask. The exact weight of the compound added was recorded to the nearest 0.1 milligrams (mg). Each compound was added to the same tared volumetric flask in a similar fashion at the appropriate ratios and diluted to the 10-ml mark with reagent-grade methanol to yield a stock standard mix. A 10-ul aliquot of the stock standard mix was then withdrawn using a dedicated 10-ul syringe, introduced into a second 10-ml volumetric flask half filled with reagent-grade methanol and diluted to the 10-ml mark with additional reagent-grade methanol to yield a working standard mix. Refer to Appendix O for standard preparation logs.

Calibration standards were prepared by injecting a 100-ul aliquot of the working standard mix into a 40-ml glass vial containing 10 grams (g) of clean sand and 20 ml of deionized water. The clean sand was demonstrated to be free of VOCs. The vial was then shaken for one minute and allowed to stand for five minutes in a sand bath heated to 50 degrees Celsius (°C). Using a gas-tight syringe, 250 ul of headspace was drawn off the calibration standard and injected into the portable GC for analysis.

Sample preparation was conducted in a similar manner. Approximately 10 g of soil sample was added to a previously-tared 40-ml glass vial and the weight recorded. The vial was capped to prevent loss of VOCs immediately after 20 ml of deionized water was added. The sample was then shaken for one minute and allowed to stand in the heated sand bath for 10 minutes. [It was determined after the first day of analysis that, due to the low temperature of the subsurface soil samples, 10 minutes, instead of five minutes, of heating was required to reach 50°C.] A 250-ul aliquot of headspace vapor was then withdrawn with a gas-tight syringe and injected into the portable GC for analysis. If the sample concentration exceeded the linear range of the detector, a smaller amount of soil was weighed and analyzed in a similar manner and the sample concentrations were then multiplied by the appropriate factor to account for dilution. In this case, all sample concentrations were obtained from the original undiluted analysis except the individual compound(s) that exceeded the linear range of the detector.

VOCs present in a sample were identified and quantified using the proceeding standard, with the concentration in ug/kg calculated in accordance with the following equation:

$$\text{Sample Conc} = \text{MI} \times \text{SA} \times 1000 / \text{STA} \times \text{SW}$$

where:

MI = mass of standard injected (ug);
SA = sample analyte peak area [millivolt-seconds (mv-s)];
1000 = conversion factor from g to kg;
STA = standard analyte peak area (mv-s); and
SW = sample wet weight (g).

The field screening results are presented in Appendix O and are summarized in tabular form in Section 7.3. Any sample concentrations reported at less than the detection limit of 50 ug/kg should be considered as estimated.

As a quality control measure, instrument blanks were analyzed at least daily to demonstrate that the instrument and injection syringe were free of contaminants. Method blanks were prepared and analyzed to verify that the distilled water, reagent-grade methanol, sand bath, associated glassware and syringes were also free of contaminants. Method blanks were prepared and analyzed in a manner identical to the standards, except for the reagent-grade methanol which was substituted for the amount of working standard added.

Samples were analyzed in duplicate at a minimum frequency of one for every 20 samples to demonstrate acceptable analytical precision. Sample and duplicate concentrations are presented in Appendix O. In general, samples exhibited acceptable analytical precision for field screening. For the instances where they did not, it is believed to be due to the heterogeneity and/or low permeability of the subsurface soil samples.

Forty-four (44) subsurface soil samples were also sent to Recra for laboratory analysis of VOCs by ASP/CLP Method 91-1. The portable GC data did correlate well with the laboratory data. The portable GCs positively identified the presence of target compounds that exhibited concentrations greater then the detection limit of 50 ug/kg. No false negative or false positive results were reported for target compounds that exceeded 50 ug/kg. The portable GC data did not exhibit a high or low bias when compared to the laboratory data.

3.3 Task 4B - Monitoring Wells

Pursuant to the approved work plan, two overburden monitoring wells were installed in the immediate vicinity of the Laboratory Waste Solvent Tanks from March 30 to April 11, 1994 to determine the nature of any groundwater contamination. Well DGC-14S was constructed next to the northern tank, while well DGC-15S was constructed next to the southern tank. These wells were installed by Parratt-Wolff under the observation of DUNN.

To install the two overburden monitoring wells, soil borings were advanced to bedrock using 4-1/4 inch ID hollow-stem augers. Soil samples were obtained in advance of the augers utilizing a split-spoon sampler according to ASTM Method D-1586 and other procedures presented in the approved Laboratory Waste Solvent Tanks IRM Work Plan. The soil samples were described by a qualified on-site geologist using the Modified Burmister and Unified Soil Classification Systems. Boring logs describing the subsurface materials encountered in the two borings are presented in Appendix C.7.2.

The two overburden wells were constructed immediately following drilling and were installed through the hollow-stem augers. Each was constructed of 2-inch ID riser pipe flush-threaded into slotted well screen of the same diameter. A 10-foot length of No. 10 slot (i.e., 0.010 inch) screen was used for each well. A threaded bottom plug was installed in the bottom of each well, and the tops of the wells were equipped with vented non-threaded caps. The well construction materials were all stainless steel.

Sand was manually introduced inside the augers in a gradual manner to fill the annular space between the screen and borehole wall. The sand pack consisted of a clean graded silica sand with grain size distribution matched to the slot-size of the screen (i.e., Morie Grade 0 or equivalent). Sand was placed from the bottom of the boring to approximately 2 feet above the top of the screen. During placement of the sand pack, the augers were withdrawn incrementally so that the formation materials did not collapse against the screen and/or riser pipe.

Bentonite pellets were manually placed above the sand pack to form a seal at least 2 feet thick. A lockable, protective steel casing was installed over the riser pipe and cemented into place. Tables 2.2 and 2.3 present the drilling and well installation information for the overburden wells. Well construction details are presented in Appendix D.5.1.

Two shallow bedrock monitoring wells were also installed in the immediate vicinity of the Laboratory Waste Solvent Tanks from June 14 to 16, 1994 after analytical results were obtained from overburden monitoring wells DGC-14S and DGC-15S. Well DGC-14B was constructed next to well DGC-14S near the northern tank, and well DGC-15B was installed near the southern tank next to well DGC-15S. Both of the shallow bedrock monitoring wells were constructed by Parratt-Wolff, under the observation of DUNN, using the same procedures as outlined in Section 2.10.5 for replacement wells B-9SR, B-17SR and B-24SR. Boring logs for wells DGC-14B and DGC-15B are presented in Appendix C.7.3. Some drilling information is also included in Table 2.4. Construction details for the two shallow bedrock monitoring wells are provided in Appendix D.5.2 and are summarized in Table 2.5.

3.4 Task 4C - Well Development

Monitoring wells DGC-14S, DGC-14B, DGC-15S and DGC-15B were developed to (a) remove fine-grained materials from the sand pack and formation, (b) reduce the turbidity of groundwater samples, and (c) increase the yield of the well to reduce the potential of the well yielding an insufficient volume of water during groundwater sampling. The wells were each developed as soon as possible, but not less than 24 hours after completion of the well installation activities. The well development procedures were as presented in the approved Laboratory Waste Solvent Tank IRM Work Plan.

Well development was continued until the turbidity goal of less than or equal to 50 NTUs was achieved. If this goal could not be achieved, development was continued until an amount of groundwater equivalent to 10 well volumes was removed. Field parameters (i.e., pH, temperature, specific conductivity, turbidity) were measured incrementally during well development. These field measurements were performed as specified in the approved work plan.

Overburden monitoring wells DGC-14S and DGC-15S were developed on April 12 and 13, 1994. Shallow bedrock wells DGC-14B and DGC-15B were developed on June 15 and 16, 1994. Well development information and associated field parameter measurements are presented on the well development logs in Appendix F.

3.5 Task 4D - Groundwater Sampling

Groundwater samples were obtained from monitoring wells DGC-14S, DGC-14B, DGC-15S and DGC-15B to determine the quality of groundwater in the vicinity of the two Laboratory Waste

Solvent Tanks. The groundwater sampling procedures were as detailed in the approved Laboratory Waste Solvent Tank IRM Work Plan.

On April 26, 1994, groundwater samples were collected from overburden wells DGC-14S and DGC-15S. Samples from these wells were analyzed for TCL volatiles by ASP/CLP Method 91-1. In accordance with the work plan, analysis of these samples for methanol was not performed because methanol was not found to be present in the tanks. Well sampling records are presented in Appendix Q.1 and the validated analytical data are presented in Appendix Q.2. Analytical results from this sampling effort are summarized in tabular form in Section 7.4.

A second round of groundwater sampling was performed on June 29, 1994. Overburden wells DGC-14S and DGC-15S were sampled, as were shallow bedrock wells DGC-14B and DGC-15B. Samples from these wells were again analyzed for TCL volatiles by ASP/CLP Method 91-1. Analytical results from this sampling effort are summarized in tabular form and discussed in Sections 7.4 and 7.5. The well sampling records are provided in Appendix R.1. The validated analytical data are presented in Appendix R.2.

3.6 Task 4E - Surveying

The soil borings and newly-installed overburden monitoring wells were surveyed on April 25, 1994. The newly-installed shallow bedrock wells were surveyed on June 29, 1994. All survey work was performed in accordance with methods and procedures outlined in the approved Laboratory Waste Solvent Tanks IRM Work Plan. Ground surface elevation and, as appropriate, measuring point elevations are provided in Table 2.6.

3.7 Task 4F - Data Validation

In accordance with the approved Laboratory Waste Solvent Tanks IRM Work Plan, the results of the ASP/CLP Method 91-1 analyses were validated following EPA Region II guidelines, modified as appropriate for the DEC's ASP. This validation was performed by personnel meeting the qualifications of the DEC for data validation. The data validation included the review and evaluation of all laboratory deliverables pertinent to volatile organic analyses as described in Section 2.13. Validated analytical results associated with the Laboratory Waste Solvent Tanks IRM are included in Appendices P, Q.2 and R.2.

3.8 Decontamination Procedures

Decontamination procedures were conducted in accordance with the approved Laboratory Waste Solvent Tanks IRM Work Plan, in order to minimize the potential for compromising data validity by reducing the possibility of cross-contamination. Non-disposable equipment used during the investigative activities was decontaminated prior to and after the investigative activities. Disposable sampling equipment was containerized after use for subsequent treatment and/or disposal off-site. More detailed equipment decontamination procedures implemented as part of this work are presented in the work plan.

The drilling program also included decontamination procedures to ensure that possible contaminants were not introduced or transferred across the site. A decontamination pad was constructed near the garage near the northeast corner of the plant building. Prior to drilling the first boring, the equipment used in drilling and overburden well installation was cleaned to remove possible contaminants. The cleaning process involved the use of a high-pressure steam cleaner. Potable water from the City of Auburn's public water supply was used for decontamination of all equipment. All equipment which came in contact with the soil, as well as water tanks, drill tools, iron casings, pumps and hoses, underwent the initial cleaning procedures. All screen, riser pipe, top caps and bottom plugs were also decontaminated and sealed in plastic before beginning drilling at the first location. While working at the site, the drilling equipment was also decontaminated between locations to prevent cross-contamination. Finally, the drill rig, drilling tools and equipment were decontaminated before leaving the site at the completion of the soil boring and overburden well installation activities. These same decontamination procedures were repeated for the installation of the shallow bedrock wells.

3.9 Handling of Investigation - Derived Wastes

Wastes resulting from the above investigative activities were handled in accordance with the approved Laboratory Waste Solvent Tanks IRM Work Plan. Solids which settled out of the groundwater produced during the drilling, development and sampling of monitoring wells were containerized. PPE and other associated debris (i.e., disposable sampling equipment) were managed separately, but in a similar manner. Decontamination fluids were also containerized. Drill cuttings from the soil borings and monitoring wells were spread on the ground surface and covered by a minimum of 6-inches of clean fill. In accordance with the approved work plan, groundwater produced during the development and sampling of the overburden wells was discharged onto the ground surface and allowed to infiltrate. Groundwater produced during the development and sampling of the shallow bedrock wells was containerized. All of the containerized aqueous wastes resulting from the investigative activities performed during the Laboratory Waste Solvent Tanks IRM have been transported off-site for treatment and/or disposal at a permitted facility. The containerized non-aqueous wastes are temporarily stored in the garage at the site and will be transported off-site for proper treatment and/or disposal at the conclusion of investigative field activities.

4.0 GEOLOGIC CONDITIONS

4.1 Regional Geology

4.1.1 Physiographic Setting

The site is located on the northern edge of the Appalachian Uplands, the most extensive physiographic province of New York State. The bedrock within this province dips gently to the south with a slope of less than 50 feet/mile in the vicinity of the site. Long-term fluvial and glacial erosion have resulted in dissection and the development of east-west trending topographic escarpments which mark the outcrops of more resistant layers. However, the Appalachian Uplands has been dissected by fluvial erosion and glacial scouring.

The topographic scarp marking the northern boundary of the Appalachian Uplands is known as the Onondaga Escarpment. The Onondaga Escarpment is formed by the more resistant strata of Devonian age [i.e., approximately 395 to 345 million years ago (mya)] which overlie less resistant strata of Silurian age (i.e., approximately 435 to 395 mya). The Onondaga Escarpment occurs just a few miles north of the site. The scarp traverses the landscape from just north of Auburn southwest to Union Springs, the latter located on the east side of Cayuga Lake. A portion of the Onondaga Escarpment is shown on Figure 1.1. The Erie-Ontario Lowlands physiographic province occurs to the north of this escarpment.

4.1.2 Glacial History

During the Mesozoic Era (i.e., 195 to 65 mya), the Finger Lakes region was eroded to a surface of little or no relief, termed a peneplane. It is postulated that the peneplane was uplifted approximately 2000 feet about 30 mya (Von Engeln, 1961). This uplift brought about renewed erosion and dissection of the plateau-like region by streams. The eastern Finger Lakes region, encompassing Seneca Lake and those lakes to the east exhibited a preglacial river system that was established in the peneplane and maintained during uplift of the region. Each of the north-south trending basins (i.e., Cayuga, Seneca, Owasco, Skaneateles and Otisco) carried a north-flowing preglacial river which provided drainage for the area until the start of the Pleistocene Epoch (i.e., 1.8 mya to 10,000 years ago) when glaciers began to resculpture the region.

There is evidence of at least two glacial advances in the Finger Lakes region during the Pleistocene Epoch. The first advance is believed to have been initiated about one million years ago (Von Engeln, 1961; Bloom, 1986). The final retreat of glacial ice from the region did not occur until about 10,000 years ago, with retreat of the Late Wisconsin Laurentide ice sheet. The Pleistocene glaciation modified the preexisting topography resulting in the distinctive landforms associated with the region today.

It is believed that the major erosional modifications of the regional topography were resultant from the first glaciation while the deposition of the large amounts of glacial sediments occurred during retreat of the Late Wisconsin glacier. These deposits acted to further modify the topography. The initial glacial advance in the region was from the north and the ice mass exerted tremendous erosive power on the underlying bedrock strata. The glacial ice was of sufficient thickness to cover the highest hills in the region with maximum thickness occurring over the major valleys. The preglacial valleys of the Finger Lakes, particularly the eastern Finger Lakes, were deepened and, to an extent, widened by the scouring of glacial ice. The erosive action was particularly concentrated along the northward-sloping preglacial valleys of Cayuga and Seneca Lakes. The combination of northward-sloping preglacial channels and progressive narrowing of the valleys to the south resulted in extreme overdeepening of these basins to below sea level.

A relatively warm interglacial period followed the first glacial advance, with streams again reshaping the land. The Late Wisconsin Laurentide ice sheet then advanced across the region, ultimately covering all of New York with the exception of Allegheny State Park. The Late Wisconsin glacial advance reached its maximum extent about 20,000 years ago and obscured most evidence of the pre-Late Wisconsin glacial deposits. At this time the Late Wisconsin ice sheet began its northward retreat which was steady until reaching the regional divide, located south of the present Finger Lakes, about 12,000 to 14,000 years ago. The ice margin stabilized at this location and built the Valley Heads Moraine, a massive complex of ice-margin deposits. With subsequent further retreat of the ice front, a glacial lake formed. The immense volume of meltwater overtopped the Valley Heads Moraine and flowed into the Susquehanna River drainage basin. As the quantity of glacial meltwater decreased and further retreat of the glacial ice opened drainage routes farther to the north, the water levels fell below the elevation of the moraine which had acted as a dam. The Finger Lakes are the remnants of a much larger glacial lake which once occupied the area.

In the area immediately north of the Finger Lakes and extending to Lake Ontario is one of the largest drumlin fields in the world. Over 10,000 of these glacial features have been counted in the area between Syracuse and Rochester. Drumlins are elongated oval hills of glacial till, built up under the glacial ice. The longitudinal axes of the drumlins parallel the direction of ice flow. Glacial till and glaciolacustrine deposits are the primary overburden materials in the area between the drumlin field in the Erie-Ontario Lowlands province to the north and the Valley Heads Moraine many miles to the south.

4.1.3 Bedrock Stratigraphy

A generalized stratigraphic column of the bedrock stratigraphy in central New York is presented in Figure 4.1 and is discussed below. The exposed bedrock is of Late Silurian and Devonian age, particularly in Cayuga County. During the Late Silurian, a sea covered central New York. This sea became hypersaline as a result of restricted circulation and an arid climate and was relatively devoid of fauna (Heaslip, 1966). As a consequence, evaporites were deposited during the Late Silurian over a widespread area known as the Salina Basin (Karig and Elkins, 1986). The depositional environments in this sea were similar to those in the Great Salt Lake and Dead Sea of today [State University of New York (SUNY), 1966].

The early Late Silurian rocks in central New York are represented by the Salina Group which consists of, in ascending order, the Vernon, Syracuse and Camillus Formations. The Salina Group is distinguishable by red beds, evaporites and a sparse faunal assemblage (Leutze, 1964).

SYSTEM	GROUP or FORMATION		MEMBER	PREDOMINANT ROCK TYPE
DEVONIAN	Canadaway			Shale
	Chemung			Shale & Sandstone
	Naples			Shale & Sandstone
	Genesee			Shale
	Tully			Limestone
	Hamilton			Shale & Sandstone
	Onondaga		Seneca	Limestone
			Moorehouse	Limestone
			Nedrow	Limestone & Shaley Ls.
			Edgecliff	Limestone
	Oriskany			Sandstone
	HELDERBERG GROUP	Kalkberg		Limestone
		Coeymans		Limestone
		Manlius	Bishop Brook	Dolomitic Ls.
			Pools Brook	Dolomitic Ls.
			Jamesville	Limestone
			Clark Reservation	Limestone
			Elmwood	Limestone & Argillaceous Dolomite
			Olney	Limestone
SILURIAN	Rondout			Argillaceous Dolomite
	Akron = Cobleskill			Dolomite & Limestone
	Bertie			Argillaceous Dolomite
	Salina Group			Shale
	Lockport			Dolomite
	DeCew			Argillaceous Dolomite
	CLINTON GROUP	Rochester (Top) Oneida (Base)		Shale, Limestone & Conglomerate
ORDOVICIAN	Medina			Sandstone
	Queenston			Shale
	Oswego			Sandstone
	Pulaski			Shale
	Frankfort			Shale
	Utica			Shale

Figure obtained from the New York State Department of Public Works (1961).

DUNN ENGINEERING COMPANY

DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

GENERALIZED STRATIGRAPHIC COLUMN
FOR CENTRAL NEW YORK STATE

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

PROJECT NO. 35126	DATE 11/30/94	DWG. NO. 35126-37	SCALE NTS	FIGURE NO. 4.1

The thickness of the Salina Group exceeds 2000 feet in south-central New York. The Salina Group outcrops in the Erie-Ontario Lowlands province and the strata dip gently to the south at 20 to 50 feet/mile.

The Vernon Formation consists of a wedge of red and green silty shales with localized lenticular bodies of dolomite, sandstone and gypsum (SUNY, 1966; Leutze, 1964). The uppermost beds of the Vernon Formation are typically green with a few interbedded, shaly dolomites. The Vernon Formation is up to 600 feet thick north of Cayuga Lake but is somewhat thinner to the east and west.

The Syracuse Formation overlies the Vernon Formation disconformably (Leutze, 1964). The Syracuse Formation includes thick salt deposits and associated dolomites, anhydrites and shales. In the center of the Salina Basin, thicknesses in excess of 1000 feet have been reported (Rickard, 1966). The Syracuse Formation is reportedly 1800 feet thick near the south end of Cayuga Lake and dips to the south at 50 feet/mile.

The Camillus Formation represents the uppermost formation of the Salina Group. The Camillus Formation consists of a green, unfossiliferous shale with some red beds and, in the center of the Salina Basin, dolomites and anhydrites. The maximum thickness occurs in Onondaga County and is approximately 200 feet. The Camillus Formation outcrops below the Onondaga Escarpment west, northwest and north of the site.

The Bertie Formation overlies the Camillus Formation. Three members are recognized in central New York: the Fiddlers Green, Forge Hollow and Oxbow Members, in ascending order. The total thickness of the Bertie Formation is 70 to 80 feet at Union Springs and Marcellus Falls, located between Auburn and Syracuse, and approximately 90 feet at Jamesville (Rickard, 1962). The Bertie Formation is often noted for its eurypterid fauna, fossils of which are found particularly in the Fiddlers Green Member.

The Fiddlers Green Member consists of a fine-grained, dark bluish dolomite with a pronounced conchoidal fracture. The upper and lower contacts appear to be gradational. The thickness of the Fiddlers Green Member is roughly 30 feet at Marcellus Falls and Jamesville and in excess of 25 feet at Union Springs.

The Forge Hollow Member of the Bertie Formation is composed of a greenish gray, pyritiferous dolomite with shaly partings. The strata are nearly devoid of fossils. The thickness of this member is approximately 40 feet at Union Springs, 30 feet at Marcellus Falls and 50 to 60 feet at Jamesville (Rickard, 1962).

The Oxbow Member consists of thin to medium-bedded, fine-grained, light gray dolomites with a conchoidal fracture. The thickness of the Oxbow Member is about 10 feet at Union Springs, 10 feet at Marcellus Falls and 7 feet near Syracuse.

In central New York, the Bertie Formation is gradationally overlain by either the Akron or Cobleskill Formation, depending upon location. Near the close of the Silurian age, an influx of clean sea water allowed growth of marine life forms. Unrestricted growth of corals and bryozoans reached reef proportions in some locations (SUNY, 1966). The rocks which resulted form the Cobleskill Formation or, farther to the west, the Akron Formation.

The Cobleskill Formation grades from fossiliferous limestones to relatively barren dolomites in an east-west direction. Limestones predominate between Gallopville and Clockville, both located east of Syracuse. Farther west, dolomite occurs except for significant recurrences of limestone at Aurelius Station and Frontenac Island, both located near Union Springs, and southwest of Seneca Falls. Where dolomitic, the Cobleskill Formation is usually pitted by solution and contains, in places, cavities lined by dolomite crystals. The Cobleskill Formation can be distinguished from dolomites above and below by its stylolites (i.e., pressure solution features), fracture, pitted surfaces, cavities and massive basal bed.

At the end of the Silurian age, less hospitable conditions returned as the marine waters withdrew from the region. The rocks which resulted from this depositional environment constitute the Rondout Formation, the uppermost formation of the Silurian System. The Rondout Formation of central New York is recognizably different from that in eastern New York and is known as the Chrysler Member.

The Chrysler Member of the Rondout Formation consists of argillaceous dolomites with shaly partings. The dolomite is light gray or bluish and has a conchoidal fracture. Mudcracks and cavities lined with calcite, celestite and strontianite crystals are commonly encountered. The fossiliferous limestone beds found in the Rondout Formation in eastern New York are rare in the Chrysler Member. Representative thicknesses of the Chrysler Member are 55 to 65 feet at Jamesville, 50 feet at Marcellus Falls and 30 to 35 feet at Union Springs.

Devonian rocks of the Helderberg Group overlie the Bertie Formation in central New York. The Helderberg Group is comprised of seven formations. In ascending order, they are the Manlius, Coeymans, Kalkberg, New Scotland, Becraft, Alsen, and Port Ewen Formations and all are limestones. However, the upper surface of the Helderberg Group is an erosional unconformity and only the Manlius, Coeymans and Kalkberg Formations are recognized in central New York. All but the Manlius Formation have been truncated near the site and the Manlius also disappears just west of Seneca Falls.

In central New York, the Manlius Formation is divided into five members which are, in ascending order, the Thacher, Olney, Elmwood, Clark Reservation and Jamesville Members (Rickard, 1962). The Thacher Member is the oldest member of the Manlius Formation and extends eastward from Jamesville. The type section is in Thacher Park located near Albany where it is 52 feet thick. The lower 35 feet is composed of dark bluish black, very fine-grained limestone beds, one to two inches thick. The remainder of the unit is comprised of biostrome and "waterlime" strata. Where present, the Thacher Member gradationally overlies the Rondout Formation.

The Olney Member of the Manlius Formation is a fine-grained, dark gray to black limestone. The lower portion is largely composed of thin, alternating, dark gray and drab colored layers. Weathering causes the dark limestone to become light gray, a color that contrasts sharply with the drab or brownish yellow layers [New York State Department of Public Works (DPW), 1961].

The upper portion is often more thickly bedded. The Olney Member is recognized from Seneca Falls to Jordanville; the Manlius is not subdivided east of Jordanville. The type section is located at Split Rock, southwest of Syracuse, where it is 33 feet thick. West of this area, the Olney Member gradationally overlies the Rondout Formation.

The type section of the Elmwood Member occurs near Syracuse where it is 13 feet thick (Rickard, 1962). The Elmwood Member extends westward from the type section to the eastern part of the Auburn quadrangle and eastward to Jordanville. At and west of the type section, the Elmwood Member of the Manlius Formation is comprised of three units. The upper and lower units are thin-bedded dolomites which split easily into flat slabs and contain argillaceous material. The middle unit is a massive limestone. To the east, this member becomes a pure limestone and cannot be separated into units.

The overlying Clark Reservation Member also extends eastward from Auburn to Jordanville. This member is a dense, fine-grained, bluish black limestone which weathers white. Although seldom more than 3 feet thick, the Clark Reservation Member is a good marker horizon when weathered. At the type section near Jamesville, this member is 4 feet thick.

The Jamesville Member extends from western Onondaga County eastward to Jordanville and has an average thickness of approximately 10 to 20 feet. This member of the Manlius Formation is a massive, dark bluish gray, medium-grained limestone similar in appearance to the Coeymans Formation. It is characterized by its position immediately above the Clark Reservation Member, medium grain size, massive appearance and the preponderance of large fossils, primarily stromatoporoids.

Deposition of the Helderberg Group ended with the temporary withdrawal of the sea. The strata were exposed to erosion. Greater thicknesses of the strata were removed to the west and, as stated previously, only the lowermost strata of the Manlius Formation remain in Cayuga County.

When marine conditions returned, the Oriskany Formation was deposited. The Oriskany Formation is a coarse-grained sandstone with fauna of large brachiopods and apparently accumulated in shallow water near the shoreline of the Devonian sea (Heaslip, 1966). The Oriskany Formation is discontinuous and in many areas is represented only by a concentration of sand grains in the lower part of the overlying Onondaga Formation (Rickard, 1963). Where the basal clastics occur, they are usually less than one foot thick and frequently grade upward into the limestone of the Onondaga Formation. It is believed that this sandy zone was formed by reworking the deposits of the Oriskany Formation [New York State Geological Association (NYSGA), 1956].

By the Middle Devonian, New York was largely covered by a shallow, warm sea with abundant invertebrate fauna including coral reefs in some locations. The limey deposits and reefs which resulted comprise the Onondaga Formation which is 70 to 150 feet thick. In the upper strata of this formation, a bentonitic layer is present indicating volcanic activity. The Onondaga Formation represents the last major carbonate deposit before inundation of the area with clastics from the uplift associated with the Acadian Orogeny to the east (Karig and Elkins, 1986).

The type section of the Onondaga Formation is near Syracuse and four members are recognized: the Edgecliff, Nedrow, Moorehouse and Seneca Members, in ascending order. These members extend across the state and are characterized by more-or-less constant lithologic and faunal characteristics.

The Edgecliff Member is a light gray, coarse-grained, crinoidal limestone with beds ranging in thickness from 0.5 to 3 feet. Light gray chert nodules are common in the upper part and are found throughout the member toward the east (Oliver, 1954). The Edgecliff Member is characterized by abundant fauna of rugose and tabulate corals. This member ranges from 8 to 22 feet in thickness in the Syracuse area and thickens toward the east. Toward the west, this member thins to 5 feet or less. In many exposures, the lower few inches of the Edgecliff Member contains sand grains apparently derived from reworking the deposits of the Oriskany Formation. Deposition of the Edgecliff Member was halted by influx of argillaceous material, presumably of terrigenous origin and possibly a result of uplift in borderlands to the east (Oliver, 1966).

The Edgecliff Member is overlain by the Nedrow Member, a medium gray, thin-bedded, very fine-grained argillaceous limestone approximately 10 to 15 feet thick. The clay content of the Nedrow Member can range up to about 25% (Lindemann, 1979). Though uncommon, the upper beds locally have some scattered medium to dark gray chert nodules (Lindemann and Feldman, 1981). Brachiopods are abundant. At the type locality, the contact with the underlying Edgecliff Member is sharp but the contact with the overlying Moorehouse Member is gradational (Oliver, 1954).

The type locality of the Moorehouse Member is near Jamesville. This member is a medium gray, very fine-grained limestone with numerous shaly partings and an abundance of various brachiopods. At the type section, the Moorehouse Member is 20 to 25 feet thick with bedding ranging from 2 inches to 5 feet thick. The upper half of this member is less shaly and more fossiliferous than the lower half. The thickness of the Moorehouse Member increases both east and west of the type section.

The Moorehouse Member gradationally overlies the Nedrow Member and the contact is often difficult to determine. In central New York, the top of the Nedrow Member is usually considered to be the uppermost shaly bed, usually separated by 6 to 8 inches from the underlying shaly bed (Lindemann and Feldman, 1981). Dark gray chert is common throughout the Moorehouse Member and increases in abundance in the upper half. The chert nodules are aligned parallel to the bedding planes and, where abundant, can form beds or anastomosing networks.

The Seneca Member of the Onondaga Formation is represented by a succession of distinctive beds of dark gray, fine-grained limestone. The lower strata are lithologically similar to the upper part of the Moorehouse Member but become darker gray and less cherty and fossiliferous in the upper part. The Seneca Member is highly argillaceous and poorly fossiliferous. The type section is at Union Springs where the member is fully exposed and measures approximately 9 feet in thickness. Near Syracuse, the Seneca Member is 19 feet thick (Oliver, 1966). The basal unit of this member is the Tioga Bentonite, a greenish gray to ocher colored clay layer about 4 to 10 inches thick. The Tioga Bentonite separates the Seneca and Moorehouse Members throughout much of New York.

During the Middle Devonian, clastic sediments began to invade central New York from the uplifted region to the east. The Hamilton Group of rocks comprise the lowermost and oldest strata of the resulting Catskill Delta. The Hamilton Group is 5000 feet thick in eastern New York and thins westward to about 300 feet near Lake Erie and is expected to be thicker than 500 feet in the Cayuga Lake region (NYSGA, 1956).

The Hamilton group is composed of four formations which are, in ascending order, the Marcellus, Skaneateles, Ludlowville and Moscow Formations. These formations are separated by thin but persistent limestones. The lowermost Marcellus Formation is composed of black shales, siltstones and sandstones. The Marcellus Formation outcrops south of the site and, due to the southward dip of the strata, does not occur in the subsurface at the site. Thus, the Middle Devonian strata are not discussed further herein.

4.2 Site Geology

4.2.1 Surficial Soils

The distribution of surficial soils in the vicinity of the site has been mapped by the United States Department of Agriculture [USDA (1971)]. Three soil types occur at the site: Cazenovia silt loam on 2 to 8% slopes (designated "CeB"), Odessa silt loam on 0 to 2% slopes (designated "OdA") and Schoharie silt loam on 0 to 2% slopes (designated "SeB"). In addition, those areas of the site with pavement and buildings are mapped as Made Lands with 0 to 15% slopes (designated "Mc").

The Cazenovia soils are mapped within the field west and northwest of the plant building and near the baseball field. The Cazenovia series consists of soils that formed in calcareous glacial till of fine texture. The mapped distribution of this series is reportedly spatially related to the Onondaga Escarpment and the parent tills are a mixture of limestone and shale fragments and reworked glaciolacustrine clays. Relative to agricultural use, the main limitations of the Cazenovia soils are slow permeability and seasonal wetness.

The Odessa silt loam is mapped to occur in the field north of the plant building and in areas of Mr. Wait's property to the northwest. Soils of this series are deep, poorly drained and fine textured. These soils formed in reddish glaciolacustrine clays and silts on the glacial lake plain, notably around the northern end of Cayuga and Owasco Lakes. Drainage is the main agricultural limitation of this soil type and drainage systems reportedly must be closely spaced.

Schoharie soils are mapped between the plant building and Route 326 to the east. This soil series reportedly formed in glaciolacustrine clays and silts. Infiltration of rainfall is slow and, consequently, runoff is rapid. Seasonal wetness and slow permeability are major agricultural limitations.

4.2.2 Overburden Materials

Table 4.1 presents the thickness of overburden materials observed at boreholes drilled during the various phases of subsurface investigation. Depth to bedrock was determined by (a) recovery of bedrock fragments in split spoon samples, (b) grinding of the lead auger during drilling and/or (c) recovery of a bedrock "plug" from within the lead auger after prolonged grinding.

The thickness of the overburden materials averages about 15 feet. However, the overburden thickness does vary, ranging from as thin as 4.9 feet at boring OSB-9 to as thick as 24.5 feet at well DGC-7B. The spatial variability in the overburden thickness is shown in the isopach map presented in Figure 4.2.

It should be noted that Figure 4.2 is highly generalized because the thickness of the overburden appears to vary significantly even in closely spaced borings. Variable overburden thickness was observed at several cluster well locations. For example, the thickness of the overburden appeared to vary by 1.0, 0.6, 0.5, 0.8, 0.6, 1.0 and 0.6 feet at clusters B-12, B-20, B-22, B-24, B-26, B-27 and B-28, respectively. At clusters DGC-9 and DGC-12, the overburden thickness appeared to vary by 2.6 and 7.0 feet, respectively. The thickness of the overburden appeared to vary by 0.5 and 4.3 feet at clusters DGC-14 and DGC-15, respectively.

In areas where numerous borings were performed, overburden thickness variability appears even more pronounced. For example, in the vicinity of the North Evaporation Pit, the thickness of the overburden appeared to vary by 10.0 feet. Overburden thickness appeared to vary by 12.5 feet in the TB series of borings performed in the vicinity of the Laboratory Waste Solvent Tanks.

The apparent variability in overburden thickness may, in part, be caused by false refusal on large cobbles or boulders within the glacial till during augering. The thickness of overburden at wells B-12S and B-12D was anomalously low relative to adjacent drilling locations. Moreover, the response of these two wells was virtually identical during hydraulic conductivity testing. Thus, it appears that the casings were not seated completely into bedrock. Such a condition might lead to sloughing of some overburden materials into the borehole, which could explain why submersible pumps became inextricably lodged at the bottom of these two boreholes during groundwater sampling activities concurrent with the drilling.

Based on the above, some of the overburden thicknesses presented in Table 4.1 may be anomalously low due to false refusal during drilling. Thus, in developing the isopach map presented in Figure 4.2, the data obtained during the drilling of bedrock boreholes was used preferentially.

With the exception of fill, the unconsolidated deposits are of glacial origin. Two unconsolidated deposits were encountered at most locations at the site: an upper glaciolacustrine deposit and an underlying glacial till. The upper glaciolacustrine deposit is composed of horizontal layers of clay, silt and fine sand and is predominantly brown to reddish brown in color. The silt and fine sand occurs in seams which are encountered infrequently and do not appear to be continuous between drilling locations. The thickness of the upper glaciolacustrine deposit ranges from 0.0

Table 4.1
Overburden Thickness and Bedrock Elevation Information

Former Powerex, Inc. Facility
Auburn, New York

Current Designation	Ground Elevation	Overburden Thickness	Bedrock Elevation
AB-1	631.3	15.5	615.8
AB-2	631.0	15.0	616.0
AB-3	630.1	14.2	615.9
B-1I*/D	637.2	13.5	623.7
B-2S	643.2	16.0	627.2
B-2I*	642.8	16.5	626.3
B-2D	643.0	15.7	627.3
B-3I*	635.2	16.5	618.7
B-3D	635.5	15.9	619.6
B-4I*/D	638.8	13.0	625.8
B-5I*/D	633.1	21.8	611.3
B-6S	638.1	19.0	619.1
B-7S	632.6	16.5	616.1
B-8S	634.4	16.5	617.9
B-8I*/D	634.6	17.0	617.6
B-9S*/I*	636.1	18.5	617.6
B-9SR	636.1	18.4	617.7
B-9D	636.3	18.5	617.8
B-10I/D	635.7	20.0	615.7
B-11I*/D*	642.0	19.0	623.0
B-12S*	632.9	13.0	619.9
B-12D*	632.9	12.0	620.9
B-13I*/D	637.2	22.0	615.2
B-14I*/D*	632.4	15.2	617.2
B-15OV	631.4	> 16.0	< 615.4
B-15S	631.7	18.0	613.7
B-15I	631.7	18.0	613.7
B-15D	631.5	18.0	613.5
B-16OV	636.2	> 20.0	< 616.2
B-16S/I	636.0	22.0	614.0
B-16D	636.3	22.0	614.3
B-17SR	632.7	12.4	620.3
B-17I*/D	632.9	12.5	620.4
B-18I*/D	632.7	16.3	616.4
B-19I*/D	635.1	7.9	627.2
B-20S/I	634.8	20.0	614.8
B-20D	635.0	20.6	614.4
B-21I*/D	630.1	20.5	609.6
B-22S*/I	629.0	20.0	609.0
B-22D	629.1	19.5	609.6
B-23I*/D	634.1	19.3	614.8
B-24S*/I*	631.6	15.4	616.2
B-24SR	631.5	15.8	615.7
B-24D	631.5	15.0	616.5
B-25I/D	639.4	21.5	617.9
B-26S	628.4	10.0	618.4
B-26I	628.2	10.5	617.7
B-26D	628.1	10.6	617.5
B-27S	632.4	12.0	620.4
B-27I	632.3	11.0	621.3

Table 4.1 (Continued)
Overburden Thickness and Bedrock Elevation Information
Former Powerex, Inc. Facility
Auburn, New York

Current Designation	Ground Elevation	Overburden Thickness	Bedrock Elevation
B-27D	632.1	11.0	621.1
B-28S	626.8	15.0	611.8
B-28I	626.9	15.5	611.4
B-28D	627.0	15.6	611.4
CH-1I*/D*	636.9	15.3	621.6
DGC-1S	640.3	19.6	620.7
DGC-1B	640.4	19.8	620.6
DGC-2S	634.4	13.4	621.0
DGC-2B	634.2	13.7	620.5
DGC-3S	637.1	12.0	625.1
DGC-3B	637.0	12.0	625.0
DGC-4S	638.6	14.8	623.8
DGC-4B	638.9	14.8	624.1
DGC-5B	637.5	10.5	627.0
DGC-6B	638.8	17.3	621.5
DGC-7B	641.2	24.5	616.7
DGC-8S	636.9	13.9	623.0
DGC-8B	636.8	13.8	623.0
DGC-9S	636.8	20.1	616.7
DGC-9B	636.9	17.5	619.4
DGC-10B	635.1	11.0	624.1
DGC-11S	637.2	> 7.5	< 629.7
DGC-12S	637.6	10.0	627.6
DGC-12I	637.5	17.0	620.5
DGC-12B	637.8	16.3	621.5
DGC-13S	636.1	8.8	627.3
DGC-14S	637.8	16.0	621.8
DGC-14B	637.3	15.5	621.8
DGC-15S	637.7	16.2	621.5
DGC-15B	637.8	20.5	617.3
NPB-1	637.5	15.1	622.4
NPB-2	637.0	14.4	622.6
NPB-3	636.5	12.0	624.5
NPB-4	638.4	15.9	622.5
NPB-5	637.3	14.1	623.2
NPB-6	637.5	16.6	620.9
NPB-7	637.8	13.6	624.2
NPB-8	638.4	14.9	623.5
NPB-9	639.0	17.2	621.8
NPB-10	637.1	13.5	623.6
NPB-11	636.7	11.6	625.1
OSB-1	632.6	10.8	621.8
OSB-2	627.1	16.0	611.1
OSB-3	628.5	10.0	618.5
OSB-4	628.6	6.9	621.7
OSB-5	628.7	10.0	618.7
OSB-6	626.9	7.0	619.9
OSB-7	628.6	11.0	617.6
OSB-8	625.2	8.0	617.2

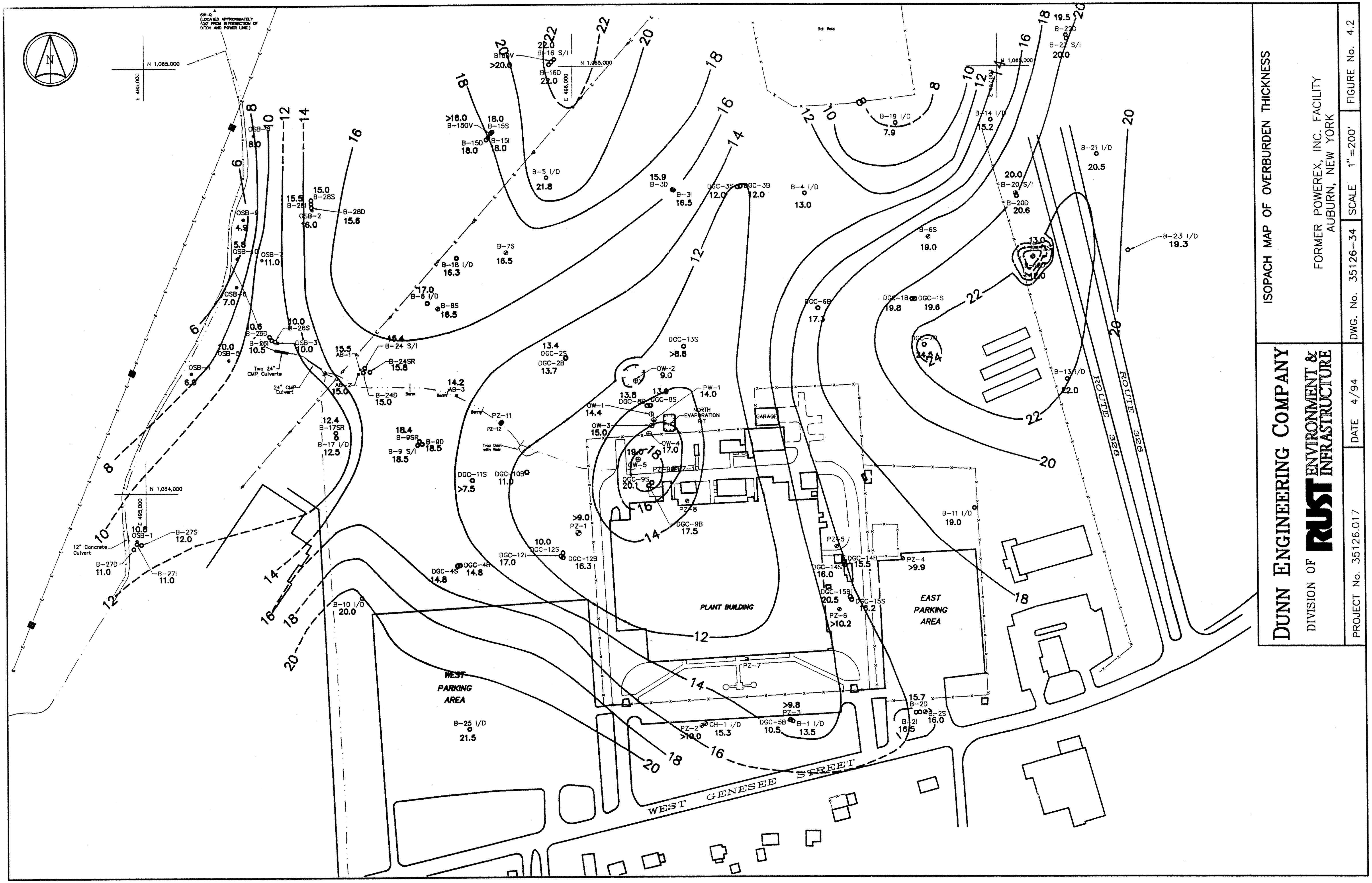
Table 4.1 (Continued)
Overburden Thickness and Bedrock Elevation Information

Former Powerex, Inc. Facility
Auburn, New York

Current Designation	Ground Elevation	Overburden Thickness	Bedrock Elevation
OSB-9	626.9	4.9	622.0
OSB-10	627.1	5.8	621.3
OW-1	637.4	14.4	623.0
OW-2	635.8	9.0	626.8
OW-3	637.5	15.0	622.5
OW-4	637.5	17.0	620.5
OW-5	637.8	19.0	618.8
PW-1	637.3	14.0	623.3
PZ-1	637.1	> 9.0	< 628.1
PZ-2	637.0	> 10.0	< 627.0
PZ-3	637.2	> 9.8	< 627.4
PZ-4	641.6	> 9.9	< 631.7
PZ-5	637.8	> 10.2	< 627.6
PZ-6	638.0	> 10.2	< 627.8
TB-1-TS	637.8	10.7	627.1
TB-2-TS	637.7	13.8	623.9
TB-3-TS	637.8	12.4	625.4
TB-4-TS	637.7	9.2	628.5
TB-5-TS	637.5	16.1	621.4
TB-6-TS	637.3	20.3	617.0
TB-7-TS	637.8	18.3	619.5
TB-8-TS	637.9	18.0	618.9
TB-9-TS	637.2	17.2	620.0
TB-11-TS	638.1	18.1	620.0
TB-12-TS	637.9	7.7	630.2
TB-1-TN	637.8	16.0	621.8
TB-2-TN	637.3	9.0	628.3
TB-3-TN	637.8	12.9	624.9
TB-4-TN	637.6	14.7	622.9
TB-5-TN	637.5	7.9	629.6
TB-6-TN	637.1	12.7	624.3
TB-7-TN	637.1	13.9	623.2
TB-8-TN	638.2	17.1	621.1
TB-9-TN	637.2	17.3	620.5
TB-10-TN	637.8	13.8	624.1

Notes:

1. All depths in feet below grade.
2. All elevations in feet above mean sea level.
3. "*" indicates that the well has been abandoned.
4. Only drilled wells included.



ISOPACH MAP OF OVERBURDEN THICKNESS

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

FIGURE No. 4.2

SCALE 1"=200'

DWG. No. 35126-34

DATE 4/94

PROJECT No. 35126.017

DUNN ENGINEERING COMPANY

DIVISION OF **RUST** ENVIRONMENT & INFRASTRUCTURE to 12.4 feet, the former in areas of fill and the latter at well B-17SR in the northwest corner of the site.

The underlying glacial till consists of a poorly sorted mixture of gravel, cobbles and boulders in a clayey silt matrix. Minor amounts of sand were also noted in the matrix. The till is generally brown with an occasional red or gray tint and ranges in thickness from 0.5 feet at well DGC-3S to 13.6 feet at well DGC-1S.

Additional unconsolidated deposits were encountered beneath the deposits discussed above at wells DGC-1S, DGC-6B and DGC-7B. These borings are located northeast of the plant building in an area where the overburden materials exceed 17 feet in thickness. At these locations, a second sequence of glaciolacustrine sediments and glacial till was found to underlie the sequence which blankets the site.

The lower glaciolacustrine deposit was encountered below the upper glacial till at wells DGC-1S, DGC-6B and DGC-7B. This unit is comprised of stiff, brownish red to grayish brown silty clay. Trace amounts of subangular fine gravel, primarily limestone, were observed and layering was not evident.

The lower glacial till was encountered only at well DGC-6B. The color of this till is gray rather than the characteristic brown of the upper glacial till. In addition, the matrix of the lower glacial till is fine sand and silt rather than silty clay.

Cross-sections showing the stratigraphy of the unconsolidated deposits are presented in the Phase III investigation report and suggest that the deposits result from two glacial advances. The lower glacial till was deposited beneath the ice during the first advance. During a period of glacial retreat, a lake was apparently formed and the lower glaciolacustrine silts and clays were deposited as lake bottom sediments. The subsequent glacial advance selectively eroded most of the existing glacial deposits (i.e., lower glaciolacustrine deposit and lower glacial till) leaving evidence of those deposits only in areas where depressions occur in the bedrock surface. The direction of this readvance was from north-northwest as indicated by the orientation of the drumlins located north of the Onondaga Escarpment. The pressure exerted by the weight of the ice may have been responsible for the stiff consistency of the lower glaciolacustrine silt and clay.

During the second glacial advance, the upper glacial till was deposited. The higher percentage of silt and clay in the upper glacial till may be due to the incorporation of the lower glaciolacustrine deposit into the basal sediment load of the glacier. During retreat, a glacial lake was again formed due to blockage of the drainageways by the ice front. The upper glaciolacustrine silt and clay was deposited within this lake and the layered (i.e., varved) nature of the deposit results from seasonal changes in the sediment load flowing into the lake.

4.2.3 Bedrock

4.2.3.1 Bedrock Topography

Table 4.1 presented the depth to bedrock determined at numerous drilling locations during the investigative phases performed to date. These data were converted into bedrock surface elevations using the surveyed ground surface elevation for each location, and the resulting elevations are presented in Table 4.1.

Figure 4.3 presents a map of the bedrock surface at the site. Like Figure 4.2, this map is highly generalized because the elevation of the bedrock surface appears to vary significantly even in closely spaced borings. For example, at cluster wells B-12, B-22, B-24, B-26 and B-27, the bedrock surface elevation was found to vary by 1.0, 0.6, 0.8, 0.9 and 0.9 feet, respectively. At clusters DGC-9, DGC-12 and DGC-15, the bedrock surface elevation appeared to vary by more than 2.6, 7.1 and 4.2 feet, respectively.

In areas where numerous borings were performed, variability in the elevation of the bedrock surface appears even more pronounced. In the vicinity of the North Evaporation Pit, for example, the bedrock surface elevation appeared to vary by 8.0 feet. Bedrock surface elevation appeared to vary by 12.6 feet in the TB series of borings performed in the vicinity of the two Laboratory Waste Solvent Tanks.

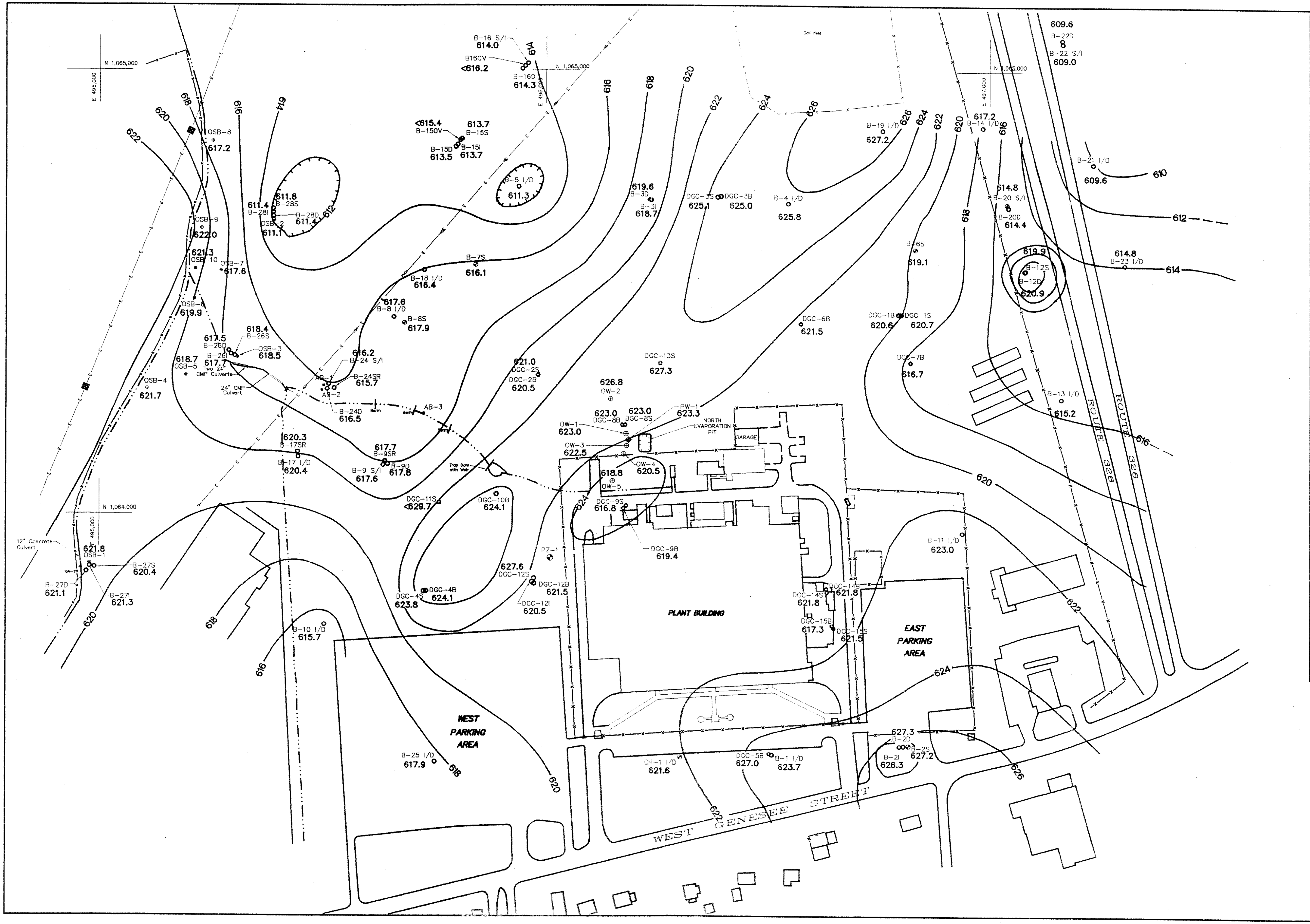
As with the variability in overburden thickness, the variability in bedrock surface elevation may, in part, be caused by false refusal on large cobbles or boulders within the glacial till during augering. Thus, some of the bedrock surface elevations presented in Table 4.1 may be anomalously high. For this reason, the data obtained during drilling of bedrock boreholes was used preferentially in preparing Figure 4.3.

4.2.3.2 Bedrock Lithology

Bedrock lithology has been determined from bedrock coring. Shallow bedrock cores obtained during the Phase II and Phase III investigations ranged from 7.8 to 13.0 feet in length and were obtained within an elevation range of 606.9 to 623.1 feet amsl. All of the cores were described as containing the Onondaga Formation.

During the early part of the Phase IV investigation, a deep bedrock core was obtained at location CH-1 located south of the plant building to further characterize the bedrock stratigraphy. Bedrock was encountered at a depth of 15.3 feet below grade at an elevation of 621.9 feet amsl. The bedrock coring extended from 16.5 feet below grade to a total depth of 100.5 feet at an elevation of 536.4 feet amsl. This core is described further below.

The Moorehouse Member of the Onondaga Formation was described in the upper part of the core from 16.5 to 28.4 feet below grade (620.4 to 608.5 feet amsl). Although truncated by erosion, the Moorehouse Member is 11.9 feet thick at this location. The Moorehouse Member was described as a medium dark gray, finely crystalline limestone with anastomosing argillaceous



BEDROCK SURFACE CONTOUR MAP

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT No. 35126.017	DATE 10/18/90	DWG. No. 35126-23	SCALE 1"=200'
			FIGURE No. 4.3

streamers. The fossil content was low to moderate, consisting mainly of brachiopods. Chert nodules and small nuggets of pyrite were noted. Fracturing or jointing were noted as common in the top of the recovered portion of this unit. The base of the Moorehouse Member is defined by a sharp color change and the presence of a 2-inch thick bioturbated zone located immediately above the underlying Nedrow Member.

The Nedrow Member of the Onondaga Formation underlies the Moorehouse Member and was encountered at 28.4 to 38.9 feet below grade (608.5 to 598.0 feet amsl) for a total thickness of 10.5 feet. The Nedrow Member was described as a medium dark gray to grayish black, finely crystalline, argillaceous limestone. Scattered fossils, mainly brachiopods, were observed in this unit. High bioturbation was noted within the more argillaceous zones. Jointing was noted throughout this unit. The presence of anastomosing argillaceous streamers increases and the color lightens with increasing depth within the Nedrow Member. Pyrite was noted near the base of the unit.

The contact between the Nedrow and Edgecliff Members of the Onondaga Formation is gradational and is based upon a change in color and grain size. Based on geologic logging, the Edgecliff Member of the Onondaga Formation occurred at 38.9 to 47.2 feet below grade (598.0 to 589.7 feet amsl), the total thickness being 8.3 feet. Thus, the Onondaga Formation encountered at boring CH-1 was 30.7 feet thick. The Edgecliff Member is a medium gray to medium dark gray, medium to coarsely crystalline, fossiliferous limestone. Crinoids, rugose coral, brachiopods and occasional stylolites were identified. Argillaceous streamers were noted as being common at the top of this unit.

The base of the Edgecliff Member increases in sand content where it contacts the Oriskany Formation. At boring CH-1, the Oriskany Formation was represented by a 1-inch zone of black sandstone clasts. As discussed previously, the Oriskany Formation is bounded by erosional unconformities.

The Manlius Formation underlies the thin Oriskany Formation and was described as being the Thacher Member. However, based on published regional geologic information, it may be more appropriately designated as the Olney Member. At boring CH-1, the Manlius Formation was 15.0 feet thick and occurred from 47.3 to 62.3 feet below grade (589.6 to 574.6 feet amsl). The Manlius Formation is a medium dark to dark gray, finely crystalline limestone with a low fossil content. Thin zones (i.e., 1 to 2 inches thick) containing fossils, primarily brachiopods, were occasionally noted. The clay content is high and gives a banded appearance. Vertical and horizontal stylolites were noted as being common throughout this unit and joints were identified. The base of the Manlius Formation is defined by a sharp contact with the underlying Rondout Formation of Silurian age.

The Rondout Formation was encountered from 62.3 to 94.2 feet below grade (574.6 to 542.7 feet amsl). The Rondout Formation was 31.9 feet thick at boring CH-1 and was described as a massive, finely crystalline dolomite. The color of this unit ranges from a light to medium light gray at the top to a medium dark to dark dray at the base of the unit. The top 7.7 feet of this unit was described as having an earthy appearance resulting from weathering. The fossil content is poor throughout this unit. The clay content is high and shale partings and seams are abundant, causing the core to be broken up into thin "wafers". Carbonaceous seams were noted to be abundant near the base of the unit.

The underlying Cobleskill Formation was encountered at 94.2 feet below grade (542.7 feet amsl). Coring was terminated after advancing 6.3 feet into the Cobleskill Formation and before encountering the underlying Bertie Formation. However, the total thickness of the Cobleskill is expected to be 8 to 10 feet based on published literature. At boring CH-1, the Cobleskill Formation was described as a medium dark gray, massive, finely crystalline dolomite. The argillaceous content of the Cobleskill Formation was noted as relatively low and occurring in faint bands. No joints or fractures were noted in this unit. Occasional stylolites were noted.

4.2.3.3 Bedrock Structure

Bedrock structure in the vicinity of the site is characterized by the gentle southward dip of the strata. Geologic information obtained during the Phase IV investigation was used to estimate the regional dip of the bedrock strata in the vicinity of the site. The elevation of the Oriskany Formation at boring CH-1 was 589.6 feet amsl. The Oriskany Formation is also exposed at an elevation of approximately 615 feet amsl in an outcrop near the Finger Lakes Mall, located approximately 4000 feet north of the plant building. Assuming a planar surface with a dip orientation of due south yields an estimated dip of 32.4 feet/mile. This is consistent with the regional dip reported in the geologic literature for the central New York region.

We have used an assumed dip of 35 feet/mile to extrapolate the geologic information obtained at corehole CH-1 to the various bedrock drilling locations. Approximately 10 feet of change occurs in the elevation of the bedrock strata in a north-south direction across the site. Table 4.2 presents the length of open interval within the various geologic formations at each of the bedrock wells. Table 4.2 also presents the total length of the monitored zone of each of these wells. These data were, in conjunction with water-level data, useful in formulating the conceptual model of the hydrogeologic system which is discussed in Section 6.2.

Table 4.2

Geological Formations Within the Open Interval of Bedrock Monitoring Wells

Former Powerex, Inc. Facility
Auburn, New York

Location	Current Designation	Total Length Open Section (Feet)	Length of Open Section within Geological Units (Feet)				
			Onondaga	**Manlius**	**Rondout**	**Cobleskill**	**Bertie**
B-1	B-1I*	39.5	33.5	6.0	0.0	0.0	0.0
B-1	B-1D	38.7	0.0	1.2	31.9	5.6	0.0
B-2	B-2S	9.0	9.0	0.0	0.0	0.0	0.0
B-2	B-2I*	53.5	36.5	15.0	2.0	0.0	0.0
B-2	B-2D	33.0	0.0	1.2	31.8	0.0	0.0
B-3	B-3I*	53.5	21.4	15.0	17.1	0.0	0.0
B-3	B-3D	31.3	0.0	0.0	16.4	11.6	3.3
B-4	B-4I*	19.4	19.4	0.0	0.0	0.0	0.0
B-4	B-4D	21.8	0.0	0.0	10.2	11.6	0.0
B-5	B-5I	50.2	13.8	15.0	21.4	0.0	0.0
B-5	B-5D	21.0	0.0	0.0	3.5	11.6	5.9
B-6	B-6S	6.0	6.0	0.0	0.0	0.0	0.0
B-7	B-7S	8.0	8.0	0.0	0.0	0.0	0.0
B-8	B-8S	5.6	5.6	0.0	0.0	0.0	0.0
B-8	B-8I*	57.3	19.9	15.0	22.4	0.0	0.0
B-8	B-8D	17.3	0.0	0.0	3.2	11.6	2.5
B-9	B-9S*	2.7	2.7	0.0	0.0	0.0	0.0
B-9	B-9I*	43.0	15.4	15.0	12.6	0.0	0.0
B-9	B-9SR	19.0	19.0	0.0	0.0	0.0	0.0
B-9	B-9D	32.0	0.0	0.0	21.5	10.5	0.0
B-10	B-10I	37.0	24.3	12.7	0.0	0.0	0.0
B-10	B-10D	17.3	0.0	0.0	8.5	8.8	0.0
B-11	B-11I*	14.5	14.5	0.0	0.0	0.0	0.0
B-11	B-11D*	57.0	6.3	15.0	31.9	3.8	0.0
B-12	B-12S*	15.0	15.0	0.0	0.0	0.0	0.0
B-12	B-12D*	72.5	23.0	15.0	31.9	2.6	0.0
B-13	B-13I*	37.5	20.6	15.0	1.9	0.0	0.0
B-13	B-13D	33.0	0.0	0.0	22.5	10.5	0.0
B-14	B-14I*	10.0	10.0	0.0	0.0	0.0	0.0
B-14	B-14D*	68.9	3.0	15.0	31.9	11.6	7.4
B-15	B-15S	14.5	14.5	0.0	0.0	0.0	0.0
B-15	B-15I	32.0	0.0	12.6	19.4	0.0	0.0
B-15	B-15D	31.7	0.0	0.0	12.1	11.6	8.0
B-16	B-16S	16.5	14.8	1.7	0.0	0.0	0.0
B-16	B-16I	25.0	0.0	9.8	15.2	0.0	0.0
B-16	B-16D	32.5	0.0	0.0	16.6	11.6	4.3
B-17	B-17SR	21.9	21.9	0.0	0.0	0.0	0.0
B-17	B-17I*	58.3	25.7	15.0	17.6	0.0	0.0
B-17	B-17D	17.3	0.0	0.0	3.4	11.6	2.3
B-18	B-18I*	57.9	20.0	15.0	22.9	0.0	0.0
B-18	B-18D	18.2	0.0	0.0	1.4	11.6	5.2
B-19	B-19I*	55.9	28.9	15.0	12.0	0.0	0.0
B-19	B-19D	17.4	0.0	0.0	1.1	11.6	4.7
B-20	B-20S	26.2	17.5	8.7	0.0	0.0	0.0
B-20	B-20I	22.5	0.0	0.0	22.5	0.0	0.0
B-20	B-20D	11.0	0.0	0.0	0.0	7.2	3.8
B-21	B-21I*	56.2	11.8	15.0	29.4	0.0	0.0
B-21	B-21D	47.0	0.0	0.0	0.0	7.8	39.2
B-22	B-22S*	26.0	9.5	15.0	1.5	0.0	0.0
B-22	B-22I	22.0	0.0	0.0	22.0	0.0	0.0

Table 4.2 (Continued)

Geological Formations Within the Open Interval of Bedrock Monitoring Wells

Former Powerex, Inc. Facility
Auburn, New York

Location	Current Designation	Total Length Open Section (Feet)	Length of Open Section within Geological Units (Feet)				
			Onondaga	Manlius	Rondout	Cobleskill	Bertie
B-22	B-22D	34.0	0.0	0.0	0.0	0.0	34.0
B-23	B-23I	78.5	18.4	15.0	31.9	11.6	1.6
B-23	B-23D	20.0	0.0	0.0	0.0	0.0	20.0
B-24	B-24S*	18.9	18.9	0.0	0.0	0.0	0.0
B-24	B-24I*	29.5	0.0	6.4	23.1	0.0	0.0
B-24	B-24SR	15.7	15.7	0.0	0.0	0.0	0.0
B-24	B-24D	17.0	0.0	0.0	0.7	11.6	4.7
B-25	B-25I	41.1	28.4	12.7	0.0	0.0	0.0
B-25	B-25D	17.4	0.0	0.0	14.2	3.2	0.0
B-26	B-26S	20.4	20.4	0.0	0.0	0.0	0.0
B-26	B-26I	22.7	0.0	0.1	22.6	0.0	0.0
B-26	B-26D	17.6	0.0	0.0	0.0	9.0	8.6
B-27	B-27S	16.4	16.4	0.0	0.0	0.0	0.0
B-27	B-27I	22.3	0.0	12.1	10.2	0.0	0.0
B-27	B-27D	16.6	0.0	0.0	3.2	11.6	1.8
B-28	B-28S	16.2	14.6	1.6	0.0	0.0	0.0
B-28	B-28I	22.5	0.0	2.0	20.5	0.0	0.0
B-28	B-28D	17.2	0.0	0.0	0.0	5.4	11.8
CH-1	CH-1I*	47.5	32.0	15.0	0.5	0.0	0.0
CH-1	CH-1D*	36.7	0.0	0.0	30.4	6.3	0.0
DGC-1B	DGC-1B	10.5	10.5	0.0	0.0	0.0	0.0
DGC-2B	DGC-2B	11.2	11.2	0.0	0.0	0.0	0.0
DGC-3B	DGC-3B	11.2	11.2	0.0	0.0	0.0	0.0
DGC-4B	DGC-4B	11.5	11.5	0.0	0.0	0.0	0.0
DGC-5B	DGC-5B	11.2	11.2	0.0	0.0	0.0	0.0
DGC-6B	DGC-6B	11.0	11.0	0.0	0.0	0.0	0.0
DGC-7B	DGC-7B	11.5	11.5	0.0	0.0	0.0	0.0
DGC-8B	DGC-8B	12.0	12.0	0.0	0.0	0.0	0.0
DGC-9B	DGC-9B	12.0	12.0	0.0	0.0	0.0	0.0
DGC-10B	DGC-10B	11.5	11.5	0.0	0.0	0.0	0.0
DGC-12B	DGC-12B	13.0	13.0	0.0	0.0	0.0	0.0
DGC-14B	DGC-14B	24.0	24.0	0.0	0.0	0.0	0.0
DGC-15B	DGC-15B	20.5	20.5	0.0	0.0	0.0	0.0
OW-1	OW-1	19.4	19.4	0.0	0.0	0.0	0.0
OW-2	OW-2	24.7	24.7	0.0	0.0	0.0	0.0
OW-3	OW-3	18.0	18.0	0.0	0.0	0.0	0.0
OW-4	OW-4	16.3	16.3	0.0	0.0	0.0	0.0
OW-5	OW-5	14.8	14.8	0.0	0.0	0.0	0.0
PW-1	PW-1	21.5	21.5	0.0	0.0	0.0	0.0

Notes:

1. Total length of open borehole section is measured from the top of the sand pack to the bottom of the sand pack.
2. For open bedrock boreholes, the top and bottom of the open section are the base of the casing and the bottom of the borehole, respectively.
3. For shallow or intermediate wells which consist of an open annulus, the top and bottom of the open section are the base of the casing and the top of the bentonite seal, respectively.
4. At wells B-12S and B-12D, the base of the casing may not be seated into bedrock.
5. Based upon projection of geologic data from boring CH-1 using a southern dip of 35 feet/mile.
6. "*" indicates that the well has been abandoned.

5.0 SURFACE WATER CONDITIONS

5.1 Routing of Surface Water to the Drainage Ditch

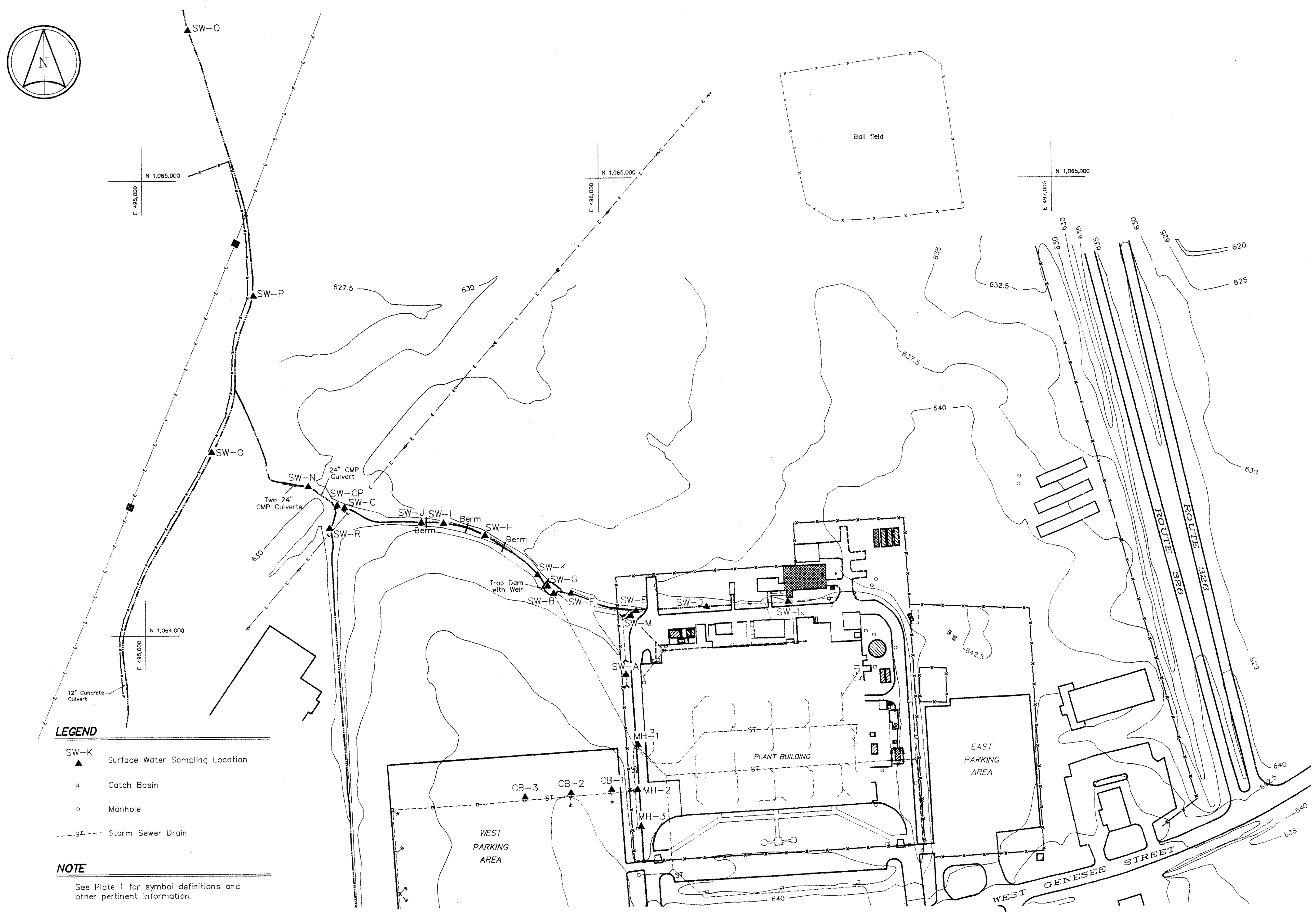
As discussed in the Phase IV investigation report, the surface water flow system at the site has evolved through time due to facility modifications and/or expansions. Prior to construction of the original plant building in 1951, a low swale existed in the same general location as the current drainage ditch and served to direct runoff to the northwest from much of the cultivated parcel. Subsurface agricultural drainage lines may also have been present. Currently, storm water at the site is routed to the drainage ditch which flows northwest from the plant building. Routing of the surface water flow system at the site is presented in Figure 5.1. Surface water sampling locations from previous investigations are also presented.

A trap dam was constructed in the mid to late 1970s or early 1980s in the drainage ditch. Two distinct sources of surface water flow discharge into the backwater of the trap dam: a storm sewer pipe, and a drainage ditch. The southernmost source of flow into the trap dam's backwater is from a 24-inch diameter, reinforced concrete storm sewer pipe set in a concrete headwall at sampling point SW-B. The intermittent flow from the pipe is "flashy" in response to precipitation events.

The pipe at sampling point SW-B extends subsurface through the field west of the plant building from a distribution box located within the security fence directly west of the plant building and access road. The pipe passes through or near the purported West Evaporation Pit. The segments of the reinforced concrete pipe are believed to be connected with simple bell joints and, based on water levels in micro-wells PS-27 through PS-30, the pipe appears to act as a sink for groundwater flow during wet portions of the year. The invert elevations are approximately 631.0 and 631.9 feet amsl at the downstream and upstream ends of this pipe, respectively, and groundwater elevations in the field west of the plant building average from approximately 632.0 to 637.8 feet amsl based on piezometer PZ-1, monitoring well DGC-12S, and micro-wells PS-24, PS-25, PS-29 and PS-30.

Three pipes feed into the distribution box, one from the south and two from the east. The southern pipe is an 8-inch diameter, metal storm sewer pipe at sampling point MH-1a. Flow entering the distribution box from this pipe comes primarily from surface water runoff in the west parking lot and southwest corner of the fenced portion of the site via several catch basins. Although design details of this storm sewer are not available, it was apparently added in the early to mid 1970s when the west parking lot was extended to the north; a line of catch basins, connected by subsurface vitreous clay piping, was added along the north and west sides of the original west parking lot and apparently tie into older, corrugated metal drainage pipes. Two sources of flow feed into the catch basin at sampling point MH-2: flow from the catch basin at sampling point MH-3 located approximately 100 feet to the south, and flow from the network of catch basins and subsurface drainage lines in the west parking lot.

The southernmost of the two pipes entering the distribution box from the east is an 18-inch diameter, vitreous clay storm sewer pipe at sampling point MH-1b. The flow in this pipe comes



LEGEND

SW-K ▲	Surface Water Sampling Location
▫	Catch Basin
○	Manhole
---ST---	Storm Sewer Drain

NOTE

See Plate 1 for symbol definitions and other pertinent information.

DUNN ENGINEERING COMPANY
DIVISION OF **RUST** ENVIRONMENT & INFRASTRUCTURE

ROUTING OF THE SURFACE WATER FLOW SYSTEM AND
LOCATION OF SURFACE WATER SAMPLING POINTS
DURING PREVIOUS INVESTIGATIONS

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

PROJECT No. 35126.017	DATE 4/94	DWG. No. 35126-39	SCALE 1"=200'

FIGURE No. 5.1

from surface water runoff from catch basins located in the front lawn and along the eastern side of the fenced portion of the site. In addition, flow from the roof drains located in the southern half of the original plant building is routed to this pipe.

The northernmost of the two eastern pipes entering the distribution box at sampling point MH-1c is from a 15-inch diameter, vitreous clay storm sewer pipe. The flow exiting this pipe comes from roof drains located in the northern half of the original plant building and an abandoned catch basin located at the south end of the building addition constructed in the mid 1970s.

The northernmost source of flow into the backwater of the trap dam is from a drainage ditch running east-west behind the plant building. A broader area exists in the drainage ditch upstream from the trap dam just inside the security fence. Three distinct sources feed into this area, two pipes and a drainage ditch. An 8-inch diameter, corrugated metal pipe extends into this area from the grassy drainage swale running north adjacent to and just inside the security fence to the west of the plant building. Flow in this pipe has only occasionally been observed after heavy rainfall events.

The main pipe which feeds into the broader area of the drainage ditch is a 12-inch diameter, reinforced concrete storm sewer pipe set in a concrete headwall at sampling point SW-M. This storm sewer drain extends along the back side of the plant building, immediately adjacent to the Waste Solvent Tank, and is used primarily to route water discharging from numerous roof drains on the two-story addition constructed on the back of the plant building in the early 1960s. This storm sewer also apparently extends to the compressor building and an abandoned catch basin located at the north end of the addition constructed in the mid 1970s on the west side of the plant building. The drain pipes are constructed of reinforced concrete, cast iron and vitreous clay piping, all probably joined by bell joints which might allow the inflow of groundwater. Based on plant drawings, corrected for datum differences, the invert elevation at sampling point SW-M is approximately 631.9 feet amsl and slopes upward to approximately 634.2 feet amsl near the compressor building. Groundwater elevations average from approximately 631.0 to 636.9 feet amsl in piezometer PZ-8, monitoring well DGC-9S, and micro-wells PS-4 and PS-35.

The third and final source of flow into the broader area of the drainage ditch at the northwest corner of the fenced portion of the site is the drainage ditch which extends along the back side of the plant building immediately north of the access road. This ditch extends half the length of the building. Farther to the east, flow is conveyed in subsurface pipes from various catch basins and the grassy drainage swale which drains the northeast corner of the fenced portion of the site. A few catch basins are located along the subsurface portion. Additionally, the subsurface portion of this drainage route appears to be connected by laterals to the condenser building and an elongated storm water grate located near a receiving dock at the northeast corner of a single-story extension from the addition constructed on the back of the plant building in the early 1960s.

5.2 Measurements of Surface Water Flow in the Drainage Ditch

5.2.1 Weir Design and Flow Calculation

The trap dam constructed in the drainage ditch flowing northwest from the plant is equipped with a rectangular, sharp-crested weir which facilitates measurement of surface water flow. A water release valve is also present in the trap dam which allows the water level behind the trap dam to be controlled; in the open position, the water level behind the trap dam would normally be low. When the valve is closed, which it has been during this and previous investigations, surface water flow is restricted and must pass through the weir.

The basic design of the trap dam and weir is shown in Figure 5.1 of the Phase IV Subsurface Investigation Report. The weir is constructed of plastic and is set into the concrete trap dam. The notch is 1.00 feet wide with a maximum depth of 0.67 feet before exceeding the capacity of the weir. An overflow spillway is also present in the concrete trap dam and is used when the depth of flow in the weir exceeds 0.50 feet. The width of this spillway is 4.00 feet.

The Francis equation (Driscoll, 1986) can be used to estimate the discharge from a rectangular weir with edge constrictions:

$$Q = 3.33\ (L - 0.2H)\ H^{3/2}$$

where Q is the discharge in cubic feet per second (ft^3/sec), L is the width of the weir opening in feet and H is the height of water in the weir relative to the base of the opening. Multiplying by 448.8 converts the discharge from ft^3/sec to gpm.

For the trap dam, when H is less than or equal to 0.50 feet, discharge is simply estimated as follows:

$$Q = 3.33\ (1.0 - 0.2H)\ H^{3/2}$$

where all terms and units are as previously described. When the height of water in the weir exceeds 0.50 feet, flow also occurs in the concrete spillway and can be estimated as follows:

$$Q = 3.33\ (1.0-0.2H)\ H^{3/2} + 3.33\ [4.0-0.2(H-0.5)]\ (H-0.5)^{3/2}$$

where all terms and units are again as previously described.

A convenient rating curve to estimate the flow through the trap dam was provided in the Phase IV investigation report. However, it should be noted that the resulting flow rate is only an estimate for several reasons. First, for the Francis equation to be valid, the following conditions should be met:

- The width of the opening should be four to eight times the height of water in the opening which is not true for the weir when H exceeds 0.25 feet; and,

- H should be measured in the backwater several feet upstream from the actual weir and not at the rectangular notch as was typically done during this and previous investigations for convenience.

Second, the capacity of the weir is exceeded when H exceeds 0.67 feet and the capacity of the overflow spillway is exceeded when H exceeds 1.17 feet. The capacity of the weir is exceeded on rare occasions. The capacity of the overflow spillway has also been exceeded on at least one occassion. Finally, considerable turbulence has been observed in the backwater when H is sufficiently high to cause flow in the spillway. Based on the above, measurements of weir flow are considered most reliable in low flow conditions (e.g., H less than 0.25 feet) while measurements at higher flow rates are considered useful estimates, although potentially low.

5.2.2 Spot Measurements of Weir Flow

Spot measurements of the height of water flowing through the weir were obtained on several occasions prior to and during the Phase IV investigation. Additional measurements were also collected during the RI in coordination with the four monthly water-level measurement events. The various spot measurements were obtained using three different methods.

The earliest data was obtained by measuring the vertical distance from the top of micro-well PS-32 to the water surface. Micro-well PS-32 was installed during the Phase III investigation and is located in the trap dam's backwater adjacent to the concrete bulkhead at sampling point SW-B (see Plate 1). These measurements were originally obtained to assess whether gaining or losing conditions existed at the drainage ditch. However, the elevation of the bottom of the weir plate (i.e., 631.69 feet amsl) was subsequently surveyed and, in conjunction with the measuring point elevation of micro-well PS-32 (i.e., 635.05 feet amsl), allowed calculation of the height of water flowing over the weir.

The second method involved measuring the depth of the water immediately behind the plastic weir plate relative to the bottom of the rectangular cement notch into which the weir is set. The distance from the bottom of the cement notch up to the bottom of the weir notch is known; this distance was manually measured as 0.59 feet on several occasions. Simple subtraction then yields the height of water actually flowing over the weir.

During the latter portion of the Phase IV investigation and during the RI, the height of water flowing in the weir was measured directly. A thin metal measuring tape is placed on the bottom of the rectangular weir notch, held vertically and oriented so as not to disrupt the flow of water. The height of water flowing in the weir is then measured at the leading edge of the measuring tape.

The four spot measurements of the height of water flowing through the weir collected during the RI ranged from 0.01 to 0.09 feet (i.e., August 9 and July 1, 1993, respectively). Thus, surface water flow in the drainage ditch was observed to range from only 1.5 to 39.6 gpm. Pursuant to the approved RI/FS Work Plan, however, these measurements were scheduled so as not to occur directly or immediately after significant precipitation events. Therefore, the calculated flow rates are not representative of the actual range.

The spot measurements of weir flow collected during previous investigations showed considerable variability. These measurements are shown on Table 5.1, along with the measurements obtained during the RI. Based on 73 spot measurements collected at the site, discharge ranged from 1.5 to 276.1 gpm with a arithmetic mean of 42.1 gpm. As will be discussed in the next section, however, even this does not adequately reflect the flashy nature of surface water flow in the drainage ditch.

5.2.3 Continuous Monitoring of Weir Flow

In addition to the spot measurements discussed above, weir flow was continuously monitored during several periods during the Phase IV investigation. The purpose of this monitoring was to obtain more accurate information on the distribution of flow rates to assist in evaluating potential remedial measures and document temporal variability which could correlate with groundwater levels or the concentration of VOCs in the drainage ditch.

The height of water flowing over the weir notch was monitored using a HERMIT 1000B data logger and associated pressure transducer, both manufactured by In-Situ, Inc. A 10 psi transducer with a full range of approximately 23 feet was used to monitor the weir. The reported absolute accuracy of the transducer was 0.1% full range or 0.02 feet at a constant temperature. The sensor was secured in the backwater of the trap dam, typically 0.50 to 0.60 feet below the top of the water surface.

Data were collected automatically during seven periods, as detailed in the Phase IV investigation report. The first period of weir monitoring began on July 6, 1989 and the most recent period for which data are available ended on April 25, 1990. All data were collected using a sampling interval of 15 minutes. A total of 22,166 data points or 230.89 days are available. The height of water flowing over the weir notch ranged from 0.02 to 0.86 feet. Thus, discharge ranged from 4.2 to 2275.1 gpm with an average of 39.6 gpm.

The flow rate through the weir during the first data acquisition period is shown on Figure 5.2 (adapted from Figure 4.15 of the Phase IV Subsurface Investigation Report) and illustrates the nature of the data collected. Weir discharge is flashy in response to precipitation events; however, discharge drops exponentially to base flow conditions soon (i.e., few hours) after precipitation ceases. The peak flow of 2275.1 gpm on July 7, 1989 was the highest estimated during any monitoring period.

Simple summary statistics and frequency distributions were calculated and are presented in the Phase IV investigation report. The mean flow rate was 39.6 gpm. However, the flow rate exceeded 100 gpm about 10% of the time. Moreover, flow rates exceeded 250 and 500 gpm about 3.0 and 0.85% of the time, respectively. These and other frequency distribution data are useful in evaluating remedial alternatives for surface water conditions.

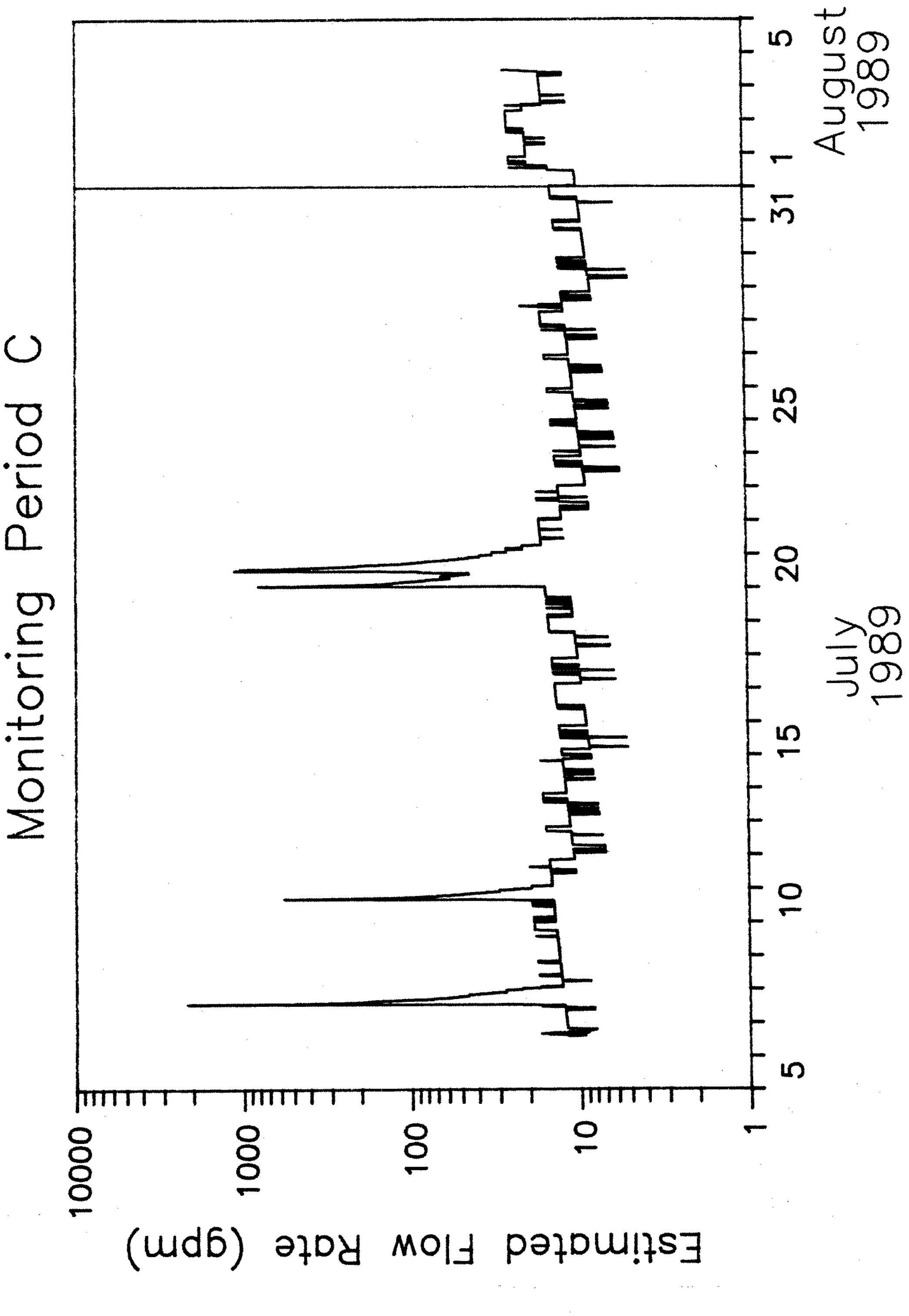
Table 5.1
Spot Measurements of Weir Flow

Former Powerex, Inc. Facility
Auburn, New York

Date	Method	Height (ft)	Flow (gpm)
02-Nov-87	1	0.10	46.3
05-Nov-87	1	0.06	21.7
13-Apr-88	2	0.07	27.3
19-Apr-88	2	0.07	27.3
20-May-88	2	0.17	101.2
02-Jun-88	1	0.09	39.6
03-Jun-88	2	0.07	27.3
08-Jul-88	2	0.04	11.9
08-Aug-88	2	0.11	53.3
24-Aug-88	3	0.13	68.2
31-Aug-88	3	0.10	46.3
07-Sep-88	3	0.11	53.3
16-Sep-88	3	0.12	60.6
19-Sep-88	3	0.10	46.3
20-Sep-88	3	0.10	46.3
22-Sep-88	3	0.06	21.7
26-Sep-88	3	0.09	39.6
27-Sep-88	3	0.10	46.3
28-Sep-88	3	0.10	46.3
29-Sep-88	3	0.08	33.3
30-Sep-88	3	0.09	39.6
03-Oct-88	3	0.10	46.3
04-Oct-88	3	0.09	39.6
05-Oct-88	3	0.08	33.3
06-Oct-88	3	0.10	46.3
18-Oct-88	3	0.13	68.2
19-Oct-88	3	0.09	39.6
24-Oct-88	3	0.13	68.2
01-Nov-88	3	0.13	68.2
04-Jan-89	3	0.05	16.5
08-Feb-89	2	0.11	53.3
03-Apr-89	3	0.34	276.1
11-Apr-89	3	0.04	11.9
17-Apr-89	3	0.04	11.9
02-May-89	3	0.14	76.1
16-May-89	3	0.09	39.6
13-Jun-89	3	0.09	39.6
26-Jun-89	2	0.04	11.9
06-Jul-89	3	0.04	11.9
07-Jul-89	3	0.04	11.9
11-Jul-89	3	0.05	16.5
13-Jul-89	3	0.04	11.9
20-Jul-89	3	0.28	209.0
21-Jul-89	3	0.06	21.7
24-Jul-89	3	0.04	11.9
25-Jul-89	3	0.04	11.9
26-Jul-89	3	0.04	11.9
27-Jul-89	3	0.04	11.9
28-Jul-89	3	0.05	16.5
08-Aug-89	3	0.05	16.5
16-Aug-89	3	0.04	11.9
06-Sep-89	3	0.04	11.9
19-Sep-89	3	0.05	16.5
04-Oct-89	3	0.03	7.7
19-Oct-89	3	0.20	128.3
30-Oct-89	3	0.04	11.9
31-Oct-89	3	0.04	11.9
12-Dec-89	3	0.05	16.5
13-Dec-89	3	0.04	11.9
08-Jan-90	3	0.12	60.6
16-Jan-90	3	0.20	128.3
17-Jan-90	3	0.16	92.6
13-Feb-90	3	0.13	68.2
07-Mar-90	3	0.11	53.3
26-Mar-90	3	0.12	60.6
10-Apr-90	3	0.11	53.3
23-Apr-90	3	0.07	27.3
08-May-90	3	0.06	21.7
24-May-90	3	0.04	11.9
04-May-93	3	0.03	7.7
02-Jun-93	3	0.03	7.7
01-Jul-93	3	0.09	39.6
09-Aug-93	3	0.01	1.5
	Min	0.01	1.5
	Avg	0.09	42.1
	Max	0.34	276.1

Methods:

1. Measurement of the vertical distance to weir backwater from the top of micro-well PS-32 and calculation of H using survey data.
2. Measurement of the total depth of water next to the weir notch followed by subtraction of the height of the notch (i.e., 0.59 feet).
3. Direct measurement of H above the bottom of the weir notch.



ADAPTED FROM FIGURE 4.15 OF THE
PHASE IV SUBSURFACE INVESTIGATION REPORT

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

CONTINUOUS WEIR FLOW RECORDED DURING
MONITORING PERIOD C

FORMER POWEREX, INC. FACILITY
AUBURN, NY

PROJECT No. 35126.017	DATE 12/22/94	DWG. No. 35126-38	SCALE AS SHOWN	FIGURE No. 5.2

5.3 Flow of Surface Water From the Drainage Ditch

At the northwest corner of the site, the drainage ditch extending downstream from the trap dam joins another drainage ditch which runs north between the site and the property immediately to the west. This other drainage ditch carries flow from residential areas south of West Genesee Street and apparently also various catch basins and roof drains on the adjacent property.

As discussed in the Phase IV investigation report, a pipe was uncovered at the confluence of the two drainage ditches by contractors of the adjacent property owners in April 1990. This pipe is believed to be an abandoned agricultural drainage line, and flow has occassionally been observed from this pipe. Prior to uncovering the pipe, this flow appears to have been discharged upward from the pipe to the site's drainage ditch at two seeps, or "springs" for lack of a more appropriate term. The location of the subsurface drainage lines leading to the downstream end of the pipe at sampling point SW-CP is not currently known. However, flow entering a hole upstream was traced to the springs using food coloring, demonstrating some type of connection.

The combined discharge from both drainage ditches, and the pipe, flows under the abandoned Lehigh Valley Railroad bed through a corrugated metal culvert onto Mr. Wait's property. The stream continues to flow to the northwest for approximately 200 feet where it is joined by a stream flowing from the southwest. This stream carries flow from rural areas both north and south of West Genesee Street, as shown in Figure 1.1. The combined discharge from both streams flows north toward Crane Brook. Although a defined stream channel extends to Crane Brook, flow disappears in a series of swallets located just north of Mr. Wait's property. The stream flows directly into Crane Brook only occasionally, most likely after large rainfall events or periods of rapid snow melt.

6.0 HYDROGEOLOGIC CONDITIONS

6.1 Local Climate and Water Budget

The Phase IV investigation report summarized daily climatic data for precipitation and temperature for four National Oceanic and Atmospheric Administration (NOAA) weather stations. The Auburn 2 NE station (index number 0321) is located closest to the site but data collection has not been continuous. Therefore, data from a nearby station, the Cayuga Lock No. 1 station (index number 1265) was used to develop a water budget, the results of which are presented below. This station is located at the northern end of Cayuga Lake, approximately seven miles west-northwest of the site.

The normal annual precipitation in the vicinity of the site is 34.44 inches based on data from the Cayuga Lock No. 1 station over the 30-year period from 1951 to 1980. The normal annual temperature is 47.7 degrees Fahrenheit (°F) based on data from NOAA's Syracuse WSO AP weather station (index number 8383). Thirty-year temperature norms were not available for stations located closer to the site.

The available climatic data were used to perform a water budget. In a water budget, mean monthly potential evapotranspiration (PET) and overland runoff are subtracted from mean monthly precipitation to obtain a water surplus or deficit value for estimating groundwater recharge. Ultimately, an estimate of groundwater recharge can be developed. Normally, a water surplus exists from September through April. During such times, groundwater recharge can occur. The high PET during late spring and summer months creates water deficit conditions which normally prevent significant recharge. During this period of high PET, the moisture content of the soil can drop well below field capacity. The soil moisture deficit must be overcome before recharge can again occur.

As stated above, the average annual precipitation is 34.44 inches in the vicinity of the site. The average annual PET was estimated in the Phase IV Subsurface Investigation Report to be 26.06 inches using Hamon's (1961) methodology. An average of 12.86 inches is available for runoff and recharge and to overcome soil moisture deficits.

Water budget conditions change from year to year as actual climatic conditions deviate from normal. As an illustration, the total annual precipitation at the Cayuga Lock No. 1 station was 33.30, 26.23 and 37.53 inches in 1987, 1988 and 1989, respectively. The estimated total annual PET for these same years was 27.46, 26.73 and 25.91 inches. The estimated annual surplus for 1987 through 1989 was 10.89, 6.13 and 14.77 inches, respectively.

6.2 Conceptual Hydrogeologic System

A conceptual model of the hydrogeologic system at the site was developed, based largely on the information obtained during the extensive Phase IV investigation, and is discussed below. The conceptual model includes three hydrogeologic units: the overburden materials, shallow bedrock and deep bedrock. The units differ in their physical properties, groundwater flow patterns and response to stresses (i.e., seasonal and other climatic changes, precipitation events, pumping, drilling and well completion).

6.2.1 Overburden Unit

The overburden hydrogeologic unit is composed of both the glaciolacustrine material and the underlying glacial till and its thickness ranges from 5 to 25 feet. The average thickness at the site is approximately 15 feet. Based on information collected during the Phase IV investigation, which was confirmed during the RI, the water table generally occurs in this hydrogeologic unit. During the late fall, winter and early spring, the water table occurs very close to the ground surface. However, the water table gets "wicked" down in this fine-grained unit when evapotranspiration (ET) rates increase during the growing season.

With the exception of less permeable surface areas (e.g., parking lots, buildings), precipitation results in a relatively uniform distribution of recharge to the overburden unit. The discharge zones for groundwater flow in the overburden are local. Groundwater flow is directed toward various storm sewers, the drainage ditch running east-west behind the plant building and nearby streams such as Crane Brook to the east of Route 326 and the unnamed stream on Mr. Wait's property to the northwest. There is also a component of downward flow into the underlying shallow bedrock hydrogeologic unit owing to the downward hydraulic gradient.

6.2.2 Shallow Bedrock Unit

The shallow bedrock hydrogeologic unit is composed of the Moorehouse, Nedrow and Edgecliff Members of the Onondaga Formation and the Oriskany and Manlius Formations. This unit varies from 25 to 55 feet thick depending upon (a) the elevation of the base of the Manlius Formation and (b) the bedrock surface elevation. The base of this unit ranges from 45 to 70 feet below grade at the site.

Except for the Oriskany Formation, the shallow bedrock unit is composed of bedded limestones. The Oriskany Formation is only a few inches thick and is represented by phosphatic nodules and sandstone clasts. The limestones are argillaceous and joints are absent or rare in some sections of this hydrogeologic unit. This unit is more permeable than the overlying overburden and the permeability is believed to result from the bedding planes which may be solutionally widened. Based on results of hydraulic monitoring performed during the Phase IV investigation, the horizontal permeability of the shallow bedrock hydrogeologic unit is much greater (i.e., 250 to 500 times) than the vertical permeability.

Water levels in the shallow bedrock hydrogeologic unit are generally above the bedrock surface and below the overburden water table. Recharge to the shallow bedrock is by leakage from the overburden hydrogeologic unit directly above. The shallow bedrock hydrogeologic unit appears to discharge locally at streams such as Crane Brook, where bedrock exposures occur in the stream bed. The shallow bedrock also appears to discharge to the underlying deep bedrock hydrogeologic unit. Although the vertical permeability of the shallow bedrock unit is relatively low, downward leakage may occur due to the large head differences which sometimes occur between this unit and the underlying deep bedrock. Additionally, some natural vertical conduits appear to exist (e.g., swallets northwest of the site) which may "link" the two hydrogeologic units and short-circuit the flow system. The shallow bedrock groundwater may flow toward these localized areas and discharge into the underlying deep bedrock system.

6.2.3 Deep Bedrock Unit

The deep bedrock hydrogeologic system is composed of the Rondout, Cobleskill and Bertie Formations. These formations are composed of bedded dolomites, and some are argillaceous, particularly the Rondout Formation. The lowermost portion of the Manlius Formation, at the contact with the Rondout Formation, may also be part of the deep bedrock hydrogeologic unit. Although drilling did not extend through the entire thickness of the Bertie Formation, the underlying Camillus Formation is, based on regional geologic information, expected to be composed of shale and is, therefore, not considered part of the deep bedrock unit.

The deep bedrock hydrogeologic system has characteristics typical of many carbonate aquifers. In addition to leakage from the overlying shallow bedrock unit, the deep bedrock system appears to receive localized recharge from surface water streams which "sink" at swallets and sinkholes. One such sinking stream is located approximately 2000 feet northwest of the plant building. Another is located approximately one mile west-southwest of the site. As a result of this localized recharge, water levels in the deep bedrock rise rapidly in response to individual precipitation events, sometimes by more than 10 feet. Additionally, seasonal changes in surface water runoff cause water levels to range in excess of 40 feet in the deep bedrock system throughout the year. The deep bedrock system does not appear to discharge locally based on measured water-level elevations, which are significantly lower than the elevation of nearby streams. More investigative activities are currently planned as part of the RI to develop a better understanding of groundwater flow in the deep bedrock unit.

6.3 Response of the Hydrogeologic System

6.3.1 Seasonal Fluctuations

As discussed in the Phase IV Subsurface Investigation Report, water levels fluctuate seasonally in each of the three hydrogeologic units (i.e., overburden, shallow bedrock and deep bedrock). These fluctuations are addressed below.

The water-level fluctuations at well cluster DGC-2 from mid 1987 through mid 1990 were shown in the Phase IV Subsurface Investigation Report. This cluster is located approximately 250 feet west-northwest of the North Evaporation Pit and consists of an overburden and a shallow bedrock monitoring well (i.e., wells DGC-2S and DGC-2B, respectively). The seasonal range in water-level fluctuations in these wells was similar and exceeded 10 feet. High water levels generally occur in the late fall, winter and early spring months and the hydraulic gradient during these times is downward. Water levels generally begin to drop in late spring when water deficit conditions begin due to higher ET rates and significant desaturation of the overburden occurs.

The water-level measurements collected at well cluster DGC-2 during the RI showed a significant drop from May 4 to August 9, 1993. The water level in wells DGC-2S and DGC-2B dropped 7.56 and 6.28 feet, respectively, from May 4 to July 9, 1993. However, the overburden did not become completely desaturated. Upward hydraulic gradients were observed during the driest conditions (i.e., on August 9, 1993), but were downward on the other dates of measurement.

The water-level fluctuations observed at well cluster DGC-3 were also shown in the Phase IV Subsurface Investigation Report. This well cluster is located approximately 700 feet north of the plant building. The seasonal range in water levels exceeded 10 feet. Moreover, based on the water-level measurements, the water table appeared to drop into the shallow bedrock hydrogeologic unit during the driest conditions. This was also observed to occur during the RI, and is the only location where the water table has been observed to occasionally occur within the shallow bedrock. Seasonal desaturation of the overburden unit is less severe in most other locations.

The long-term water-level fluctuations at well cluster B-16 were discussed in the Phase IV Subsurface Investigation Report. This is a four-well cluster located north of the site. A seasonal water-level fluctuation of approximately 10 feet was observed in the overburden unit, which was never observed to be completely desaturated. A downward hydraulic gradient between the overburden and shallow bedrock units was consistently observed. The water level in the shallow bedrock generally paralleled that in the overburden but the seasonal range in the shallow bedrock wells was somewhat smaller (i.e., approximately 6 to 7 feet).

The water-level measurements collected from well cluster B-16 during the RI support the above observations. The water levels in wells B-16OV and B-16S dropped 9.59 and 5.45 feet, respectively, from May 4 to August 9, 1993. A downward hydraulic gradient existed throughout this decline in water levels.

There is a strong downward hydraulic gradient between the shallow and deep bedrock hydrogeologic units, which is illustrated in the Phase IV Subsurface Investigation Report for well cluster B-16. The water-level elevation in the deep bedrock well (i.e., well B-16D) ranged from 22.7 to 57.4 feet lower than the water-level elevation in the shallow bedrock well. The seasonal range of water levels in the deep bedrock exceeded 40 feet. The lowest water-level elevation recorded in well B-16D was 563.43 feet amsl on December 22, 1988. The water-level elevation "peaked" at 599.15 feet amsl on June 26, 1989, after the spring runoff. Water levels in the deep bedrock subsequently receded to 568.82 feet amsl on September 6, 1989. Water levels were also dropping within the overburden materials and the shallow bedrock, although not as dramatically.

The water-level measurements collected from well cluster B-16 during the RI support observations made during the Phase IV investigation. A downward hydraulic gradient existed between the shallow and deep bedrock on all dates of measurement. The water-level elevation in well B-16D fell from 602.65 feet amsl on May 4, 1993 to 566.23 feet amsl on August 9, 1993, a drop of 36.42 feet. The water-level elevation in well B-16S also dropped during this period, but only by 5.45 feet.

The large water-level fluctuations which have been observed in B-16D have also been observed in other deep bedrock monitoring wells. The water-level fluctuations for wells B-2D, B-16D, B-17D and B-22D, for example, were illustrated in the Phase IV Subsurface Investigation Report. These wells are all located near the site boundary in various directions. The response of each of these wells to seasonal changes in climatic conditions is very similar.

6.3.2 Response to Individual Precipitation Events

In addition to seasonal fluctuations, the water-level elevations obtained during the Phase IV investigation showed that the water level in most site wells fluctuates in response to individual precipitation events. This is discussed in greater detail below.

The water levels in some overburden wells have been observed to fluctuate over one foot in response to individual precipitation events. Examples of such response were presented in the Phase IV Subsurface Investigation Report for monitoring wells B-15OV and B-16OV. The response in the overburden hydrogeologic unit is the result of diffuse (i.e., distributed) recharge.

The water-level fluctuations in the deep bedrock hydrogeologic unit are more dramatic, often exceeding 10 feet in response to an individual precipitation event. Such a response is attributed to the localized recharge which occurs at sinking streams (e.g., swallets northwest of the site, sinkhole west-southwest of the site). As discussed in the Phase IV Subsurface Investigation Report, although there is some difference in the response of individual wells, these water-level fluctuations occur in all of the deep bedrock monitoring wells.

In the Phase IV Subsurface Investigation Report, the water-level fluctuations observed in deep bedrock wells B-21D, B-22D and B-23D from October 9 to 28, 1989 were compared to both the flow rate and total flow through the on-site weir and to the amount of precipitation measured at NOAA's Auburn 2 NE weather station. The water levels in the deep wells responded quickly to individual precipitation events and the magnitude of the rise correlated nicely to the amount of localized recharge, indicated by the total flow through the weir.

The shallow bedrock hydrogeologic unit does not display the dramatic fluctuations observed in the deep bedrock in response to individual precipitation events. The water-level elevations in wells B-21I, B-22S and B-23I displayed gradual rises as a result of the precipitation events which occurred from October 9 to 28, 1989. Thus, based upon the data collected during the Phase IV investigation, the shallow bedrock system does not appear to be affected by localized recharge.

6.3.3 Response to Pumping

A step-rate pumping test was performed during the RI to evaluate the response of the shallow bedrock unit to pumping. As discussed in Section 2.9, this test was performed using pumping well PW-1 located adjacent to the North Evaporation Pit. The water-level data collected during the test are shown in Appendix H.1.

The water-level data collected during the test demonstrate that pumping well PW-1 is relatively low yielding. The pumping rate used during the third step of the test was 1.25 gpm. About 17.9 feet of drawdown was observed in the pumping well by the end of this step, and the drawdown was not yet approaching stabilization when the pumping test was terminated. Moreover, at the conclusion of pumping, the water-level elevation in the pumping well was about 608.6 feet amsl. This is significantly below the overburden-bedrock interface, which occurs at about 623.3 feet amsl, and only 4.8 feet above the base of the well. Thus, while the yield of well PW-1 may be affected by seasonal fluctuations, its long-term yield is expected to be less than 1.25 gpm.

Although the step-rate pumping test was of limited duration and the yield of pumping well PW-1 was relatively low, a significant cone of depression was produced in the shallow bedrock unit during the test. Table 6.1 shows the drawdowns which were produced in the pumping well and selected shallow bedrock wells at the conclusion of the first, second and third steps of the test. At the end of the test, drawdowns at a radial distance of 15 feet from the pumping well exceeded 5.0 feet, and drawdowns at a radial distance of 30 feet were observed to be 2.2 feet. Even at a radial distance of 100 feet, a drawdown of 0.8 feet was observed at the end of the test. Thus, based on these data, pumping well PW-1 appears to be capable of producing a significant capture zone if pumped on a long-term basis.

The water-level data collected during the step-rate pumping test indicate that the shallow bedrock is isotropic in the horizontal plane. To monitor the test, shallow bedrock wells were installed at similar radial distances along two "spokes" extending outward from the pumping well in two different directions. One spoke has an azimuth of 345° and includes wells OW-1, DGC-8B and OW-2 at radial distances of 15, 35 and 100 feet, respectively. The other spoke has an azimuth of 210° and includes wells OW-3, OW-4 and OW-5 at radial distances of 15, 30 and 100 feet, respectively. As shown on Table 6.1, the drawdowns measured along the two spokes were very similar, indicating little or no anisotropy. As discussed in Section 6.4.2, however, the vertical permeability of the shallow bedrock unit appears to be much lower than its horizontal permeability.

Drawdown was also measured in the overburden unit in response to groundwater withdrawal from the shallow bedrock unit during the step-rate pumping test. Overburden monitoring wells DGC-8S and DGC-9S both showed a response to pumping. Approximately 1.3 feet of drawdown was measured at DGC-8S, located about 35 feet from the pumping well. In well DGC-9S, located about 145 feet from the pumping well, a drawdown of 0.33 feet was measured. These data suggest that the overburden and shallow bedrock units are interconnected. However, the drawdowns measured in the overburden unit were not expected given its fine-grained nature and the limited duration of the step-rate pumping test, and it is possible that well construction methods may have influenced the above results. Wells DGC-8S and DGC-9S were both installed in a sand pack placed directly on top of the bedrock surface. Thus, drawdown in the shallow bedrock unit could "drain" groundwater from the overburden wells, which in turn could bias water-level measurements. Drawdowns measured in the corresponding shallow bedrock wells (i.e., 2.2 and 0.17 feet in wells DGC-8B and DGC-9B, respectively) support this as a possible interpretation. Regardless, the overburden and shallow bedrock units are interconnected to some degree and some dewatering of the overburden unit would be expected to result from long-term pumping in the shallow bedrock unit.

Table 6.1
Measured Drawdowns During Step-Rate Pumping Test

Former Powerex, Inc. Facility
Auburn, New York

Well	Distance from Pumping Well (feet)	Drawdown After 1st Step (feet)	Drawdown After 2nd Step (feet)	Drawdown After 3rd Step (feet)
PW-1	0	3.5	6.5	17.9
OW-1	15	1.7	3.0	5.0
OW-3	15	1.9	3.3	5.2
DGC-8B	35	0.72	1.4	2.2
OW-4	30	0.71	1.4	2.2
OW-2	100	*	*	*
OW-5	100	0.21	0.42	0.76

Note:

"*" designates erratic, unusable data collected.

Short-term pumping tests were also performed in monitoring wells DGC-9B and DGC-12B to confirm the low yield of the shallow bedrock hydrogeologic unit. These tests are discussed in Section 2.9. The water-level data collected during these tests are shown in Appendices H.2 and H.3, respectively.

The yield of monitoring well DGC-9B was very low. In fact, a pumping rate of 0.07 gpm could not be sustained. Intermittent pumping at a variable rate produced in excess of 18 feet of drawdown in the pumping well. No drawdown was observed in well DGC-9S, the corresponding overburden well, during this short-term pumping test. Given the response of these wells during the step-rate pumping test performed on well PW-1, these data suggest that the response of monitoring well DGC-9B to pumping may not be representative.

A yield of about 1.25 gpm was sustained during the short-term pumping test performed on monitoring well DGC-12B. Moreover, drawdown in this well was observed to stabilize quickly at about 4.7 feet. Given that the available drawdown in the pumping well exceeded 10 feet without any desaturation of the well screen, the potential yield of DGC-12B is believed to be considerably higher. Overburden wells DGC-12S and DGC-12I were also monitored during this short-term pumping test. No drawdown was observed in well DGC-12S, the shallower of the two overburden monitoring wells installed at this location. However, about 0.75 feet was observed in well DGC-12I. The screen and sand pack of this well are installed directly on the bedrock surface. Given the short duration of this test, these data may indicate that drawdown in the shallow bedrock unit during pumping caused some "draining" of groundwater from well DGC-12I, biasing the water-level data.

6.3.4 Effects of Drilling and Well Completion

Bedrock drilling activities in the early part of the Phase IV investigation resulted in several open bedrock boreholes extending to depths of 100 feet below grade. At a few locations (i.e., B-2, B-3 and B-9), water could be heard running down the sides of the open bedrock boreholes, indicating that these boreholes were potentially connecting zones of differing hydraulic head. Screened wells were subsequently constructed at these locations to prevent continued flow.

As a result of the above, a prototype borehole flowmeter was used in the other open bedrock boreholes. Results are presented in the Phase IV investigation report and indicated that some downward flow was occurring in most of the boreholes. As a result, all of the deep open bedrock boreholes were converted into monitoring wells, except at location B-12 where a submersible pump was inextricably lodged in the borehole. A thick bentonite pellet seal was placed above the well screen and sand pack but the remainder of the annular space was not grouted. This allowed for monitoring of the shallow and deep bedrock units in the same bedrock borehole. As discussed in Section 2.10, most of these open annular spaces were permanently abandoned during the RI.

The potential effects of drilling were also illustrated by water-level data collected during the drilling of well cluster B-28. The deep bedrock borehole at this location temporarily (i.e., less than 24 hours) connected the shallow and deep bedrock units after drilling the fourth run (i.e., 65 to 80 feet below grade). The water level in the borehole dropped and water could be heard flowing down the sides of the borehole. Additionally, in the short time before well B-28D was completed, the water levels in nearby deep bedrock wells B-5D and B-18D rose several feet. Water-level recovery was initiated as soon as the well screen, bentonite pellet seal and grout for well B-28D were installed. Drilling of the bedrock boreholes for wells B-28I and B-28S did not result in any water-level fluctuations in the deep bedrock unit. However, the water level in shallow bedrock well B-18I was observed to drop whenever bedrock drilling was occurring at location B-28 due to the "pumping" effect of the air rotary drilling method.

6.4 Hydraulic Properties

6.4.1 Hydraulic Properties of the Overburden Unit

During the Phase II, III and IV investigations, in-situ hydraulic conductivity tests were performed in seven overburden monitoring wells (i.e., DGC-1S, DGC-2S, DGC-3S, DGC-4S, DGC-11S, B-15OV and B-16OV) and piezometer PZ-1. Results indicated that the horizontal hydraulic conductivity of the overburden materials ranged over two orders of magnitude from 0.051 to 5.5 feet/day (1.8×10^{-5} to 1.9×10^{-3} cm/sec). The geometric mean horizontal hydraulic conductivity was approximately 0.63 feet/day (2.2×10^{-4} cm/sec). This value is at the upper range of the permeabilities expected for glacial tills (Freeze and Cherry, 1979; Fetter, 1980) and is higher than anticipated for the glaciolacustrine silts and clays.

As discussed in Section 2.6, in-situ hydraulic conductivity testing was also performed during the RI. Four overburden wells were tested (i.e., DGC-8S, DGC-9S, DGC-12S, DGC-12I). The results are summarized in Table 6.2 and are presented in detail in Appendix G.1. The horizontal hydraulic conductivity of the overburden materials for these wells ranged from 0.018 to 1.2 feet/day (6.4×10^{-6} to 4.3×10^{-4} cm/sec), with a geometric mean horizontal hydraulic conductivity of 0.42 feet/day (1.5×10^{-4} cm/sec). These results are similar to the results obtained during previous investigations.

Shelby tube samples were obtained from the glaciolacustrine material and the glacial till in borings located near the North Evaporation Pit during the Phase IV investigation. These samples were analyzed for various physical properties including vertical hydraulic conductivity. The vertical permeability of the glaciolacustrine material was measured as 4.9×10^{-5} feet/day (1.7×10^{-8} cm/sec). The vertical permeability of the glacial till was half an order of magnitude higher at 1.8×10^{-4} feet/day (6.5×10^{-8} cm/sec). These data suggest that the overburden materials are potentially highly anisotropic (i.e., horizontal permeability several orders of magnitude higher than the vertical permeability). Even the lowest horizontal hydraulic conductivity measured in an overburden well [i.e., 0.018 feet/day (6.4×10^{-6} cm/sec) for DGC-12S] is two orders of magnitude greater than the measured vertical permeabilities. It should be noted, however, that the "scale" of the two types of tests differs and that the laboratory tests of vertical permeability may not consider permeability which could be associated with secondary porosity features such as desiccation cracks, root channels and animal burrows due to the smaller volume of material which is tested.

Table 6.2
Hydraulic Conductivity Test Results for the Overburden Unit

Former Powerex, Inc. Facility
Auburn, New York

Well	Date Tested	Slug Tests Number Performed	Slug Tests Number Analyzed	Hvorslev Method Avg Kh (cm/sec)	Hvorslev Method Avg Kh (ft/day)	Bouwer & Rice Method Avg Kh (cm/sec)	Bouwer & Rice Method Avg Kh (ft/day)
DGC-8S	7/22/93	2	2	2.2×10^{-3}	6.21	1.43×10^{-3}	4.1
DGC-9S	7/22/93	2	2	4.3×10^{-4}	1.14	3.0×10^{-4}	0.84
DGC-12S	7/23/93	1	1	6.4×10^{-6}	0.02	4.0×10^{-6}	0.011
DGC-12I	7/22/93	2	2	8.2×10^{-5}	0.23	6.1×10^{-5}	0.17
Geometric Mean				1.5×10^{-4}	0.42	NC	NC

Notes:
1. Kh designates horizontal hydraulic conductivity.
2. Average Kh value shown is the arithmetic mean.
3. "NC" designates not calculated.
4. Overburden well DGC-13S was dry and, therefore, was not tested.

The total porosity of the Shelby tube samples was also determined by laboratory testing. The total porosity for the glaciolacustrine material and the glacial till were 44.9 and 32.7%, respectively. The value measured for the glaciolacustrine material is consistent with ranges presented in Freeze and Cherry (1979) and Fetter (1980); the value for the glacial till is higher than the range presented in Fetter (1980), perhaps owing to the high percentage of silts and clays (i.e., greater than 85%) in the glacial till at the site.

Effective porosity is the ratio of the void space through which groundwater flow occurs to the total volume. The effective porosity is expected to be less than the total porosity discussed above, especially for fine-grained materials such as those at the site. The value of effective porosity is important because it is often used in conjunction with the permeability and hydraulic gradient to calculate the average linear velocity of groundwater flow.

The effective porosity of the overburden unit was estimated during the Phase IV investigation by analyzing the water-level fluctuations in overburden wells B-15OV and B16OV in response to precipitation events of known magnitude. The data which was collected indicated effective porosities of 10.2 and 10.5%, respectively. Therefore, the effective porosity of 10 to 20% assumed for the overburden materials during the Phase III investigation for calculation of the average linear velocity of groundwater flow seems reasonable.

6.4.2 Hydraulic Properties of the Shallow Bedrock Unit

In-situ hydraulic conductivity tests were performed in 20 shallow bedrock monitoring wells during the Phase III and Phase IV investigations. These were B-7S, B-8S, B-9S, B-12S, B-16S, B-20S, B-22S, B-24S, B-26S, B-28S, DGC-1B, DGC-2B, DGC-3B, DGC-4B, DGC-5B, DGC-6B, DGC-7B, DGC-8B and DGC-10B. The horizontal hydraulic conductivity of the shallow bedrock ranged from 0.022 to 18 feet/day (7.8 x 10^{-6} to 6.4 x 10^{-3} cm/sec). The geometric mean horizontal hydraulic conductivity was approximately 2.9 feet/day (1.0 x 10^{-3} cm/sec) based on results from all of the wells listed above. This value is higher than that calculated for either the overburden or deep bedrock units.

In-situ hydraulic conductivity tests were also performed during the RI. Six shallow bedrock monitoring wells were tested (i.e., DGC-12B, OW-1, OW-2, OW-3, OW-4, OW-5). The results are presented in Appendix G.2 and G.3 and are summarized in Table 6.3. For these tests, the horizontal hydraulic conductivity of the shallow bedrock ranged from 0.28 to 5.1 feet/day (9.9 x 10^{-5} to 1.8 x 10^{-3} cm/sec) and the geometric mean horizontal hydraulic conductivity was approximately 2.2 feet/day (7.7 x 10^{-4} cm/sec). These results also compare favorably with those obtained during previous investigations.

Analysis of the slug and bail tests assumed isotropic conditions where (a) the horizontal and vertical hydraulic conductivity are equal and (b) the horizontal hydraulic conductivity is evenly distributed over the screened or open interval. This assumption is not true for the shallow bedrock unit in which the permeability results primarily from discrete bedding planes which are nearly horizontal (i.e., dip of only about 35 feet/mile). Thus, the horizontal hydraulic conductivity is expected to be greater than the vertical hydraulic conductivity.

Table 6.3
Hydraulic Conductivity Test Results for the Shallow Bedrock Unit

Former Powerex, Inc. Facility
Auburn, New York

Well	Date Tested	Slug Tests		Hvorslev Method		Bouwer & Rice Method	
		Number Performed	Number Analyzed	Avg Kh (cm/sec)	Avg Kh (ft/day)	Avg Kh (cm/sec)	Avg Kh (ft/day)
DGC-12B	7/22/93	2	2	9.1×10^{-4}	2.58	NA	NA
OW-1	7/23/93	2	2	9.9×10^{-5}	0.28	NA	NA
OW-2	7/23/93	2	2	1.4×10^{-3}	3.90	NA	NA
OW-3	7/23/93	2	2	1.6×10^{-3}	4.42	NA	NA
OW-4	7/23/93	2	2	6.0×10^{-4}	1.71	NA	NA
OW-5	7/23/93	2	2	1.8×10^{-3}	5.16	NA	NA
Geometric Mean				7.7×10^{-4}	2.17	NA	NA

Notes:
1. Kh designates horizontal hydraulic conductivity.
2. Average Kh value shown is the arithmetic mean.
3. "NA" designates not applicable.

The anisotropic nature of the shallow bedrock is strongly supported by the geologic, hydraulic and chemical information collected at the site. The shallow bedrock is composed of the Moorehouse, Nedrow and Edgecliff Members of the Onondaga Formation. As described in Section 4.0, the Moorehouse and Nedrow Members are thin- to medium-bedded, argillaceous limestones with frequent shale partings. Although dipping joints are frequent in the Nedrow Member, they are less frequent or absent in the Moorehouse Member. The Edgecliff Member of the Onondaga Formation is a more massive limestone and joints are rare. The shale partings, lack of pervasive joints and argillaceous nature of the shallow bedrock result in a lower vertical hydraulic conductivity.

The hydraulic data obtained during the Phase IV investigation also support a lower vertical hydraulic conductivity for the shallow bedrock. First, as discussed in the Phase IV Subsurface Investigation Report, due to localized recharge at sinking streams, water levels in the deep bedrock fluctuate significantly (i.e., often greater than 10 feet) in response to individual precipitation events. If the shallow bedrock was vertically conductive, these fluctuations would be transmitted upward from the deep bedrock into the shallow bedrock. Upward propagation of these "waves" was not observed, however, supporting the conclusion that the shallow bedrock unit is not vertically conductive.

As an illustration, water levels were recorded continuously at wells B-16S and B-16D during a portion of the Phase IV investigation. The water level in deep bedrock well B-16D rose more than 10 feet and peaked late on May 13, 1989 in response to 1.53 inches of rainfall recorded at NOAA's Cayuga Lock No. 1 weather station on May 10 to 12, 1989. A second peak occurred late on May 16, 1989 in response to an additional 0.94 inches of rainfall on May 15 and 16, 1989. The water level in shallow bedrock well B-16S rose only 0.9 feet in response to these precipitation events, less than 10% that of the deep bedrock well. Moreover, the water level in well B-16S peaked on May 12, 1989, prior to peak water levels in well B-16D. This is inconsistent with upward propagation of a wave.

Second, the hydraulic data collected during the drilling of well cluster B-28 also shows that the vertical hydraulic conductivity of the shallow bedrock is much lower than the horizontal hydraulic conductivity. The deep borehole at this location temporarily (i.e., less than 24 hours) connected the shallow and deep bedrock units after drilling the fourth run (i.e., 65 to 80 feet below grade). In the short time before well B-28D was completed, the water levels in nearby deep bedrock monitoring wells B-5D and B-18D rose several feet. These wells are located approximately 550 and 350 feet from well B-28D, respectively. Based on concurrent water-level measurements collected at wells B-5I and B-18I, this water-level "pulse" was not transmitted upward into the shallow bedrock, another indication of the low vertical hydraulic conductivity of this unit.

Even though the shallow bedrock is not vertically conductive, the hydraulic data indicate that it is relatively transmissive in the horizontal direction. The water level in shallow bedrock well B-18I dropped during periods in which bedrock drilling was being performed at well cluster B-28, located 350 feet to the northwest. These fluctuations were the result of the "pumping" action of the air rotary drilling method. These data also appear to confirm that the horizontal hydraulic conductivity of the shallow bedrock unit is much greater than its vertical hydraulic conductivity.

Third and finally, the large differences in hydraulic head between the shallow and deep bedrock wells also suggest that the shallow bedrock is anisotropic with a relatively low vertical hydraulic conductivity. Head differences in excess of 50 feet have been observed between the shallow and deep bedrock wells based on data collected during both the Phase IV investigation and the RI. These head differences can not be supported without a low vertical hydraulic conductivity.

During the Phase IV investigation, Darcy's law was used in conjunction with a mass balance approach to estimate the vertical hydraulic conductivity of the shallow bedrock unit. Darcy's law can be stated as:

$$K_v = q/i_v$$

where K_v is the vertical hydraulic conductivity (feet/day), q is the specific discharge (feet/day) and i_v is the vertical hydraulic gradient (feet/feet). The specific discharge is defined as the volume rate of flow through any cross-sectional area perpendicular to the direction of flow.

The specific discharge and vertical hydraulic gradient can both be estimated for a given period of time. During periods of little or no recharge, the water table drops in the overburden unit. Assuming this change is entirely due to vertical leakage through the shallow bedrock unit in response to the downward hydraulic gradients, the specific discharge can be estimated by:

$$q = n\ (Hov_1 - Hov_2)\ /\ (T_1 - T_2)$$

where n is the effective porosity of the overburden unit, Hov is the hydraulic head in an overburden well (feet) and T is time (days). The subscripts 1 and 2 refer to the beginning and end of the period, respectively. An effective porosity of 10% was used for the overburden unit based on data presented in the previous section.

If some precipitation occurs during the period, it can be incorporated by assuming complete infiltration and modifying the above equation as follows:

$$q = [n\ (Hov_1 - Hov_2) + P]\ /\ (T_1 - T_2)$$

where P is the precipitation received during the period (feet) and other terms are as previously defined.

The average vertical hydraulic gradient for a given period of time can be estimated by:

$$i_v = (Hs_1 + Hs_2 - Hd_1 - Hd_2)\ /\ [2\ (Zs - Zd)]$$

where Hs is the hydraulic head in a shallow bedrock well (feet), Hd is the hydraulic head in a corresponding deep bedrock well (feet) and Zs and Zd are the assumed elevations of the shallow and deep bedrock wells, respectively. The subscripts 1 and 2 again refer to the beginning and end of the time period. The assumed elevations may be the top, middle or bottom of the open intervals, and the elevations of the top of the open intervals were used here.

Combining the above equations yields:

$$K_v = 2\ (Zs\text{-}Zd)\ [n\ (Hov_1\text{-}Hov_2) + P]\ /\ [(Hs_1\text{+}Hs_2\text{-}Hd_1\text{-}Hd_2)\ (T_1\text{-}T_2)]$$

where all terms are as previously defined.

The above equation was used in the Phase IV Subsurface Investigation Report to estimate the vertical hydraulic conductivity of the shallow bedrock unit. Water-level data collected on August 8, August 23 and September 6, 1989 at well clusters B-15 and B-16 were employed. Water levels dropped steadily during this period and the total rainfall measured at NOAA's Auburn 2 NE weather station was only 0.82 inches. Well clusters B-15 and B-16 were selected because overburden wells are present in addition to shallow and deep bedrock wells. Results of the calculation indicated a vertical hydraulic conductivity of about 0.013 feet/day (4.7×10^{-6} cm/sec). Incorporating the precipitation increased this estimate only slightly, to 0.016 feet/day (5.6×10^{-6} cm/sec).

As discussed previously, analysis of in-situ hydraulic conductivity tests has assumed isotropic conditions. The vertical hydraulic conductivities calculated independently above can assist in the analysis of the test data. Different values of the transformation ratio, which relates the horizontal and vertical permeabilities, were used in a trial-and-error approach until results "matched" the vertical hydraulic conductivity estimated above. The degree of anisotropy and horizontal hydraulic conductivity were then determined with the appropriate transformation ratio. Reanalysis of the slug and bail test data indicated that the horizontal hydraulic conductivities presented in the Phase IV Subsurface Investigation Report for the shallow bedrock unit could be 45 to 60% higher (i.e., less than a two-fold increase). Thus, for the testing performed during the Phase IV investigation, the geometric mean horizontal hydraulic conductivity could actually be 4.2 to 4.6 feet/day (1.5×10^{-3} to 1.6×10^{-3} cm/sec), suggesting that the horizontal hydraulic conductivity of the shallow bedrock is 250 to 500 times higher than the vertical hydraulic conductivity. Although not performed, the test results obtained during the RI could also be reanalyzed assuming anisotropic conditions.

6.4.3 Hydraulic Properties of the Deep Bedrock Unit

In-situ hydraulic conductivity tests were performed during the Phase IV investigations in 27 deep bedrock monitoring wells. The horizontal hydraulic conductivity of the deep bedrock ranged from 0.051 to 18 feet/day (1.8×10^{-5} to 6.4×10^{-3} cm/sec). No additional results were performed during the RI because additional deep bedrock wells have not yet been installed.

Most of the deep bedrock monitoring wells which were tested had similar open intervals, with 5- to 30-foot screens typically set at 70 to 100 feet below grade. However, wells B-11D, B-12D, B-14D, B-21D, B-22D and B-23D were anomalous; well B-12D was an open bedrock borehole, wells B-11D and B-14D had unusually long screens (i.e., greater than 50 feet) and wells B-21D, B-22D and B-23D each have two screens separated by a short section of "blank" riser material. In addition, wells B-1D and CH-1D displayed water levels higher than the other deep wells and are also considered anomalous. Ignoring the test results for these anomalous wells, the geometric mean horizontal hydraulic conductivity of the deep bedrock was estimated to be 0.71 feet/day

(2.5×10^{-4} cm/sec). This value is lower than that calculated using the same methodology for the shallow bedrock unit.

6.5 Groundwater Flow

6.5.1 Groundwater Flow Within the Overburden Unit

As discussed in the Phase IV Subsurface Investigation Report, the seasonal range in water levels in some overburden wells exceeds 10 feet, with high water levels generally occurring in the late fall, winter and early spring months when ET rates are lowest. Figure 1.2 presents the water-table contour map for the overburden unit on February 13, 1990, during the Phase IV investigation, when water levels were high. Water levels were generally less than 1 to 2 feet below ground surface, and the water table is generally shown to subtly mimic the topography.

Away from the plant building, overburden groundwater flow tends to be directed toward natural surface water bodies such as Crane Brook to the east of Route 326 and the unnamed stream on Mr. Wait's property to the northwest of the site. However, nearer to the plant building, overburden groundwater flows (a) toward the drainage ditch which runs east-west behind the plant building, (b) toward various storm sewer drains and (c) seemingly inward toward the plant itself.

During the late fall, winter and early spring months, water-level elevations collected during the Phase IV investigation from overburden piezometers PZ-9 and PZ-10, located within the drainage ditch between the North Evaporation Pit and Waste Solvent Tank, were similar and were generally higher than the water level in the drainage ditch, indicating that the drainage ditch acts as a discharge zone during these periods (i.e., effluent conditions exist). During the growing season, when ET rates are higher and the overburden water levels drop, the water-level elevation in PZ-9 and PZ-10 fell well below the water level in the drainage ditch. These conditions were also generally confirmed during the RI. Influent conditions exist during these periods and the drainage ditch appears to act as a localized source of water to the overburden unit.

The storm sewer drains also appear to act as localized discharge zones for the overburden groundwater during periods of high water levels. Micro-wells were installed during the Phase III investigation to determine if the storm sewer drain running through the field west of the plant building was acting as a groundwater discharge zone. Micro-wells PS-27 and PS-28 were installed within the fill material directly adjacent to and on opposite sides of the storm sewer. Micro-wells PS-29 and PS-30 were installed to similar depths 10 to 20 feet away from the storm sewer. As shown in the Phase IV Subsurface Investigation Report, during periods of high water levels, the water-level elevations in micro-wells PS-27 through PS-30 were higher than both the storm sewer invert elevation and the elevation of the notch in the trap dam's weir. Moreover, the water-level elevations in PS-29 and PS-30 were generally higher than the water-level elevations in PS-27 and PS-28. These data indicated that groundwater flow in the overburden unit is directed toward the storm sewer drain during periods of high water levels.

During the growing season, however, the lower reach of the storm sewer drain in the field west of the plant building appears to act as a source of water to the overburden materials. The water-level elevations in PS-27 through PS-30 drop below the invert elevation. Moreover, the water levels in PS-27 and PS-28, located immediately adjacent to the storm sewer, did not drop as low as the water levels in PS-29 and PS-30. Thus, groundwater flow during dry periods of the year appears to be away from this portion of the storm sewer.

The seemingly inward flow of overburden groundwater toward the plant building may be the result of (a) the network of storm and sanitary sewer lines around and under the plant building and/or (b) a "recharge shadow". A recharge shadow is produced when natural recharge is limited by an impervious surface (e.g., parking lot, building) and downward hydraulic gradients exist. When recharge to the overburden is reduced or eliminated over a certain area, the natural downward flow is no longer balanced and water levels drop. Eventually, a new "equilibrium" condition is attained and the downward flow under the impervious surface is balanced by inward flow to that area.

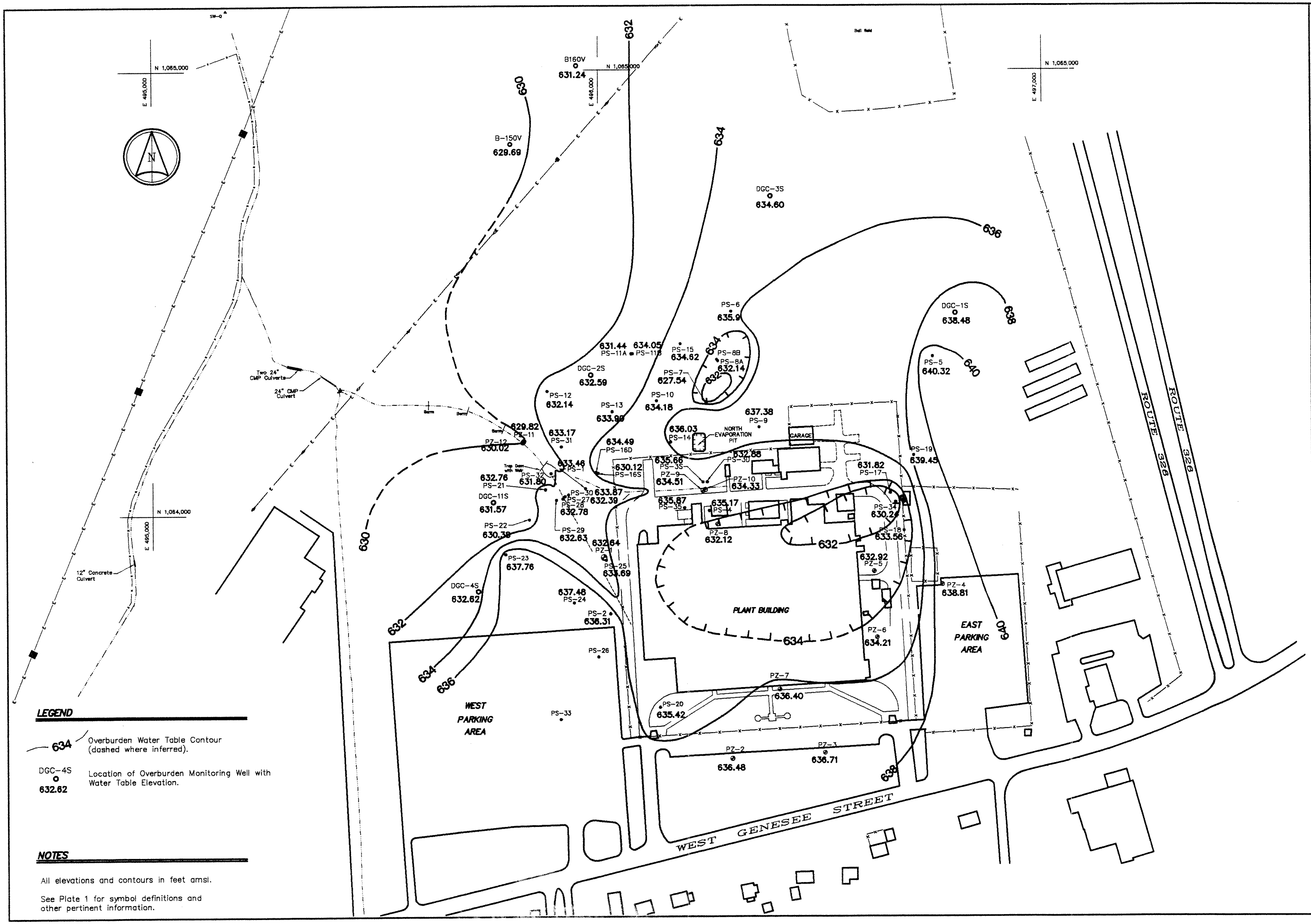
The changes which occurred in the overburden groundwater flow system as water levels dropped during the RI are shown in Figures 6.1 and 6.2. These figures present the water-table contour maps for May 4 and August 9, 1993, respectively. As shown, the direction of groundwater flow in many areas changes when the water levels decline, primarily because the water table drops below many portions of the drainage ditch and storm sewer drain system and conditions appear to change from effluent to influent.

Several features of the overburden water table are persistent, as shown in the Phase IV Subsurface Investigation Report and Figures 6.1 and 6.2. A groundwater divide occurs in the field and parking lot located east of the plant building; overburden groundwater east of this divide flows toward Crane Brook while that west of the divide flows toward the plant or to the northwest toward the unnamed stream on Mr. Wait's property. Persistent, localized groundwater mounds occur in the general vicinity of (a) the southern portion of the field west of the plant building, (b) the Waste Solvent Tank area and (c) the lawn in front of the site but north of the visitor's parking lot. These mounds are bounded by discharge zones such as the drainage ditch, storm sewer drains and the plant building. Persistent high water levels also occur in the central and southern portions of the west parking lot.

Because the groundwater flow pattern and hydraulic gradients change through time, it is difficult to provide values for the average linear velocity of groundwater flow within the overburden unit. However, in the fields west and north of the plant building, horizontal hydraulic gradients from the Phase IV investigation generally ranged from 0.023 to 0.080 feet/feet and from 0.0094 to 0.023 feet/feet, respectively. The higher gradients in the field west of the plant building appear to result from the influence of the nearby storm sewer drain. The geometric mean hydraulic conductivity was estimated as 0.63 feet/day during the Phase IV investigation and the effective porosity was estimated to range from 10 to 20%. The average linear velocity (v) of groundwater flow is given by:

$$v = Ki/n$$

where K is the hydraulic conductivity, i is the hydraulic gradient and n is the effective porosity.



LEGEND

634 — Overburden Water Table Contour (dashed where inferred).

DGC-4S ○ 632.62 — Location of Overburden Monitoring Well with Water Table Elevation.

NOTES

All elevations and contours in feet amsl.

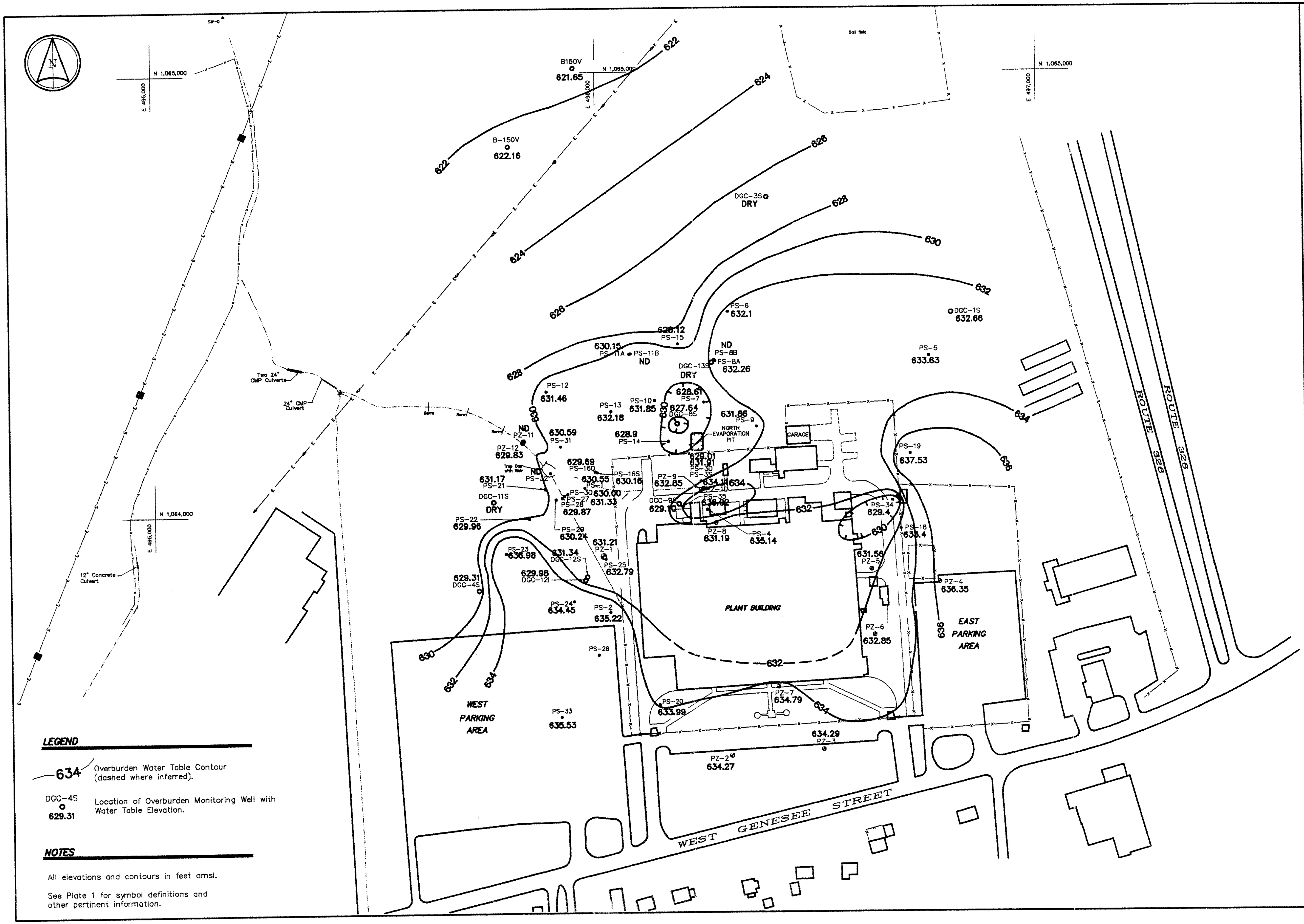
See Plate 1 for symbol definitions and other pertinent information.

WATER TABLE MAP FOR THE OVERBURDEN
UNIT ON MAY 4, 1993

POWEREX, INC. FACILITY
AUBURN, NEW YORK

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT No. 35126.017
DATE 4/94
DWG. No. 35126-25
SCALE 1"=200'
FIGURE No. 6.1



LEGEND

634 Overburden Water Table Contour (dashed where inferred).

DGC-4S
629.31
Location of Overburden Monitoring Well with Water Table Elevation.

NOTES

All elevations and contours in feet amsl.

See Plate 1 for symbol definitions and other pertinent information.

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

WATER TABLE MAP FOR THE OVERBURDEN UNIT ON AUGUST 9, 1993

POWEREX, INC. FACILITY
AUBURN, NEW YORK

PROJECT No. 35126.017	DATE 4/94
DWG. No. 35126-04	SCALE 1"=200'
FIGURE No. 6.2	

Use of the above equation resulted in predicted velocities of 0.03 to 0.14 feet/day in the field north of the plant and 0.073 to 0.50 feet/day in the west field. It is important to note, however, that there is also a downward component of the hydraulic gradient into the shallow bedrock unit.

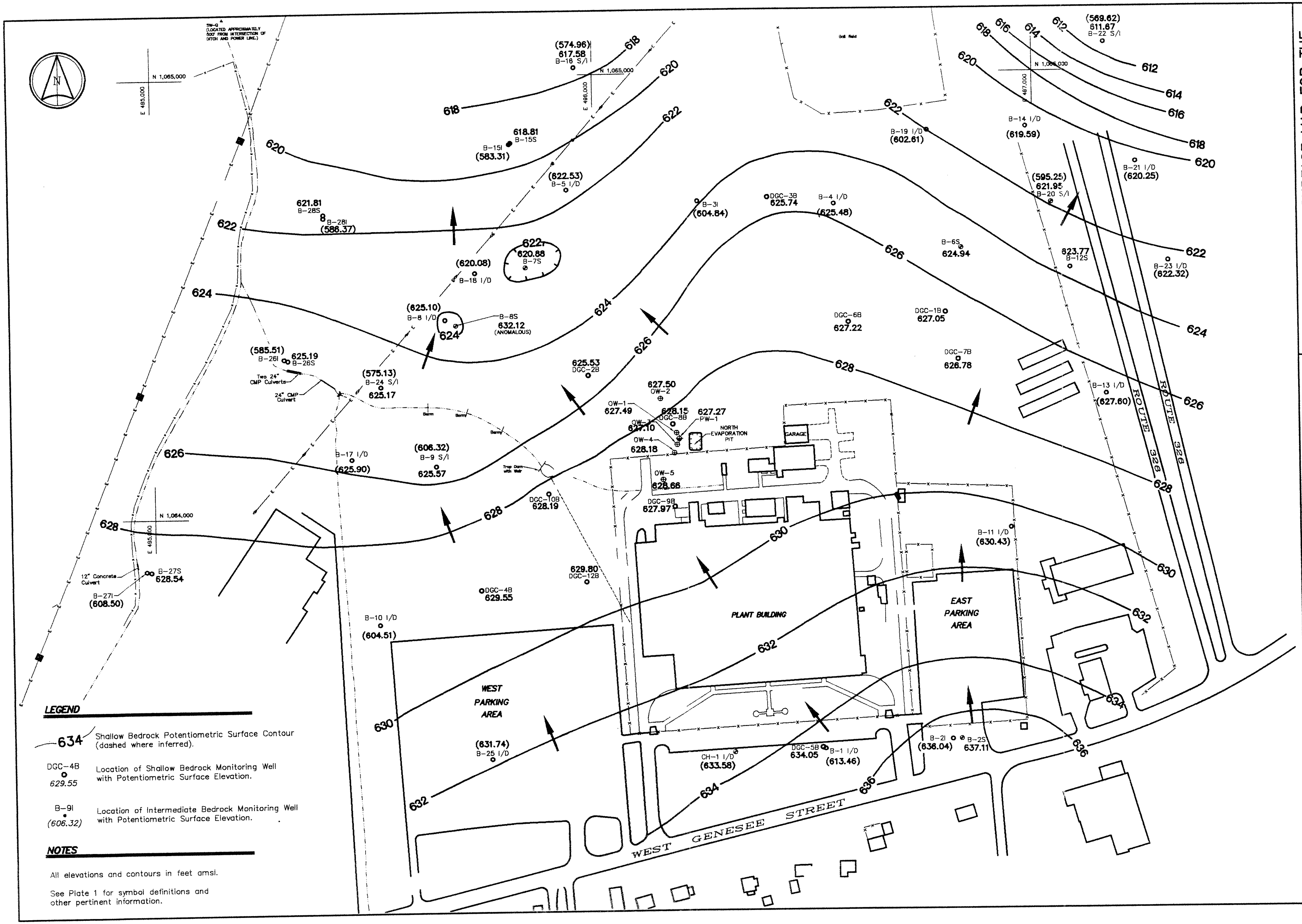
Based upon data collected during the RI, horizontal hydraulic gradients in the field west of the plant building ranged from 0.0043 to 0.13 feet/feet. North of the plant building, gradients generally ranged from 0.0059 to 0.25 feet/feet. The geometric mean hydraulic conductivity calculated for the overburden unit during the RI was estimated as 0.25 feet/day (8.8×10^{-5} cm/sec) and the effective porosity was again estimated to range from 10 to 20%. Thus, using Darcy's law, the average linear velocity of groundwater flow appears to be from 0.0107 to 0.31 feet/day in the west field and 0.015 to 0.62 feet/day north of the plant building.

6.5.2 Groundwater Flow Within the Shallow Bedrock Unit

As discussed in the Phase IV Subsurface Investigation Report, the seasonal range in the water levels in the shallow bedrock hydrogeologic unit exceeds 10 feet in some wells, with high water levels occurring in late fall, winter and early spring. However, unlike the overburden, these seasonal fluctuations do not cause significant changes in the pattern of groundwater flow in the shallow bedrock unit.

Figure 1.3 presents the piezometric surface for the shallow bedrock unit on February 13, 1990, a period of the Phase IV investigation when water levels were high. The highest water-level elevations occurred in the vicinity and south of the plant building and flow in these areas was generally directed northward. A groundwater divide occurred in the shallow bedrock unit, extending north from the plant building toward the baseball field. East of this divide, groundwater flow was generally toward Crane Brook which represents a potential discharge zone. Bedrock outcrops have been observed in the stream bed of Crane Brook at some locations, most notably to the north of the site close to Route 20. To the west of the groundwater divide, flow in the shallow bedrock was generally toward the northwest. Potential discharge zones for this flow were identified as (a) the unnamed stream on Mr. Wait's property, (b) the swallets northwest of the site which appear to mark the location of a natural connection between surface water and the deep bedrock system and (c) Crane Brook to the north of the site. It is important to note that the North Evaporation Pit, purported West Evaporation Pit and Waste Solvent Tank area are located to the west of the shallow bedrock groundwater divide, and flow in these areas is toward the northwest.

Figures 6.3 and 6.4 present the shallow bedrock piezometric surface on May 4 and August 9, 1993, respectively. During this period of the RI, water levels in the shallow bedrock unit declined substantially. However, as the water levels decline from late spring through summer, the direction of groundwater flow did not change significantly. In fact, these piezometric surface maps are very similar to those presented in the Phase IV Subsurface Investigation Report for the water-level data collected on February 13, 1990 and August 23, 1989, respectively. The groundwater divide extending north from the plant building is persistent although it appears to be somewhat less prominent during dry periods than during wet periods.



LEGEND

634 Shallow Bedrock Potentiometric Surface Contour (dashed where inferred).

DGC-4B 629.55 Location of Shallow Bedrock Monitoring Well with Potentiometric Surface Elevation.

B-9I (606.32) Location of Intermediate Bedrock Monitoring Well with Potentiometric Surface Elevation.

NOTES

All elevations and contours in feet amsl.

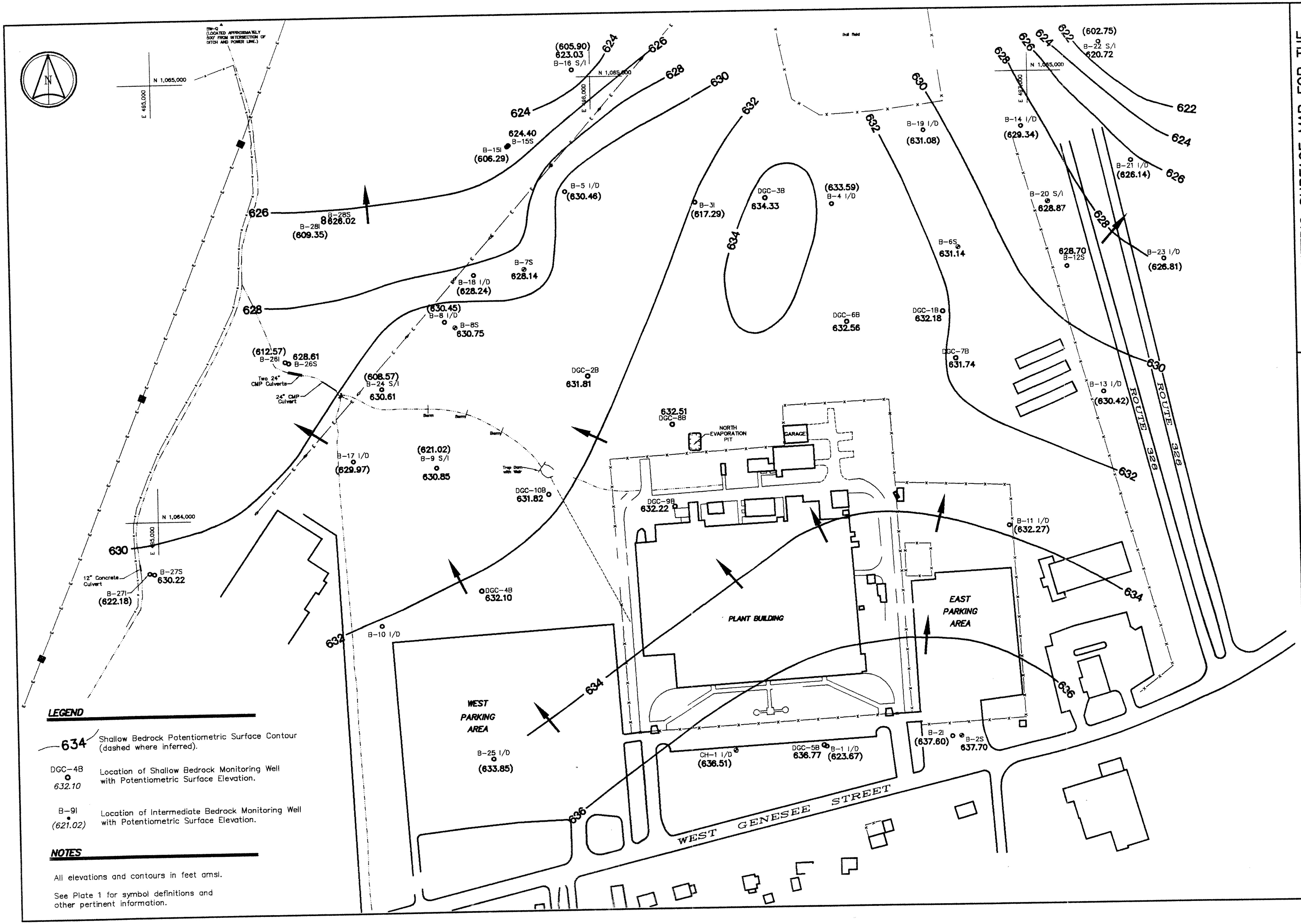
See Plate 1 for symbol definitions and other pertinent information.

POTENTIOMETRIC SURFACE MAP FOR THE SHALLOW BEDROCK UNIT ON AUGUST 9, 1993

POWEREX, INC. FACILITY
AUBURN, NEW YORK

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT No. 35126.017 | DATE 8/94 | DWG. No. 35126-41 | SCALE 1"=200' | FIGURE No. 6.4



LEGEND

634 Shallow Bedrock Potentiometric Surface Contour (dashed where inferred).

DGC-4B ○ 632.10 Location of Shallow Bedrock Monitoring Well with Potentiometric Surface Elevation.

B-9I ● (621.02) Location of Intermediate Bedrock Monitoring Well with Potentiometric Surface Elevation.

NOTES

All elevations and contours in feet amsl.

See Plate 1 for symbol definitions and other pertinent information.

POTENTIOMETRIC SURFACE MAP FOR THE SHALLOW BEDROCK UNIT ON MAY 4, 1993

POWEREX, INC. FACILITY
AUBURN, NEW YORK

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE No.	6.3
SCALE	1"=200'
DWG. No.	35126-40
DATE	8/94
PROJECT No.	35126.017

Groundwater flow within the shallow bedrock unit is believed to be primarily along bedding planes, perhaps widened by solution. The velocity of flow will vary considerably within and between individual bedding planes and fractures. Nevertheless, the rate of flow has been estimated herein using Darcy's law. The geometric mean horizontal hydraulic conductivity of the shallow bedrock was calculated during the Phase IV investigation as 2.9 feet/day (1.0×10^{-3} cm/sec), which is generally consistent with results obtained during the RI. The horizontal hydraulic gradient within the shallow bedrock unit does not generally exceed 0.015 feet/feet. Using the above and an effective porosity of 1%, as assumed during the Phase III investigation, yields a generalized rate of groundwater flow of approximately 4.4 feet/day.

The geometric mean horizontal hydraulic conductivity of the shallow bedrock unit was calculated as 2.2 feet/day (7.7×10^{-4} cm/sec) based on data collected during the RI. Based on Figures 6.3 and 6.4, the maximum horizontal hydraulic gradient within the shallow bedrock unit is about 0.023 feet/feet. Using Darcy's law and the assumed effective porosity of 1% yields a generalized rate of groundwater flow of approximately 5.1 feet/day, similar to that calculated during previous investigation.

It should be noted that the above calculations are very sensitive to the assumed value of the effective porosity. An effective porosity of 5%, for example, would result in estimated groundwater flow velocities of only 0.88 to 1.0 feet/day. Nevertheless, these rates are considerably higher than those estimated for the overburden unit and, as discussed in Section 7.4, the extent of VOCs in the shallow bedrock unit is greater than in the overburden unit.

6.5.3 Groundwater Flow Within the Deep Bedrock Unit

The water-level elevations in the deep bedrock wells fluctuate considerably, but are generally lower in elevation than the nearby surface water bodies which would typically act as discharge zones. The elevation of Crane Brook, the stream into which surface water at the site occasionally flows, is between 600 and 610 feet amsl to the north of the site. Water-level data presented in the Phase IV Subsurface Investigation Report have been as low as 555 to 565 feet amsl. Thus, Crane Brook does not appear to be the discharge zone for the deep bedrock groundwater. During the RI, similar water-level elevations were obtained in numerous deep bedrock monitoring wells on August 9, 1993. Thus, the deep bedrock groundwater appears to flow to a more distant, regional discharge zone.

Attempts to "map" the piezometric surface of the deep bedrock system have not been successful. The water levels in many of the deep bedrock wells are very similar indicating low hydraulic gradients. Those wells with dissimilar water-level elevations seem anomalously low (e.g., B-2D located in the southeast corner of the site, B-23D located east of Route 326) or were anomalously high due to aspects of well construction (e.g., B-11D located just north of the east parking lot). Additional activities are planned as part of the RI to develop a better understanding of the deep bedrock hydrogeologic system.

7.0 NATURE AND EXTENT OF CONTAMINANTS

7.1 General

This section addresses the nature and extent of contaminants in the surface water, subsurface soils in source areas, and overburden, shallow bedrock and deep bedrock groundwater. Results from previous investigations and the RI are both discussed. Investigative results from the Laboratory Waste Solvent Tanks IRM are also discussed.

Sampling and analytical activities have been performed during the RI to confirm the results of the previous phases of investigation at the site. Surface water samples were collected from five locations including two locations representing background conditions (i.e., sampling points SW-S and SW-T). These samples were collected to evaluate surface water quality at and downstream from the site, evaluate current conditions and confirm previous investigation results. The background samples were collected for comparison purposes.

Subsurface soil samples were collected from one boring location during the installation of monitoring wells in the vicinity of the purported West Evaporation Pit. These samples were collected in a continuing attempt to confirm and/or refute the existence of the purported West Evaporation Pit. Several subsurface soil samples were also collected from the soil borings associated with the Laboratory Waste Solvent Tanks IRM. The soil borings at the Laboratory Waste Solvent Tanks were performed to determine the nature and extent of any contamination in this area.

Groundwater samples were collected from selected existing and newly-installed wells in the overburden, shallow bedrock and deep bedrock units. This included the sampling of wells deemed representative of background conditions in each of these units (i.e., overburden well B-16OV; shallow bedrock well B-27S; and deep bedrock wells B-13D and B-25D).

Additional well installation and sampling is planned during the ongoing RI. However, the results of previous investigations and the analyses performed thus far during the RI are summarized below to support decision-making regarding an interim remedial action.

7.2 Surface Water

7.2.1 Results of Previous Investigations

Surface water samples were obtained from three locations (i.e., sampling locations SW-A, SW-B and SW-C) on November 4, 1987 during the Phase III investigation and analyzed for VOCs. Results indicated that VOCs were present in the drainage ditch flowing to the northwest from the plant building. TCE and 1,2-DCE were the primary VOCs detected, but bromodichloromethane, chloroform, PCE, TCA and vinyl chloride were also detected in one or more samples. The concentration of total VOCs at the site boundary was 85 micrograms per liter (ug/l).

Additional surface water samples were collected on June 3, 1988 during the initial stages of the Phase IV investigation to confirm conditions in the drainage ditch. Samples were obtained from two locations; one sample was collected from immediately behind the spillway of the trap dam (i.e., sampling location SW-G) and the other sample was collected near the site boundary (i.e., sampling location SW-C). Both samples were analyzed for VOCs, and results confirmed the presence of VOCs in the drainage ditch. TCE, 1,2-DCE and chloroform were the only VOCs detected, and the concentrations were considerably lower than previous results (i.e., less than 20 ug/l of total VOCs near the property line).

Surface water samples were also obtained on two other occasions during the Phase IV investigation for laboratory analysis. On February 13, 1990 samples were obtained from eight locations, including at least one background location, and analyzed for VOCs. No VOCs were detected in the background sample obtained at sampling location SW-O. TCE, 1,2-DCE and chloroform were detected in the other samples obtained in the drainage ditch at and downstream from the site. TCA was also detected in one sample. The concentration of total VOCs at the site boundary was 167 ug/l.

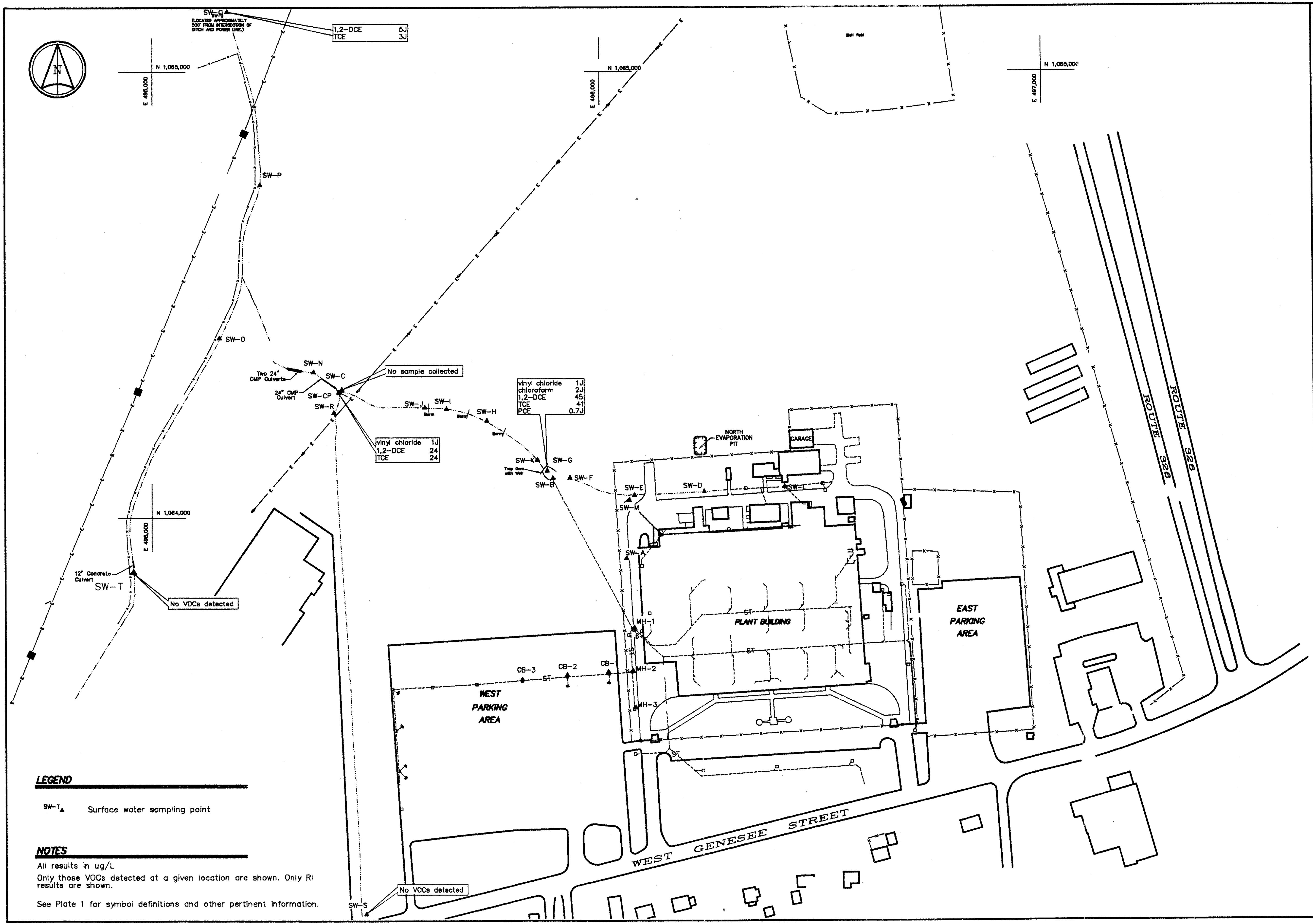
Surface water samples were also obtained on May 2, 1990 from four locations (i.e., sampling locations SW-C, SW-CP, SW-K and SW-Q) and analyzed for VOCs. TCE and 1,2-DCE were detected in these samples. Chloroform, vinyl chloride and acetone were also detected in one or more of the samples. At the site boundary, the concentration of total VOCs was about 96 ug/l.

A portable GC was used during the Phase IV investigation to analyze numerous surface water samples. This facilitated "mapping" the distribution of VOCs in surface water at the site by sampling at numerous locations (see Figure 7.1). TCE and 1,2-DCE were found to occur in the storm sewer drains located in the northeast corner of the west parking lot and in the field west of the plant building. Flow from the storm sewer drain which runs along the back of the plant building, adjacent to the Waste Solvent Tank area, was found to contain PCE, TCA and xylenes in addition to TCE and 1,2-DCE. TCE, 1,2-DCE and PCE were found to occur in the drainage ditch running behind the plant building, upstream from the trap dam. Other results are discussed below.

7.2.1.1 Volatile Organics in Storm Sewers

Sampling point SW-B is located at the outfall of the storm sewer which flows through the field west of the plant building. This location was sampled once for laboratory analysis during the Phase III investigation and sampled numerous times during the Phase IV investigation for analysis with a portable GC. The laboratory results showed chloroform at 11 ug/l, cis-1,2-DCE at 92 ug/l, TCE at 97 ug/l and vinyl chloride at 5 ug/l. Results from the portable GC showed consistent detection of TCE and 1,2-DCE. Notably, however, PCE, TCA, ethylbenzene and xylenes were not detected.

A distribution box is located in the storm sewer upstream from sampling point SW-B. Surface water exiting the distribution box and flowing toward sampling location SW-B was sampled once for laboratory analysis during the Phase III investigation. This sampling point, originally designated SW-A, was redesignated MH-1 during the Phase IV investigation. Laboratory results



LEGEND

SW-T ▲ Surface water sampling point

NOTES

All results in ug/L

Only those VOCs detected at a given location are shown. Only RI results are shown.

See Plate 1 for symbol definitions and other pertinent information.

DUNN ENGINEERING COMPANY

DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

SURFACE WATER SAMPLING LOCATIONS AND VOLATILE ORGANIC RESULT FOR RI

POWEREX, INC. FACILITY
AUBURN, NEW YORK

PROJECT No. 35126.017

DATE 1/95

DWG. No. 35126-42

SCALE 1"=200'

FIGURE No. 7.1

indicated chloroform at 16 ug/l, 1,2-DCE at 11 ug/l and TCE at 14 ug/l. Comparison with laboratory results obtained from a concurrent sample from sampling point SW-B, presented above, appears to indicate that the concentration of VOCs increases along this storm sewer pipe in a downstream direction, probably due to the infiltration of contaminated groundwater in the field west of the plant building. This is supported by results obtained with the portable GC. On-site analysis of a sample collected from sampling point MH-1 on February 13, 1990 showed no detectable VOCs while a sample obtained concurrently at sampling point SW-B revealed TCE at 131 ug/l and 1,2-DCE at 23 ug/l.

The flow into the distribution box at sampling point MH-1a was sampled on five occasions and analyzed with the portable GC. TCE and 1,2-DCE were consistently detected. Toluene was detected at trace concentrations on one occasion.

Several catch basins located upstream from sampling point MH-1a have been sampled and analyzed using the portable GC to determine the extent of VOCs. The flow exiting sampling point MH-2 was analyzed on four occasions and TCE and 1,2-DCE were consistently detected. Toluene was detected at trace concentrations on one occasion. Sampling point MH-3 was sampled on two occasions and results indicated no detectable VOCs. VOCs were, however, detected in some of the catch basins located in the northeast corner of the west parking lot, although at progressively lower concentrations in an upstream direction (i.e., sampling points CB-1 to CB-3). These three catch basins were sampled on several occasions. TCE and 1,2-DCE were the only compounds detected at sampling points CB-1 and CB-2. Xylenes were detected at sampling point CB-3 at trace concentrations on one occasion; no other VOCs were detected.

Flow exiting the storm sewer pipe at sampling point MH-1b in the distribution box was sampled on five occasions for analysis with the portable GC. A trace concentration of TCE was detected on only one occasion. Thus, storm water flow entering the distribution box at sampling point MH-1b is considered to be free of VOCs.

The surface water exiting into the distribution box from the pipe at sampling point MH-1c has been sampled five times. Analysis with the portable GC has shown only occasional detections of TCE and 1,2-DCE, at concentrations up to 10 and 3 ug/l, respectively.

Another storm sewer pipe discharges flow into the drainage ditch at an outfall located at sampling point SW-M. Surface water samples were collected here on numerous occasions during the Phase IV investigation for analysis with the portable GC. TCE, 1,2-DCE and PCE were routinely detected. Xylenes were also detected. Ethylbenzene, toluene and TCA were occasionally detected. The storm water drain which flows to sampling point SW-M runs along the Waste Solvent Tank area and the above-mentioned VOCs have been found to occur in the groundwater in this area.

7.2.1.2 Volatile Organics in the Drainage Ditch

Surface water was sampled in the drainage ditch approximately 50 feet upstream from the trap dam at sampling point SW-F on numerous occasions during the Phase IV investigation and analyzed using the portable GC. Results showed TCE and 1,2-DCE at concentrations up to 107 and 34 ug/l, respectively. PCE was also detected. Xylenes were detected occasionally. TCA, ethylbenzene and toluene were also detected on one occasion. It is worth noting that PCE, TCA, ethylbenzene and xylenes were not detected in surface water samples obtained from sampling point SW-B or associated sampling points upstream from this source of flow into the trap dam's backwater.

Farther upstream in the drainage ditch, surface water was sampled at sampling points SW-D and SW-E on numerous occasions during the Phase IV investigation for analysis by the portable GC. Sampling point SW-E is located just upstream from the outfall at sampling point SW-M. TCE and 1,2-DCE were routinely detected at this location. PCE was also detected. Sampling point SW-D is located immediately south of the North Evaporation Pit and is upstream from sampling point SW-E. TCE and 1,2-DCE were detected at this location, as was PCE. Toluene was occasionally detected at low concentrations (i.e., less than 10 ug/l) at both sampling locations SW-D and SW-E. It is worth noting that TCA, ethylbenzene and xylenes were not detected at these two sampling points.

Flow exiting the catch basin at sampling point SW-L, located upstream of the drainage ditch, was sampled on two occasions during the Phase IV investigation. Analysis with the portable GC revealed no detectable VOCs. Thus, surface water flow from areas east of sampling point SW-L is considered to be free of VOCs.

Based on the results of previous investigations, there appeared to be three sources of VOCs to the surface water entering the backwater of the trap dam. These sources are:

- Infiltration of overburden groundwater containing VOCs (i.e., TCE, 1,2-DCE, vinyl chloride) into storm sewer pipes adjacent to and within the field west of the plant building;
- Infiltration of overburden groundwater containing VOCs (i.e., TCE, 1,2-DCE, PCE, TCA, xylenes) into the storm sewer pipe running along the Waste Solvent Tank area at the northwest corner of the plant building; and,
- Discharge of overburden groundwater containing VOCs (i.e., TCE, 1,2-DCE and PCE) into the drainage ditch, especially near the northwest corner of the plant building.

7.2.1.3 Temporal Variability of Volatile Organics in the Drainage Ditch

The results of the laboratory and field analyses conducted during the Phase IV investigation indicate that the concentration of VOCs in surface water is temporally variable at any given location. The temporal variability of TCE and 1,2-DCE concentrations at the trap dam was illustrated in the Phase IV Subsurface Investigation Report using the portable GC results. Concentrations varied by more than an order of magnitude; TCE and 1,2-DCE ranged from nondetectable levels (i.e., less than 1 ug/l) to 85 and 29 ug/l, respectively. Similar temporal variability was observed at other locations and, at some locations, was confirmed by laboratory results.

The results of both laboratory and field analyses conducted in the Phase IV investigation showed that the highest concentrations are generally observed during the late fall, winter and early spring. Groundwater levels and base flow at the trap dam's weir are generally highest during these months. Thus, higher concentrations could result from (a) decreased volatilization due to lower temperatures and/or (b) increased flow of groundwater with VOCs from the overburden unit to the storm sewer pipes and the drainage ditch.

In addition to seasonal variability, the concentration of VOCs in surface water also displayed short-term fluctuations, presumably resulting from individual precipitation events. Data obtained with the portable GC from samples collected before and after an intense rainfall on July 7, 1989, during the Phase IV investigation, indicate a complex response. For example, at sampling point SW-M, the concentration of PCE increased (i.e., 8 to 871 ug/l) after the rainfall event and xylenes, previously nondetectable, were detected at about 238 ug/l. Similar changes were noted at sampling point SW-F located just downstream. The response at the trap dam, however, was much different, presumably due to influx of large amounts of storm water with nondetectable or low concentrations of VOCs at sampling point SW-B. Results from sampling point SW-G showed that the concentrations of TCE and 1,2-DCE dropped from 11 and 17 ug/l to trace and nondetectable concentrations, respectively, after the rainfall. Further, no PCE was detected. The response at the trap dam was also confirmed by laboratory analyses performed on surface water samples collected throughout a rainfall event on August 28, 1992.

7.2.1.4 Surface Water Downstream from the Trap Dam

The concentration of VOCs generally decreases in the drainage ditch downstream from the trap dam (i.e., downstream from sampling point SW-K). This decrease in concentrations is attributed to additional volatilization and to dilution with other surface water and discharging groundwater.

The abandoned agricultural drainage pipe uncovered at sampling point SW-CP was sampled for laboratory analysis during the Phase IV investigation. Discharge from this pipe contained VOCs, namely acetone, chloroform, TCE, 1,2-DCE and vinyl chloride. Although the detection of acetone was suspect, the presence of TCE and 1,2-DCE was supported by laboratory results. Thus, flow from this pipe may be an additional source of VOCs to surface water.

The stream channel just downstream from the abandoned railroad bed which runs along the northwest boundary of the site was sampled at sampling point SW-N during the Phase IV investigation for laboratory analysis. Results indicated chloroform, TCE and 1,2-DCE at concentrations of 6, 120 and 59 ug/l, respectively. TCE and 1,2-DCE were also detected in samples obtained for field analysis with the portable GC. The concentrations at sampling point SW-N were generally half of those observed at the site boundary.

During the Phase IV investigation, surface water samples were also obtained at sampling point SW-Q on two occasions for laboratory analysis. TCE and 1,2-DCE were detected at concentrations up to 41 and 28 ug/l, respectively. Although substantial reductions are achieved, volatilization to nondetectable levels does not appear to occur at all times of the year before the surface water seeps into the swallets. Thus, surface water at the site can be a potential source of VOCs to groundwater.

7.2.2 Remedial Investigation Results

During the RI, surface water samples were collected from five locations (i.e., sampling points SW-G, SW-CP, SW-Q, SW-S and SW-T) on June 8, 1993. The location of these sampling points are presented on Plate 1. Sampling points SW-S and SW-T are background locations. Samples SW-G, SW-S and SW-T were analyzed for the complete TCL/TAL list of parameters using the DEC's ASP methodologies. The remaining samples were analyzed for TCL volatiles using ASP/CLP Method 91-1. Analytical results are presented in Tables 7.1 through 7.4.

7.2.2.1 Volatile Organics

No VOCs were detected in the two background samples collected at locations SW-S and SW-T. VOCs were, however, detected in surface water samples collected at and downstream from the site. Sample SW-G, collected at the trap dam, showed detectable concentrations of TCE, 1,2-DCE, vinyl chloride, chloroform and PCE. TCE and 1,2-DCE were the only VOCs detected at sampling points SW-CP and SW-Q. The analytical data for VOCs indicate that samples SW-G, SW-CP and SW-Q exhibited concentrations of TCE in excess of New York State's guidance value of 11 ug/l for Class C waters.

7.2.2.2 Semi-Volatile Organics

With the exception of bis(2-ethylhexyl)phthalate, no semi-volatile organic compounds (SVOCs) were detected in samples SW-G, SW-S or SW-T. Bis(2-ethylhexyl)phthalate was detected at concentrations equal to or less than 0.7J ug/l in all three samples, including the two samples collected at background locations. However, the detection of this compound is attributed to laboratory and/or sampling artifacts.

7.2.2.3 Pesticides/PCBs

No pesticides were detected in the surface water samples collected from sampling points SW-G, SW-S and SW-T. Likewise, no PCBs were detected.

7.2.2.4 Inorganics

Analytical results for the TAL inorganic parameters indicate no detectable cyanide in samples SW-G, SW-S and SW-T. Not unexpectedly, however, metals were detected. Aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium and zinc were detected in all three samples. Moreover, the concentration of each of these metals was lower in sample SW-G, collected at the site, than in either of the two background samples collected at locations SW-S and SW-T. Thus, the occurrence of these metals are not believed to be site-related.

In addition to the above, chromium, copper and lead were detected in the two background samples. These metals were not, however, detected in surface water at the site (i.e., sampling point SW-G).

Table 7.1
Surface Water Analytical Data
Volatile Organics
Former Powerex, Inc. Facility
Auburn, New York

Sampling Date: June 8, 1993

Sample ID Compound	SW-G	SW-CP	SW-Q	X-1 (SW-Q)	SW-S (Background)	SW-T (Background)	Standard/ Guidance Value
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U	---
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U	---
Vinyl Chloride	1 J	1 J	10 U	10 U	10 U	10 U	---
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U	---
Methylene Chloride	10 U	10 U	10 U	10 U	10 U	10 U	---
Acetone	10 U	10 U	10 U	10 U	10 U	10 U	---
Carbon Disulfide	10 U	10 U	10 U	10 U	10 U	10 U	---
1,1-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	---
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	---
1,2-Dichloroethene (total)	45	24	5 J	5 J	10 U	10 U	---
Chloroform	2 J	10 U	10 U	10 U	10 U	10 U	---
1,2-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	---
2-Butanone	10 U	10 U	10 U	10 U	10 U	10 U	---
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	---
Carbon Tetrachloride	10 U	10 U	10 U	10 U	10 U	10 U	---
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U	10 U	---
1,2-Dichloropropane	10 U	10 U	10 U	10 U	10 U	10 U	---
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	---
Trichloroethene	41	24	3 J	3 J	10 U	10 U	11GV H(B)
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U	10 U	---
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	---
Benzene	10 U	10 U	10 U	10 U	10 U	10 U	6GV H(B)
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	---
Bromoform	10 U	10 U	10 U	10 U	10 U	10 U	---
4-Methyl-2-Pentanone	10 U	10 U	10 U	10 U	10 U	10 U	---
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U	---
Tetrachloroethene	0.7 J	10 U	10 U	10 U	10 U	10 U	1GV H(B)
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	10 U	10 U	---
Toluene	10 U	10 U	10 U	10 U	10 U	10 U	---
Chlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	5 (A)
Ethylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	---
Styrene	10 U	10 U	10 U	10 U	10 U	10 U	---
Total Xylenes	10 U	10 U	10 U	10 U	10 U	10 U	---

Results expressed in ug/L.
U indicates that the compound was not detected at the quantitation limit indicated.
J indicates that the value reported is estimated.
GV indicates that the value shown is a guidance value rather than a standard.
H(B) indicates that the value listed is based on protection for human consumption of fish.
(A) indicates that the value listed is based on protection for fish propagation or wildlife consumption of fish.
Sample X-1 is a blind sample obtained at sampling location SW-Q.
--- indicates that no standard or guidance value exists for Class C water.

Table 7.2
Surface Water Analytical Data
Semi-Volatile Organics
Former Powerex, Inc. Facility
Auburn, New York

Sampling Date: June 8, 1993

Sample ID Compound	SW-G	SW-S (Background)	SW-T (Background)	Standard/ Guidance Value
Phenol	10 U	10 U	11 U	5 (A) (a)
bis(2-Chloroethyl)Ether	10 U	10 U	11 U	---
2-Chlorophenol	10 U	10 U	11 U	1 (A) (b)
1,3-Dichlorobenzene	10 U	10 U	11 U	5 (A) (c)
1,4-Dichlorobenzene	10 U	10 U	11 U	5 (A) (c)
1,2-Dichlorobenzene	10 U	10 U	11 U	5 (A) (c)
2-Methylphenol	10 U	10 U	11 U	5 (A) (a)
2,2'-oxybis(1-Chloropropane)	10 U	10 U	11 U	---
4-Methylphenol	10 U	10 U	11 U	5 (A) (a)
N-Nitroso-Di-n-Propylamine	10 U	10 U	11 U	---
Hexachloroethane	10 U	10 U	11 U	---
Nitrobenzene	10 U	10 U	11 U	---
Isophorone	10 U	10 U	11 U	---
2-Nitrophenol	10 U	10 U	11 U	5 (A) (a)
2,4-Dimethylphenol	10 U	10 U	11 U	5 (A) (a)
bis(2-Chloroethoxy)Methane	10 U	10 U	11 U	---
2,4-Dichlorophenol	10 U	10 U	11 U	1 (A) (b)
1,2,4-Trichlorobenzene	10 U	10 U	11 U	5 (A) (b)
Naphthalene	10 U	10 U	11 U	---
4-Chloroaniline	10 U	10 U	11 U	---
Hexachlorobutadiene	10 U	10 U	11 U	1.0 (A)
4-Chloro-3-Methylphenol	10 U	10 U	11 U	1 (A) (a)
2-Methylnapthalene	10 U	10 U	11 U	---
Hexachlorocyclopentadiene	10 U	10 U	11 U	0.45 (A)
2,4,6-Trichlorophenol	10 U	10 U	11 U	1 (A) (b)
2,4,5-Trichlorophenol	25 U	25 U	28 U	1 (A) (b)
2-Chloronaphthalene	10 U	10 U	11 U	---
2-Nitroaniline	25 U	25 U	28 U	---
Dimethyl Phthalate	10 U	10 U	11 U	---
Acenaphthylene	10 U	10 U	11 U	---
2,6-Dinitrotoluene	10 U	10 U	11 U	---
3-Nitroaniline	25 U	25 U	28 U	---

Results expressed in ug/L.
U indicates that the compound was not detected at the quantitation limit indicated.
J indicates that the value reported is estimated.
S indicates that the value reported is suspected to be due to laboratory contamination.
GV indicates that the value listed is a guidance value rather than a standard.
H(B) indicates that the value listed is based on protection for human consumption of fish.
(A) indicates that the value listed is based on protection for fish propagation or wildlife consumption of fish.
--- indicates that no standard or guidance value exists for Class C water.
(a) indicates standard applies to total unchlorinated phenolic compounds.
(b) indicates standard applies to total chlorinated phenolic compounds.
(c) indicates standard applies to sum of dichlorobenzenes.

Table 7.2 (Continued)
Surface Water Analytical Data
Semi-Volatile Organics
Former Powerex, Inc. Facility
Auburn, New York

Sampling Date: June 8, 1993

Sample ID Compound	SW-G	SW-S (Background)	SW-T (Background)	Standard/ Guidance Value
Acenaphthene	10 U	10 U	11 U	---
2,4-Dinitrophenol	25 U	25 U	28 U	1 (A) (b) or 5 (A) (a)
4-Nitrophenol	25 U	25 U	28 U	1 (A) (b) or 5 (A) (a)
Dibenzofuran	10 U	10 U	11 U	---
2,4-Dinitrotoluene	10 U	10 U	11 U	---
Diethylphthalate	10 U	10 U	11 U	---
4-Chlorophenyl-Phenylether	10 U	10 U	11 U	---
Fluorene	10 U	10 U	11 U	---
4-Nitroaniline	25 U	25 U	28 U	---
4,6-Dinitro-2-Methylphenol	25 U	25 U	28 U	1 (A) (b) or 5 (A) (a)
N-Nitrosodiphenylamine	10 U	10 U	11 U	---
4-Bromophenyl-Phenylether	10 U	10 U	11 U	---
Hexachlorobenzene	10 U	10 U	11 U	---
Pentachlorophenol	25 U	25 U	28 U	0.4 (A) or 1 (A) (b)
Phenanthrene	10 U	10 U	11 U	---
Anthracene	10 U	10 U	11 U	---
Carbazole	10 U	10 U	11 U	---
Di-n-Butylphthalate	10 U	10 U	11 U	---
Fluoranthene	10 U	10 U	11 U	---
Pyrene	10 U	10 U	11 U	---
Butylbenzylphthalate	10 U	10 U	11 U	---
3,3'-Dichlorobenzidine	10 U	10 U	11 U	---
Benzo(a)Anthracene	10 U	10 U	11 U	---
Chrysene	10 U	10 U	11 U	---
bis(2-Ethylhexyl)Phthalate	0.7 JS	0.4 JS	0.6 JS	0.6 (A)
Di-n-Octyl Phthalate	10 U	10 U	11 U	---
Benzo(b)Fluoranthene	10 U	10 U	11 U	---
Benzo(k)Fluoranthene	10 U	10 U	11 U	---
Benzo(a)Pyrene	10 U	10 U	11 U	0.0012 GV H(B)
Indeno(1,2,3-cd)Pyrene	10 U	10 U	11 U	---
Dibenz(a,h)Anthracene	10 U	10 U	11 U	---
Benzo(g,h,i)Perylene	10 U	10 U	11 U	---

Results expressed in ug/L.
U indicates that the compound was not detected at the quantitation limit indicated.
J indicates that the value reported is estimated.
S indicates that the value reported is suspected to be due to laboratory contamination.
GV indicates that the value listed is a guidance value rather than a standard.
H(B) indicates that the value listed is based on protection for human consumption of fish.
(A) indicates that the value listed is based on protection for fish propagation or wildlife consumption of fish.
--- indicates that no standard or guidance value exists for Class C water.
(a) indicates standard applies to total unchlorinated phenolic compounds.
(b) indicates standard applies to total chlorinated phenolic compounds.
(c) indicates standard applies to sum of dichlorobenzenes.

Table 7.3
Surface Water Analytical Data
Pesticides/PCBs
Former Powerex, Inc. Facility
Auburn, New York

Sampling Date: June 8, 1993

Sample ID Compound	SW-G	SW-S (Background)	SW-T (Background)	Standard/ Guidance Value
alpha-BHC	0.050 U	0.050 U	0.050 U	0.01 (A) (a)
beta-BHC	0.050 U	0.050 U	0.050 U	0.01 (A) (a)
delta-BHC	0.050 U	0.050 U	0.050 U	0.01 (A) (a)
gamma-BHC (Lindane)	0.050 U	0.050 U	0.050 U	0.01 (A) (a)
Heptachlor	0.050 U	0.050 U	0.050 U	0.001 (A) (b)
Aldrin	0.050 U	0.050 U	0.050 U	0.001 H(B) (c)
Heptachlor epoxide	0.050 U	0.050 U	0.050 U	0.001 (A) (b)
Endosulfan I	0.050 U	0.050 U	0.050 U	0.009 (A)
Dieldrin	0.10 U	0.10 U	0.10 U	0.001 H(B) (c)
4,4'-DDE	0.10 U	0.10 U	0.10 U	0.001 (A) (d)
Endrin	0.10 U	0.10 U	0.10 U	0.002 H(B)
Endosulfan II	0.10 U	0.10 U	0.10 U	0.009 (A)
4,4'-DDD	0.10 U	0.10 U	0.10 U	0.001 (A) (d)
Endosulfan sulfate	0.10 U	0.10 U	0.10 U	---
4,4'-DDT	0.10 U	0.10 U	0.10 U	0.001 (A) (d)
Methoxychlor	0.50 U	0.50 U	0.50 U	0.03 (A)
Endrin ketone	0.10 U	0.10 U	0.10 U	---
Endrin aldehyde	0.10 U	0.10 U	0.10 U	---
alpha-Chlordane	0.050 U	0.050 U	0.050 U	0.002GV H(B) (e)
gamma-Chlordane	0.050 U	0.050 U	0.050 U	0.002GV H(B) (e)
Toxaphene	5.0 U	5.0 U	5.0 U	0.005 (A)
Aroclor-1016	1.0 U	1.0 U	1.0 U	0.001 (A) (f)
Aroclor-1221	2.0 U	2.0 U	2.0 U	0.001 (A) (f)
Aroclor-1232	1.0 U	1.0 U	1.0 U	0.001 (A) (f)
Aroclor-1242	1.0 U	1.0 U	1.0 U	0.001 (A) (f)
Aroclor-1248	1.0 U	1.0 U	1.0 U	0.001 (A) (f)
Aroclor-1254	1.0 U	1.0 U	1.0 U	0.001 (A) (f)
Aroclor-1260	1.0 U	1.0 U	1.0 U	0.001 (A) (f)

Results expressed in ug/L.
U indicates that the compound was not detected at or above the quantitation limit indicated.
GV indicates that the value listed is a guidance value rather than a standard.
H(B) indicates that the value listed is based on protection for human consumption of fish.
(A) indicates that the value listed is based on protection for fish propagation or wildlife consumption of fish.
--- indicates that no standard or guidance value exists for Class C waters.
(a) values listed apply to sum of these substances.
(b) values listed apply to sum of these substances.
(c) values listed apply to sum of these substances.
(d) values listed apply to sum of these substances.
(e) values listed apply to sum of these substances.
(f) values listed apply to sum of these substances.
Standard listed when both standard and guidance values exist.

Table 7.4
Surface Water Analytical Data
Inorganics
Former Powerex, Inc. Facility
Auburn, New York

Sampling Date: June 8, 1993

Analyte	SW-G	SW-S (Background)	SW-T (Background)	Standard Guidance Value
Aluminum	178 B	2210	7840	100 (A)**
Antimony	5.0 UW	5.0 UW	5.0 U	---
Arsenic	4.0 U	4.0 U	4.0 U	190****
Barium	50.0 B	52.0 B	185 B	---
Beryllium	8.2 V	5.0 U	5.0 U	**11/11/1100 (A)***
Cadmium	0.20 U	0.20 U	0.20 U	**1.77/1.95/3.12 (A)**
Calcium	52600	58100	103000	---
Chromium	10.0 UV	11.0 V	17.0 V	**329.21/363.69/595.56 (A)**
Cobalt	20.0 U	20.0 U	20.0 U	5 (A)*
Copper	10.0 U	15.0 B	15.0 B	**19.19/21.29/35.62 (A)**
Iron	580	2090	9950	300 (A)
Lead	3.0 U	12.0	5.0	**6.60/7.69/16.49 (A)**
Magnesium	10900	13100	25800	---
Manganese	72.0 V	151 V	949 V	---
Mercury	0.20 U	0.20 U	0.20 U	0.2GV H(B)
Nickel	30.0 UV	30.0 UV	30.0 UV	**147.02/161.26/254.85 (A)**
Potassium	999 B	3110 B	3770 B	---
Selenium	4.0 U	4.0 UW	4.0 UW	1 (A)*
Silver	0.30 U	0.30 U	0.30 U	0.1 (A)**
Sodium	10600	109000	53000	---
Thallium	5.0 U	5.0 U	5.0 U	8 (A)
Vanadium	20.0 U	20.0 U	20.0 U	14 (A)*
Zinc	56.0 V	128 V	238 V	**133.76/148.32/247.46 (A)**
Cyanide	10.0 U	10.0 U	10.0 U	5.2 (A)***

Results expressed in ug/L.
U indicates analyte result less than instrument detection limit (IDL).
B indicates analyte result between IDL and contract required detection limit.
V indicates reported value is estimated due to variance from quality control limits.
W indicates analytical spike was out of 85-125% limit, while sample absorbance was less than 50% of spike absorbance.
GV indicates that the value listed is a guidance value rather than a standard.
H(B) indicates that the value listed is based on protection for human consumption of fish.
(A) indicates that the value listed is based on protection for fish propagation or wildlife consumption of fish.
Standards which appear in boldface type have been calculated using the hardness of the associated sample; the value listed is based on protection for fish propagation or wildlife consumption of fish; values shown for samples SW-G, SW-S and SW-T, in that order.
* indicates standard applies only to the acid soluble form.
** indicates that the standard applies only to ionic form.
*** indicates that the standard is expressed as free cyanide.
**** indicates standard applies to dissolved form.
--- indicates that no standard or guidance value exists for Class C waters.

Beryllium was the only metal detected in sample SW-G which was not detected in the two background samples. However, it was detected at a concentration of only 8.2 ug/l. The guidance value for beryllium in Class C waters is 11 ug/l when the hardness is less than 75 mg/l, as was the case for the sample collected at location SW-G.

Based on the above, and the results presented in Table 7.4, there appears to be no site-related metals in surface water at or downstream from the site.

7.3 Subsurface Soils in Source Areas

7.3.1 Results of Previous Investigations

A total of 59 subsurface soil samples were obtained at or near the North Evaporation Pit during the Phase I and Phase IV investigations. These samples were all analyzed for VOCs. Additionally, selected samples were also analyzed for other parameters.

The most frequently detected VOCs were TCE, 1,2-DCE, acetone, xylenes, toluene and ethylbenzene. The maximum concentrations detected for TCE and xylenes were 12,000 and 6700 mg/kg, respectively, suggesting that these compounds may be present as NAPLs at some locations. The maximum concentration detected for acetone was 2800 mg/kg. The maximum concentrations of toluene, ethylbenzene and 1,2-DCE were considerably lower at 96, 370 and 96 mg/kg, respectively.

Methylene chloride was also frequently detected, having been reported in 11 of 59 subsurface soil samples collected at or near the North Evaporation Pit. However, methylene chloride is recognized as a common laboratory contaminant. Eight of the methylene chloride detections were from the Phase I investigation and these results were not rigorously validated. The remaining three detections of methylene chloride were from soil borings performed during the Phase IV investigation. However, these results were considered suspect due to the detection of methylene chloride in a method blank at a higher concentration than in the samples, prior to multiplication by the dilution factors. Thus, methylene chloride is not believed to be present in subsurface soils in the vicinity of the North Evaporation Pit.

TCA, PCE, carbon tetrachloride and 1,2-dichlorobenzene were also detected occasionally in subsurface soils at or near the North Evaporation Pit. However, review of the data suggests that TCA and PCE may not actually be present in this area. TCA was detected in only one sample, and that sample was collected during the Phase I investigation. PCE was detected in three samples. Again, each of these samples was collected during the Phase I investigation. Neither TCA nor PCE was detected in any of the 43 subsurface soil samples collected at or near the North Evaporation Pit during the Phase IV investigation, including a sample obtained from directly within the pit.

A total of 16 subsurface soil samples were obtained from soil borings within the North Evaporation Pit during the Phase I investigation for analyses of methanol. Methanol was detected at elevated concentrations and is considered to be a contaminant in subsurface soils at the North Evaporation Pit. Although also present in groundwater, its extent is not widespread due to rapid biodegradation.

Three subsurface soil samples were analyzed for SVOCs during the Phase IV investigation. Naphthalene was detected in all three samples at concentrations of 4560, 100 and 100 ug/kg, the highest concentration occurring in a sample collected from directly within the North Evaporation Pit. 2-methylnaphthalene was detected in two of the three samples at concentrations of 200 and 120 ug/kg. Bis(2-ethylhexyl)phthalate was detected in one sample at a concentration of 120 ug/kg. Based on these results, SVOCs were not deemed to be of concern relative to VOCs in subsurface soils at or near the North Evaporation Pit.

A subsurface soil sample obtained from directly within the North Evaporation Pit was also analyzed for pesticides, PCBs and cyanide. No pesticides, PCBs or cyanide were detected.

A total of 24 subsurface soil samples collected at or near the North Evaporation Pit during previous investigations were analyzed for copper, tin and zinc. In addition, three subsurface soil samples were analyzed during the Phase IV investigation for other metals. As expected, metals were detected. However, their concentrations should be evaluated relative to ranges reported in the literature for natural soils, or site-specific background levels if available. Results obtained from borings NPB-1 and NPB-3 are considered to represent site-specific background levels because these borings are approximately 15 and 100 feet from the North Evaporation Pit, respectively, and the reported concentrations do not differ significantly. Comparison with the other results reveals that copper and zinc may occur above background levels but, if so, the areal and vertical extent of such elevated concentrations is extremely limited.

7.3.2 Remedial Investigation Results

Three subsurface soil samples were collected during the drilling at location DGC-12 in the vicinity of the purported West Evaporation Pit. These samples were submitted for analysis of TCL volatiles using ASP/CLP Method 91-1. The analytical results are presented in Table 7.5.

All three subsurface soil samples from location DGC-12 showed elevated concentrations of TCE. Other VOCs detected in these samples included acetone, 1,2-DCE, carbon tetrachloride, PCE, toluene, ethylbenzene and xylenes, although generally at much lower concentrations.

7.3.3 Results of Laboratory Waste Solvent Tanks IRM

Numerous subsurface soil samples were collected during the Laboratory Waste Solvent Tanks IRM for field analyses of selected VOCs using portable GCs. The field data are summarized in Table 7.6. Forty-four (44) samples were also submitted for laboratory analysis of TCL volatiles using ASP/CLP Method 91-1. Analytical results are summarized in Table 7.7. The objective of these soil borings was to determine the extent of contamination in the vicinity of the two Laboratory Waste Solvent Tanks.

Table 7.5
Subsurface Soil Analytical Data
Soil Boring Performed at Location DGC-12 During RI
Former Powerex, Inc. Facility
Auburn, New York

Sampling Date: June 7, 1993

Sample ID Compound	DGC-12D (S-3 4-6')	DGC-12D (S-4 6-8')	DGC-12D (S-5 8-10')
Chloromethane	11 U	11 U	11 U
Bromomethane	11 U	11 U	11 U
Vinyl Chloride	11 U	11 U	11 U
Chloroethane	11 U	11 U	11 U
Methylene Chloride	11 U	11 U	11 U
Acetone	72	1400 EV	17000 D
Carbon Disulfide	11 U	11 U	11 U
1,1-Dichloroethene	11 U	11 U	11 U
1,1-Dichloroethane	11 U	11 U	11 U
1,2-Dichloroethene (total)	51	29	52
Chloroform	11 U	11 U	11 U
1,2-Dichloroethane	11 U	11 U	11 U
2-Butanone	11 U	11 U	11 U
1,1,1-Trichloroethane	11 U	11 U	11 U
Carbon Tetrachloride	3 J	3 J	3 J
Bromodichloromethane	11 U	11 U	11 U
1,2-Dichloropropane	11 U	11 U	11 U
cis-1,3-Dichloropropene	11 U	11 U	11 U
Trichloroethene	38000 D	130000 D	110000 D
Dibromochloromethane	11 U	11 U	11 U
1,1,2-Trichloroethane	11 U	11 U	11 U
Benzene	11 U	11 U	11 U
trans-1,3-Dichloropropene	11 U	11 U	11 U
Bromoform	11 U	11 U	11 U
4-Methyl-2-Pentanone	11 U	11 U	11 U
2-Hexanone	11 U	11 U	11 U
Tetrachloroethene	4 J	3 J	2 J
1,1,2,2-Tetrachloroethane	11 U	11 U	11 U
Toluene	11 U	28 B	86 B
Chlorobenzene	11 U	11 U	1 J
Ethylbenzene	29	26	17
Styrene	11 U	11 U	11 U
Total Xylenes	2300 D	1400 DJ	840 DJ

Results expressed in ug/kg.
U indicates that the compound was not detected at the quantitation limit indicated.
J indicates that the value reported is estimated.
D indicates that the value reported is taken from the analysis of a diluted sample.
B indicates that the analyte is also found in the associated method blank.
V indicates that result reported has been estimated due to variance from quality control criteria.

Table 7.6
Subsurface Soil Field Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Compound Sample ID	t-1,2-DCE	c-1,2-DCE	Benzene	TCE	Toluene	PCE	Ethylbenzene	m&p-Xylenes	o-Xylene	Weight (g)
TB-1-TS 0-2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.6
TB-1-TS 2'-4'	16.8	216	ND	19.4	ND	ND	ND	ND	ND	10.3
TB-1-TS 4'-6'	ND	27	ND	ND	ND	ND	ND	ND	ND	10.2
TB-1-TS 6'-8' *	2.1	369	ND	48.9	ND	ND	ND	ND	ND	10.6
TB-1-TS 8'-10' *	ND	135	ND	32	ND	ND	ND	ND	ND	10.6
TB-4-TS 0-2'	8.6	351	ND	88	ND	ND	ND	ND	ND	10.3
TB-4-TS 2'-4'	ND	ND	ND	7.0	ND	ND	ND	ND	ND	10.6
TB-4-TS 4'-6' *	26	270	ND	2429	ND	ND	ND	ND	ND	10.0
TB-4 -TS 6'-8'	17	535	ND	2003	ND	ND	15	ND	ND	10.0
DUP	37	1100	ND	3126	ND	ND	12	ND	ND	ND
TB-4-TS 8'-8.4' *	1.4	88.2	ND	532	ND	ND	ND	ND	ND	10.0
TB-2-TS 0-2'	ND	ND	ND	24.3	ND	ND	ND	ND	ND	10.2
TB-2-TS 2'-4'	ND	32	ND	2.4	ND	ND	ND	ND	ND	10.3
TB-2-TS 4'-6' *	ND	80.8	ND	5.0	ND	ND	ND	ND	ND	10.2
TB-2-TS 6'-8'	ND	58	ND	2.5	ND	ND	ND	ND	ND	10.7
TB-2-TS 8'-10'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-2-TS 10'-12'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.5
TB-2-TS 12'-14' *	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.1

All sample results are expressed in ug/kg (wet weight).
ND indicates not detected at quantitation limit of 50 ug/kg (wet weight).
* indicates samples sent to the laboratory for confirmation.
t-1,2-DCE = trans-1,2-dichloroethene; c-1,2-DCE = cis-1,2-dichloroethene; TCE = trichloroethene; PCE = tetrachloroethene (also refered to as perchloroethene).

Table 7.6 (Continued)
Subsurface Soil Field Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Compound Sample ID	t-1,2-DCE	c-1,2-DCE	Benzene	TCE	Toluene	PCE	Ethylbenzene	m&p-Xylenes	o-Xylene	Weight (g)
TB-3-TS 0'-2'	ND	ND	ND	ND	ND	ND	11	ND	ND	10.4
TB-3-TS 2'-4'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-3-TS 4'-6'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.3
TB-3-TS 6'-8'	ND	64	ND	39	ND	ND	10	ND	ND	10.4
DUP	ND	56	ND	34	ND	ND	ND	ND	ND	10.4
TB-3-TS 8'-10' *	ND	82	ND	545	ND	ND	ND	ND	ND	10.5
TB-3-TS 10'-12' *	ND	95	ND	1510	ND	ND	ND	ND	ND	10.4
	ND	64	ND	2910	ND	ND	ND	ND	ND	1.1
TB-2-TN 0-2'	ND	ND	ND	13	ND	ND	ND	ND	ND	10.7
TB-2-TN 2'-4' *	ND	185	ND	6142	ND	ND	ND	ND	ND	10.6
	ND	ND	ND	3529	ND	ND	ND	ND	ND	0.5
TB-2-TN 4'-6'	ND	129	ND	3052	ND	ND	ND	ND	ND	10.7
	ND	ND	ND	2020	ND	ND	ND	ND	ND	0.6
TB-2-TN 6'-8' *	ND	220.5	ND	8850	ND	ND	ND	125	ND	1.6
TB-1-TN 0'-2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.4
TB-1-TN 2'-4'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.4
TB-1-TN 4'-6'	ND	3	ND	ND	ND	ND	ND	ND	ND	10.3
TB-1-TN 8'-10' *	ND	ND	ND	522	ND	ND	ND	ND	ND	10.2
TB-1-TN 10'-12'	ND	ND	ND	72	ND	ND	ND	ND	ND	10.0
TB-1-TN 12'-14'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.9
TB-1-TN 14'-16' *	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.1

All sample results are expressed in ug/kg (wet weight).

ND indicates not detected at quantitation limit of 50 ug/kg (wet weight).

* indicates samples sent to the laboratory for confirmation.

t-1,2-DCE = trans-1,2-dichloroethene; c-1,2-DCE = cis-1,2-dichloroethene; TCE = trichloroethene; PCE = tetrachloroethene (also refered to as perchloroethene).

Table 7.6 (Continued)
Subsurface Soil Field Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Compound Sample ID	t-1,2-DCE	c-1,2-DCE	Benzene	TCE	Toluene	PCE	Ethylbenzene	m&p-Xylenes	o-Xylene	Weight (g)
TB-4-TS 4'-6'	ND	2590	ND	824	ND	ND	ND	ND	ND	0.5
TB-4-TS 6'-8'	ND	874	ND	2000	ND	ND	ND	ND	ND	0.5
TB-4-TN 0-2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.1
TB-4-TN 2'-4'	ND	ND	ND	5	ND	ND	ND	ND	ND	10.0
TB-4-TN 4'-6'	ND	ND	ND	23	ND	ND	ND	ND	ND	10.7
TB-4-TN 6'-8'	ND	5	ND	19.8	ND	ND	ND	ND	ND	10.0
TB-4-TN 8'-10'	ND	14	ND	763	ND	ND	ND	ND	ND	10.5
	ND	ND	ND	1840	ND	ND	ND	ND	ND	1.0
TB-4-TN 10'-12' *	ND	6	ND	1342	ND	ND	ND	ND	ND	10.1
	ND	389	ND	1690	ND	ND	ND	ND	ND	1.0
TB-4-TN 12'-14'	ND	ND	ND	25.8	ND	ND	ND	ND	ND	10.0
TB-4-TN 14'-16' *	ND	ND	ND	2	ND	ND	ND	ND	ND	10.1
TB-3-TN 0-2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-3-TN 2'-4'	ND	ND	ND	6.2	ND	ND	ND	ND	ND	10.0
TB-3-TN 4'-6'	39	1270	ND	1280	ND	ND	59	16	ND	10.5
TB-3-TN 6'-8' *	ND	1600	ND	4,300	ND	ND	800	2000	400	0.5
TB-3-TN 8'-10'	10	1810	20	30000	ND	ND	770	1820	660	1.0
TB-3-TN 10'-12' *	160	500	ND	46000	ND	ND	ND	130	ND	1.0
TB-3-TN 12'-14' *	ND	630	ND	20000	ND	ND	ND	ND	ND	1.0

All sample results are expressed in ug/kg (wet weight).
ND indicates not detected at quantitation limit of 50 ug/kg (wet weight).
* indicates samples sent to the laboratory for confirmation.
t-1,2-DCE = trans-1,2-dichloroethene; c-1,2-DCE = cis-1,2-dichloroethene; TCE = trichloroethene; PCE = tetrachloroethene (also refered to as perchloroethene).

Table 7.6 (Continued)
Subsurface Soil Field Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Compound Sample ID	t-1,2-DCE	c-1,2-DCE	Benzene	TCE	Toluene	PCE	Ethylbenzene	m&p-Xylenes	o-Xylene	Weight (g)
TB-6-TN 0-2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.3
TB-6-TN 2'-4'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.4
TB-6-TN 4'-6'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.2
TB-6-TN 6'-8' *	ND	44.4	ND	50.0	ND	ND	ND	ND	ND	10.1
DUP	ND	45.4	ND	38	ND	ND	ND	ND	ND	10.1
TB-6-TN 8'-10'	ND	71	ND	24	ND	ND	ND	ND	ND	10.5
TB-6-TN 10'-12' *	ND	84	ND	39	ND	ND	ND	ND	ND	10.5
TB-7-TN 0'-2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.2
TB-7-TN 2'-4'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.2
TB-7-TN 4'-6'	ND	ND	ND	10.0	ND	ND	ND	ND	ND	10.1
TB-7-TN 6'-8'	11	96	ND	302	ND	ND	ND	ND	ND	10.1
TB-7-TN 8'-10'	ND	159	ND	932	ND	ND	ND	ND	ND	10.4
TB-7-TN 10'-12' *	ND	138	ND	5620	ND	ND	ND	ND	ND	10.2
TB-7-TN 12'-14' *	7	450	ND	1520	ND	ND	ND	ND	ND	10.2

All sample results are expressed in ug/kg (wet weight).
ND indicates not detected at quantitation limit of 50 ug/kg (wet weight).
* indicates samples sent to the laboratory for confirmation.
t-1,2-DCE = trans-1,2-dichloroethene; c-1,2-DCE = cis-1,2-dichloroethene; TCE = trichloroethene; PCE = tetrachloroethene (also refered to as perchloroethene).

Table 7.6 (Continued)
Subsurface Soil Field Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM
Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Compound Sample ID	t-1,2-DCE	c-1,2-DCE	Benzene	TCE	Toluene	PCE	Ethylbenzene	m&p-Xylenes	o-Xylene	Weight (g)
TB-5-TN 0-2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-5-TN 2'-4'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-5-TN 4'-6' *	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.4
DUP	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.2
TB-5-TN 6'-8' *	ND	9.0	ND	4.0	ND	ND	ND	ND	ND	10.2
TB-8-TN 0-2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.3
TB-8-TN 2'-4'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.1
TB-8-TN 4'-6'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.4
TB-8-TN 6'-8'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.3
DUP	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-8-TN 8'-10'	ND	ND	ND	4.5	ND	ND	ND	ND	ND	10.4
TB-8-TN 10'-12' *	ND	ND	ND	17.3	ND	ND	ND	ND	ND	10.2
DUP	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.2
TB-8-TN 12'-14'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.2
TB-8-TN 14'-16'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.4
TB-8-TN 16'-18' *	ND	ND	ND	3.0	ND	ND	ND	ND	ND	10.2

All sample results are expressed in ug/kg (wet weight).
ND indicates not detected at quantitation limit of 50 ug/kg (wet weight).
* indicates samples sent to the laboratory for confirmation.
t-1,2-DCE = trans-1,2-dichloroethene; c-1,2-DCE = cis-1,2-dichloroethene; TCE = trichloroethene; PCE = tetrachloroethene (also refered to as perchloroethene).

Table 7.6 (Continued)
Subsurface Soil Field Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Compound Sample ID	t-1,2-DCE	c-1,2-DCE	Benzene	TCE	Toluene	PCE	Ethylbenzene	m&p-Xylenes	o-Xylene	Weight (g)
TB-5-TS 0-2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.3
TB-5-TS 2'-4'	ND	101	ND	22	ND	ND	ND	ND	ND	10.2
TB-5-TS 4'-6'	15	187	243	343	ND	ND	ND	10	ND	10.2
TB-5-TS 6'-8'	17	1480	ND	2,000	ND	ND	ND	ND	ND	1.1
TB-5-TS 8'-10' *	54	1840	ND	13,200	ND	ND	ND	ND	ND	1.1
DUP	70	3,200	ND	18,800	ND	ND	ND	ND	ND	1.1
TB-5-TS 10'-12'	ND	148	ND	230	ND	ND	ND	ND	ND	1.1
TB-5-TS 12'-14'	ND	10	ND	246	ND	ND	ND	ND	ND	1.1
TB-5-TS 14'-16' *	ND	9	ND	17	ND	ND	ND	ND	ND	10.1
TB-6-TS 0'-2'	ND	2	ND	2	ND	ND	ND	ND	ND	10.1
TB-6-TS 2'-4'	ND	20	ND	7	ND	ND	ND	ND	ND	10.2
TB-6-TS 4'-6' *	ND	45	ND	63	ND	ND	ND	ND	ND	10.0
TB-6-TS 6'-8'	ND	28.9	ND	36	ND	ND	ND	ND	ND	10.0
DUP	ND	14	ND	13	ND	ND	ND	ND	ND	10.1
TB-6-TS 8'-10'	ND	14.5	ND	ND	ND	ND	ND	ND	ND	10.0
TB-6-TS 10'-12'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-6-TS 12'-14'	ND	22.5	ND	ND	ND	ND	ND	ND	ND	10.0
TB-6-TS 14'-16'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.6
TB-6-TS 16'-18'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.3
TB-6-TS 18'-20' *	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0

All sample results are expressed in ug/kg (wet weight).

ND indicates not detected at quantitation limit of 50 ug/kg (wet weight).

* indicates samples sent to the laboratory for confirmation.

t-1,2-DCE = trans-1,2-dichloroethene; c-1,2-DCE = cis-1,2-dichloroethene; TCE = trichloroethene; PCE = tetrachloroethene (also refered to as perchloroethene).

Table 7.6 (Continued)
Subsurface Soil Field Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Compound Sample ID	t-1,2-DCE	c-1,2-DCE	Benzene	TCE	Toluene	PCE	Ethylbenzene	m&p-Xylenes	o-Xylene	Weight (g)
TB-8-TS 0-2'	ND	ND	ND	19.0	ND	ND	ND	ND	ND	10.0
TB-8-TS 2'-4'	ND	23	ND	43	ND	ND	ND	ND	ND	10.1
TB-8-TS 4'-6'	14.8	352	ND	355	ND	ND	ND	ND	ND	10.0
TB-8-TS 6'-8'	ND	4,100	ND	770	ND	ND	ND	ND	ND	0.1
TB-8-TS 8'-10' *	ND	3400	ND	24320	200	ND	ND	ND	ND	ND
DUP	ND	5570	ND	48800	386	ND	ND	ND	ND	0.1
TB-8-TS 10'-12'	177	779	ND	9633	ND	ND	ND	ND	ND	0.6
TB-8-TS 12'-14'	ND	112	ND	278	ND	ND	ND	ND	ND	1.0
TB-8-TS 14'-16'	4.5	7.0	ND	11.2	ND	ND	ND	ND	ND	10.1
TB-8-TS 16'-18' *	3	145	ND	239	ND	ND	ND	ND	ND	10.2
TB-9-TN 0-2'	No Sample Taken									
TB-9-TN 2'-4'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-9-TN 4'-6' *	ND	22	ND	ND	ND	ND	ND	ND	ND	10.1
TB-9-TN 6'-8'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-9-TN 8'-10'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.3
TB-9-TN 10'-12'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-9-TN 12'-14'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-9-TN 14'-16'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-9-TN 16'-17.3' *	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.2

All sample results are expressed in ug/kg (wet weight).
ND indicates not detected at quantitation limit of 50 ug/kg (wet weight).
* indicates samples sent to the laboratory for confirmation.
t-1,2-DCE = trans-1,2-dichloroethene; c-1,2-DCE = cis-1,2-dichloroethene; TCE = trichloroethene; PCE = tetrachloroethene (also refered to as perchloroethene).

Table 7.6 (Continued)
Subsurface Soil Field Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Compound Sample ID	t-1,2-DCE	c-1,2-DCE	Benzene	TCE	Toluene	PCE	Ethylbenzene	m&p-Xylenes	o-Xylene	Weight (g)
TB-7-TS 0-2'	ND	ND	ND	7	ND	ND	ND	ND	ND	10.3
TB-7-TS 2'-4'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-7-TS 4'-6'	ND	ND	ND	7	ND	ND	ND	ND	ND	10.7
TB-7-TS 6'-8'	ND	29	ND	82	ND	ND	ND	ND	ND	10.1
TB-7-TS 8'-10' *	ND	76	ND	73	ND	ND	ND	ND	ND	10.2
DUP	ND	156	ND	169	ND	ND	ND	ND	ND	10.2
TB-7-TS 10'-12'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.2
TB-7-TS 14'-16'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-7-TS 16'-18'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.1
TB-7-TS 18'-18.3' *	ND	4	ND	7	ND	ND	ND	ND	ND	10.2
DUP	ND	15	ND	28	ND	ND	ND	ND	ND	10.5
TB-9-TS 0-2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-9-TS 2'-4'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.7
TB-9-TS 4'-6'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.2
TB-9-TS 6'-8'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.2
TB-9-TS 8'-10' *	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.3
TB-9-TS 10'-12'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.1
TB-9-TS 12'-14' *	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0

All sample results are expressed in ug/kg (wet weight).
ND indicates not detected at quantitation limit of 50 ug/kg (wet weight).
* indicates samples sent to the laboratory for confirmation.
t-1,2-DCE = trans-1,2-dichloroethene; c-1,2-DCE = cis-1,2-dichloroethene; TCE = trichloroethene; PCE = tetrachloroethene (also refered to as perchloroethene).

Table 7.6 (Continued)
Subsurface Soil Field Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Compound Sample ID	t-1,2-DCE	c-1,2-DCE	Benzene	TCE	Toluene	PCE	Ethylbenzene	m&p-Xylenes	o-Xylene	Weight (g)
TB-12-TS 0'-2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.3
TB-12-TS 2'-4'	ND	ND	ND	8.5	ND	ND	ND	ND	ND	10.0
TB-12-TS 4'-6' *	ND	4	ND	6	ND	ND	ND	ND	ND	10.4
TB-12-TS 6'-8' *	ND	62	ND	97	ND	ND	ND	ND	ND	10.2
DUP	ND	48	ND	63	ND	ND	ND	ND	ND	10.0
TB-11-TS 0-2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-11-TS 2'-4'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-11-TS 4'-6'	ND	ND	ND	2	ND	ND	ND	ND	ND	10.1
TB-11-TS 6'-8'	9.2	11	ND	49	ND	ND	ND	ND	ND	10.4
TB-11-TS 8'-10' *	6.0	20	2.6	79	ND	ND	ND	ND	ND	10.0
TB-11-TS 10'-12'	ND	8	ND	2	ND	ND	ND	ND	ND	10.1
TB-11-TS 12'-14'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-11-TS 14'-16'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-11-TS 16'-18' *	ND	5	ND	34	ND	ND	ND	ND	ND	10.0

All sample results are expressed in ug/kg (wet weight).
ND indicates not detected at quantitation limit of 50 ug/kg (wet weight).
* indicates samples sent to the laboratory for confirmation.
t-1,2-DCE = trans-1,2-dichloroethene; c-1,2-DCE = cis-1,2-dichloroethene; TCE = trichloroethene; PCE = tetrachloroethene (also refered to as perchloroethene).

Table 7.6 (Continued)
Subsurface Soil Field Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Compound Sample ID	t-1,2-DCE	c-1,2-DCE	Benzene	TCE	Toluene	PCE	Ethylbenzene	m&p-Xylenes	o-Xylene	Weight (g)
DGC-15 0-2'	ND	7.0	ND	13	ND	ND	ND	ND	ND	10.5
DGC-15 2'-4'	ND	ND	ND	228	ND	ND	ND	ND	ND	10.1
DGC-15 4'-6'	19	1700	ND	180	ND	ND	ND	ND	ND	5.0
DGC-15 6'-8'	13	910	ND	957	82	ND	ND	ND	ND	1.0
DGC-15 8'-10'	26	3380	ND	20800	ND	ND	ND	ND	ND	1.0
DUP	16	1480	ND	5980	ND	ND	ND	ND	ND	1.0
DGC-15 10'-12'	ND	140	ND	41	ND	ND	ND	ND	ND	1.1
DGC-15 12'-14'	ND	ND	ND	40	ND	ND	ND	ND	ND	1.0
DGC-15 14'-16'	ND	23	ND	50	ND	ND	ND	ND	ND	5.0
TB-10-TN 0-2'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.5
TB-10-TN 2'-4'	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
TB-10-TN 4-6'	ND	ND	ND	ND	ND	ND	30	11	ND	10.0
TB-10-TN 6'-8' *	3	ND	ND	ND	5	34	22	83	ND	10.1
TB-10-TN 8'-10'	ND	ND	ND	ND	4	ND	ND	ND	4	10.2
TB-10-TN 10'-12' *	ND	54	ND	ND	2	ND	ND	ND	ND	10.2
TB-10-TN 12'-13'	11	235	ND	27	ND	ND	ND	ND	ND	10.0

All sample results are expressed in ug/kg (wet weight).

ND indicates not detected at quantitation limit of 50 ug/kg (wet weight).

* indicates samples sent to the laboratory for confirmation.

t-1,2-DCE = trans-1,2-dichloroethene; c-1,2-DCE = cis-1,2-dichloroethene; TCE = trichloroethene; PCE = tetrachloroethene (also refered to as perchloroethene).

Table 7.7
Subsurface Soil Analytical Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Boring Location: Depth: Compound	TB-1-TS 6-8'	TB-1-TS 8-10'	TB-4-TS 4-6'	TB-4-TS 8-8.4'	TB-2-TS 12-14'	TB-2-TS 4-6'	TB-3-TS 10-12'	TB-3-TS 8-10'	TB-2-TN 2-4'	TB-2-TN 6-8'
Chloromethane	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
Bromomethane	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
Vinyl Chloride	120 D	110	1200 DJ	27	11 U	57	11 U	9 J	12 U	12 U
Chloroethane	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
Methylene Chloride	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
Acetone	11 U	11 U	370 EV	16000 D	11 U	12 U	11 U	11 U	53	44
Carbon Disulfide	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
1,1-Dichloroethene	11 U	11 U	22	1 J	11 U	12 U	11 U	1 J	12 U	9 J
1,1-Dichloroethane	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	3 J
1,2-Dichloroethene (total)	1400 D	240 D	14000 D	1000 DJ	11 U	560 D	65	150	190 DJ	280 EV
Chloroform	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
1,2-Dichloroethane	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	2 J
2-Butanone	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	31	24
1,1,1-Trichloroethane	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
Carbon Tetrachloride	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
Bromodichloromethane	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
1,2-Dichloropropane	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
cis-1,2-Dichloropropene	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
Trichloroethene	210 D	480 D	1200 DJ	8800 D	11 U	8 J	12000 D	6600 D	19000 D	36000 D
Dibromochloromethane	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
1,1,2-Trichloroethane	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
Benzene	11 U	11 U	5 J	11 U	11 U	12 U	11 U	11 U	12 U	12 U
trans-1,3-Dichloropropene	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
Bromoform	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
4-Methyl-2-Pentanone	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
2-Hexanone	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
Tetrachloroethene	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	4 J	2 J
1,1,2,2-Tetrachloroethane	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
Toluene	11 U	11 U	8 J	11 U	11 U	12 U	11 U	11 U	12 U	12 U
Chlorobenzene	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
Ethylbenzene	11 U	11 U	2 J	11 U	11 U	12 U	11 U	11 U	7 J	2 J
Styrene	11 U	11 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U
Xylene (total)	11 U	11 U	16	2 J	11 U	12 U	11 U	11 U	36	12

Results expressed in ug/kg.
U indicates that the compound was not detected at the quantitation limit indicated.
J indicates that the reported value is estimated.
D indicates that the value reported is taken from the analysis of a diluted sample.
E indicates that the reported value exceeds the calibration range of the instrument.
V indicates that the value reported is considered estimated due to variance from quality control criteria.

Table 7.7 (Continued)
Subsurface Soil Analytical Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM
Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Boring Location:	TB-1-TN	TB-1-TN	DUP1 [TB-1-TN]	TB-4-TN	TB-4-TN	TB-3-TN	TB-3-TN	TB-3-TN	TB-6-TN	TB-6-TN
Depth:	8-10'	14-16'	14-16'	10-12'	14-16'	6-8'	10-12'	12-14'	6-8'	10-12'
Compound										
Chloromethane	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
Bromomethane	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
Vinyl Chloride	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	3 J	11 U
Chloroethane	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
Methylene Chloride	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
Acetone	11 U	11 U	11 U	11 U	11 U	18000	11000 D	8100 D	12 U	11 U
Carbon Disulfide	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
1,1-Dichloroethene	11 U	11 U	11 U	1 J	11 U	1500 U	11 U	10 U	12 U	11 U
1,1-Dichloroethane	11 U	11 U	11 U	2 J	11 U	1500 U	11 U	10 U	12 U	11 U
1,2-Dichloroethene (total)	11 U	11 U	11 U	1 J	11 U	920 J	23	29	200	3 J
Chloroform	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
1,2-Dichloroethane	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
2-Butanone	11 U	11 U	11 U	11 U	11 U	1500 U	74	69	12 U	11 U
1,1,1-Trichloroethane	4 J	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	7 J	11 U
Carbon Tetrachloride	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
Bromodichloromethane	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
1,2-Dichloropropane	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
cis-1,2-Dichloropropene	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
Trichloroethene	450 D	9 J	7 J	200	12	380000 D	70000 D	21000 D	160	4 J
Dibromochloromethane	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
1,1,2-Trichloroethane	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
Benzene	11 U	11 U	2 J	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
trans-1,3-Dichloropropene	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
Bromoform	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 U
4-Methyl-2-Pentanone	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 UV
2-Hexanone	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 UV
Tetrachloroethene	11 U	11 U	11 U	11 U	11 U	1500 U	0.9 J	10 U	12 U	11 UV
1,1,2,2-Tetrachloroethane	11 U	11 U	11 U	11 U	11 U	1500 U	2 J	10 U	12 U	11 UV
Toluene	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 UV
Chlorobenzene	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 UV
Ethylbenzene	11 U	11 U	11 U	11 U	11 U	610 J	11 U	10 U	12 U	11 UV
Styrene	11 U	11 U	11 U	11 U	11 U	1500 U	11 U	10 U	12 U	11 UV
Xylene (total)	11 U	11 U	11 U	11 U	11 U	2100	0.7 J	10 U	12 U	11 UV

Results expressed in ug/kg.
U indicates that the compound was not detected at the quantitation limit indicated.
J indicates that the reported value is estimated.
D indicates that the value reported is taken from the analysis of a diluted sample.
E indicates that the reported value exceeds the calibration range of the instrument.
V indicates that the value reported is considered estimated due to variance from quality control criteria.

Table 7.7 (Continued)
Subsurface Soil Analytical Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Boring Location:	TB-7-TN	TB-7-TN	TB-5-TN	TB-5-TN	TB-8-TN	TB-8-TN	TB-5-TS	TB-5-TS	TB-6-TS	TB-6-TS
Depth:	10-12'	12-14'	6-8'	4-6'	10-12'	16-17.5'	8-10'	14-16'	4-6'	18-20'
Compound										
Chloromethane	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
Bromomethane	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
Vinyl Chloride	11 U	11 U	10 U	12 U	11 U	11 U	140	3 J	3 J	10 U
Chloroethane	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
Methylene Chloride	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
Acetone	11 U	11 U	10 U	12 U	11 U	11 U	1100 DJ	11 U	12 U	10 U
Carbon Disulfide	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
1,1-Dichloroethene	3 J	11 U	10 U	12 U	11 U	11 U	8 J	11 U	12 U	10 U
1,1-Dichloroethane	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
1,2-Dichloroethene (total)	690 DJ	76	24	1 J	11 U	11 U	1700 D	5 J	37	10 U
Chloroform	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
1,2-Dichloroethane	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
2-Butanone	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
1,1,1-Trichloroethane	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
Carbon Tetrachloride	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
Bromodichloromethane	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
1,2-Dichloropropane	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
cis-1,2-Dichloropropene	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
Trichloroethene	21000 D	360 D	6 J	12 U	11 U	11 U	22000 D	11 U	79	10 U
Dibromochloromethane	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
1,1,2-Trichloroethane	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
Benzene	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
trans-1,3-Dichloropropene	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
Bromoform	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 U	12 U	10 U
4-Methyl-2-Pentanone	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 UV	12 U	10 U
2-Hexanone	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 UV	12 U	10 U
Tetrachloroethene	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 UV	12 U	10 U
1,1,2,2-Tetrachloroethane	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 UV	12 U	10 U
Toluene	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 UV	12 U	10 U
Chlorobenzene	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 UV	12 U	10 U
Ethylbenzene	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 UV	12 U	10 U
Styrene	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 UV	12 U	10 U
Xylene (total)	11 U	11 U	10 U	12 U	11 U	11 U	10 U	11 UV	12 U	10 U

Results expressed in ug/kg.
U indicates that the compound was not detected at the quantitation limit indicated.
J indicates that the reported value is estimated.
D indicates that the value reported is taken from the analysis of a diluted sample.
E indicates that the reported value exceeds the calibration range of the instrument.
V indicates that the value reported is considered estimated due to variance from quality control criteria.

Table 7.7 (Continued)
Subsurface Soil Analytical Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Boring Location: Depth: Compound	TB-8-TS 8-10'	TB-8-TS 16-18'	TB-9-TN 4-6'	TB-9-TN 16-17.3'	TB-7-TS 8-10'	TB-7-TS 18-18.3'	TB-9-TS 8-10'	TB-9-TS 14-16'	TB-11-TS 8-10'	DUP2 [TB-11-TS] 8-10'
Chloromethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Bromomethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Vinyl Chloride	3 J	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Chloroethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Methylene Chloride	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Acetone	2200 D	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Carbon Disulfide	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,1-Dichloroethene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,1-Dichloroethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,2-Dichloroethene (total)	2200 D	20	12 U	0.8 J	12	12	11 U	11 U	13 V	6 JV
Chloroform	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,2-Dichloroethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
2-Butanone	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,1,1-Trichloroethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Carbon Tetrachloride	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Bromodichloromethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,2-Dichloropropane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
cis-1,2-Dichloropropene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Trichloroethene	14000 D	90	12 U	11 U	2 J	3 J	11 U	11 U	96 V	43 V
Dibromochloromethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,1,2-Trichloroethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Benzene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
trans-1,3-Dichloropropene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Bromoform	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
4-Methyl-2-Pentanone	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
2-Hexanone	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Tetrachloroethene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,1,2,2-Tetrachloroethane	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Toluene	2 J	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Chlorobenzene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Ethylbenzene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Styrene	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Xylene (total)	11 U	11 U	12 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U

Results expressed in ug/kg.

U indicates that the compound was not detected at the quantitation limit indicated.

J indicates that the reported value is estimated.

D indicates that the value reported is taken from the analysis of a diluted sample.

E indicates that the reported value exceeds the calibration range of the instrument.

V indicates that the value reported is considered estimated due to variance from quality control criteria.

Table 7.7 (Continued)
Subsurface Soil Analytical Data
Soil Borings Performed for Laboratory Waste Solvent Tanks IRM

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: March 29 to April 11, 1994

Boring Location: Depth: Compound	TB-11-TS 16-17.3'	TB-12-TS 4-6'	TB-12-TS 6-8'	TB-10-TN 10-12'	TB-10-TN 6-8'	DUP3 [TB-10-TN] 6-8'
Chloromethane	11 U	12 U	12 U	12 U	12 U	12 U
Bromomethane	11 U	12 U	12 U	12 U	12 U	12 U
Vinyl Chloride	11 U	12 U	4 J	110	12 U	12 U
Chloroethane	11 U	12 U	12 U	12 U	12 U	12 U
Methylene Chloride	11 U	12 U	12 U	12 U	12 U	12 U
Acetone	11 U	12 U	12 U	12 U	12 U	12 U
Carbon Disulfide	11 U	12 U	12 U	12 U	12 U	12 U
1,1-Dichloroethene	11 U	12 U	12 U	12 U	12 U	12 U
1,1-Dichloroethane	11 U	12 U	12 U	12 U	12 U	12 U
1,2-Dichloroethene (total)	3 J	41	37	110	0.7 J	12 U
Chloroform	11 U	12 U	12 U	12 U	12 U	12 U
1,2-Dichloroethane	11 U	12 U	12 U	12 U	12 U	12 U
2-Butanone	11 U	12 U	12 U	12 U	12 U	12 U
1,1,1-Trichloroethane	11 U	12 U	12 U	12 U	12 U	12 U
Carbon Tetrachloride	11 U	12 U	12 U	12 U	12 U	12 U
Bromodichloromethane	11 U	12 U	12 U	12 U	12 U	12 U
1,2-Dichloropropane	11 U	12 U	12 U	12 U	12 U	12 U
cis-1,2-Dichloropropene	11 U	12 U	12 U	12 U	12 U	12 U
Trichloroethene	32	84	85	12 U	12 U	12 U
Dibromochloromethane	11 U	12 U	12 U	12 U	12 U	12 U
1,1,2-Trichloroethane	11 U	12 U	12 U	12 U	12 U	12 U
Benzene	11 U	12 U	12 U	12 U	12 U	12 U
trans-1,3-Dichloropropene	11 U	12 U	12 U	12 U	12 U	12 U
Bromoform	11 U	12 U	12 U	12 U	12 U	12 U
4-Methyl-2-Pentanone	11 U	12 U	12 U	12 U	12 U	12 U
2-Hexanone	11 U	12 U	12 U	12 U	12 U	12 U
Tetrachloroethene	11 U	12 U	12 U	12 U	12 U	12 U
1,1,2,2-Tetrachloroethane	11 U	12 U	12 U	12 U	12 U	12 U
Toluene	11 U	12 U	12 U	12 U	12 U	12 U
Chlorobenzene	11 U	12 U	12 U	12 U	12 U	12 U
Ethylbenzene	11 U	0.6 J	12 U	12 U	1 J	0.8 J
Styrene	11 U	12 U	12 U	12 U	12 U	12 U
Xylene (total)	11 U	12 U	12 U	12 U	12 U	12 U

Results expressed in ug/kg.

U indicates that the compound was not detected at the quantitation limit indicated.

J indicates that the reported value is estimated.

D indicates that the value reported is taken from the analysis of a diluted sample.

E indicates that the reported value exceeds the calibration range of the instrument.

V indicates that the value reported is considered estimated due to variance from quality control criteria.

TCE and its degradation products (i.e., 1,2-DCE and vinyl chloride) were the dominant VOCs detected in the subsurface soil samples. However, acetone, 1,1-DCE, 1,1-dichloroethane (1,1-DCA), 1,2-dichloroethane (1,2-DCA), 2-butanone, TCA, benzene, PCE, 1,1,2,2-tetrachloroethene, toluene, ethylbenzene and xylenes were also detected in one or more samples, albeit generally at much lower concentrations. The extent of VOCs was generally limited to within 40 feet of the two tanks.

7.4 Overburden Groundwater

7.4.1 Results of Previous Investigations

No groundwater samples were obtained during the Phase I investigation. However, the extent of VOCs within the overburden groundwater in the vicinity of the North Evaporation Pit, West Evaporation Pit and the Waste Solvent Tank area was defined during the Phase II and Phase III investigations. During the Phase IV investigation, additional overburden groundwater samples were obtained to (a) confirm the nature and extent of VOCs in the overburden unit and (b) allow comparison to contemporaneous analytical results for VOCs in the shallow bedrock unit.

The most comprehensive "snapshot" of groundwater quality information available to date for the overburden unit was collected during the Phase IV investigation. Samples were obtained on April 24 to May 8, 1990 from seven monitoring wells, 18 micro-wells and nine piezometers. General Testing Corporation (GTC) of Rochester, New York analyzed these samples for VOCs. The most frequently detected VOCs were TCE, 1,2-DCE, vinyl chloride, acetone, toluene, xylenes and methylene chloride. Three of these VOCs (i.e., acetone, toluene and methylene chloride) are recognized by EPA as common laboratory contaminants, but are nevertheless believed to be present in localized areas at the site. Additionally, while not detected frequently, PCE and TCA were also found to occur at the site in localized areas.

Isoconcentration contour maps were prepared during the Phase IV investigation to show the extent of VOCs in the overburden unit. The isoconcentration map for TCE in the overburden unit is shown in Figure 1.4. The North Evaporation Pit, purported West Evaporation Pit and Waste Solvent Tank area appear to be source areas for TCE. The resulting "plumes" have coalesced and extend to the west, northwest and north of the plant building. However, as shown in Figure 1.4, the concentration of TCE drops sharply with increasing distance from the source areas and there was no indication of off-site migration of TCE within the overburden unit. Wells located 150 to 300 feet from the North Evaporation Pit (e.g., monitoring wells DGC-2S and micro-wells PS-11B, PS-15, PS-8B and PS-9) showed either no detectable TCE or TCE at less than 5 ug/l. Likewise, wells located 300 to 350 feet from the area of the purported West Evaporation Pit (e.g., monitoring wells DGC-4S and DGC-11S and micro-well PS-33) showed either no detectable TCE or concentrations less than 10 ug/l. The extent of TCE in the vicinity of the Waste Solvent Tank area is also believed to be limited.

There were isolated occurrences of TCE at a few other locations, the most notable being at piezometer PZ-5. This piezometer is located in the overburden unit about 50 feet north of the northern Laboratory Waste Solvent Tank. TCE and other VOCs such as 1,2-DCE and vinyl chloride were detected at this location. With the exception of a very low concentration of toluene, no VOCs were detected in piezometer PZ-6, located about 50 feet southwest of the southern Laboratory Waste Solvent Tank. Field analyses performed during the Phase IV investigation, however, showed elevated concentrations of VOCs in this tank. As a result, both of the Laboratory Waste Solvent Tanks were considered potential source areas.

The concentrations of TCE were sufficiently elevated in some overburden groundwater samples to suggest the possible presence of NAPLs in localized areas. A general rule-of-thumb is that concentrations of the "mother" compounds in excess of 1 to 5% of the aqueous solubility are indicative of NAPLs. The aqueous solubility of TCE is 1,100 mg/l, but may be somewhat higher in the presence of cosolvents such as acetone and methanol. Regardless, concentrations exceeded 1 to 5% of the aqueous solubility of TCE in areas at and between the North Evaporation Pit and Waste Solvent Tank. TCE concentrations greater than 1 to 5% of the aqueous solubility had also previously been observed in the field west of the plant building.

Isoconcentration contour maps were also presented in the Phase IV Subsurface Investigation Report for 1,2-DCE, vinyl chloride, toluene, xylenes, PCE and TCA. The extent of 1,2-DCE in groundwater in the overburden unit was found to be only slightly greater than the extent of TCE shown in Figure 1.4. The greater extent was not unexpected due to (a) degradation of TCE to 1,2-DCE and (b) the greater mobility of 1,2-DCE in groundwater due to less sorption. Regardless, however, there was no evidence of off-site migration of 1,2-DCE within the overburden unit.

The extent of vinyl chloride in the overburden groundwater appeared to be somewhat less than the extent of either TCE or 1,2-DCE based on results obtained during the Phase IV investigation. Likewise, the extent of toluene and xylenes in the overburden were also less than the extent of TCE shown in Figure 1.4. There were, however, a few isolated low-level detections of toluene and xylenes in a few areas.

The distribution of PCE was generally limited to the Waste Solvent Tank area. However, PCE was also detected in micro-well PS-9, located between the North Evaporation Pit and the garage. PCE was not reported in the vicinity of the North Evaporation Pit or purported West Evaporation Pit and disposal in these areas reportedly predates use of PCE at the plant.

The distribution of TCA was also shown to be limited in the overburden unit. TCA was reported only in the Waste Solvent Tank area. Isolated low-level detections of TCA were, however, reported in a few other localities. TCA was generally not reported in the vicinity of the North Evaporation Pit or purported West Evaporation Pit, and the use of TCA at the plant reportedly postdates disposal in these areas.

Isoconcentration contour maps were not prepared for acetone, methylene chloride or methanol during the Phase IV investigation. Acetone and methylene chloride are recognized as common laboratory contaminants by the EPA and the low-level detections were deemed suspect. However, acetone did appear to be present in the overburden groundwater at the North Evaporation Pit, near the purported West Evaporation Pit and at the Waste Solvent Tank area. Methylene chloride appeared to be present only at the Waste Solvent Tank area. Methanol was known to occur at the North Evaporation Pit and Waste Solvent Tank area based on (a) analyses of subsurface soil samples at and near the North Evaporation Pit and (b) analytical results from groundwater samples obtained from the shallow bedrock unit near the North Evaporation Pit and adjacent to the Waste Solvent Tank. Results showed that the lateral extent of acetone, methylene chloride and methanol in groundwater in the overburden unit was very limited. The limited extent of acetone and methanol, both of which are completely miscible in water and very mobile, was believed to be due to rapid biodegradation. This has been confirmed by the biodegradation study performed during the RI.

A total of five groundwater samples were obtained from four overburden monitoring wells during the Phase II and Phase IV investigations for analysis of SVOCs. Only two constituents were detected [i.e., bis(2-ethylhexyl)phthalate and n-nitrosodiphenylamine] and both were detected at trace concentrations below the quantitation limits. Both of these compounds were also detected at trace concentrations in the associated trip blank. Based on the above, bis(2-ethylhexyl)phthalate and n-nitrosodiphenylamine were considered to be laboratory and/or sampling artifacts.

Five groundwater samples were also obtained from four wells in the overburden unit during previous investigations for analysis of copper, tin and zinc. Copper was detected at 0.0052 mg/l in one sample. Tin and zinc were not detected in the overburden groundwater. The detection of copper was attributed to the occurrence of various metals in naturally-occurring groundwater (i.e., background).

7.4.2 Remedial Investigation Results

During the RI, groundwater samples were collected from eight overburden monitoring wells from July 12 to 21, 1993. Samples from monitoring wells B-16OV, DGC-2S and DGC-8S were analyzed for the complete TCL/TAL list of parameters using methodologies in the DEC's ASP. Samples from the other five wells (i.e., wells DGC-4S, DGC-9S, DGC-12S, DGC-12I and DGC-13S) were analyzed for TCL volatiles using ASP/CLP Method 91-1. The results of these analyses are presented in Tables 7.8, 7.12, 7.13 and 7.14. Miscellaneous wet chemistry results for selected wells are presented in Table 7.17.

On September 27 to 29, 1993, additional samples were collected from overburden wells DGC-2S, DGC-8S and B-16OV and analyzed for TAL metals. Both total and dissolved metals were analyzed. Analytical results are presented in Tables 7.15 and 7.16, respectively.

During the Laboratory Waste Solvent Tanks IRM, groundwater samples were obtained from overburden wells DGC-14S and DGC-15S on two occasions (i.e., April 26 and June 29, 1994). These samples were analyzed for TCL volatiles by ASP/CLP Method 91-1. Analytical results are presented on Tables 7.10 and 7.11, respectively. Results of the above analyses are discussed further below.

7.4.2.1 Volatile Organics

As shown in Tables 7.8, 7.10 and 7.11, analytical results for VOCs indicate that groundwater from the overburden unit exceeds New York State's groundwater standards at monitoring wells

Table 7.8
Groundwater Analytical Data
Wells Sampled During Main Sampling Event of RI
Volatile Organics
Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: July 12 to 21, 1993

Sample ID Compound	B-16OV (Background)	DGC-2S	DGC-4S	DGC-8S	DGC-9S	X-1 (DGC-9S)	DGC-12S	DGC-12I	DGC-13S	B-2S	B-7S	Standard/ Guidance Value
Chloromethane	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	5
Bromomethane	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	5
Vinyl Chloride	10 U	2900 D	10 U	100000 U	9500 DJ	12000 D	50000 U	17000 JD	10 U	10 U	10 U	2
Chloroethane	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	5
Methylene Chloride	10 U	200 U	10 U	100000 U	1000000 D	930000 D	50000 U	40000 U	10 U	10 U	10 U	5
Acetone	10 U	320 D	10 U	3600000 D	2200000 D	2100000 D	50000 U	1300000 D	77	10 U	10 U	50 (GV)
Carbon Disulfide	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	---
1,1-Dichloroethene	10 U	200 U	10 U	100000 U	750 DJ	790 DJ	50000 U	40000 U	10 U	10 U	10 U	5
1,1-Dichloroethane	10 U	200 U	10 U	100000 U	730 DJ	990 DJ	50000 U	40000 U	10 U	10 U	10 U	5
1,2-Dichloroethene (total)	10 U	1500 D	10 U	640000 D	180000 D	200000 D	50000 U	260000 D	2 J	10 U	10 U	5
Chloroform	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	7
1,2-Dichloroethane	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	5
2-Butanone	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	50 (GV)
1,1,1-Trichloroethane	10 U	200 U	10 U	100000 U	5900 DJ	5200 DJ	50000 U	40000 U	10 U	10 U	10 U	5
Carbon Tetrachloride	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	5
Bromodichloromethane	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	50 (GV)
1,2-Dichloropropane	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	5
cis-1,3-Dichloropropene	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	5
Trichloroethene	10 U	200 U	10 U	350000 D	520000 D	480000 D	690000 D	1100000 BD	10	10 U	10 U	5
Dibromochloromethane	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	50 (GV)
1,1,2-Trichloroethane	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	5
Benzene	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	0.7
trans-1,3-Dichloropropene	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	5
Bromoform	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	50 (GV)
4-Methyl-2-Pentanone	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	---
2-Hexanone	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	50 (GV)
Tetrachloroethene	10 U	200 U	10 U	100000 U	7400 DJ	6800 DJ	50000 U	40000 U	10 U	10 U	10 U	5
1,1,2,2-Tetrachloroethane	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	5
Toluene	10 U	13 DJ	10 U	5000 DJ	3100 DJ	3000 DJ	50000 U	40000 U	10 U	10 U	10 U	5
Chlorobenzene	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	5
Ethylbenzene	10 U	200 U	10 U	100000 U	600 DJ	640 DJ	50000 U	40000 U	10 U	10 U	10 U	5
Styrene	10 U	200 U	10 U	100000 U	10000 U	10000 U	50000 U	40000 U	10 U	10 U	10 U	5
Total Xylenes	10 U	200 U	10 U	100000 U	2400 DJ	2600 DJ	50000 U	40000 U	10 U	10 U	10 U	5

Results expressed in ug/L.
U indicates that the compound was not detected at the quantitation limit indicated.
J indicates that the value reported is estimated.
D indicates that the value reported is taken from the analysis of a diluted sample.
B indicates that the analyte is also found in the associated method blank.
(GV) indicates a guidance value rather than a standard.
--- indicates that no standard or guidance value exists.

Table 7.8 (Continued)
Groundwater Analytical Data
Wells Sampled During Main Sampling Event of RI
Volatile Organics

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: July 12 to 21, 1993

Sample ID Compound	B-8S	B-9S	B-10I	B-13I	B-14I	B-15S	B-17I	B-19I	B-20S	B-20I	B-21I	Standard/ Guidance Value
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Vinyl Chloride	10 U	180	3 J	10 U	10 U	10 U	54	10 U	10 U	42	10 U	2
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Methylene Chloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Acetone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
Carbon Disulfide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	---
1,1-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
1,2-Dichloroethene (total)	10 U	47	7 J	10 U	10 U	10 U	14	10 U	10 U	15	10 U	5
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	7
1,2-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
2-Butanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Carbon Tetrachloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
1,2-Dichloropropane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Trichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Benzene	0.6 J	0.8 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.7
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Bromoform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
4-Methyl-2-Pentanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	---
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Toluene	1 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Chlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Ethylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Styrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Total Xylenes	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5

Results expressed in ug/L.
U indicates that the compound was not detected at the quantitation limit indicated.
J indicates that the value reported is estimated.
D indicates that the value reported is taken from the analysis of a diluted sample.
B indicates that the analyte is also found in the associated method blank.
(GV) indicates a guidance value rather than a standard.
--- indicates that no standard or guidance value exists.

Table 7.8 (Continued)
Groundwater Analytical Data
Wells Sampled During Main Sampling Event of RI
Volatile Organics

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: July 12 to 21, 1993

Sample ID Compound	B-23I	B-24S	B-25I	X-2 (B-25I)	B-26S	B-27S (Background)	B-28S	DGC-1B	DGC-2B	DGC-3B	DGC-4B	Standard/ Guidance Value
Chloromethane	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
Bromomethane	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
Vinyl Chloride	10 U	7 J	10 U	10 U	160 DJ	10 U	64	7200 D	32000 D	10 U	280 D	2
Chloroethane	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
Methylene Chloride	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
Acetone	10 U	10 U	10 U	10 U	250 U	10 U	10 U	37000 D	6900 D	10 U	40 U	50 (GV)
Carbon Disulfide	10 U	5 J	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	22	40 U	---
1,1-Dichloroethene	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
1,1-Dichloroethane	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
1,2-Dichloroethene (total)	10 U	6 J	10 U	10 U	4100 D	10 U	50	8000 D	33000 D	10 U	1300 D	5
Chloroform	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	7
1,2-Dichloroethane	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
2-Butanone	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	50 (GV)
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
Carbon Tetrachloride	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
Bromodichloromethane	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	50 (GV)
1,2-Dichloropropane	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
Trichloroethene	10 U	10 U	10 U	10 U	17 DJ	10 U	1 J	500 U	2000 U	10 U	68 BD	5
Dibromochloromethane	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	50 (GV)
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
Benzene	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	0.7
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
Bromoform	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	50 (GV)
4-Methyl-2-Pentanone	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	---
2-Hexanone	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	50 (GV)
Tetrachloroethene	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
Toluene	10 U	10 U	10 U	10 U	250 U	10 U	10 U	120 DJ	520 DJ	10 U	40 U	5
Chlorobenzene	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
Ethylbenzene	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
Styrene	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	2000 U	10 U	40 U	5
Total Xylenes	10 U	10 U	10 U	10 U	250 U	10 U	10 U	500 U	300 DJ	10 U	40 U	5

Results expressed in ug/L.
U indicates that the compound was not detected at the quantitation limit indicated.
J indicates that the value reported is estimated.
D indicates that the value reported is taken from the analysis of a diluted sample.
B indicates that the analyte is also found in the associated method blank.
(GV) indicates a guidance value rather than a standard.
--- indicates that no standard or guidance value exists.

Table 7.8 (Continued)
Groundwater Analytical Data
Wells Sampled During Main Sampling Event of RI
Volatile Organics

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: July 12 to 21, 1993

Sample ID Compound	DGC-5B	DGC-8B	DGC-9B	DGC-10B	DGC-12B	B-2D	B-8D	B-9D	B-10D	B-13D (Background)	B-14D	Standard/ Guidance Value
Chloromethane	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Bromomethane	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Vinyl Chloride	10 U	100000 U	18000 D	380 DJ	39000 D	10 U	4 J	7 J	10 U	10 U	10 U	2
Chloroethane	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Methylene Chloride	10 U	100000 U	300000 D	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Acetone	10 U	2400000 D	1200000 D	10 U	130000 D	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
Carbon Disulfide	10 U	100000 U	10000 U	10 U	4000 U	10 U	25	10 U	10 U	10 U	10 U	---
1,1-Dichloroethene	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
1,1-Dichloroethane	10 U	100000 U	2000 DJ	62	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
1,2-Dichloroethene (total)	10 U	430000 D	340000 D	9100 D	100000 D	10 U	2 J	2 J	10 U	10 U	10 U	5
Chloroform	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	7
1,2-Dichloroethane	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
2-Butanone	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
1,1,1-Trichloroethane	10 U	100000 U	2800 DJ	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Carbon Tetrachloride	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Bromodichloromethane	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
1,2-Dichloropropane	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
cis-1,3-Dichloropropene	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Trichloroethene	10 U	820000 D	80000 D	4100 D	2600 BDJ	10 U	10 U	10 U	10 U	10 U	10 U	5
Dibromochloromethane	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
1,1,2-Trichloroethane	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Benzene	10 U	100000 U	10000 U	9 J	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	0.7
trans-1,3-Dichloropropene	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Bromoform	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
4-Methyl-2-Pentanone	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	---
2-Hexanone	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
Tetrachloroethene	10 U	100000 U	6800 DJ	2 J	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
1,1,2,2-Tetrachloroethane	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Toluene	10 U	6900 DJ	1900 DJ	4 J	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Chlorobenzene	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Ethylbenzene	10 U	100000 U	1500 DJ	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Styrene	10 U	100000 U	10000 U	10 U	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Total Xylenes	10 U	6900 DJ	8600 DJ	3 J	4000 U	10 U	10 U	10 U	10 U	10 U	10 U	5

Results expressed in ug/L.
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J indicates that the value reported is estimated.
D indicates that the value reported is taken from the analysis of a diluted sample.
B indicates that the analyte is also found in the associated method blank.
(GV) indicates a guidance value rather than a standard.
--- indicates that no standard or guidance value exists.

Table 7.8 (Continued)
Groundwater Analytical Data
Wells Sampled During Main Sampling Event of RI
Volatile Organics

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: July 12 to 21, 1993

Sample ID Compound	B-15D	B-17D	B-19D	B-20D	B-21D	B-23D	B-24D	B-25D (Background)	B-26D	B-27D	B-28D	Standard/ Guidance Value
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Vinyl Chloride	10 U	10 U	10 U	34	10 U	10 U	8 J	10 U	2 J	10 U	10 U	2
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Methylene Chloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Acetone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
Carbon Disulfide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	---
1,1-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
1,2-Dichloroethene (total)	10 U	1 J	10 U	12	10 U	10 U	3 J	10 U	9 J	10 U	10 U	5
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	7
1,2-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
2-Butanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Carbon Tetrachloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
1,2-Dichloropropane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Trichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Benzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.7
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Bromoform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
4-Methyl-2-Pentanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	---
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	50 (GV)
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Toluene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Chlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Ethylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Styrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5
Total Xylenes	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5

Results expressed in ug/L.
U indicates that the compound was not detected at the quantitation limit indicated.
J indicates that the value reported is estimated.
D indicates that the value reported is taken from the analysis of a diluted sample.
B indicates that the analyte is also found in the associated method blank.
(GV) indicates a guidance value rather than a standard.
--- indicates that no standard or guidance value exists.

Table 7.9
Groundwater Analytical Data
Resampling of Selected Shallow and Deep Bedrock Wells During RI
Volatile Organics
Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: June 13 and 14, 1994

Sample ID Compound	B-8S	B-9SR	B-17SR	B-20S	B-20I	B-24SR	B-26S	B-8D	X-1 (B-8D)	B-9D	B-20D	B-24D	B-26D	Standard/ Guidance Value
Bromodichloromethane	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	50 (GV)
Bromoform	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	50 (GV)
Bromomethane	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
Carbon Tetrachloride	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
Chlorobenzene	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
Chloroethane	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
2-Chloroethylvinyl ether	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	---
Chloroform	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	7
Chloromethane	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
Dibromochloromethane	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	50 (GV)
1,2-Dichlorobenzene	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	4.7
1,3-Dichlorobenzene	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
1,4-Dichlorobenzene	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	4.7
1,1-Dichloroethane	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
1,2-Dichloroethane	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
1,1-Dichloroethene	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
cis-1,2-Dichloroethene	1 U	130 X	9.9 X	1 U	9.7 X	1.2 X	1130 XE	3.4 X	3.3 X	1.4 X	2.1 X	4.1 X	4.9 X	5
trans-1,2-Dichloroethene	1 U	25 U	10 U	1 U	1 U	1 U	15 J	1 U	1 U	1 U	1 U	1 U	1 U	5
1,2-Dichloropropane	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
cis-1,3-Dichloropropene	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
trans-1,3-Dichloropropene	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
Methylene chloride	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
1,1,2,2-Tetrachloroethane	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
Tetrachloroethene	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
1,1,1-Trichloroethane	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
1,1,2-Trichloroethane	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
Trichloroethene	1 U	25 U	10 U	1 U	1 U	1 U	34	1 U	1 U	1 U	1 U	1 U	1 U	5
Trichlorofluoromethane	1 U	25 U	10 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U	1 U	5
Vinyl chloride	2.4	880	110	2.1	50	3.5	210	8.3	8.6	6.2	11	5.9	2.1	2

Results expressed in ug/L.
U indicates that the compound was not detected at the quantitation limit indicated.
D indicates that the value reported is taken from the analysis of a diluted sample.
E indicates that the value reported exceeds the calibration range of the instrument.
X indicates that, because the laboratory did not run a continuing calibration for cis-1,2-dichloroethene on the day the sample was analyzed,
cis-1,2-dichloroethene result shown was estimated by the laboratory based upon the most recent calibration standard analyzed.
(GV) indicates a guidance value rather than a standard.
--- indicates that no standard or guidance value exists.

Table 7.10
Groundwater Analytical Data
Wells Sampled During First Sampling Event of Laboratory Waste Solvent Tanks IRM
Volatile Organics
Former Powerex, Inc. Facility
Auburn, New York

Sampling Date: April 26, 1994

Sample ID Compound	DGC-14S	X-1 (DGC-14S)	DGC-15S	Standard/ Guidance Value
Chloromethane	10 U	10 U	10 U	5
Bromomethane	10 U	10 U	10 U	5
Vinyl Chloride	78	71	810 D	2
Chloroethane	10 U	10 U	10 U	5
Methylene Chloride	10 U	10 U	10 U	5
Acetone	10 U	10 U	10 U	50 (GV)
Carbon Disulfide	10 U	10 U	10 U	---
1,1-Dichloroethene	10 U	10 U	13	5
1,1-Dichloroethane	10 U	10 U	10 U	5
1,2-Dichloroethene (total)	160 D	150 D	4900 D	5
Chloroform	10 U	10 U	10 U	7
1,2-Dichloroethane	10 U	10 U	10 U	5
2-Butanone	10 U	10 U	10 U	50 (GV)
1,1,1-Trichloroethane	1 J	1 J	10 U	5
Carbon Tetrachloride	10 U	10 U	10 U	5
Bromodichloromethane	10 U	10 U	10 U	50 (GV)
1,2-Dichloropropane	10 U	10 U	10 U	5
cis-1,3-Dichloropropene	10 U	10 U	10 U	5
Trichloroethene	1100 D	1100 D	1900 D	5
Dibromochloromethane	10 U	10 U	10 U	50 (GV)
1,1,2-Trichloroethane	10 U	10 U	10 U	5
Benzene	10 U	10 U	0.7 J	0.7
trans-1,3-Dichloropropene	10 U	10 U	10 U	5
Bromoform	10 U	10 U	10 U	50 (GV)
4-Methyl-2-Pentanone	10 U	10 U	10 U	---
2-Hexanone	10 U	10 U	10 U	50 (GV)
Tetrachloroethene	10 U	10 U	10 U	5
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	5
Toluene	10 U	10 U	10 U	5
Chlorobenzene	10 U	10 U	10 U	5
Ethylbenzene	10 U	10 U	10 U	5
Styrene	10 U	10 U	10 U	5
Total Xylenes	1 J	1 J	4 J	5

Results expressed in ug/L.
U indicates that the compound was not detected at the quantitation limit indicated.
J indicates that the value reported is estimated.
D indicates that the value reported is taken from the analysis of a diluted sample.
(GV) indicates a guidance value rather than a standard.
--- indicates that no standard or guidance value exists.

Table 7.11
Groundwater Analytical Data
Wells Sampled During Second Sampling Event of Laboratory Waste Solvent Tanks IRM
Volatile Organics

Former Powerex, Inc. Facility
Auburn, New York

Sampling Date: June 29, 1994

Sample ID Compound	DGC-14S	DGC-15S	DGC-14B	DGC-15B	X-2 (DGC-15B)	Standard/ Guidance Value
Chloromethane	200 U	200 U	40 U	10 U	10 U	5
Bromomethane	200 U	200 U	40 U	10 U	10 U	5
Vinyl Chloride	980 D	1100 D	49	28	29	2
Chloroethane	200 U	200 U	40 U	10 U	10 U	5
Methylene Chloride	200 U	200 U	40 U	10 U	10 U	5
Acetone	200 U	200 U	40 U	10 U	10 U	50 (GV)
Carbon Disulfide	200 U	200 U	40 U	10 U	10 U	---
1,1-Dichloroethene	200 U	200 U	40 U	10 U	10 U	5
1,1-Dichloroethane	200 U	200 U	40 U	10 U	10 U	5
1,2-Dichloroethene (total)	3600 D	3400 D	250 D	50	53	5
Chloroform	200 U	200 U	40 U	10 U	10 U	7
1,2-Dichloroethane	200 U	200 U	40 U	10 U	10 U	5
2-Butanone	200 U	200 U	40 U	10 U	10 U	50 (GV)
1,1,1-Trichloroethane	200 U	200 U	40 U	10 U	10 U	5
Carbon Tetrachloride	200 U	200 U	40 U	10 U	10 U	5
Bromodichloromethane	200 U	200 U	40 U	10 U	10 U	50 (GV)
1,2-Dichloropropane	200 U	200 U	40 U	10 U	10 U	5
cis-1,3-Dichloropropene	200 U	200 U	40 U	10 U	10 U	5
Trichloroethene	320 D	2300 D	490 D	49	52	5
Dibromochloromethane	200 U	200 U	40 U	10 U	10 U	50 (GV)
1,1,2-Trichloroethane	200 U	200 U	40 U	10 U	10 U	5
Benzene	200 U	200 U	40 U	10 U	10 U	0.7
trans-1,3-Dichloropropene	200 U	200 U	40 U	10 U	10 U	5
Bromoform	200 U	200 U	40 U	10 U	10 U	50 (GV)
4-Methyl-2-Pentanone	200 U	200 U	40 U	10 U	10 U	---
2-Hexanone	200 U	200 U	40 U	10 U	10 U	50 (GV)
Tetrachloroethene	200 U	200 U	40 U	10 U	10 U	5
1,1,2,2-Tetrachloroethane	200 U	200 U	40 U	10 U	10 U	5
Toluene	200 U	200 U	4 JS	3 JS	3 JS	5
Chlorobenzene	200 U	200 U	40 U	10 U	10 U	5
Ethylbenzene	200 U	200 U	40 U	10 U	10 U	5
Styrene	200 U	200 U	40 U	10 U	10 U	5
Total Xylenes	200 U	200 U	40 U	10 U	10 U	5

Results expressed in ug/L.
U indicates that the compound was not detected at the quantitation limit indicated.
J indicates that the value reported is estimated.
D indicates that the value reported is taken from the analysis of a diluted sample.
S indicates that the value reported is suspected to be due to laboratory contamination.
(GV) indicates a guidance value rather than a standard.
--- indicates that no standard or guidance value exists.

Table 7.12
Groundwater Analytical Data
Wells Sampled During Main Sampling Event of RI
Semi-Volatile Organics
Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: July 12 to 21, 1993

Sample ID Compound	B-16OV (Background)	DGC-2S	DGC-8S	B-8S	B-25I	B-27S (Background)	DGC-8B	DGC-9B	B-8D	B-13D (Background)	B-25D (Background)	Standard/ Guidance Value
Phenol	10 U	10 U	30	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	1
bis(2-Chloroethyl)Ether	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	1
2-Chlorophenol	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	1
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	5
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	4.7
1,2-Dichlorobenzene	10 U	10 U	69	10 U	10 U	11 U	72	11 U	10 U	10 U	10 U	4.7
2-Methylphenol	10 U	10 U	6 J	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	1
2,2'-oxybis(1-Chloropropane)	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	---
4-Methylphenol	10 U	8 J	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	1
N-Nitroso-Di-n-Propylamine	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	---
Hexachloroethane	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	---
Nitrobenzene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	5
Isophorone	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	50 (GV)
2-Nitrophenol	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	1
2,4-Dimethylphenol	10 U	10 U	10 U	10 U	10 U	11 U	10 U	12	10 U	10 U	10 U	1
bis(2-Chloroethoxy)Methane	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	---
2,4-Dichlorophenol	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	1
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	5
Naphthalene	10 U	10 U	10	10 U	10 U	11 U	21	12	10 U	10 U	10 U	10 (GV)
4-Chloroaniline	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	---
Hexachlorobutadiene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	5
4-Chloro-3-Methylphenol	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	1
2-Methylnapthalene	10 U	10 U	3 J	10 U	10 U	11 U	6 J	11 U	10 U	10 U	10 U	---
Hexachlorocyclopentadiene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	5
2,4,6-Trichlorophenol	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	1
2,4,5-Trichlorophenol	25 U	25 U	25 U	25 U	25 U	28 U	25 U	26 U	25 U	25 U	25 U	1
2-Chloronaphthalene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	10 (GV)
2-Nitroaniline	25 U	25 U	25 U	25 U	25 U	28 U	25 U	26 U	25 U	25 U	25 U	---
Dimethyl Phthalate	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	50 (GV)
Acenaphthylene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	---
2,6-Dinitrotoluene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	5
3-Nitroaniline	25 U	25 U	25 U	25 U	25 U	28 U	25 U	26 U	25 U	25 U	25 U	---

Results expressed in ug/L.

U indicates that the compound was not detected at the quantitation limit indicated.

J indicates that the value reported is estimated.

S indicates that the value reported is suspected to be due to laboratory contamination.

(GV) indicates a guidance value rather than a standard.

--- indicates that no standard or guidance value exists.

Table 7.12 (Continued)
Groundwater Analytical Data
Wells Sampled During Main Sampling Event of RI
Semi-Volatile Organics
Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: July 12 to 21, 1993

Sample ID Compound	B-16OV (Background)	DGC-2S	DGC-8S	B-8S	B-25I	B-27S (Background)	DGC-8B	DGC-9B	B-8D	B-13D (Background)	B-25D (Background)	Standard/ Guidance Value
Acenaphthene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	20 (GV)
2,4-Dinitrophenol	25 U	25 U	25 U	25 U	25 U	28 U	25 U	26 U	25 U	25 U	25 U	1
4-Nitrophenol	25 U	25 U	25 U	25 U	25 U	28 U	25 U	26 U	25 U	25 U	25 U	1
Dibenzofuran	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	---
2,4-Dinitrotoluene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	---
Diethylphthalate	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	50 (GV)
4-Chlorophenyl-phenylether	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	---
Fluorene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	50 (GV)
4-Nitroaniline	25 U	25 U	25 U	25 U	25 U	28 U	25 U	26 U	25 U	25 U	25 U	---
4,6-Dinitro-2-Methylphenol	25 U	25 U	25 U	25 U	25 U	28 U	25 U	26 U	25 U	25 U	25 U	1
N-Nitrosodiphenylamine	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	50 (GV)
4-Bromophenyl-phenylether	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	---
Hexachlorobenzene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	0.35
Pentachlorophenol	25 U	25 U	25 U	25 U	25 U	28 U	25 U	26 U	25 U	25 U	25 U	1
Phenanthrene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	50 (GV)
Anthracene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	50 (GV)
Carbazole	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	---
Di-n-Butylphthalate	10 U	10 U	0.8 JS	10 U	10 U	11 U	6 JS	11 U	10 U	10 U	0.4 JS	50
Fluoranthene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	50 (GV)
Pyrene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	50 (GV)
Butylbenzylphthalate	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	50 (GV)
3,3'-Dichlorobenzidine	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	---
Benzo(a)Anthracene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	0.002 (GV)
Chrysene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	0.002 (GV)
bis(2-Ethylhexyl)phthalate	0.4 JS	10 S	10 U	10 U	10 U	11 U	4 JS	0.8 JS	10 U	10 U	10 U	50
Di-n-Octyl Phthalate	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	50 (GV)
Benzo(b)Fluoranthene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	0.002 (GV)
Benzo(k)Fluoranthene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	0.002 (GV)
Benzo(a)Pyrene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	ND
Indeno(1,2,3-cd)Pyrene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	0.002 (GV)
Dibenz(a,h)Anthracene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	---
Benzo(g,h,i)Perylene	10 U	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	10 U	10 U	---

Results expressed in ug/L.
U indicates that the compound was not detected at the quantitation limit indicated.
J indicates that the value reported is estimated.
S indicates that the value reported is suspected to be due to laboratory contamination.
GV indicates a guidance value rather than a standard.
--- indicates that no standard or guidance value exists.

Table 7.13
Groundwater Analytical Data
Wells Sampled During Main Sampling Event of RI
Pesticides/PCBs

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: July 12 to 21, 1993

Sample ID Compound	B-16OV (Background)	DGC-2S	DGC-8S	B-8S	B-25I	B-27S (Background)	DGC-8B	DGC-9B	B-8D	B-13D (Background)	B-25D (Background)	Standard
alpha-BHC	0.054 U	0.050 U	0.050 U	0.053 UV	0.050 U	0.050 U	0.26 U	0.052 UV	0.050 UV	0.050 UV	0.050 U	ND (a)
beta-BHC	0.054 U	0.050 U	0.050 U	0.053 UV	0.050 U	0.050 U	0.26 U	0.052 UV	0.050 UV	0.050 UV	0.050 U	ND (a)
delta-BHC	0.054 U	0.050 U	0.050 U	0.053 UV	0.050 U	0.050 U	0.26 U	0.052 UV	0.050 UV	0.050 UV	0.050 U	ND (a)
gamma-BHC (Lindane)	0.054 U	0.050 U	0.050 U	0.053 UV	0.072 UV	0.050 U	0.26 U	0.052 UV	0.050 UV	0.050 UV	0.050 U	ND (a)
Heptachlor	0.054 U	0.050 U	0.050 U	0.053 UV	0.072 UV	0.050 U	0.26 U	0.052 UV	0.050 UV	0.050 UV	0.050 U	ND (b)
Aldrin	0.054 U	0.050 U	0.050 U	0.053 UV	0.072 UV	0.050 U	0.26 U	0.052 UV	0.050 UV	0.050 UV	0.050 U	ND (b)
Heptachlor epoxide	0.054 U	0.050 U	0.050 U	0.053 UV	0.050 U	0.050 U	0.13 JPV	0.052 UV	0.050 UV	0.050 UV	0.050 U	ND (b)
Endosulfan I	0.054 U	0.050 U	0.050 U	0.053 UV	0.050 U	0.050 U	0.26 U	0.052 UV	0.050 UV	0.050 UV	0.050 U	---
Dieldrin	0.11 U	0.10 U	0.10 U	0.11 UV	0.14 UV	0.10 U	0.52 U	0.10 UV	0.10 UV	0.10 UV	0.10 U	ND
4,4'-DDE	0.11 U	0.10 U	0.10 U	0.11 UV	0.10 U	0.10 U	0.52 U	0.10 UV	0.10 UV	0.10 UV	0.10 U	ND (c)
Endrin	0.11 U	0.10 U	0.10 U	0.11 UV	0.14 UV	0.10 U	0.52 U	0.10 UV	0.10 UV	0.10 UV	0.10 U	ND
Endosulfan II	0.11 U	0.10 U	0.10 U	0.11 UV	0.10 U	0.10 U	0.52 U	0.10 UV	0.10 UV	0.10 UV	0.10 U	---
4,4'-DDD	0.11 U	0.10 U	0.10 U	0.11 UV	0.10 U	0.10 U	0.52 U	0.10 UV	0.10 UV	0.10 UV	0.10 U	ND (c)
Endosulfan sulfate	0.11 U	0.10 U	0.10 U	0.11 UV	0.10 U	0.10 U	0.52 U	0.10 UV	0.10 UV	0.10 UV	0.10 U	---
4,4'-DDT	0.11 U	0.10 U	0.10 U	0.11 UV	0.14 UV	0.10 U	0.52 U	0.014 JPV	0.10 UV	0.10 UV	0.10 U	ND (c)
Methoxychlor	0.54 U	0.50 U	0.50 U	0.53 UV	0.50 U	0.50 U	2.6 U	0.52 UV	0.50 UV	0.50 UV	0.50 U	35
Endrin ketone	0.11 U	0.10 U	0.10 U	0.11 UV	0.10 U	0.10 U	0.52 U	0.10 UV	0.10 UV	0.10 UV	0.10 U	---
Endrin aldehyde	0.11 U	0.10 U	0.10 U	0.11 UV	0.10 U	0.10 U	0.52 U	0.10 UV	0.10 UV	0.10 UV	0.10 U	---
alpha-Chlordane	0.054 U	0.050 U	0.050 U	0.053 UV	0.050 U	0.050 U	0.65 PV	0.052 UV	0.050 UV	0.050 UV	0.050 U	0.1 (d)
gamma-Chlordane	0.054 U	0.050 U	0.050 U	0.053 UV	0.050 U	0.050 U	0.26 U	0.052 UV	0.050 UV	0.050 UV	0.050 U	0.1 (d)
Toxaphene	5.4 U	5.0 U	5.0 U	5.3 UV	5.0 U	5.0 U	26 U	5.2 UV	5.0 UV	5.0 UV	5.0 U	ND
Aroclor-1016	1.1 U	1.0 U	1.0 U	1.1 UV	1.0 U	1.0 U	5.2 U	1.0 UV	1.0 UV	1.0 UV	1.0 U	0.1 (e)
Aroclor-1221	2.2 U	2.0 U	2.0 U	2.1 UV	2.0 U	2.0 U	10 U	2.1 UV	2.0 UV	2.0 UV	2.0 U	0.1 (e)
Aroclor-1232	1.1 U	1.0 U	1.0 U	1.1 UV	1.0 U	1.0 U	5.2 U	1.0 UV	1.0 UV	1.0 UV	1.0 U	0.1 (e)
Aroclor-1242	1.1 U	1.0 U	1.0 U	1.1 UV	1.0 U	1.0 U	5.2 U	1.0 UV	1.0 UV	1.0 UV	1.0 U	0.1 (e)
Aroclor-1248	1.1 U	1.0 U	1.0 U	1.1 UV	1.0 U	1.0 U	5.2 U	1.0 UV	1.0 UV	1.0 UV	1.0 U	0.1 (e)
Aroclor-1254	1.1 U	1.0 U	1.0 U	1.1 UV	1.0 U	1.0 U	5.2 U	1.0 UV	1.0 UV	1.0 UV	1.0 U	0.1 (e)
Aroclor-1260	1.1 U	1.0 U	1.0 U	1.1 UV	1.0 U	1.0 U	5.2 U	1.0 UV	1.0 UV	1.0 UV	1.0 U	0.1 (e)

Results expressed in ug/L.
U indicates that the compound was analyzed for but not detected at the quantitation limit indicated.
V indicates that reported value is estimated due to variance from quality control criteria.
J indicates that reported value is estimated.
P indicates that relative percent difference between the results from the two analytical columns is greater than 40%.
ND indicates a non-detectable concentration by the appropriate DEC-approved analytical method.
(a) values listed apply to sum of these substances.
(b) values listed apply to sum of these substances.
(c) values listed apply to sum of these substances.
(d) values listed apply to sum of these substances.
(e) values listed apply to sum of these substances.
--- indicates that no standard or guidance value exists.

Table 7.14
Groundwater Analytical Data
Wells Sampled During Main Sampling Event of RI
Total Metals

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: July 12 to 21, 1993

Sample ID Analyte	B-16OV (Background)	DGC-2S	DGC-8S	B-8S	B-25I	B-27S (Background)	DGC-8B	DGC-9B	B-8D	B-13D (Background)	B-25D (Background)	Standard/ Guidance Value
Aluminum	13200	19400	50400	48000	391	769	725	15500	5120	6180	953 V	---
Antimony	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UW	5.0 U	5.0 U	3 (GV)
Arsenic	5.0 B	4.0 U	18.0	22.0	14.3 SV	4.0 U	20.7 S	28.0	4.0 U	10.0	4.0 UW	25
Barium	169 B	337	816	622	304	164 B	343	12600	203	352	250	1000
Beryllium	3.0 U	3.0 U	3.0 U	3.0 U	5.6	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3 (GV)
Cadmium	0.20 UW	0.20 B	0.30 BV	0.70 BV	0.20 U	0.20 U	0.80 BV	0.20 U	0.20 U	0.20 U	0.20 U	10
Calcium	151000	324000	928000	410000	138000	115000	229000	1740000	104000	282000	108000	---
Chromium	20.7	19.6	93.7	49.7	10.0 U	10.0 U	11.2	111	10.0 U	10.0 U	10.0 U	50
Cobalt	20.0 U	20.0 U	64.8	36.3 B	24.4 B	20.0 U	31.4 B	20.0 U	20.0 U	20.9 B	20.0 U	---
Copper	5.0 U	10.7 B	37.7	41.3	28.7	5.4 B	14.3 B	219	5.0 U	8.7 B	5.0 U	200
Iron	17400	20900	111000	141000	68100	50300	14600	62100	6960	11000	1890	300
Lead	18.2 S	12.0	49.2 SV	66.9 SV	2.0 UW	2.0 UW	2.0 UW	107 SV	11.0 S	14.0	2.0 U	25
Magnesium	64600	104000	317000	137000	63600	36800	81400	164000	52300	156000	53000	35000 (GV)
Manganese	324	828	2990	1140	257	180	871	713	106	337	20.6	300
Mercury	0.20 U	0.20 U	0.40	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	2
Nickel	30.0 U	33.2 B	118	97.4	30.0 B	30.0 U	34.4 B	103	30.0 U	30.0 U	30.0 U	---
Potassium	4630 B	8740	17100	14200	1680 B	1850 B	1800 B	6300	1530 B	4680 B	2810 B	---
Selenium	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 UW	3.0 U	3.0 U	3.0 U	10
Silver	0.40 U	1.0 BV	0.40 U	0.40 U	R	0.40 U	0.40 U	0.40 U	0.40 UV	0.40 UV	0.40 UV	50
Sodium	3290 B	6950	6950	11700	68800	26300	4950 B	15200 V	5330	4560 B	32800 V	20000
Thallium	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4 (GV)
Vanadium	27.0 B	20.7 B	85.7	67.0	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	---
Zinc	46.7 V	186	263	170	26.4 V	10.0 U	369	138	136	47.3 V	10.0 U	300
Cyanide	10.0 U	10.0 U	10.0 U	10.0 U	R	10.4	14.2	10.0 U	10.0 U	10.0 U	10.0 U	100

Results expressed in ug/L.
U indicates analyte result less than instrument detection limit (IDL).
B indicates analyte result between IDL and contract required detection limit.
V indicates reported value is estimated due to variance from quality control limits.
W indicates graphite furnace atomic absorption analytical spike was out of 85-125 percent control limit, while sample absorbance was less than 50% of spike absorbance.
S indicates that the reported value was determined by the method of standard additions.
R indicates that the data has been rejected due to variance from quality control limits; rejected data is unusable.
(GV) indicates a guidance value rather than a standard.
--- indicates that no standard or guidance value exists.

Table 7.15
Groundwater Analytical Data
Wells Resampled for Metals During RI
Total Metals

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: September 27 to 29, 1993

Sample ID Analyte	B-16OV (Background)	DGC-2S	DGC-8S	B-8S	B-25I	B-27S (Background)	DGC-8B	DGC-9B	B-8D	B-13D (Background)	B-25D (Background)	Standard/ Guidance Value
Aluminum	19800	1680	64300	123000	R	179 B	4460	3030	7260	6290	1310	---
Antimony	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UW	5.0 U	3 (GV)
Arsenic	3.0 U	10.0	22.0	42.0	3.0 U	3.0 U	52.0	10.0	3.0 B	22.0	15.0 U	25
Barium	219	598	947	1540	244	167 B	351	3790	249	324	233	1000
Beryllium	3.0 U	3.0 U	3.0 U	9.0	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3 (GV)
Cadium	0.20 U	0.20 UW	0.20 UW	0.20 UW	0.20 U	0.20 U	0.20 UW	0.20 UW	0.20 UW	0.20 UW	0.20 UW	10
Calcium	291000	266000	1140000	1640000	131000	123000	266000	341000	122000	145000	116000	---
Chromium	24.0	10.0 U	142	191	13.4	10.0 U	96.0	52.0	10.0 U	12.9	10.0 U	50
Cobalt	20.0 U	20.0 U	57.1	174 B	20.0 U	20.0 U	31.3 B	20.0 U	20.0 U	42.3 B	20.0 U	---
Copper	10.0 U	236	90.9	359	62.2 V	10.0 U	38.5	34.4	18.4 B	10.1 B	27.4	200
Iron	20600	16700	106000	366000	47800 V	11900	16600	7370	11800	13000	5810	300
Lead	19.0	R	1570 SV	195 S	2.0 U	2.0 U	7.0 V	39.5 SV	20.0	18.0	5.0	25
Magnesium	119000	73300	332000	468000	62000	36500	82400	76000	57700	79800	48900	35000 (GV)
Manganese	791	412	3520	5200	250 V	44.7	1030	174	123	204	81.8	300
Mercury	0.40 U	0.40 U	0.57	0.64 U	0.40 U	0.40 U	0.43	0.40 U	0.40 U	0.40 U	0.40 U	2
Nickel	30.0 U	30.0 U	149	410	30.0 U	30.0 U	69.2	39.9 B	30.0 U	43.9	30.0 U	---
Potassium	5930	5750	17900	40100	1670 B	2280 B	3800 B	4930 B	2160 B	4620 B	2760 B	---
Selenium	3.0 UV	3.0 UV	3.0 UWV	3.0 UV	3.0 UWV	3.0 UWV	3.0 UV	15.0 UWV	3.0 UV	15.0 UWV	3.0 UWV	10
Silver	0.20 UWV	0.20 UWV	0.20 UWV	0.20 UWV	0.20 UWV	0.20 UWV	1.2 BV	2.2 BV	0.20 UWV	0.20 UWV	0.20 UWV	50
Sodium	6320 E	7760 E	8440 E	38800 EV	62700 EV	51200 E	7790 E	18500 E	6720 E	6730 E	30400 E	20000
Thallium	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	4 (GV)
Vanadium	31.0 B	20.0 U	80.6	237	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	---
Zinc	131	206	349	725	42.1 V	10.0 U	1870	59.1	92.0	111.0	127	300

Results expressed in ug/L.
U indicates analyte result less than instrument detection limit (IDL).
B indicates analyte result between IDL and contract required detection limit.
V indicates reported value is estimated due to variance from quality control limits.
W indicates graphite furnace atomic absorption analytical spike was out of 85-125 percent control limit, while sample absorbance was less than 50% of spike absorbance.
S indicates that the reported value was determined by the method of standard additions.
R indicates that the data has been rejected due to variance from quality control limits; data is unusable.
(GV) indicates a guidance value rather than a standard.
--- indicates that no standard or guidance value exists.

Table 7.16
Groundwater Analytical Data
Wells Resampled for Metals During RI
Dissolved Metals
Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: September 27 to 29, 1993

Sample ID Analyte	B-16OV (Background)	DGC-2S	DGC-8S	B-8S	B-25I	B-27S (Background)	DGC-8B	DGC-9B	B-8D	B-13D (Background)	B-25D (Background)
Aluminum	90.0 U	90.0 U	90.0 U	90.0 U	NR	NR	90.0 U	90.0 U	90.0 U	90.0 U	90.0 U
Antimony	5.0 U	5.0 U	5.0 U	5.0 U	NR	NR	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Arsenic	3.0 U	7.0 B	3.0 U	3.0 U	NR	NR	10.0	3.0 U	3.0 U	3.0 U	3.0 U
Barium	94.7 B	574	512	430	NR	NR	332	3200	199 B	239	206
Beryllium	3.0 U	3.0 U	3.0 U	3.0 U	NR	NR	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Cadmium	0.20 UW	0.20 U	0.20 UW	0.20 U	NR	NR	0.20 U	0.20 U	0.20 U	0.20 U	0.20 UW
Calcium	105000	247000	375000	92600	NR	NR	228000	228000	100000	92700	100000
Chromium	10.0 U	10.0 U	10.0 U	10.0 U	NR	NR	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Cobalt	20.0 U	20.0 U	31.8 B	20.0 U	NR	NR	28.9 B	20.0 U	20.0 U	20.0 U	20.0 U
Copper	10.0 U	10.0 U	10.0 U	10.0 U	NR	NR	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Iron	40.0 U	8010	47200	640	2000	312	11800	841	1540	68.7 B	56.0 B
Lead	2.0 UW	3.0 W	19.8 S	2.0 UW	NR	NR	13.0 V	2.0 B	2.0 U	2.0 U	2.0 U
Magnesium	47000	67200	73100	37800	NR	NR	67500	64900	48100	54700	48300
Manganese	5.0 U	328	1110.0	21.3	NR	NR	933.0	91.7	21.9	44.6	21.4
Mercury	0.40 U	0.40 U	0.40 U	0.40 U	NR	NR	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U
Nickel	30.0 U	30.0 U	30.0 U	30.0 U	NR	NR	30.0 U	30.0 U	30.0 U	30.0 U	30.0 U
Potassium	1000 U	5520	1490 B	13400	NR	NR	1780 B	4960 B	1070 B	2200 B	2530 B
Selenium	3.0 UW	3.0 UW	3.0 U	3.0 UW	NR	NR	3.0 UW	3.0 U	3.0 UW	3.0 U	3.0 U
Silver	0.20 UV	0.20 UV	0.20 UV	0.20 UV	NR	NR	0.20 UV	0.20 UV	0.20 UV	0.20 UV	0.20 UV
Sodium	4910 B	7160	5510	47400 V	64000	52800	6460	18300	5830	5870	32700
Thallium	3.0 U	3.0 U	3.0 U	3.0 U	NR	NR	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Vanadium	20.0 U	20.0 U	20.0 U	20.0 U	NR	NR	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
Zinc	10.0 U	35.1	10.0 U	10.0 U	NR	NR	36.0	10.0 U	10.0 U	10.0 U	32.2

Results expressed in ug/L.
NR indicates that analysis was not requested.
U indicates analyte result less than instrument detection limit (IDL).
B indicates analyte result between IDL and contract required detection limit.
V indicates reported value is estimated due to variance from quality control limits.
W indicates graphite furnace atomic absorption analytical spike was out of 85-125 percent control limit, while sample absorbance was less than 50% of spike absorbance.
S indicates that the reported value was determined by the method of standard additions.
R indicates that the data has been rejected due to variance from quality control limits; data is unusable.
(GV) indicates a guidance value rather than a standard.
--- indicates that no standard or guidance value exists.

Table 7.17
Groundwater Analytical Data
Wells Sampled During Main Sampling Event of RI
Wet Chemistry

Former Powerex, Inc. Facility
Auburn, New York

Sampling Dates: July 12 to 16, 1993

Sample ID Compound	B-16OV (Background)	DGC-2S	B-2S	B-7S	B-8S	B-15S	B-27S (Background)	B-28S	DGC-1B	DGC-2B	Standard/ Guidance Value
Ammonia	< 0.050	0.084	0.84	0.32	< 0.050	0.073	< 0.050	< 0.050	< 0.050	< 0.050	2
Chloride	< 1.0	44.7	1090	7.9	< 1.0	4.8	11	< 1.0	139	8.4	250
H2S Released (mg/kg)	68.5	< 10	< 10	< 10	< 10	< 10	61.6	57.4	< 10	< 10	0.050 (GV)
Nitrate	1.1	< 0.050	< 0.050	0.053	< 0.050	< 0.050	0.81	< 0.050	< 0.050	< 0.050	10 *
Nitrite	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	10 *
Soluble Phosphorus	< 0.020	< 0.020	< 0.020	0.07	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	---
Sulfate	42.8	10.9	29	41.4	11.6	30.4	20.5	44	5.2	6	250
Total Phosphorus	< 0.020	0.3	< 0.020	< 0.020	0.27	< 0.020	< 0.020	< 0.020	< 0.020	0.026	---

Sample ID Compound	DGC-3B	DGC-4B	DGC-5B	DGC-8B	DGC-10B	B-9D	B-13D (Background)	B-20D	B-25D (Background)	B-26D	Standard/ Guidance Value
Ammonia	0.06	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	0.26	< 0.050	2
Chloride	14.5	62.2	794	8.8	16.5	29.4	32.5	32.1	115	< 1.0	250
H2S Released (mg/kg)	< 10	< 10	< 10	24.2	39.3	< 10	< 10	< 10	< 10	72.6	0.050 (GV)
Nitrate	0.052	< 0.050	0.052	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	10 *
Nitrite	< 0.050	0.063	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	10 *
Soluble Phosphorus	0.054	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	---
Sulfate	74	47.4	116	35.6	26.3	18	36.2	30.2	35.2	5	250
Total Phosphorus	0.16	< 0.020	0.049	0.041	0.041	0.026	0.11	1.2	0.039	0.11	---

Results expressed in mg/L unless otherwise specified.
(GV) indicates a guidance value rather than a standard.
* indicates that the value listed applies to the sum of these analytes.

DGC-2S, DGC-8S, DGC-9S, DGC-12S, DGC-12I, DGC-13S, DGC-14S and DGC-15S. Groundwater standards were exceeded for TCE, 1,2-DCE, 1,1-DCE, 1,1-DCA, vinyl chloride, acetone, toluene, ethylbenzene and xylenes in one or more of these wells. No VOCs were detected in groundwater from overburden monitoring wells B-16OV, the background well, or DGC-4S.

Groundwater in the immediate vicinity of the three primary source areas exhibited VOC concentrations exceeding their respective groundwater standards by several orders of magnitude. Groundwater from overburden monitoring well DGC-8S, located near the North Evaporation Pit, exhibited elevated concentrations of TCE, 1,2-DCE, acetone and toluene. In the Waste Solvent Tank area, well DGC-9S exhibited elevated concentrations of these same four compounds. However, the concentration of PCE, 1,2-DCE, 1,1-DCE, TCA, 1,1-DCA, methylene chloride, ethylbenzene and xylenes also exceeded their respective groundwater standards in this well. Groundwater from monitoring wells DGC-12S and DGC-12I, both located in the vicinity of the purported West Evaporation Pit, exhibited concentrations of TCE, 1,2-DCE, vinyl chloride and acetone in excess of their respective groundwater standards.

At the two Laboratory Waste Solvent Tanks, VOC concentrations in overburden groundwater were also found to exceed New York State's groundwater standards. Specifically, the standards for TCE, 1,2-DCE, 1,1-DCE and vinyl chloride were exceeded in wells DGC-14S and/or DGC-15S.

The concentration of TCE detected in some groundwater monitoring wells are sufficiently high to indicate the potential presence of NAPL even though NAPL has not been observed in these wells. The aqueous solubility of TCE is about 1,100 mg/l, and groundwater concentrations greater than 1 to 5% of the aqueous solubility can be indicative of the presence of NAPL. Such concentrations are present in wells DGC-8S, DGC-9S, DGC-12S and DGC-12I. Thus, NAPLs may be present in the vicinity of the North Evaporation Pit, purported West Evaporation Pit and the Waste Solvent Tank area. The concentration of TCE in overburden wells DGC-14S and DGC-15S, located at the two Laboratory Waste Solvent Tanks, does not exceed 1 to 5% of its aqueous solubility.

Isoconcentration contour maps for TCE, 1,2-DCE and vinyl chloride in the overburden unit are presented in Figures 7.2 to 7.4, respectively. These maps are based on the analytical results presented in Tables 7.8, 7.10 and 7.11. Isoconcentration contour maps are not presented for the remaining VOCs because their extent is similar to or more limited than that for TCE, 1,2-DCE and/or vinyl chloride.

The isoconcentration map for TCE indicates that TCE concentrations decrease rapidly with increasing distance from the suspected source areas. There is no evidence of off-site migration of TCE within the overburden unit. These results are consistent with those from the Phase IV investigation (see Figure 1.4).

The isoconcentration contour maps for 1,2-DCE and vinyl chloride (Figures 7.3 and 7.4, respectively) also generally confirm results of the Phase IV investigation. Both of these compounds emanate from the suspected source areas. However, there is no evidence of off-site migration of 1,2-DCE or vinyl chloride in the overburden unit. Only the data from monitoring well DGC-2S is inconsistent with previous results. Vinyl chloride was not detected in this well during the groundwater sampling round performed during the Phase IV investigation, and 1,2-DCE was detected at only 14.6 ug/l. In contrast, during the RI, 1,2-DCE and vinyl chloride were detected in this well at 1,500 and 2,900 ug/l, respectively.

7.4.2.2 Semi-Volatile Organics

During the RI, groundwater from overburden monitoring wells B-16OV, DGC-2S and DGC-8S were analyzed for the TCL SVOCs. Analytical results are presented in Table 7.12.

Well B-16OV is deemed representative of background and, except for a low-level detection of bis(2-ethylhexyl)phthalate suspected of being a laboratory and/or sampling artifact, no SVOCs were detected. The only SVOCs detected in overburden wells DGC-2S and DGC-8S were phenol, 1,2-dichlorobenzene, 2-methylphenol, 4-methylphenol, naphthalene, 2-methylnaphthalene, di-n-butylphthalete and bis(2-ethylhexyl)phthalate. Of these, the detections of phthalates are suspected of being laboratory and/or sampling artifacts. Regardless, only phenol, 1,2-dichlorobenzene and 2-methylphenol exceeded the New York State's groundwater standards or guidance values in wells DGC-2S and/or DGC-8S. Groundwater from monitoring well DGC-8S exhibited phenol, 1,2-dichlorobenzene and 2-methylphenol at 30, 69 and 6J ug/l, respectively. The standards for these compounds are 1, 4.7 and 1 ug/l, respectively. In well DGC-2S, 4-methylphenol was detected at 8J ug/l. Although no standard exists for this compound, the standard for total phenols is 1 ug/l. These data indicate that SVOCs, although they do occur at low concentrations in overburden groundwater in the vicinity of suspected source areas, are not a significant concern at the site.

7.4.2.3 Pesticides/PCBs

Groundwater from overburden monitoring wells B-16OV, DGC-2S and DGC-8S was analyzed for TCL pesticides and PCBs during the RI. Analytical results are presented in Table 7.13. No pesticides or PCBs were detected.

7.4.2.4 Inorganics

Groundwater samples from overburden monitoring wells B-16OV, DGC-2S and DGC-8S were sampled and analyzed for TAL inorganic parameters on two occasions during the RI. Analytical results for total metals are summarized in Tables 7.14 and 7.15. Cyanide was analyzed on the first occasion, and the results are presented on Table 7.14. On the second occasion, results were also obtained for dissolved metals. These results are presented in Table 7.16.

Several metals were detected in well B-16OV, the background well for the overburden unit, namely aluminum, arsenic, barium, calcium, chromium, iron, lead, magnesium, manganese, potassium, sodium, vanadium and zinc. The concentrations of iron and manganese both exceeded New York State's groundwater standard of 300 ug/l. Moreover, the concentration of magnesium exceeded the guidance value of 35,000 ug/l.

Metals detected in monitoring wells DGC-2S and DGC-8S were aluminum, arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, vanadium and zinc. Cobalt and mercury were also detected in well DGC-8S. Silver was also detected in well DGC-2S. Like the background monitoring well, the results for iron, manganese and magnesium exceeded New York State's groundwater standards and/or guidance values. The standard for copper was exceeded in well DGC-2S. In well DGC-8S, the standards for chromium, lead and zinc were exceeded.

It is important to note that the above discussion and the data presented in Tables 7.14 and 7.15 regard total metals. Filtered samples were also collected during the RI for analysis of dissolved metals. These analyses were performed to evaluate the impact of suspended sediment in the samples on the total metals concentrations and to provide a potentially more realistic indication of the actual metals concentrations in groundwater at the site. Total matrix samples which contain sediment can exhibit metals concentrations which are not representative of actual groundwater conditions. Suspended matter occurring in samples (usually introduced as an unavoidable artifact of sampling) is likely to have metal ions adsorbed on its surface and as an integral component of the suspended matter itself. When samples are preserved in the field with acid, per standard protocol, and when the samples are prepared in the laboratory via hot acid digestion, prior to analysis metals will be desorbed from the matrix, resulting in reported metals concentrations higher than those actually occurring in the groundwater.

The dissolved metals data from monitoring well B-16OV showed iron and manganese concentrations to be less than New York State's groundwater standards. The concentration of magnesium, however, still exceeded the guidance value. For wells DGC-2S and DGC-8S, the only dissolved metals that exceeded standards and/or guidance values were for iron, magnesium and manganese. These data indicate that metals are not a significant concern in the overburden groundwater system.

7.5 Shallow Bedrock Groundwater

7.5.1 Results of Previous Investigations

Groundwater samples were obtained from shallow bedrock wells during the Phase II and III investigations for laboratory analyses. The results documented the presence of VOCs in groundwater within the shallow bedrock unit at elevated concentrations in the vicinity of the suspected source areas. The areal extent of VOCs within the shallow bedrock unit was not fully defined during these investigations, however. Thus, numerous additional shallow bedrock wells were installed during the Phase IV investigation.

A comprehensive round of sampling was performed on April 24 to May 8, 1990, during which groundwater samples were collected from 50 wells in the shallow bedrock unit. These samples were analyzed by GTC for VOCs. 1,2-DCE and vinyl chloride were the most widely-distributed VOCs. However, TCE, acetone, toluene and xylenes were also frequently detected. PCE, TCA and methylene chloride were detected at the Waste Solvent Tank area.

Isoconcentration contour maps were prepared during the Phase IV investigation to show the extent of VOCs in the shallow bedrock unit. The isoconcentration contour map for 1,2-DCE is shown in Figure 1.5. The isoconcentration map for vinyl chloride was very similar. Both of these VOCs appeared to be migrating off-site in the shallow bedrock unit in the northwest and northeast directions. The areal extent of the other VOCs detected in the shallow bedrock unit was much more limited.

Elevated concentrations of TCE were detected in the shallow bedrock groundwater in the vicinity of the North Evaporation Pit and Waste Solvent Tank area. The concentrations at well DGC-8B, located 50 feet downgradient from the North Evaporation Pit, and well DGC-9B, located next to the Waste Solvent Tank, were sufficiently elevated to suggest the presence of NAPLs. Elevated concentrations were also expected in the area of the purported West Evaporation Pit, although this could not be confirmed with the existing monitoring well network.

The concentration of TCE dropped sharply with increasing distance downgradient (i.e., northwest) from the source areas. Shallow bedrock wells located only 300 to 400 feet away showed no TCE (i.e., wells B-9S and DGC-2B). In addition, shallow bedrock wells located near the site boundary (i.e., wells B-7S, B-8S, B-17I, B-18I and B-24S) also showed no TCE. A few isolated low-level detections of TCE did occur away from the suspected source areas (i.e., wells B-4I, B-26S and B-28S), but these detections were within the more-extensive plume identified for 1,2-DCE and vinyl chloride.

Isoconcentration contour maps for toluene and xylene were prepared for the shallow bedrock unit during the Phase IV investigation. The distributions of these two VOCs were more limited than either 1,2-DCE or vinyl chloride. The occurrence of toluene and xylenes was generally limited to the areas around the North Evaporation Pit and Waste Solvent Tank. Low levels of toluene and/or xylenes were, however, detected in well B-26S, located to the northwest, and wells B-6S, DGC-1B and DGC-7B, located to the northeast.

Isoconcentration contour maps were not prepared for PCE or TCA because these VOCs were not detected in any of the shallow bedrock monitoring wells. Additionally, isoconcentration contour maps were not prepared for acetone, methylene chloride or methanol during the Phase IV investigation. Acetone and methylene chloride are recognized as common laboratory contaminants and the low-level detections were deemed suspect. However, acetone did appear to occur at wells DGC-1B, DGC-8B and DGC-9B. Further, methylene chloride appeared to be present in the shallow bedrock unit at well DGC-9B adjacent to the Waste Solvent Tank area.

7.5.2 Remedial Investigation Results

During the RI, groundwater samples were collected from 29 shallow bedrock monitoring wells on July 12 to 21, 1993. Groundwater samples from five of these wells were analyzed for the complete TCL/TAL parameters using the DEC's ASP methodologies. The remaining 24 samples were analyzed for TCL volatiles using ASP/CLP Method 91-1. The analytical results for volatile organics are summarized in Table 7.8. The analytical results for SVOCs, pesticides/PCBs and metals are summarized in Tables 7.12, 7.13 and 7.14, respectively. Wet chemistry results were also obtained for some wells and are summarized in Table 7.17.

On September 27 to 29, 1993, additional groundwater samples were collected from shallow bedrock monitoring wells B-8S, B-25I, B-27S, DGC-8B and DGC-9B and analyzed for TAL metals. Both total and dissolved metals were analyzed. Analytical results are presented in Tables 7.15 and 7.16, respectively.

Seven shallow bedrock monitoring wells were resampled on June 13 to 14, 1994. Three of these wells (i.e., wells B-9SR, B-17SR and B-24SR) were newly-installed replacement wells. All of these samples were analyzed for VOCs using EPA Method 8010. Analytical results are summarized in Table 7.9 and are similar to results obtained previously during the RI.

On June 29, 1994, groundwater samples were collected from newly-installed shallow bedrock wells DGC-14B and DGC-15B. These wells were installed near the two Laboratory Waste Solvent Tanks in order to evaluate groundwater quality in the shallow bedrock in this area. The groundwater samples from these wells were analyzed for TCL volatiles using ASP/CLP Method 91-1, and the results are summarized in Table 7.11.

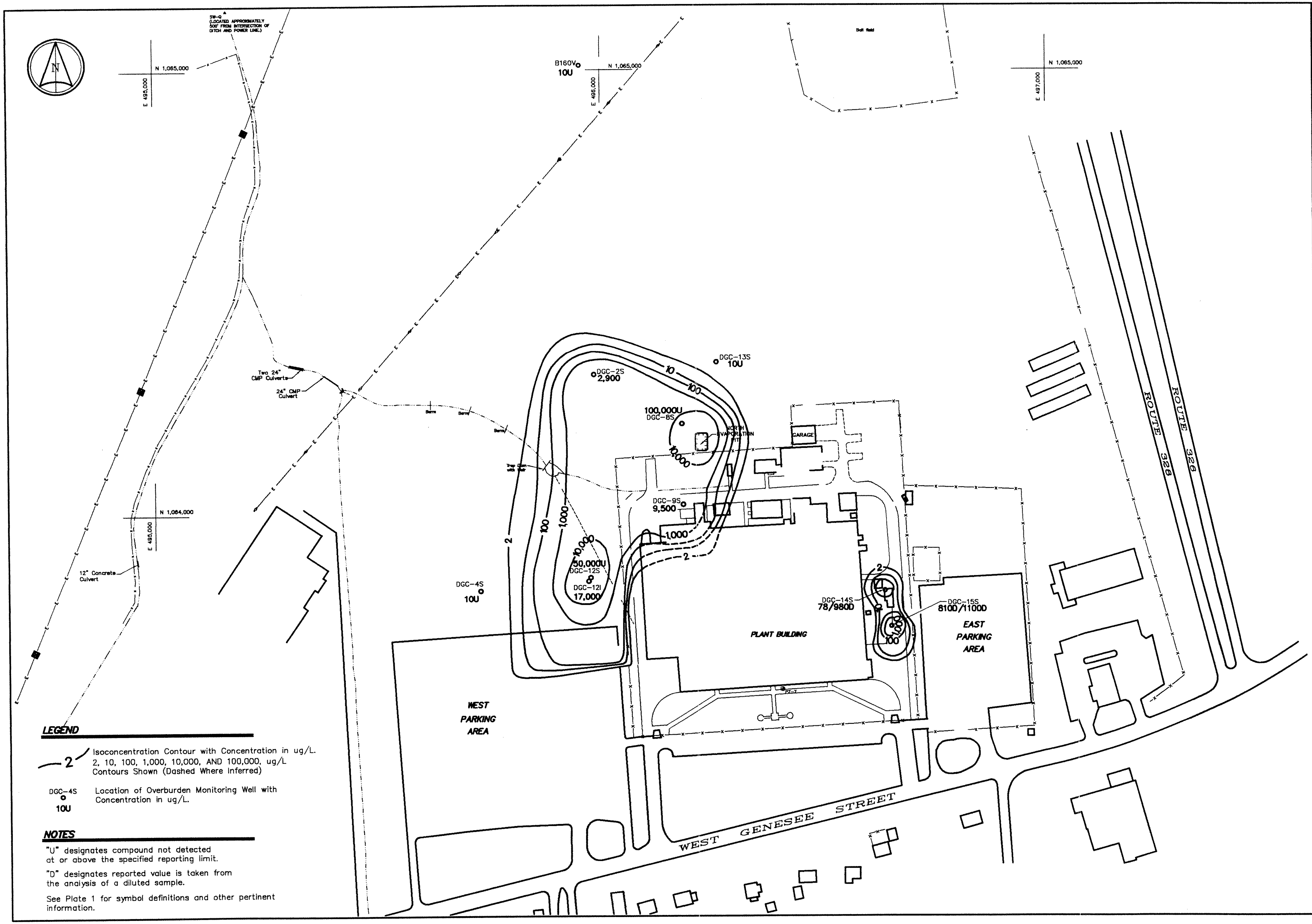
7.5.2.1 Volatile Organics

As shown in Tables 7.8, 7.9 and 7.11, analytical results for VOCs indicate that groundwater from the shallow bedrock unit exceeds New York State's groundwater standards and/or guidance values in several wells. However, the concentration of VOCs in wells B-2S, B-7S, B-8S, B-13I, B-14I, B-15S, B-19I, B-20S, B-21I, B-23I, B-25I, B-27S, DGC-3B and DGC-5B did not exceed the standards and/or guidance values.

The isoconcentration contour map for TCE is presented in Figure 7.5. As shown in this map, the distribution of TCE was generally consistent with that observed during the Phase IV investigation. The analytical results indicate that the highest TCE concentrations were generally detected in monitoring wells located near the source areas, namely well DGC-8B, located near the North Evaporation Pit, well DGC-9B, located adjacent to the Waste Solvent Tank, and well DGC-12B, located in the vicinity of the purported West Evaporation Pit. The concentrations of TCE in wells DGC-8B and DGC-9B are sufficiently high to be indicative of the potential presence of NAPL. Although at much lower concentrations, TCE was also detected in wells DGC-14B and DGC-15B, located at the two Laboratory Waste Solvent Tanks.

The data for TCE indicates that concentrations of this VOC attenuate rapidly with increasing distance downgradient from the source areas. With the exception of wells B-26S and B-28S, TCE was not detected in shallow bedrock wells located only 300 to 500 feet from the source areas (e.g., wells DGC-2B and B-9S). Additionally, TCE was not detected in shallow bedrock wells located at the site boundary (e.g., wells B-10I, B-17I, B-24S and B-8S). Regarding the exceptions, TCE was detected at 17 ug/l in well B-26S and at 1J ug/l in well B-28S.

1,2-DCE and vinyl chloride were the two most frequently detected VOCs in the shallow bedrock unit. The isoconcentration contour maps for 1,2-DCE and vinyl chloride are shown in Figures 7.6 and 7.7, respectively. The distributions of these two compounds are similar to those determined in the Phase IV investigation, and are more extensive and continuous than the distribution of TCE. 1,2-DCE and vinyl chloride appear to migrate away from the source areas



LEGEND

2 — Isoconcentration Contour with Concentration in ug/L. 2, 10, 100, 1,000, 10,000, AND 100,000, ug/L Contours Shown (Dashed Where Inferred)

DGC-4S ○ 10U — Location of Overburden Monitoring Well with Concentration in ug/L.

NOTES

"U" designates compound not detected at or above the specified reporting limit.

"D" designates reported value is taken from the analysis of a diluted sample.

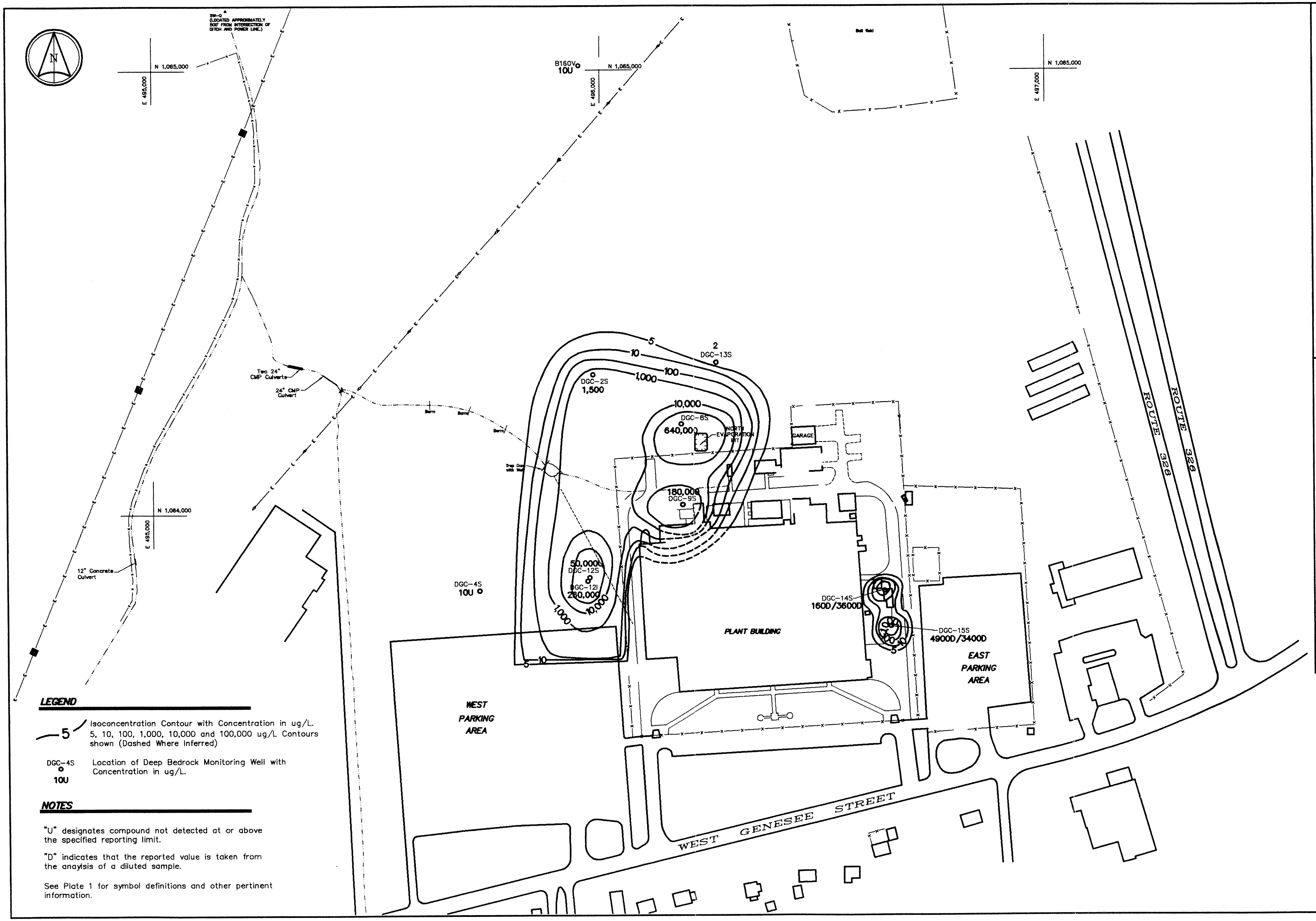
See Plate 1 for symbol definitions and other pertinent information.

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

ISOCONCENTRATION MAP OF VINYL CHLORIDE IN OVERBURDEN GROUNDWATER

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

PROJECT No. 35126.017
DATE 4/94
DWG. No. 35126-18
SCALE 1"=200'
FIGURE No. 7.4



LEGEND

—5—	Isoconcentration Contour with Concentration in ug/L. 5, 10, 100, 1,000, 10,000 and 100,000 ug/L Contours shown (Dashed Where Inferred)
DGC-4S ○ 10U	Location of Deep Bedrock Monitoring Well with Concentration in ug/L.

NOTES

"U" designates compound not detected at or above the specified reporting limit.

"D" indicates that the reported value is taken from the anaylsis of a diluted sample.

See Plate 1 for symbol definitions and other pertinent information.

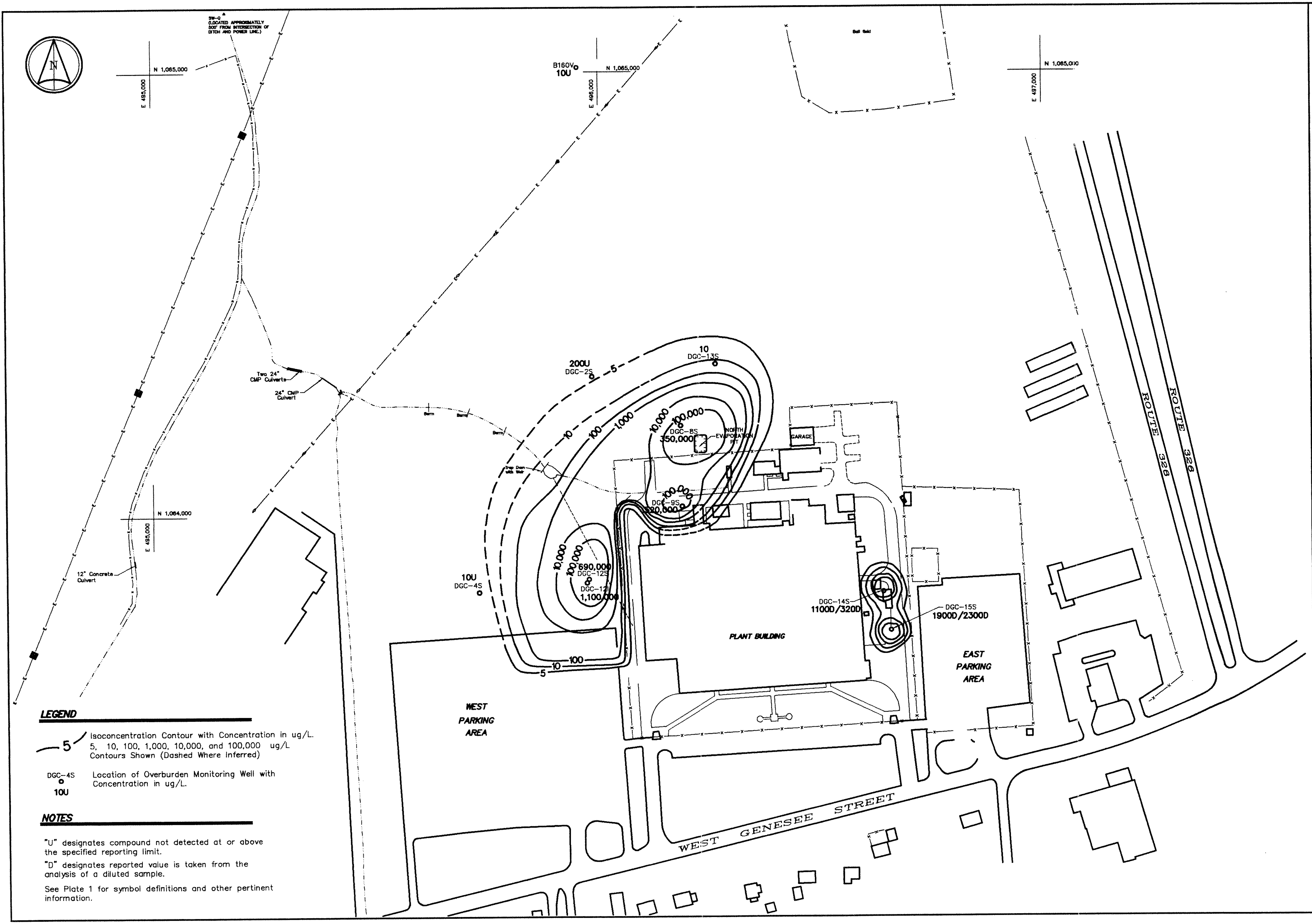
ISOCONCENTRATION MAP OF 1,2-DCE IN OVERBURDEN GROUNDWATER

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT No. 35126.017	DATE 4/94	DWG. No. 35126-17	SCALE 1"=200'

FIGURE No. 7.3



LEGEND

5 Isoconcentration Contour with Concentration in ug/L. 5, 10, 100, 1,000, 10,000, and 100,000 ug/L Contours Shown (Dashed Where Inferred)

DGC-4S 10U Location of Overburden Monitoring Well with Concentration in ug/L.

NOTES

"U" designates compound not detected at or above the specified reporting limit.

"D" designates reported value is taken from the analysis of a diluted sample.

See Plate 1 for symbol definitions and other pertinent information.

ISOCONCENTRATION MAP OF TCE IN OVERBURDEN GROUNDWATER

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

FIGURE No. 7.2

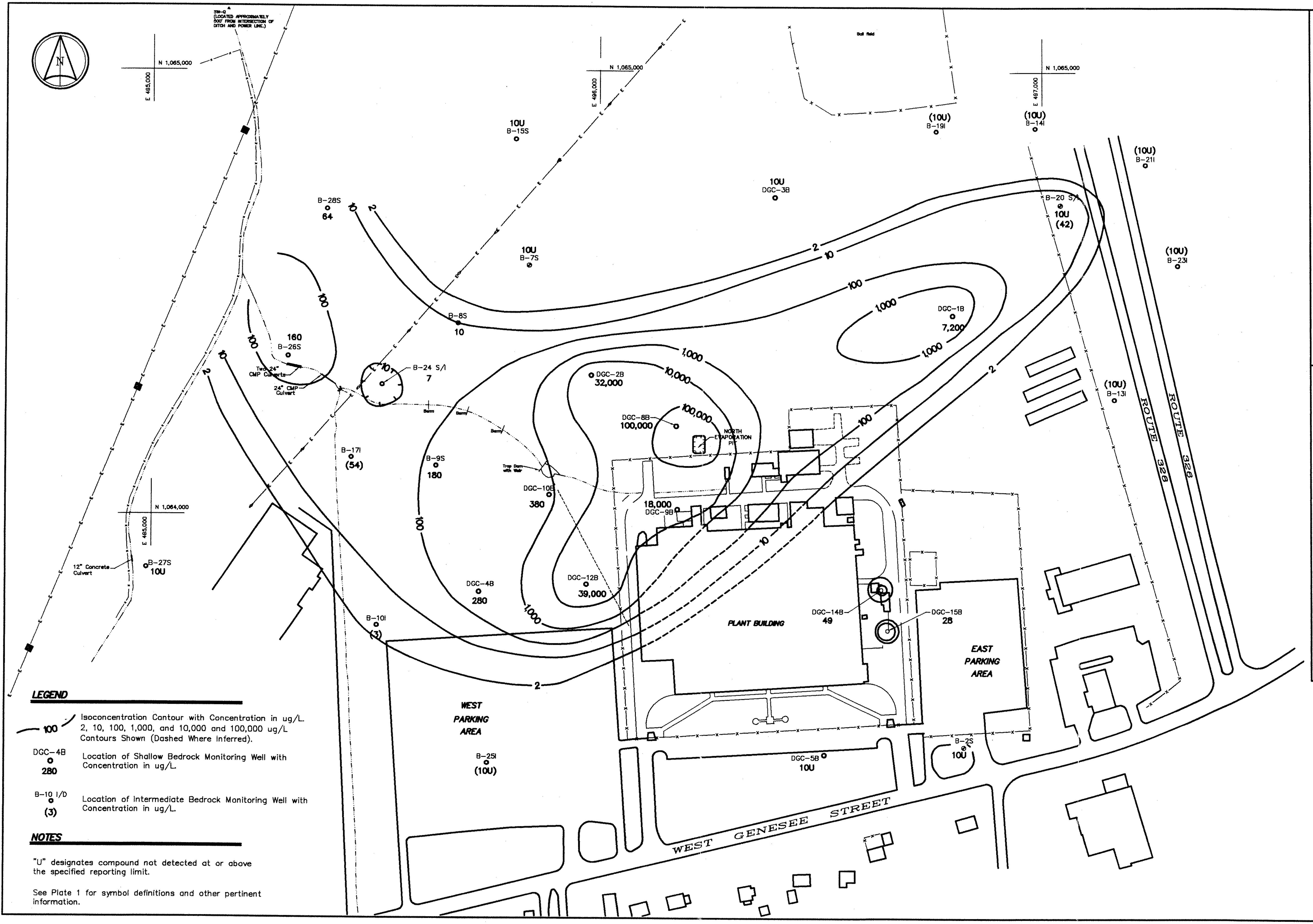
SCALE 1"=200'

DWG. No. 35126-16

DATE 4/94

PROJECT No. 35126.017

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE



LEGEND

100	Isoconcentration Contour with Concentration in ug/L. 2, 10, 100, 1,000, and 10,000 and 100,000 ug/L Contours Shown (Dashed Where Inferred).
DGC-4B ○ 280	Location of Shallow Bedrock Monitoring Well with Concentration in ug/L.
B-10 I/D ○ (3)	Location of Intermediate Bedrock Monitoring Well with Concentration in ug/L.

NOTES

"U" designates compound not detected at or above the specified reporting limit.

See Plate 1 for symbol definitions and other pertinent information.

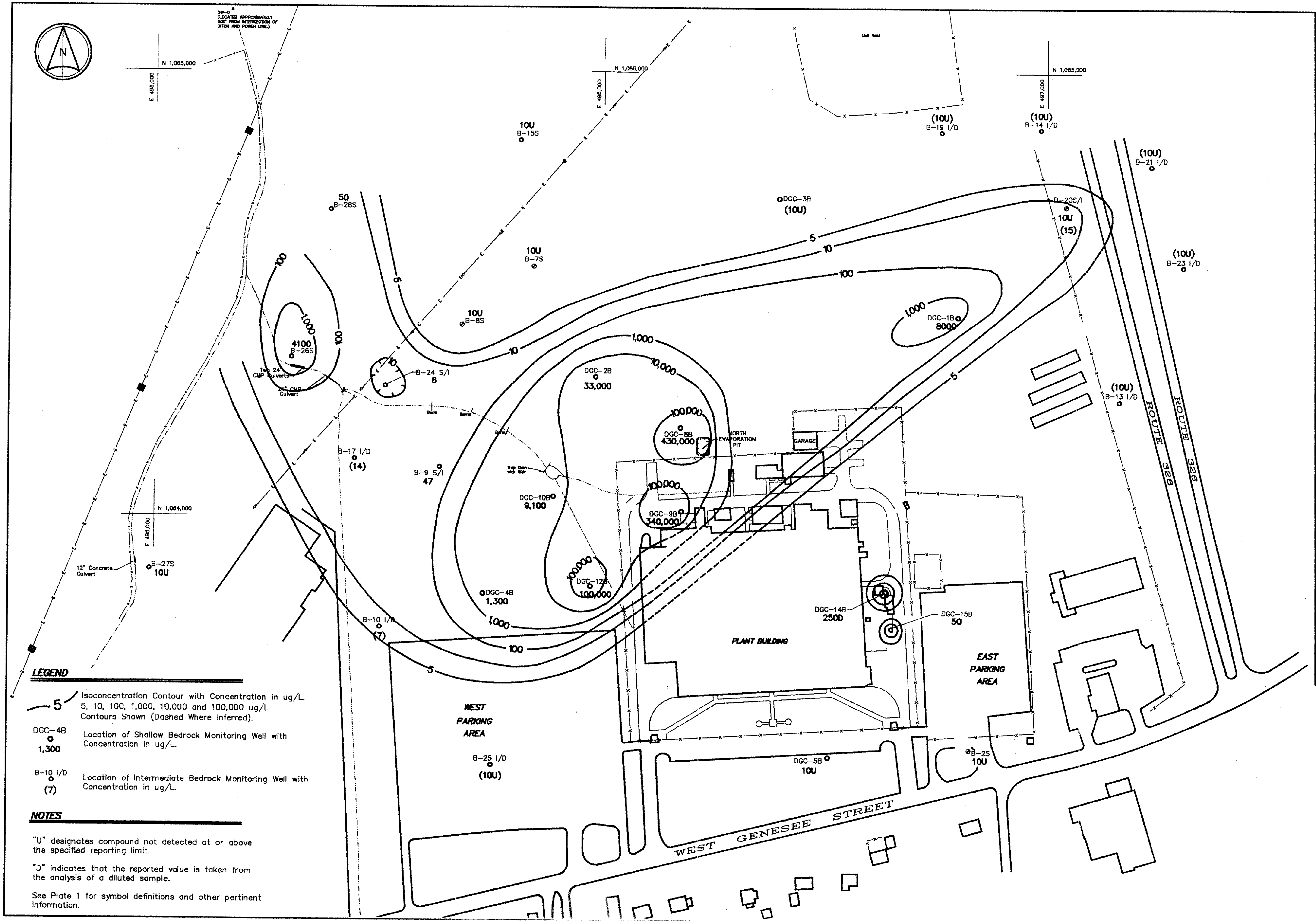
DUNN ENGINEERING COMPANY

DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

ISOCONCENTRATION MAP OF VINYL CHLORIDE IN SHALLOW BEDROCK GROUNDWATER

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

PROJECT No. 35126.01·7
DATE 4/94
DWG. No. 35126-35
SCALE 1"=200'
FIGURE No. 7.7



LEGEND

5 Isoconcentration Contour with Concentration in ug/L. 5, 10, 100, 1,000, 10,000 and 100,000 ug/L Contours Shown (Dashed Where Inferred).

DGC-4B ○ 1,300 Location of Shallow Bedrock Monitoring Well with Concentration in ug/L.

B-10 I/D ○ (7) Location of Intermediate Bedrock Monitoring Well with Concentration in ug/L.

NOTES

"U" designates compound not detected at or above the specified reporting limit.

"D" indicates that the reported value is taken from the analysis of a diluted sample.

See Plate 1 for symbol definitions and other pertinent information.

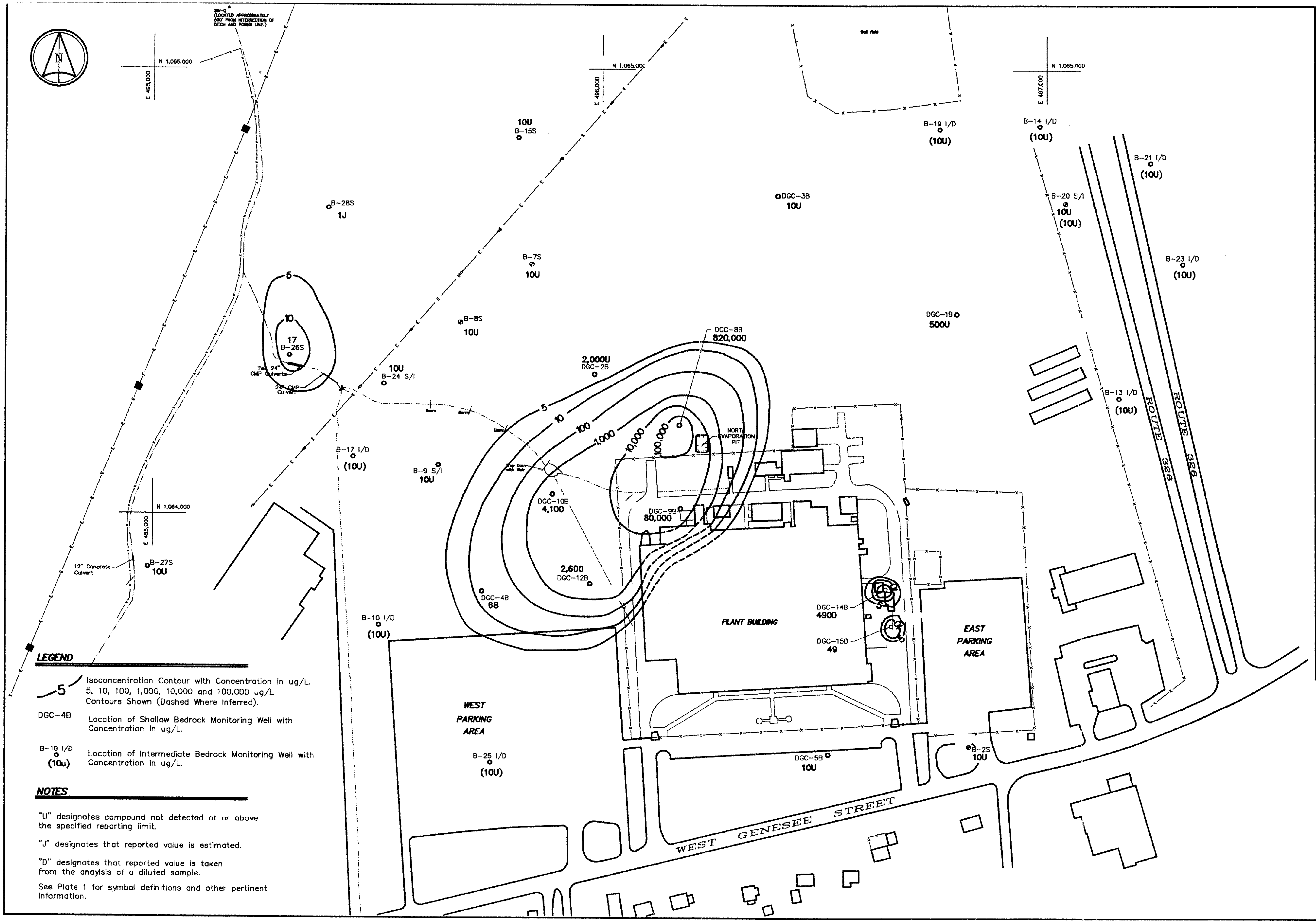
ISOCONCENTRATION MAP OF 1,2-DCE IN SHALLOW BEDROCK GROUNDWATER

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

DWG. No. 35126-09 | SCALE 1"=200' | FIGURE No. 7.6

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT No. 35126.017 | DATE 4/94



LEGEND

5	Isoconcentration Contour with Concentration in ug/L. 5, 10, 100, 1,000, 10,000 and 100,000 ug/L Contours Shown (Dashed Where Inferred).
DGC-4B	Location of Shallow Bedrock Monitoring Well with Concentration in ug/L.
B-10 I/D (10u)	Location of Intermediate Bedrock Monitoring Well with Concentration in ug/L.

NOTES

"U" designates compound not detected at or above the specified reporting limit.

"J" designates that reported value is estimated.

"D" designates that reported value is taken from the anaylsis of a diluted sample.

See Plate 1 for symbol definitions and other pertinent information.

DUNN ENGINEERING COMPANY
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ISOCONCENTRATION MAP OF TCE
IN SHALLOW BEDROCK GROUNDWATER

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

PROJECT No. 35126.017 | DATE 4/94 | DWG. No. 35126-11 | SCALE 1"=200' | FIGURE No. 7.5

in the shallow bedrock unit. These VOCs are detected in off-site areas to the northwest and to the northeast of the primary source areas (i.e., North Evaporation Pit, Waste Solvent Tank area, purported West Evaporation Pit).

Acetone was detected in shallow bedrock wells DGC-1B, DGC-2B, DGC-8B, DGC-9B and DGC-12B. The concentration of acetone exceeded New York State's groundwater standard of 50 ug/l at each of these wells. Elevated concentrations of acetone were found in the shallow bedrock unit at the North Evaporation Pit, Waste Solvent Tank area and purported West Evaporation Pit. Acetone was not, however, detected in the shallow bedrock at the two Laboratory Waste Solvent Tanks.

The analytical data indicate that both the areal extent and concentrations of toluene and xylenes in the shallow bedrock unit are considerably less than that of either 1,2-DCE and vinyl chloride. For this reason, isoconcentration contour maps are not presented for these VOCs. However, the analytical data collected during the RI generally confirms the results of the Phase IV investigation. Toluene and xylenes concentrations in excess of New York State's groundwater standards do not occur beyond the site boundary. Toluene and xylenes in the shallow bedrock unit are restricted primarily to the immediate vicinity of the North Evaporation Pit and Waste Solvent Tank area, with some toluene also detected in well DGC-1B.

With one exception, methylene chloride, PCE and TCA were only detected at well DGC-9B. The concentration of these VOCs exceeded New York State's groundwater standards at this well. PCE was also detected at a very low concentration (i.e., 2J ug/l) in well DGC-10B. These data confirm previous results and indicate that the occurrence of these VOCs is very limited, being restricted to the Waste Solvent Tank area. PCE, TCA and methylene chloride were also detected in the overburden unit in this same area.

7.5.2.2 Semi-Volatile Organics

During the RI, shallow bedrock groundwater samples from monitoring wells B-8S, B-25I, B-27S, DGC-8B and DGC-9B were analyzed for SVOCs. Analytical results are summarized in Table 7.12.

Well B-27S is deemed representative of background and no SVOCs were detected in this well. Likewise, no SVOCs were detected in wells B-8S and B-25I. SVOCs were, however, detected in wells DGC-8B and DGC-9B. These two wells are located in a source area (i.e., at the North Evaporation Pit and Waste Solvent Tank, respectively).

SVOCs detected in well DGC-8B included 1,2-dichlorobenzene, naphthalene, 2-methylnaphthalene, di-n-butylphthalate and bis(2-ethylhexyl)phthalate. The low-level detections of phthalates are considered to be an artifact of sampling and/or laboratory methodologies.

Regardless, only 1,2-dichlorobenzene and naphthalene were detected at concentrations above New York State's groundwater standards.

Groundwater from monitoring well DGC-9B showed detections of 2,4-dimethylphenol, naphthalene and bis(2-ethylhexyl)phthalate. Again, the detection of phthalates is attributed to a laboratory and/or sampling artifact and was, in any event, well below the standards. The detections of the other two SVOCs both exceeded New York State's groundwater standards and/or guidance values.

The analytical data indicate that the shallow bedrock groundwater quality has not been significantly impacted by SVOCs. The extent of any site-related SVOCs appears to be very limited, being restricted to the immediate vicinity of the source areas.

7.5.2.3 Pesticides/PCBs

Groundwater samples from shallow bedrock wells B-8S, B-25I, B-27S, DGC-8B and DGC-9B were analyzed for TCL pesticides and PCBs during the RI. Analytical results are presented in Table 7.13. No PCBs were detected in any of the samples. No pesticides were detected in wells B-8S and B-25I and the background well (i.e., well B-27S). The pesticides heptachlor epoxide and alpha-chlordane were detected in well DGC-8B, and the pesticide 4,4-DDT was detected in well DGC-9B. These detections, however, were all qualified during data validation.

7.5.2.4 Inorganics

Groundwater samples from shallow bedrock monitoring wells B-8S, B-25I, B-27S, DGC-8B and DGC-9B were analyzed for TAL inorganic parameters on two occasions during the RI. Analytical results for total metals are presented in Tables 7.14 and 7.15. Cyanide was analyzed on the first occasion and the results are presented on Table 7.14. On the second occasion, results were also obtained for dissolved metals, and these results are presented in Table 7.16. The field filtered samples were analyzed to evaluate the effect of sample sediment load on the total metals data.

Several metals were detected in well B-27S, the background well for the shallow bedrock unit, namely aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, potassium, sodium and zinc. The concentration of iron, magnesium and sodium exceeded New York State's groundwater standards in the background well.

The same metals detected in the background well were also detected in shallow bedrock wells B-8S, B-25I, DGC-8B and DGC-9B. Beryllium, cadmium, lead, mercury, silver and vanadium were also detected in one or more of these wells. Again, the concentrations of iron, magnesium and sodium exceeded their respective New York State groundwater standards and/or guidance values in one or more of these wells. However, the concentration of arsenic, barium, beryllium, chromium, copper, lead, manganese and zinc also exceeded their standards and/or guidance values at one or more of these wells.

It is important to note that the results discussed above, and Tables 7.14 and 7.15, regard total metals and may, therefore, be influenced by suspended matter in the samples. The dissolved metals concentration were generally much lower than the total metals concentrations. The concentration of dissolved iron and magnesium exceeded New York State's groundwater standards and/or guidance values in wells B-8S, DGC-8B and DGC-9B. The concentration of barium, manganese and sodium exceeded its standard in only a single well (i.e., DGC-9B, DGC-8B and B-8S, respectively). The concentration of the other metals did not exceed their standards and/or guidance values for the filtered samples.

Cyanide was detected in two of the five shallow bedrock wells tested during the RI. A concentration of 10.7 ug/l cyanide was detected in background well B-27S, and a concentration of 14.2 ug/l was detected in well DGC-8B. These results, while seemingly anomalous, are both well below New York State's groundwater standard of 100 ug/l.

7.6 Deep Bedrock Groundwater

7.6.1 Results of Previous Investigations

Groundwater samples were obtained during the Phase IV investigation for laboratory analyses. The most comprehensive sampling round was performed on April 24 to May 8, 1990 when samples were obtained from 27 deep bedrock monitoring wells. These samples were analyzed for VOCs, and the samples from selected deep bedrock monitoring wells were also analyzed for other parameters.

1,2-DCE and vinyl chloride were the only VOCs detected in the deep bedrock monitoring wells. However, these compounds were only detected in six deep bedrock wells at concentrations in excess of New York State's groundwater standards (i.e., wells B-8D, B-9D, B-20D, B-21D, B-24D and B-26D). The highest concentration of 1,2-DCE was 33.7 ug/l in well B-26D. The highest concentration of vinyl chloride was 52.7 ug/l in well B-8D.

Isoconcentration contour maps were prepared during the Phase IV investigation to convey the general extent and low concentration of 1,2-DCE and vinyl chloride in the deep bedrock unit. The map for 1,2-DCE is presented in Figure 1.6 and the distribution of vinyl chloride is very similar. Although the concentrations are much lower, the distribution of 1,2-DCE and vinyl chloride in the deep bedrock was generally found to mimic the distribution of VOCs in the shallow bedrock unit (compare Figures 1.5 and 1.6).

Two groundwater samples were obtained from the deep bedrock unit during the Phase IV investigation for analysis of SVOCs. These samples were obtained from wells B-20D and B-24D. No SVOCs were detected in these wells.

Samples were also obtained from deep bedrock wells B-20D and B-24D for analysis of pesticides and PCBs. No pesticides or PCBs were detected.

Finally, groundwater samples from deep bedrock monitoring wells B-20D and B-24D were analyzed for total metals during the Phase IV investigation. Aluminum, barium, calcium, iron, magnesium, manganese, nickel, potassium, sodium and zinc were detected in one or both of these wells. These metals occur naturally and many were expected to occur in groundwater from the carbonate bedrock, especially calcium, magnesium, iron, sodium and potassium, and the occurrence of various metals in the deep bedrock groundwater was attributed to background.

7.6.2 Remedial Investigation Results

During the RI, groundwater samples were collected from 17 deep bedrock monitoring wells from July 12 to 21, 1993. The groundwater samples from three of the wells were analyzed for the complete TCL/TAL list of parameters using methodologies in the DEC's ASP. Samples from the other 14 deep bedrock wells were analyzed for TCL volatiles by ASP/CLP Method 91.1. Results of these analyses are summarized in Tables 7.8, 7.12, 7.13 and 7.14. Miscellaneous wet chemistry results were obtained for some wells and are shown in Table 7.17.

On September 27 to 29, 1993, additional groundwater samples were obtained from monitoring wells B-8D, B-13D and B-25D and analyzed for TAL metals. Both total and dissolved metals were analyzed. As previously discussed, the filtered samples were collected and analyzed to evaluate the impact of sediment on the total metals data. Analytical results are presented in Tables 7.15 and 7.16, respectively.

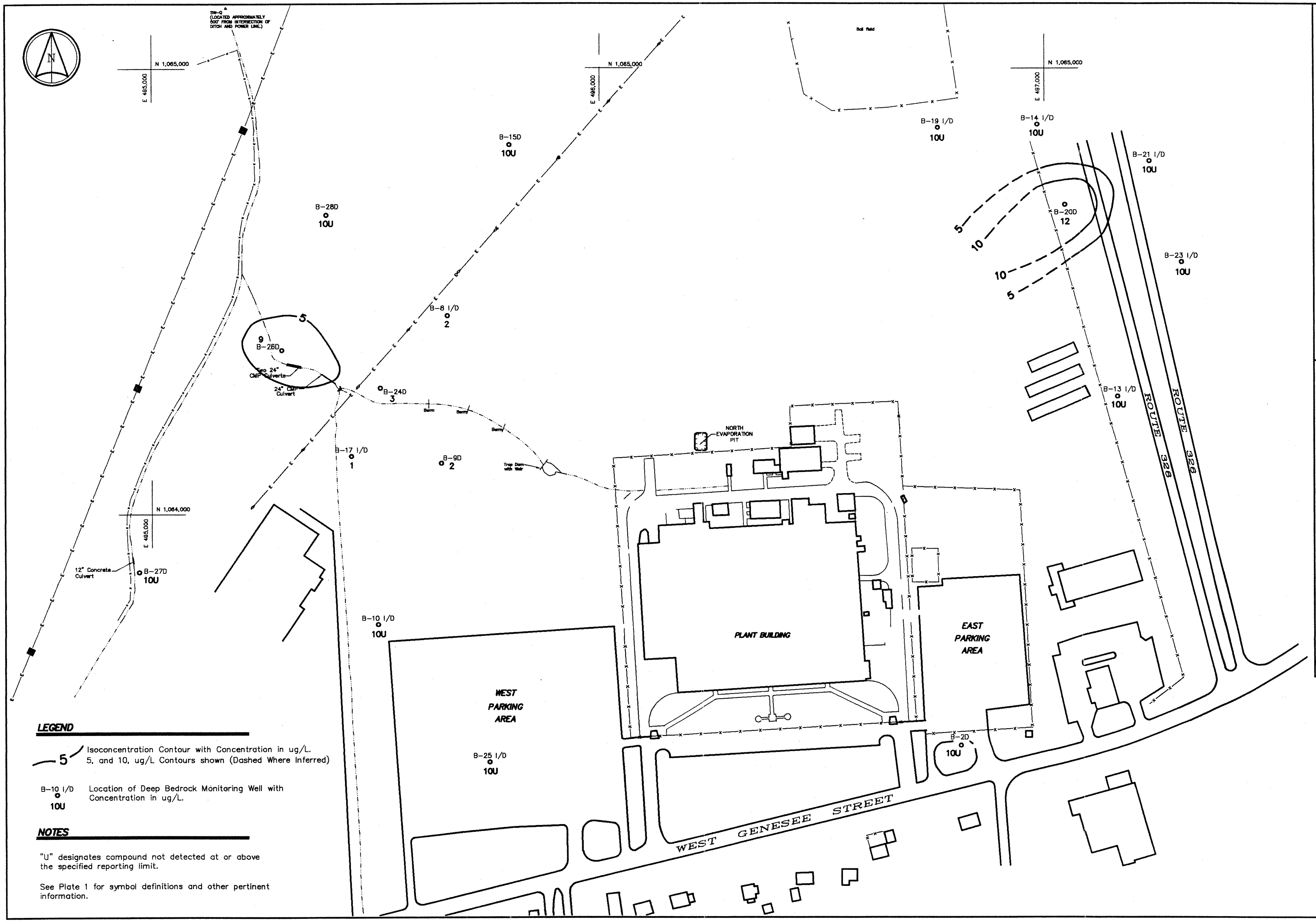
Deep bedrock wells B-8D, B-9D, B-20D, B-24D and B-26D were resampled on June 13 and 14, 1994, several months after completing the well abandonment activities discussed in Section 2.10. These samples were analyzed for VOCs by EPA Method 8010. Analytical results are summarized in Table 7.9.

7.6.2.1 Volatile Organics

As shown in Tables 7.8 and 7.9, analytical results are generally consistent with data obtained during the Phase IV investigation. With the exception of an anomalous detection of carbon disulfide at 25 ug/l in well B-8D, 1,2-DCE and vinyl chloride were the only VOCs detected in the deep bedrock unit.

During the initial sampling, groundwater from deep bedrock wells B-20D and B-26D exhibited 1,2-DCE concentrations that exceeded New York State's groundwater standard. The maximum concentration of 1,2-DCE was 12 ug/l in well B-20D. Groundwater from deep bedrock wells B-8D, B-9D, B-20D, B-24D, and B-26D exhibited vinyl chloride concentrations that exceeded its groundwater standard of 2 ug/l. The highest vinyl chloride concentration was detected in well B-20D at 34 ug/l. No VOCs were detected above New York State's groundwater standards in deep bedrock wells B-2D, B-10D, B-13D, B-14D, B-15D, B-17D, B-19D, B-21D, B-23D, B-25D, B-27D and B-28D.

Isoconcentration contour maps for 1,2-DCE and vinyl chloride in the deep bedrock unit are depicted in Figures 7.8 and 7.9, respectively. Data is not available for the deep bedrock at or near the suspected source areas because deep bedrock monitoring wells were intentionally not drilled in these areas due to the potential for creating a pathway for contaminants to migrate downward from the shallow bedrock unit into the deep bedrock unit in response to the downward hydraulic gradient. In spite of the lack of data in these areas, consistent with results of the Phase



LEGEND

5 Isoconcentration Contour with Concentration in ug/L. 5, and 10, ug/L Contours shown (Dashed Where Inferred)

B-10 I/D ○ 10U Location of Deep Bedrock Monitoring Well with Concentration in ug/L.

NOTES

"U" designates compound not detected at or above the specified reporting limit.

See Plate 1 for symbol definitions and other pertinent information.

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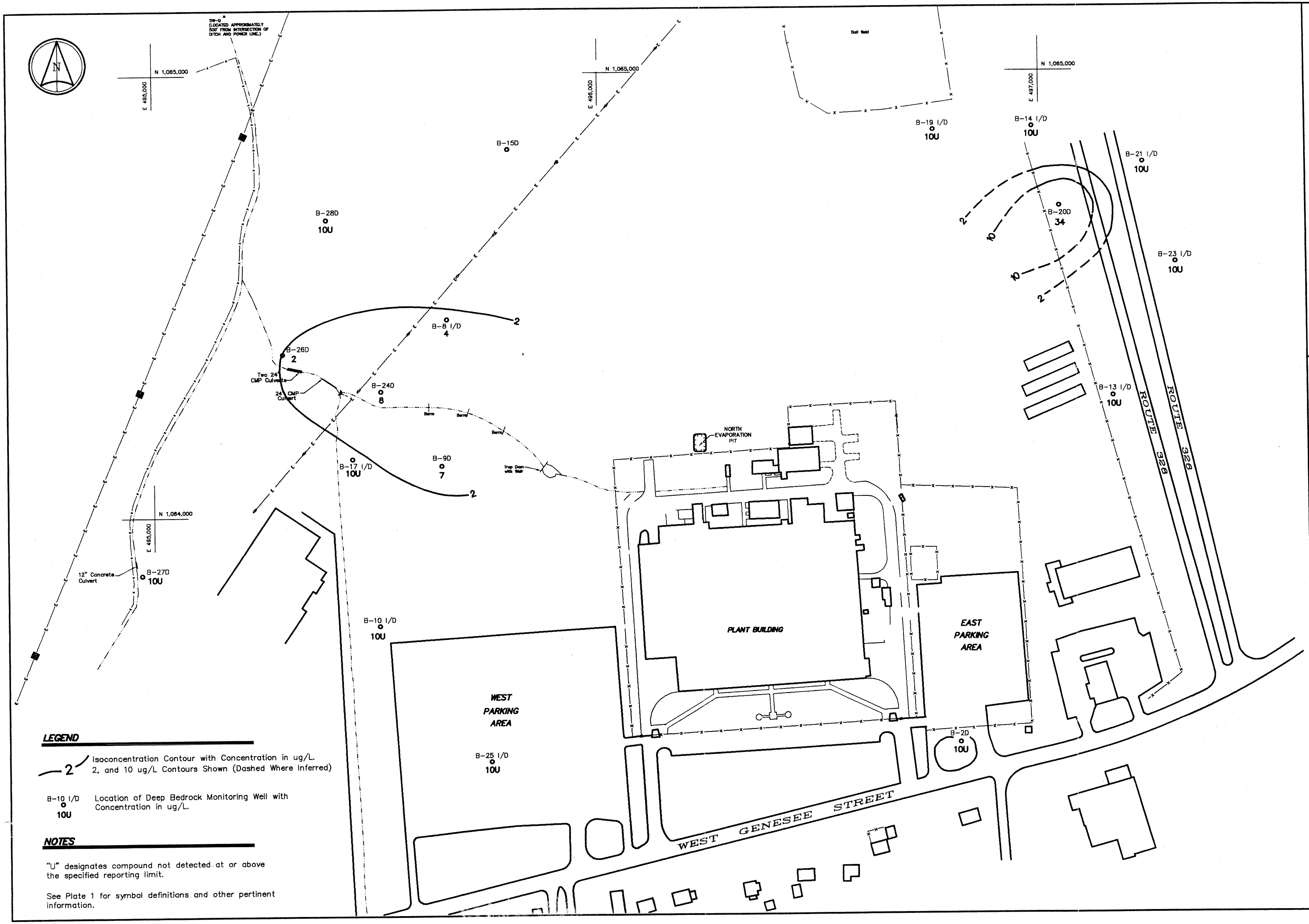
ISOCONCENTRATION MAP OF 1,2-DCE
IN DEEP BEDROCK GROUNDWATER

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

PROJECT No. 35126.017	DATE 4/94	DWG. No. 35126-01	SCALE 1"=200'	FIGURE No. 7.8



LEGEND

2 Isoconcentration Contour with Concentration in ug/L. 2, and 10 ug/L Contours Shown (Dashed Where Inferred)

B-10 I/D 10U Location of Deep Bedrock Monitoring Well with Concentration in ug/L.

NOTES

"U" designates compound not detected at or above the specified reporting limit.

See Plate 1 for symbol definitions and other pertinent information.

ISOCONCENTRATION MAP OF VINYL CHLORIDE IN DEEP BEDROCK GROUNDWATER

FORMER POWEREX, INC. FACILITY
AUBURN, NEW YORK

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT No. 35126.017	DATE 4/94	DWG. No. 35126-07	SCALE 1"=200'	FIGURE No. 7.9

IV investigation, the distribution of VOCs in the deep bedrock unit appears to mimic that in the shallow bedrock unit.

It is interesting to note that the concentrations of VOCs detected in the deep bedrock unit during the RI are generally lower than those detected in the Phase IV investigation. Only five deep bedrock wells, rather than six, showed concentrations of VOCs in excess of New York State's groundwater standards. Moreover, the maximum concentrations of 1,2-DCE and vinyl chloride were 12 and 34 ug/l, respectively, during the RI, down from maxima of about 34 and 53 during the Phase IV investigation.

Low concentrations of 1,2-DCE and vinyl chloride may be migrating into the deep bedrock groundwater from the overlying shallow bedrock groundwater. Although the vertical permeability of the shallow bedrock unit may be 250 to 500 times lower than its horizontal permeability, water-level data collected during both the Phase IV investigation and the RI indicate that large head differences exist between the shallow and deep bedrock units. These gradients could lead to some downward flow of groundwater, which in turn could explain why the distribution of VOCs in the deep bedrock unit closely matches that observed in the shallow bedrock unit.

Other potential sources of the VOCs in the deep bedrock unit include temporary connection of the shallow and deep bedrock units during drilling and less significant connection of the shallow and deep bedrock units resulting from aspects of well construction. In this regard, numerous monitoring wells were permanently abandoned during the RI, as discussed in Section 2.10, to help ensure that such connections are not present.

Five deep bedrock monitoring wells (i.e., B-8D, B-9D, B-20D, B-24D and B-26D) were resampled several months after the well abandonment activities were performed to assess the impact, if any, of that work. The wells which were resampled were those in which VOCs had been detected at concentrations in excess of New York State's groundwater standards. The samples were analyzed for VOCs using EPA Method 8010. Analytical results are presented in Table 7.9.

All five deep bedrock wells again exhibited vinyl chloride concentrations in excess of New York State's groundwater standard of 2 ug/l. However, the maximum concentration was only 11 ug/l in well B-20D. The maximum reported during the initial sampling event of the RI was 34 ug/l in this same well. Cis-1,2-DCE detections in five deep bedrock wells were all lower than the groundwater standard. The maximum concentration was estimated at 4.9 ug/l in well B-26D. This too represented an improvement over previous results. During the initial sampling round, two wells (i.e., wells B-20D and B-26D) had detections of cis-1,2-DCE above New York State's groundwater standard, and the maximum reported concentration was 12 ug/l. No other VOCs were detected in the groundwater samples from these five deep bedrock monitoring wells. Additional sampling of these five wells will be performed during the ongoing RI to better assess any concentration trends.

The analytical data obtained during the RI show very low concentrations of cis-1,2-DCE and vinyl chloride in the deep bedrock unit. The concentration of these VOCs has declined somewhat, perhaps as a result of the well abandonment activities. Additional well installation and sampling is planned as part of the ongoing RI to further assess concentration trends and develop a better understanding of the deep bedrock groundwater system.

7.6.2.2 Semi-Volatile Organics

During the RI, groundwater samples collected from deep bedrock wells B-8D, B-13D and B-25D were analyzed for TCL SVOCs using the DEC's ASP. Analytical results are summarized in Table 7.12. With one exception, no SVOCs were detected. The detection of di-n-butylphthalate at 0.4J ug/l in background well B-25D is attributed to laboratory and/or sampling artifacts. Regardless, this concentration is well below New York State's groundwater standard of 50 ug/l.

7.6.2.3 Pesticides/PCBs

Groundwater from deep bedrock monitoring wells B-8D, B-13D and B-25D was analyzed for TCL pesticides and PCBs during the RI. Analytical results are presented in Table 7.13. No pesticides or PCBs were detected.

7.6.2.4 Inorganics

Groundwater from deep bedrock wells B-8D, B-13D and B-25D was sampled and analyzed for TAL inorganic parameters on two occasions during the RI. Results for total metals are presented in Tables 7.14 and 7.15. On the second occasion, the samples were also analyzed for dissolved metals, and the results are presented in Table 7.16. The dissolved metals analyses were performed to evaluate the potential impact of sediment on the total metals data. Cyanide was analyzed on the first occasion, and, as presented in Table 7.14, was not detected.

Several metals were detected in wells B-13D and B-25D, the background wells for the deep bedrock unit, namely aluminum, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium and zinc. However, only iron, magnesium, manganese and sodium were detected at concentrations above New York State's groundwater standards and/or guidance values.

Aluminum, arsenic, barium, calcium, copper, iron, lead, magnesium, manganese, potassium, sodium and zinc were also detected in deep bedrock well B-8D. However, only iron and magnesium were detected at concentrations above New York State's groundwater standards and/or guidance values. In fact, the concentrations of the detected metals in this well were generally lower than the maximum concentrations detected in the two background wells. Based on these data, the metals detected in the deep bedrock wells are not believed to be site-related.

The data for dissolved metals were generally lower than those for total metals. However, in background wells B-13D and B-25D, the concentrations of magnesium and sodium were still in excess of New York State's standard and/or guidance value. The results for well B-8D showed concentrations in excess of the groundwater standards and/or guidance values for iron and magnesium. Nonetheless, the concentrations observed are considered to be representative of background conditions.

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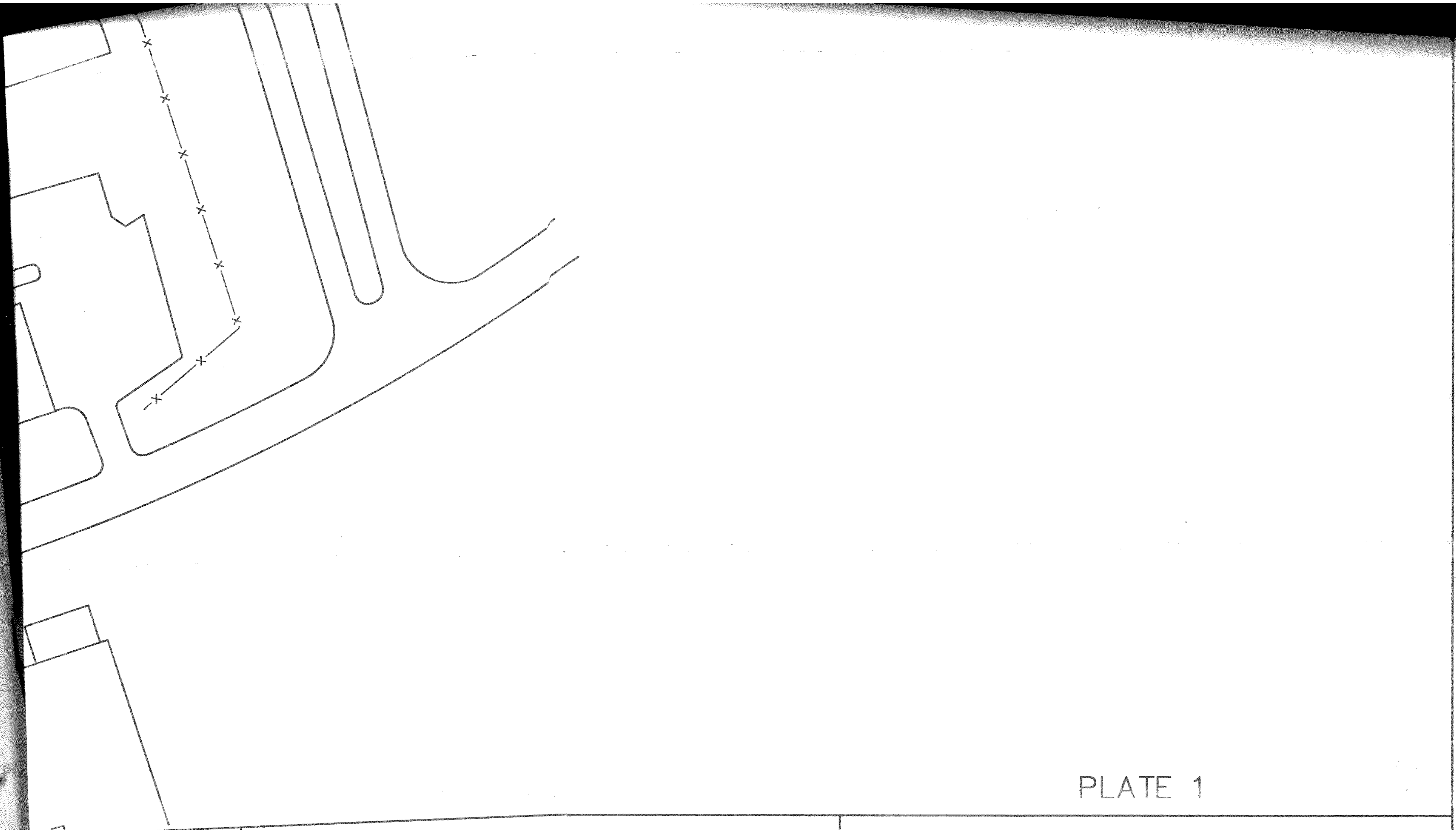

PLATE 1

MES	DATE
DAM	
:G. KERZIC	7/15/94
:G. KERZIC	7/15/94

1"=100'
100
200

REMEDIAL INVESTIGATION
SAMPLING LOCATIONS

FORMER POWEREX, INC. FACILITY

CITY OF AUBURN
CAYUGA COUNTY, NY

DUNN ENGINEERING COMPANY

DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT NUMBER 35126.100
DATE 7/15/94
RUST DWG NUMBER 35126-21
REVISION NUMBER 2
CLIENT DWG NUMBER
SHEET NUMBER OF

CAD FILE NAME: 35126-21
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