~~Report. HW. 1996. Groundwater_Sampling_and_Analysis_Event~~

~~Report. HW. 712004, 1996. Groundwater_Sampling_and_Analysis_Event. PDF~~

Report. HW. 712004. 1996-01-01. Groundwater_Sampling_and_Analysis_Event. PDF

cc'd/DOH
3/26/96

FILE

BBL
BLASLAND, BOUCK & LEE, INC.
*engineers & scientists*

*Transmitted Via FedEx*

March 8, 1996

Mr. Mark Granger
United States Environmental Protection Agency
290 Broadway
20th Floor
New York, NY 10007-1866

Re: Rosen Site
December 1995 Ground-Water Sampling and Analysis Event
Project #: 0494 494.05 #2

Dear Mr. Granger:

This letter reports the results of the December 1995 ground-water sampling and analysis event conducted at the Rosen Site. This ground-water sampling and analysis event was conducted to evaluate the concentration trends of volatile organic constituents (VOCs), to assess the presence of polychlorinated biphenyls (PCBs), to evaluate indicators of intrinsic biodegradation, and to assess the condition of the microbial population present in the ground water at the Rosen Site.

This letter contains the following sections:

- A ground-water sampling and analysis section summarizing the activities completed during this event;
- A results section presenting the analytical results for this event;
- A discussion section evaluating the VOC concentration trends and intrinsic biodegradation; and
- A summary section setting forth the main results of this sampling event.

## Ground-Water Sampling and Analysis

Blasland, Bouck & Lee, Inc. (BBL) collected ground-water samples from 15 monitoring wells (W-01, W-02, W-03, W-04, W-06, W-07, W-08, W-10, W-11, W-12, W-16, W-17, W-18, W-19, and W-24) from December 12 through 15, 1995. These wells were selected to represent ground-water quality conditions upgradient of the site, at the site, at the downgradient perimeter of the site, and downgradient of the site as follows:

- Upgradient wells W-24 and W-04 were selected to monitor impacted ground water associated with the former city of Cortland dump and non-impacted ground water, respectively. Well W-04 was rehabilitated on November 28, 1995 to remove root matter that interfered with the August

6723 Towpath Road • P.O. Box 66 • Syracuse, NY 13214-0066
Tel (315) 446-9120 • Voice Mail (315) 446-2570 • Fax (315) 449-0017 • Offices Nationwide

1995 sampling attempts. The low-flow sampling event conducted in August 1995 indicated that most metals are not present in a dissolved phase in the ground water. As a result, wells W-21 and W-22 were not sampled because only metals have been consistently detected at these locations.

- On-site wells W-06 and W-07 were selected to monitor the trends of VOCs and PCBs (well W-07 only) at the site, while well W-05 was not sampled because of consistently low concentrations of VOCs detected in previous sampling events.

- All downgradient perimeter wells in the upper outwash were selected to monitor the water quality conditions in the hydrogeologic unit of interest except for wells W-25 and W-26. Well W-26 monitors an interval of the upper outwash similar to the interval monitored at well W-11. In fact, ground water from both wells show similar concentrations of VOCs when sampled concurrently. Well W-25 monitors a similar interval of the upper outwash as the combination of wells W-02 and W-11. Therefore, BBL selected only wells W-02 and W-11 for sampling to monitor the upper and lower sections of the upper outwash in that area of the site.

- All downgradient wells in the upper outwash were selected to monitor the ground water in the hydrogeologic unit of interest.

- Sidegradient wells W-13 and W-14 were not sampled due to consistently low concentrations of VOCs detected in previous sampling events.

BBL sampled the 15 wells in accordance with procedures set forth in the Remedial Investigation (RI) Sampling and Analysis Plan (SAP) (Blasland & Bouck Engineers, P.C., December 1990), as modified by Attachment 1 for low-flow sampling procedures. Ms. Denise Paige of I.C.F. Kaiser conducted oversight of the field activities on behalf of the United States Environmental Protection Agency (USEPA).

For this sampling event, ground-water samples from 15 monitoring wells were analyzed for Target Compound List (TCL) VOCs by USEPA Contract Laboratory Program-Statement of Work (CLP-SOW) 10/92 Superfund Analytical Methods for Low Concentration Water for Organic Analysis. The ground-water sample from well W-07 (unfiltered only) was also analyzed for PCBs according to USEPA CLP-SOW OLM01.9. Recra Environmental, Inc. (Recra) performed the CLP analyses. BBL validated the CLP data, using the procedures set forth in the RI SAP.

In addition, Upstate Laboratories, Inc. (Upstate) analyzed ground-water samples from all 15 wells for nitrate, sulfate, and sulfide as indicators of intrinsic biodegradation. These samples were analyzed using USEPA Methods 352.1, 375.4, and 376.2 for nitrate, sulfate, and sulfide, respectively. BBL also obtained ground-water samples for filtered and unfiltered iron and manganese by USEPA Method 200.7. Ferric (III)/ferrous (II) iron and manganese (II/IV) were estimated from the filtered and unfiltered metal results. The ratio of the oxidation states of iron and manganese were used as indicators of intrinsic biodegradation.

Potential nutrients available to the microbial population were assessed by analysis of nitrogen as ammonia and phosphorous as ortho-phosphate by USEPA Methods 350.2 and 365.2. To evaluate the type of microbial population present at the site, ground-water samples from four wells (W-04, upgradient; W-06 and W-11, on site; and W-19, downgradient) were analyzed for phospholipid fatty acids (PLFA) by gas chromatography/mass spectrometer (GC/MS).

In addition to the standard field parameter measurements (pH, temperature, and conductivity), BBL measured dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity. DO, pH, temperature, and ORP were used to assess environmental conditions, while turbidity was used to assess the condition of the samples submitted for total metals and PCB analyses.

Quality assurance/quality control (QA/QC) samples, which include field duplicates, trip blanks, field blanks (required due to the use of non-dedicated pumps for the low-flow sampling method), laboratory fortified blanks, and matrix spike/matrix spike duplicates, were also analyzed for the CLP samples. A trip blank was included in each cooler containing samples for VOC analyses, while other QA/QC samples were analyzed at a rate of one per 20 samples for CLP analyses.

On behalf of USEPA, Ms. Denise Paige, ICF Kaiser, collected the following ground-water split samples:

| Well | Analyses |
|---|---|
| W-04 | TCL VOCs and unfiltered TAL metals |
| W-06 | TCL VOCs and unfiltered TAL metals |
| W-07 | TCL VOCs, and unfiltered TCL PCBs and TAL metals |
| W-10 | TCL VOCs and unfiltered TAL metals |
| W-11 | TCL VOCs and unfiltered TAL metals |
| W-16 | TCL VOCs and unfiltered TAL metals |
| W-17 | TCL VOCs and unfiltered TAL metals |
| W-18 | TCL VOCs and unfiltered TAL metals |
| W-19 | TCL VOCs and unfiltered TAL metals |
| W-24 | TCL VOCs and unfiltered TAL metals |

USEPA also collected six surface soil samples from the "coal bin area," located east of well W-06 and north of the retaining wall, for the analysis of TCL SVOCs, TCL PCBs/pesticides, and TAL metals. In addition, USEPA collected six surface soil samples from the vicinity of the "crane area," located in the central part of the site, for the analysis of TCL PCBs. USEPA also screened these soil samples with a Organic Vapor Analyzer (OVA) Flame Ionization Detector (FID). Organic vapors were not detected by the OVA.

Prior to initiating ground-water sampling, BBL obtained a complete round of water levels. At the time of this sampling event, both Perplexity Creek and its tributary were frozen. Table 1 presents water level measurements from March 1991 through December 1995. December 1995 ground-water elevations were 1.4 to 8.5 feet higher than those obtained in August 1995.

Figure 1 is a potentiometric surface map constructed from the December 12, 1995 water elevation data to depict the water table. As indicated on Figure 1, ground water flowed generally to the north-northeast on this date. A hydraulic gradient of 0.01 (14.6 ft. divided by 1030 ft.) was calculated between well W-06, on site, and well W-18 downgradient of the site. Both the ground-water flow direction and hydraulic gradient are consistent with those observed during the RI/FS.

**Results**

This section summarizes the analytical results of this sampling event as follows:

- VOC and PCB results;
- Indicators of intrinsic biodegradation, including iron, manganese, nitrate, sulfate, and sulfide;
- Nutrient and PFLA results; and
- Field parameter measurements.

VOCs

Ground-water analytical data for the 11 detected VOCs are presented in Table 2. VOCs detected in ground-water samples consist mainly of 1,1,1-trichloroethane (TCA), trichloroethene (TCE), and their degradation products (chloroethane [CA], 1,1-dichloroethane [DCA], 1,1-dichloroethene [1,1-DCE], 1,2-dichloroethene [1,2-DCE], and vinyl chloride). Specifically, CA and DCA are degradation products of TCA; 1,2-DCE and vinyl chloride are degradation products of TCE. 1,1-DCE can result from the degradation of either TCA or TCE.

In addition to TCA/TCE and their degradation products, three other VOCs, tetrachloroethene (PCE), chloroform, and methylene chloride, were detected at low levels in ground-water samples analyzed during this sampling event. PCE was only detected at four wells (W-03, W-06, W-17, and W-18) at concentrations ranging from 0.39 micrograms per liter (ug/L, estimated) at well W-18 to 17 ug/L at well W-03. Chloroform was detected at well W-06 at an estimated concentration of 0.68 ug/L, but not in the duplicate sample from well W-06. Methylene chloride was detected at well W-06 at estimated concentrations of 1.3 ug/L and 3.6 ug/L, respectively, in the ground-water sample and its duplicate.

No VOCs were detected in the trip blanks. Toluene was detected at an estimated concentration of 0.28 ug/L in the field blank; however, toluene was not detected in any of the VOC samples.

As indicated in Table 2, five VOCs exceeded federal maximum contaminant levels (MCLs) at a total of four wells: TCA at well W-06 (5,000 ug/L, MCL=200 ug/L); cis-1,2-DCE at well W-24 (99 ug/L, MCL=70 ug/L); PCE at well W-03 (17 ug/L, MCL=5 ug/L); TCE at wells W-06 (18 ug/L, MCL=5 ug/L), W-12 (21 ug/L), and W-24 (200 ug/L); and vinyl chloride at well W-24 (19 ug/L, MCL=2 ug/L).

VOC concentrations were also compared to the New York State ground-water standards. These standards are the same as federal MCLs for PCE, TCE and vinyl chloride and are very similar for 1,1-DCE; however, the New York State standards are more stringent than the federal MCLs for TCA, DCA, and 1,2-DCE.

Table 2 indicates the VOCs detected above the federal MCLs and New York State standards. TCA and its degradation product DCA exceeded the New York State standard at most on-site and downgradient wells (Figure 2). The TCE degradation product cis-1,2-DCE exceeded the New York State standard at on-site well W-06, at hydraulically downgradient well W-18, and at hydraulically upgradient well W-24 (Figure 3). However, the trans-1,2-DCE isomer exceeded the New York State standard only at upgradient well W-24. 1,1-DCE exceeded the New York State standard of 5 ug/L at wells W-06 and W-11, but was below the similar federal MCL of 7 ug/L.

## PCBs

The PCB analytical data are summarized in Table 3 and both August and December 1995 Form I data sheets are included as Attachment 2. The PCB Aroclor 1254 was tentatively identified at well W-07 at an estimated concentration of 0.27 ug/L in unfiltered ground water. This concentration is below the federal MCL of 0.5 ug/L, but slightly above the New York State standard of 0.1 ug/L. A filtered sample was not analyzed for PCBs during this sampling event; however, during the August 1995 sampling event, PCBs were not detected in filtered ground water from well W-07. PCBs were not detected in the corresponding field equipment blank.

To evaluate the condition of the unfiltered ground-water samples that were analyzed for PCBs and metals, the turbidity of the ground water was monitored during purging and sampling. Unfiltered ground-water samples were collected at turbidity values ranging from 0 to 42 nephelometric turbidity units (NTU). As shown in Table 4, the majority of the samples were collected with turbidity values less than or equal to 15 NTU (plus or minus 5 NTU). The turbidity measured at well W-07 during ground-water sampling was 19 NTU.

## Indicators of Intrinsic Biodegradation

Table 5 presents a summary of the inorganic analytical results including iron, manganese, nitrate, sulfate, and sulfide. As shown on Figure 4, total and soluble manganese and iron were detected both hydraulically upgradient and downgradient of the site. Upgradient total manganese concentrations ranged from non-detect at well W-04 to 430 ug/L at W-24; downgradient total manganese concentrations ranged from non-detect (wells W-01, W-06, and W-17) to 1,600 ug/L (well W-19). Upgradient soluble manganese concentrations ranged from non-detect (well W-04) to 320 ug/L (well W-24); downgradient concentrations ranged from non-detect (wells W-01, W-06, and W-17) to 1,240 ug/L (well W-02). Upgradient total iron concentrations ranged from 130 ug/L (well W-24) to 320 ug/L (well W-04); downgradient levels of total iron ranged from 40 ug/L (well W-18), to 5,000 ug/L (well W-11). Soluble iron upgradient concentrations ranged from 90 ug/L (well W-04) to 110 ug/L (well W-24); downgradient soluble iron concentrations ranged from non-detect (well W-12) to 5,400 ug/L (well W-11).

As shown on Figure 4, nitrate concentrations at the two upgradient wells ranged from non-detect at well W-24 to 700 ug/L at well W-04. Nitrate was detected at four downgradient wells (W-01, W-16, W-17, and W-18) at concentrations ranging from 400 ug/L at well W-18 to 1,100 ug/L at well W-16. Sulfate was detected at each of the 15 wells sampled. Concentrations of sulfate at the two upgradient wells ranged 18,000 ug/L at well W-04 to 130,000 ug/L at W-24. The average downgradient sulfate concentration of 147,000 ug/L was higher than the observed upgradient concentrations. As shown in Table 5, sulfide was not detected in any of the ground-water samples.

Nutrients and PLFA

Ammonium nitrogen and ortho-phosphate phosphorous were analyzed to provide an indication of the macronutrients available to the microbial population. These results are summarized in Table 5. Although neither of these potential nutrients were detected in the ground-water samples, they may be present at concentrations below the method detection limits.

Ground-water samples were collected from four locations (wells W-04, W-06, W-11, and W-19) and analyzed for PLFA by GC/MS. These results are presented in Attachment 3. PLFA analysis provides information on the level of microbial biomass present, on the general types of microorganisms present (by functional group), and the metabolic status of a particular functional group of microorganisms.

The PLFA data indicates that microbial biomass on site (well W-06) is more diverse and larger than at the upgradient (well W-04) and downgradient (wells W-11 and W-19) locations. Ground water from well W-06 contained 630 picomoles (pmoles) of PLFA compared to wells W-04 (57 pmoles), W-11 (11 pmoles), and W-19 (10 pmoles). The PLFA data also indicates that two sulfate-reducing bacteria are more abundant on site and suggests that the bacterial community is entering a stationary growth phase.

Field Parameters

Field parameter measurements were conducted during purging and at the time of sampling. Measurements taken at the time of sampling are presented in Table 4. ORP values ranged from -128 (W-07) to 169 (W-17) millivolts (mV) across the site and averaged 120 mV upgradient and 40 mV downgradient of the site. DO concentrations ranged from non-detect to 8.3 milligrams per liter (mg/L) and averaged 5.3 mg/L upgradient and 3.9 mg/L downgradient of the site. As previously mentioned, turbidity values at the time of sampling ranged from 0 to 42 NTU, with most samples collected having turbidity values of 15 NTU or less. Samples were collected at an average temperature of 7.4 degrees Celsius, an average pH of 7.2, and an average conductivity of 0.94 milliSiemens per centimeter.

## Discussion

The following discussions provide an evaluation of the following:

- VOC concentration trends; and
- Intrinsic biodegradation.

VOC Concentration Trends

As shown on Figures 3 and 4, the observed VOC concentrations decreased between May 1991 and August 1995. From August to December 1995, VOC concentrations generally continued to decrease or remain similar at most on-site and downgradient wells. However, VOC concentrations generally increased at wells W-03, W-06, W-08, and W-24. For example, TCA concentrations at well W-06 had decreased from 3,400 ug/L in May 1991 to 15 ug/L in August 1995. In December 1995, however, the TCA concentration at well W-06 increased to 5,000 ug/L. Similarly, TCE concentrations at upgradient well W-24 had decreased with time from 200 ug/L in June 1993 to

40 ug/L in August 1995. However, in December 1995, the TCE concentration at well W-24 increased to 200 ug/L. Although VOC concentrations increased at certain wells (e.g., W-06 and W-24) between August and December 1995, the concentrations should in the future decrease due to a combination of intrinsic biodegradation and hydrodynamic dispersion.

NOT IF SOURCE IS PRESENT

The increase in VOC concentrations during the December 1995 ground-water sampling event is likely the result of increased leaching of residual constituents in the soil from the existing source areas. Observed VOC concentration increases indicate source reactivation of both an on-site TCA source (i.e., near well W-06) and an upgradient TCE source (i.e., near well W-24).

Water level and precipitation trends were examined to determine if the source reactivation was affected by ground-water fluctuation or precipitation infiltration. To evaluate a possible correlation of infiltration to the VOC concentration increase between August and December 1995, BBL obtained 1995 daily precipitation data for Cortland from the Northeast Regional Climate Center. The observed water table averaged 3 feet higher in December 1995 than in August 1995. However, the water table has been historically higher (e.g., March 1991 and January 1995) than observed in December 1995. As shown on Figure 5, the least amount of precipitation was recorded in August 1995 (1.25 inches) and the most precipitation was recorded in October 1995 (5.79 inches). In fact, almost half (15.85 inches) of the annual recorded precipitation (34.30 inches) in Cortland was received in the last quarter of 1995.

As indicated on Figure 5, the increased TCA concentration at well W-06 appears more strongly correlated to precipitation than water table fluctuation. This indicates that the reactivation of a source above the water table in the vicinity of well W-06 is likely related to infiltration of precipitation. As shown on Figure 6, there is a correlation between both the water table fluctuation and the precipitation data and the increased TCE concentration at well W-24. This suggests that the TCE source reactivation is influenced by both rising ground-water levels and increased infiltration of precipitation. Since well W-24 is located closer to the recharge area located south of the site than well W-06, the water table at well W-24 would be more influenced by infiltration.

## Intrinsic Biodegradation

The status of microbial activity at the Rosen Site was evaluated using a combination of the indicators of intrinsic biodegradation and the PLFA data. These data provide strong indications that reductive dehalogenation of TCA/TCE is occurring due to biological activity.

### *Indicators of Intrinsic Biodegradation*

During bacterial respiration, electron acceptors tend to be used in order of decreasing energy yield, as follows: oxygen ($O_2$), nitrate ($NO_3$), Mn (IV) and Fe (III) oxides, sulfate ($SO_4$), and carbon dioxide ($CO_2$), under neutral pH conditions. When oxygen is depleted and other electron acceptors are used, the system is referred to as anoxic. DO levels are highest at well W-04, upgradient of the site, (8.3 mg/L), decrease at the site (W-06, 2.6 mg/L) and at the perimeter of the site (from 0 mg/L at well W-08 to 3.4 mg/L at well W-02). The ORP levels are highest upgradient of the site (+153 mV) and decrease at the site (0.4 mV at well W-06) and at the perimeter of the site (from -0.3 mV at well W-11 to +68 mV at well W-12). Nitrate was not detected in the ground water at most wells sampled, except for the upgradient well W-04 and a few downgradient wells, primarily those located along Huntington Street (W-16, W-17, and W-18) and perimeter well W-01. Even where present nitrate concentrations were relatively low, 1,100 ug/L or less. Overall, the levels of $O_2$ and $NO_3$ at the site are relatively low. The ORP data indicate reduced conditions are present throughout the site and surrounding areas, although the most-reduced conditions exist on-site.

Mn (IV) and Fe (III) oxides and sulfate, which are generally present in ground water at the site, likely act as electron acceptors in bacterial respiration. These electron acceptors can be used by variety of bacteria that possess the capability to reductively dehalogenate compounds (Bower, 1993). In comparison to upgradient conditions, the soluble iron species (Fe II) comprises the majority of the total iron detected along the perimeter of the site (i.e., the ratio of soluble iron concentrations to total iron concentrations increases). Likewise, the ratio of soluble manganese (Mn II) concentrations to total manganese concentrations in ground water increases between locations upgradient of the site and along the downgradient perimeter of the site. Sulfate concentrations are generally similar at and downgradient of the site to those concentrations detected upgradient of the site (18,000 ug/L at well W-04 at 120,000 ug/L at well W-24), except at wells W-11 and W-19 where sulfate concentrations are higher. In general, both sulfate and iron/manganese oxides are present to act as electrons acceptors. Sulfate appears to be the predominant electron acceptor on site (near well W-06), while iron and manganese oxides appear to be the predominant electron acceptors downgradient of the site.

Under anoxic conditions, halogenated compounds (e.g., TCA) also act as electron acceptors. In this process, halogen atoms (e.g., chlorine) are removed and replaced with hydrogen atoms. When halogenated compounds such as TCA act as electron acceptors, the concentrations of the parent compound (e.g., TCA) and their degradation products provide information to evaluate the significance of biological activity in the dehalogenation process. Figures 2 and 3 present the distribution of TCA/TCE and their degradation products in ground water. The presence of parent halogenated compounds, such as TCA and TCE, and their degradation products, suggests that reductive dechlorination has occurred due to biological activity. In general TCA, the parent halogenated compound, is more predominant near its source near well W-06 than further downgradient along the perimeter of the site and along Huntington Street.

### *PLFA Data*

The PLFA data indicates that microbial biomass is greater at the on-site (well W-06) location than at the upgradient (well W-04) and downgradient (wells W-11 and W-19) locations. In addition to the higher biomass levels in the ground water at the on-site location (well W-06), two particular species of sulfate-reducing bacteria (*DeSulfobacter* and *Desulfovibrio*) were observed suggesting the potential for increased sulfate reduction. Sulfate-reducing organisms appear to be active at the on-site and upgradient locations. The increased activity of the sulfate reducing community is supported by spatial change in sulfate concentrations detected in the ground water; less sulfate is present where PLFA analyses detected the presence of sulfate reducers.

The microbial community on site appears to be entering a stationary growth phase potentially due to substrate or nutrient limiting conditions. Ammonium nitrogen and ortho-phosphate phosphorous concentrations were not detected in ground-water samples. The lack of these two nutrients could be limiting the activity of the microbial populations. Due to the low biomass levels at the upgradient and downgradient locations, the growth phase could not be assessed.

## Summary

Although VOC concentrations have generally decreased in ground water across the site between May 1991 and August 1993, increased VOC concentrations were observed at wells W-06 and W-24 from between the August 1995 and the December 1995 sampling events. The strong correlation between VOC concentrations and precipitation demonstrate that the recent elevated VOC concentrations are the result of increased leaching of residual constituents in the source area from infiltrating precipitation. The VOC concentrations will continue to be reduced by the combined effects of intrinsic biodegradation and hydrodynamic dispersion. Further, the installation of an engineered cap at the site would reduce infiltration and thus mitigate future reactivation of the source near well W-06.

They HAVEN'T Yet

PCBs are still present at well W-07, although the concentration of Aroclor 1254 continues to diminish. Historically, PCBs have not been present in filtered samples from this well, indicating that PCBs are associated with particulates.

PLFA and select geochemical indicator (i.e., sulfate, iron, and manganese, DO, and ORP) results suggest that biological activity on site is greater than at the upgradient and downgradient locations. This correlation suggests that TCA dechlorination occurs at the site due to biological activity.

If you have any questions or comments regarding the information presented herein, please contact Mr. Charlie Poole.

Very truly yours,

BLASLAND, BOUCK & LEE, INC.

Nancy E. Gensky

Nancy E. Gensky
Associate

NEG/add

cc: Mr. Charles Poole, CPRP Group Coordinator, Overhead Door Corporation
CPRP Group (Distribution List)
Mr. Robert K. Goldman, P.E., Blasland, Bouck & Lee, Inc.
Mr. David W. Hale, Blasland, Bouck & Lee, Inc.
Ms. Lynette B. Mokry, Blasland, Bouck & Lee, Inc.

# TABLES

TABLE 1

# GROUND-WATER/SURFACE-WATER ELEVATIONS

ROSEN SITE
CORTLAND, NEW YORK

| Well | TOIC Elev. | 03/04/91 | 03/14/91 | 03/19/91 | 04/16/91 | 5/10/91 | 8/16/91 | 2/10/92 | 5/22/92 | 12/7/92 | 12/28/94 | 12/29/94 | 01/04/95 | 01/19/95 | 02/28/95 | 07/31/95 | 12/12/95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| W-01 | 1124.30 | 1113.86 | 1111.14 | 1111.09 | 1110.78 | 1109.35 | 1105.81 | 1108.63 | 1109.65 | 1110.95 | 1110.14 | 1110.24 | 1110.01 | 1111.65 | 1109.90 | 1106.13 | 1108.53 |
| W-02 | 1125.69 | 1115.66 | 1114.10 | 1113.83 | 1113.48 | 1112.33 | 1108.07 | 1111.62 | 1112.47 | 1114.22 | 1114.25 | 1114.09 | 1113.93 | 1115.17 | 1113.33 | 1108.54 | 1112.66 |
| W-03 | 1128.44 | 1118.71 | 1117.27 | 1116.75 | 1116.08 | 1115.39 | 1110.57 | 1114.01 | NA | NA | NA | 1116.68 | 1117.09 | 1119.45 | 1114.84 | 1110.87 | 1116.66 |
| W-04 | 1138.12 | 1134.89 | 1133.87 | 1133.74 | 1133.22 | 1133.02 | 1120.59 | 1133.82 | 1132.17 | 1134.48 | NA | 1134.76 | 1134.42 | 1135.13 | 1135.19 | NA | 1134.07 |
| W-05 | 1130.84 | 1124.62 | 1117.65 | 1117.61 | 1116.43 | 1114.99 | 1109.05 | 1114.34 | 1114.62 | 1117.88 | 1116.65 | 1116.51 | 1116.39 | 1119.18 | 1115.51 | 1109.41 | 1113.87 |
| W-06 | 1131.43 | 1127.73 | 1123.24 | 1122.51 | 1121.97 | 1121.61 | 1114.94 | 1120.93 | 1121.09 | 1126.29 | 1123.54 | 1123.31 | 1123.10 | 1126.54 | 1124.20 | 1115.43 | 1122.45 |
| W-07 | 1125.87 | 1117.56 | 1114.56 | 1114.45 | 1113.90 | 1112.82 | 1107.82 | 1111.67 | 1112.42 | 1114.42 | 1113.70 | 1113.68 | 1113.56 | 1115.61 | 1113.10 | 1108.73 | 1111.39 |
| W-08 | 1123.61 | 1111.03 | 1110.22 | 1109.60 | 1109.23 | 1108.76 | 1105.54 | 1107.85 | 1108.76 | 1109.66 | 1109.06 | 1108.99 | 1108.81 | 1109.82 | 1108.60 | 1105.77 | 1107.89 |
| W-09 | 1123.57 | 1111.60 | 1110.42 | 1110.22 | 1109.80 | 1109.97 | 1105.76 | 1108.17 | 1109.07 | 1110.45 | 1109.66 | 1109.60 | 1109.43 | 1110.50 | 1109.09 | 1106.13 | 1108.36 |
| W-10 | 1123.36 | 1115.54 | 1113.36 | 1113.17 | 1112.81 | 1112.18 | 1108.09 | 1111.16 | 1111.75 | 1113.26 | 1112.70 | 1112.64 | 1112.51 | 1113.86 | 1112.25 | 1108.37 | 1111.38 |
| W-11 | 1124.47 | 1112.39 | 1111.77 | 1111.38 | 1111.05 | 1110.88 | 1107.46 | 1109.44 | 1110.70 | 1111.87 | 1111.48 | 1111.24 | 1111.10 | 1111.99 | 1109.74 | 1107.86 | 1110.32 |
| W-12 | 1127.63 | 1114.35 | 1113.53 | 1113.26 | 1112.97 | 1112.68 | 1109.02 | 1111.14 | 1112.47 | 1113.86 | 1113.08 | 1113.06 | 1112.92 | 1114.02 | 1112.55 | 1109.30 | 1112.26 |
| W-13 | 1132.21 | 1126.18 | 1123.09 | 1122.29 | 1121.89 | 1121.78 | 1114.29 | 1120.61 | 1121.47 | 1125.16 | 1123.43 | 1123.22 | 1122.81 | 1129.09 | 1126.81 | 1114.47 | 1123.01 |
| W-14 | 1132.19 | 1124.10 | 1122.49 | 1122.03 | 1121.51 | 1121.60 | 1115.09 | 1119.79 | 1121.28 | 1123.39 | 1122.39 | 1122.23 | 1122.08 | 1124.58 | 1122.57 | 1115.41 | 1121.91 |
| W-15 | 1125.02 | NA | NA | NA | NA | NA | NA | 1109.59 | 1111.10 | 1112.06 | 1111.42 | 1111.31 | 1111.18 | 1112.06 | 1110.81 | 1107.95 | 1110.46 |
| W-16 | 1122.63 | NA | NA | NA | NA | NA | NA | 1108.67 | 1110.27 | 1111.11 | 1110.44 | 1110.26 | 1110.18 | 1110.71 | 1109.85 | 1107.71 | 1109.65 |
| W-17 | 1122.28 | NA | NA | NA | NA | NA | NA | 1108.28 | 1109.96 | 1111.66 | 1109.99 | 1109.95 | 1109.83 | 1110.43 | 1109.52 | 1107.59 | 1109.46 |
| W-18 | 1120.86 | NA | NA | NA | NA | NA | NA | 1107.09 | 1108.42 | 1109.31 | 1108.52 | 1108.42 | 1108.29 | 1109.04 | 1108.01 | 1106.15 | 1107.88 |
| W-19 | 1120.67 | NA | NA | NA | NA | NA | NA | 1106.70 | 1108.21 | 1108.85 | 1108.24 | 1108.12 | 1108.00 | 1108.54 | 1107.69 | 1105.76 | 1107.48 |
| W-20 | 1120.63 | NA | NA | NA | NA | NA | NA | 1106.60 | 1108.13 | 1108.55 | 1108.24 | 1108.08 | 1107.98 | 1108.41 | 1107.78 | 1105.67 | 1107.03 |
| W-21 | 1144.42 | NA | NA | NA | NA | NA | NA | 1117.46 | 1123.57 | 1130.16 | 1130.55 | 1130.27 | 1130.13 | 1131.08 | 1129.87 | 1125.36 | 1117.89 |
| W-22 | 1135.35 | NA | NA | NA | NA | NA | NA | 1115.91 | 1115.52 | 1118.79 | 1126.23 | 1117.70 | 1117.36 | 1120.40 | 1116.67 | 1110.50 | 1114.74 |
| W-23 | 1137.44 | NA | NA | NA | NA | NA | NA | NA | NA | 1128.92 | 1127.51 | 1128.14 | 1127.44 | 1128.37 | 1126.81 | NA | NA |
| W-24 | 1137.16 | NA | NA | NA | NA | NA | NA | NA | NA | 1127.94 | 1125.39 | 1127.16 | 1126.36 | 1127.22 | 1125.32 | 1118.38 | 1122.37 |
| W-25 | 1124.50 | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1112.73 | 1112.60 | 1112.50 | 1113.67 | 1112.03 | 1108.45 | 1111.59 |
| W-26 | 1124.60 | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1111.96 | 1111.85 | 1111.69 | 1112.75 | 1111.31 | 1108.15 | 1110.88 |
| Stream Point | Top, Stream Point Elev. | 03/04/91 | 03/14/91 | 03/19/91 | 04/16/91 | 5/10/91 | 8/16/91 | 2/10/92 | 5/22/92 | 12/7/92 | 12/28/94 | 12/29/94 | 1/11/95 | 01/19/95 | 02/28/95 | 07/31/95 | 12/12/95 |
| SP-1 | 1136.30 | NA | NA | 1134.80 | 1134.80 | 1134.80 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SP-2 | 1120.80 | NA | NA | 1120.10 | 1120.10 | 1119.40 | NA | NA | 1119.99 | NA | NA | NA | NA | NA | 1120.20 | NA | NA |
| SP-3 | 1117.70 | NA | NA | 1115.60 | 1115.60 | 1115.40 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SP-4 | 1117.20 | NA | NA | 1116.10 | 1115.80 | 1115.80 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SP-2A | 1124.16 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1120.56 | 1121.68 | NA | NA | NA |
| SP-3A | 1120.01 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1118.46 | NA | NA | NA | NA |
| SP-5 | 1121.80 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1119.05 | 1119.26 | 1119.70 | NA | NA |

Notes:
Elevations are in feet above mean sea level based on National Geodetic Vertical Datum of 1929.
NA - Indicates water elevations were not measured.
TOIC - top of inner casing.

TABLE 2

VOLATILE ORGANIC COMPOUNDS DETECTED IN GROUND WATER - DECEMBER 1995

ROSEN SITE
CORTLAND, NEW YORK

| Compound | W-01 | W-02 | W-03 | W-04 | W-06 | W-06(DUP) | W-07 | W-08 | W-10 | W-11 | W-12 | W-16 | W-17 | W-18 | W-19 | W-24 | New York State Standards/ Guidance Values | MCLs/ MCLGs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 3.7 | **16** | **9.4** | 1.0 U | **5000 D** | **4900 D** | **27 D** | **59 D** | **46** | **65** | **15** | **23** | 2.3 | 3.6 | **54** | 1.0 U | 5 | 200/200 (G) |
| 1,1-Dichloroethane | 1.2 | **12** | 2.3 | 1.0 U | **390 D** | **380 D** | **34 D** | **11** | **13** | **37** | 3.0 | 3.5 | 0.66 J | **5.6** | **33** | 1.0 U | 5 | |
| 1,1-Dichloroethene | 1.0 U | 0.41 J | 1.0 U | 1.0 U | **5.5** | 5.0 J | 0.54 J | 0.90 J | 0.59 J | **5.4** | 0.53 J | 0.21 J | 1.0 U | 1.0 U | 2.7 | 3.2 | 5 | 7/7 (G) |
| Chloroethane | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 4.2 | 4.1 J | 0.41 J | 1.0 U | 2.5 U | 4.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 2.5 U | 1.0 U | 5 | |
| Chloroform | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 0.68 J | 10 U | 1.0 U | 1.0 U | 2.5 U | 4.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 2.5 U | 1.0 U | 7 | 100[1] / 0 (G) |
| cis-1,2-Dichloroethene | 1.0 U | 1.0 U | 1.0 U | 1.0 U | **8.6** | **9.3 J** | 1.0 U | 1.0 U | 2.5 U | 4.0 U | 0.23 J | 1.0 U | 0.89 J | **7.2** | 2.4 J | **99 D** | 5 | 70/70 (G) |
| Methylene chloride | 2.0 U | 2.0 U | 2.0 U | 2.0 U | 1.3 J | 3.6 J | 2.0 U | 2.0 U | 5.0 U | 8.0 U | 2.0 U | 2.0 U | 2.0 U | 2.0 U | 5.0 U | 2.0 U | 5 | 5/0 (G) |
| Tetrachloroethene | 1.0 U | 1.0 U | **17** | 1.0 U | 1.1 | 10 U | 1.0 U | 1.0 U | 2.5 U | 4.0 U | 1.0 U | 1.0 U | 2.7 | 0.39 J | 2.5 U | 1.0 U | 5 | 5/0 (G) |
| trans-1,2-Dichloroethene | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 10 U | 1.0 U | 1.0 U | 2.5 U | 4.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 2.5 U | **9.4** | 5 | 100/100 (G) |
| Trichloroethene | 1.0 U | 0.33 J | 0.46 J | 1.0 U | **18** | **18** | 0.4 J | 1.0 U | 0.58 J | 4.0 U | **21** | 3.1 | 4.8 | 3.0 | 4.3 | **200 D** | 5 | 5/0 (G) |
| Vinyl chloride | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 10 U | 1.0 U | 1.0 U | 2.5 U | 4.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 2.5 U | **19** | 2 | 2/0 (G) |

NOTES:

All concentrations are reported in micrograms per liter (ug/L) equivalent to parts per billion (ppb).

[1] Applies to the total of trihalomethanes.

The following volatile organic compounds were also analyzed, but were not detected in the ground-water samples:

1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane
1,3-Dichlorobenzene

1,4-Dichlorobenzene
2-Butanone
2-Hexanone
4-Methyl-2-pentanone
Acetone
Benzene
Bromochloromethane

Bromodichloromethane
Bromoform
Bromomethane
Carbon Disulfide
Carbon Tetrachloride
Chlorobenzene
Chloromethane

cis-1,3-Dichloropropene
Dibromochloromethane
Ethyl benzene
Styrene
Toluene
Total Xylenes
trans-1,3-Dichloropropene

D = Identifies compounds identified in an analysis at a secondary dilution factor.
E = Identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.
J = Indicates an estimated value.
U = Identifies compounds that were not detected. The value presented is the detection limit.
DUP = Duplicate.
Bold indicates NYSDEC standards exceeded; shading indicates federal MCLs exceeded.

References:

Standard and Guidance values are according to the New York State Department of Environmental Conservation, Division of Water Technical and Operation Guidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values [designated by (G)], October 1993.

MCLs [Maximum Contaminant Levels], MCLGs [Maximum Contaminant Level Goals, designated by (G)], and SMCLs [Secondary Maximum Contaminant Levels, designated by (S)], according to the Code of Federal Regulations, Protection of Environment 40, Part 141, July 1, 1991, and the Drinking Water Regulations and Health Advisories, Office of Water, U.S. Environmental Protection Agency, May 1995.

# TABLE 3

# GROUND-WATER PCB ANALYTICAL RESULTS - DECEMBER 1995

ROSEN SITE
CORTLAND, NEW YORK

| Constituent | W-07 | New York State Standards/ Guidance Values | MCLs/ MCLGs |
|---|---|---|---|
| Aroclor 1016 | 1 U | 0.1 | 0.5 / 0 (G) |
| Aroclor 1221 | 2.1 U | 0.1 | 0.5 / 0 (G) |
| Aroclor 1232 | 1 U | 0.1 | 0.5 / 0 (G) |
| Aroclor 1242 | 1 U | 0.1 | 0.5 / 0 (G) |
| Aroclor 1248 | 1 U | 0.1 | 0.5 / 0 (G) |
| Aroclor 1254 | **0.27 JN** | 0.1 | 0.5 / 0 (G) |
| Aroclor 1260 | 1 U | 0.1 | 0.5 / 0 (G) |

NOTES:

All concentrations in micrograms per liter (ug/L) equivalent to parts per billion (ppb).

JN = Indicates the presence of a compounds for which there is presumptive evidence to make a tentative identification.
The associated numerical value is an estimated concentration only.

U = Identifies compounds that were not detected. The value presented is the detection limit.

Bold indicates NYSDEC standards exceeded; shading indicates federal MCLs exceeded.

References:

Standard and Guidance values are according to the New York State Department of Environmental Conservation, Division of Water Technical and Operation Guidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values [designated by (G)], October 1993.

MCLs [Maximum Contaminant Levels], MCLGs [Maximum Contaminant Level Goals, designated by (G)], and SMCLs [Secondary Maximum Contaminant Levels, designated by (S)], according to the Code of Federal Regulations, Protection of Environment 40, Part 141, July 1, 1991, and the Drinking Water Regulations and Health Advisories, Office of Water, U.S. Environmental Protection Agency, May 1995.

## TABLE 4

## FIELD PARAMETERS
## DECEMBER 1995 GROUND-WATER SAMPLING EVENT

## ROSEN SITE
## CORTLAND, NEW YORK

| Well | ORP mV | DO mg/L | Turbidity NTU | Temperature Celsius | pH S.U. | Conductivity mS/cm |
|---|---|---|---|---|---|---|
| W-01 | 127 | 7.3 | 12 | 2.7 | 7.3 | 0.45 |
| W-02 | 0.6 | 3.4 | 1 | 6.3 | 7.0 | 0.76 |
| W-03 | 0.1 | 3.3 | 0 | 6.3 | 7.1 | 0.59 |
| W-04 | 153 | 8.3 | 19 | 6.6 | 7.5 | 1.12 |
| W-05 | NA | NA | NA | NA | NA | NA |
| W-06 | 0.4 | 2.6 | 7 | 7.1 | 7.1 | 0.80 |
| W-07 | -128 | 1.1 | 19 | 9.5 | 6.8 | 0.89 |
| W-08 | 31 | 0.0 | 42 | 8.2 | 7.4 | 1.18 |
| W-09 | NA | NA | NA | NA | NA | NA |
| W-10 | 23 | 2.8 | 0 | 7.2 | 7.3 | 0.61 |
| W-11 | -0.3 | 1.6 | 10 | 6.6 | 7.0 | 1.83 |
| W-12 | 68 | 1.2 | 6 | 6.6 | 7.2 | 0.74 |
| W-13 | NA | NA | NA | NA | NA | NA |
| W-14 | NA | NA | NA | NA | NA | NA |
| W-15 | NA | NA | NA | NA | NA | NA |
| W-16 | 90 | 2.6 | 15 | 6.1 | 7.7 | 0.84 |
| W-17 | 169 | 4.6 | 15 | 10.0 | 7.5 | 0.65 |
| W-18 | 66 | 1.5 | 14 | 11.7 | 6.8 | 1.11 |
| W-19 | 78 | 0.1 | 28 | 9.0 | 6.9 | 1.50 |
| W-20 | NA | NA | NA | NA | NA | NA |
| W-21 | NA | NA | NA | NA | NA | NA |
| W-22 | NA | NA | NA | NA | NA | NA |
| W-23 | NA | NA | NA | NA | NA | NA |
| W-24 | 86 | 2.2 | 5 | 7.5 | 7.1 | 1.06 |
| W-25 | NA | NA | NA | NA | NA | NA |
| W-26 | NA | NA | NA | NA | NA | NA |

Notes:

NA = Not available.
Field measurements were made at time of sampling.
mV = Millivolts.
mg/L = Milligrams per liter, equivalent to parts per million (ppm).
NTU = Nephelometric turbidity units.
S.U. = Standard pH units.
mS/cm = MilliSiemens per centimeter.

# TABLE 5

## GROUND-WATER INORGANIC CONSTITUENT ANALYTICAL RESULTS - DECEMBER 1995

## ROSEN SITE
## CORTLAND, NEW YORK

| Constituent | W-01 | W-02 | W-03 | W-04 | W-06 | W-07 | W-08 | W-10 | W-11 | W-12 | W-16 | W-17 | W-18 | W-19 | W-24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Iron, Total | 170 | 60 | 190 | 320 | 910 | 4,900 | 270 | 80 | 5,000 | 50 | 160 | 280 | 40 | 60 | 130 |
| Iron, Soluble | 70 | 40 | 160 | 90 | 90 | 4,400 | 100 | 80 | 5,400 | < 30 | 60 | 170 | 40 | NA | 110 |
| Manganese, Total | < 20 | 540 | 540 | < 20 | < 20 | 750 | 470 | 50 | 820 | 410 | 20 | < 20 | 590 | 1,600 | 430 |
| Manganese, Soluble | < 20 | 540 | 460 | < 20 | < 20 | 590 | 430 | 50 | 910 | 400 | 20 | < 20 | 320 | NA | 320 |
| Ammonia-Nitrogen | < 500 | < 500 | < 500 | < 500 | < 500 | < 500 | < 500 | < 500 | < 500 | < 500 | < 500 | < 500 | < 500 | < 500 | < 500 |
| Nitrate-Nitrogen | 800 | < 200 | < 200 | 700 | < 200 | < 200 | < 200 | < 200 | < 200 | < 200 | 1,100 | 600 | 400 | < 200 | < 200 |
| Ortho-Phosphorus | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| Sulfate | 14,000 | 100,000 | 22,000 | 18,000 | 41,000 | 120,000 | 45,000 | 37,000 | 620,000 | 100,000 | 130,000 | 69,000 | 73,000 | 540,000 | 130,000 |
| Sulfide | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 |

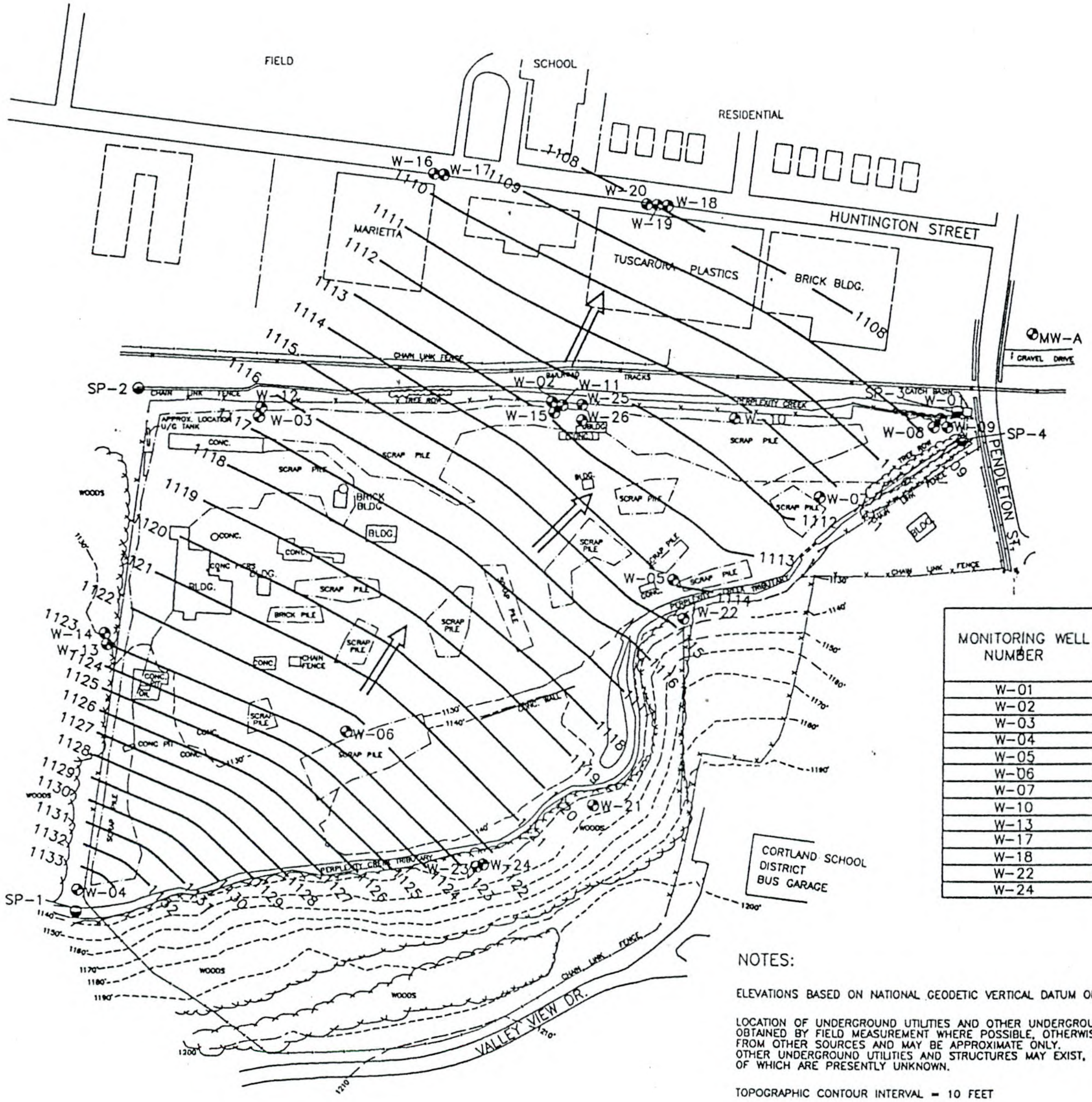
NOTES:

All concentrations in micrograms per liter (ug/L) equivalent to parts per billion (ppb).

The less than sign indicates that the constituent was not detected. The value reported is the detection limit.

NA = Indicates that the analysis was not performed.

# FIGURES



## LEGEND

◐ MONITORING WELL

1113 ——— GROUND-WATER ELEVATION CONTOUR LINE (FT., NGVD; DASHED WHERE INFERRED)

⇦ GENERALIZED GROUND-WATER FLOW DIRECTION

◒ STREAM MONITORING POINT

SCALE

200' 0 200'

| MONITORING WELL NUMBER | GROUND-WATER ELEVATION 12/12/95 |
|---|---|
| W-01 | 1108.53 |
| W-02 | 1112.66 |
| W-03 | 1116.66 |
| W-04 | 1134.07 |
| W-05 | 1113.87 |
| W-06 | 1122.45 |
| W-07 | 1111.39 |
| W-10 | 1111.38 |
| W-13 | 1123.01 |
| W-17 | 1109.46 |
| W-18 | 1107.88 |
| W-22 | 1114.74 |
| W-24 | 1122.37 |

NOTES:

ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

LOCATION OF UNDERGROUND UTILITIES AND OTHER UNDERGROUND STRUCTURES OBTAINED BY FIELD MEASUREMENT WHERE POSSIBLE, OTHERWISE OBTAINED FROM OTHER SOURCES AND MAY BE APPROXIMATE ONLY. OTHER UNDERGROUND UTILITIES AND STRUCTURES MAY EXIST, THE LOCATIONS OF WHICH ARE PRESENTLY UNKNOWN.

TOPOGRAPHIC CONTOUR INTERVAL = 10 FEET

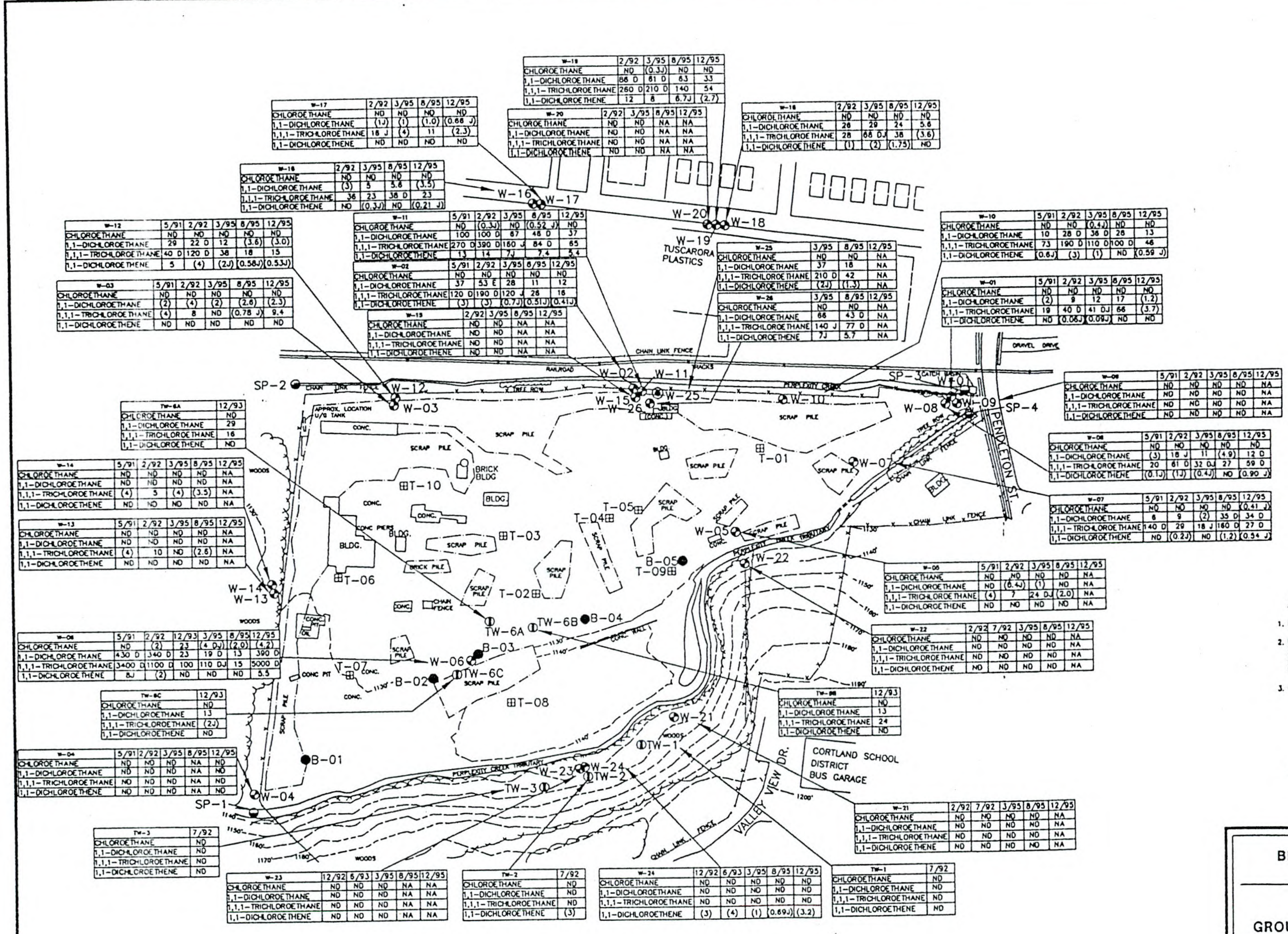
**BLASLAND, BOUCK & LEE, INC.**
*ENGINEERS & SCIENTISTS*

ROSEN SITE
CORTLAND, NEW YORK
GROUND-WATER MONITORING REPORT

**GROUND-WATER TABLE CONTOUR MAP 12/12/95**

FIGURE 1

GWB95 ON TESTHOLE,SOIL_BORINGS,AREA,REF,SS,SSS,TPNEW,TWNEW,AIR,PCB,PMW,SITEMAP,PATH OFF
1/29/96 54-PGL
49405002\49405SM1.DWG



| W-19 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|
| CHLOROETHANE | ND | (0.3J) | ND | ND |
| 1,1-DICHLOROETHANE | 88 D | 81 D | 63 | 33 |
| 1,1,1-TRICHLOROETHANE | 260 D | 210 D | 140 | 54 |
| 1,1-DICHLOROETHENE | 12 | 8 | 6.7J | (2.7) |

| W-17 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | (1J) | (1) | (1.0) | (0.66 J) |
| 1,1,1-TRICHLOROETHANE | 18 J | (4) | 11 | (2.3) |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND |

| W-20 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|
| CHLOROETHANE | ND | ND | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | NA | NA |

| W-18 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | 26 | 29 | 24 | 5.6 |
| 1,1,1-TRICHLOROETHANE | 28 | 68 DJ | 38 | (3.6) |
| 1,1-DICHLOROETHENE | (1) | (2) | (1.75) | ND |

| W-16 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | (3) | 5 | 5.6 | (3.5) |
| 1,1,1-TRICHLOROETHANE | 36 | 23 | 38 D | 23 |
| 1,1-DICHLOROETHENE | ND | (0.3J) | ND | (0.21 J) |

| W-12 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | 29 | 22 D | 12 | (3.6) | (3.0) |
| 1,1,1-TRICHLOROETHANE | 40 D | 120 D | 38 | 18 | 15 |
| 1,1-DICHLOROETHENE | 5 | (4) | (2J) | (0.58J) | (0.53J) |

| W-11 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | (0.3J) | ND | (0.52 J) | ND |
| 1,1-DICHLOROETHANE | 100 | 100 D | 67 | 46 D | 37 |
| 1,1,1-TRICHLOROETHANE | 270 D | 390 D | 160 J | 84 D | 65 |
| 1,1-DICHLOROETHENE | 13 | 14 | 7J | 7.4 | 5.4 |

| W-02 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | 37 | 53 E | 28 | 11 | 12 |
| 1,1,1-TRICHLOROETHANE | 120 D | 190 D | 120 J | 28 | 16 |
| 1,1-DICHLOROETHENE | (3) | (3) | (0.7J) | (0.51J) | (0.41J) |

| W-03 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | (2) | (4) | (2) | (2.6) | (2.3) |
| 1,1,1-TRICHLOROETHANE | (4) | 8 | ND | (0.78 J) | 9.4 |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | ND |

| W-15 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|
| CHLOROETHANE | ND | ND | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | NA | NA |

| W-25 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|
| CHLOROETHANE | ND | ND | NA |
| 1,1-DICHLOROETHANE | 37 | 18 | NA |
| 1,1,1-TRICHLOROETHANE | 210 D | 42 | NA |
| 1,1-DICHLOROETHENE | (2J) | (1.3) | NA |

| W-26 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|
| CHLOROETHANE | ND | ND | NA |
| 1,1-DICHLOROETHANE | 66 | 43 D | NA |
| 1,1,1-TRICHLOROETHANE | 140 J | 77 D | NA |
| 1,1-DICHLOROETHENE | 7J | 5.7 | NA |

| W-10 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | (0.4J) | ND | ND |
| 1,1-DICHLOROETHANE | 10 | 28 D | 36 D | 28 | 13 |
| 1,1,1-TRICHLOROETHANE | 73 | 190 D | 110 D | 100 D | 46 |
| 1,1-DICHLOROETHENE | (0.6J) | (3) | (1) | ND | (0.59 J) |

| W-01 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | (2) | 9 | 12 | 17 | (1.2) |
| 1,1,1-TRICHLOROETHANE | 19 | 40 D | 41 DJ | 66 | (3.7) |
| 1,1-DICHLOROETHENE | ND | (0.06J) | (0.09J) | ND | ND |

| W-09 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA |

| W-08 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | (3) | 18 J | 11 | (4.9) | 12 D |
| 1,1,1-TRICHLOROETHANE | 20 | 61 D | 32 DJ | 27 | 59 D |
| 1,1-DICHLOROETHENE | (0.1J) | (1J) | (0.4J) | ND | (0.90 J) |

| W-07 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | (0.41 J) |
| 1,1-DICHLOROETHANE | 6 | 9 | (2) | 35 D | 34 D |
| 1,1,1-TRICHLOROETHANE | 140 D | 29 | 18 J | 160 D | 27 D |
| 1,1-DICHLOROETHENE | ND | (0.2J) | ND | (1.2) | (0.54 J) |

| TW-6A | 12/93 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | 29 |
| 1,1,1-TRICHLOROETHANE | 16 |
| 1,1-DICHLOROETHENE | ND |

| W-14 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA |
| 1,1,1-TRICHLOROETHANE | (4) | 5 | (4) | (3.5) | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA |

| W-13 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA |
| 1,1,1-TRICHLOROETHANE | (4) | 10 | ND | (2.6) | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA |

| W-05 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHANE | ND | (0.4J) | (1) | ND | NA |
| 1,1,1-TRICHLOROETHANE | (4) | 7 | 24 DJ | (2.0) | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA |

| W-22 | 2/92 | 7/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA |

| W-06 | 5/91 | 2/92 | 12/93 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | (2) | 23 | (4 DJ) | (2.0) | (4.2) |
| 1,1-DICHLOROETHANE | 430 D | 340 D | 23 | 19 D | 13 | 390 D |
| 1,1,1-TRICHLOROETHANE | 3400 D | 1100 D | 100 | 110 DJ | 15 | 5000 D |
| 1,1-DICHLOROETHENE | 8J | (2) | ND | ND | ND | 5.5 |

| TW-6C | 12/93 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | 13 |
| 1,1,1-TRICHLOROETHANE | (2J) |
| 1,1-DICHLOROETHENE | ND |

| TW-6B | 12/93 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | 13 |
| 1,1,1-TRICHLOROETHANE | 24 |
| 1,1-DICHLOROETHENE | ND |

| W-04 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | NA | ND |
| 1,1-DICHLOROETHANE | ND | ND | ND | NA | ND |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | NA | ND |
| 1,1-DICHLOROETHENE | ND | ND | ND | NA | ND |

| W-21 | 2/92 | 7/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA |

| TW-3 | 7/92 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | ND |
| 1,1,1-TRICHLOROETHANE | ND |
| 1,1-DICHLOROETHENE | ND |

| W-23 | 12/92 | 6/93 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | NA | NA |

| TW-2 | 7/92 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | ND |
| 1,1,1-TRICHLOROETHANE | ND |
| 1,1-DICHLOROETHENE | (3) |

| W-24 | 12/92 | 6/93 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | ND |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHENE | (3) | (4) | (1) | (0.69J) | (3.2) |

| TW-1 | 7/92 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | ND |
| 1,1,1-TRICHLOROETHANE | ND |
| 1,1-DICHLOROETHENE | ND |

LEGEND

| | |
|---|---|
| ◉ | PUMPING WELL |
| ◍ | MONITORING WELL |
| ● | TEST BORING |
| ⊞ | TEST PIT |
| ◒ | STREAM MONITORING POINT |
| ◑ | TEMPORARY WELL |
| 280 | CONCENTRATION IN ug/L EQUIVALENT TO ppb. |
| (4) | CONCENTRATION DETECTED BUT NOT ABOVE STATE OR FEDERAL STANDARDS |
| J | INDICATES ESTIMATED VALUE |
| D | INDICATES SAMPLE DILUTION |
| B | INDICATES COMPOUND ALSO FOUND IN LABORATORY BLANK |
| NA | NOT ANALYZED |
| ND | NOT DETECTED ABOVE METHOD DETECTION LIMIT |

NOTES:

1. ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.
2. LOCATION OF UNDERGROUND STRUCTURES OBTAINED BY FIELD MEASUREMENT WHERE POSSIBLE, OTHERWISE OBTAINED FROM OTHER SOURCES AND MAY BE APPROXIMATE ONLY. OTHER UNDERGROUND STRUCTURES MAY EXIST, THE LOCATIONS OF WHICH ARE PRESENTLY UNKNOWN.
3. CONTOUR INTERVAL = 10 FEET.

SCALE

200' 0 200'

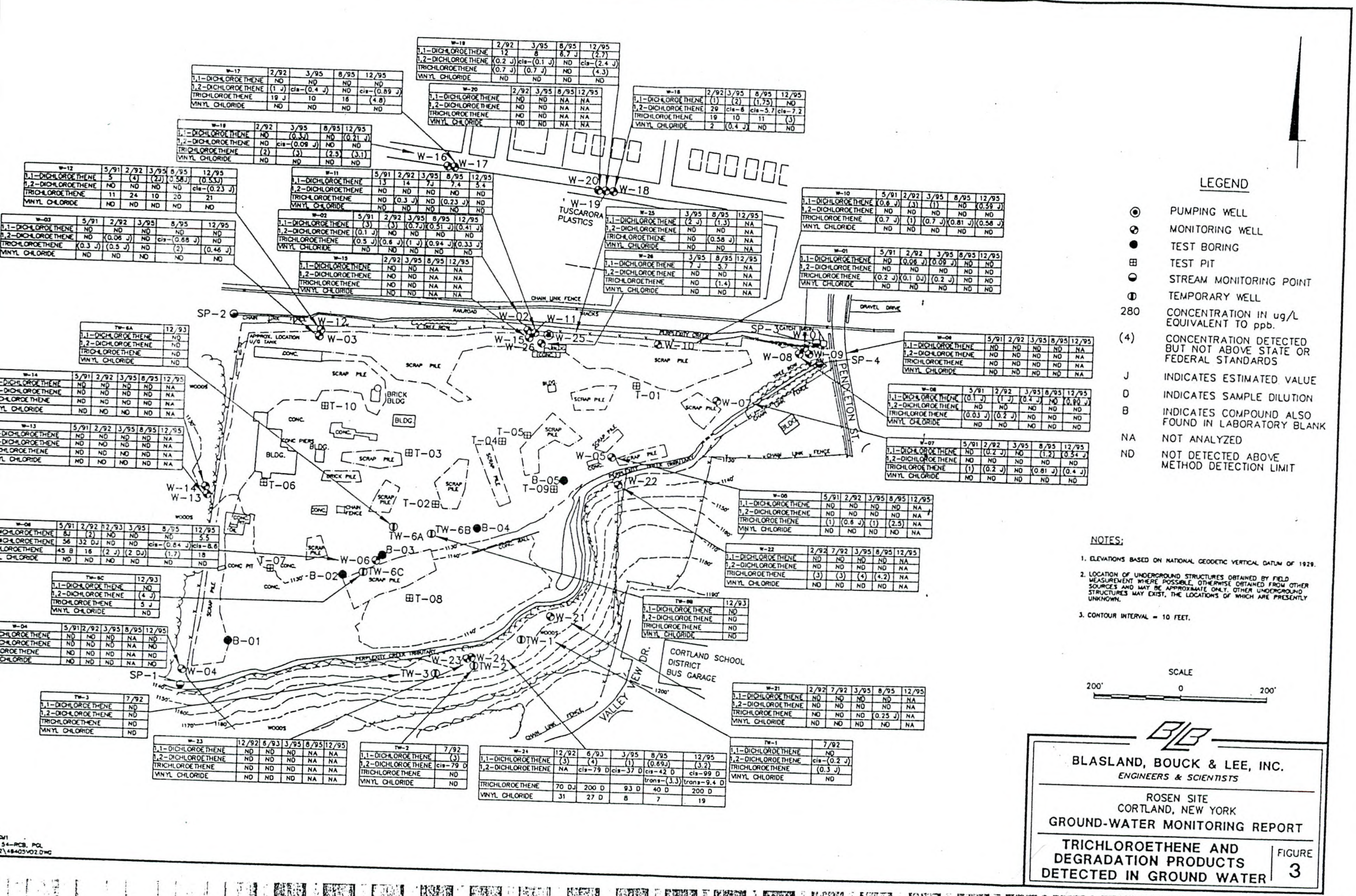
**BLASLAND, BOUCK & LEE, INC.**
*ENGINEERS & SCIENTISTS*

ROSEN SITE
CORTLAND, NEW YORK
GROUND-WATER MONITORING REPORT

**1,1,1- TRICHLOROETHANE AND DEGRADATION PRODUCTS DETECTED IN GROUND WATER**

FIGURE
2

2/8/96 54-RCB, PGL
49405002\49405V01.DWG



| W-19 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|
| 1,1-DICHLOROETHENE | 12 | 8 | 6.7 J | (2.7) |
| 1,2-DICHLOROETHENE | (0.2 J) | cis-(0.1 J) | ND | cis-(2.4 J) |
| TRICHLOROETHENE | (0.7 J) | (0.7 J) | ND | (4.3) |
| VINYL CHLORIDE | ND | ND | ND | ND |

| W-17 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND |
| 1,2-DICHLOROETHENE | (1 J) | cis-(0.4 J) | ND | cis-(0.89 J) |
| TRICHLOROETHENE | 19 J | 10 | 16 | (4.8) |
| VINYL CHLORIDE | ND | ND | ND | ND |

| W-20 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | NA | NA |
| TRICHLOROETHENE | ND | ND | NA | NA |
| VINYL CHLORIDE | ND | ND | NA | NA |

| W-18 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (1) | (2) | (1.75) | ND |
| 1,2-DICHLOROETHENE | 29 | cis-6 | cis-5.7 | cis-7.2 |
| TRICHLOROETHENE | 19 | 10 | 11 | (3) |
| VINYL CHLORIDE | 2 | (0.4 J) | ND | ND |

| W-16 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | (0.3J) | ND | (0.21 J) |
| 1,2-DICHLOROETHENE | ND | cis-(0.09 J) | ND | ND |
| TRICHLOROETHENE | (2) | (3) | (2.5) | (3.1) |
| VINYL CHLORIDE | ND | ND | ND | ND |

| W-12 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | 5 | (4) | (2J) | (0.58J) | (0.53J) |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | cis-(0.23 J) |
| TRICHLOROETHENE | 11 | 24 | 10 | 20 | 21 |
| VINYL CHLORIDE | ND | ND | ND | ND | ND |

| W-11 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | 13 | 14 | 7J | 7.4 | 5.4 |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND |
| TRICHLOROETHENE | ND | (0.3 J) | ND | (0.23 J) | ND |
| VINYL CHLORIDE | ND | ND | ND | ND | ND |

| W-03 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | ND |
| 1,2-DICHLOROETHENE | ND | (0.06 J) | ND | cis-(0.68 J) | ND |
| TRICHLOROETHENE | (0.3 J) | (0.5 J) | ND | (2) | (0.46 J) |
| VINYL CHLORIDE | ND | ND | ND | ND | ND |

| W-02 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (3) | (3) | (0.7J) | (0.51 J) | (0.41 J) |
| 1,2-DICHLOROETHENE | (0.1 J) | ND | ND | ND | ND |
| TRICHLOROETHENE | (0.5 J) | (0.6 J) | (1 J) | (0.94 J) | (0.33 J) |
| VINYL CHLORIDE | ND | ND | ND | ND | ND |

| W-15 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | NA | NA |
| TRICHLOROETHENE | ND | ND | NA | NA |
| VINYL CHLORIDE | ND | ND | NA | NA |

| W-25 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|
| 1,1-DICHLOROETHENE | (2 J) | (1.3) | NA |
| 1,2-DICHLOROETHENE | ND | ND | NA |
| TRICHLOROETHENE | ND | (0.58 J) | NA |
| VINYL CHLORIDE | ND | ND | NA |

| W-26 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|
| 1,1-DICHLOROETHENE | 7 J | 5.7 | NA |
| 1,2-DICHLOROETHENE | ND | ND | NA |
| TRICHLOROETHENE | ND | (1.4) | NA |
| VINYL CHLORIDE | ND | ND | NA |

| W-10 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (0.6 J) | (3) | (1) | ND | (0.59 J) |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND |
| TRICHLOROETHENE | (0.7 J) | (1) | (0.7 J) | (0.81 J) | (0.58 J) |
| VINYL CHLORIDE | ND | ND | ND | ND | ND |

| W-01 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | (0.06 J) | (0.09 J) | ND | ND |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND |
| TRICHLOROETHENE | (0.2 J) | (0.1 DJ) | (0.2 J) | ND | ND |
| VINYL CHLORIDE | ND | ND | ND | ND | ND |

| TW-6A | 12/93 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | ND |
| TRICHLOROETHENE | ND |
| VINYL CHLORIDE | ND |

| W-09 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA |
| TRICHLOROETHENE | ND | ND | ND | ND | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA |

| W-14 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| -DICHLOROETHENE | ND | ND | ND | ND | NA |
| -DICHLOROETHENE | ND | ND | ND | ND | NA |
| CHLOROETHENE | ND | ND | ND | ND | NA |
| YL CHLORIDE | ND | ND | ND | ND | NA |

| W-08 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (0.1 J) | (1 J) | (0.4 J) | ND | (0.90 J) |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND |
| TRICHLOROETHENE | (0.03 J) | (0.2 J) | ND | ND | ND |
| VINYL CHLORIDE | ND | ND | ND | ND | ND |

| W-13 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| -DICHLOROETHENE | ND | ND | ND | ND | NA |
| -DICHLOROETHENE | ND | ND | ND | ND | NA |
| HLOROETHENE | ND | ND | ND | ND | NA |
| L CHLORIDE | ND | ND | ND | ND | NA |

| W-07 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | (0.2 J) | ND | (1.2) | (0.54 J) |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND |
| TRICHLOROETHENE | (1) | (0.2 J) | ND | (0.81 J) | (0.4 J) |
| VINYL CHLORIDE | ND | ND | ND | ND | ND |

| W-05 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA |
| TRICHLOROETHENE | (1) | (0.6 J) | (1) | (2.5) | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA |

| W-06 | 5/91 | 2/92 | 12/93 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|---|
| ICHLOROETHENE | 8J | (2) | ND | ND | ND | 5.5 |
| ICHLOROETHENE | 56 | 32 DJ | ND | ND | cis-(0.84 J) | cis-8.6 |
| LOROETHENE | 45 B | 16 | (2 J) | (2 DJ) | (1.7) | 18 |
| L CHLORIDE | ND | ND | ND | ND | ND | ND |

| W-22 | 2/92 | 7/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA |
| TRICHLOROETHENE | (3) | (3) | (4) | (4.2) | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA |

| TW-6C | 12/93 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | (4 J) |
| TRICHLOROETHENE | 5 J |
| VINYL CHLORIDE | ND |

| TW-6B | 12/93 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | ND |
| TRICHLOROETHENE | ND |
| VINYL CHLORIDE | ND |

| W-04 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| CHLOROETHENE | ND | ND | ND | NA | ND |
| CHLOROETHENE | ND | ND | ND | NA | ND |
| OROETHENE | ND | ND | ND | NA | ND |
| CHLORIDE | ND | ND | ND | NA | ND |

| W-21 | 2/92 | 7/92 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA |
| TRICHLOROETHENE | ND | ND | ND | (0.25 J) | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA |

| TW-3 | 7/92 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | ND |
| TRICHLOROETHENE | ND |
| VINYL CHLORIDE | ND |

| W-23 | 12/92 | 6/93 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | NA | NA |
| TRICHLOROETHENE | ND | ND | ND | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | NA | NA |

| TW-2 | 7/92 |
|---|---|
| 1,1-DICHLOROETHENE | (3) |
| 1,2-DICHLOROETHENE | cis-79 D |
| TRICHLOROETHENE | ND |
| VINYL CHLORIDE | ND |

| W-24 | 12/92 | 6/93 | 3/95 | 8/95 | 12/95 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (3) | (4) | (1) | (0.69J) | (3.2) |
| 1,2-DICHLOROETHENE | NA | cis-79 D | cis-37 D | cis-42 D | cis-99 D |
| | | | | trans-(3.3) | trans-9.4 D |
| TRICHLOROETHENE | 70 DJ | 200 D | 93 D | 40 D | 200 D |
| VINYL CHLORIDE | 31 | 27 D | 8 | 7 | 19 |

| TW-1 | 7/92 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | cis-(0.2 J) |
| TRICHLOROETHENE | (0.3 J) |
| VINYL CHLORIDE | ND |

## LEGEND

| | |
|---|---|
| ◉ | PUMPING WELL |
| ⊘ | MONITORING WELL |
| ● | TEST BORING |
| ⊞ | TEST PIT |
| ◒ | STREAM MONITORING POINT |
| ⦶ | TEMPORARY WELL |
| 280 | CONCENTRATION IN ug/L EQUIVALENT TO ppb. |
| (4) | CONCENTRATION DETECTED BUT NOT ABOVE STATE OR FEDERAL STANDARDS |
| J | INDICATES ESTIMATED VALUE |
| D | INDICATES SAMPLE DILUTION |
| B | INDICATES COMPOUND ALSO FOUND IN LABORATORY BLANK |
| NA | NOT ANALYZED |
| ND | NOT DETECTED ABOVE METHOD DETECTION LIMIT |

NOTES:

1. ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.
2. LOCATION OF UNDERGROUND STRUCTURES OBTAINED BY FIELD MEASUREMENT WHERE POSSIBLE, OTHERWISE OBTAINED FROM OTHER SOURCES AND MAY BE APPROXIMATE ONLY. OTHER UNDERGROUND STRUCTURES MAY EXIST, THE LOCATIONS OF WHICH ARE PRESENTLY UNKNOWN.
3. CONTOUR INTERVAL = 10 FEET.

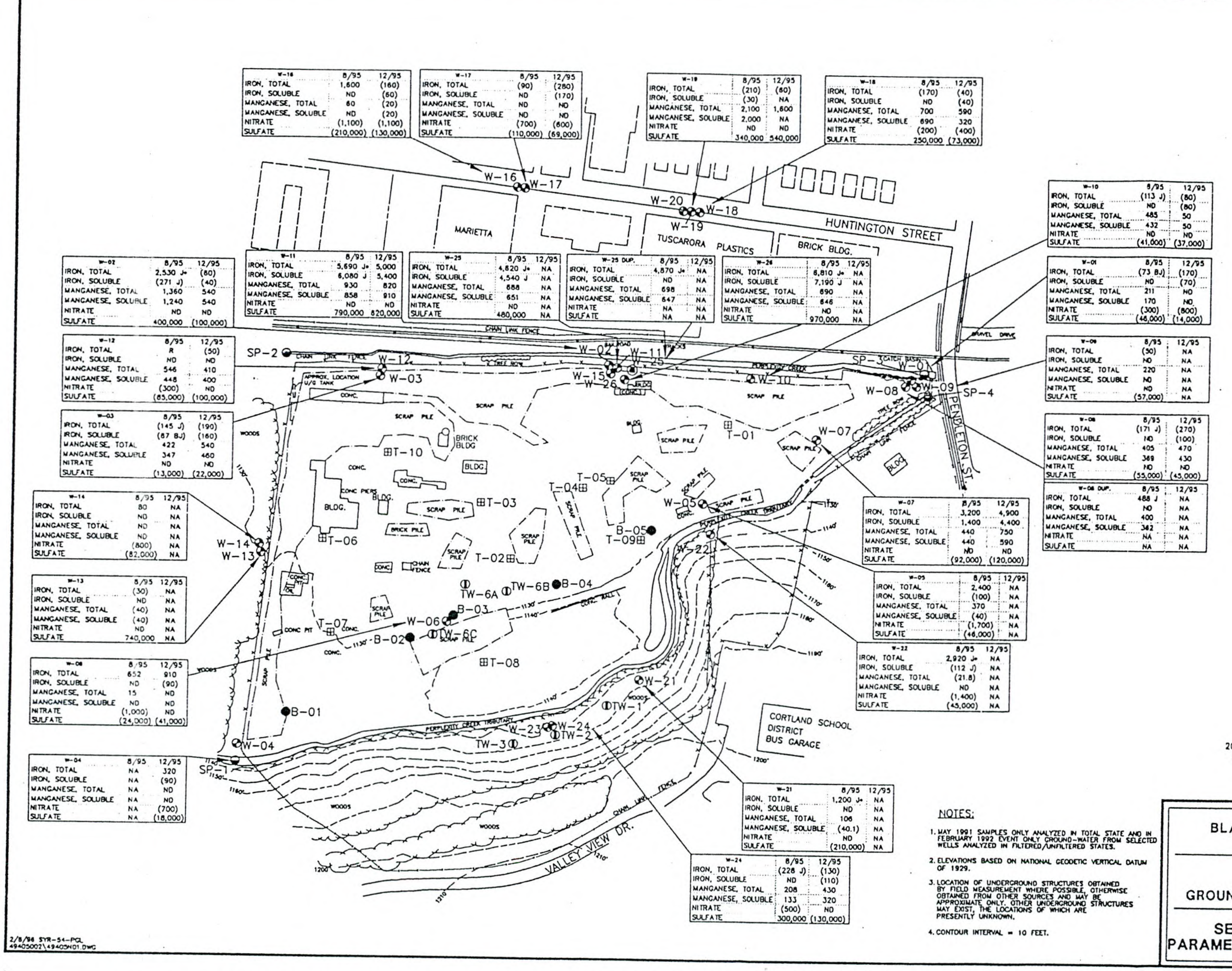
BLASLAND, BOUCK & LEE, INC.
*ENGINEERS & SCIENTISTS*

ROSEN SITE
CORTLAND, NEW YORK
GROUND-WATER MONITORING REPORT

TRICHLOROETHENE AND DEGRADATION PRODUCTS DETECTED IN GROUND WATER

FIGURE 3

M1
54-RCB, PGL
Z\48405V02.DWG



| W-16 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | 1,600 | (160) |
| IRON, SOLUBLE | ND | (60) |
| MANGANESE, TOTAL | 60 | (20) |
| MANGANESE, SOLUBLE | ND | (20) |
| NITRATE | (1,100) | (1,100) |
| SULFATE | (210,000) | (130,000) |

| W-17 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | (90) | (280) |
| IRON, SOLUBLE | ND | (170) |
| MANGANESE, TOTAL | ND | ND |
| MANGANESE, SOLUBLE | ND | ND |
| NITRATE | (700) | (600) |
| SULFATE | (110,000) | (69,000) |

| W-19 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | (210) | (60) |
| IRON, SOLUBLE | (30) | NA |
| MANGANESE, TOTAL | 2,100 | 1,600 |
| MANGANESE, SOLUBLE | 2,000 | NA |
| NITRATE | ND | ND |
| SULFATE | 340,000 | 540,000 |

| W-18 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | (170) | (40) |
| IRON, SOLUBLE | ND | (40) |
| MANGANESE, TOTAL | 700 | 590 |
| MANGANESE, SOLUBLE | 690 | 320 |
| NITRATE | (200) | (400) |
| SULFATE | 250,000 | (73,000) |

| W-02 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | 2,530 J• | (80) |
| IRON, SOLUBLE | (271 J) | (40) |
| MANGANESE, TOTAL | 1,360 | 540 |
| MANGANESE, SOLUBLE | 1,240 | 540 |
| NITRATE | ND | ND |
| SULFATE | 400,000 | (100,000) |

| W-11 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | 5,690 J• | 5,000 |
| IRON, SOLUBLE | 6,080 J | 5,400 |
| MANGANESE, TOTAL | 930 | 820 |
| MANGANESE, SOLUBLE | 858 | 910 |
| NITRATE | ND | ND |
| SULFATE | 790,000 | 820,000 |

| W-25 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | 4,820 J• | NA |
| IRON, SOLUBLE | 4,540 J | NA |
| MANGANESE, TOTAL | 688 | NA |
| MANGANESE, SOLUBLE | 651 | NA |
| NITRATE | ND | NA |
| SULFATE | 480,000 | NA |

| W-25 DUP. | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | 4,870 J• | NA |
| IRON, SOLUBLE | ND | NA |
| MANGANESE, TOTAL | 698 | NA |
| MANGANESE, SOLUBLE | 647 | NA |
| NITRATE | NA | NA |
| SULFATE | NA | NA |

| W-26 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | 6,810 J• | NA |
| IRON, SOLUBLE | 7,190 J | NA |
| MANGANESE, TOTAL | 690 | NA |
| MANGANESE, SOLUBLE | 646 | NA |
| NITRATE | ND | NA |
| SULFATE | 970,000 | NA |

| W-10 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | (113 J) | (80) |
| IRON, SOLUBLE | ND | (80) |
| MANGANESE, TOTAL | 485 | 50 |
| MANGANESE, SOLUBLE | 432 | 50 |
| NITRATE | ND | ND |
| SULFATE | (41,000) | (37,000) |

| W-12 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | R | (50) |
| IRON, SOLUBLE | ND | ND |
| MANGANESE, TOTAL | 546 | 410 |
| MANGANESE, SOLUBLE | 448 | 400 |
| NITRATE | (300) | ND |
| SULFATE | (65,000) | (100,000) |

| W-01 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | (73 BJ) | (170) |
| IRON, SOLUBLE | ND | (70) |
| MANGANESE, TOTAL | 211 | ND |
| MANGANESE, SOLUBLE | 170 | ND |
| NITRATE | (300) | (800) |
| SULFATE | (48,000) | (14,000) |

| W-03 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | (145 J) | (190) |
| IRON, SOLUBLE | (87 BJ) | (160) |
| MANGANESE, TOTAL | 422 | 540 |
| MANGANESE, SOLUBLE | 347 | 460 |
| NITRATE | ND | ND |
| SULFATE | (13,000) | (22,000) |

| W-09 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | (50) | NA |
| IRON, SOLUBLE | ND | NA |
| MANGANESE, TOTAL | 220 | NA |
| MANGANESE, SOLUBLE | ND | NA |
| NITRATE | ND | NA |
| SULFATE | (57,000) | NA |

| W-08 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | (171 J) | (270) |
| IRON, SOLUBLE | ND | (100) |
| MANGANESE, TOTAL | 405 | 470 |
| MANGANESE, SOLUBLE | 369 | 430 |
| NITRATE | ND | ND |
| SULFATE | (55,000) | (45,000) |

| W-08 DUP. | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | 488 J | NA |
| IRON, SOLUBLE | ND | NA |
| MANGANESE, TOTAL | 400 | NA |
| MANGANESE, SOLUBLE | 382 | NA |
| NITRATE | NA | NA |
| SULFATE | NA | NA |

| W-14 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | 80 | NA |
| IRON, SOLUBLE | ND | NA |
| MANGANESE, TOTAL | ND | NA |
| MANGANESE, SOLUBLE | ND | NA |
| NITRATE | (800) | NA |
| SULFATE | (82,000) | NA |

| W-07 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | 3,200 | 4,900 |
| IRON, SOLUBLE | 1,400 | 4,400 |
| MANGANESE, TOTAL | 440 | 750 |
| MANGANESE, SOLUBLE | 440 | 590 |
| NITRATE | ND | ND |
| SULFATE | (92,000) | (120,000) |

| W-13 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | (30) | NA |
| IRON, SOLUBLE | ND | NA |
| MANGANESE, TOTAL | (40) | NA |
| MANGANESE, SOLUBLE | (40) | NA |
| NITRATE | ND | NA |
| SULFATE | 740,000 | NA |

| W-05 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | 2,400 | NA |
| IRON, SOLUBLE | (100) | NA |
| MANGANESE, TOTAL | 370 | NA |
| MANGANESE, SOLUBLE | (40) | NA |
| NITRATE | (1,700) | NA |
| SULFATE | (46,000) | NA |

| W-06 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | 652 | 910 |
| IRON, SOLUBLE | ND | (90) |
| MANGANESE, TOTAL | 15 | ND |
| MANGANESE, SOLUBLE | ND | ND |
| NITRATE | (1,000) | ND |
| SULFATE | (24,000) | (41,000) |

| W-22 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | 2,920 J• | NA |
| IRON, SOLUBLE | (112 J) | NA |
| MANGANESE, TOTAL | (21.8) | NA |
| MANGANESE, SOLUBLE | ND | NA |
| NITRATE | (1,400) | NA |
| SULFATE | (45,000) | NA |

| W-04 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | NA | 320 |
| IRON, SOLUBLE | NA | (90) |
| MANGANESE, TOTAL | NA | ND |
| MANGANESE, SOLUBLE | NA | ND |
| NITRATE | NA | (700) |
| SULFATE | NA | (18,000) |

| W-21 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | 1,200 J• | NA |
| IRON, SOLUBLE | ND | NA |
| MANGANESE, TOTAL | 106 | NA |
| MANGANESE, SOLUBLE | (40.1) | NA |
| NITRATE | ND | NA |
| SULFATE | (210,000) | NA |

| W-24 | 8/95 | 12/95 |
|---|---|---|
| IRON, TOTAL | (228 J) | (130) |
| IRON, SOLUBLE | ND | (110) |
| MANGANESE, TOTAL | 208 | 430 |
| MANGANESE, SOLUBLE | 133 | 320 |
| NITRATE | (500) | ND |
| SULFATE | 300,000 | (130,000) |

## LEGEND

| | |
|---|---|
| ◉ | PUMPING WELL |
| ⊗ | MONITORING WELL |
| ● | TEST BORING |
| ⊞ | TEST PIT |
| ◒ | STREAM MONITORING POINT |
| ◑ | TEMPORARY WELL |
| 280 | CONCENTRATION IN ug/L EQUIVALENT TO ppb. |
| (4) | CONCENTRATION DETECTED BUT NOT ABOVE STATE OR FEDERAL STANDARDS |
| J | ESTIMATED VALUE |
| R | VALUE UNUSABLE AFTER DATA VALIDATION |
| B | VALUE EQUAL TO OR LESS THAN THE INSTRUMENT DETECTION LIMIT BUT LESS THAN THE CONTRACT DETECTION LIMIT. |
| ND | NOT DETECTED ABOVE METHOD DETECTION LIMIT |
| • | INDICATES RESULT IS OUTSIDE QC LIMIT |
| NA | NOT ANALYZED |

NOTES:

1. MAY 1991 SAMPLES ONLY ANALYZED IN TOTAL STATE AND IN FEBRUARY 1992 EVENT ONLY GROUND-WATER FROM SELECTED WELLS ANALYZED IN FILTERED/UNFILTERED STATES.
2. ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.
3. LOCATION OF UNDERGROUND STRUCTURES OBTAINED BY FIELD MEASUREMENT WHERE POSSIBLE, OTHERWISE OBTAINED FROM OTHER SOURCES AND MAY BE APPROXIMATE ONLY. OTHER UNDERGROUND STRUCTURES MAY EXIST, THE LOCATIONS OF WHICH ARE PRESENTLY UNKNOWN.
4. CONTOUR INTERVAL = 10 FEET.

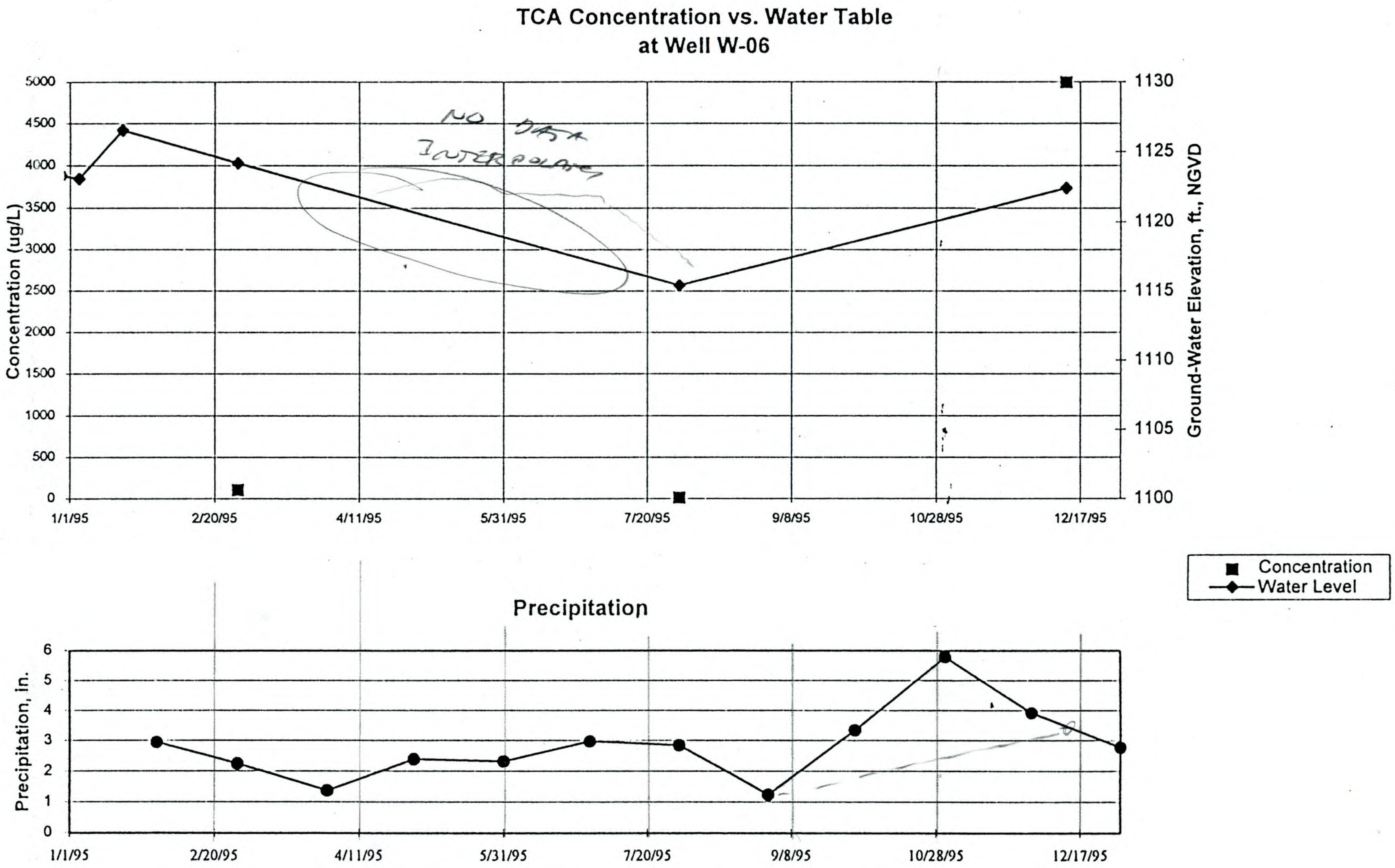
BLASLAND, BOUCK & LEE, INC.
*ENGINEERS & SCIENTISTS*

ROSEN SITE
CORTLAND, NEW YORK
GROUND-WATER MONITORING REPORT

SELECTED INDICATOR PARAMETERS IN GROUND WATER

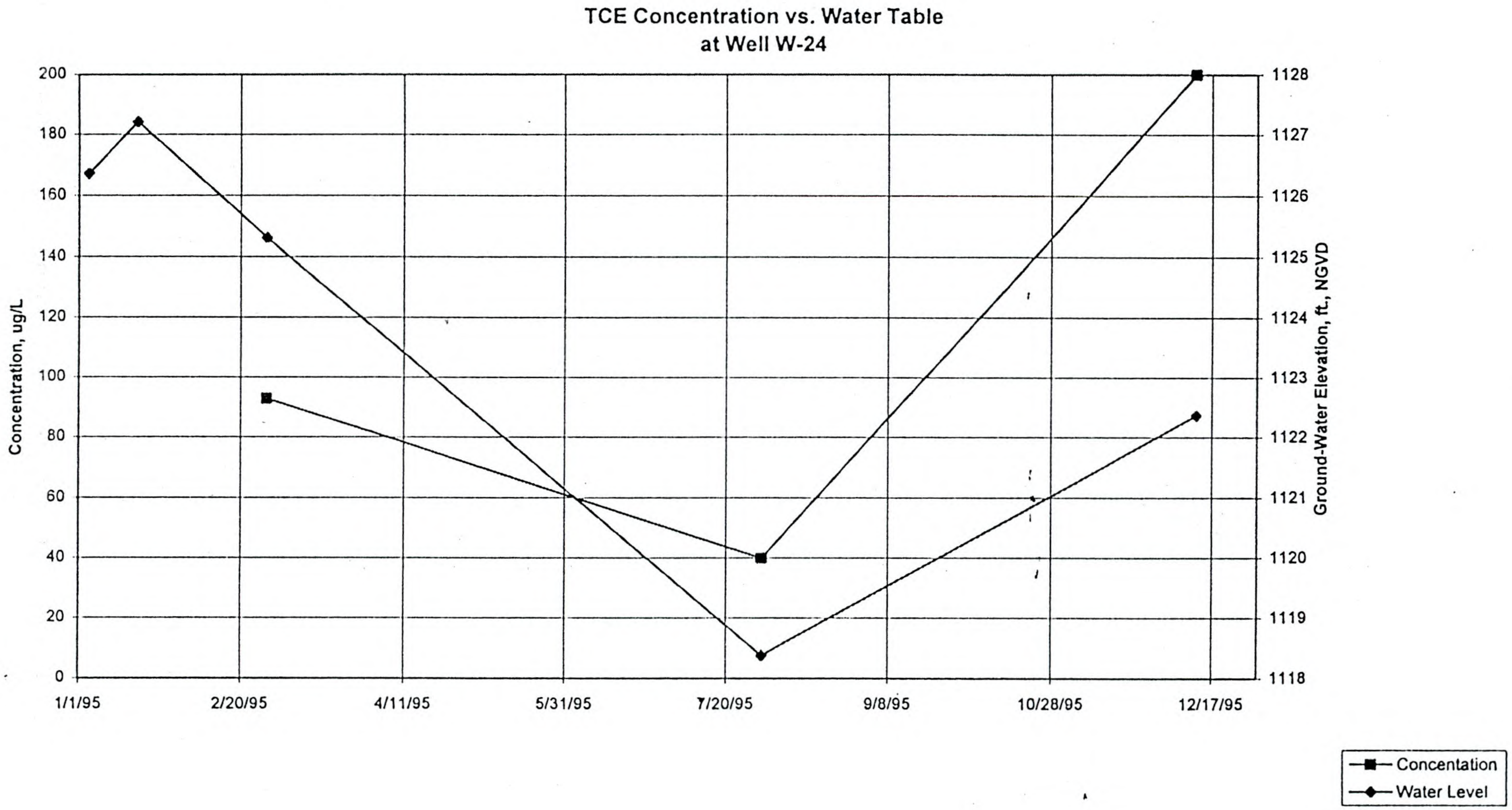
FIGURE 4

2/8/96 SYR-54-PCL
49405002\49405N01.DWG

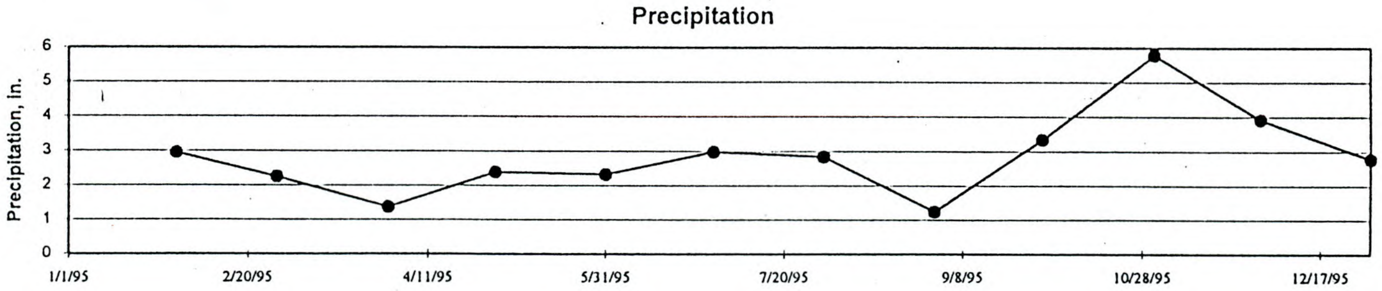


PRECIP.XLS

FIGURE 5



TCE Concentration vs. Water Table at Well W-24



Precipitation

PRECIP.XLS

FIGURE 6

FILE

BBL
BLASLAND, BOUCK & LEE, INC.
*engineers & scientists*

*Transmitted Via FedEx*

July 31, 1996

Mr. Mark Granger
United States Environmental Protection Agency
290 Broadway, 20th Floor
New York, New York 10007-1866

Re: Rosen Site
March 1996 Ground-Water Sampling and Analysis Event
Project #: 0494 494.05

Dear Mr. Granger:

This letter reports the results of the March 1996 ground-water sampling and analysis event conducted at the Rosen Site in Cortland, New York. This ground-water sampling and analysis event was conducted to further evaluate the concentration trends of volatile organic constituents (VOCs) and to evaluate indicators of intrinsic biodegradation.

This letter contains the following sections:

- A ground-water sampling and analysis section summarizing the activities completed during this event;
- A results section presenting the analytical results for this event; and
- A discussion section evaluating the VOC concentration trends and intrinsic biodegradation.

**Ground-Water Sampling and Analysis**

Blasland, Bouck & Lee, Inc. (BBL) collected ground-water samples from 15 wells (W-01, W-02, W-03, W-04, W-06, W-07, W-08, W-10, W-11, W-12, W-16, W-17, W-18, W-19, W-24) from March 13 through 15, 1995. These wells were selected to represent ground-water quality conditions upgradient of the site, at the site, at the downgradient perimeter of the site, and downgradient of the site as follows:

- Upgradient wells W-24 and W-04 were selected to monitor impacted ground water associated with the former city of Cortland dump and non-impacted ground water, respectively.
- On-site wells W-06 and W-07 were selected to monitor the trends of VOCs at the site.

- All downgradient perimeter wells in the upper outwash were selected to monitor the water quality conditions in the hydrogeologic unit of interest except for wells W-25 and W-26. At that well cluster, BBL selected only wells W-02 and W-11 for sampling to monitor the upper and lower sections of the upper outwash in that area of the site.

- All downgradient wells in the upper outwash were selected to monitor the ground water in the hydrogeologic unit of interest.

- Side gradient wells W-13 and W-14 were not sampled due to consistently low concentrations of VOCs detected in previous sampling events.

BBL sampled the 15 wells in accordance with procedures set forth in the Remedial Investigation (RI) Sampling and Analysis Plan (SAP) (Blasland & Bouck Engineers, P.C., December 1990), as modified by Attachment 1 for low-flow sampling procedures. Mr. Todd Miller of the United States Geological Survey (USGS) conducted oversight of the field activities on behalf of the United States Environmental Protection Agency (USEPA).

For this sampling event, ground-water samples from 15 monitoring wells were analyzed for Target Compound List (TCL) VOCs by USEPA Contract Laboratory Program-Statement of Work (CLP-SOW) 10/92 Superfund Analytical Methods for Low Concentration Water for Organic Analysis. The ground-water samples from wells W-02, W-04, W-06, W-10, W-11, W-18, W-19, and W-24 were also analyzed for total organic carbon (TOC) by USEPA SW-846 Method 9060. Recra Environmental, Inc. (Recra) performed the CLP and TOC analyses. BBL validated the CLP data, using the procedures set forth in the RI SAP.

In addition, Upstate Laboratories, Inc. (Upstate) analyzed ground-water samples from eight wells (W-02, W-04, W-06, W-10, W-11, W-18, W-19, and W-24) for sulfate, as an indicator of intrinsic biodegradation. Sulfate was determined during the December 1995 ground-water sampling event to be an appropriate indicator of intrinsic biodegradation at the Rosen Site. These samples were analyzed using USEPA Method 375.4 for sulfate. BBL also obtained ground-water samples for filtered and unfiltered iron and manganese by USEPA Method 200.7. Ferric (III)/ferrous (II) iron and manganese (II/IV) were estimated from the filtered and unfiltered metal results. The ratio of the oxidation states of iron and manganese were also used as indicators of intrinsic biodegradation.

To further evaluate the type of microbial population present at the site, ground-water samples from four wells (W-04, upgradient; W-06, on site; W-11, downgradient perimeter; and W-19, downgradient) were analyzed for phospholipid fatty acids (PLFA) by gas chromatography/mass spectrometer (GC/MS).

In addition to the standard field parameter measurements (pH, temperature, and conductivity), BBL measured dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity. DO, pH, temperature, and ORP were used to assess environmental conditions, while turbidity was used to assess the condition of the samples submitted for total metals analyses.

Quality assurance/quality control (QA/QC) samples, which include field duplicates, trip blanks, field blanks (required due to the use of non-dedicated pumps for the low-flow sampling method), laboratory fortified blanks, and matrix spike/matrix spike duplicates, were also analyzed for the CLP samples. A trip blank was included in each cooler containing samples for VOC analyses, while other QA/QC samples were analyzed at a rate of one per 20 samples for CLP analyses.

On behalf of USEPA, Mr. Todd Miller, USGS, collected the following ground-water split samples:

| Well | Analyses |
|---|---|
| W-06 | TCL VOCs and unfiltered Target Analyte List (TAL) metals |
| W-11 | TCL VOCs and unfiltered TAL metals |
| W-19 | TCL VOCs and unfiltered TAL metals |
| W-24 | TCL VOCs and unfiltered TAL metals |

These analyses were performed by BUCK Environmental Laboratories, Inc. (BUCK), and the results of these analyses are included as Attachment 2. To evaluate the consistency of the primary sample (i.e., those collected by BBL) and the USEPA split sample results, the relative percent difference (RPD) between the detections was calculated. This comparison is included in the results section of this report.

BBL utilized three different sampling methods at well W-11, per USEPA request to assess the possible variation in VOC concentrations. These VOC samples were obtained as follows:

- Low-flow Sampling: Three well volumes of ground water were purged at about 0.6 gallons per minute (gpm) using a Grundfos submersible pump, which was set within the upper third of the 10-foot long well screen. The first VOC sample was collected through dedicated polyethylene tubing.

- Pump Sampling: Three additional well volumes of ground water were purged at 1.5 gpm, with the Grundfos submersible pump. The pumping rate was decreased to approximately 0.1 gpm and allowed to stabilize. The second VOC sample was then sampled through the dedicated tubing.

- Bailer Sampling: The submersible pump was removed from the well, and a dedicated teflon bailer was used to obtain the third VOC sample.

This is discussed further in the results section of this report.

Prior to initiating ground-water sampling, BBL obtained a complete round of water levels. At the time of this sampling event, both Perplexity Creek and its tributary were frozen. Table 1 presents water level measurements from March 1991 through March 1996.

Figure 1 is a potentiometric surface map constructed from the March 13, 1996 data to depict the water table. As indicated on Figure 1, ground water flowed generally to the north-northeast on this date. A hydraulic gradient of 0.013 (13.44 ft. divided by 1030 ft.) was calculated between well W-06, on site, and well W-18, downgradient of the site. Both the ground-water flow direction and hydraulic gradient are consistent with those observed during the RI/FS.

**Results**

This section summarizes the analytical results of this sampling event as follows:

- VOC results;
- Indicators of intrinsic biodegradation including iron, manganese, sulfate, TOC, and PLFA results;
- Field parameter measurements; and
- Split sample and well W-11 sample results.

## VOCs

Ground-water analytical data for the 11 detected VOCs are presented in Table 2. Consistent with previous sampling results, the VOCs detected in the ground-water samples consisted mainly of 1,1,1-trichloroethane (TCA), trichloroethene (TCE), and their degradation products (chloroethane [CA], 1,1-dichloroethane [DCA], 1,1-dichloroethene [1,1-DCE], 1,2-dichloroethene [1,2-DCE], and vinyl chloride). Specifically, CA and DCA are degradation products of TCA; 1,2-DCE and vinyl chloride are degradation products of TCE. 1,1-DCE can result from the degradation of either TCA or TCE.

In addition to TCA, TCE and their degradation products, three other VOCs were detected at low levels in ground-water samples collected during this sampling event: tetrachloroethene (PCE), methylene chloride, and toluene. PCE was only detected at four wells (W-03, W-06, W-17, and W-18) at concentrations ranging from an estimated value of 0.29 micrograms per liter (ug/L) at wells W-06 and W-18 to 4.7 ug/L at well W-03. Methylene chloride was detected only at well W-06 at a low estimated concentration of 0.35 ug/L. Toluene was detected at four wells (W-02, W-04, W-06, and W-11) at low estimated concentrations ranging from 0.24 to 0.55 ug/L.

Methylene chloride was detected in Trip Blank 1 at an estimated concentration of 0.22 ug/L. Based on this observation, the methylene chloride detections in samples from wells W-17 and W-24 were qualified as undetected by the data validator. No VOCs were detected in the other trip blanks or in the method blanks.
As indicated in Table 2, three VOCs exceeded the federal maximum contaminant levels (MCLs): TCA at well W-06 (1,000 ug/L, MCL-200 ug/L); TCE at wells W-06 (5.7 ug/L, MCL=5 ug/L), W-12 (22 ug/L, MCL=5 ug/L), W-17 (5.7 ug/L, MCL=5 ug/L), W-18 (8 ug/L, MCL=5 ug/L), and W-24 (130 ug/L, MCL=5 ug/L); and vinyl chloride at well W-24 (13 ug/L, MCL=2 ug/L).

VOC concentrations were also compared to the New York State ground-water standards. These standards are the same as the federal MCLs for PCE, TCE, and vinyl chloride and are very similar for 1,1-DCE; however, the New York State standards are more stringent for TCA, DCA, and 1,2-DCE. Exceedances of the New York State standards are indicated in Table 2. TCA and its degradation product DCA exceeded the more stringent New York State standard of 5 ug/L at most on-site and downgradient wells (Figure 2). Cis-1,2-DCE was detected at concentrations above the New York State standard of 5 ug/L, but below the federal MCL of 70 ug/L at downgradient well W-18 and at upgradient well W-24 (Figure 3). At well W-24, where the highest concentration of cis-1,2-DCE was observed at 52ug/L, the trans-1,2-DCE isomer was also detected above the New York State standard of 5 ug/L. 1,1-DCE was observed at well W-11 at a concentration above the New York State standard of 5 ug/L, but below the federal MCL of 7 ug/L.

## Indicators of Intrinsic Biodegradation

Table 3 and Figure 4 summarize the inorganic analytical results including iron, manganese, and sulfate. Upgradient total iron concentrations ranged from 120 ug/L at well W-24 to 300 ug/L at well W-04. Soluble iron was not detected at upgradient well W-24 and was detected at 30 ug/L at well W-04. At other wells sampled, the total and soluble iron concentrations were relatively low (300 ug/L or less), except at well W-11, where total iron was observed at 5,600 ug/L and soluble iron was observed at 5,500 ug/L. Iron concentrations at well W-02, the water table well in the cluster with well W-11, were much lower at 250 ug/L for total iron and 110 ug/L for soluble iron.

Manganese was not detected in unfiltered or filtered samples at upgradient well W-04, but was detected at 580 and 440 ug/L, respectively, at upgradient well W-24. At on-site well W-06, manganese was not detected in unfiltered or filtered samples. Concentrations of manganese were higher at the northern site perimeter and downgradient of the site. The highest manganese concentrations were observed at well W-19, where total manganese was 1,900 ug/L and soluble manganese was 1,800 ug/L. Lower concentrations of manganese were observed at the water table well W-18 in the cluster with well W-19. A similar trend was also noted at the well W-02/W-11 cluster.

Sulfate concentrations at the northern site perimeter and downgradient of the site ranged from 90,000 ug/L at well W-02 to 620,000 ug/L at well W-11. Based on the observed variation of sulfate concentrations at this well cluster and at the cluster comprised of wells W-18 and W-19, the sulfate concentrations appear to be higher near the bottom of the upper outwash unit than at the water table. During this sampling event, upgradient concentrations of sulfate were 16,000 ug/L at well W-04, representing non-impacted ground water, and 150,000 ug/L at well W-24, representing impacted upgradient ground water.

As indicated in Table 2, TOC concentrations ranged from less than 1,000 ug/L at upgradient well W-04 to 3,300 ug/L at northern perimeter well W-10. At upgradient well W-24, the TOC concentration was 1,800 ug/L.

Biomass levels for this sampling event ranged from 5.6 picomoles (pmoles) of PLFA at upgradient well W-04 to 23.8 pmoles of PLFA at well W-11. These results are evaluated in the discussion of intrinsic biodegradation in this letter report and presented in Attachment 3.

Field Parameters

Field parameters were measured during well purging and at the time of sampling. The measurements obtained at the time of sampling are presented in Table 4. Ground-water samples were collected at an average conductivity of 0.95 milliSiemens per centimeter (mS/cm), dissolved oxygen concentration of 3.1 milligrams per liter (mg/L), ORP reading of 93 millivolts (mV), 7.1 standard pH units, 7.3 degrees Celsius, and 16 ± 10 nephelometric turbidity units (NTU). The highest dissolved oxygen concentration of 10.1 mg/L was observed during this sampling event at shallow perimeter well W-01. ORP values were positive at most wells, indicating generally oxidizing conditions. Non-positive ORP values were observed at wells W-07 (-98 mV) and W-08 (-200 mV), indicating generally reducing conditions.

Split Sample and Well W-11 Sample Results

As previously mentioned, ground-water split samples were collected on behalf of USEPA for VOCs and TAL metals at wells W-06, W-11, W-19, and W-24. These results are incuded as Attachment 2. The RPD between the primary ground-water sample detections and the split sample detections was calculated to provide an indication of the sample comparability. Based on USEPA CLP data review guidelines (SOP No. HW-2, Revision 11, Region II, January 1992 and National Functional Guidelines for Inorganic Data Review, February 1994), an RPD of less than 50 percent is considered within acceptable limits for inorganic ground-water duplicate samples. As there is no defined acceptable RPD limit for VOCs (SOP No. HW-6, Revision 8, Region II, January 1992 and National Functional Guidelines for Organic Data Review, February 1994), the 50 percent RPD is used here as a screening limit. An acceptable RPD for split samples sent to different laboratories would be expected to be somewhat higher than an acceptable RPD for duplicate samples analyzed by the same laboratory.

As indicated in Table 5, for VOCs detected by both laboratories, the RPDs are within acceptable limits for duplicate samples sent to the same laboratory. However, in cases where one or both of the laboratories reported an estimated value below the detection limit (i.e., J-qualified), the RPD was slightly above acceptable limits for duplicate samples. VOCs that were detected by only one laboratory consist of J-qualified detections.

Total iron and manganese were the only inorganic parameters for which there are both primary and split sample results. As indicated in Table 5, these results are generally within acceptable limits.

As indicated in Table 2, the VOC results for the well W-11 samples are very similar. The RPDs were less than 20 percent, which is within acceptable limits for duplicate sample results. This indicates that the historic data, which was collected using traditional bailer methods, and the low-flow samples collected through bailers or pumps after a low-flow purge, are comparable.

**Discussion**

The following discussions provide an evaluation of the following:

- VOC concentration trends; and
- Intrinsic biodegradation.

<u>VOC Concentration Trends</u>

Figures 3 and 4, respectively, show the concentration trends of TCA and TCE and their degradation products. Although the observed VOC concentrations in ground water have generally decreased with time, increases in VOC concentrations were noted in December 1995 at wells W-03, W-06, W-08, and W-24. TCA concentrations at well W-06 had decreased from 3,400 ug/L in May 1991 to 15 ug/L in August 1995. In December 1995, however, the TCA concentration at well W-06 had increased to 5,000 ug/L. Similarly, TCE concentrations at upgradient well W-24 had decreased with time from 200 ug/L in June 1993 to 40 ug/L in August 1995. However, in December 1995, the TCE concentration at well W-24 had increased to 200 ug/L.

In March 1996, observed VOC concentrations decreased once again at wells W-06 and W-24, but remained similar or increased slightly at other wells. The slightly increased concentations observed at some wells is likely the result of downgradient movement of the increased concentrations observed at wells W-06 and W-24 during December 1995. The TCA concentration at well W-06 decreased about an order of magnitude from 5,000 ug/L in December 1995 to 700 ug/L (1,000 ug/L in the duplicate sample) in March 1996. Also, the TCE concentration at well W-24 decreased from 200 ug/L to 130 ug/L between December 1995 and March 1996.

As discussed in the previous ground-water sampling report, the observed VOC concentration increase in December 1995 was likely the result of increased leaching of residual constituents in existing source areas. Observed increased concentrations at wells W-06 and W-24 in December 1995 were likely associated with increased leaching of an on-site TCA source (i.e., near well W-06) and an upgradient TCE source (i.e., near well W-24). An evaluation of 1995 water level and precipitation trends was included in the previous report, which indicated that the increased TCA concentration at well W-06 was more strongly correlated to precipitation than water table fluctuation. The increased TCE concentration at well W-24 appeared to be correlative to both water table fluctuation and the precipitation data. Since well W-24 is closer to the recharge area south of the site, the water table in the vicinity of well W-24 would be more influenced by infiltration than in the vicinity of well W-06.

Figures 5 and 6 provide graphs of TCA and TCE concentrations, ground-water levels, and precipitation data, from April 1991 to March 1996. Due to the less frequent collection of the ground-water analytical data and ground-water level data, it is difficult to evaluate the trends over this time period. For the period of time where quarterly data has been obtained (i.e., from March 1995 to March 1996), there is an apparent correlation between the precipitation rates and the concentration trends. Concentrations were lower in the first three quarters of 1995 when there was less precipitation, and concentrations were higher in the last quarter of 1995 and the first quarter of 1996 when there was more precipitation. This trend is generalized, because precipitation rates can cause variable rates of infiltration (i.e., the passage of water through the ground surface into the soil). It is the infiltration of water into the subsurface that leads to the leaching or partitioning of constituents from the soil into the ground water. Observed constituent concentrations in ground water are a function of the source, soil (e.g., porosity, moisture, organic matter), and aquifer characteristics. Infiltration rates also vary based on ground surface conditions (e.g., vegetation, snow cover, topography), and evapotranspiration rates. Seasonal changes, such as those due to frozen ground conditions, variation in vegetation, or to the rate of evapotranspiration, will therefore lead to seasonal changes in the amount of infiltration. Variation of infiltration rates results in changes in the leaching rate of constituents from the soil into the ground water. In this manner, the leaching of the residual constituents present near wells W-06 and W-24 would be affected by seasonal changes of infiltration and precipitation, as documented by the data collected at the site.

## Intrinsic Biodegradation

The status of microbial activity at the Rosen Site was evaluated using a combination of the indicators of intrinsic biodegradation, including iron, manganese, sulfate, TOC, and PLFA data.

During bacterial respiration under neutral pH conditions, electron acceptors tend to be used in order of decreasing energy yield, as follows: oxygen ($O_2$), nitrate ($NO_3$), Mn (IV) and Iron (III) oxides, sulfate ($SO_4$), and carbon dioxide ($CO_2$). When oxygen is depleted and other electron acceptors are used, the system is referred to as anoxic.

DO concentrations measured during this sampling event decreased along the ground-water flow path from 9.9 mg/L at shallow upgradient well W-04, to 4.0 mg/L at site well W-06, to 0.4 mg/L at northern perimeter well W-11. The DO concentrations then increased slightly atdowngradient off-site well W-19 to 1.9 mg/L. Across the site, the geometric mean DO concentration was relatively low at 1.8 mg/L, indicating near anoxic conditions at many of the wells. ORP values were positive at most wells, indicating generally oxidizing conditions. The highest ORP value was observed at well W-06 and lower, less oxidizing values were observed downgradient of well W-06. Non-positive ORP values were observed at wells W-07 (-98 mV) and W-08 (-200 mV), indicating generally reducing conditions in the northeast portion of the site.

Manganese (IV) and iron (III) oxides and sulfate, which are generally present at the site, likely act as electron acceptors in bacterial respiration. These electron acceptors can be used by a variety of bacteria that have the capability to reductively dehalogenate compounds (Bower, 1993). As shown on Figure 4, iron, manganese, and sulfate concentrations were generally similar to those observed during previous sampling events. Total and soluble iron and manganese, as well as sulfate concentrations, were generally higher at the northern site perimeter and downgradient of the site.

For the purposes of this evaluation, the concentrations of the lower iron and manganese oxidation states (i.e., iron and manganese [II]) were approximated by the corresponding soluble concentrations. The higher oxidation state concentrations were determined by subtracting the soluble concentration from the total concentration. As shown on Figure 4, the majority of the iron was present in the iron (III) oxidation state at upgradient shallow well W-04. Iron (II) was present at northern perimeter wells W-02, W-10, and W-11. At well W-11, iron (II) was the predominant iron species. Manganese (II) was the predominate manganese species across the site, except at wells W-04 and W-06 where it was not observed. Sulfate concentrations are generally similar at and downgradient of the site, to those observed upgradient of the site (16,000 ug/L at well W-04 and 150,000 ug/L at well W-24). Sulfate concentrations ranged from 16,000 ug/L at upgradient shallow well W-04 to 620,000 ug/L at downgradient perimeter well W-11. In general, higher sulfate concentrations were observed in downgradient wells that are screened near the base of the upper outwash (e.g, wells W-11, W-19).

Under anoxic conditions, halogenated compounds such as TCA can also act as electron acceptors. In this process, halogen atoms (e.g., chlorine) are removed and are replaced with hydrogen atoms. When halogenated compounds act as electron acceptors, the presence of parent and degradation products provides data to aid the evaluation of the degree of biological activity in the dehalogenation process. The presence of TCA, TCE, and their degradation products suggests that reductive dechlorination has occurred at the site due to biological activity. In general, parent compound TCA is more predominant at well W-06 near its source than further downgradient.

TOC concentrations ranged from less than 1,000 ug/L at upgradient well W-04 to 3,300 ug/L at northern perimeter well W-10. At upgradient well W-24, the TOC concentration was 1,800 ug/L. These TOC levels may indicate that a sufficient carbon source for microbial growth and energy may not be available.

The PLFA levels observed in the ground-water samples collected in March 1996, were lower than the levels observed in December 1995, except at well W-11. Biomass levels at wells W-04 and W-06 decreased by about an order of magnitude, while biomass levels at wells W-11 and W-19 remained similar. The observed decrease in biomass levels may be attributed to seasonal changes in environmental conditions or TOC concentrations. The PLFA results are presented in Attachment 3.

The indicators of intrinsic biodegradation suggest the following changes along the ground-water flow path from upgradient well W-04 to downgradient well W-19:

- The dissolved oxygen concentrations generally decreased, indicating aerobic conditions at wells W-04 and W-06 and anaerobic conditions at wells W-11 and W-19.

- ORP values increased from upgradient well W-04 to well W-06, decreased from well W-06 to well W-11, and increased from well W-11 to well W-19. ORP values generally indicate less oxidizing or reducing conditions near the northern site perimeter.

- Concentrations of possible electron acceptors iron (III) and manganese (IV) generally decreased to the northern perimeter, while reduced species iron (II) and manganese (II) generally increased.

- Concentrations of possible electron acceptor sulfate increased to the northern perimeter and downgradient of the site.

- TOC was not detected upgradient, but was detected at the same concentration at wells W-06 and W-11, then decreased slightly at well W-19.

- PLFA levels generally increased from upgradient well W-04 to well W-11 at the northern perimeter, then decreased at downgradient well W-19.

These data suggest that along the ground-water flow path from well W-04 to well W-19 that conditions at the northern perimeter are generally the most favorable for intrinsic biodegradation.

If you have any questions or comments regarding the information presented herein, please contact Mr. Charlie Poole.

Very truly yours,

BLASLAND, BOUCK & LEE, INC.

Nancy E. Gensky

Nancy E. Gensky
Associate

NEG/add

cc: Mr. Charles Poole, CPRP Group Coordinator, Overhead Door Corporation
CPRP Group (Distribution List)
Mr. Robert K. Goldman, P.E., Blasland, Bouck & Lee, Inc.
Mr. David W. Hale, Blasland, Bouck & Lee, Inc.
Ms. Lynette B. Mokry, Blasland, Bouck & Lee, Inc.

# *Tables*

BLASLAND, BOUCK & LEE, INC.

***engineers & scientists***

TABLE 1

GROUND-WATER/SURFACE-WATER ELEVATIONS

ROSEN SITE
CORTLAND, NEW YORK

| Well | TOIC Elev. | 03/04/91 | 03/14/91 | 03/19/91 | 04/16/91 | 5/10/91 | 8/16/91 | 2/10/92 | 5/22/92 | 12/7/92 | 12/28/94 | 12/29/94 | 01/04/95 | 01/19/95 | 02/28/95 | 07/31/95 | 12/12/95 | 03/13/96 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| W-01 | 1124.30 | 1113.86 | 1111.14 | 1111.09 | 1110.78 | 1109.35 | 1105.81 | 1108.63 | 1109.65 | 1110.95 | 1110.14 | 1110.24 | 1110.01 | 1111.65 | 1109.90 | 1106.13 | 1108.53 | 1109.35 |
| W-02 | 1125.69 | 1115.66 | 1114.10 | 1113.83 | 1113.48 | 1112.33 | 1108.07 | 1111.62 | 1112.47 | 1114.22 | 1114.25 | 1114.09 | 1113.93 | 1115.17 | 1113.33 | 1108.54 | 1112.66 | 1113.57 |
| W-03 | 1128.44 | 1118.71 | 1117.27 | 1116.75 | 1116.08 | 1115.39 | 1110.57 | 1114.01 | NA | NA | NA | 1116.68 | 1117.09 | 1119.45 | 1114.84 | 1110.87 | 1116.66 | 1117.42 |
| W-04 | 1138.12 | 1134.89 | 1133.87 | 1133.74 | 1133.22 | 1133.02 | 1120.59 | 1133.82 | 1132.17 | 1134.48 | NA | 1134.76 | 1134.42 | 1135.13 | 1135.19 | NA | 1134.07 | 1134.20 |
| W-05 | 1130.84 | 1124.62 | 1117.65 | 1117.61 | 1116.43 | 1114.99 | 1109.05 | 1114.34 | 1114.62 | 1117.88 | 1116.65 | 1116.51 | 1116.39 | 1119.18 | 1115.51 | 1109.41 | 1113.87 | 1114.83 |
| W-06 | 1131.43 | 1127.73 | 1123.24 | 1122.51 | 1121.97 | 1121.61 | 1114.94 | 1120.93 | 1121.09 | 1126.29 | 1123.54 | 1123.31 | 1123.10 | 1126.54 | 1124.20 | 1115.43 | 1122.45 | 1122.30 |
| W-07 | 1125.87 | 1117.56 | 1114.56 | 1114.45 | 1113.90 | 1112.82 | 1107.82 | 1111.67 | 1112.42 | 1114.42 | 1113.70 | 1113.68 | 1113.56 | 1115.61 | 1113.10 | 1108.73 | 1111.39 | 1112.14 |
| W-08 | 1123.61 | 1111.03 | 1110.22 | 1109.60 | 1109.23 | 1108.76 | 1105.54 | 1107.85 | 1108.76 | 1109.66 | 1109.06 | 1108.99 | 1108.81 | 1109.82 | 1108.60 | 1105.77 | 1107.89 | 1108.59 |
| W-09 | 1123.57 | 1111.60 | 1110.42 | 1110.22 | 1109.80 | 1109.97 | 1105.76 | 1108.17 | 1109.07 | 1110.45 | 1109.66 | 1109.60 | 1109.43 | 1110.50 | 1109.09 | 1106.13 | 1108.36 | 1109.15 |
| W-10 | 1123.36 | 1115.54 | 1113.36 | 1113.17 | 1112.81 | 1112.18 | 1108.09 | 1111.16 | 1111.75 | 1113.26 | 1112.70 | 1112.64 | 1112.51 | 1113.86 | 1112.25 | 1108.37 | 1111.38 | 1111.90 |
| W-11 | 1124.47 | 1112.39 | 1111.77 | 1111.38 | 1111.05 | 1110.88 | 1107.46 | 1109.44 | 1110.70 | 1111.87 | 1111.48 | 1111.24 | 1111.10 | 1111.99 | 1109.74 | 1107.86 | 1110.32 | 1111.24 |
| W-12 | 1127.63 | 1114.35 | 1113.53 | 1113.26 | 1112.97 | 1112.68 | 1109.02 | 1111.14 | 1112.47 | 1113.86 | 1113.08 | 1113.06 | 1112.92 | 1114.02 | 1112.55 | 1109.30 | 1112.26 | 1113.21 |
| W-13 | 1132.21 | 1126.18 | 1123.09 | 1122.29 | 1121.89 | 1121.78 | 1114.29 | 1120.61 | 1121.47 | 1125.16 | 1123.43 | 1123.22 | 1122.81 | 1129.09 | 1126.81 | 1114.47 | 1123.01 | 1122.69 |
| W-14 | 1132.19 | 1124.10 | 1122.49 | 1122.03 | 1121.51 | 1121.60 | 1115.09 | 1119.79 | 1121.28 | 1123.39 | 1122.39 | 1122.23 | 1122.08 | 1124.58 | 1122.57 | 1115.41 | 1121.91 | 1122.37 |
| W-15 | 1125.02 | NA | NA | NA | NA | NA | NA | 1109.59 | 1111.10 | 1112.06 | 1111.42 | 1111.31 | 1111.18 | 1112.06 | 1110.81 | 1107.95 | 1110.46 | 1111.39 |
| W-16 | 1122.63 | NA | NA | NA | NA | NA | NA | 1108.67 | 1110.27 | 1111.11 | 1110.44 | 1110.26 | 1110.18 | 1110.71 | 1109.85 | 1107.71 | 1109.65 | 1111.00 |
| W-17 | 1122.28 | NA | NA | NA | NA | NA | NA | 1108.28 | 1109.96 | 1111.66 | 1109.99 | 1109.95 | 1109.83 | 1110.43 | 1109.52 | 1107.59 | 1109.46 | 1110.65 |
| W-18 | 1120.86 | NA | NA | NA | NA | NA | NA | 1107.09 | 1108.42 | 1109.31 | 1108.52 | 1108.42 | 1108.29 | 1109.04 | 1108.01 | 1106.15 | 1107.88 | 1108.86 |
| W-19 | 1120.67 | NA | NA | NA | NA | NA | NA | 1106.70 | 1108.21 | 1108.85 | 1108.24 | 1108.12 | 1108.00 | 1108.54 | 1107.69 | 1105.76 | 1107.48 | 1108.56 |
| W-20 | 1120.63 | NA | NA | NA | NA | NA | NA | 1106.60 | 1108.13 | 1108.55 | 1108.24 | 1108.08 | 1107.98 | 1108.41 | 1107.78 | 1105.67 | 1107.03 | 1109.10 |
| W-21 | 1144.42 | NA | NA | NA | NA | NA | NA | 1117.46 | 1123.57 | 1130.16 | 1130.55 | 1130.27 | 1130.13 | 1131.08 | 1129.87 | 1125.36 | 1117.89 | 1130.60 |
| W-22 | 1135.35 | NA | NA | NA | NA | NA | NA | 1115.91 | 1115.52 | 1118.79 | 1126.23 | 1117.70 | 1117.36 | 1120.40 | 1116.67 | 1110.50 | 1114.74 | 1115.81 |
| W-23 | 1137.44 | NA | NA | NA | NA | NA | NA | NA | NA | 1128.92 | 1127.51 | 1128.14 | 1127.44 | 1128.37 | 1126.81 | NA | NA | NA |
| W-24 | 1137.16 | NA | NA | NA | NA | NA | NA | NA | NA | 1127.94 | 1125.39 | 1127.16 | 1126.36 | 1127.22 | 1125.32 | 1118.38 | 1122.37 | 1125.48 |
| W-25 | 1124.50 | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1112.73 | 1112.60 | 1112.50 | 1113.67 | 1112.03 | 1108.45 | 1111.59 | 1112.39 |
| W-26 | 1124.60 | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1111.96 | 1111.85 | 1111.69 | 1112.75 | 1111.31 | 1108.15 | 1110.88 | 1111.79 |
| Stream Point | Top, Stream Point Elev. | 03/04/91 | 03/14/91 | 03/19/91 | 04/16/91 | 5/10/91 | 8/16/91 | 2/10/92 | 5/22/92 | 12/7/92 | 12/28/94 | 12/29/94 | 1/11/95 | 01/19/95 | 02/28/95 | 07/31/95 | 12/12/95 | 12/12/95 |
| SP-1 | 1136.30 | NA | NA | 1134.80 | 1134.80 | 1134.80 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SP-2 | 1120.80 | NA | NA | 1120.10 | 1120.10 | 1119.40 | NA | NA | 1119.99 | NA | NA | NA | NA | NA | 1120.20 | NA | NA | NA |
| SP-3 | 1117.70 | NA | NA | 1115.60 | 1115.60 | 1115.40 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SP-4 | 1117.20 | NA | NA | 1116.10 | 1115.80 | 1115.80 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SP-2A | 1124.16 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1120.56 | 1121.68 | NA | NA | NA | NA |
| SP-3A | 1120.01 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1118.46 | NA | NA | NA | NA | NA |
| SP-5 | 1121.80 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1119.05 | 1119.26 | 1119.70 | NA | NA | NA |

Notes:
Elevations are in feet above mean sea level based on National Geodetic Vertical Datum of 1929.
NA - Indicates water elevations were not measured.
TOIC - top of inner casing.

TABLE 2

ORGANIC COMPOUNDS DETECTED IN GROUND WATER - MARCH 1996

ROSEN SITE
CORTLAND, NEW YORK

| | New York State Standards/ Guidance Values | MCLs/MCLGs | W-01 | W-02 | W-03 | W-04 | W-06 | W-06 (DUP) | W-07 | W-08 | W-10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Compound | | | 3/14/96 | 3/14/96 | 3/15/96 | 3/13/96 | 3/14/96 | 3/14/96 | 3/15/96 | 3/14/96 | 3/15/96 |
| Volatiles | | | | | | | | | | | |
| 1,1,1-Trichloroethane | 5 | 200/200 (G) | **7.4** | **22 D** | **8.5** | 1 U | **700 D** | **1000 D** | **130 D** | **75 D** | **88** |
| 1,1-Dichloroethane | 5 | | 3.6 | **14** | 3.9 | 1 U | **46 DJ** | **55** | **42 D** | **21** | **26** |
| 1,1-Dichloroethene | 5 | 7/7 (G) | 1 U | 0.39 J | 1 U | 1 U | 1.2 | 10 U | 1.8 | 1.4 | 1.1 J |
| Chloroethane | 5 | | 1 U | 1 U | 1 U | 1 U | 1 | 10 U | 0.94 J | 1 U | 4 U |
| cis-1,2-Dichloroethene | 5 | 70/70 (G) | 1 U | 1 U | 0.53 J | 1 U | 1.3 | 10 U | 1 U | 1 U | 4 U |
| Methylene chloride | 5 | 5/0 (G) | 2 U | 2 U | 2 U | 2 U | 0.35 J | 20 U | 2 U | 2 U | 8 U |
| Tetrachloroethene | 5 | 5/0 (G) | 1 U | 1 U | 4.7 | 1 U | 0.29 J | 10 U | 1 U | 1 U | 4 U |
| Toluene | | | 1 U | 0.37 J | 1 U | 0.26 J | 0.24 J | 10 U | 1 U | 1 U | 4 U |
| trans-1,2-Dichloroethene | 5 | 100/100 (G) | 1 U | 1 U | 1 U | 1 U | 1 U | 10 U | 1 U | 1 U | 4 U |
| Trichloroethene | 5 | 5/0 (G) | 1 U | 0.47 J | 0.97 J | 1 U | **5.7** | 3.8 J | 0.81 J | 0.46 J | 4 U |
| Vinyl chloride | 2 | 2/0 (G) | 1 U | 1 U | 1 U | 1 U | 1 U | 10 U | 1 U | 1 U | 4 U |
| Other | | | | | | | | | | | |
| Total Organic Carbon | | | NA | 2700 | NA | 1000 U | 2200 | NA | NA | NA | 3300 |

# TABLE 2

## VOLATILE ORGANIC COMPOUNDS DETECTED IN GROUND WATER - MARCH 1996

ROSEN SITE
CORTLAND, NEW YORK

| Compound | New York State Standards/ Guidance Values | MCLs/MCLGs | W-11 | W-11 (BAILER) | W-11 (PUMP) | W-12 | W-16 | W-17 | W-18 | W-19 | W-24 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 3/14/96 | 3/14/96 | 3/14/96 | 3/15/96 | 3/19/96 | 3/13/96 | 3/15/96 | 3/13/96 | 3/13/96 |
| Volatiles | | | | | | | | | | | |
| 1,1,1-Trichloroethane | 5 | 200/200 (G) | **45 D** | **49** | **52** | **16** | **22** | **5.2** | **25** | **62** | 1 U |
| 1,1-Dichloroethane | 5 | | **34** | **30** | **36** | 3.2 | 3.8 | 0.69 J | **14** | **26** | 1 U |
| 1,1-Dichloroethene | 5 | 7/7 (G) | **5.4** | **5** | **5.7** | 0.47 J | 0.33 J | 1 U | 1.4 | 3.5 J | 2.3 |
| Chloroethane | 5 | | 2 U | 2.5 U | 2.5 U | 1 U | 1 U | 1 U | 1 U | 4 U | 1 U |
| cis-1,2-Dichloroethene | 5 | 70/70 (G) | 2 U | 2.5 U | 2.5 U | 0.21 J | 1 U | 0.32 J | **7.2** | 4 U | **52 D** |
| Methylene chloride | 5 | 5/0 (G) | 4 U | 5 U | 5 U | 2 U | 2 U | 1 U | 2 U | 8 U | 1 U |
| Tetrachloroethene | 5 | 5/0 (G) | 2 U | 2.5 U | 2.5 U | 1 U | 1 U | 2 | 0.29 J | 4 U | 1 U |
| Toluene | | | 0.55 J | 2.5 U | 2.5 U | 1 U | 1 U | 1 U | 1 U | 4 U | 1 U |
| trans-1,2-Dichloroethene | 5 | 100/100 (G) | 2 U | 2.5 U | 2.5 U | 1 U | 1 U | 1 U | 1 U | 4 U | **7** |
| Trichloroethene | 5 | 5/0 (G) | 2 U | 2.5 U | 2.5 U | **22** | 2.7 | **5.7** | **8** | 1.4 J | **130 D** |
| Vinyl chloride | 2 | 2/0 (G) | 2 U | 2.5 U | 2.5 U | 1 U | 1 U | 1 U | 0.6 J | 4 U | **13** |
| Other | | | | | | | | | | | |
| Total Organic Carbon | | | 2200 | NA | NA | NA | NA | NA | 1300 | 1100 | 1800 |

NOTES:

All concentrations in micrograms per liter (ug/L); equivelent to parts per billion (ppb).

The following volatile organic compounds were also analyzed, but were not detected in the ground-water samples:

1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2-Butanone
2-Hexanone
4-Methyl-2-pentanone
Acetone
Benzene
Bromochloromethane
Bromodichloromethane
Bromoform
Bromomethane
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroform
Chloromethane
cis-1,3-Dichloropropene
Ethylbenzene
Styrene
trans-1,3-Dichloropropene
Xylenes, Total

D = Identifies compounds indentified in an analysis at a secondary dilution factor.
J = Indicates an estimated value.
U = Indentifies compounds that were not detected. The value presented is the detection limit.
DUP = Duplicate.
NA = Not Analyzed.
Bold indicates NYSDEC standards exceeded; shading indicates federal MCLs exceeded.

References:

Standard and Guidance values are according to the New York State Department of Environmental Conservation, Division of Water Technical and Operation Guidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values [designated by (G)], October 1993.

MCLs [Maximum Contaminant Levels], MCLGs [Maximum Contaminant Level Goals, designated by (G)], and SMCLs [Secondary Maximum Contaminant Levels, designated by (S)], according to the Code of Federal Regulations, Protection of the Environment 40, Part 141, July 1, 1991, and the Drinking Water Regulations and Health Advisories, Office of Water, U.S. Environmental Protection Agency, May 1995.

## TABLE 3

## GROUND-WATER INORGANIC CONSTITUENT ANALYTICAL RESULTS - MARCH 1996

## ROSEN SITE
## CORTLAND, NEW YORK

| | New York State Standards/ Guidance Values | MCLs/MCLGs | W-02 | W-04 | W-06 | W-10 | W-11 | W-18 | W-19 | W-24 |
|---|---|---|---|---|---|---|---|---|---|---|
| Constituent | | | 3/14/96 | 3/13/96 | 3/14/96 | 3/15/96 | 3/14/96 | 3/15/96 | 3/13/96 | 3/13/96 |
| Iron, Total | 300 | 300 (S) | 250 | **300** | 110 | 40 | **5,600** | 50 | 140 | 120 |
| Iron, Soluble | 300 | 300 (S) | 110 | 30 | 30 U | 40 | **5,500** | 30 U | 30 U | 30 U |
| Manganese, Total | 500 | 50 (S) | **500** | 20 U | 20 U | 280 | **930** | 410 | **1,900** | 580 |
| Manganese, Soluble | 500 | 50 (S) | **500** | 20 U | 20 U | 290 | **960** | 400 | **1,800** | 440 |
| Sulfate | 250,000 | 250,000 | 90,000 | 16,000 | 35,000 | 100,000 | **620,000** | 140,000 | **550,000** | 150,000 |

NOTES:
All concentrations in micrograms per liter (ug/L); equivalent to parts per billion (ppb).
U = The constituent was not detected above the reported detection limit.

Bold indicates NYSDEC standards exceeded; shading indicates federal MCLs exceeded.

References:

Standard and Guidance values are according to the New York State Department of Environmental Conservation, Division of Water Technical and Operation Guidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values [designated by (G)], October 1993.

MCLs [Maximum Contaminant Levels], MCLGs [Maximum Contaminant Level Goals, designated by (G)], and SMCLs [Secondary Maximum Contaminant Levels, designated by (S)], according to the Code of Federal Regulations, Protection of the Environment 40, Part 141, July 1, 1991, and the Drinking Water Regulations and Health Advisories, Office of Water, U.S. Environmental Protection Agency, May 1995.

# TABLE 4

## FIELD PARAMETERS
## MARCH 1996 GROUND-WATER SAMPLING EVENT

## ROSEN SITE
## CORTLAND, NEW YORK

| Well | Date | Conductivity mS/cm | DO mg/L | ORP mV | pH S.U. | Temperature Celsius | Turbidity NTU |
|---|---|---|---|---|---|---|---|
| W-01 | 3/14/96 | 0.61 | 10.1 | 62 | 7.0 | 2.8 | 4 |
| W-02 | 3/14/96 | 0.59 | 1.0 | 37 | 6.5 | 5.6 | 6 |
| W-03 | 3/15/96 | 0.64 | 4.9 | 21 | 7.2 | 4.2 | 2 |
| W-04 | 3/13/96 | 1.30 | 9.9 | 87 | 7.3 | 7.3 | 34 |
| W-06 | 3/14/96 | 1.27 | 4.0 | 300 | 7.1 | 7.5 | 15 |
| W-07 | 3/15/96 | 0.65 | 0.3 | -98 | 6.9 | 7.6 | 12 |
| W-08 | 3/14/96 | 1.26 | 0.7 | -220 | 7.3 | 7.4 | 20 |
| W-10 | 3/15/96 | 0.66 | 0.9 | 104 | 7.0 | 7.9 | 15 |
| W-11 | 3/14/96 | 1.84 | 0.4 | 12 | 6.9 | 8.6 | 20 |
| W-12 | 3/15/96 | 0.60 | 2.1 | 119 | 7.1 | 7.3 | 25 |
| W-16 | 3/15/96 | 0.70 | 2.2 | 22 | 7.4 | 10.1 | 50 |
| W-17 | 3/13/96 | 0.55 | 6.2 | 323 | 7.5 | 6.9 | 9 |
| W-18 | 3/15/96 | 0.74 | 0.9 | 34 | 7.1 | 8.2 | 2 |
| W-19 | 3/13/96 | 1.60 | 1.9 | 314 | 7.0 | 9.2 | 12 |
| W-24 | 3/13/96 | 1.24 | 1.0 | 270 | 7.1 | 8.3 | 14 |

Notes:

NA - Not available.
Field measurements were made at the time of sampling.
mS/cm = MilliSiemens per centimeter.
mg/L = Milligrams per liter, equivalent to parts per million (ppm).
mV = Millivolts
S.U. = Standard pH units.
NTU = Nephelometric turbidity units.

TABLE 5

# COMPARISON OF SPLIT SAMPLE RESULTS

ROSEN SITE
CORTLAND, NEW YORK

| Well | W-06 | | | W-11 | | | W-19 | | | W-24 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Type | FS | SPLIT | RPD | FS | SPLIT | RPD | FS | SPLIT | RPD | FS | SPLIT | RPD |
| Volatiles | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | 700 | 602 | 15.1 | 45 | 40 | 11.8 | 62 | 47 | 27.5 | ND | ND | NA |
| 1,1-Dichloroethane | 46 | 52 | 12.2 | 34 | 29 | 15.9 | 26 | 23 | 12.2 | ND | ND | NA |
| 1,1-Dichloroethene | 1.2 | 0.70 | 52.6 | 5.4 | 4.0 | 29.8 | 3.5 | 4.0 | 13.3 | 2.3 | 2.0 | 14.0 |
| 1,2-Dichloroethane | ND | 0.30 | NA | ND | 0.30 | NA | ND | 0.20 | NA | ND | ND | NA |
| 1,2-Dichloroethene, Total | NA | 0.60 | NA | NA | 0.10 | NA | NA | 0.30 | NA | NA | 26 | NA |
| Chloroethane | 1.0 | 1.0 | 0.0 | ND | 0.30 | NA | ND | ND | NA | ND | ND | NA |
| cis-1,2-Dichloroethene | 1.3 | 1.0 | 26.1 | ND | 0.30 | NA | ND | 0.50 | NA | 52 | 47 | 10.1 |
| Methylene chloride | 0.35 | 0.20 | 54.5 | ND | ND | NA | ND | ND | NA | ND | ND | NA |
| Tetrachloroethene | 0.29 | 0.20 | 36.7 | ND | ND | NA | ND | ND | NA | ND | ND | NA |
| Toluene | 0.24 | ND | NA | 0.55 | ND | NA | ND | ND | NA | ND | ND | NA |
| trans-1,2-Dichloroethene | ND | ND | NA | ND | ND | NA | ND | ND | NA | 7 | 6 | 15.4 |
| Trichloroethene | 5.7 | 4.0 | 35.1 | ND | 0.70 | NA | 1.4 | 1.0 | 33.3 | 130 | 97 | 29.1 |
| Vinyl Chloride | ND | ND | NA | ND | ND | NA | ND | ND | NA | 13 | 16 | 20.7 |
| Inorganics | | | | | | | | | | | | |
| Aluminum | NA | ND | NA | NA | 96.5 | NA | NA | 202 | NA | NA | ND | NA |
| Antimony | NA | ND | NA | NA | ND | NA | NA | 11.8 | NA | NA | ND | NA |
| Barium | NA | 89.1 | NA | NA | ND | NA | NA | ND | NA | NA | ND | NA |
| Calcium | NA | 145,750 | NA | NA | 402,250 | NA | NA | 327,000 | NA | NA | ND | NA |
| Chromium | NA | 8.1 | NA | NA | 3.5 | NA | NA | 4.0 | NA | NA | ND | NA |
| Cobalt | NA | ND | NA | NA | 5.6 | NA | NA | 6.4 | NA | NA | ND | NA |
| Iron | 110 | 85.1 | 25.5 | 5600 | 6,044 | 7.6 | 140 | 250 | 56.4 | 0.3 | ND | NA |
| Magnesium | NA | 24,910 | NA | NA | 14,750 | NA | NA | 19,200 | NA | NA | ND | NA |
| Manganese | ND | 4.9 | NA | 930 | 877 | 5.9 | 1900 | 1,830 | 3.8 | ND | ND | NA |
| Mercury | NA | 0.10 | NA | NA | ND | NA | NA | ND | NA | NA | ND | NA |
| Nickel | NA | 21 | NA | NA | 3.2 | NA | NA | ND | NA | NA | ND | NA |
| Potassium | NA | 2,714 | NA | NA | 2,184 | NA | NA | 1,640 | NA | NA | ND | NA |
| Selenium | NA | 8.2 | NA | NA | ND | NA | NA | 5.5 | NA | NA | ND | NA |
| Sodium | NA | 72,770 | NA | NA | 22,170 | NA | NA | 20,800 | NA | NA | ND | NA |
| Zinc | NA | 18.5 | NA | NA | 19.1 | NA | NA | 19.9 | NA | NA | ND | NA |

Notes:

Concentrations in micrograms per liter (ug/L) equivalent to parts per billion (ppb).

ND = Not detected.

NA = Not analyzed.

FS = Primary field sample.

RPD = Relative percent difference.

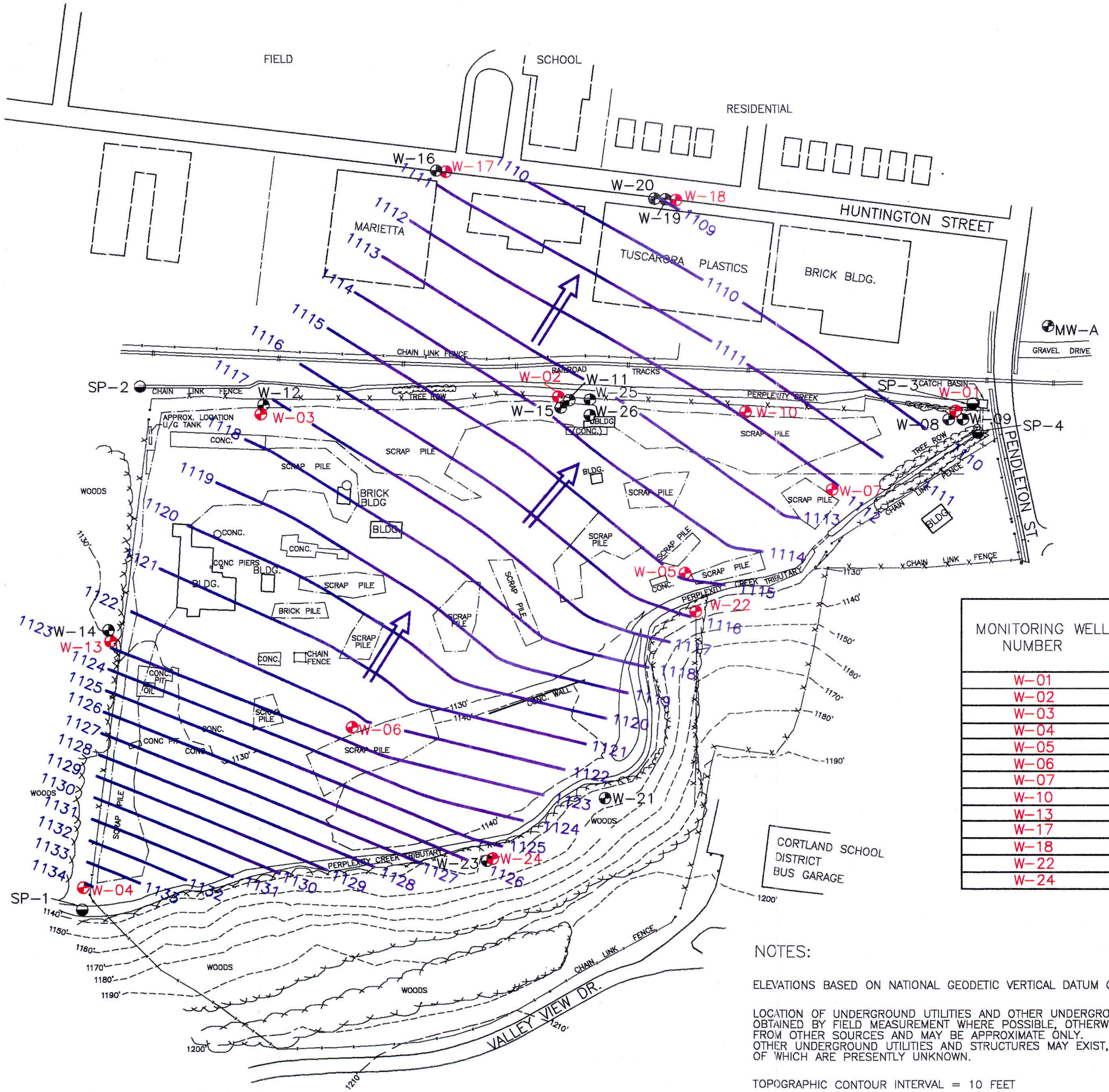
Includes only those analyses where a parameter was detected in either the primary sample or the split sample.

Primary samples analyzed by Recra Environmental (VOCs) or Upstate (Inorganics). Split samples analyzed by Buck Laboratories.

# Figures

BLASLAND, BOUCK & LEE, INC.

*engineers & scientists*



LEGEND

◐ MONITORING WELL

1113' —— GROUND-WATER ELEVATION CONTOUR LINE (DASHED WHERE INFERRED)

⇦ GROUND-WATER FLOW DIRECTION

◓ STREAM MONITORING POINT

SCALE

200' 0 200'

| MONITORING WELL NUMBER | GROUND-WATER ELEVATION 3/13/96 |
|---|---|
| W-01 | 1109.35 |
| W-02 | 1113.57 |
| W-03 | 1117.42 |
| W-04 | 1134.20 |
| W-05 | 1114.83 |
| W-06 | 1122.30 |
| W-07 | 1112.14 |
| W-10 | 1111.90 |
| W-13 | 1122.69 |
| W-17 | 1110.65 |
| W-18 | 1108.86 |
| W-22 | 1115.81 |
| W-24 | 1125.48 |

NOTES:

ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

LOCATION OF UNDERGROUND UTILITIES AND OTHER UNDERGROUND STRUCTURES OBTAINED BY FIELD MEASUREMENT WHERE POSSIBLE, OTHERWISE OBTAINED FROM OTHER SOURCES AND MAY BE APPROXIMATE ONLY. OTHER UNDERGROUND UTILITIES AND STRUCTURES MAY EXIST, THE LOCATIONS OF WHICH ARE PRESENTLY UNKNOWN.

TOPOGRAPHIC CONTOUR INTERVAL = 10 FEET

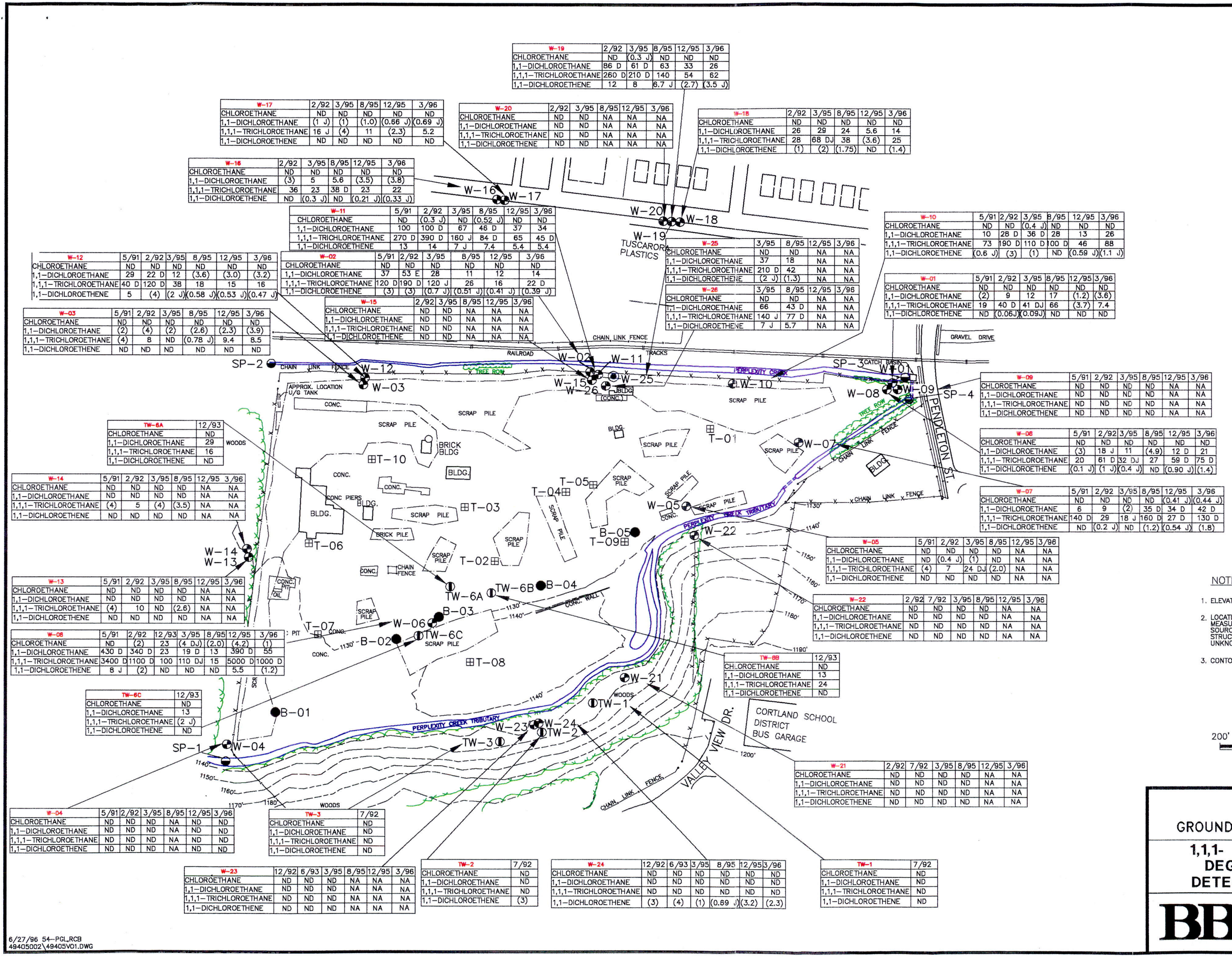
ROSEN SITE
CORTLAND, NEW YORK
GROUND-WATER MONITORING REPORT

**GROUND-WATER TABLE CONTOUR MAP 3/13/96**

BBL BLASLAND, BOUCK & LEE, INC.
*engineers & scientists*

FIGURE 1

L: ON = 396C,396CT,*; OFF = FROZEN LAYERS
6/27/96 SYR-54-PGL RCB
49405003/49401SM1.DWG



| W-19 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | (0.3 J) | ND | ND | ND |
| 1,1-DICHLOROETHANE | 86 D | 61 D | 63 | 33 | 26 |
| 1,1,1-TRICHLOROETHANE | 260 D | 210 D | 140 | 54 | 62 |
| 1,1-DICHLOROETHENE | 12 | 8 | 6.7 J | (2.7) | (3.5 J) |

| W-17 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | (1 J) | (1) | (1.0) | (0.66 J) | (0.69 J) |
| 1,1,1-TRICHLOROETHANE | 16 J | (4) | 11 | (2.3) | 5.2 |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | ND |

| W-20 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | NA | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | NA | NA | NA |

| W-18 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | 26 | 29 | 24 | 5.6 | 14 |
| 1,1,1-TRICHLOROETHANE | 28 | 68 DJ | 38 | (3.6) | 25 |
| 1,1-DICHLOROETHENE | (1) | (2) | (1.75) | ND | (1.4) |

| W-16 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | (3) | 5 | 5.6 | (3.5) | (3.8) |
| 1,1,1-TRICHLOROETHANE | 36 | 23 | 38 D | 23 | 22 |
| 1,1-DICHLOROETHENE | ND | (0.3 J) | ND | (0.21 J) | (0.33 J) |

| W-11 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | (0.3 J) | ND | (0.52 J) | ND | ND |
| 1,1-DICHLOROETHANE | 100 | 100 D | 67 | 46 D | 37 | 34 |
| 1,1,1-TRICHLOROETHANE | 270 D | 390 D | 160 J | 84 D | 65 | 45 D |
| 1,1-DICHLOROETHENE | 13 | 14 | 7 J | 7.4 | 5.4 | 5.4 |

| W-12 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | 29 | 22 D | 12 | (3.6) | (3.0) | (3.2) |
| 1,1,1-TRICHLOROETHANE | 40 D | 120 D | 38 | 18 | 15 | 16 |
| 1,1-DICHLOROETHENE | 5 | (4) | (2 J) | (0.58 J) | (0.53 J) | (0.47 J) |

| W-02 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | 37 | 53 E | 28 | 11 | 12 | 14 |
| 1,1,1-TRICHLOROETHANE | 120 D | 190 D | 120 J | 26 | 16 | 22 D |
| 1,1-DICHLOROETHENE | (3) | (3) | (0.7 J) | (0.51 J) | (0.41 J) | (0.39 J) |

| W-03 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | (2) | (4) | (2) | (2.6) | (2.3) | (3.9) |
| 1,1,1-TRICHLOROETHANE | (4) | 8 | ND | (0.78 J) | 9.4 | 8.5 |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | ND | ND |

| W-15 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | NA | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | NA | NA | NA |

| W-25 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|
| CHLOROETHANE | ND | ND | NA | NA |
| 1,1-DICHLOROETHANE | 37 | 18 | NA | NA |
| 1,1,1-TRICHLOROETHANE | 210 D | 42 | NA | NA |
| 1,1-DICHLOROETHENE | (2 J) | (1.3) | NA | NA |

| W-26 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|
| CHLOROETHANE | ND | ND | NA | NA |
| 1,1-DICHLOROETHANE | 66 | 43 D | NA | NA |
| 1,1,1-TRICHLOROETHANE | 140 J | 77 D | NA | NA |
| 1,1-DICHLOROETHENE | 7 J | 5.7 | NA | NA |

| W-10 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | (0.4 J) | ND | ND | ND |
| 1,1-DICHLOROETHANE | 10 | 28 D | 36 D | 28 | 13 | 26 |
| 1,1,1-TRICHLOROETHANE | 73 | 190 D | 110 D | 100 D | 46 | 88 |
| 1,1-DICHLOROETHENE | (0.6 J) | (3) | (1) | ND | (0.59 J) | (1.1 J) |

| W-01 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | (2) | 9 | 12 | 17 | (1.2) | (3.6) |
| 1,1,1-TRICHLOROETHANE | 19 | 40 D | 41 DJ | 66 | (3.7) | 7.4 |
| 1,1-DICHLOROETHENE | ND | (0.06J) | (0.09J) | ND | ND | ND |

| W-09 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | ND | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |

| W-08 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | (3) | 18 J | 11 | (4.9) | 12 D | 21 |
| 1,1,1-TRICHLOROETHANE | 20 | 61 D | 32 DJ | 27 | 59 D | 75 D |
| 1,1-DICHLOROETHENE | (0.1 J) | (1 J) | (0.4 J) | ND | (0.90 J) | (1.4) |

| W-07 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | (0.41 J) | (0.44 J) |
| 1,1-DICHLOROETHANE | 6 | 9 | (2) | 35 D | 34 D | 42 D |
| 1,1,1-TRICHLOROETHANE | 140 D | 29 | 18 J | 160 D | 27 D | 130 D |
| 1,1-DICHLOROETHENE | ND | (0.2 J) | ND | (1.2) | (0.54 J) | (1.8) |

| W-05 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA | NA |
| 1,1-DICHLOROETHANE | ND | (0.4 J) | (1) | ND | NA | NA |
| 1,1,1-TRICHLOROETHANE | (4) | 7 | 24 DJ | (2.0) | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |

| TW-6A | 12/93 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | 29 |
| 1,1,1-TRICHLOROETHANE | 16 |
| 1,1-DICHLOROETHENE | ND |

| W-14 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA | NA |
| 1,1,1-TRICHLOROETHANE | (4) | 5 | (4) | (3.5) | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |

| W-13 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA | NA |
| 1,1,1-TRICHLOROETHANE | (4) | 10 | ND | (2.6) | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |

| W-06 | 5/91 | 2/92 | 12/93 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | (2) | 23 | (4 DJ) | (2.0) | (4.2) | (1) |
| 1,1-DICHLOROETHANE | 430 D | 340 D | 23 | 19 D | 13 | 390 D | 55 |
| 1,1,1-TRICHLOROETHANE | 3400 D | 1100 D | 100 | 110 DJ | 15 | 5000 D | 1000 D |
| 1,1-DICHLOROETHENE | 8 J | (2) | ND | ND | ND | 5.5 | (1.2) |

| TW-6C | 12/93 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | 13 |
| 1,1,1-TRICHLOROETHANE | (2 J) |
| 1,1-DICHLOROETHENE | ND |

| W-22 | 2/92 | 7/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | ND | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |

| TW-6B | 12/93 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | 13 |
| 1,1,1-TRICHLOROETHANE | 24 |
| 1,1-DICHLOROETHENE | ND |

| W-21 | 2/92 | 7/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | ND | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |

| W-04 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | NA | ND | ND |
| 1,1-DICHLOROETHANE | ND | ND | ND | NA | ND | ND |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | NA | ND | ND |
| 1,1-DICHLOROETHENE | ND | ND | ND | NA | ND | ND |

| TW-3 | 7/92 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | ND |
| 1,1,1-TRICHLOROETHANE | ND |
| 1,1-DICHLOROETHENE | ND |

| W-23 | 12/92 | 6/93 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | NA | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | NA | NA | NA |

| TW-2 | 7/92 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | ND |
| 1,1,1-TRICHLOROETHANE | ND |
| 1,1-DICHLOROETHENE | (3) |

| W-24 | 12/92 | 6/93 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | ND | ND |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHENE | (3) | (4) | (1) | (0.69 J) | (3.2) | (2.3) |

| TW-1 | 7/92 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | ND |
| 1,1,1-TRICHLOROETHANE | ND |
| 1,1-DICHLOROETHENE | ND |

## LEGEND

| | |
|---|---|
| ◉ | PUMPING WELL |
| ◕ | MONITORING WELL |
| ● | TEST BORING |
| ⊞ | TEST PIT |
| ⊖ | STREAM MONITORING POINT |
| ◐ | TEMPORARY WELL |
| 280 | CONCENTRATION IN ug/L EQUIVALENT TO ppb. |
| (4) | CONCENTRATION DETECTED BUT NOT ABOVE STATE OR FEDERAL STANDARDS |
| J | INDICATES ESTIMATED VALUE |
| D | INDICATES SAMPLE DILUTION |
| B | INDICATES COMPOUND ALSO FOUND IN LABORATORY BLANK |
| NA | NOT ANALYZED |
| ND | NOT DETECTED ABOVE METHOD DETECTION LIMIT |

NOTES:

1. ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.
2. LOCATION OF UNDERGROUND STRUCTURES OBTAINED BY FIELD MEASUREMENT WHERE POSSIBLE, OTHERWISE OBTAINED FROM OTHER SOURCES AND MAY BE APPROXIMATE ONLY. OTHER UNDERGROUND STRUCTURES MAY EXIST, THE LOCATIONS OF WHICH ARE PRESENTLY UNKNOWN.
3. CONTOUR INTERVAL = 10 FEET.

ROSEN SITE
CORTLAND, NEW YORK

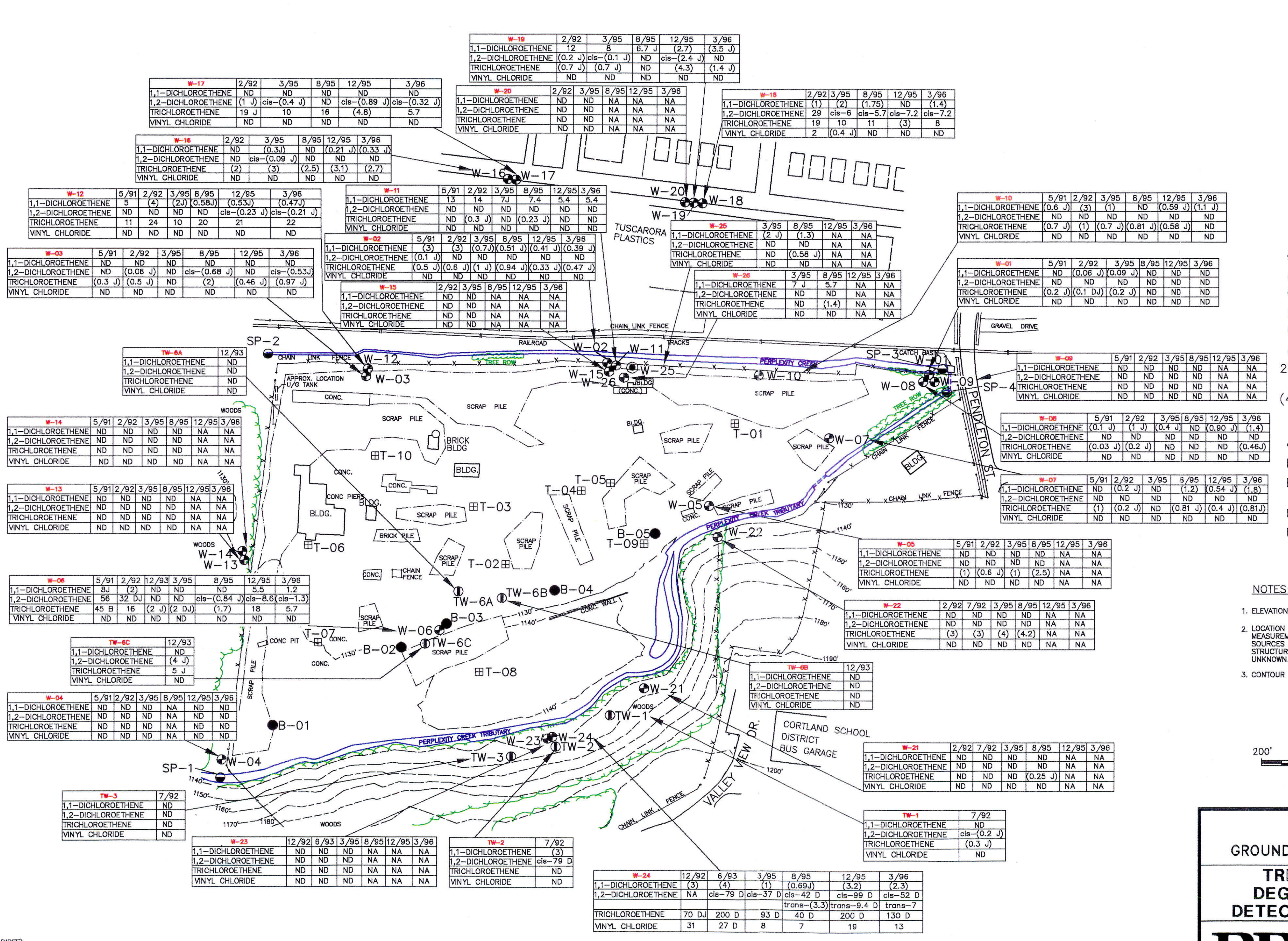
GROUND-WATER MONITORING REPORT

**1,1,1- TRICHLOROETHANE AND DEGRADATION PRODUCTS DETECTED IN GROUND WATER**

BBL BLASLAND, BOUCK & LEE, INC.
*engineers & scientists*

FIGURE
2

6/27/96 54-PGL,RCB
49405002\49405V01.DWG



| W-17 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | ND |
| 1,2-DICHLOROETHENE | (1 J) | cis-(0.4 J) | ND | cis-(0.89 J) | cis-(0.32 J) |
| TRICHLOROETHENE | 19 J | 10 | 16 | (4.8) | 5.7 |
| VINYL CHLORIDE | ND | ND | ND | ND | ND |

| W-16 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | (0.3J) | ND | (0.21 J) | (0.33 J) |
| 1,2-DICHLOROETHENE | ND | cis-(0.09 J) | ND | ND | ND |
| TRICHLOROETHENE | (2) | (3) | (2.5) | (3.1) | (2.7) |
| VINYL CHLORIDE | ND | ND | ND | ND | ND |

| W-12 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | 5 | (4) | (2J) | (0.58J) | (0.53J) | (0.47J) |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | cis-(0.23 J) | cis-(0.21 J) |
| TRICHLOROETHENE | 11 | 24 | 10 | 20 | 21 | 22 |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND |

| W-03 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | ND | ND |
| 1,2-DICHLOROETHENE | ND | (0.06 J) | ND | cis-(0.68 J) | ND | cis-(0.53J) |
| TRICHLOROETHENE | (0.3 J) | (0.5 J) | ND | (2) | (0.46 J) | (0.97 J) |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND |

| W-19 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | 12 | 8 | 6.7 J | (2.7) | (3.5 J) |
| 1,2-DICHLOROETHENE | (0.2 J) | cis-(0.1 J) | ND | cis-(2.4 J) | ND |
| TRICHLOROETHENE | (0.7 J) | (0.7 J) | ND | (4.3) | (1.4 J) |
| VINYL CHLORIDE | ND | ND | ND | ND | ND |

| W-20 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | NA | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | NA | NA | NA |
| TRICHLOROETHENE | ND | ND | NA | NA | NA |
| VINYL CHLORIDE | ND | ND | NA | NA | NA |

| W-18 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (1) | (2) | (1.75) | ND | (1.4) |
| 1,2-DICHLOROETHENE | 29 | cis-6 | cis-5.7 | cis-7.2 | cis-7.2 |
| TRICHLOROETHENE | 19 | 10 | 11 | (3) | 8 |
| VINYL CHLORIDE | 2 | (0.4 J) | ND | ND | ND |

| W-11 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | 13 | 14 | 7J | 7.4 | 5.4 | 5.4 |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND | ND |
| TRICHLOROETHENE | ND | (0.3 J) | ND | (0.23 J) | ND | ND |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND |

| W-02 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (3) | (3) | (0.7J) | (0.51 J) | (0.41 J) | (0.39 J) |
| 1,2-DICHLOROETHENE | (0.1 J) | ND | ND | ND | ND | ND |
| TRICHLOROETHENE | (0.5 J) | (0.6 J) | (1 J) | (0.94 J) | (0.33 J) | (0.47 J) |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND |

| W-15 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | NA | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | NA | NA | NA |
| TRICHLOROETHENE | ND | ND | NA | NA | NA |
| VINYL CHLORIDE | ND | ND | NA | NA | NA |

| W-25 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (2 J) | (1.3) | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | NA | NA |
| TRICHLOROETHENE | ND | (0.58 J) | NA | NA |
| VINYL CHLORIDE | ND | ND | NA | NA |

| W-26 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|
| 1,1-DICHLOROETHENE | 7 J | 5.7 | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | NA | NA |
| TRICHLOROETHENE | ND | (1.4) | NA | NA |
| VINYL CHLORIDE | ND | ND | NA | NA |

| W-10 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (0.6 J) | (3) | (1) | ND | (0.59 J) | (1.1 J) |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND | ND |
| TRICHLOROETHENE | (0.7 J) | (1) | (0.7 J) | (0.81 J) | (0.58 J) | ND |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND |

| W-01 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | (0.06 J) | (0.09 J) | ND | ND | ND |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND | ND |
| TRICHLOROETHENE | (0.2 J) | (0.1 DJ) | (0.2 J) | ND | ND | ND |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND |

| W-09 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| TRICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA | NA |

| W-08 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (0.1 J) | (1 J) | (0.4 J) | ND | (0.90 J) | (1.4) |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND | ND |
| TRICHLOROETHENE | (0.03 J) | (0.2 J) | ND | ND | ND | (0.46J) |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND |

| W-07 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | (0.2 J) | ND | (1.2) | (0.54 J) | (1.8) |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND | ND |
| TRICHLOROETHENE | (1) | (0.2 J) | ND | (0.81 J) | (0.4 J) | (0.81J) |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND |

| TW-8A | 12/93 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | ND |
| TRICHLOROETHENE | ND |
| VINYL CHLORIDE | ND |

| W-14 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| TRICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA | NA |

| W-13 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| TRICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA | NA |

| W-06 | 5/91 | 2/92 | 12/93 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | 8J | (2) | ND | ND | ND | 5.5 | 1.2 |
| 1,2-DICHLOROETHENE | 56 | 32 DJ | ND | ND | cis-(0.84 J) | cis-8.6 | (cis-1.3) |
| TRICHLOROETHENE | 45 B | 16 | (2 J) | (2 DJ) | (1.7) | 18 | 5.7 |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND | ND |

| TW-6C | 12/93 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | (4 J) |
| TRICHLOROETHENE | 5 J |
| VINYL CHLORIDE | ND |

| W-04 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | NA | ND | ND |
| 1,2-DICHLOROETHENE | ND | ND | ND | NA | ND | ND |
| TRICHLOROETHENE | ND | ND | ND | NA | ND | ND |
| VINYL CHLORIDE | ND | ND | ND | NA | ND | ND |

| TW-3 | 7/92 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | ND |
| TRICHLOROETHENE | ND |
| VINYL CHLORIDE | ND |

| W-05 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| TRICHLOROETHENE | (1) | (0.6 J) | (1) | (2.5) | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA | NA |

| W-22 | 2/92 | 7/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| TRICHLOROETHENE | (3) | (3) | (4) | (4.2) | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA | NA |

| TW-6B | 12/93 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | ND |
| TRICHLOROETHENE | ND |
| VINYL CHLORIDE | ND |

| W-21 | 2/92 | 7/92 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA | NA |
| TRICHLOROETHENE | ND | ND | ND | (0.25 J) | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA | NA |

| TW-1 | 7/92 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | cis-(0.2 J) |
| TRICHLOROETHENE | (0.3 J) |
| VINYL CHLORIDE | ND |

| W-23 | 12/92 | 6/93 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | NA | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | NA | NA | NA |
| TRICHLOROETHENE | ND | ND | ND | NA | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | NA | NA | NA |

| TW-2 | 7/92 |
|---|---|
| 1,1-DICHLOROETHENE | (3) |
| 1,2-DICHLOROETHENE | cis-79 D |
| TRICHLOROETHENE | ND |
| VINYL CHLORIDE | ND |

| W-24 | 12/92 | 6/93 | 3/95 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (3) | (4) | (1) | (0.69J) | (3.2) | (2.3) |
| 1,2-DICHLOROETHENE | NA | cis-79 D | cis-37 D | cis-42 D<br>trans-(3.3) | cis-99 D<br>trans-9.4 D | cis-52 D<br>trans-7 |
| TRICHLOROETHENE | 70 DJ | 200 D | 93 D | 40 D | 200 D | 130 D |
| VINYL CHLORIDE | 31 | 27 D | 8 | 7 | 19 | 13 |

## LEGEND

| | |
|---|---|
| ◉ | PUMPING WELL |
| ⊕ | MONITORING WELL |
| ● | TEST BORING |
| ⊞ | TEST PIT |
| ◒ | STREAM MONITORING POINT |
| ◐ | TEMPORARY WELL |
| 280 | CONCENTRATION IN ug/L EQUIVALENT TO ppb. |
| (4) | CONCENTRATION DETECTED BUT NOT ABOVE STATE OR FEDERAL STANDARDS |
| J | INDICATES ESTIMATED VALUE |
| D | INDICATES SAMPLE DILUTION |
| B | INDICATES COMPOUND ALSO FOUND IN LABORATORY BLANK |
| NA | NOT ANALYZED |
| ND | NOT DETECTED ABOVE METHOD DETECTION LIMIT |

NOTES:

1. ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.
2. LOCATION OF UNDERGROUND STRUCTURES OBTAINED BY FIELD MEASUREMENT WHERE POSSIBLE, OTHERWISE OBTAINED FROM OTHER SOURCES AND MAY BE APPROXIMATE ONLY. OTHER UNDERGROUND STRUCTURES MAY EXIST, THE LOCATIONS OF WHICH ARE PRESENTLY UNKNOWN.
3. CONTOUR INTERVAL = 10 FEET.

SCALE

200' 0 200'

ROSEN SITE
CORTLAND, NEW YORK
GROUND-WATER MONITORING REPORT

# TRICHLOROETHENE AND DEGRADATION PRODUCTS DETECTED IN GROUND WATER

BBL
BLASLAND, BOUCK & LEE, INC.
*engineers & scientists*

FIGURE
3

X: (XREF)
L: (LAYER)
P: 49401SM1
6/96 SYR-54-YCC RCB
49405003/49405V02.DWG

| W-16 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | 1,600 | (160) | NA |
| IRON, SOLUBLE | ND | (60) | NA |
| MANGANESE, TOTAL | 60 | (20) | NA |
| MANGANESE, SOLUBLE | ND | (20) | NA |
| NITRATE | (1,100) | (1,100) | NA |
| SULFATE | (210,000) | (130,000) | NA |

| W-17 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | (90) | (280) | NA |
| IRON, SOLUBLE | ND | (170) | NA |
| MANGANESE, TOTAL | ND | ND | NA |
| MANGANESE, SOLUBLE | ND | ND | NA |
| NITRATE | (700) | (600) | NA |
| SULFATE | (110,000) | (69,000) | NA |

| W-19 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | (210) | (60) | (140) |
| IRON, SOLUBLE | (30) | NA | ND |
| MANGANESE, TOTAL | 2,100 | 1,600 | 1,900 |
| MANGANESE, SOLUBLE | 2,000 | NA | 1,800 |
| NITRATE | ND | ND | NA |
| SULFATE | 340,000 | 540,000 | 550,000 |

| W-18 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | (170) | (40) | (50) |
| IRON, SOLUBLE | ND | (40) | ND |
| MANGANESE, TOTAL | 700 | 590 | 410 |
| MANGANESE, SOLUBLE | 690 | 320 | 400 |
| NITRATE | (200) | (400) | NA |
| SULFATE | 250,000 | (73,000) | (140,000) |

| W-11 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | 5,690 J* | 5,000 | 5,600 |
| IRON, SOLUBLE | 6,080 J | 5,400 | 5,500 |
| MANGANESE, TOTAL | 930 | 820 | 930 |
| MANGANESE, SOLUBLE | 858 | 910 | 960 |
| NITRATE | ND | ND | NA |
| SULFATE | 790,000 | 620,000 | 620,000 |

| W-10 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | (113 J) | (80) | (40) |
| IRON, SOLUBLE | ND | (80) | (40) |
| MANGANESE, TOTAL | 485 | 50 | 280 |
| MANGANESE, SOLUBLE | 432 | 50 | 290 |
| NITRATE | ND | ND | NA |
| SULFATE | (41,000) | (37,000) | (100,000) |

| W-25 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | 4,620 J* | NA | NA |
| IRON, SOLUBLE | 4,540 J | NA | NA |
| MANGANESE, TOTAL | 688 | NA | NA |
| MANGANESE, SOLUBLE | 651 | NA | NA |
| NITRATE | ND | NA | NA |
| SULFATE | 480,000 | NA | NA |

| W-25 DUP. | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | 4,870 J* | NA | NA |
| IRON, SOLUBLE | ND | NA | NA |
| MANGANESE, TOTAL | 698 | NA | NA |
| MANGANESE, SOLUBLE | 647 | NA | NA |
| NITRATE | NA | NA | NA |
| SULFATE | NA | NA | NA |

| W-26 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | 6,810 J* | NA | NA |
| IRON, SOLUBLE | 7,190 J | NA | NA |
| MANGANESE, TOTAL | 690 | NA | NA |
| MANGANESE, SOLUBLE | 646 | NA | NA |
| NITRATE | ND | NA | NA |
| SULFATE | 970,000 | NA | NA |

| W-02 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | 2,530 J* | (60) | (250) |
| IRON, SOLUBLE | (271 J) | (40) | (110) |
| MANGANESE, TOTAL | 1,360 | 540 | 500 |
| MANGANESE, SOLUBLE | 1,240 | 540 | 500 |
| NITRATE | ND | ND | NA |
| SULFATE | 400,000 | (100,000) | (90,000) |

| W-01 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | (73 BJ) | (170) | NA |
| IRON, SOLUBLE | ND | (70) | NA |
| MANGANESE, TOTAL | 211 | ND | NA |
| MANGANESE, SOLUBLE | 170 | ND | NA |
| NITRATE | (300) | (800) | NA |
| SULFATE | (46,000) | (14,000) | NA |

| W-12 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | R | (50) | NA |
| IRON, SOLUBLE | ND | ND | NA |
| MANGANESE, TOTAL | 546 | 410 | NA |
| MANGANESE, SOLUBLE | 448 | 400 | NA |
| NITRATE | (300) | ND | NA |
| SULFATE | (85,000) | (100,000) | NA |

| W-09 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | (50) | NA | NA |
| IRON, SOLUBLE | ND | NA | NA |
| MANGANESE, TOTAL | 220 | NA | NA |
| MANGANESE, SOLUBLE | ND | NA | NA |
| NITRATE | ND | NA | NA |
| SULFATE | (57,000) | NA | NA |

| W-03 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | (145 J) | (190) | NA |
| IRON, SOLUBLE | (87 BJ) | (160) | NA |
| MANGANESE, TOTAL | 422 | 540 | NA |
| MANGANESE, SOLUBLE | 347 | 460 | NA |
| NITRATE | ND | ND | NA |
| SULFATE | (13,000) | (22,000) | NA |

| W-08 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | (171 J) | (270) | NA |
| IRON, SOLUBLE | ND | (100) | NA |
| MANGANESE, TOTAL | 405 | 470 | NA |
| MANGANESE, SOLUBLE | 369 | 430 | NA |
| NITRATE | ND | ND | NA |
| SULFATE | (55,000) | (45,000) | NA |

| W-08 DUP. | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | 488 J | NA | NA |
| IRON, SOLUBLE | ND | NA | NA |
| MANGANESE, TOTAL | 400 | NA | NA |
| MANGANESE, SOLUBLE | 362 | NA | NA |
| NITRATE | NA | NA | NA |
| SULFATE | NA | NA | NA |

| W-14 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | 80 | NA | NA |
| IRON, SOLUBLE | ND | NA | NA |
| MANGANESE, TOTAL | ND | NA | NA |
| MANGANESE, SOLUBLE | ND | NA | NA |
| NITRATE | (800) | NA | NA |
| SULFATE | (82,000) | NA | NA |

| W-07 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | 3,200 | 4,900 | NA |
| IRON, SOLUBLE | 1,400 | 4,400 | NA |
| MANGANESE, TOTAL | 440 | 750 | NA |
| MANGANESE, SOLUBLE | 440 | 590 | NA |
| NITRATE | ND | ND | NA |
| SULFATE | (92,000) | (120,000) | NA |

| W-13 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | (30) | NA | NA |
| IRON, SOLUBLE | ND | NA | NA |
| MANGANESE, TOTAL | (40) | NA | NA |
| MANGANESE, SOLUBLE | (40) | NA | NA |
| NITRATE | ND | NA | NA |
| SULFATE | 740,000 | NA | NA |

| W-05 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | 2,400 | NA | NA |
| IRON, SOLUBLE | (100) | NA | NA |
| MANGANESE, TOTAL | 370 | NA | NA |
| MANGANESE, SOLUBLE | (40) | NA | NA |
| NITRATE | (1,700) | NA | NA |
| SULFATE | (46,000) | NA | NA |

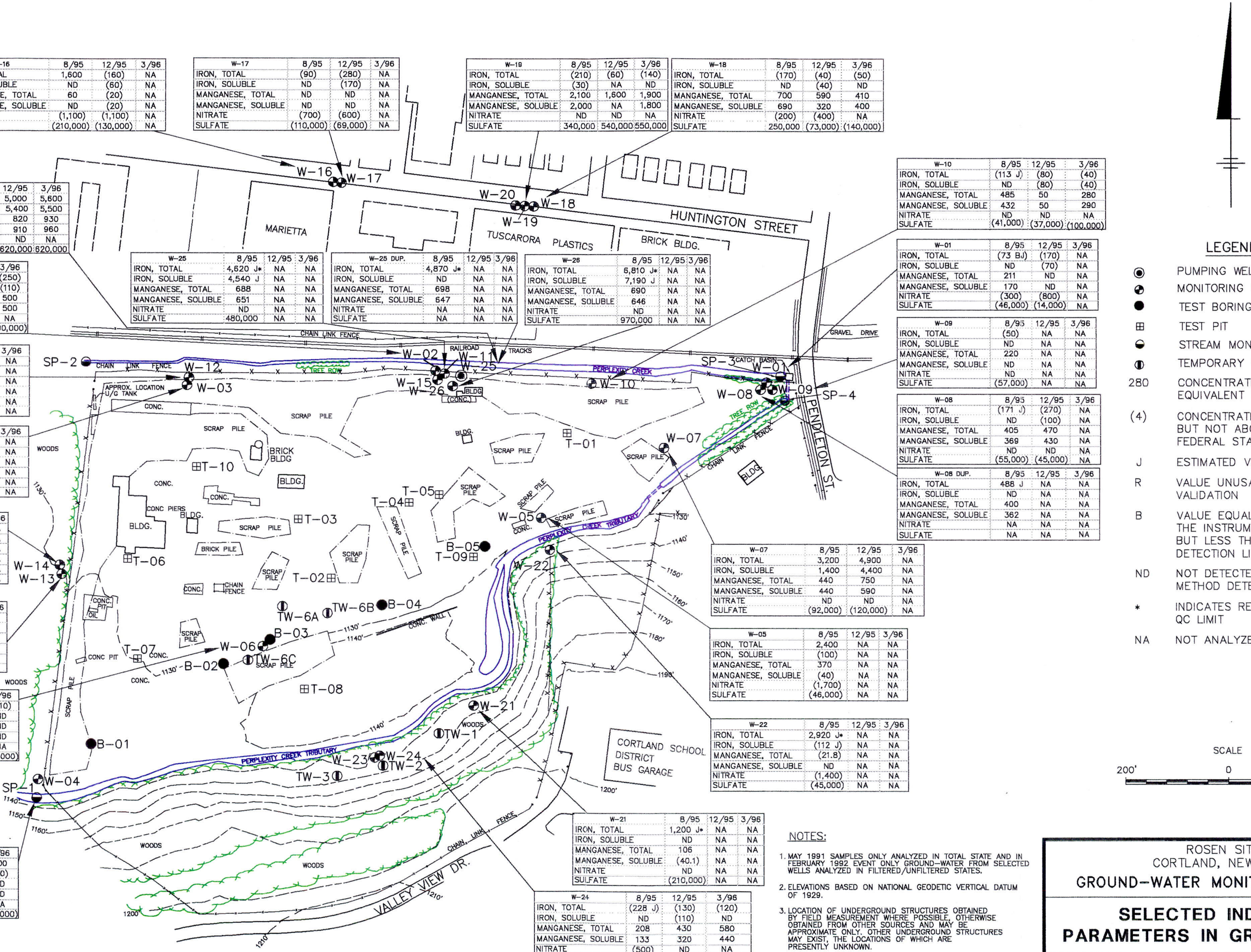
| W-06 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | 652 | 910 | (110) |
| IRON, SOLUBLE | ND | (90) | ND |
| MANGANESE, TOTAL | 15 | ND | ND |
| MANGANESE, SOLUBLE | ND | ND | ND |
| NITRATE | (1,000) | ND | NA |
| SULFATE | (24,000) | (41,000) | (35,000) |

| W-22 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | 2,920 J* | NA | NA |
| IRON, SOLUBLE | (112 J) | NA | NA |
| MANGANESE, TOTAL | (21.8) | NA | NA |
| MANGANESE, SOLUBLE | ND | NA | NA |
| NITRATE | (1,400) | NA | NA |
| SULFATE | (45,000) | NA | NA |

| W-21 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | 1,200 J* | NA | NA |
| IRON, SOLUBLE | ND | NA | NA |
| MANGANESE, TOTAL | 106 | NA | NA |
| MANGANESE, SOLUBLE | (40.1) | NA | NA |
| NITRATE | ND | NA | NA |
| SULFATE | (210,000) | NA | NA |

| W-04 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | NA | 320 | 300 |
| IRON, SOLUBLE | NA | (90) | (30) |
| MANGANESE, TOTAL | NA | ND | ND |
| MANGANESE, SOLUBLE | NA | ND | ND |
| NITRATE | NA | (700) | NA |
| SULFATE | NA | (18,000) | (16,000) |

| W-24 | 8/95 | 12/95 | 3/96 |
|---|---|---|---|
| IRON, TOTAL | (228 J) | (130) | (120) |
| IRON, SOLUBLE | ND | (110) | ND |
| MANGANESE, TOTAL | 208 | 430 | 580 |
| MANGANESE, SOLUBLE | 133 | 320 | 440 |
| NITRATE | (500) | ND | NA |
| SULFATE | 300,000 | (130,000) | (150,000) |



## LEGEND

| | |
|---|---|
| ◉ | PUMPING WELL |
| ◕ | MONITORING WELL |
| ● | TEST BORING |
| ⊞ | TEST PIT |
| ◒ | STREAM MONITORING POINT |
| ◐ | TEMPORARY WELL |
| 280 | CONCENTRATION IN ug/L EQUIVALENT TO ppb. |
| (4) | CONCENTRATION DETECTED BUT NOT ABOVE STATE OR FEDERAL STANDARDS |
| J | ESTIMATED VALUE |
| R | VALUE UNUSABLE AFTER DATA VALIDATION |
| B | VALUE EQUAL TO OR LESS THAN THE INSTRUMENT DETECTION LIMIT BUT LESS THAN THE CONTRACT DETECTION LIMIT. |
| ND | NOT DETECTED ABOVE METHOD DETECTION LIMIT |
| * | INDICATES RESULT IS OUTSIDE QC LIMIT |
| NA | NOT ANALYZED |

SCALE

200' 0 200'

NOTES:

1. MAY 1991 SAMPLES ONLY ANALYZED IN TOTAL STATE AND IN FEBRUARY 1992 EVENT ONLY GROUND-WATER FROM SELECTED WELLS ANALYZED IN FILTERED/UNFILTERED STATES.
2. ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.
3. LOCATION OF UNDERGROUND STRUCTURES OBTAINED BY FIELD MEASUREMENT WHERE POSSIBLE, OTHERWISE OBTAINED FROM OTHER SOURCES AND MAY BE APPROXIMATE ONLY. OTHER UNDERGROUND STRUCTURES MAY EXIST, THE LOCATIONS OF WHICH ARE PRESENTLY UNKNOWN.
4. CONTOUR INTERVAL = 10 FEET.

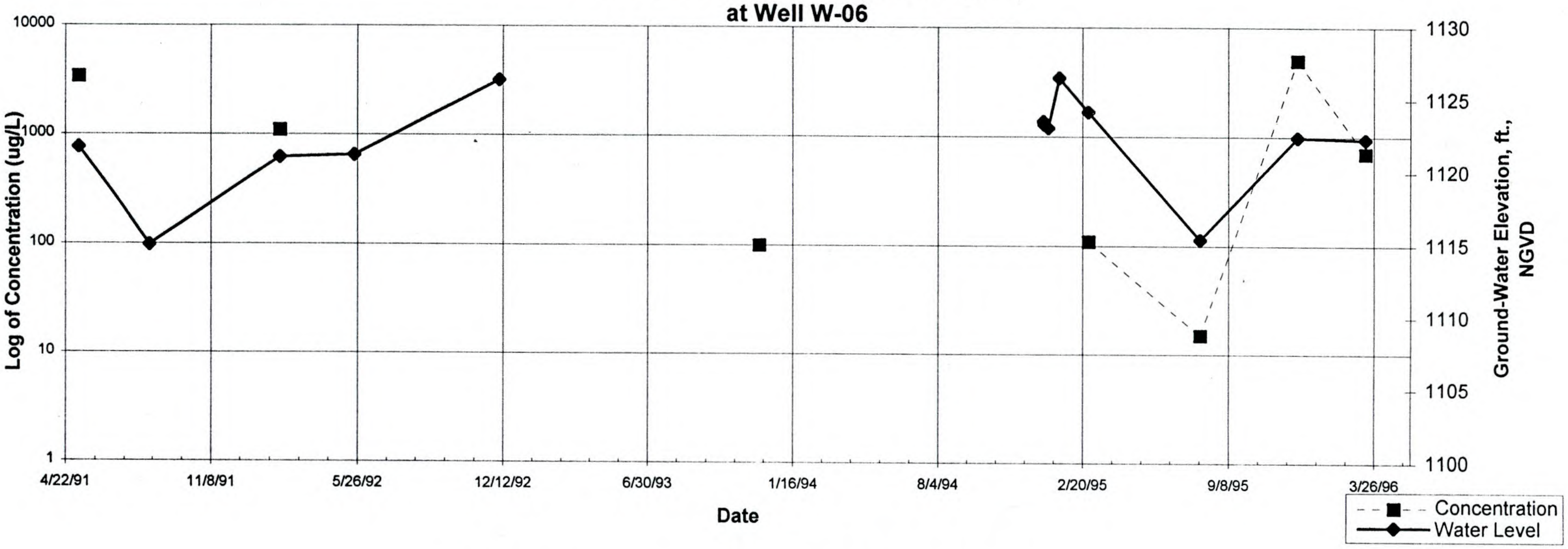
ROSEN SITE
CORTLAND, NEW YORK
GROUND-WATER MONITORING REPORT

# SELECTED INDICATOR PARAMETERS IN GROUND WATER

BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists

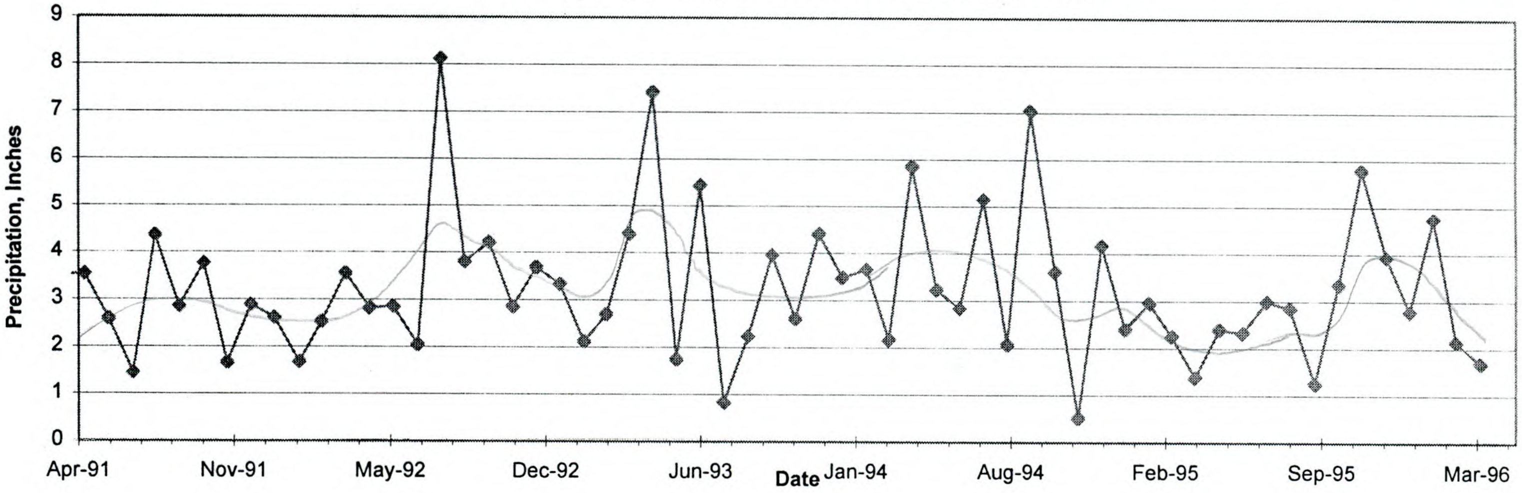
FIGURE
4

X: (XREF)
L: (LAYER)
P: 49401SM1
6/96 SYR-54-YCC RCB
49405003/49405N01.DWG



TCA Concentration vs. Water Table at Well W-06

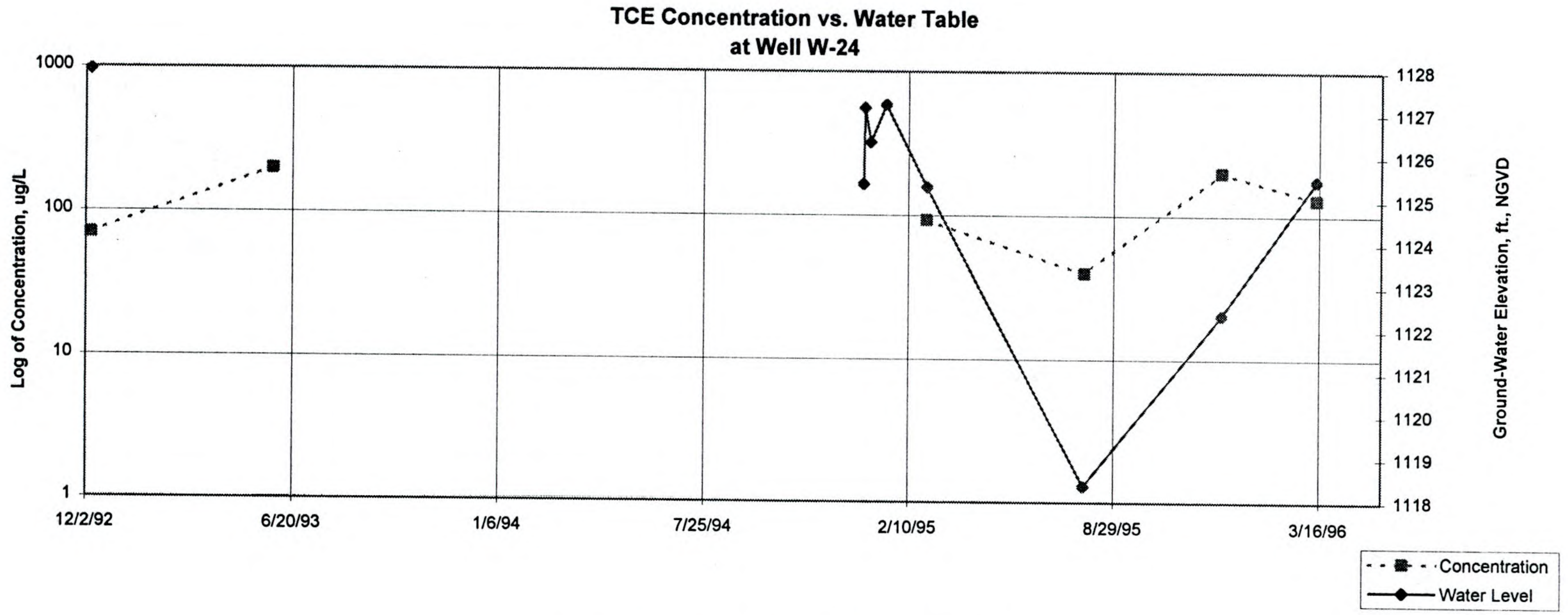
Total Monthly Precipitation for Cortland, New York



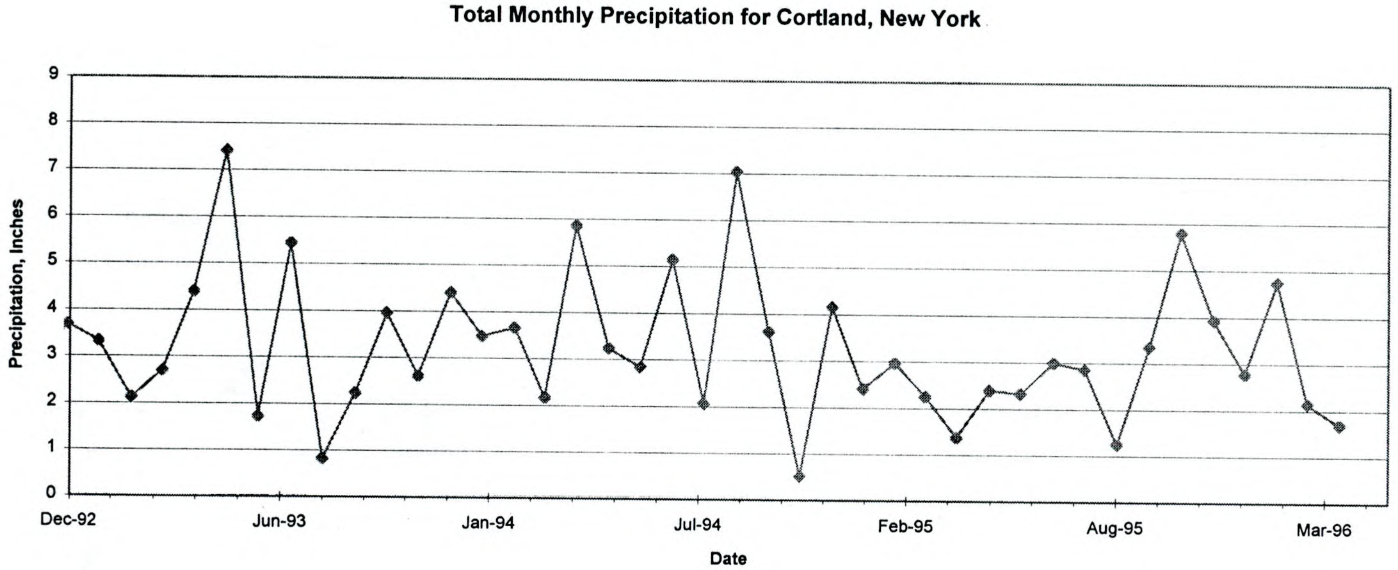
PRECIP.XLS

7/17/96

FIGURE 5



TCE Concentration vs. Water Table
at Well W-24



Total Monthly Precipitation for Cortland, New York

PRECIP.XLS

7/17/96

FIGURE 6

FILE

BBL
BLASLAND, BOUCK & LEE, INC.
*engineers & scientists*

*Transmitted Via U.S. Postal Service*

December 26, 1996

Mr. Mark Granger
United States Environmental Protection Agency
290 Broadway, 20th Floor
New York, New York 10007-1866

Re: Rosen Site
August 1996 Ground-Water Sampling and Analysis Event
Project #: 0494 494.05 #2

Dear Mr. Granger:

This letter reports the results of the August 1996 ground-water sampling and analysis event conducted at the Rosen Site in Cortland, New York. This ground-water sampling and analysis event was conducted to further evaluate the concentration trends of volatile organic constituents (VOCs) and to evaluate indicators of intrinsic biodegradation.

This letter contains the following sections:

- A ground-water sampling and analysis section summarizing the activities completed during this event;
- A results section presenting the analytical results for this event;
- A discussion section evaluating the VOC concentration trends and intrinsic biodegradation; and
- A summary section.

## Ground-Water Sampling and Analysis

Blasland, Bouck & Lee, Inc. (BBL) collected ground-water samples from seven wells (W-02, W-04, W-06, W-11, W-18, W-19, W-23) on August 21 and 22, 1996. These wells were selected to represent ground-water quality conditions upgradient of the site, at the site, at the downgradient perimeter of the site, and downgradient of the site along the ground-water flow path at the center of the area containing VOCs in ground water as follows:

- Upgradient wells W-24 and W-04 were selected to monitor impacted ground water associated with the former city of Cortland dump and non-impacted ground water, respectively.
- On-site well W-06 was selected to monitor the trends of VOCs at the site near a source of 1,1,1-trichloroethane (TCA).

6723 Towpath Road • P.O. Box 66 • Syracuse, NY 13214-0066
Tel (315) 446-9120 • Voice Mail (315) 446-2570 • Fax (315) 449-0017 • Offices Nationwide

- Perimeter wells W-02 and W-11 were selected to monitor the distribution of VOCs in the upper and lower sections of the upper outwash.

- Downgradient wells W-18 and W-19 were selected to monitor the distribution of VOCs in the upper and lower sections of the upper outwash.

BBL sampled the seven wells in accordance with procedures set forth in the Remedial Investigation (RI) Sampling and Analysis Plan (SAP) (Blasland & Bouck Engineers, P.C., December 1990), as modified by Attachment 1 for low-flow sampling procedures. Mr. Todd Miller of the United States Geological Survey (USGS) conducted oversight of the field activities on behalf of the United States Environmental Protection Agency (USEPA).

For this sampling event, ground-water samples from seven monitoring wells were analyzed for Target Compound List (TCL) VOCs by USEPA Contract Laboratory Program-Statement of Work (CLP-SOW) 10/92 Superfund Analytical Methods for Low Concentration Water for Organic Analysis. In addition, the ground-water samples from seven monitoring wells were analyzed for total organic carbon (TOC) by USEPA SW-846 Method 9060. TOC was analyzed as an indicator of environmental conditions for intrinsic biodegraration. Recra Environmental, Inc. (Recra) performed the VOC CLP and TOC analyses. BBL validated the VOC CLP data, using the procedures set forth in the RI SAP.

In addition, MICROSEEPS analyzed ground-water samples from seven wells for dissolved gases (carbon dioxide, nitrogen, dissolved oxygen, methane, and sulfide) in ground water as indicators of intrinsic biodegradation. These samples were analyzed using method AM15.01.

Additionally, Galson Laboratories (Galson) analyzed ground-water samples from seven wells for sulfate, iron, manganese, alkalinity, and total suspended solids (TSS). Sulfate was determined during the December 1995 ground-water sampling event to be an appropriate indicator of intrinsic biodegradation at the Rosen site. Sulfate was analyzed using USEPA Method 375.4. Filtered and unfiltered iron and manganese were analyzed by USEPA Method 200.7. Ferric (III)/ferrous(II) iron and manganese (II/IV) were estimated from the filtered and unfiltered metal results. The different oxidation states of iron and manganese were also used as indicators of intrinsic biodegradation. Alkalinity in ground water was analyzed by USEPA Method 310.1 to support and evaluate the dissolved gases data.

In addition to the standard field parameter measurement (pH, temperature, and conductivity), BBL measured dissolved oxygen (DO) and turbidity. DO, pH, and temperature were used to assess the environmental conditions for intrinsic biodegradation, while turbidity was used to assess the condition of the samples submitted for total metals analysis. Oxidation-reduction potential (ORP) was intended to be measured during this sampling event; however, the ORP could not be measured due to equipment problems.

Quality assurance/quality control (QA/QC) samples, which include field duplicates, trip blanks, field blanks (required due to the use of non-dedicated pumps for the low-flow sampling method), laboratory fortified blanks, and matrix spike/matrix spike duplicates, were also analyzed for the VOC CLP samples. A trip blank was included in each cooler containing samples for VOC analyses, while other QA/QC samples were analyzed at a rate of one per 20 samples or one per day for VOC CLP analyses.

On behalf of USEPA, Mr. Todd Miller, USGS, collected the following ground-water split samples:

| Well | Analyses |
|---|---|
| W-06 | TCL VOCs and unfiltered Target Analyte List (TAL) metals |
| W-19 | TCL VOCs and unfiltered TAL metals |
| W-24 | TCL VOCs and unfiltered TAL metals |

These analyses were performed by Buck Environmental Laboratories, Inc. (Buck), and the results of these analyses are included as Attachment 2. To evaluate the consistency of the primary sample (i.e., those collected by BBL) and the USEPA split sample results, the relative percent difference (RPD) between the detections was calculated. This comparison is included in the results section of this report.

BBL utilized two different sampling methods at well W-06 to assess the possible variation in VOC concentrations. These VOC samples were obtained as follows:

- Pump Sampling: The first sample was obtained after the removal of seven well volumes and the stabilization of the field parameters. The pumping rate was decreased to approximately 0.1 gallons per minute (gpm) and allowed to stabilize. The sample was collected through dedicated tubing.

- Bailer Sampling: The pump was removed from the well, and a dedicated Teflon bailer was used to obtain a duplicate VOC sample.

The VOC concentrations of the sample obtained through the pump and the duplicate sample obtained through the bailer are compared in the results section of this report.

Prior to initiating ground-water sampling, BBL obtained a complete round of water levels. At the time of this sampling event, both Perplexity Creek and its tributary were dry. Table 1 presents water level measurements from March 1991 through August 1996.

Figure 1 is a potentiometric surface map constructed from the August 21, 1996 data to depict the water table. As indicated on Figure 1, ground water flowed generally to the north-northeast on this date. A hydraulic gradient of 0.011 (11.12 ft. divided by 1030 ft.) was calculated between well W-06, on site, and well W-18, downgradient of the site. Both the ground-water flow direction and hydraulic gradient are consistent with those observed during the RI and post-RI sampling events.

## Results

This section summarizes the analytical results of this sampling event as follows:

- VOC results;

- Indicators of intrinsic biodegradation including iron, manganese, sulfate, TOC, and dissolved gases with supporting alkalinity data;

- Field parameter measurements; and
- Split sample results.

*VOCs*

Ground-water analytical data for the eight detected VOCs are presented in Table 2. Consistent with previous sampling results, the VOCs detected in the ground-water samples included TCA, trichloroethene (TCE), and their degradation products [1,1-dichloroethane (DCA), 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethene (1,2-DCE), and vinyl chloride (VC)]. Specifically, DCA is a degradation product of TCA; 1,2-DCE and VC are degradation products of TCE. 1,1-DCE can result from the degradation of either TCA or TCE. Figures 2 and 3 present TCA and associated degradation product concentration distributions and TCE and associated degradation product concentration distributions, respectively.

In addition to TCA, TCE, and their degradation products, one other VOC was detected at a low concentration in the ground-water samples collected during this sampling event: tetrachloroethene (PCE). PCE was only detected at one well (W-18) at an estimated concentration of 0.33 micrograms per liter (ug/L).

As indicated in Table 2, three VOCs exceeded the federal maximum contaminant levels (MCLs): TCA at well W-06 (240 in sample/840 in duplicate ug/L, MCL=200 ug/L); TCE at wells W-06 (9.4 ug/L in sample/22 ug/L in duplicate, MCL=5 ug/L), W-18 (10 ug/L, MCL=5 ug/L), and W-24 (57 ug/L, MCL=5 ug/L); and VC at well W-24 (6.3 ug/L, MCL=2 ug/L).

VOC concentrations were also compared to the New York State ground-water standards. These standards are the same as the federal standards for PCE, TCE, and VC and are similar for 1,1-DCE; however, the New York State standards are more stringent for TCA, DCA, and 1,2-DCE. As indicated in Table 2, TCA and its degradation product DCA exceeded the more stringent New York State standard of 5 ug/L at wells W-02 (30 ug/L and 22 ug/L), W-06 (240/840 ug/L and 56/190 ug/L), W-11 (41 ug/L and 29 ug/L), W-18 (30 ug/L and 16 ug/L), and W-19 (83 ug/L and 16 ug/L). Cis-1,2-DCE was detected at concentrations above the New York State standard of 5 ug/L, but below the federal MCL of 70 ug/L at downgradient well W-18 (5.8 ug/L) and upgradient well W-24 (25 ug/L). 1,1-DCE was observed at well W-19 (6.2 ug/L) at a concentration above the New York State standard of 5 ug/L, but below the federal MCL of 7 ug/L.

*Indicators of Intrinsic Biodegradation*

Table 3 and Figure 4 summarize the inorganic analytical results including iron, manganese, and sulfate. Upgradient total iron concentrations ranged from 120 ug/L at well W-24 to 250 ug/L at well W-04. Soluble iron was not detected at either of the upgradient wells. Iron was also detected at well W-06 and downgradient perimeter wells W-02 and W-11. At well W-06, total iron was observed at 1,300 ug/L, while soluble iron was not detected. At well W-11, total iron was observed at 5,900 ug/L and soluble iron was observed at 5,600 ug/L. Iron concentrations at well W-02, the water table well in the cluster with well W-11, were lower at 5,300 ug/L for total iron and 280 ug/L for dissolved iron. Total and soluble iron were not detected at either of the downgradient wells (W-18 and W-19).

Neither total nor soluble manganese was detected in the samples at upgradient well W-04, but were detected at 460 ug/L and 540 ug/L, respectively, at upgradient well W-24. At on-site well W-06, total manganese was observed at 12 ug/L, while soluble manganese was not detected. Concentrations of manganese were higher at the northern site perimeter and downgradient of the site. The highest manganese concentrations were observed at well W-19, where total and soluble manganese were 1,600 ug/L. Lower concentrations of total and soluble manganese were observed at the water table well W-18 in the cluster with well W-19, at 540 ug/L. Total and soluble manganese were also observed at the well W-02/W-11 cluster. Comparable concentrations of total and soluble manganese were observed at each well, 950 ug/L (total) and 1,000 ug/L (soluble) at well W-02 and 940 ug/L (total and soluble) at well W-11.

Sulfate concentrations at the northern site perimeter and downgradient of the site ranged from 128,000 ug/L at wells W-02 and W-18 to 348,000 ug/L at well W-11 and 654,000 ug/L at well W-19. Based on the observed variation of sulfate concentrations at this well cluster and at the cluster comprised of wells W-18 and W-19, the sulfate concentrations appear to be higher near the bottom of the upper outwash unit than at the water table. During this sampling event, upgradient concentrations of sulfate were 110,000 ug/L at well W-02, representing non-impacted ground water, and 132,000 ug/L at well W-24, representing impacted upgradient ground water. At well W-06, sulfate concentrations were 68,300 ug/L.

As indicated in Table 2, TOC concentrations ranged from 1,800 ug/L at upgradient well W-04 to 2,900 ug/L at northern perimeter well W-02. At upgradient well W-24, the TOC concentration was 2,500 ug/L.

Table 4 presents the dissolved gases analytical results, including carbon monoxide, methane, nitrogen, sulfide, carbon dioxide, and oxygen. Carbon monoxide and methane were not detected in the ground-water samples. Nitrogen concentrations ranged from 18,700 ug/L at well W-11 to 22,200 ug/L at well W-19. Sulfide was detected at well W-02 at 900 ug/L, well W-04 at 510 ug/L, and at well W-18 at 1,090 ug/L. Upgradient concentrations of carbon dioxide were 18,200 ug/L at well W-04 and 33,200 ug/L at well W-24. At on-site well W-06, the carbon dioxide concentration was 33,000 ug/L. Downgradient perimeter concentrations of carbon dioxide were 35,600 ug/L at well W-02 and 33,800 ug/L at well W-11. Downgradient of the site, carbon dioxide concentrations were 21,500 ug/L at well W-18 and 38,200 ug/L at well W-19. Upgradient concentrations of oxygen were 5,450 ug/L at well W-04 and 1,210 ug/L at well W-24. At on-site well W-06, the dissolved oxygen concentration was 3,760 ug/L. Downgradient perimeter concentrations of oxygen were 1,160 ug/L at well W-02 and 960 ug/L at well W-11. Downgradient of the site, oxygen concentrations were 1,210 ug/L at well W-18 and 1,110 ug/L at well W-19.

Alkalinity ranged from 210,000 ug/L to 250,000 ug/L at all wells sampled except for wells W-06 and W-24, where the alkalinity concentrations were 300,000 ug/L.

TSS concentrations were not detected at wells W-06, W-18, W-19, and W-24 (detection level of 4,000 ug/L). TSS concentrations of 8,000 ug/L, 13,000 ug/L, and 26,000 ug/L were observed at wells W-04, W-11, and W-02, respectively.

### *Field Parameters*

Field parameters were measured during well purging and at the time of sampling. The measurements obtained at the time of sampling are presented in Table 5. Ground-water samples were collected at an average conductivity of 1.1 milliSiemens per centimeter (mS/cm), DO concentration of 1.3 milligrams per liter (mg/L), temperature of 11 degrees Celsius, and turbidity of 8 ± 10 nephelometric turbidity units (NTUs). The pH of ground-water samples ranged from 6.6 to 7.1 standard pH units. The highest DO concentration of 4.0 mg/L was observed during this sampling event at upgradient well W-04, followed by 2.2 mg/L at well W-06. The DO concentrations at the remaining wells were 1.0 mg/L or less.

*Split Sample Results*

As previously mentioned, ground-water split samples were collected on behalf of USEPA for VOCs and unfiltered TAL metals at wells W-06, W-19, and W-24. These results are included as Attachment 2. The RPD between the primary ground-water sample detections and the split sample detections was calculated to provide an indication of the sample comparability. Based on USEPA CLP data review guidelines (SOP No. HW-2, Revision 11, Region II, January 1992 and National Functional Guidelines for Inorganic Data Review, February 1994), an RPD of less than 50 percent is considered within acceptable limits for inorganic ground-water duplicate samples. As there is no defined acceptable RPD limit for VOCs (SOP No. HW-6, Revision 8, Region II, January 1992 and National Functional Guidelines for Organic Data Review, February 1994), the 50 percent RPD is used here as a screening limit. An acceptable RPD for split samples sent to different laboratories would be expected to be somewhat higher than an acceptable RPD for duplicate samples analyzed by the same laboratory.

As indicated in Table 6, for the VOC results from Recra and Buck where VOCs detected at non-qualified concentrations and at both laboratories, the RPDs are within acceptable limits except for the TCA, DCA, and TCE results from well W-06. Total iron and manganese were the only inorganic constituents for which there are primary and split sample results. The RPDs for inorganic constituents are within acceptable limits, except for the iron results from well W-24. Those concentrations with RPDs outside generally accepted limits are still within a factor of 3.2.

*Duplicate Sample Results*

As indicated in Table 2, the VOC results for the well W-06 sample and duplicate sample are less similar than those observed during the March 1996 sampling event. The RPDs range from 80.3 to 111.1 percent, which are not typically considered within the acceptable limits for duplicate sample results. However, the primary sample was collected with a bailer and the duplicate was collected with a pump, additional variation is possible. The split sample collected at well W-06 was also collected with a bailer. In general, the sample obtained through the bailers had higher VOC concentrations than the sample obtained through the pump. During previous comparisons, the opposite trend was observed. The RPDs for VOCs collected using different sampling methods (i.e., pump vs. bailer) during the March 1996 event were less than 30 percent. The higher RPDs for the August 1996 sampling event may be attributable to minor variations in sampling or laboratory analytical techniques.

## Discussion

The following discussions provide an evaluation of the following:

- VOC concentration trends; and
- Intrinsic biodegradation.

*VOC Concentration Trends*

Figures 3 and 4, respectively, show the concentration trends of TCA and TCE and their degradation products. From May 1991 to August 1996, the VOC concentrations have generally decreased with time. However, in December 1995, VOC concentration increases were observed -- most notably at well W-06 for TCA and at well W-24 for TCE. Since December 1995, two ground-water sampling events have been conducted in March 1996 and in August 1996. In both events, VOC concentrations at wells W-06 and W-24 are lower than those observed in December 1995 and similar at the other wells sampled. VOC concentration trends upgradient of the site at impacted well W-24, on site at well W-06, at the downgradient perimeter at wells W-02 and W-11, and downgradient of the site at wells W-18 and W-19 are discussed below.

At upgradient well W-24, TCE and its degradation products have generally decreased in concentration from June 1993 (200 ug/L of TCE, 79 ug/L of 1,2-DCE, and 27 ug/L of VC) to August 1995 (40 ug/L of TCE, 43.5 ug/L of 1,2-DCE, and 7 ug/L of VC). In December 1995, TCE and its degradation products increased in concentration (200 ug/L of TCE, 108.4 ug/L of 1,2-DCE, and 19 ug/L of VC). Since December 1995, concentrations of TCE and its degradation products have decreased in the March 1996 (130 ug/L of TCE, 59 ug/L of 1,2-DCE, and 13 ug/L of VC) and the August 1996 (57 ug/L of TCE, 27.3 ug/L of 1,2-DCE, and 6.3 ug/L of VC) sampling events. From March 1996 to August 1996, TCE, 1,2-DCE, 1,1-DCE, and VC concentrations decreased approximately a half an order of magnitude.

At on-site well W-06, TCA and its degradation products have generally decreased in concentration from May 1991 (3,400 ug/L of TCA and 430 ug/L of DCA) to August 1995 (15 ug/L of TCA and 13 ug/L of DCA). In December 1995, TCA and its degradation products increased in concentration (5,000 ug/L of TCA and 390 ug/L of DCA). Since December 1995, concentrations of TCA and its degradation products have decreased in the March 1996 and August 1996 sampling events. In the March 1996 and August 1996 sampling events, TCA concentrations decreased (1,000 ug/L compared to 240 ug/L), and DCA concentrations remained similar (55 ug/L to 56 ug/L). At well W-06, TCE and its degradation products have generally decreased in concentration from May 1991 (45 ug/L of TCE and 56 ug/L of 1,2-DCE) to August 1995 (1.7 ug/L of TCE and 0.84 ug/L of 1,2-DCE). In December 1995, TCE and its degradation products increased in concentration (18 ug/L of TCE and 8.6 ug/L of 1,2-DCE). Since December 1995, concentrations of TCE and its degradation products have decreased in the March 1996 and August 1996 sampling events. From March 1996 to August 1996, TCE concentrations remained similar (5.7 ug/L to 9.4 ug/L); no TCE degradation products were detected in the August 1996 sampling event.

At perimeter wells W-02 and W-11, TCA and its degradation products have generally decreased in concentration from February 1992 (390 ug/L of TCA and 100 ug/L of DCA at well W-11 and 190 ug/L of TCA and 53 ug/L of DCA at well W-02) to August 1996. In the March 1996 and August 1996 sampling events, TCA and DCA concentrations remained similar (45 ug/L compared to 41 ug/L for TCA and 34 ug/L compared to 29 ug/L for DCA) at well W-11, and TCA and DCA concentrations at well W-02 remained similar (22 ug/L compared to 30 ug/L of TCA and 14 ug/L compared to 22 ug/L of DCA).

At downgradient wells W-18 and W-19, TCA and its degradation products have generally decreased in concentration from February 1992 (260 ug/L of TCA and 86 ug/L of DCA at well W-19 and 68 ug/L [March 1995] of TCA and 26 ug/L of DCA at well W-18) to August 1996. In the March 1996 and August 1996 sampling events, TCA and DCA concentrations remained approximately the same or increased slightly (62 ug/L compared to 83 ug/L of TCA and 26 ug/L compared to 38 ug/L of DCA) at well W-19, and TCA and DCA concentrations at well W-18 remained approximately the same (25 ug/L compared to 30 ug/L of TCA and 14 ug/L compared to 16 ug/L of DCA).

As discussed in the previous ground-water sampling reports, the observed VOC concentration increases in December 1995 were likely the result of increased leaching of residual constituents in existing source areas of TCA on site near well W-06 and of TCE off site and upgradient near well W-24. TCA concentrations at well W-06 appear to be more strongly correlated to precipitation than water table fluctuation, while TCE concentrations at well W-24 appear to be correlated to both precipitation and water table fluctuations.

Figures 5 and 6 provide graphs of TCA and TCE concentrations, ground-water levels, and precipitation data from April 1991 to August 1996. For the period where quarterly data have been obtained (March 1995 to August 1996), there is an apparent correlation between the precipitation amounts and the concentration trends. Concentrations were lower in the first three quarters of 1995 when there was less precipitation, and concentrations were higher in the last quarter of 1995 following periods when there was more precipitation. This trend is generalized, because the amount of precipitation is not necessarily equivalent to the amount of infiltration (i.e., the passage of water through the ground surface into the soil). It is the infiltration of water into the subsurface that leads to the leaching or partitioning of constituents from the soil into the ground water. The amount of precipitation that becomes infiltration is dependent on the ground surface conditions (e.g., vegetation, snow/ice cover, topography) and evapotranspiration. Seasonal changes such as frozen ground conditions, variations in vegetation, or the rate of evapotranspiration, will therefore lead to seasonal changes in the amount of infiltration for a given amount of precipitation. Changes in the amount of infiltration results in changes to the amount of constituents leached into the ground water. For example, at well W-06, the precipitation prior to the December 1995 sampling event caused increased leaching of the VOC source near this location resulting in increases and/or the maintenance of similar TCA and TCE concentrations. However, the precipitation prior to the March 1996 event did not appear to cause increased leaching of the VOC source near this location, which could be attributed to less infiltration due to frozen ground surfaces or lesser amounts of precipitation. Likewise, the precipitation prior to the August 1996 event did not appear to cause increased leaching of the VOC source near this location, which could be attributed to less infiltration due to evapotranspiration or ground conditions.

*Intrinsic Biodegradation*

Chlorinated hydrocarbons such as TCA and TCE can be biodegraded through three pathways: through use as an electron acceptor, through use as an electron donor, or through co-metabolism. The electron acceptor reactions are the most important processes for the intrinsic biodegradation of chlorinated hydrocarbons such as TCA and TCE. During microbial respiration under neutral pH conditions, electron acceptors tend to be used in order of decreasing energy yield, as follows: oxygen ($O_2$), nitrate ($NO_3$), manganese (IV) and iron (III) oxides, sulfate ($SO_4$), and carbon dioxide ($CO_2$). In addition, organic compounds such as TCA and TCE can be used as electron acceptors directly. Trends in oxygen, nitrogen, manganese and iron, sulfur, and carbon compound (hydrocarbons and carbon dioxide) concentrations and distributions in the ground water are use to evaluate intrinsic biodegradation at the Rosen site. These trends are discussed for the ground-water flow path extending from upgradient well W-04 to on-site well W-06, downgradient perimeter wells W-02 and W-11, and to downgradient off-site wells W-18 and W-19.

Field DO concentrations measured during this sampling event decreased along the ground-water flow path from 4.0 mg/L at well W-04, to 2.2 mg/L at on-site well W-06, to 0.3 mg/L at perimeter well W-11, and to 0.3 at downgradient off-site well W-19. Dissolved oxygen gas measured in the laboratory during this sampling event decreased along the flow path from 5.45 mg/L at well W-04, to 3.76 mg/L at on-site well W-06, to 0.96 mg/L at perimeter well W-11, and to 1.11 mg/L at downgradient perimeter well W-19. The dissolved oxygen data trends suggest that oxygen is being used up as an electron acceptor along the flow path. The dissolved oxygen concentrations suggest residual oxygen may be competing with other electron acceptors.

In previous sampling events, no trends were noted for nitrogen compounds. Nitrate was detected during one of two events where this parameter was analyzed at upgradient well W-04 and on-site well W-06. Nitrate was not detected in two sampling events at perimeter wells W-02 and W-11 and off-site well W-19. Nitrate was detected (200 ug/L and 400 ug/L) at off-site well W-18. Dissolved nitrogen gas concentrations measured during this sampling event along the flow path increased slightly on site and at the perimeter of the site. Nitrogen gas concentrations were 18,900 ug/L at upgradient well W-04, 21,800 ug/L at on-site well W-06, 21,800 ug/L at perimeter well W-02, 18,700 ug/L at perimeter well W-11, 19,700 ug/L at downgradient well W-18, and 22,200 ug/L at downgradient well W-19. The lack of nitrate in background ground water suggests that nitrate is likely not the primary electron acceptor. The slight increase in nitrogen gas, coupled with previous nitrate concentration measurements, could indicate that limited nitrate reduction is occurring on site and at the downgradient perimeter.

ORP measurements could not be obtained during this sampling event; however, in previous sampling events the ORP measurements indicated that reducing conditions are present. The ORP results from previous sampling events are summarized below.

| Well | ORP Value Range (mV) |
|---|---|
| W-04 | 87 to 153 |
| W-06 | -492 to 300 |
| W-02 | 0.6 to 88 |
| W-11 | -11 to 12 |
| W-18 | 34 to 120 |
| W-19 | 78 to 314 |

Based on these ORP results, the environmental conditions at the Rosen site are conducive for the reduction of manganese oxides (ORP values in the 200 mV range) and iron oxides (ORP values in the 20 mV range) and possibly sulfate (ORP values in the -200 mV range). Manganese (IV), iron (III), and sulfate, which are generally present at the site, likely act as electron acceptors in microbial respiration. These electron acceptors can be used by a variety of microbes that have the capability to reductively dehalogenate chlorinated compounds (Bouwer, 1993). For the purposes of this evaluation, the concentrations of the lower manganese and iron oxidation states [i.e., iron and manganese (II)] were approximated by the corresponding filtered (soluble) concentrations. The higher oxidation state concentrations were determined by subtracting the filtered (soluble) concentration from the unfiltered (total) concentration.

Manganese concentrations (total) increased during this sampling event along the flow path from not detected at upgradient well W-04; 12 ug/L at on-site well W-06; 950 and 940 ug/L at perimeter wells W-02 and W-11; and 540 and 1,600 ug/L at downgradient wells W-18 and W-19. At the downgradient wells (perimeter and off site), manganese (II) was the predominant oxidation state observed. Iron concentrations (total) also increased during this sampling event along the flow path from 250 ug/L at upgradient well W-04; 1,300 ug/L at on-site well W-06; and 5,300 and 5,900 ug/L at perimeter wells W-02 and W-11. However, neither total nor soluble iron was detected at downgradient wells W-18 and W-19. At the upgradient well W-04, on-site well W-06, and perimeter well W-02, iron (III) was the predominant oxidation state. However, at perimeter well W-11, iron (II) was the predominant oxidation state. This may indicate that iron (III) is being used as an electron acceptor.

Sulfate concentrations decreased than increased along the flow path during this sampling event from 110,000 ug/L at upgradient well W-04; 68,300 ug/L at on-site well W-06; 128,000 and 348,000 ug/L at perimeter wells W-02 and W-11; and 128,000 and 654,000 ug/L at downgradient wells W-18 and W-19. In general, higher sulfate concentrations were observed in the downgradient wells that are screened in the lower portion of the upper outwash (e.g., wells W-11 and W-19). Dissolved sulfide gas was present at upgradient well W-04 (510 ug/L), perimeter well W-02 (900 ug/L), and downgradient well W-18 (1,090 ug/L). Sulfide gas was not detected at the other wells sampled during this event. These sulfide concentrations suggest limited sulfate reduction is occurring. These data trends suggest the reduction of manganese and iron oxides is occurring at the site, and possibly sulfate reduction is occurring in the vicinity of well W-06.

For heterotrophic microorganisms to gain energy and grow, the transport of electrons from a donor to an acceptor occurs. This source of electron donors is primarily from organic compounds, but not the higher oxidized compounds such as TCA or TCE. Therefore, sources of native and/or anthropogenic carbon are required. The TOC concentrations indicate 1,800 ug/L of presumably native carbon is present in the flow system (TOC concentration at W-04), with slightly higher TOC concentrations at the site (2,700 ug/L at well W-06), at the downgradient perimeter (2,900 ug/L at well W-02 and 2,400 ug/L at well W-11) and off-site downgradient (2,000 ug/L at well W-18 and 2,600 ug/L at well W-19). The higher concentrations of TOC could indicate the contribution of anthropogenic carbon from the site.

Under reducing conditions, halogenated compounds such as TCA can also act as electron acceptors. In this process, the halogen (chlorine for TCA) is removed and replaced with hydrogen. When halogenated compounds act as electron acceptors, the presence of parent and degradation products provides data to evaluate the degree of microbial activity in the dehalogenation process. The presence of TCA, TCE, DCA, 1,2-DCE, and VC along the flow path suggests that reductive dechlorination is occurring at the site and upgradient of the site due to microbial activity. In general, parent compound TCA is more predominant at well W-06 near a TCA source than further downgradient along the flow path.

Methane was not detected in the dissolved gases. The lack of methane indicates methanogenesis is not occurring at the site, which is supported by the ORP data (i.e., environmental conditions may not be reducing enough).

Carbon dioxide gas concentrations measured during this sampling event increased along the flow path from 18,200 ug/L at upgradient well W-04; 33,000 ug/L at on-site well W-06; 35,600 ug/L at W-02 and 33,800 ug/L at W-11 (perimeter wells); and 21,500 ug/L at W-18 and 38,200 ug/L at W-19 (off-site downgradient wells). Since methanogenesis is not likely occurring at the site (where carbon dioxide would be used as the electron acceptor), the increase in carbon dioxide could be the result of the complete reduction of organic compounds, including TCA.

Alkalinity remained at a fairly consistent concentration along the flow path during this sampling event from 240,000 ug/L at upgradient well W-04, to 300,000 ug/L at on-site well W-06, to 240,000 ug/L and 210,000 ug/L at perimeter wells W-02 and W-11, and to 230,000 ug/L and 250,000 ug/L at off-site wells W-18 and W-19. The pH dropped slightly along the flow path from 7.1 at upgradient well W-04 to 6.8 and 6.6 at perimeter wells W-02 and W-11, respectively. A slight increase in pH was observed at downgradient well W-18 and W-19 (i.e., 7.0 and 6.8). As a result of carbon dioxide production, alkalinity would be expected to increase while pH decreased, which may be observed at on-site well W-06.

## Summary

Based on the results of this and previous ground-water sampling events, the following observations can be made:

- Only three VOCs exceeded federal MCLs during this sampling event: TCA at well W-06; TCE at wells W-06, W-18, and W-24; and VC at well W-24. Exceedances at well W-24 represent upgradient impacts. The only VOC that currently exceeds the federal MCL downgradient of the site is TCE at well W-18.

- VOC concentrations in ground water have generally decreased with time, as a result of natural attenuation (i.e., a combination of volatilization, hydrolysis, dehalogenation, and biodegradation) and hydrodynamic dispersion. Increased VOC concentrations observed on site in December 1995 (e.g., at well W-06) are attributed to increased leaching of a residual source. The increased leaching, which is linked to infiltration of precipitation, can be eliminated by installation of an engineered cap to cover the source area.

- Downgradient VOC concentrations did not increase in response to the on-site December 1995 increased concentrations. Instead, these downgradient VOC concentrations have continued to decrease or remained similar.

- Intrinsic biodegradation is occurring at the site, based on the combined evidence listed below.

    - The presence of TCA and TCE and their degradation products at the site, indicates that reductive dehalogenation is occurring at the site due to biological activity.

    - DO trends suggest that oxygen is being depleted along the flow path from well W-04 to W-19.

    - ORP data indicates that reducing conditions generally exist at the site. Based on the observed ranges of ORP values, manganese (IV), iron (III), and sulfate, which are generally present at the site, likely act as electron acceptors in microbial respiration. Further, under such reducing conditions, halogenated compounds such as TCA and TCE are also acting as electron acceptors.

    - Concentrations of possible electron acceptors [i.e., iron (III) and manganese (IV)] generally decreased to the northern perimeter, while reduced species [i.e., iron (II) and manganese (II)] generally increased. Concentrations of possible electron acceptor sulfate generally increased to the northern perimeter and downgradient of the site. Sulfide, a reduced species, was observed at perimeter well W-02 and downgradient well W-18. This data suggests that limited sulfate reduction may occur in the vicinity of well W-06, while iron (III) and manganese (IV) reduction may occur in the vicinity of the northern site perimeter.

If you have any questions or comments regarding the information presented herein, please contact Mr. Charles Poole.

Very truly yours,
BLASLAND, BOUCK & LEE, INC.

Nancy E. Gensky

Nancy E. Gensky
Associate

NEG/gap
Attachments

cc: Mr. Charles Poole, CPRP Group Coordinator, Overhead Door Corporation
CPRP Group (Distribution List)
Mr. Robert K. Goldman, P.E., Blasland, Bouck & Lee, Inc.
Mr. David W. Hale, Blasland, Bouck & Lee, Inc.
Ms. Lynette B. Mokry, Blasland, Bouck & Lee, Inc.

# Tables

BLASLAND, BOUCK & LEE, INC.
*engineers & scientists*

TABLE 1

## GROUND-WATER/SURFACE-WATER ELEVATIONS

ROSEN SITE
CORTLAND, NEW YORK

| Well | TOIC Elev. | 3/4/91 | 3/14/91 | 3/19/91 | 4/16/91 | 5/10/91 | 8/16/91 | 2/10/92 | 5/22/92 | 12/7/92 | 12/28/94 | 12/29/94 | 1/4/95 | 1/19/95 | 2/28/95 | 7/31/95 | 12/12/95 | 3/13/96 | 8/21/96 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| W-01 | 1124.30 | 1113.86 | 1111.14 | 1111.09 | 1110.78 | 1109.35 | 1105.81 | 1108.63 | 1109.65 | 1110.95 | 1110.14 | 1110.24 | 1110.01 | 1111.65 | 1109.90 | 1106.13 | 1108.53 | 1109.35 | 1107.77 |
| W-02 | 1125.69 | 1115.66 | 1114.10 | 1113.83 | 1113.48 | 1112.33 | 1108.07 | 1111.62 | 1112.47 | 1114.22 | 1114.25 | 1114.09 | 1113.93 | 1115.17 | 1113.33 | 1108.54 | 1112.66 | 1113.57 | 1111.10 |
| W-03 | 1128.44 | 1118.71 | 1117.27 | 1116.75 | 1116.08 | 1115.39 | 1110.57 | 1114.01 | NA | NA | NA | 1116.68 | 1117.09 | 1119.45 | 1114.84 | 1110.87 | 1116.66 | 1117.42 | 1112.66 |
| W-04 | 1138.12 | 1134.89 | 1133.87 | 1133.74 | 1133.22 | 1133.02 | 1120.59 | 1133.82 | 1132.17 | 1134.48 | NA | 1134.76 | 1134.42 | 1135.13 | 1135.19 | NA | 1134.07 | 1134.20 | 1128.92 |
| W-05 | 1130.84 | 1124.62 | 1117.65 | 1117.61 | 1116.43 | 1114.99 | 1109.05 | 1114.34 | 1114.62 | 1117.88 | 1116.65 | 1116.51 | 1116.39 | 1119.18 | 1115.51 | 1109.41 | 1113.87 | 1114.83 | 1112.03 |
| W-06 | 1131.43 | 1127.73 | 1123.24 | 1122.51 | 1121.97 | 1121.61 | 1114.94 | 1120.93 | 1121.09 | 1126.29 | 1123.54 | 1123.31 | 1123.10 | 1126.54 | 1124.20 | 1115.43 | 1122.45 | 1122.30 | 1118.63 |
| W-07 | 1125.87 | 1117.56 | 1114.56 | 1114.45 | 1113.90 | 1112.82 | 1107.82 | 1111.67 | 1112.42 | 1114.42 | 1113.70 | 1113.68 | 1113.56 | 1115.61 | 1113.10 | 1108.73 | 1111.39 | 1112.14 | 1110.23 |
| W-08 | 1123.61 | 1111.03 | 1110.22 | 1109.60 | 1109.23 | 1108.76 | 1105.54 | 1107.85 | 1108.76 | 1109.66 | 1109.06 | 1108.99 | 1108.81 | 1109.82 | 1108.60 | 1105.77 | 1107.89 | 1108.59 | 1107.19 |
| W-09 | 1123.57 | 1111.60 | 1110.42 | 1110.22 | 1109.80 | 1109.97 | 1105.76 | 1108.17 | 1109.07 | 1110.45 | 1109.66 | 1109.60 | 1109.43 | 1110.50 | 1109.09 | 1106.13 | 1108.36 | 1109.15 | 1107.68 |
| W-10 | 1123.36 | 1115.54 | 1113.36 | 1113.17 | 1112.81 | 1112.18 | 1108.09 | 1111.16 | 1111.75 | 1113.26 | 1112.70 | 1112.64 | 1112.51 | 1113.86 | 1112.25 | 1108.37 | 1111.38 | 1111.90 | 1110.29 |
| W-11 | 1124.47 | 1112.39 | 1111.77 | 1111.38 | 1111.05 | 1110.88 | 1107.46 | 1109.44 | 1110.70 | 1111.87 | 1111.48 | 1111.24 | 1111.10 | 1111.99 | 1109.74 | 1107.86 | 1110.32 | 1111.24 | 1109.54 |
| W-12 | 1127.63 | 1114.35 | 1113.53 | 1113.26 | 1112.97 | 1112.68 | 1109.02 | 1111.14 | 1112.47 | 1113.86 | 1113.08 | 1113.06 | 1112.92 | 1114.02 | 1112.55 | 1109.30 | 1112.26 | 1113.21 | 1111.18 |
| W-13 | 1132.21 | 1126.18 | 1123.09 | 1122.29 | 1121.89 | 1121.78 | 1114.29 | 1120.61 | 1121.47 | 1125.16 | 1123.43 | 1123.22 | 1122.81 | 1129.09 | 1126.81 | 1114.47 | 1123.01 | 1122.69 | 1118.16 |
| W-14 | 1132.19 | 1124.10 | 1122.49 | 1122.03 | 1121.51 | 1121.60 | 1115.09 | 1119.79 | 1121.28 | 1123.39 | 1122.39 | 1122.23 | 1122.08 | 1124.58 | 1122.57 | 1115.41 | 1121.91 | 1122.37 | 1118.94 |
| W-15 | 1125.02 | NA | NA | NA | NA | NA | NA | 1109.59 | 1111.10 | 1112.06 | 1111.42 | 1111.31 | 1111.18 | 1112.06 | 1110.81 | 1107.95 | 1110.46 | 1111.39 | 1109.70 |
| W-16 | 1122.63 | NA | NA | NA | NA | NA | NA | 1108.67 | 1110.27 | 1111.11 | 1110.44 | 1110.26 | 1110.18 | 1110.71 | 1109.85 | 1107.71 | 1109.65 | 1111.00 | 1109.29 |
| W-17 | 1122.28 | NA | NA | NA | NA | NA | NA | 1108.28 | 1109.96 | 1111.66 | 1109.99 | 1109.95 | 1109.83 | 1110.43 | 1109.52 | 1107.59 | 1109.46 | 1110.65 | 1109.08 |
| W-18 | 1120.86 | NA | NA | NA | NA | NA | NA | 1107.09 | 1108.42 | 1109.31 | 1108.52 | 1108.42 | 1108.29 | 1109.04 | 1108.01 | 1106.15 | 1107.88 | 1108.86 | 1107.51 |
| W-19 | 1120.67 | NA | NA | NA | NA | NA | NA | 1106.70 | 1108.21 | 1108.85 | 1108.24 | 1108.12 | 1108.00 | 1108.54 | 1107.69 | 1105.76 | 1107.48 | 1108.56 | 1107.16 |
| W-20 | 1120.63 | NA | NA | NA | NA | NA | NA | 1106.60 | 1108.13 | 1108.55 | 1108.24 | 1108.08 | 1107.98 | 1108.41 | 1107.78 | 1105.67 | 1107.03 | 1109.10 | 1107.09 |
| W-21 | 1144.42 | NA | NA | NA | NA | NA | NA | 1117.46 | 1123.57 | 1130.16 | 1130.55 | 1130.27 | 1130.13 | 1131.08 | 1129.87 | 1125.36 | 1117.89 | 1130.60 | 1125.11 |
| W-22 | 1135.35 | NA | NA | NA | NA | NA | NA | 1115.91 | 1115.52 | 1118.79 | 1126.23 | 1117.70 | 1117.36 | 1120.40 | 1116.67 | 1110.50 | 1114.74 | 1115.81 | 1112.87 |
| W-23 | 1137.44 | NA | NA | NA | NA | NA | NA | NA | NA | 1128.92 | 1127.51 | 1128.14 | 1127.44 | 1128.37 | 1126.81 | NA | NA | NA | NA |
| W-24 | 1137.16 | NA | NA | NA | NA | NA | NA | NA | NA | 1127.94 | 1125.39 | 1127.16 | 1126.36 | 1127.22 | 1125.32 | 1118.38 | 1122.37 | 1125.48 | 1121.32 |
| W-25 | 1124.50 | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1112.73 | 1112.60 | 1112.50 | 1113.67 | 1112.03 | 1108.45 | 1111.59 | 1112.39 | 1110.42 |
| W-26 | 1124.60 | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1111.96 | 1111.85 | 1111.69 | 1112.75 | 1111.31 | 1108.15 | 1110.88 | 1111.79 | 1109.92 |

| Stream Point | Top, Stream Point Elev. | 3/4/91 | 3/14/91 | 3/19/91 | 4/16/91 | 5/10/91 | 8/16/91 | 2/10/92 | 5/22/92 | 12/7/92 | 12/28/94 | 12/29/94 | 1/11/95 | 1/19/95 | 2/28/95 | 7/31/95 | 12/12/95 | 3/13/96 | 8/21/96 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP-1 | 1136.30 | NA | NA | 1134.80 | 1134.80 | 1134.80 | NA | NA | 1135.49 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SP-2 | 1120.80 | NA | NA | 1120.10 | 1120.10 | 1119.40 | NA | NA | NA | NA | NA | NA | NA | NA | 1120.20 | NA | NA | NA | NA |
| SP-2A | 1124.16 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1120.56 | 1121.68 | NA | NA | NA | NA | NA |
| SP-3 | 1117.70 | NA | NA | 1115.60 | 1115.60 | 1115.40 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SP-3A | 1120.01 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1118.46 | NA | NA | NA | NA | NA | NA |
| SP-4 | 1117.20 | NA | NA | 1116.10 | 1115.80 | 1115.80 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| SP-5 | 1121.80 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1119.05 | 1119.26 | 1119.70 | NA | NA | NA | NA |

NOTES:
Elevations are in feet above mean sea level based on National Geodetic Vertical Datum of 1929.
NA - Indicates water elevations were not measured.
TOIC - top of inner casing

TABLE 2

# VOLATILE ORGANIC COMPOUNDS DETECTED IN GROUND WATER - AUGUST 1996

ROSEN SITE
CORTLAND, NEW YORK

| Compound | New York State Standards/ Guidance Values | MCLs/MCLGs | W-02<br>8/21/96 | W-04<br>8/21/96 | W-06<br>8/22/96 | W-06 (DUP)<br>8/22/96 | W-11<br>8/21/96 | W-18<br>8/21/96 | W-19<br>8/22/96 | W-24<br>8/22/96 |
|---|---|---|---|---|---|---|---|---|---|---|
| Volatiles | | | | | | | | | | |
| 1,1,1-Trichloroethane | 5 | 200/200 (G) | **30 D** | 1 U | **240** | **840** | **41** | **30 D** | **83** | 4 U |
| 1,1-Dichloroethane | 5 | | **22** | 1 U | **56** | **190** | **29** | **16** | **38** | 4 U |
| 1,1-Dichloroethene | 5 | 7/7 (G) | 1.4 | 1 U | 10 U | 50 U | 4.1 | 1.8 | **6.2** | 4 U |
| cis-1,2-Dichloroethene | 5 | 70/70 (G) | 1 U | 1 U | 10 U | 50 U | 4 U | **5.8** | 4 U | **25** |
| Tetrachloroethene | 5 | 5/0 (G) | 1 U | 1 U | 10 U | 50 U | 4 U | 0.33 J | 4 U | 4 U |
| trans-1,2-Dichloroethene | 5 | 100/100 (G) | 1 U | 1 U | 10 U | 50 U | 4 U | 1 U | 4 U | 2.3 J |
| Trichloroethene | 5 | 5/0 (G) | 0.48 J | 1 U | **9.4 J** | **22 J** | 4 U | **10** | 4 U | **57** |
| Vinyl chloride | 2 | 2/0 (G) | 1 U | 1 U | 10 U | 50 U | 4 U | 0.39 J | 4 U | **6.3** |
| Other: | | | | | | | | | | |
| Total Organic Carbon | | | 2900 | 1800 | 2700 | NA | 2400 | 2000 | 2600 | 2500 |

NOTES:
All concentrations in micrograms per liter (ug/L); equivalent to parts per billion (ppb).
Results presented represent the best result from the original and dilution runs.
The following volatile organic compounds were also analyzed, but were not detected in the ground-water samples:

1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2-Butanone
2-Hexanone
4-Methyl-2-pentanone
Acetone
Benzene
Bromochloromethane
Bromodichloromethane
Bromoform
Bromomethane
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
cis-1,3-Dichloropropene
Ethylbenzene
Methylene chloride
Styrene
Toluene
trans-1,3-Dichloropropene
Xylenes, Total

D = Identifies compounds identified in an analysis at a secondary dilution factor.
J = Indicates an estimated value.
U = Identifies compounds that were not detected. The value presented is the detection limit.
DUP = Duplicate sample.
NA = Not Analyzed.

Bold indicates NYSDEC standards exceeded; shading indicates federal MCLs exceeded.

References:

Standard and Guidance values are according to the New York State Department of Environmental Conservation, Division of Water Technical and Operation Guidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values [designated by (G)], October 1993.

MCLs [Maximum Contaminant Levels], MCLGs [Maximum Contaminant Level Goals, designated by (G)], and SMCLs [Secondary Maximum Contaminant Levels, designated by (S)], according to the Code of Federal Regulations, Protection of the Environment 40, Part 141, July 1, 1991, and the Drinking Water Regulations and Health Advisories, Office of Water, U.S. Environmental Protection Agency, May 1995.

TABLE 3

## GROUND-WATER INORGANIC CONSTITUENT ANALYTICAL RESULTS - AUGUST 1996

ROSEN SITE
CORTLAND, NEW YORK

| | New York State Standards/Guidance Values | MCLs/MCLGs | W-02 8/21/96 | W-04 8/21/96 | W-06 8/22/96 | W-11 8/21/96 | W-18 8/21/96 | W-19 8/22/96 | W-24 8/22/96 |
|---|---|---|---|---|---|---|---|---|---|
| Iron | 300 | 300 (S) | **5,300** | 250 | **1,300** | **5,900** | 100 U | 100 U | 120 |
| Iron, Dissolved | 300 | 300 (S) | 280 | 100 U | 200 U | **5,600** | 100 U | 100 U | 200 U |
| Manganese | 500 | 50 (S) | **950** | 10 U | 12 | **940** | **540** | **1,600** | 460 |
| Manganese, Dissolved | 500 | 50 (S) | **1,000** | 10 U | 10 U | **940** | **540** | **1,600** | **540** |
| Sulfate | 250,000 | 250,000 | 128,000 | 110,000 | 68,300 | **348,000** | 128,000 | **654,000** | 132,000 |
| Total Alkalinity | NA | NA | 240,000 | 240,000 | 300,000 | 210,000 | 230,000 | 250,000 | 300,000 |
| Total Suspended Solids | NA | NA | 26,000 | 8,000 | 4,000 U | 13,000 | 4,000 U | 4,000 U | 4,000 U |

NOTES:

All concentrations in micrograms per liter (ug/L); equivalent to parts per billion (ppb).
U = The constituent was not detected above the reported detection limit.

Bold indicates NYSDEC standards exceeded; shading indicates federal MCLs exceeded.

References:

Standard and Guidance values are according to the New York State Department of Environmental Conservation, Division of Water Technical and Operation Guidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values [designated by (G)], October 1993.

MCLs [Maximum Contaminant Levels], MCLGs [Maximum Contaminant Level Goals, designated by (G)], and SMCLs [Secondary Maximum Contaminant Levels, designated by (S)], according to the Code of Federal Regulations, Protection of the Environment 40, Part 141, July 1, 1991, and the Drinking Water Regulations and Health Advisories, Office of Water, U.S. Environmental Protection Agency, May 1995.

TABLE 4

GROUND-WATER DISSOLVED GASES ANALYTICAL RESULTS - AUGUST 1996

ROSEN SITE
CORTLAND, NEW YORK

| | W-02 8/21/96 | W-04 8/21/96 | W-06 8/22/96 | W-11 8/21/96 | W-18 8/21/96 | W-19 8/22/96 | W-24 8/22/96 |
|---|---|---|---|---|---|---|---|
| Carbon Dioxide | 35,600 | 18,200 | 33,000 | 33,800 | 21,500 | 38,200 | 33,200 |
| Carbon Monoxide | 400 U | 400 U | 400 U | 400 U | 400 U | 400 U | 400 U |
| Methane | 70 U | 70 U | 70 U | 70 U | 70 U | 70 U | 70 U |
| Nitrogen | 21,800 | 18,900 | 20,400 | 18,700 | 19,700 | 22,200 | 20,400 |
| Oxygen | 1,160 | 5,450 | 3,760 | 960 | 1,210 | 1,110 | 1,210 |
| Sulfide | 900 | 510 | 200 U | 200 U | 1,090 | 200 U | 200 U |

NOTES:
All concentrations in micrograms per liter (ug/L); equivalent to parts per billion (ppb).
U = The constituent was not detected above the reported detection limit.

TABLE 5

## FIELD PARAMETERS
## AUGUST 1996 GROUND-WATER SAMPLING EVENT

ROSEN SITE
CORTLAND, NEW YORK

| Well | Date | Conductivity mS/cm | DO mg/L | ORP mV | pH S.U. | Temperature Celsius | Turbidity NTU |
|---|---|---|---|---|---|---|---|
| W-02 | 8/21/96 | 0.69 | 1.0 | NA | 6.8 | 11 | 4 |
| W-04 | 8/21/96 | 0.73 | 4.0 | NA | 7.1 | 10 | 5 |
| W-06 | 8/22/96 | 1.11 | 2.2 | NA | 7.0 | 11 | 8 |
| W-11 | 8/21/96 | 1.70 | 0.3 | NA | 6.6 | 8 | 2 |
| W-18 | 8/21/96 | 0.79 | 0.4 | NA | 7.0 | 14 | 2 |
| W-19 | 8/22/96 | 1.41 | 0.3 | NA | 6.8 | 10 | 4 |
| W-24 | 8/22/96 | 1.14 | 0.6 | NA | 7.0 | 11 | 29 |

NOTES:

Field measurements were made at the time of sampling.
NA - Not available.

mS/cm = MilliSiemens per centimeter.
mg/L = Milligrams per liter, equivalent to parts per million (ppm).
mV = Millivolts.
S.U. = Standard pH units.
NTU = Nephelometric turbidity units.

TABLE 6

COMPARISON OF SPLIT SAMPLE RESULTS

ROSEN SITE
CORTLAND, NEW YORK

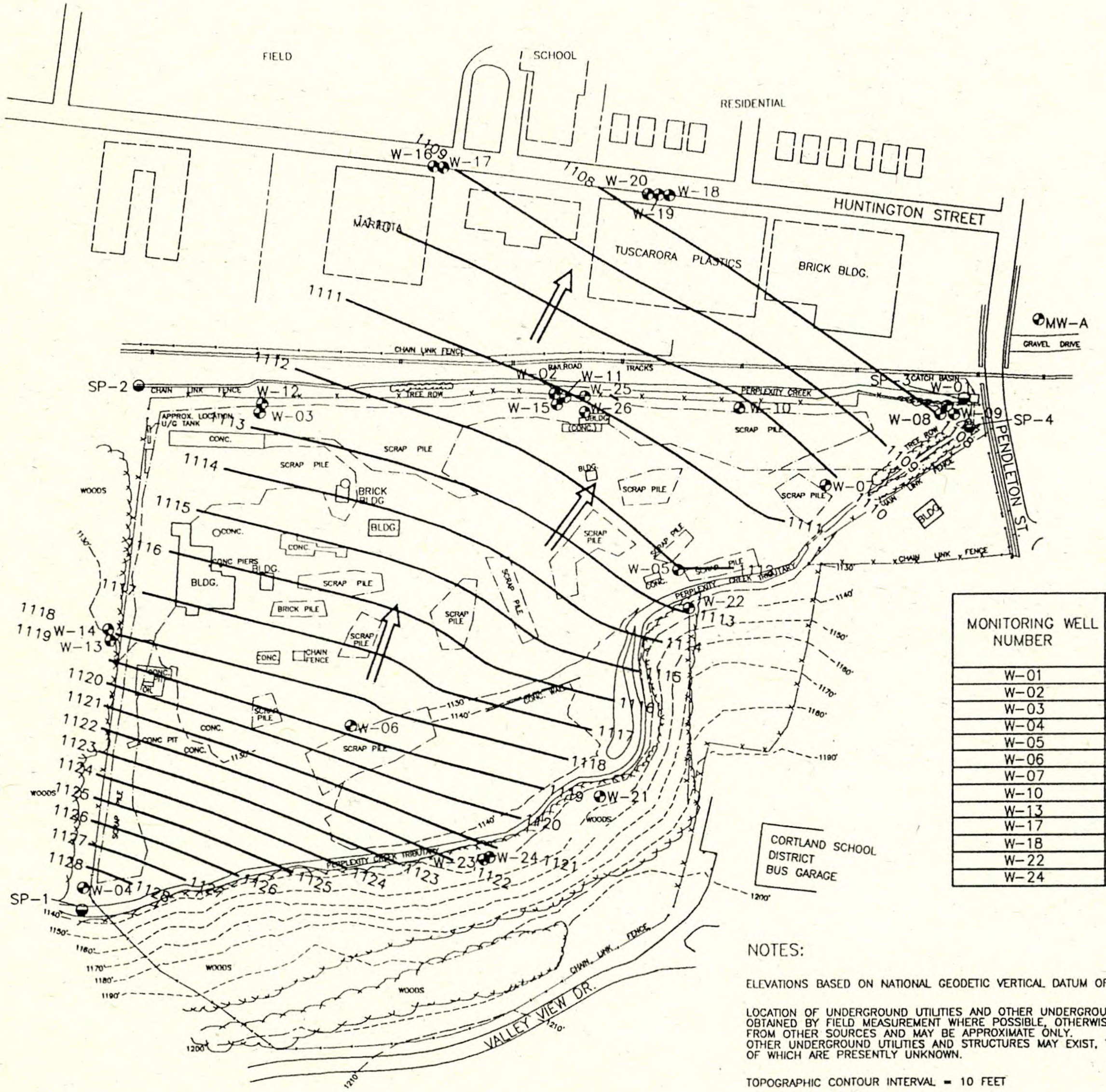
| Well | W-06 | | | W-19 | | | W-24 | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Type | FS | SPLIT | RPD | FS | SPLIT | RPD | FS | SPLIT | RPD |
| Volatiles | | | | | | | | | |
| 1,1,1-Trichloroethane | 240 | 75 | **104.8** | 83 | 58 | **35.5** | ND | 0.2 | NA |
| 1,1-Dichloroethane | 56 | 25 | **76.5** | 38 | 28 | **30.3** | ND | ND | NA |
| 1,1-Dichloroethene | ND | 0.4 | NA | 6.2 | 6.0 | **3.3** | ND | 6.0 | NA |
| cis-1,2-Dichloroethene | ND | NA | NA | ND | NA | NA | 25 | NA | NA |
| Tetrachloroethene | ND | 0.1 | NA | ND | ND | NA | ND | ND | NA |
| trans-1,2-Dichloroethene | ND | NA | NA | ND | NA | NA | 2.3 | ND | NA |
| Trichloroethene | 9.4 | 4.0 | **80.6** | ND | 0.5 | NA | 57 | 46 | **21.4** |
| Toluene | ND | ND | NA | ND | 0.2 | NA | ND | 0.1 | NA |
| Vinyl Chloride | ND | ND | NA | ND | ND | NA | 6.3 | 7.0 | **10.5** |
| Inorganics | | | | | | | | | |
| Aluminum | NA | 55.5 | NA | NA | 54.8 | NA | NA | 149 | NA |
| Antimony | NA | 61 | NA | NA | 13.1 | NA | NA | ND | NA |
| Arsenic | NA | ND | NA | NA | ND | NA | NA | 25.9 | NA |
| Barium | NA | 99.7 | NA | NA | ND | NA | NA | 15.5 | NA |
| Beryllium | NA | ND | NA | NA | ND | NA | NA | ND | NA |
| Cadmium | NA | ND | NA | NA | ND | NA | NA | ND | NA |
| Calcium | NA | 116500 | NA | NA | 287000 | NA | NA | 133300 | NA |
| Chromium | NA | 84.6 | NA | NA | ND | NA | NA | 6.1 | NA |
| Cobalt | NA | ND | NA | NA | ND | NA | NA | ND | NA |
| Copper | NA | ND | NA | NA | ND | NA | NA | ND | NA |
| Iron | 1300 | 868 | **39.9** | ND | 94.7 | NA | 120 | 393 | **106.4** |
| Lead | NA | ND | NA | NA | ND | NA | NA | ND | NA |
| Magnesium | NA | 23960 | NA | NA | 18620 | NA | NA | 30940 | NA |
| Manganese | 12 | 8.2 | **37.6** | 1600 | 1625 | **1.6** | 460 | 397 | **14.7** |
| Mercury | NA | ND | NA | NA | ND | NA | NA | ND | NA |
| Nickel | NA | 13.4 | NA | NA | ND | NA | NA | ND | NA |
| Potassium | NA | 3288 | NA | NA | 1344 | NA | NA | 2422 | NA |
| Selenium | NA | 11.8 | NA | NA | 7.9 | NA | NA | 15.9 | NA |
| Silver | NA | ND | NA | NA | ND | NA | NA | ND | NA |
| Sodium | NA | 82620 | NA | NA | 21730 | NA | NA | 634 | NA |
| Thallium | NA | ND | NA | NA | ND | NA | NA | ND | NA |
| Vanadium | NA | ND | NA | NA | ND | NA | NA | ND | NA |
| Zinc | NA | ND | NA | NA | ND | NA | NA | ND | NA |

Notes:
Concentrations in micrograms per liter (ug/L); equivalent to parts per billion (ppb).
ND = Not detected.
NA = Not analyzed.
FS = Primary field sample.
RPD = Relative percent difference.
Includes only those analyses where a parameter was detected in either the primary sample or the split sample.
Primary samples analyzed by Recra Environmental (VOCs) or Galson (Inorganics). Split samples analyzed by Buck Laboratories.
Data qualifiers are not included in this table.

# *Figures*

BLASLAND, BOUCK & LEE, INC.

*engineers & scientists*



| MONITORING WELL NUMBER | GROUND-WATER ELEVATION 8/21/96 |
|---|---|
| W-01 | 1107.77 |
| W-02 | 1111.10 |
| W-03 | 1112.66 |
| W-04 | 1128.92 |
| W-05 | 1112.03 |
| W-06 | 1118.63 |
| W-07 | 1110.23 |
| W-10 | 1110.29 |
| W-13 | 1118.16 |
| W-17 | 1109.08 |
| W-18 | 1107.51 |
| W-22 | 1112.87 |
| W-24 | 1121.32 |

## LEGEND

| | |
|---|---|
| ● | MONITORING WELL |
| 1113' —— | GROUND-WATER ELEVATION CONTOUR LINE (DASHED WHERE INFERRED) |
| ⇦ | GROUND-WATER FLOW DIRECTION |
| ◒ | STREAM MONITORING POINT |

SCALE

200' 0 200'

NOTES:

ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

LOCATION OF UNDERGROUND UTILITIES AND OTHER UNDERGROUND STRUCTURES OBTAINED BY FIELD MEASUREMENT WHERE POSSIBLE, OTHERWISE OBTAINED FROM OTHER SOURCES AND MAY BE APPROXIMATE ONLY. OTHER UNDERGROUND UTILITIES AND STRUCTURES MAY EXIST, THE LOCATIONS OF WHICH ARE PRESENTLY UNKNOWN.

TOPOGRAPHIC CONTOUR INTERVAL = 10 FEET

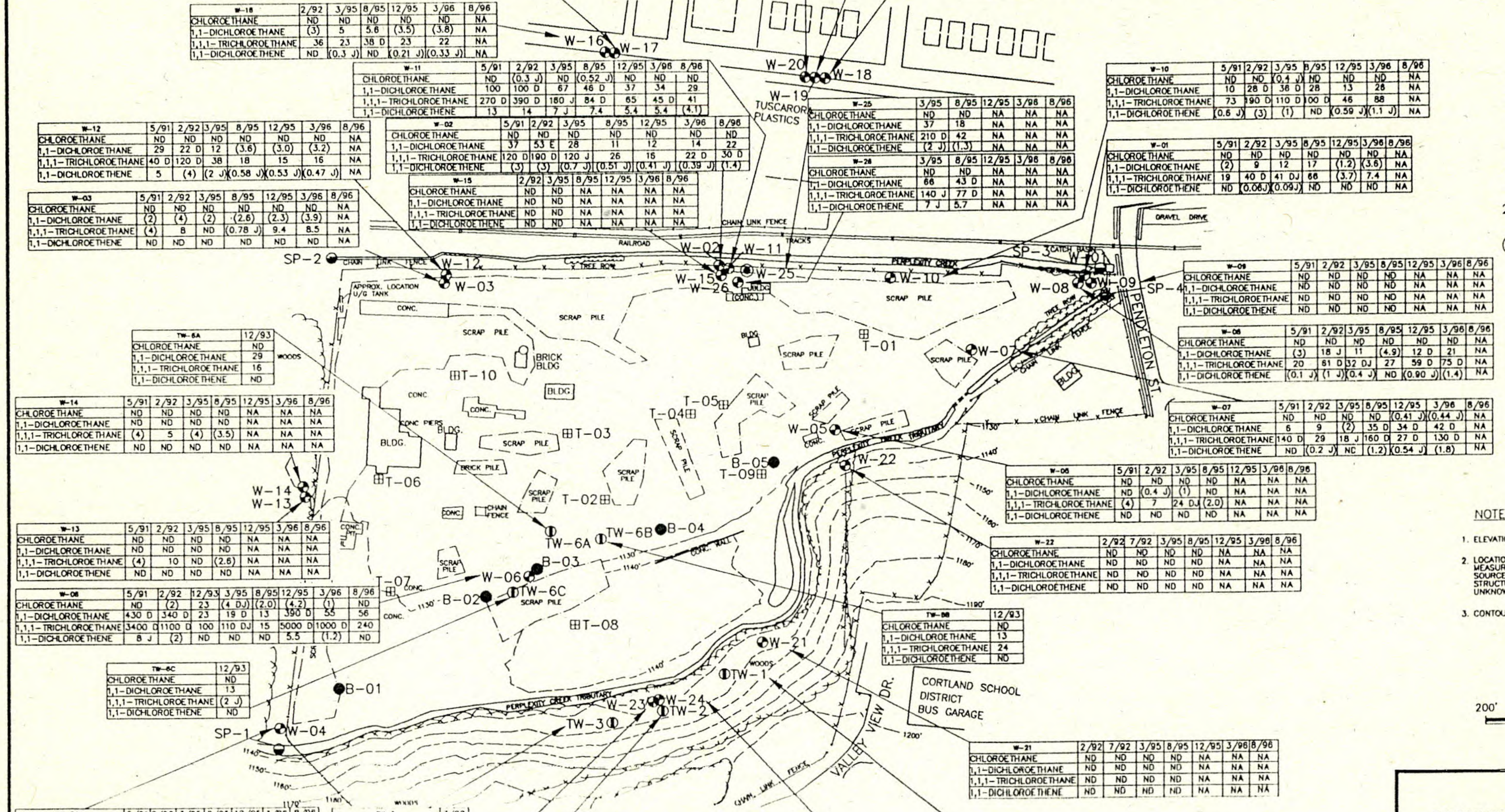
ROSEN SITE
CORTLAND, NEW YORK
GROUND-WATER MONITORING REPORT

# GROUND-WATER TABLE CONTOUR MAP 8/21/96

**BBL** BLASLAND, BOUCK & LEE, INC.
*engineers & scientists*

FIGURE
1

L: ON = 896C,896CT,*; OFF = FROZEN LAYERS
10/9/96 SYR-54-PGL DMW
49405003/49401SM2.DWG



| W-19 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | (0.3 J) | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | 86 D | 61 D | 83 | 33 | 26 | 38 |
| 1,1,1-TRICHLOROETHANE | 260 D | 210 D | 140 | 54 | 62 | 83 |
| 1,1-DICHLOROETHENE | 12 | 8 | 6.7 J | (2.7) | (3.5 J) | 6.2 |

| W-17 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHANE | (1 J) | (1) | (1.0) | (0.66 J) | (0.69 J) | NA |
| 1,1,1-TRICHLOROETHANE | 16 J | (4) | 11 | (2.3) | 5.2 | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | ND | NA |

| W-20 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | NA | NA | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | NA | NA | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | NA | NA | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | NA | NA | NA | NA |

| W-18 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | 26 | 29 | 24 | 5.6 | 14 | 16 |
| 1,1,1-TRICHLOROETHANE | 28 | 68 DJ | 38 | (3.6) | 25 | 30 D |
| 1,1-DICHLOROETHENE | (1) | (2) | (1.75) | ND | (1.4) | (1.8) |

| W-16 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHANE | (3) | 5 | 5.6 | (3.5) | (3.8) | NA |
| 1,1,1-TRICHLOROETHANE | 36 | 23 | 38 D | 23 | 22 | NA |
| 1,1-DICHLOROETHENE | ND | (0.3 J) | ND | (0.21 J) | (0.33 J) | NA |

| W-11 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | (0.3 J) | ND | (0.52 J) | ND | ND | ND |
| 1,1-DICHLOROETHANE | 100 | 100 D | 67 | 46 D | 37 | 34 | 29 |
| 1,1,1-TRICHLOROETHANE | 270 D | 390 D | 180 J | 84 D | 65 | 45 D | 41 |
| 1,1-DICHLOROETHENE | 13 | 14 | 7 J | 7.4 | 5.4 | 5.4 | (4.1) |

| W-10 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | (0.4 J) | ND | ND | ND | NA |
| 1,1-DICHLOROETHANE | 10 | 28 D | 36 D | 28 | 13 | 28 | NA |
| 1,1,1-TRICHLOROETHANE | 73 | 190 D | 110 D | 100 D | 46 | 88 | NA |
| 1,1-DICHLOROETHENE | (0.6 J) | (3) | (1) | ND | (0.59 J) | (1.1 J) | NA |

| W-25 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHANE | 37 | 18 | NA | NA | NA |
| 1,1,1-TRICHLOROETHANE | 210 D | 42 | NA | NA | NA |
| 1,1-DICHLOROETHENE | (2 J) | (1.3) | NA | NA | NA |

| W-26 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHANE | 66 | 43 D | NA | NA | NA |
| 1,1,1-TRICHLOROETHANE | 140 J | 77 D | NA | NA | NA |
| 1,1-DICHLOROETHENE | 7 J | 5.7 | NA | NA | NA |

| W-12 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHANE | 29 | 22 D | 12 | (3.6) | (3.0) | (3.2) | NA |
| 1,1,1-TRICHLOROETHANE | 40 D | 120 D | 38 | 18 | 15 | 16 | NA |
| 1,1-DICHLOROETHENE | 5 | (4) | (2 J) | (0.58 J) | (0.53 J) | (0.47 J) | NA |

| W-02 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | 37 | 53 E | 28 | 11 | 12 | 14 | 22 |
| 1,1,1-TRICHLOROETHANE | 120 D | 190 D | 120 J | 26 | 16 | 22 D | 30 D |
| 1,1-DICHLOROETHENE | (3) | (3) | (0.7 J) | (0.51 J) | (0.41 J) | (0.39 J) | (1.4) |

| W-01 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHANE | (2) | 9 | 12 | 17 | (1.2) | (3.6) | NA |
| 1,1,1-TRICHLOROETHANE | 19 | 40 D | 41 DJ | 66 | (3.7) | 7.4 | NA |
| 1,1-DICHLOROETHENE | ND | (0.06J) | (0.09J) | ND | ND | ND | NA |

| W-15 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | NA | NA | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | NA | NA | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | NA | NA | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | NA | NA | NA | NA |

| W-03 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHANE | (2) | (4) | (2) | (2.6) | (2.3) | (3.9) | NA |
| 1,1,1-TRICHLOROETHANE | (4) | 8 | ND | (0.78 J) | 9.4 | 8.5 | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | ND | ND | NA |

| W-09 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |

| W-08 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | ND | NA |
| 1,1-DICHLOROETHANE | (3) | 18 J | 11 | (4.9) | 12 D | 21 | NA |
| 1,1,1-TRICHLOROETHANE | 20 | 61 D | 32 DJ | 27 | 59 D | 75 D | NA |
| 1,1-DICHLOROETHENE | (0.1 J) | (1 J) | (0.4 J) | ND | (0.90 J) | (1.4) | NA |

| TW-6A | 12/93 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | 29 |
| 1,1,1-TRICHLOROETHANE | 16 |
| 1,1-DICHLOROETHENE | ND |

| W-14 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA | NA | NA |
| 1,1,1-TRICHLOROETHANE | (4) | 5 | (4) | (3.5) | NA | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |

| W-07 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | (0.41 J) | (0.44 J) | NA |
| 1,1-DICHLOROETHANE | 6 | 9 | (2) | 35 D | 34 D | 42 D | NA |
| 1,1,1-TRICHLOROETHANE | 140 D | 29 | 18 J | 160 D | 27 D | 130 D | NA |
| 1,1-DICHLOROETHENE | ND | (0.2 J) | NC | (1.2) | (0.54 J) | (1.8) | NA |

| W-05 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHANE | ND | (0.4 J) | (1) | ND | NA | NA | NA |
| 1,1,1-TRICHLOROETHANE | (4) | 7 | 24 DJ | (2.0) | NA | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |

| W-13 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA | NA | NA |
| 1,1,1-TRICHLOROETHANE | (4) | 10 | ND | (2.6) | NA | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |

| W-22 | 2/92 | 7/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |

| W-06 | 5/91 | 2/92 | 12/93 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | (2) | 23 | (4 DJ) | (2.0) | (4.2) | (1) | ND |
| 1,1-DICHLOROETHANE | 430 D | 340 D | 23 | 19 D | 13 | 390 D | 55 | 56 |
| 1,1,1-TRICHLOROETHANE | 3400 D | 1100 D | 100 | 110 DJ | 15 | 5000 D | 1000 D | 240 |
| 1,1-DICHLOROETHENE | 8 J | (2) | ND | ND | ND | 5.5 | (1.2) | ND |

| TW-6B | 12/93 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | 13 |
| 1,1,1-TRICHLOROETHANE | 24 |
| 1,1-DICHLOROETHENE | ND |

| TW-6C | 12/93 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | 13 |
| 1,1,1-TRICHLOROETHANE | (2 J) |
| 1,1-DICHLOROETHENE | ND |

| W-21 | 2/92 | 7/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | NA | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | ND | NA | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |

| W-04 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | NA | ND | ND | ND |
| 1,1-DICHLOROETHANE | ND | ND | ND | NA | ND | ND | ND |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | NA | ND | ND | ND |
| 1,1-DICHLOROETHENE | ND | ND | ND | NA | ND | ND | ND |

| TW 3 | 7/92 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | ND |
| 1,1,1-TRICHLOROETHANE | ND |
| 1,1-DICHLOROETHENE | ND |

| W-23 | 12/92 | 6/93 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | NA | NA | NA | NA |
| 1,1-DICHLOROETHANE | ND | ND | ND | NA | NA | NA | NA |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | NA | NA | NA | NA |
| 1,1-DICHLOROETHENE | ND | ND | ND | NA | NA | NA | NA |

| TW-2 | 7/92 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | ND |
| 1,1,1-TRICHLOROETHANE | ND |
| 1,1-DICHLOROETHENE | (3) |

| W-24 | 12/92 | 6/93 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| CHLOROETHANE | ND | ND | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | ND | ND | ND | ND | ND | ND | ND |
| 1,1,1-TRICHLOROETHANE | ND | ND | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHENE | (3) | (4) | (1) | (0.89 J) | (3.2) | (2.3) | ND |

| TW-1 | 7/92 |
|---|---|
| CHLOROETHANE | ND |
| 1,1-DICHLOROETHANE | ND |
| 1,1,1-TRICHLOROETHANE | ND |
| 1,1-DICHLOROETHENE | ND |

## LEGEND

| | |
|---|---|
| ◉ | PUMPING WELL |
| ◐ | MONITORING WELL |
| ● | TEST BORING |
| ⊞ | TEST PIT |
| ◒ | STREAM MONITORING POINT |
| ◑ | TEMPORARY WELL |
| 280 | CONCENTRATION IN ug/L EQUIVALENT TO ppb. |
| (4) | CONCENTRATION DETECTED BUT NOT ABOVE STATE OR FEDERAL STANDARDS |
| J | INDICATES ESTIMATED VALUE |
| D. | INDICATES SAMPLE DILUTION |
| B | INDICATES COMPOUND ALSO FOUND IN LABORATORY BLANK |
| NA | NOT ANALYZED |
| ND | NOT DETECTED ABOVE METHOD DETECTION LIMIT |

NOTES:

1. ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929
2. LOCATION OF UNDERGROUND STRUCTURES OBTAINED BY FIELD MEASUREMENT WHERE POSSIBLE, OTHERWISE OBTAINED FROM OTHER SOURCES AND MAY BE APPROXIMATE ONLY. OTHER UNDERGROUND STRUCTURES MAY EXIST, THE LOCATIONS OF WHICH ARE PRESENTLY UNKNOWN.
3. CONTOUR INTERVAL = 10 FEET.

SCALE

200' 0 200'

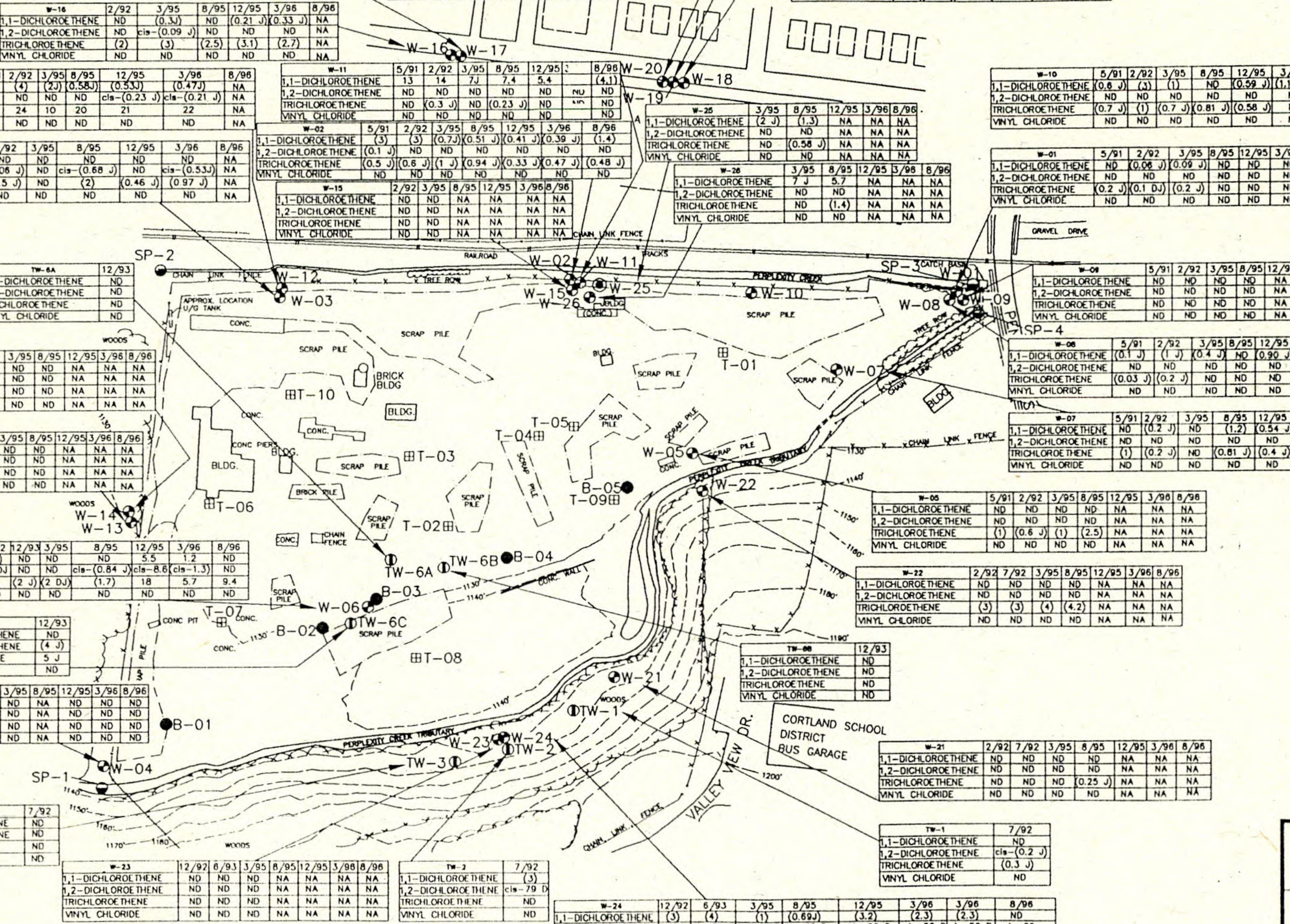
ROSEN SITE
CORTLAND, NEW YORK
GROUND-WATER MONITORING REPORT

**1,1,1- TRICHLOROETHANE AND DEGRADATION PRODUCTS DETECTED IN GROUND WATER**

BBL BLASLAND, BOUCK & LEE, INC.
*engineers & scientists*

FIGURE
2

10/17/98 54- PCL,RCB
49405003\49405V01.DWG



| W-19 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | 12 | 8 | 6.7 J | (2.7) | (3.5 J) | 6.2 |
| 1,2-DICHLOROETHENE | (0.2 J) | cis-(0.1 J) | ND | cis-(2.4 J) | ND | ND |
| TRICHLOROETHENE | (0.7 J) | (0.7 J) | ND | (4.3) | (1.4 J) | ND |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND |

| W-17 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | ND | NA |
| 1,2-DICHLOROETHENE | (1 J) | cis-(0.4 J) | ND | cis-(0.89 J) | cis-(0.32 J) | NA |
| TRICHLOROETHENE | 19 J | 10 | 16 | (4.8) | 5.7 | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | NA |

| W-20 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | NA | NA | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | NA | NA | NA | NA |
| TRICHLOROETHENE | ND | ND | NA | NA | NA | NA |
| VINYL CHLORIDE | ND | ND | NA | NA | NA | NA |

| W-18 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (1) | (2) | (1.75) | ND | (1.4) | (1.8) |
| 1,2-DICHLOROETHENE | 29 | cis-6 | cis-5.7 | cis-7.2 | cis-7.2 | cis-5.8 |
| TRICHLOROETHENE | 19 | 10 | 11 | (3) | 8 | 10 |
| VINYL CHLORIDE | 2 | (0.4 J) | ND | ND | ND | (0.39 J) |

| W-16 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | (0.3J) | ND | (0.21 J) | (0.33 J) | NA |
| 1,2-DICHLOROETHENE | ND | cis-(0.09 J) | ND | ND | ND | NA |
| TRICHLOROETHENE | (2) | (3) | (2.5) | (3.1) | (2.7) | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | NA |

| W-12 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | 5 | (4) | (2J) | (0.58J) | (0.53J) | (0.47J) | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | cis-(0.23 J) | cis-(0.21 J) | NA |
| TRICHLOROETHENE | 11 | 24 | 10 | 20 | 21 | 22 | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND | NA |

| W-11 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | [illegible] | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | 13 | 14 | 7J | 7.4 | 5.4 | | (4.1) |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND | ND | ND |
| TRICHLOROETHENE | ND | (0.3 J) | ND | (0.23 J) | ND | ND | ND |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | | ND |

| W-03 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | ND | ND | NA |
| 1,2-DICHLOROETHENE | ND | (0.06 J) | ND | cis-(0.68 J) | ND | cis-(0.53J) | NA |
| TRICHLOROETHENE | (0.3 J) | (0.5 J) | ND | (2) | (0.46 J) | (0.97 J) | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND | NA |

| W-02 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (3) | (3) | (0.7J) | (0.51 J) | (0.41 J) | (0.39 J) | (1.4) |
| 1,2-DICHLOROETHENE | (0.1 J) | ND | ND | ND | ND | ND | ND |
| TRICHLOROETHENE | (0.5 J) | (0.6 J) | (1 J) | (0.94 J) | (0.33 J) | (0.47 J) | (0.48 J) |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND | ND |

| W-25 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (2 J) | (1.3) | NA | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | NA | NA | NA |
| TRICHLOROETHENE | ND | (0.58 J) | NA | NA | NA |
| VINYL CHLORIDE | ND | ND | NA | NA | NA |

| W-15 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | NA | NA | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | NA | NA | NA | NA |
| TRICHLOROETHENE | ND | ND | NA | NA | NA | NA |
| VINYL CHLORIDE | ND | ND | NA | NA | NA | NA |

| W-26 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | 7 J | 5.7 | NA | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | NA | NA | NA |
| TRICHLOROETHENE | ND | (1.4) | NA | NA | NA |
| VINYL CHLORIDE | ND | ND | NA | NA | NA |

| W-10 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (0.6 J) | (3) | (1) | ND | (0.59 J) | (1.1 J) | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND | ND | NA |
| TRICHLOROETHENE | (0.7 J) | (1) | (0.7 J) | (0.81 J) | (0.58 J) | ND | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND | NA |

| W-01 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | (0.06 J) | (0.09 J) | ND | ND | ND | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND | ND | NA |
| TRICHLOROETHENE | (0.2 J) | (0.1 DJ) | (0.2 J) | ND | ND | ND | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND | NA |

| TW-6A | 12/93 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | ND |
| TRICHLOROETHENE | ND |
| VINYL CHLORIDE | ND |

| W-09 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| TRICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA | NA | NA |

| W-08 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (0.1 J) | (1 J) | (0.4 J) | ND | (0.90 J) | (1.4) | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND | ND | NA |
| TRICHLOROETHENE | (0.03 J) | (0.2 J) | ND | ND | ND | (0.46J) | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND | NA |

| W-14 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| TRICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA | NA | NA |

| W-07 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | (0.2 J) | ND | (1.2) | (0.54 J) | (1.8) | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | ND | ND | NA |
| TRICHLOROETHENE | (1) | (0.2 J) | ND | (0.81 J) | (0.4 J) | (0.81J) | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND | NA |

| W-13 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| TRICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA | NA | NA |

| W-05 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| TRICHLOROETHENE | (1) | (0.6 J) | (1) | (2.5) | NA | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA | NA | NA |

| W-06 | 5/91 | 2/92 | 12/93 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | 8J | (2) | ND | ND | ND | 5.5 | 1.2 | ND |
| 1,2-DICHLOROETHENE | 56 | 32 DJ | ND | ND | cis-(0.84 J) | cis-8.6 | (cis-1.3) | ND |
| TRICHLOROETHENE | 45 B | 16 | (2 J) | (2 DJ) | (1.7) | 18 | 5.7 | 9.4 |
| VINYL CHLORIDE | ND | ND | ND | ND | ND | ND | ND | ND |

| W-22 | 2/92 | 7/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| TRICHLOROETHENE | (3) | (3) | (4) | (4.2) | NA | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA | NA | NA |

| TW-6C | 12/93 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | (4 J) |
| TRICHLOROETHENE | 5 J |
| VINYL CHLORIDE | ND |

| TW-6B | 12/93 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | ND |
| TRICHLOROETHENE | ND |
| VINYL CHLORIDE | ND |

| W-04 | 5/91 | 2/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | NA | ND | ND | ND |
| 1,2-DICHLOROETHENE | ND | ND | ND | NA | ND | ND | ND |
| TRICHLOROETHENE | ND | ND | ND | NA | ND | ND | ND |
| VINYL CHLORIDE | ND | ND | ND | NA | ND | ND | ND |

| W-21 | 2/92 | 7/92 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | ND | NA | NA | NA |
| TRICHLOROETHENE | ND | ND | ND | (0.25 J) | NA | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | ND | NA | NA | NA |

| TW-3 | 7/92 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | ND |
| TRICHLOROETHENE | ND |
| VINYL CHLORIDE | ND |

| TW-1 | 7/92 |
|---|---|
| 1,1-DICHLOROETHENE | ND |
| 1,2-DICHLOROETHENE | cis-(0.2 J) |
| TRICHLOROETHENE | (0.3 J) |
| VINYL CHLORIDE | ND |

| W-23 | 12/92 | 6/93 | 3/95 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | ND | ND | ND | NA | NA | NA | NA |
| 1,2-DICHLOROETHENE | ND | ND | ND | NA | NA | NA | NA |
| TRICHLOROETHENE | ND | ND | ND | NA | NA | NA | NA |
| VINYL CHLORIDE | ND | ND | ND | NA | NA | NA | NA |

| TW-2 | 7/92 |
|---|---|
| 1,1-DICHLOROETHENE | (3) |
| 1,2-DICHLOROETHENE | cis-79 D |
| TRICHLOROETHENE | ND |
| VINYL CHLORIDE | ND |

| W-24 | 12/92 | 6/93 | 3/95 | 8/95 | 12/95 | 3/96 | 3/96 | 8/96 |
|---|---|---|---|---|---|---|---|---|
| 1,1-DICHLOROETHENE | (3) | (4) | (1) | (0.69J) | (3.2) | (2.3) | (2.3) | ND |
| 1,2-DICHLOROETHENE | NA | cis-79 D | cis-37 D | cis-42 D | cis-99 D | cis-52 D | cis-52 D | cis-25 |
| | | | | trans-(3.3) | trans-9.4 D | trans-7 | trans-7 | trans-(2.3J) |
| TRICHLOROETHENE | 70 DJ | 200 D | 93 D | 40 D | 200 D | 130 D | 130 D | 57 |
| VINYL CHLORIDE | 31 | 27 D | 8 | 7 | 19 | 13 | 13 | 6.3 |

## LEGEND

| | |
|---|---|
| ◉ | PUMPING WELL |
| ◕ | MONITORING WELL |
| ● | TEST BORING |
| ⊞ | TEST PIT |
| ◒ | STREAM MONITORING POINT |
| ⦶ | TEMPORARY WELL |
| 280 | CONCENTRATION IN ug/L EQUIVALENT TO ppb. |
| (4) | CONCENTRATION DETECTED BUT NOT ABOVE STATE OR FEDERAL STANDARDS |
| J | INDICATES ESTIMATED VALUE |
| D | INDICATES SAMPLE DILUTION |
| B | INDICATES COMPOUND ALSO FOUND IN LABORATORY BLANK |
| NA | NOT ANALYZED |
| ND | NOT DETECTED ABOVE METHOD DETECTION LIMIT |

NOTES:

1. ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.
2. LOCATION OF UNDERGROUND STRUCTURES OBTAINED BY FIELD MEASUREMENT WHERE POSSIBLE, OTHERWISE OBTAINED FROM OTHER SOURCES AND MAY BE APPROXIMATE ONLY. OTHER UNDERGROUND STRUCTURES MAY EXIST, THE LOCATIONS OF WHICH ARE PRESENTLY UNKNOWN.
3. CONTOUR INTERVAL = 10 FEET.

SCALE

200' 0 200'

ROSEN SITE
CORTLAND, NEW YORK
GROUND-WATER MONITORING REPORT

# TRICHLOROETHENE AND DEGRADATION PRODUCTS DETECTED IN GROUND WATER

BBL BLASLAND, BOUCK & LEE, INC.
*engineers & scientists*

FIGURE
3

X: (XREF)
L: (LAYER)
P: 49401SM1
10/21/96 SYR-54-YCC RCB
49405003/49405V02.DWG

| W-16 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | 1,600 | (160) | NA | NA |
| IRON, SOLUBLE | ND | (60) | NA | NA |
| MANGANESE, TOTAL | 60 | (20) | NA | NA |
| MANGANESE, SOLUBLE | ND | (20) | NA | NA |
| NITRATE | (1,100) | (1,100) | NA | NA |
| SULFATE | (210,000) | (130,000) | NA | NA |

| W-17 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | (90) | (280) | NA | NA |
| IRON, SOLUBLE | ND | (170) | NA | NA |
| MANGANESE, TOTAL | ND | ND | NA | NA |
| MANGANESE, SOLUBLE | ND | ND | NA | NA |
| NITRATE | (700) | (600) | NA | NA |
| SULFATE | (110,000) | (69,000) | NA | NA |

| W-19 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | (210) | (60) | (140) | ND |
| IRON, SOLUBLE | (30) | NA | ND | ND |
| MANGANESE, TOTAL | 2,100 | 1,600 | 1,900 | 1,600 |
| MANGANESE, SOLUBLE | 2,000 | NA | 1,800 | 1,600 |
| NITRATE | ND | ND | NA | NA |
| SULFATE | 340,000 | 540,000 | 550,000 | 654,000 |

| W-18 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | (170) | (40) | (50) | ND |
| IRON, SOLUBLE | ND | (40) | ND | ND |
| MANGANESE, TOTAL | 700 | 590 | 410 | 540 |
| MANGANESE, SOLUBLE | 690 | 320 | 400 | 540 |
| NITRATE | (200) | (400) | NA | NA |
| SULFATE | 250,000 | (73,000) | (140,000) | (128,000) |

| W-11 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | 5,690 J• | 5,000 | 5,600 | 5,900 |
| IRON, SOLUBLE | 6,080 J | 5,400 | 5,500 | 5,600 |
| MANGANESE, TOTAL | 930 | 820 | 930 | 940 |
| MANGANESE, SOLUBLE | 858 | 910 | 960 | 940 |
| NITRATE | ND | ND | NA | NA |
| SULFATE | 790,000 | 620,000 | 620,000 | 348,000 |

| W-02 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | 2,530 J• | (60) | (250) | 5,300 |
| IRON, SOLUBLE | (271 J) | (40) | (110) | (280) |
| MANGANESE, TOTAL | 1,360 | 540 | 500 | 950 |
| MANGANESE, SOLUBLE | 1,240 | 540 | 500 | 1,000 |
| NITRATE | ND | ND | NA | NA |
| SULFATE | 400,000 | (100,000) | (90,000) | (128,000) |

| W-25 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | 4,820 J• | NA | NA | NA |
| IRON, SOLUBLE | 4,540 J | NA | NA | NA |
| MANGANESE, TOTAL | 688 | NA | NA | NA |
| MANGANESE, SOLUBLE | 651 | NA | NA | NA |
| NITRATE | ND | NA | NA | NA |
| SULFATE | 480,000 | NA | NA | NA |

| W-25 DUP. | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | 4,870 J• | NA | NA | NA |
| IRON, SOLUBLE | ND | NA | NA | NA |
| MANGANESE, TOTAL | 698 | NA | NA | NA |
| MANGANESE, SOLUBLE | 647 | NA | NA | NA |
| NITRATE | NA | NA | NA | NA |
| SULFATE | NA | NA | NA | NA |

| W-26 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | 6,810 J• | NA | NA | NA |
| IRON, SOLUBLE | 7,190 J | NA | NA | NA |
| MANGANESE, TOTAL | 690 | NA | NA | NA |
| MANGANESE, SOLUBLE | 646 | NA | NA | NA |
| NITRATE | ND | NA | NA | NA |
| SULFATE | 970,000 | NA | NA | NA |

| W-10 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | (113 J) | (80) | (40) | NA |
| IRON, SOLUBLE | ND | (80) | (40) | NA |
| MANGANESE, TOTAL | 485 | 50 | 280 | NA |
| MANGANESE, SOLUBLE | 432 | 50 | 290 | NA |
| NITRATE | ND | ND | NA | NA |
| SULFATE | (41,000) | (37,000) | (100,000) | NA |

| W-01 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | (73 BJ) | (170) | NA | NA |
| IRON, SOLUBLE | ND | (70) | NA | NA |
| MANGANESE, TOTAL | 211 | ND | NA | NA |
| MANGANESE, SOLUBLE | 170 | ND | NA | NA |
| NITRATE | (300) | (800) | NA | NA |
| SULFATE | (46,000) | (14,000) | NA | NA |

| W-09 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | (50) | NA | NA | NA |
| IRON, SOLUBLE | ND | NA | NA | NA |
| MANGANESE, TOTAL | 220 | NA | NA | NA |
| MANGANESE, SOLUBLE | ND | NA | NA | NA |
| NITRATE | ND | NA | NA | NA |
| SULFATE | (57,000) | NA | NA | NA |

| W-08 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | (171 J) | (270) | NA | NA |
| IRON, SOLUBLE | ND | (100) | NA | NA |
| MANGANESE, TOTAL | 405 | 470 | NA | NA |
| MANGANESE, SOLUBLE | 369 | 430 | NA | NA |
| NITRATE | ND | ND | NA | NA |
| SULFATE | (55,000) | (45,000) | NA | NA |

| W-08 DUP. | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | 488 J | NA | NA | NA |
| IRON, SOLUBLE | ND | NA | NA | NA |
| MANGANESE, TOTAL | 400 | NA | NA | NA |
| MANGANESE, SOLUBLE | 362 | NA | NA | NA |
| NITRATE | NA | NA | NA | NA |
| SULFATE | NA | NA | NA | NA |

| W-12 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | R | (50) | NA | NA |
| IRON, SOLUBLE | ND | ND | NA | NA |
| MANGANESE, TOTAL | 546 | 410 | NA | NA |
| MANGANESE, SOLUBLE | 448 | 400 | NA | NA |
| NITRATE | (300) | ND | NA | NA |
| SULFATE | (85,000) | (100,000) | NA | NA |

| W-03 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | (145 J) | (190) | NA | NA |
| IRON, SOLUBLE | (87 BJ) | (160) | NA | NA |
| MANGANESE, TOTAL | 422 | 540 | NA | NA |
| MANGANESE, SOLUBLE | 347 | 460 | NA | NA |
| NITRATE | ND | ND | NA | NA |
| SULFATE | (13,000) | (22,000) | NA | NA |

| W-14 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | 80 | NA | NA | NA |
| IRON, SOLUBLE | ND | NA | NA | NA |
| MANGANESE, TOTAL | ND | NA | NA | NA |
| MANGANESE, SOLUBLE | ND | NA | NA | NA |
| NITRATE | (800) | NA | NA | NA |
| SULFATE | (82,000) | NA | NA | NA |

| W-13 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | (30) | NA | NA | NA |
| IRON, SOLUBLE | ND | NA | NA | NA |
| MANGANESE, TOTAL | (40) | NA | NA | NA |
| MANGANESE, SOLUBLE | (40) | NA | NA | NA |
| NITRATE | ND | NA | NA | NA |
| SULFATE | 740,000 | NA | NA | NA |

| W-06 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | 652 | 910 | (110) | 1,300 |
| IRON, SOLUBLE | ND | (90) | ND | ND |
| MANGANESE, TOTAL | 15 | ND | ND | 12 |
| MANGANESE, SOLUBLE | ND | ND | ND | ND |
| NITRATE | (1,000) | ND | NA | NA |
| SULFATE | (24,000) | (41,000) | (35,000) | (68,300) |

| W-04 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | NA | 320 | 300 | (250) |
| IRON, SOLUBLE | NA | (90) | (30) | ND |
| MANGANESE, TOTAL | NA | ND | ND | ND |
| MANGANESE, SOLUBLE | NA | ND | ND | ND |
| NITRATE | NA | (700) | NA | NA |
| SULFATE | NA | (18,000) | (16,000) | (110,000) |

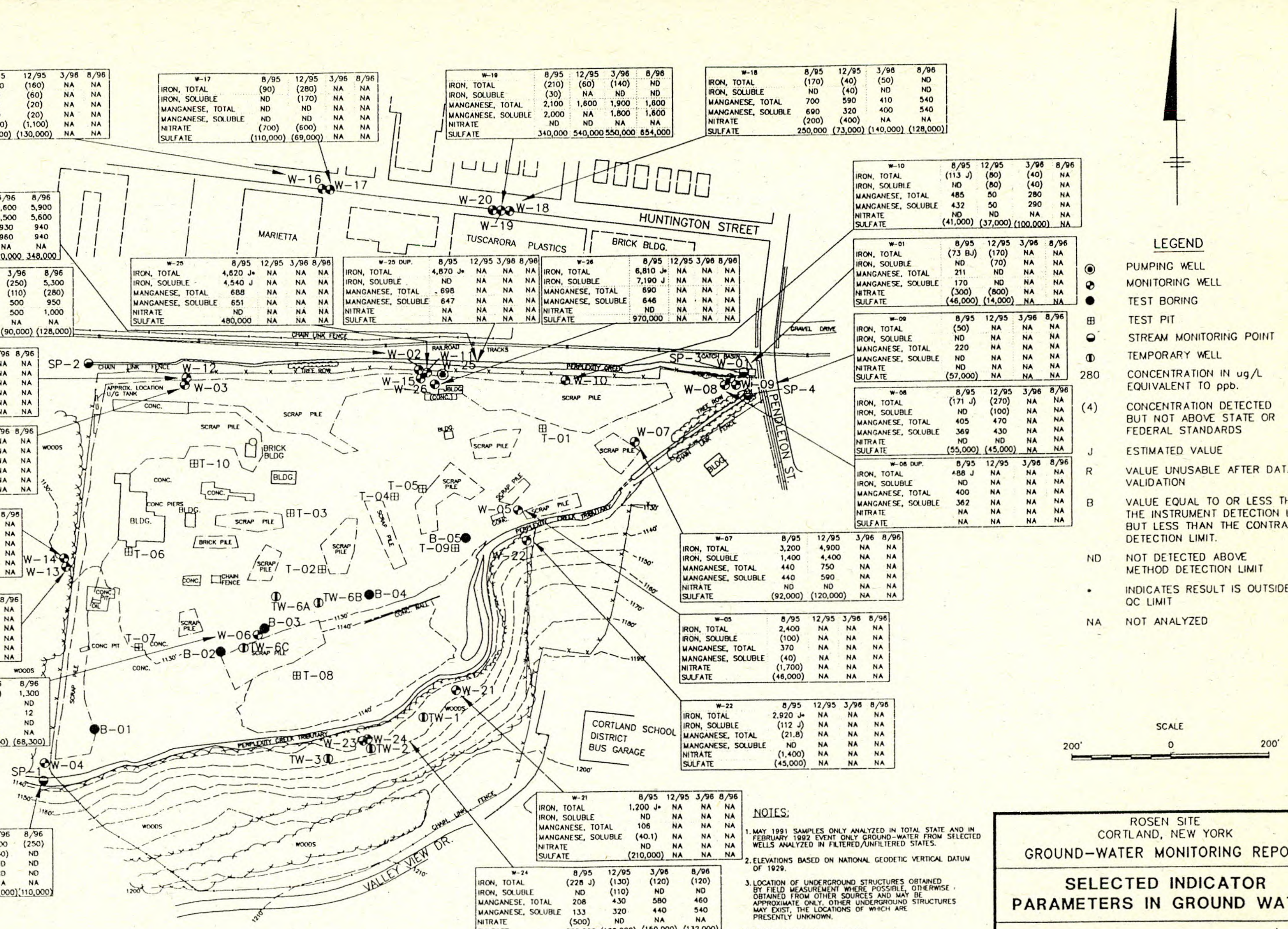
| W-07 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | 3,200 | 4,900 | NA | NA |
| IRON, SOLUBLE | 1,400 | 4,400 | NA | NA |
| MANGANESE, TOTAL | 440 | 750 | NA | NA |
| MANGANESE, SOLUBLE | 440 | 590 | NA | NA |
| NITRATE | ND | ND | NA | NA |
| SULFATE | (92,000) | (120,000) | NA | NA |

| W-05 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | 2,400 | NA | NA | NA |
| IRON, SOLUBLE | (100) | NA | NA | NA |
| MANGANESE, TOTAL | 370 | NA | NA | NA |
| MANGANESE, SOLUBLE | (40) | NA | NA | NA |
| NITRATE | (1,700) | NA | NA | NA |
| SULFATE | (46,000) | NA | NA | NA |

| W-22 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | 2,920 J• | NA | NA | NA |
| IRON, SOLUBLE | (112 J) | NA | NA | NA |
| MANGANESE, TOTAL | (21.8) | NA | NA | NA |
| MANGANESE, SOLUBLE | ND | NA | NA | NA |
| NITRATE | (1,400) | NA | NA | NA |
| SULFATE | (45,000) | NA | NA | NA |

| W-21 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | 1,200 J• | NA | NA | NA |
| IRON, SOLUBLE | ND | NA | NA | NA |
| MANGANESE, TOTAL | 106 | NA | NA | NA |
| MANGANESE, SOLUBLE | (40.1) | NA | NA | NA |
| NITRATE | ND | NA | NA | NA |
| SULFATE | (210,000) | NA | NA | NA |

| W-24 | 8/95 | 12/95 | 3/96 | 8/96 |
|---|---|---|---|---|
| IRON, TOTAL | (228 J) | (130) | (120) | (120) |
| IRON, SOLUBLE | ND | (110) | ND | ND |
| MANGANESE, TOTAL | 208 | 430 | 580 | 460 |
| MANGANESE, SOLUBLE | 133 | 320 | 440 | 540 |
| NITRATE | (500) | ND | NA | NA |
| SULFATE | 300,000 | (130,000) | (150,000) | (132,000) |



## LEGEND

| | |
|---|---|
| ◉ | PUMPING WELL |
| ◕ | MONITORING WELL |
| ● | TEST BORING |
| ⊞ | TEST PIT |
| ◒ | STREAM MONITORING POINT |
| ◑ | TEMPORARY WELL |
| 280 | CONCENTRATION IN ug/L EQUIVALENT TO ppb. |
| (4) | CONCENTRATION DETECTED BUT NOT ABOVE STATE OR FEDERAL STANDARDS |
| J | ESTIMATED VALUE |
| R | VALUE UNUSABLE AFTER DATA VALIDATION |
| B | VALUE EQUAL TO OR LESS THAN THE INSTRUMENT DETECTION LIMIT BUT LESS THAN THE CONTRACT DETECTION LIMIT. |
| ND | NOT DETECTED ABOVE METHOD DETECTION LIMIT |
| • | INDICATES RESULT IS OUTSIDE QC LIMIT |
| NA | NOT ANALYZED |

NOTES:

1. MAY 1991 SAMPLES ONLY ANALYZED IN TOTAL STATE AND IN FEBRUARY 1992 EVENT ONLY GROUND-WATER FROM SELECTED WELLS ANALYZED IN FILTERED/UNFILTERED STATES.
2. ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.
3. LOCATION OF UNDERGROUND STRUCTURES OBTAINED BY FIELD MEASUREMENT WHERE POSSIBLE, OTHERWISE OBTAINED FROM OTHER SOURCES AND MAY BE APPROXIMATE ONLY. OTHER UNDERGROUND STRUCTURES MAY EXIST, THE LOCATIONS OF WHICH ARE PRESENTLY UNKNOWN.
4. CONTOUR INTERVAL = 10 FEET.

ROSEN SITE
CORTLAND, NEW YORK
GROUND-WATER MONITORING REPORT

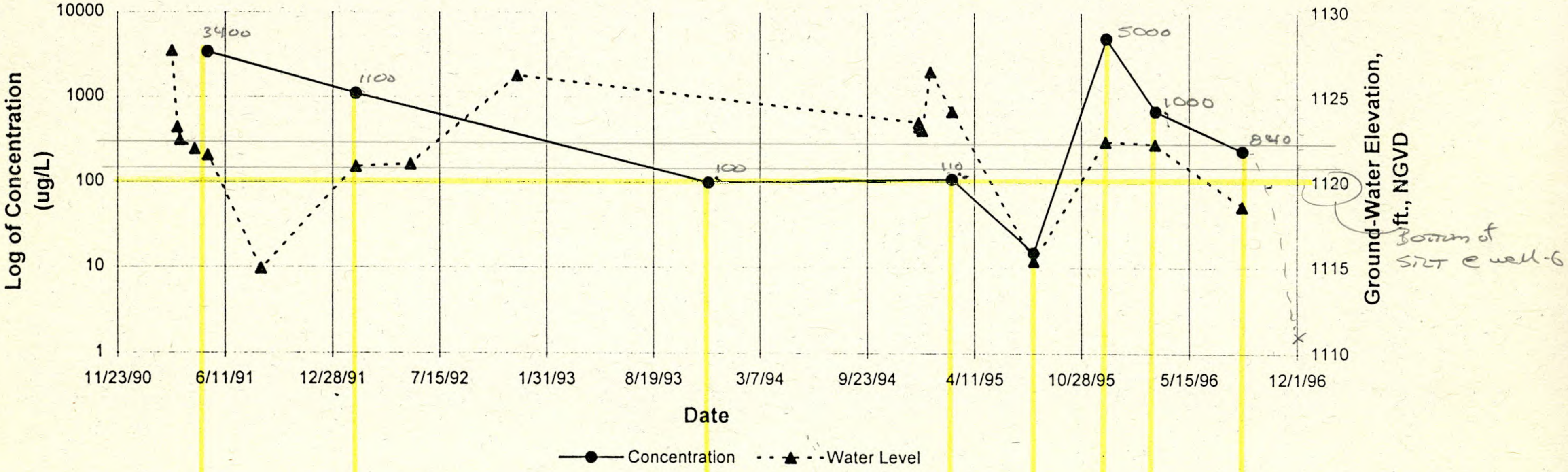
# SELECTED INDICATOR PARAMETERS IN GROUND WATER

**BBL** BLASLAND, BOUCK & LEE, INC.
*engineers & scientists*

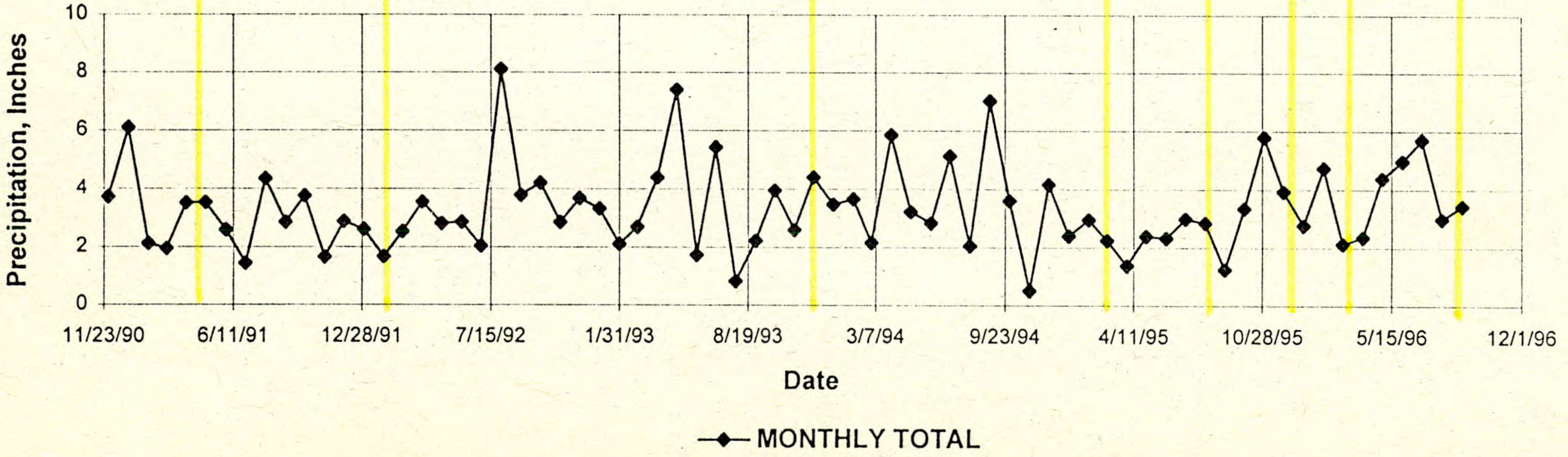
FIGURE
4

X: (XREF)
L: (LAYER)
P: 49401SM1
9/98 SYR-54- RCB
49405003/49405N01.DWG

## FIGURE 5



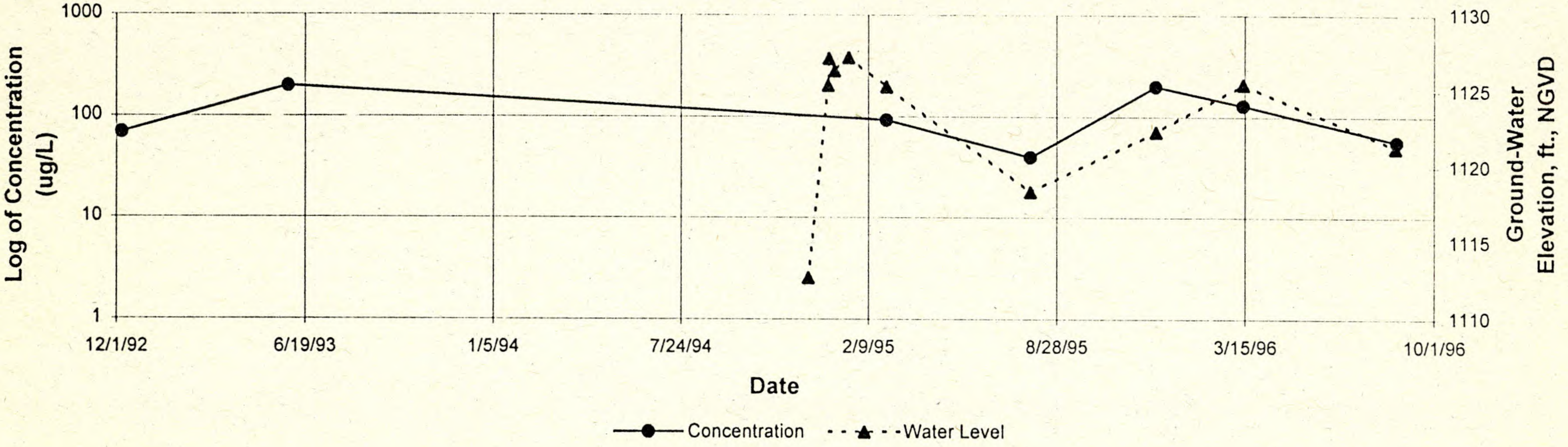
TCA Concentration vs. Water Table Elevation at Well W-06



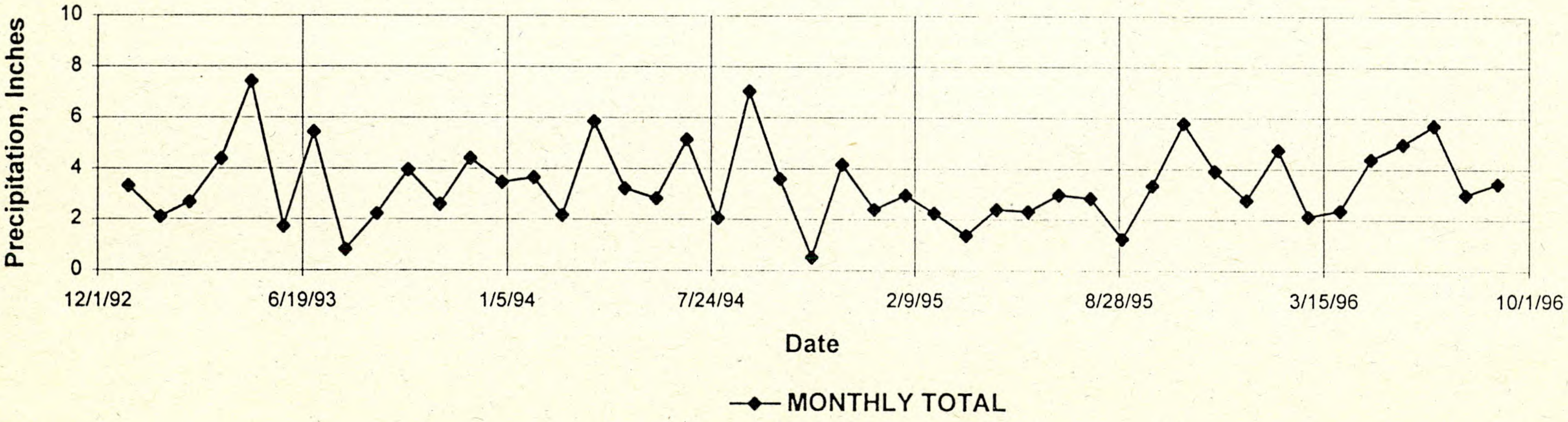
Total Monthly Precipitation for Cortland, New York

# FIGURE 6

TCE Concentration vs. Water Table Elevation at Well W-24



Total Monthly Precipitation for Cortland, New York

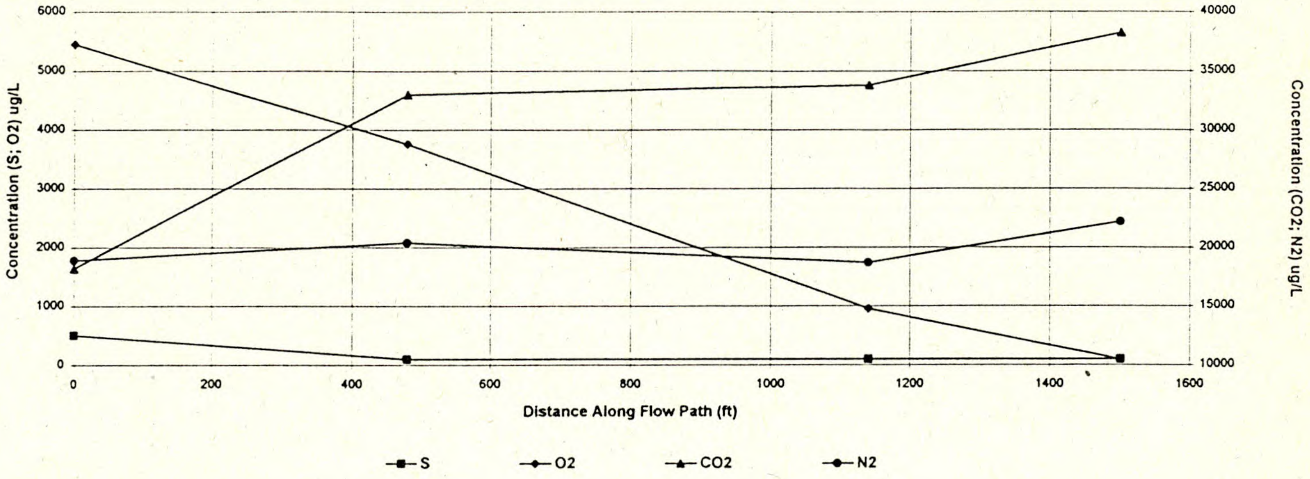


## FIGURE 7

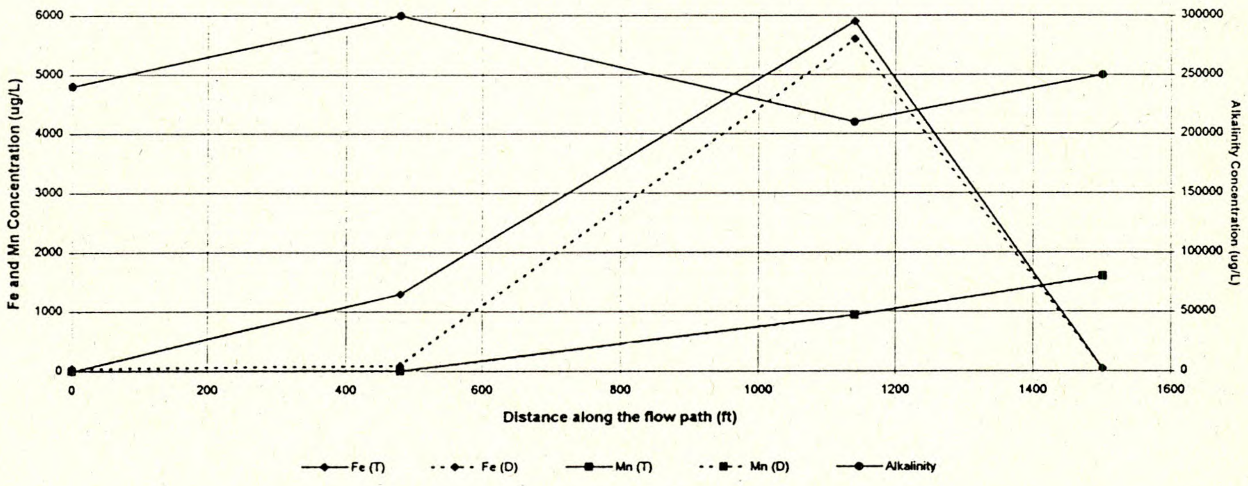
## INDICATOR PARAMETERS ALONG THE FLOW PATH (WELLS W-04, W-06, W-11, AND W-19)

what date?

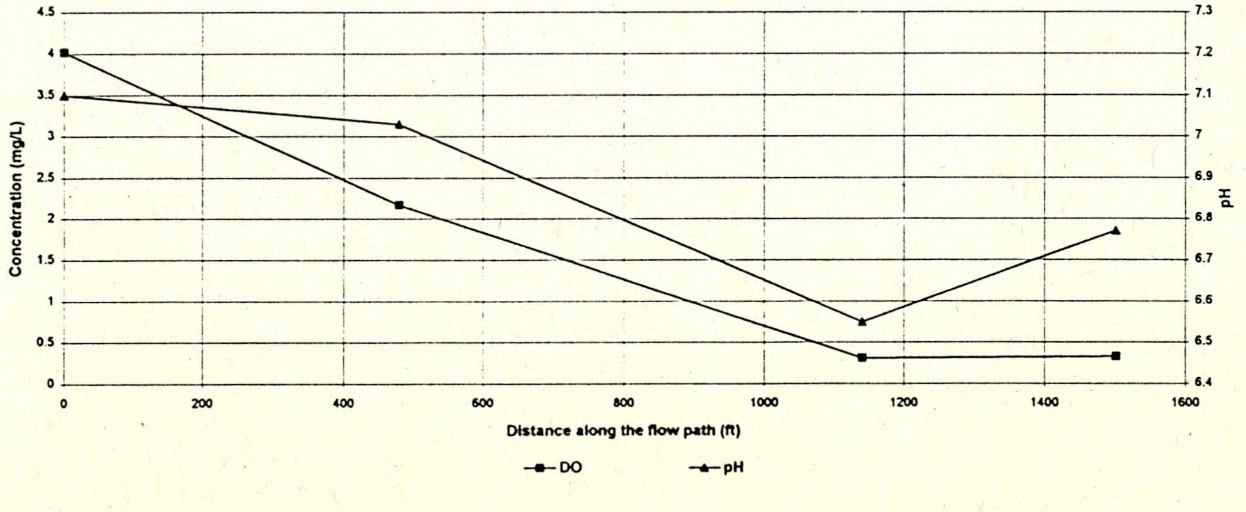
### DISSOLVED GASES ALONG THE FLOW PATH



### IRON, MANGANESE, AND ALKALINITY ALONG THE FLOW PATH



### FIELD PARAMETERS ALONG THE FLOW PATH



**Note**

Where a constituent was not detected, a value of one-half the detection limit was used for graphing purposes.