915063

Final Report

CHERRY FARM/RIVER ROAD SITE
GROUNDWATER UPWELLING STUDY

October 2003 Sampling Event and Final Report
Tonawanda, New York

SUBMITTED TO:

NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION
DIVISION OF HAZARDOUS WASTE REMEDIATION

SUBMITTED BY:

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Cherry Farm/River Road Site
Groundwater Upwelling Study

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EXECUTIVE SUMMARY

The groundwater extraction system at the Cherry Farm/River Road Site was installed in 1997 to collect groundwater from the intermediate and deep zones and pump the water to the onsite treatment plant.

In order to assess the impact that the permanent shutdown of the extraction system would have on the quality of the Niagara River, a one year groundwater upwelling study was completed. This study consisted of installing piezometers and sampling stations beneath the river and the collection and laboratory analysis of groundwater samples from the sampling stations, onsite wells, and the river surface water. This study was conducted in accordance with the July 2002 NYSDEC-approved work plan.

As part of the study, the pumps in the eleven deep zone groundwater extraction wells were turned off on October 14, 2002. The pumps and piping from each of the recovery wells was removed, cleaned, and placed in storage. The piping system for the deep and shallow recovery systems was flushed to remove accumulated deposits. During the upwelling study, only the pumps in the shallow groundwater collection trench remained active.

Prior to the shut down of the extraction system, and then quarterly between December 2002 and October 2003, groundwater samples were collected and analyzed for the presence of benzene, toluene, ethylbenzene, xylene, semi-volatile organic compounds, polychlorinated biphenyls, and the major cation and anions. Water level and temperature data were collected on a regular basis. Following each quarterly monitoring event, data reports were submitted to the NYSDEC for review.

The sampling results for major anions and cations, integrated with the water level and temperature data, confirm that there is a clear distinction between surface water samples and samples collected from the groundwater monitoring points installed below the river. Thus, it appears that the river station samples are not being influenced by river water, and that there was no leakage from the surface water to the sampling pumps.

The water level results from the nearshore stations consistently showed an upward hydraulic gradient during the study. The offshore monitoring stations either exhibited a neutral or downward gradient. The strong upward gradients at the nearshore piezometer locations indicate that most of the discharge of groundwater is near-shore.

Indicator compounds, as expected, were detected in the intermediate/deep groundwater underlying the Site. No indicator compounds were detected in the river sampling stations during the time that the deep extraction system was shutdown.

The purpose of the groundwater upwelling study was to determine whether the deep groundwater extraction system could be permanently shut down, without having an adverse impact on the chemistry of the Niagara River. Based upon the results of this one year study, the discontinuation of the intermediate/deep groundwater extraction system will not have an impact on the quality of the groundwater upwelling to the Niagara River.

INTRODUCTION

The Cherry Farm/River Road Site in Tonawanda, New York (Figure 1) currently has an 11-well groundwater extraction system that was designed to prevent migration of impacted groundwater in the deeper aquifer from reaching the Niagara River. The deeper extraction system complements a shallow groundwater trench that continues to collect groundwater in the upper aquifer. The deep extraction system began operation in August 1997, and was temporarily shut down in October 2002 as part of this study.

A review of the routine groundwater sampling results from the Site (from 1997 to 2003), indicates that the impacts from organic chemical compounds on the groundwater quality in the intermediate/deep zone has decreased since the extraction system was started. In most cases the concentrations were below the NYSDEC Class GA Groundwater Standards or Guidance values. The relatively low concentrations in the deep groundwater provided an impetus for designing and implementing this study.

The primary objective of this groundwater upwelling study was to quantify the chemical concentrations of groundwater that is upwelling into the Niagara River from the Site. This objective was accomplished through direct sampling and measurements in the Niagara River, sampling systems installed in the sediments beneath the river, and monitoring of the onsite wells. The study was completed in accordance with the Work Plan which was approved by the NYSDEC in their letter of August 30, 2002. The purpose of the study was to determine whether the deep extraction system could be permanently shut down, without adverse impact to the river. The results obtained during the study indicate that permanent shut-down of the deep wells can proceed. This final report presents a summary of the year-long study, including tabular and graphical representations of hydrologic, physical, and chemical data, and presents conclusions and recommendations.

METHODOLOGY

The approach proposed for measuring groundwater discharge and quality into and through the river-bottom sediment was as follows:

- Installation of eight sampling stations in the river. consisting of two arrays of four stations. Each sampling/monitoring point consisted of a pair of vibrating-wire piezometers and a single dedicated dual-valve pneumatic sampling pump. The two arrays were constructed downgradient of onshore monitoring wells MW-4 and MW-5 as shown on Figure 2.
- Sampling of water from the eight newly-installed sampling stations below the river, the two upgradient monitoring wells, four groundwater extraction wells, and the river water, prior to shutting down the extraction system.
- Shut-down of the deep extraction system for one year, combined with quarterly water quality sampling and analysis for the eight sample stations, river water, monitoring wells, and extraction wells.

- Regular measurement of hydraulic pressures (water levels) and temperature with vibrating wire piezometers.

Details of the sample station installation and subsequent data collection efforts are provided below.

Sampling Station Locations

Groundwater sampling pumps and vibrating wire piezometers were installed below the Niagara River sediments downgradient (west) of monitoring wells MW-4 and MW-5 (Figure 2). Downgradient from each well, two nearshore stations approximately 15 feet from shore and five to seven feet deep (below the sediment surface), and two offshore stations, approximately 40 feet from shore and 10 to 12 feet below the sediment surface, were constructed. These locations were chosen to characterize groundwater concentrations directly downgradient of the areas with the highest historical chemical constituent concentrations (MW-4 and MW-5). The depths and distances from shore were determined from known groundwater flow directions, chemical concentration distribution in the existing onsite monitoring wells, and groundwater flow modeling. The modeling was particularly useful in predicting groundwater flow paths and travel times from the shoreline to the sediments within the river. The model was developed from data collected prior to the installation and operation of the collection system. A graphical representation of the model, showing cross-sectional flow paths of particles traveling from the Site to the river, has been included as Figure 3.

Sample locations were marked with buoys, and a New York State licensed surveyor located positions on the shore. Measurements from the surveyed shoreline positions to the sample stations were then used to estimate the positions of the stations in the river. All survey results were tied into an existing site benchmark, and integrated into the existing coordinate system.

Installation of Piezometers and Sampling Pumps

The sampling stations were constructed utilizing a motorized cat-head on a tripod system, a drop hammer, and a high-pressure water pump secured to a 24-foot by 8-foot barge. The borings for sampling and piezometer installation were advanced using 4-inch diameter casing, which was jetted into place with water. Prior to casing advancement, continuous split-spoon samples were collected using the cat-head assisted hammer to characterize the sediments.

Two vibrating wire piezometers were installed in each boring. One of the piezometers within each of the deeper holes was placed approximately five to seven feet below the river bottom. The second piezometer was placed approximately 10 to 12 feet below the river bottom (see Figure 4–installation schematic). In each hole, a single dual-valve sampling pump was installed directly adjacent to the shallower piezometer.

Each of the sampling and monitoring devices was installed inside of the casing. A sand filter pack was placed 0.5 feet below and one foot above the piezometer port or pump intake. The annular space between the two piezometers was filled with a bentonite/sand mixture. The annular space between the upper sand pack and the top of the sediment was filled with a thick

bentonite slurry seal. The temporary casing was removed as the equipment was installed, leaving all equipment directly buried with sand and filter packs as described above, and no casing.

Cables and tubing from the piezometers and sampling pumps were placed along the river bottom to an onshore monitoring station. Flexible hosing was wrapped around the wires and tubing for protection. Concrete blocks were used to weight the tubing to the river bottom, allowing boat traffic to pass over the area of investigation without disturbing the piezometer and sampling setup.

Once onshore, cables and tubing were routed to an equipment shed at a designated, discrete location (total of two equipment sheds/one for each array). These locations were secured with padlocks.

Pre-Sampling Quality Assurance/Quality Control Tests

After the first river station (RS-1) was installed, two tests were conducted to evaluate the effectiveness of the sand/bentonite seals between the upper and lower piezometers, and between the sampling pump and the sediment/water interface. (1) An informal pumping test was conducted between the upper sampling pump/piezometer and the lower piezometer. Piezometer readings taken while the pump was on were compared to readings taken while the pump was off. (2) Analytical samples were collected from the station and from the river. The samples were analyzed for major anions and cations to compare water quality between the sampling station and the river.

Results from the pre-sampling pumping test indicated that the methods used to hydraulically isolate the piezometers and pumps were sufficient. Pumping from RS-1 reduced the hydraulic head of the upper piezometer by 2.6 ft, but the lower piezometer only changed a negligible amount of 0.01 ft, indicating a good seal.

Results of the anion/cation analysis indicated clear differences in water quality between the river station pump and the river water sample. Details of the analytical results from this initial event and subsequent sampling events are provided in the Results section.

Based on the results of these pre-sampling tests, the method of instrument installation was assumed to be sufficient to hydraulically isolate the instruments, and was used for the remaining installations.

Sampling Methods

After installation of the river stations, a full round of samples was collected prior to shutting down the extraction wells. Samples were collected from all eight sampling stations, four groundwater extraction wells (RW-2 through RW-5) and two monitoring wells (MW-4 and MW-5). These samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), naphthalene, polychlorinated biphenyls (PCBs), and major anions and cations. One surface water sample was collected directly from the river and analyzed for major anions and cations.

The river stations and monitoring wells were purged prior to sampling. Samples from the river stations were collected at low flow rates (less than 200 ml/min). Monitoring wells were sampled with disposal bailers, and the extraction wells were sampled from sampling ports while the pumps were running.

Four additional sampling/data collection events were completed between December 2002 and October 2003. A summary of the samples collected and their respective analytes is included as Table 1. Following each monitoring event (through June 2003), data reports were submitted to the NYSDEC for review. Results of the final, October 2003 sampling event are presented in this final report.

Piezometer Readings

Piezometer readings were used to quantify the vertical hydraulic gradient at each station. The river stage was also monitored using the existing staff gauge combined with data from the NOAA water level stations in the Niagara River. Pressure and temperature readings were recorded from switch boxes housed in the onsite sheds. A hand-held readout unit was used to display the piezometer reading. The data were then entered into a spreadsheet that used a linear equation to correct for changes from initial conditions, and to derive hydraulic head differences. Since the distance between the piezometers in each pair was known, the vertical gradient at each river station could be calculated.

Shutdown of Extraction System

The pumps in the eleven deep zone groundwater extraction wells were turned off on October 14, 2002. In accordance with the July 2002 work plan, the pumps and piping from each of the recovery wells was removed, cleaned, and placed in storage. The piping systems for the deep and shallow recovery systems were flushed to remove accumulated deposits. During the upwelling study, only the pumps in the shallow groundwater collection trench remained active.

RESULTS

Major Anions and Cations

The anion and cation composition of the water samples was analyzed to verify that river water was not infiltrating and impacting the samples being collected from the river station (RS) sampling points. Samples were analyzed for calcium, magnesium, sodium, bicarbonate, chloride, and sulfate. The total concentration of these six major ions normally comprises more than 90 percent of the total dissolved solids (TDS) in the water (Freeze and Cherry). For the purposes of this report, TDS was approximated by summing the concentrations of the ions analyzed. Anion/cation analytical results from the each sampling event are provided in Table 2.

For each quarterly sampling event, analyses of major anions and cations were plotted on a Piper trilinear diagram (Piper, 1944). The eight river station (RS) water analyses represent groundwater below the river. River surface water samples were collected near the barrier island located between the two river station sampling areas. The samples collected from MW-4 and from MW-5 are representative of onsite, deep zone groundwater.

Piper trilinear diagrams for each of the sampling events have been included as Figures 5 through 9. The Piper diagrams show a clear distinction between the ionic concentrations in the river water and the samples collected from the river stations. The samples from the river stations typically had a lower percentage of sodium and chloride ions than the river water samples. The river station (RS) samples also had smaller percentages of sulfates and higher carbonates than the river water samples.

The approximate TDS concentrations also indicated a chemical differentiation between the river water and the groundwater below the river. The approximate TDS concentration was included with cation/anion ratios on the table below the Piper diagram. The Piper bubble diagrams (Figure 10 through 14) demonstrate the TDS relationship within a Piper diamond plot. On the figure, TDS concentration is directly related to the symbol size.

The third type of graphical presentation of cation/anion chemical analysis is the Stiff (1951) pattern (Figures 15 through 19). Stiff diagrams are plotted for individual samples as a method of graphically comparing the concentration of selected anions and cations for several individual samples. The shape formed by the Stiff diagrams is used to quickly identify samples that have similar ionic compositions. A polygonal shape is created from four parallel horizontal axes extending on either side of a vertical zero axis. Cations are plotted on the left side of the zero axis, and anions are plotted on the right side. The larger the area of the polygon, the greater the concentrations of the various ions (Fetter, 1994).

In the Stiff plots, the polygon defined by the river water samples (bottom polygon) is considerably smaller than those based on the samples of groundwater from below the river stations. This provides further indication that the river stations samples (RS series) are chemically different than the river water. In addition, a comparison of the Stiff patterns created for sample pairs (i.e. RS-01 and RS-02) are very similar in pattern, indicating similar ionic ratios.

While the anion/cation data show some scatter, there is clearly a distinction between surface water samples and the river station samples. Thus, it appears that the river station samples are not being influenced by river water, and that there was no evidence of leakage from the surface water to the sampling pumps.

Hydraulic Gradient

Water level data were collected from each of the piezometers. Vertical hydraulic gradients for each station were calculated by subtracting the shallower piezometer value from the deeper piezometer value. Positive values represent an upward hydraulic gradient, and negative values represent a downward hydraulic gradient (Table 3).

Vertical hydraulic gradients during the study ranged from -0.079 to 0.097 feet per foot (ft/ft). The head differences between the two piezometers in a set did not exceed 0.39 feet.

Vertical hydraulic gradient measurements are graphically displayed in Figure 20 (A through D). Two adjacent stations (nearshore and offshore) were plotted on each graph. For example, in Figure 7A, Station RS-1, was installed 15 feet from shore and Station RS-2 was installed 40 feet

from shore. Odd-numbered stations are nearshore (15 feet from shore) and even-numbered stations are offshore (40 feet).

The nearshore stations consistently showed an upward hydraulic gradient during the study. The offshore monitoring stations either exhibited a neutral or downward gradient. Thus, groundwater upwelling appears to be occurring in the stations located 15 feet from shore, but is not evident at most of the stations located 40 feet from shore. The stronger upward gradients at the nearshore piezometer locations indicate that most of the discharge of groundwater is nearshore, which is consistent both with theory and the groundwater model results. The neutral gradients further offshore indicate little flux between the river and sediment, and are also consistent with theory. The offshore locations with negative gradients suggest that the majority of groundwater discharge is nearshore.

Water Temperature

Temperatures, recorded from the river station piezometers, are shown in Table 4. The upper portion of the table lists the temperature readings. The lower section of the table shows the temperature difference between piezometers at each station. Positive values represent conditions where water adjacent to the deeper piezometer is colder than the water adjacent to the shallower piezometer; negative values represent the opposite conditions.

As expected, the temperature in the river and in the groundwater is seasonally affected. During the summer period, the water temperature in the shallow piezometer in each station was higher than in the deep piezometer. This trend was reversed in the winter period. At all times of year, the fluctuations in the deeper groundwater river stations were more moderate than the shallow stations. The temperature fluctuations in the shallow river stations were more moderate than the river water temperatures.

Although not an integral part of the study, temperature differentials between the deep and shallow piezometers at each river station provide further indication of groundwater upwelling. This is also a strong indicator of the integrity of the sand/bentonite seals separating the river station groundwater monitoring points and the river surface water.

Indicator Compounds

Samples of the groundwater from the monitoring wells, recovery wells, and the river monitoring stations were collected during the course of the study, and analyzed for several indicator compounds (BTEX, naphthalene, PCBs) and major anions and cations. The laboratory analytical results from the pre-shutdown and four quarterly sampling rounds are presented in Tables 5 through 9.

Prior to the shutdown of the extraction system, concentrations of benzene, ethylbenzene, toluene and xylene were detected in MW-5, in exceedance of the NYSDEC Class GA Groundwater Quality Standard. Exceedances of the standard were also detected in RW-04 (benzene) and RW-05 (benzene, ethylbenzene, and xylene). Benzene was detected in one of the

river monitoring stations (RS-08), with a concentration of 1 ug/L, equal to the NYSDEC standard.

In the first quarterly sampling round (December 2002), benzene (52 ug/L), toluene (5 ug/L), ethylbenzene (4 ug/L), xylene (17 ug/L), naphthalene (13 ug/L) and PCBs (20 ug/L) were detected in the samples from MW-5. No indicator compounds were detected in the river sampling stations.

In the second quarterly sampling round (March 2003), in accordance with the work plan, samples were only collected from the river monitoring stations. No compounds were detected in any of the samples.

In the third quarterly sampling round (June 2003), benzene (38 ug/L), toluene (4 ug/L), ethylbenzene (2 g/L), xylene (7 ug/L), and naphthalene (5 ug/L) were detected in the sample from MW-5. Samples were not collected from the recovery wells. No indicator compounds were detected in the river sampling stations.

In the fourth quarter (October 2003), benzene was detected in samples from MW-5 with a concentration of 23 ug/L and in RW-05 with a concentration of 9.3 ug/L. No indicator compounds were detected in the river sampling stations.

CONCLUSIONS

A review of the chemical analytical results, hydraulic gradients, and temperature data from the groundwater upwelling study leads to the following conclusions:

- **Groundwater from the intermediate/deep groundwater zones under the Site is upwelling into the Niagara River. Groundwater upwelling appeared to be more prevalent in the nearshore sampling stations**. This determination is based on the water level and temperature measurements collected using the vibrating wire piezometers. The results confirmed the groundwater modeling analysis that was conducted to predict potential areas of upwelling, and to appropriately locate the piezometers.

- **The water samples collected from the river station sampling points are representative of the groundwater upwelling from the intermediate/deep groundwater zone, and are not being impacted by leakage from the river surface water**. This conclusion is based on the analysis of the anion/cation concentrations in the groundwater and river water samples, temperature readings, and a pumping test conducted on RS-01. The samples from the river stations typically had a lower percentage of sodium and chloride ions than the river water samples. The river station samples also had smaller percentages of sulfates and higher carbonates that the river water samples.

- **There is no evidence of site indicator compounds from the intermediate/deep groundwater zone beneath the Site, migrating to the river via groundwater.**

This determination is based on the chemical analytical data collected from the monitoring wells, extraction wells, river water, and the river sampling stations. Indicator compounds, as expected, were detected in the intermediate/deep groundwater underlying the Site. No indicator compounds were detected in the river sampling stations during the time that the deep extraction system was shut down.

RECOMMENDATIONS

This upwelling study has successfully quantified and characterized the chemical concentrations of the groundwater that is upwelling from the Site to the Niagara River. The following recommendations are offered based on results of the upwelling study described in this report.

1. Based on the results of the groundwater upwelling study, the discontinued use of the intermediate/deep groundwater extraction system will not have an adverse impact on the quality of the groundwater upwelling to the Niagara River. Permanent shut-down of the deep extraction system, which has not been operational since October 2002, should proceed.

2. The deep groundwater extraction wells and the associated equipment should be decommissioned, to reduce the potential for interconnection between the shallow and deep groundwater zones. This will include the removal of the electrical and control system and the closure of the extraction wells.

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Piper, A.M., 1944. "A Graphical Procedure in the Geochemical Interpretation of Water Analysis." American Geophysical Union Transactions, vol 25, pp. 914-923.

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Table 1

Cherry Farm/River Road Groundwater Upwelling Study
Sampling and Analysis Summary

Sampling Events Event Method	Date	BTEX EPA 8020	SVOCs EPA 8270	Naphthalene EPA 8270	PCBs EPA 8082	cat/anion*	Comments
Pre-shutdown	October 2003	15	15		15	15	8 RSs, 5RWs, 2MWs, 1 dup, 1 RV, 2 trip blanks (VOCs)
Quarter 1	December 2002	11		11	11	12	8 RSs, 2MWs, 1 dup, MWs done by OBG, one river sample. For cat/anions. 2 trip blanks
Quarter 2	March 2003	9		9	9	10	8 RSs, 1 dup, one riv. sample for cat/ions, no cat/anion dupe. 1 trip blank
Quarter 3	June 2003	11		11	11	12	8 RSs, 2 MWs, 1RV, 1 trip blank
Quarter 4	October 2003	15		15	15	15	8 RSs, 4 RWs, 2 MWs, 1 RV, 1 dup. 1 trip blank
Total		**61**	**15**	**46**	**61**	**64**	

*Ca, Na, Mg, bicarbonate, Cl, Sulfate
MWs: MW-4, MW-5
RWs: RW-2, RW-3, RW-4, and RW-5

Samples submitted to CES, with the exception of MW-4 and MW-5 samples in Dec. 02 and June 03, which were analyzed by OBG.

WELL	CATIONS				ANIONS				CATION-ANION	TDS (approx)
	Ca	Mg	Ca+Mg	Na+K	Cl	SO_4	$Cl+SO_4$	HCO_3+CO_3	Balance Error	MG/L
RW-02-P	60%	38%	97%	3%	19%	22%	40%	60%	10%	900
RS-01-P	32%	11%	43%	57%	29%	9%	38%	62%	10%	816
RV-01-P	62%	23%	85%	15%	23%	23%	45%	55%	42%	178
MW-05-1	27%	13%	40%	60%	14%	8%	22%	78%	17%	881
MW-04-1	29%	12%	41%	59%	10%	4%	14%	86%	4%	589
MW-05-1	27%	13%	40%	60%	14%	8%	22%	78%	17%	1128
RW-02-1	51%	27%	78%	22%	17%	21%	39%	61%	7%	1117
RW-03-1	47%	18%	65%	35%	13%	9%	22%	78%	33%	475
RW-04-1	39%	14%	53%	47%	14%	12%	26%	74%	4%	688
RW-05-1	42%	19%	61%	39%	13%	16%	29%	71%	5%	946
RS-01-1	47%	12%	58%	42%	32%	4%	36%	64%	16%	570
RS-02-1	17%	10%	26%	74%	11%	27%	38%	62%	12%	737
RS-03-1	72%	20%	92%	8%	21%	5%	27%	73%	47%	474
RS-04-1	35%	14%	49%	51%	15%	13%	28%	72%	13%	413
RS-05-1	33%	10%	42%	58%	15%	15%	29%	71%	8%	264
RS-06-1	27%	7%	35%	65%	18%	21%	39%	61%	153%	613
RS-07-1	44%	7%	51%	49%	13%	12%	25%	75%	3%	417
RS-08-1	38%	10%	49%	51%	15%	13%	28%	72%	30%	416
RV-01-1	61%	23%	84%	16%	18%	14%	32%	68%	137%	718
MW-04-2	58%	25%	82%	18%	28%	15%	43%	57%	17%	666
MW-05-2	53%	22%	75%	25%	17%	14%	31%	69%	17%	1023
RS-01-2	35%	11%	45%	55%	4%	24%	28%	72%	10%	903
RS-02-2	25%	10%	35%	65%	3%	12%	15%	85%	16%	900
RS-03-2	47%	11%	57%	43%	3%	16%	19%	81%	1%	826
RS-04-2	31%	13%	44%	56%	10%	12%	21%	79%	1%	515
RS-05-2	33%	9%	42%	58%	5%	10%	15%	85%	10%	616
RS-06-2	18%	5%	24%	76%	0%	15%	15%	85%	4%	733
RS-07-2	29%	4%	33%	67%	16%	9%	25%	75%	13%	539
RS-08-2	39%	7%	47%	53%	0%	11%	11%	89%	47%	211
RV-01-2	60%	23%	83%	17%	22%	17%	38%	62%	29%	1073
RS-01-3	43%	12%	55%	45%	27%	1%	28%	72%	8%	1045

Cherry Farm/River Road Site, Tonawanda, New York

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TABLE 2
Cherry Farm/River Road
Groundwater Upwelling Study
Cation/Anion Analytical Summary

WELL	CATIONS				ANIONS				CATION-ANION	TDS (approx)
	Ca	Mg	Ca+Mg	Na+K	Cl	SO_4	$Cl+SO_4$	HCO_3+CO_3	Balance Error	MG/L
RS-01dp-3	42%	12%	54%	46%	28%	1%	30%	70%	2%	933
RS-02-3	24%	12%	36%	64%	14%	2%	15%	85%	5%	876
RS-03-3	43%	10%	54%	46%	20%	1%	21%	79%	2%	956
RS-04-3	22%	10%	32%	68%	15%	1%	16%	84%	7%	528
RS-05-3	25%	6%	31%	69%	12%	1%	13%	87%	7%	601
RS-06-3	17%	4%	21%	79%	18%	1%	19%	81%	28%	691
RS-07-3	33%	4%	37%	63%	12%	6%	18%	82%	6%	470
RS-08-3	30%	5%	35%	65%	14%	1%	16%	84%	40%	159
RV-01-3	55%	23%	78%	22%	27%	18%	45%	55%	10%	745
MW-4-4	58%	24%	81%	19%	6%	8%	14%	86%	38%	889
MW-5-4	59%	22%	81%	19%	19%	19%	38%	62%	31%	1249
RS-01-4	42%	10%	52%	48%	35%	1%	36%	64%	19%	1133
RS-01dp-4	43%	11%	54%	46%	23%	1%	24%	76%	45%	1033
RS-02-4	27%	10%	37%	63%	13%	2%	14%	86%	46%	948
RS-03-4	46%	8%	55%	45%	17%	1%	19%	81%	40%	1054
RS-04-4	28%	10%	38%	62%	15%	1%	16%	84%	53%	519
RS-05-4	29%	7%	35%	65%	12%	1%	13%	87%	14%	638
RS-06-4	17%	4%	20%	80%	16%	1%	17%	83%	5%	759
RS-07-4	35%	4%	39%	61%	11%	4%	15%	85%	34%	480
RS-08-4	34%	5%	39%	61%	13%	1%	15%	85%	8%	193
RV-01-4	61%	24%	85%	15%	21%	18%	38%	62%	32%	505
MW-4-5	39%	6%	44%	56%	5%	41%	46%	54%	61%	756
MW-5-5	31%	8%	39%	61%	20%	21%	41%	59%	109%	674
RS-01-5	39%	6%	46%	54%	34%	2%	36%	64%	4%	797
RS-02-5	15%	8%	23%	77%	14%	2%	16%	84%	81%	673
RS-03-5	74%	14%	88%	12%	18%	1%	19%	81%	122%	733
RS-04-5	44%	7%	51%	49%	15%	1%	16%	84%	150%	495
RS-05-5	25%	6%	31%	69%	12%	0%	12%	88%	3%	687
RS-06-5	16%	4%	20%	80%	16%	0%	16%	84%	48%	659
RS-07-5	56%	8%	63%	37%	12%	3%	14%	86%	33%	443
RS-08-5	27%	11%	38%	62%	0%	11%	11%	89%	50%	214
RV-01-5	59%	16%	75%	25%	16%	38%	54%	46%	63%	0

Cherry Farm/River Road Site, Tonawanda, New York

PARSONS

180 Lawrence Bell Drive · Suite 104 · Williamsville, NY 14221 · (716) 633-7074

TABLE 2 (continued)
Cherry Farm/River Road
Groundwater Upwelling Study
Cation/Anion Analytical Summary

TABLE 3
Cherry Farm/River Road
Groundwater Upwelling Study
Hydraulic Head Summary

Station ID		10/10/02	10/28/02	11/12/02	11/18/02	11/27/02	12/4/02	12/13/02	12/16/02	12/23/02	1/15/03	2/6/03	3/13/03	3/18/03	3/26/03
RS-01	Head difference between pair (ft)	0.15	0.19	0.17	0.15	0.24	0.26	0.28	0.27	0.20	0.25	0.33	0.39	0.34	0.39
	Upward Hydraulic Gradient	0.037	0.049	0.042	0.038	0.061	0.065	0.071	0.067	0.049	0.062	0.083	0.097	0.086	0.096
RS-02	Head difference between pair (ft)	0.10	0.07	-0.02	0.01	0.17	0.02	0.07	0.04	0.00	0.08	0.04	0.04	0.04	0.07
	Upward Hydraulic Gradient	0.026	0.018	-0.006	0.003	0.044	0.004	0.017	0.010	-0.001	0.021	0.011	0.011	0.010	0.017
RS-03	Head difference between pair (ft)	0.17	0.20	0.19	0.17	0.20	0.20	0.20	0.19	0.18	0.15	0.17	0.18	0.18	0.19
	Upward Hydraulic Gradient	0.049	0.058	0.054	0.048	0.058	0.057	0.058	0.054	0.050	0.042	0.049	0.051	0.052	0.053
RS-04	Head difference between pair (ft)	0.11	-0.01	-0.09	-0.12	-0.14	-0.17	-0.21	-0.21	-0.26	-0.33	-0.35	-0.44	-0.39	-0.40
	Upward Hydraulic Gradient	0.021	-0.003	-0.017	-0.022	-0.026	-0.031	-0.038	-0.038	-0.047	-0.059	-0.064	-0.079	-0.071	-0.072
RS-05	Head difference between pair (ft)	0.08	0.05	0.03	0.03	0.02	0.01	0.00	-0.01	0.02	-0.07	-0.05	-0.09	-0.10	-0.04
	Upward Hydraulic Gradient	0.022	0.016	0.007	0.009	0.005	0.004	0.000	-0.002	0.005	-0.020	-0.014	-0.025	-0.028	-0.012
RS-06	Head difference between pair (ft)	0.03	0.00	-0.02	-0.04	0.00	-0.01	0.00	-0.04	-0.01	-0.02	-0.04	-0.02	-0.03	-0.02
	Upward Hydraulic Gradient	0.008	-0.001	-0.005	-0.011	0.001	-0.004	-0.001	-0.011	-0.002	-0.007	-0.011	-0.006	-0.009	-0.006
RS-07	Head difference between pair (ft)	0.23	0.17	0.22	0.12	0.18	0.15	0.09	0.13	0.13	0.09	0.08	0.03	0.02	0.01
	Upward Hydraulic Gradient	0.057	0.042	0.055	0.030	0.045	0.037	0.023	0.032	0.031	0.023	0.020	0.008	0.006	0.003
RS-08	Head difference between pair (ft)	-0.02	-0.04	-0.10	-0.09	-0.04	-0.07	-0.06	-0.03	-0.08	-0.07	-0.05	-0.03	-0.04	0.00
	Upward Hydraulic Gradient	-0.006	-0.013	-0.030	-0.025	-0.012	-0.019	-0.018	-0.010	-0.023	-0.020	-0.013	-0.008	-0.013	-0.001
River Level	(ft at staff gauge)	0.44	0.14	-0.44	0.12	0.50	-0.31	-0.80	-0.40	0.70	0.18	-0.57	-0.81	-1.00	-0.33

TABLE 3 continued
Cherry Farm/River Road
Groundwater Upwelling Study
Hydraulic Head Summary

Station ID		4/2/03	4/11/03	4/18/03	4/30/03	5/7/03	5/20/03	5/30/03	7/23/03	8/11/03	8/29/03	9/29/03	10/10/03	10/31/03	11/14/03
RS-01	Head difference between pair (ft)	0.36	0.37	0.34	0.35	0.34	0.31	0.34	0.26	0.23	0.12	-0.07	0.15	0.13	0.19
	Upward Hydraulic Gradient	0.091	0.092	0.084	0.088	0.085	0.079	0.084	0.066	0.056	0.029	-0.017	0.037	0.034	0.048
RS-02	Head difference between pair (ft)	0.03	0.04	0.05	0.06	0.04	0.02	0.04	0.03	0.02	0.03	0.03	0.02	0.04	0.09
	Upward Hydraulic Gradient	0.008	0.010	0.013	0.016	0.009	0.006	0.011	0.008	0.004	0.006	0.007	0.006	0.010	0.022
RS-03	Head difference between pair (ft)	0.16	0.15	0.12	0.18	0.15	0.15	0.14	0.13	0.15	0.15	0.16	0.15	0.17	0.18
	Upward Hydraulic Gradient	0.045	0.043	0.035	0.052	0.043	0.044	0.041	0.038	0.042	0.043	0.045	0.044	0.050	0.051
RS-04	Head difference between pair (ft)	-0.41	-0.42	-0.43	-0.43	-0.41	-0.39	-0.41	-0.29	-0.26	-0.18	-0.23	-0.09	-0.27	-0.30
	Upward Hydraulic Gradient	-0.074	-0.076	-0.079	-0.078	-0.075	-0.072	-0.075	-0.053	-0.048	-0.034	-0.042	-0.017	-0.050	-0.054
RS-05	Head difference between pair (ft)	-0.09	-0.08	-0.07	-0.11	-0.09	-0.07	-0.05	0.00	0.03	0.01	-0.02	0.07	0.08	0.04
	Upward Hydraulic Gradient	-0.025	-0.023	-0.021	-0.030	-0.026	-0.021	-0.013	-0.001	0.009	0.004	-0.005	0.019	0.022	0.012
RS-06	Head difference between pair (ft)	-0.04	-0.02	-0.03	-0.05	-0.03	-0.04	0.00	-0.05	-0.05	-0.06	-0.10	-0.07	-0.12	-0.06
	Upward Hydraulic Gradient	-0.010	-0.007	-0.009	-0.013	-0.010	-0.012	-0.001	-0.014	-0.013	-0.018	-0.029	-0.018	-0.033	-0.017
RS-07	Head difference between pair (ft)	0.03	0.04	0.03	0.06	0.02	0.02	0.02	0.09	0.10	0.10	0.12	0.10	0.09	0.11
	Upward Hydraulic Gradient	0.008	0.009	0.008	0.014	0.005	0.006	0.004	0.022	0.024	0.025	0.030	0.025	0.022	0.029
RS-08	Head difference between pair (ft)	-0.08	-0.08	-0.04	-0.04	-0.04	-0.04	-0.02	-0.03	-0.04	-0.06	-0.07	-0.06	-0.06	-0.04
	Upward Hydraulic Gradient	-0.023	-0.022	-0.011	-0.012	-0.012	-0.011	-0.007	-0.008	-0.010	-0.018	-0.020	-0.017	-0.016	-0.012
River Level	(ft at staff gauge)	-0.20	0.15	0.10	-0.08	0.20	0.30	0.45	0.60	-1.48	0.50	1.00	-0.01	0.06	0.00

TABLE 4
Cherry Farm/River Road
Groundwater Upwelling Study
River Station Temperature Data

Station ID	Piezometer ID	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F
		10-Oct-02	28-Oct-02	12-Nov-02	18-Nov-02	27-Nov-02	4-Dec-02	13-Dec-02	16-Dec-02	23-Dec-02	15-Jan-03	6-Feb-03	12-Mar-03	18-Mar-03	26-Mar-03
RS-01D	2351	60.3	59.9	58.6	57.9	57.1	56.2	55.0	54.4	53.4	50.9	49.2	46.1	45.7	45.2
RS-01S	2352	64.6	61.3	57.5	56.3	53.9	52.6	50.2	49.5	48.2	45.1	43.0	40.2	40.1	40.1
RS-02D	2353	67.8	57.9	57.6	57.5	57.0	56.7	56.0	55.7	55.4	53.4	52.1	49.5	49.2	48.7
RS-02S	2354	66.0	60.7	59.1	58.4	57.1	56.2	55.0	54.4	53.4	50.7	48.9	45.8	45.5	45.1
RS-03D	2355	63.8	59.7	58.4	57.8	56.7	55.9	54.4	54.1	53.1	50.4	48.5	45.7	45.2	44.8
RS-03S	2356	67.0	61.3	57.8	56.8	54.6	53.1	51.2	50.4	49.2	46.0	43.9	41.0	40.8	40.8
RS-04D	2358	64.9	57.1	56.8	56.7	56.2	55.9	55.2	55.0	54.4	52.8	51.7	49.0	48.5	48.2
RS-04S	2357	64.9	61.9	59.4	58.4	57.0	55.9	54.2	53.6	52.5	49.6	47.5	44.5	44.0	43.7
RS-05D	2359	57.5	57.5	57.1	56.8	56.2	55.9	55.0	54.4	54.1	52.1	50.9	48.2	47.8	47.3
RS-05S	2360	61.0	60.0	58.3	57.5	56.0	55.2	53.6	52.6	52.0	49.2	47.5	44.3	44.3	43.9
RS-06D	2361	59.5	58.9	58.3	57.9	57.1	56.7	56.7	54.7	56.7	53.7	52.6	50.6	49.8	49.8
RS-06S	2362	61.4	60.3	58.6	57.6	56.5	56.5	54.1	53.1	52.5	49.8	47.9	45.2	44.9	44.6
RS-07D	2363	56.5	56.8	56.7	56.5	56.0	55.5	55.0	54.6	54.2	52.5	51.3	48.9	48.4	48.1
RS-07S	2364	60.3	59.4	57.8	57.1	55.9	55.0	53.7	52.9	52.3	49.6	47.9	45.1	44.8	44.5
RS-08D	2366	59.5	56.8	58.3	56.8	56.0	56.7	56.7	54.7	56.7	53.7	52.6	51.3	51.0	50.7
RS-08S	2365	60.5	59.7	58.4	57.8	56.8	55.7	54.6	53.9	53.3	50.9	49.5	46.7	46.4	46.0
River water		64	56	50	46	43	36	35	33	18	16	16	33	33	36

Station ID		Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F
RS-01		-4.3	-1.4	1.1	1.6	3.2	3.6	4.8	4.9	5.2	5.8	6.2	5.9	5.6	5.1
RS-02		1.8	-2.8	-1.5	-0.9	-0.1	0.5	1.0	1.3	2.0	2.7	3.2	3.7	3.7	3.6
RS-03		-3.2	-1.6	0.6	1.0	2.1	2.8	3.2	3.7	3.9	4.4	4.6	4.7	4.4	4.0
RS-04		0.0	-4.8	-2.6	-1.7	-0.8	0.0	1.0	1.4	1.9	3.2	4.2	4.5	4.5	4.5
RS-05		-3.5	-2.5	-1.2	-0.7	0.2	0.7	1.4	1.8	2.1	2.9	3.4	3.9	3.5	3.4
RS-06		-1.9	-1.4	-0.3	0.3	0.6	0.2	2.6	1.6	4.2	3.9	4.7	5.4	4.9	5.2
RS-07		-3.8	-2.6	-1.1	-0.6	0.1	0.5	1.3	1.7	1.9	2.9	3.4	3.8	3.6	3.6
RS-08		-1.0	-2.9	-0.1	-1.0	-0.8	1.0	2.1	0.8	3.4	2.8	3.1	4.6	4.6	4.7

Blank Cell: No measurement

TABLE 4 (continued)
Cherry Farm/River Road
Groundwater Upwelling Study
River Station Temperature Data

Station ID	Piezometer ID	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F	Temperature °F
		3-Apr-03	11-Apr-03	18-Apr-03	30-Apr-03	7-May-03	20-May-03	30-May-03	23-Jul-03	11-Aug-03	29-Aug-03	29-Sep-03	10-Oct-03	31-Oct-03	14-Nov-03
RS-01D	2351	45.1	44.8	44.8	44.8	44.9	45.5	46.0	51.7	53.9	56.2	58.3	58.4	57.3	56.3
RS-01S	2352	40.5	40.4	40.8	42.4	43.4	44.9	46.3	58.6	61.0	63.3	63.2	61.1	57.8	55.5
RS-02D	2353	48.4	47.9	47.8	47.3	47.3	47.2	47.3	49.8	51.3	52.9	55.5	56.0	56.2	55.9
RS-02S	2354	44.8	44.6	44.3	44.6	44.8	45.5	46.0	52.6	55.5	57.5	59.7	59.5	57.9	56.8
RS-03D	2355	44.6	44.3	44.2	44.3	44.6	45.1	45.7	51.7	53.9	56.2	58.3	58.3	57.1	56.0
RS-03S	2356	41.1	41.0	41.3	42.7	43.6	45.1	46.1	57.9	60.5	62.9	62.3	61.0	57.9	55.9
RS-04D	2358	47.8	47.5	47.2	46.9	46.7	46.6	46.1	49.0	50.6	52.0	54.2	60.7	55.2	54.7
RS-04S	2357	43.7	43.7	43.4	44.0	44.5	45.4	46.1	54.6	57.5	60.0	61.3	54.7	58.4	56.8
RS-05D	2359	47.2	46.7	46.6	46.3	46.3	46.3	46.7	49.9	51.7	53.3	55.5	55.9	55.9	55.4
RS-05S	2360	43.7	43.6	43.4	43.7	44.0	44.9	45.7	53.1	55.7	57.8	52.5	59.1	57.5	56.2
RS-06D	2361	49.2	48.7	48.9	48.1	47.6	47.9	49.9	51.2	53.3	54.2	54.6	59.4	54.7	58.3
RS-06S	2362	44.5	44.3	44.2	44.3	44.5	45.4	46.0	53.3	56.0	58.3	59.9	59.5	57.6	56.3
RS-07D	2363	47.8	47.5	47.2	46.9	46.7	46.7	46.9	49.6	51.2	52.5	54.6	55.0	55.4	54.9
RS-07S	2364	44.3	44.0	43.9	43.9	44.3	44.9	45.7	52.1	54.6	56.8	58.6	58.3	57.0	55.9
RS-08D	2366	50.4	49.9	49.8	49.5	49.2	49.3	49.2	51.0	52.3	53.6	56.2	56.5	56.5	56.2
RS-08S	2365	46.0	45.7	45.5	45.4	45.5	46.0	46.4	52.3	54.6	56.8	58.7	58.6	57.5	56.3
River water		34	34	38	47	46	50	57	71	75	76	65	59	51	46

Station ID		Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F	Difference °F
RS-01		4.6	4.4	4.0	2.4	1.5	0.6	-0.3	-6.9	-7.1	-7.1	-4.9	-2.7	-0.5	0.8
RS-02		3.6	3.3	3.5	2.7	2.5	1.7	1.3	-2.8	-4.2	-4.6	-4.2	-3.5	-1.7	-0.9
RS-03		3.5	3.3	2.9	1.6	1.0	0.0	-0.4	-6.2	-6.6	-6.7	-4.0	-2.7	-0.8	0.1
RS-04		4.1	3.8	3.8	2.9	2.2	1.2	0.0	-5.6	-6.9	-8.0	-7.1	6.0	-3.2	-2.1
RS-05		3.5	3.1	3.2	2.6	2.3	1.4	1.0	-3.2	-4.0	-4.5	3.0	-3.2	-1.6	-0.8
RS-06		4.7	4.4	4.7	3.8	3.1	2.5	3.9	-2.1	-2.7	-4.1	-5.3	-0.1	-2.9	2.0
RS-07		3.5	3.5	3.3	3.0	2.4	1.8	1.2	-2.5	-3.4	-4.3	-4.0	-3.3	-1.6	-1.0
RS-08		4.4	4.2	4.3	4.1	3.7	3.3	2.8	-1.3	-2.3	-3.2	-2.5	-2.1	-1.0	-0.1

Blank Cell: No measuremen

Table 5
Cherry Farm/River Road
Groundwater Upwelling Study
Pre System Shutdown Sampling Event
(October 2002)
Analytical Results

Cherry Farm Upwelling Data Study October 2002 Revised Laboratory Analytical Results from the Initial Report (Table 2)		Sample ID: Lab Sample Id: Source: SDG: Matrix: Sampled: Validated:	NYSDEC Class GA Groundwater Standards	MW-04 301457/68/78/88/97 CES 301455 WATER 10/11/2002	MW-05 301456/67/77/87/96 CES 301455 WATER 10/11/2002	RS-01 301177/83/88/93/99 CES 301177 WATER 10/9/2002	RS-02 301178/84/94/200 CES 301177 WATER 10/9/2002	RS-03 301179/85/90/95/201 CES 301177 WATER 10/9/2002	RS-04 301180/86/91/96/202 CES 301177 WATER 10/9/2002	RS-05 301455/66/76/86/95 CES 301455 WATER 10/11/2002	RS-06 301181/87/92/98/204 CES 301177 WATER 10/9/2002	RS-07 301458/69/79/89/98 CES 301455 WATER 10/11/2002	RS-0 301464/75/85 CES 30145 WATE 10/11/2
CAS NO.	COMPOUND	UNITS:											
	VOLATILES												
71-43-2	Benzene	ug/L	1	0.7 U	70	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	1
108-88-3	Toluene	ug/L	5	1 U	10	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1
100-41-4	Ethylbenzene	ug/L	5	1 U	15	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1
1330-20-7	Total Xylenes	ug/L	5	3 U	59	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3
	SEMIVOLATILES												
91-20-3	Naphthalene	ug/L	10	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
208-96-8	Acenaphthylene	ug/L	NS	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
83-32-9	Acenaphthene	ug/L	20	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
86-73-7	Fluorene	ug/L	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
85-01-8	Phenanthrene	ug/L	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
120-12-7	Anthracene	ug/L	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
206-44-0	Fluoranthene	ug/L	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
129-00-0	Pyrene	ug/L	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
56-55-3	Benzo(a)anthracene	ug/L	0.002	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
218-01-9	Chrysene	ug/L	0.002	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
205-99-2	Benzo(b)fluoranthene	ug/L	0.002	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
207-08-9	Benzo(k)fluoranthene	ug/L	0.002	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
50-32-8	Benzo(a)pyrene	ug/L	ND	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
193-39-5	Indeno(1,2,3-cd)pyrene	ug/L	0.002	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
53-70-3	Dibenzo(a,h)anthracene	ug/L	NS	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
191-24-2	Benzo(ghi)perylene	ug/L	NS	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5
	PCBs												
11104-28-2	Aroclor 1221	ug/L	sum of	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065
11141-16-5	Aroclor 1232	ug/L	PCBs	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065
53469-21-9/12674-11-2	Aroclor 1242/1016	ug/L	= 0.09	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065
12672-29-6	Aroclor 1248	ug/L		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065
11097-69-1	Aroclor 1254	ug/L		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065
11096-82-5	Aroclor 1260	ug/L		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065
	METALS												
7440-70-2	Calcium, Total	ug/L		67400	36100	135000	26800	107000	48000	33800	34000	68800	34500
7439-95-4	Magnesium, Total	ug/L		16500	11000	20300	9530	18300	11200	5930	5610	6180	5570
7440-23-5	Sodium, Total	ug/L		156000	93800	139000	137000	13300	79700	67800	92700	87700	53100
	OTHER												
	Bicarbonate Alkalinity	ug/L		581000	378000	487000	275000	488000	266000	238000	91000	360000	256000
(CHLOR)	Chloride	ug/L		40000	38000	143000	29000	83000	32000	29000	16000	37000	32000
(SULFA)	Sulfate	ug/L		20000	32000	21400	92300	27500	36600	38700	24300	44800	35800

Table 5
Cherry Farm/River Road
Groundwater Upwelling Study
Pre System Shutdown Sampling Event
(October 2002)
Analytical Results

Cherry Farm Upwelling Data Study October 2002 Revised Laboratory Analytical Results from the Initial Report (Table 2)		Sample ID: Lab Sample Id: Source: SDG: Matrix: Sampled: Validated:	NYSDEC Class GA Groundwater Standards		RV-01 301197/203 CES 301177 WATER 10/9/2002	RW-02 301459/70/80/90/99 CES 301455 WATER 10/11/2002	RW-03 301460/71/81/91/500 CES 301455 WATER 10/11/2002	RW-04 301461/72/82/92/501 CES 301455 WATER 10/11/2002	RW-05 301462/73/83/93/502 CES 301455 WATER 10/11/2002	dup of RW-5 RW-00 301463/74/84 CES 301455 WATER 10/11/2002	TRIP BLANK 301182 CES 301177 WATER 10/9/2002	TRIP BLANK 301465 CES 301455 WATER 10/11/2002
CAS NO.	COMPOUND	UNITS:										
	VOLATILES											
71-43-2	Benzene	ug/L	1			0.7 U	0.7 U	120	42	49	0.7 U	0.7 U
108-88-3	Toluene	ug/L	5	U		1 U	1 U	5 U	13	21	1 U	1 U
100-41-4	Ethylbenzene	ug/L	5	U		1 U	1 U	5 U	5	7.5	1 U	1 U
1330-20-7	Total Xylenes	ug/L	5	U		3 U	3 U	15 U	22	31	3 U	3 U
	SEMIVOLATILES											
91-20-3	Naphthalene	ug/L	10	U		5 U	5 U	5 U	5 U	5 U		
208-96-8	Acenaphthylene	ug/L	NS	U		5 U	5 U	5 U	5 U	5 U		
83-32-9	Acenaphthene	ug/L	20	U		5 U	5 U	5 U	5 U	5 U		
86-73-7	Fluorene	ug/L	50	U		5 U	5 U	5 U	5 U	5 U		
85-01-8	Phenanthrene	ug/L	50	U		5 U	5 U	5 U	5 U	5 U		
120-12-7	Anthracene	ug/L	50	U		5 U	5 U	5 U	5 U	5 U		
206-44-0	Fluoranthene	ug/L	50	U		5 U	5 U	5 U	5 U	5 U		
129-00-0	Pyrene	ug/L	50	U		5 U	5 U	5 U	5 U	5 U		
56-55-3	Benzo(a)anthracene	ug/L	0.002	U		5 U	5 U	5 U	5 U	5 U		
218-01-9	Chrysene	ug/L	0.002	U		5 U	5 U	5 U	5 U	5 U		
205-99-2	Benzo(b)fluoranthene	ug/L	0.002	U		5 U	5 U	5 U	5 U	5 U		
207-08-9	Benzo(k)fluoranthene	ug/L	0.002	U		5 U	5 U	5 U	5 U	5 U		
50-32-8	Benzo(a)pyrene	ug/L	ND	U		5 U	5 U	5 U	5 U	5 U		
193-39-5	Indeno(1,2,3-cd)pyrene	ug/L	0.002	U		5 U	5 U	5 U	5 U	5 U		
53-70-3	Dibenzo(a,h)anthracene	ug/L	NS	U		5 U	5 U	5 U	5 U	5 U		
191-24-2	Benzo(ghi)perylene	ug/L	NS	U		5 U	5 U	5 U	5 U	5 U		
	PCBs											
11104-28-2	Aroclor 1221	ug/L	sum of	U		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
11141-16-5	Aroclor 1232	ug/L	PCBs	U		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
53469-21-9/12674-11-2	Aroclor 1242/1016	ug/L	= 0.09	U		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
12672-29-6	Aroclor 1248	ug/L		U		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
11097-69-1	Aroclor 1254	ug/L		U		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
11096-82-5	Aroclor 1260	ug/L		U		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
	METALS											
7440-70-2	Calcium, Total	ug/L			34400	168000	111000	47300	74400			
7439-95-4	Magnesium, Total	ug/L			7880	53100	25400	10300	20500			
7440-23-5	Sodium, Total	ug/L			10200	82600	95900	65100	78600			
	OTHER											
	Bicarbonate Alkalinity	ug/L			276000	573000	743000	284000	400000			
(CHLOR)	Chloride	ug/L			43000	95000	74000	31000	44000			
(SULFA)	Sulfate	ug/L			44600	156000	67200	37100	70900			

Table 6
Cherry Farm/River Road
Groundwater Upwelling Study
1st Quarter Sampling Event
(December 2002)
Analytical Results

Cherry Farm Upwelling Data Study December 2002 Laboratory Analytical Results		Sample ID: Lab Sample Id: Source: SDG: Matrix: Sampled: Validated:	NYSDEC Class GA Groundwater Standard	MW-04 306944/Z7814 CES/OBG 4219 WATER 12/18/2002	MW-05 306946/Z7815 CES/OBG 4219 WATER 12/18/2002	RS-01 306923 CES 112462 WATER 12/16/2002	RS-02 306926 CES 112462 WATER 12/19/2002	RS-03 306924 CES 112462 WATER 12/18/2002	RS-04 309625 CES 112462 WATER 12/18/2002	RS-05 306928 CES 112462 WATER 12/19/2002	RS-06 307072 CES 112462 WATER 12/20/2002	RS-07 307082 CES 112462 WATER 12/20/2002	RS-08 307077 CES 112462 WATER 12/20/2002	RS-09 306927 CES 112462 WATER 12/19/2002	RV-01 306950 CES 112462 WATER 12/19/2002	TRIP BLANK 306929 CES 112462 WATER 12/19/2002	TRIP BLANK 307087 CES 112462 WATER 12/20/2002
CAS NO.	COMPOUND	UNITS:															
	VOLATILES																
71-43-2	Benzene	ug/L	1	10 U	52	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U		0.7 U	0.7 U
108-88-3	Toluene	ug/L	5	10 U	5 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U	1 U
100-41-4	Ethylbenzene	ug/L	5	10 U	4 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U	1 U
1330-20-7	Total Xylenes	ug/L	5	10 U	17	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U		3 U	3 U
	SEMIVOLATILES																
91-20-3	Naphthalene	ug/L	10	11 U	13	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U			
	PCBs																
11104-28-2	Aroclor 1221	ug/L		2 U	20	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U			
11141-16-5	Aroclor 1232	ug/L	sum of	1 U	1 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U			
53469-21-9/12674-11-2	Aroclor 1242/1016	ug/L	PCBs	1 U	1 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U			
12672-29-6	Aroclor 1248	ug/L	= 0.09	1 U	1 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U			
11097-69-1	Aroclor 1254	ug/L		1 U	1 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U			
11096-82-5	Aroclor 1260	ug/L		1 U	1 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U			
	METALS																
7440-70-2	Calcium, Total	mg/L		104	84.4	98.3	62	106	66.3	40	28.9	60.7	39	59.6	28.9		
7439-95-4	Magnesium, Total	mg/L		27.2	21.2	18.3	15.6	15.1	16.8	6.71	4.96	5.2	4.53	15	6.76		
7440-23-5	Sodium, Total	mg/L		36.6	46.7	178	189	111	139	80.3	137	158	61.1	144	9.53		
	OTHER																
	Bicarbonate Alkalinity	mg/L		370	396	561	563	567	508	344	392	416	396	567	117		
(SULFA)	Sulfate	mg/L		105	54.9	17.7	13.3	11.1	36.1	11.5	0.5 U	53.1	0.5 U	13.3	24		
(CHLOR)	Chloride	mg/L		75	62.5	150	60	90	60	32.5	52.5	40	38	62.5	25		

Note: OBG analyzed VOCs, SVOCs, and PCBs for MW-04 and MW-05. CES analyzed metals and other parameters for MW-04 and MW-05.

Table 7
Cherry Farm/River Road
Groundwater Upwelling Study
2nd Quarter Sampling Event
(March 2003)
Analytical Results

Cherry Farm Upwelling Data Study March 2003		Sample ID: Lab Sample Id: Source: SDG: Matrix: Sampled: Validated:	NYSDEC Class GA Groundwater Standard	RS-01 316522 CES 11246-3 WATER 3/31/2003	RS-02 316527 CES 11246-3 WATER 3/31/2003	RS-03 316793 CES 11246-3 WATER 4/2/2003	RS-04 316532 CES 11246-3 WATER 3/31/2003	RS-05 316800 CES 11246-3 WATER 4/2/2003	RS-06 316805 CES 11246-3 WATER 4/2/2003	RS-07 316810 CES 11246-3 WATER 4/2/2003	RS-08 316815 CES 11246-3 WATER 4/2/2003	RS-DUP 316537 CES 11246-3 WATER 3/31/2003	RV-01 316798 CES 11246-3 WATER 4/2/2003	TRIP BLANK 316542 CES 11246-3 WATER 3/31/2003
CAS NO.	COMPOUND	UNITS:												
	VOLATILES													
71-43-2	Benzene	ug/L	1	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U		0.7 U
108-88-3	Toluene	ug/L	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U
100-41-4	Ethylbenzene	ug/L	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U
1330-20-7	Total Xylenes	ug/L	5	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U		3 U
	SEMIVOLATILES													
91-20-3	Naphthalene	ug/L	10	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U		
	PCBs													
11104-28-2	Aroclor 1221	ug/L	sum of	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
11141-16-5	Aroclor 1232	ug/L	PCBs	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
53469-21-9/12	Aroclor 1242/1016	ug/L	= 0.09	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
12672-29-6	Aroclor 1248	ug/L		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
11097-69-1	Aroclor 1254	ug/L		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
11096-82-5	Aroclor 1260	ug/L		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
	METALS													
7440-70-2	Calcium, Total	mg/L		116	58.8	98.3	57.4	31.8	21.3	55.6	27.6	117	26.5	
7439-95-4	Magnesium, Total	mg/L		20.5	17.7	14	15.7	4.61	3.11	4.24	2.81	20.5	6.57	
7440-23-5	Sodium, Total	mg/L		141	183	121	200	100	116	122	69.4	146	12.3	
	OTHER													
	Bicarbonate Alkalinity	mg/L		649	607	555	612	360	406	446	333	611	89	
(CHLOR)	Chloride	mg/L		141	58	80	63	28	51	37	33	143	25	
(SULFA)	Sulfate	mg/L		5.41	8.64	7.89	8.04	2 U	2 U	26.4	2 U	7.8	22.7	

Table 8
Cherry Farm/River Road
Groundwater Upwelling Study
3rd Quarter Sampling Event
(June 2003)
Analytical Results

Cherry Farm Upwelling Data Study June 2003		Sample ID:	NYSDEC	MW-4	MW-5	RS-01	RS-02	RS-03	RS-04	RS-05	RS-06	RS-07	RS-08	RS-10	RV-01	TRIP BLANK
		Lab Sample Id	Class GA	327478/A7432	327475/A7431	327428	327438	327443	327448	327453	327458	327463	327468	327433	327473	327477
		Depth:	Groundwater													
		Source:	Standard	CES/OBG	CES/OBG	CES	CES	CES	CES	CES	CES	CES	CES	CES	CES	CES
		SDG:		11246-3/5716	11246-3/5716	11246-3	11246-3	11246-3	11246-3	11246-3	11246-3	11246-3	11246-3	11246-3	11246-3	11246-3
		Matrix:		WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
		Sampled:		6/24/2003	6/24/2003	6/23/2003	6/23/2003	6/23/2003	6/23/2003	6/23/2003	6/24/2003	6/24/2003	6/24/2003	6/23/2003	6/23/2003	6/24/2003
		Validated:														
CAS NO.	COMPOUND	UNITS:														
	VOLATILES															
71-43-2	Benzene	ug/L	1	10 U	38	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U		0.7 U
108-88-3	Toluene	ug/L	5	10 U	4 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U
100-41-4	Ethylbenzene	ug/L	5	10 U	2 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		1 U
1330-20-7	Total Xylenes	ug/L	5	10 U	7 J	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U		3 U
	SEMIVOLATILES															
91-20-3	Naphthalene	ug/L	10	10 U	5 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U		
	PCBs															
11104-28-2	Aroclor 1221	ug/L	sum of	2 U	2 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
11141-16-5	Aroclor 1232	ug/L	PCBs	1 U	1 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
53469-21-9/12	Aroclor 1242/1016	ug/L	= 0.09	1 U	1 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
12672-29-6	Aroclor 1248	ug/L		1 U	1 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
11097-69-1	Aroclor 1254	ug/L		1 U	1 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
11096-82-5	Aroclor 1260	ug/L		1 U	1 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U		
	METALS															
7440-70-2	Calcium, Total	mg/L		141	175	163	91.6	144	102	41.1	28.3	83.6	38.8	166	40.1	
7439-95-4	Magnesium, Total	mg/L		35	39.5	24.6	21.1	15.8	22.5	5.88	3.59	5.57	3.7	25.5	9.58	
7440-23-5	Sodium, Total	mg/L		52.2	65.5	214	247	162	256	107	153	164	80.6	207	11.1	
	OTHER															
	Bicarbonate Alkalinity	mg/L		465	430	634	613	551	605	335	404	454	324	617	93.1	
(CHLOR)	Chloride	mg/L		18	76	205	52	68	61	26	45	35	29	110	18	
(SULFA)	Sulfate	mg/L		33.9	103	7.96	8.79	7.11	7.64	4 U	4 U	16.7	4 U	7.75	21.2	

Note: OBG analyzed VOCs, SVOCs, and PBCs for MW-04 and MW-05. CES analyzed metals and other parameters for MW-04 and MW-05.

Table 9
Cherry Farm/River Road
Groundwater Upwelling Study
4th Quarter Sampling Event
(October 2003)
Analytical Results

Cherry Farm Upwelling Data Study October 2003 Laboratory Analytical Results		Sample ID: Lab Sample Id Depth: Source: SDG: Matrix: Sampled: Validated:	NYSDEC Class GA Groundwater Standard	MW-4 341660 CES WATER 10/9/2003	MW-5 341655 CES WATER 10/9/2003	RS-01 341512 CES WATER 10/7/2003	RS-02 341517 CES WATER 10/7/2003	RS-03 341522 CES WATER 10/7/2003	RS-04 341527 CES WATER 10/7/2003	RS-05 341491 CES WATER 10/6/2003	RS-06 341496 CES WATER 10/6/2003	RS-07 341501 CES WATER 10/6/2003
CAS NO.	COMPOUND	UNITS:										
	VOLATILES											
71-43-2	Benzene	ug/L	1	0.7 U	23	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
108-88-3	Toluene	ug/L	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
100-41-4	Ethylbenzene	ug/L	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1330-20-7	Total Xylenes	ug/L	5	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U
	SEMIVOLATILES											
91-20-3	Naphthalene	ug/L	10	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
	PCBs											
11104-28-2	Aroclor 1221	ug/L	sum of	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U
11141-16-5	Aroclor 1232	ug/L	PCBs	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U
53469-21-9/12	Aroclor 1242/1016	ug/L	= 0.09	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U
12672-29-6	Aroclor 1248	ug/L		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U
11097-69-1	Aroclor 1254	ug/L		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U
11096-82-5	Aroclor 1260	ug/L		0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U
	INORGANICS											
7440-70-2	Calcium, Total	mg/L		71.4	34.9	70.4	18.6	69.1	39.6	31.3	36.5	75.5
7439-95-4	Magnesium, Total	mg/L		6.13	5.87	6.93	6.47	8.06	3.69	4.89	5.7	6.43
7440-23-5	Sodium, Total	mg/L		117	80	112	113	12.7	50.5	101	108	56.8
	OTHER											
	Bicarbonate Alkalinity	mg/L		189	430	365	590	510	572	332	393	472
(CHLOR)	Chloride	mg/L		9.1	84	112	59	66	59	26	44	37
(SULFA)	Sulfate	mg/L		112	121	7.26	9.49	7.4	7.82	5 U	5 U	11.6

Table 9
Cherry Farm/River Road
Groundwater Upwelling Study
4th Quarter Sampling Event
(October 2003)
Analytical Results

Cherry Farm Upwelling Data Study October 2003 Laboratory Analytical Results		Sample ID: / Lab Sample Id / Depth: / Source: / SDG: / Matrix: / Sampled: / Validated:	NYSDEC Class GA Groundwater Standard	RS-08 341506 CES WATER 10/6/2003	RV-01 341610 CES WATER 10/8/2003	RW-2 341618 CES WATER 10/8/2003	RW-3 341625 CES WATER 10/8/2003	RW-4 341645 CES WATER 10/8/2003	RW-5 341650 CES WATER 10/9/2003	dup of RW-3 RW-300 341634 CES WATER 10/6/2003	TRIP BLANK 341511 CES WATER 10/28/2003
CAS NO.	COMPOUND	UNITS:									
	VOLATILES										
71-43-2	Benzene	ug/L	1	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	9.3	0.7 U	0.7 U
108-88-3	Toluene	ug/L	5	1 U	1 U	1 U	1 U	1 U	2.5	1 U	1 U
100-41-4	Ethylbenzene	ug/L	5	1 U	1 U	1 U	1 U	1 U	2.1	1 U	1 U
1330-20-7	Total Xylenes	ug/L	5	3 U	3 U	3 U	3 U	3 U	4.5	3 U	3 U
	SEMIVOLATILES										
91-20-3	Naphthalene	ug/L	10	5 U	5 U	5 U	5 U	5 U	5 U	5 U	
	PCBs										
11104-28-2	Aroclor 1221	ug/L	sum of	0.065 U	0.065 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	
11141-16-5	Aroclor 1232	ug/L	PCBs	0.065 U	0.065 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	
53469-21-9/12	Aroclor 1242/1016	ug/L	= 0.09	0.065 U	0.065 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	
12672-29-6	Aroclor 1248	ug/L		0.065 U	0.065 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	
11097-69-1	Aroclor 1254	ug/L		0.065 U	0.065 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	
11096-82-5	Aroclor 1260	ug/L		0.065 U	0.065 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	
	INORGANICS										
7440-70-2	Calcium, Total	mg/L		22	24.3	90.9	107	39.1	75.8	29.1	
7439-95-4	Magnesium, Total	mg/L		5.31	4.11	34.3	4.05	5.41	30.2	4.15	
7440-23-5	Sodium, Total	mg/L		56.8	11.6	64.3	65	63.9	119	63.9	
	OTHER										
	Bicarbonate Alkalinity	mg/L		327	93	466	314	453	446	386	
(CHLOR)	Chloride	mg/L		32	19	63	84	78	66	91 U	
(SULFA)	Sulfate	mg/L		5 U	61.6	126	125	200	56.9	110	

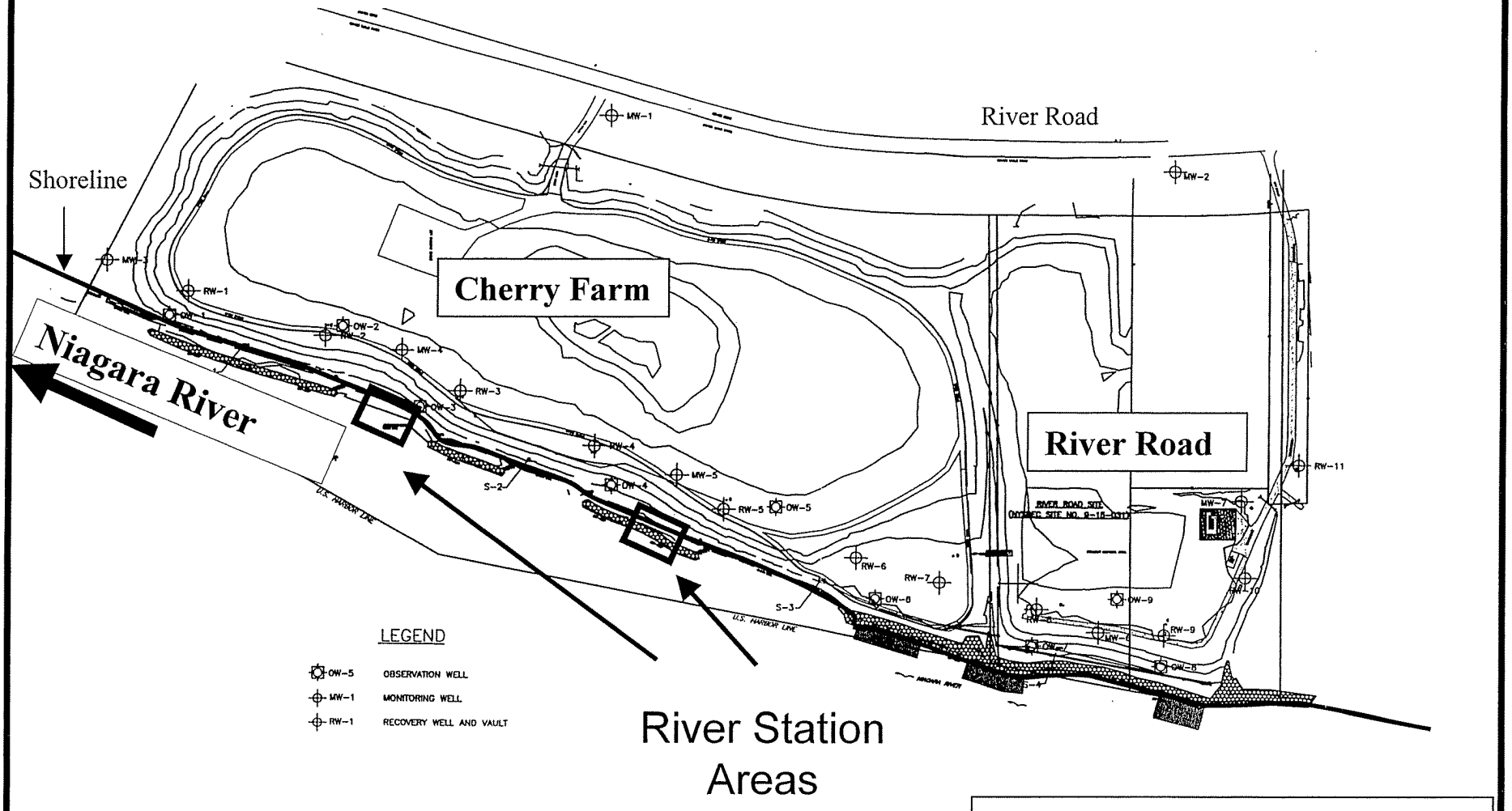

Figure 1

Site Plan

P:\\742539\tech\Fig1 Site Plan.ppt

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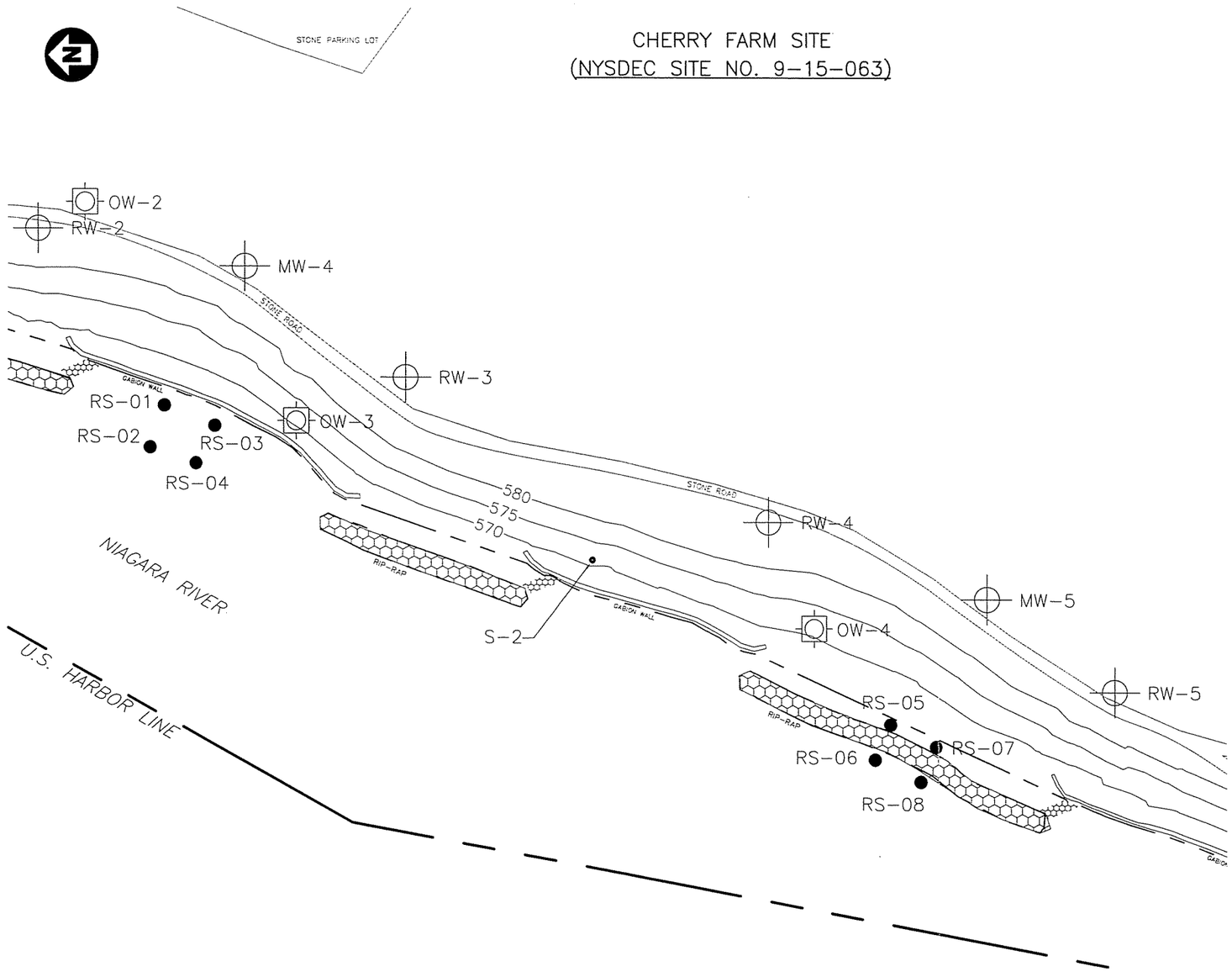
CHERRY FARM SITE
(NYSDEC SITE NO. 9-15-063)



LEGEND

● RS-04	RIVER STATION
OW-5	OBSERVATION WELL
MW-1	MONITORING WELL
RW-1	RECOVERY WELL AND VAULT
• S-2	SHALLOW SUMP LOCATION
575	PROPOSED FINAL GRADE INDEX CONTOUR
	RIP-RAP

120 60 0 120 240

SCALE: 1"=120'

FIGURE 2

CHERRY FARM/RIVER ROAD SITE
ANNUAL GROUNDWATER MONITORING REPORT

SAMPLE LOCATION MAP

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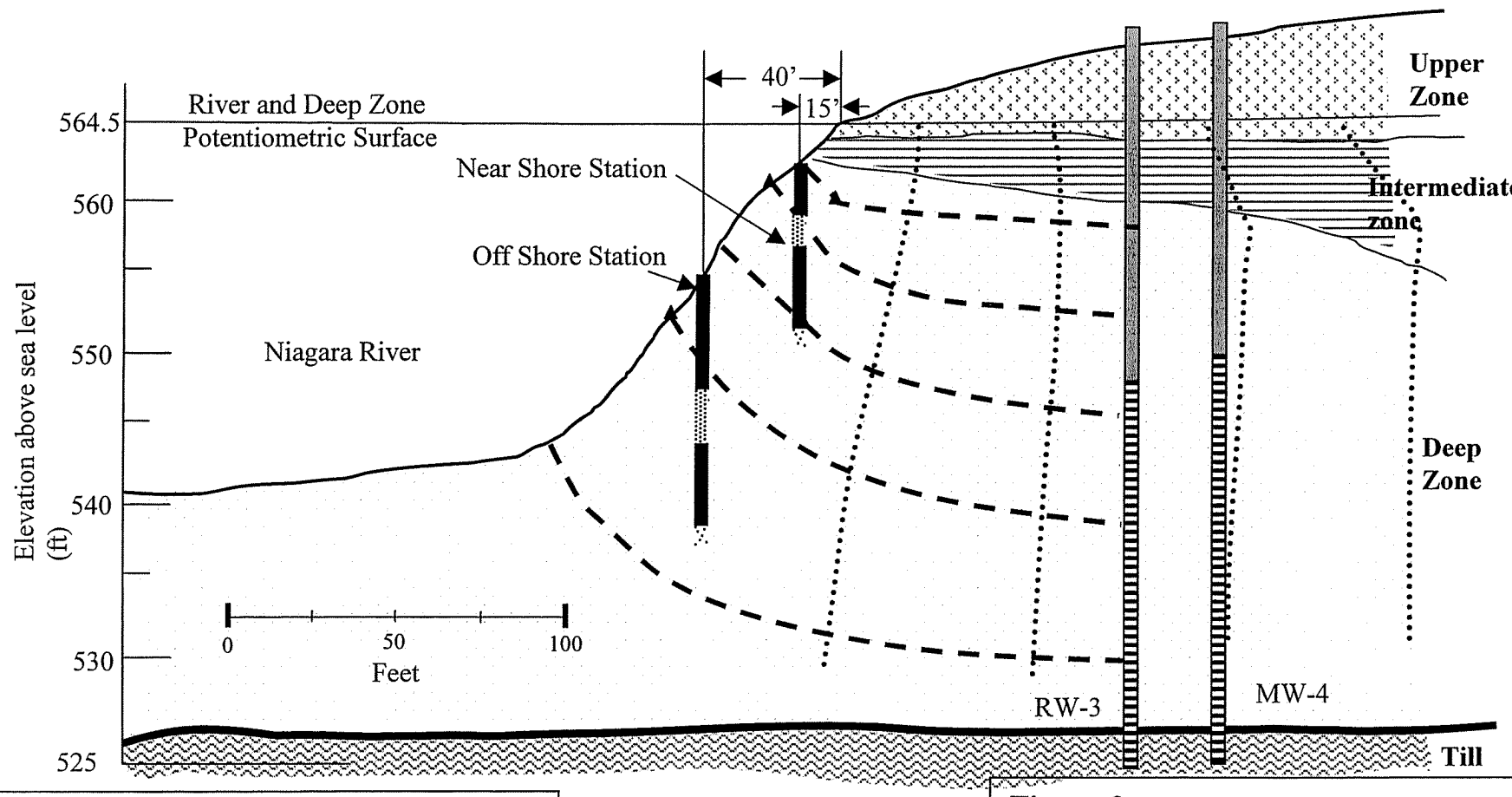
180 LAWRENCE BELL DRIVE, SUITE 104, WILLIAMSVILLE, N.Y. 14221, PHONE: 716-633-7074

P:\742539\cad\39187F01.dwg, 01/21/04 at 13:15, MAB, 1=1
No XREFs



Legend

Flowline

Equipotential Line

Equipotential interval is 0.1 ft

Vertical Exaggeration = 4x

Note: due to vertical exaggeration, flow lines are not orthogonal to equipotential lines

Figure 3

Graphical Groundwater Model Representation

Cherry Farm/River Road Site Groundwater Upwelling Study

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P:\\742539\tech\Fig3 Graphical Groundwater Model Representation.ppt

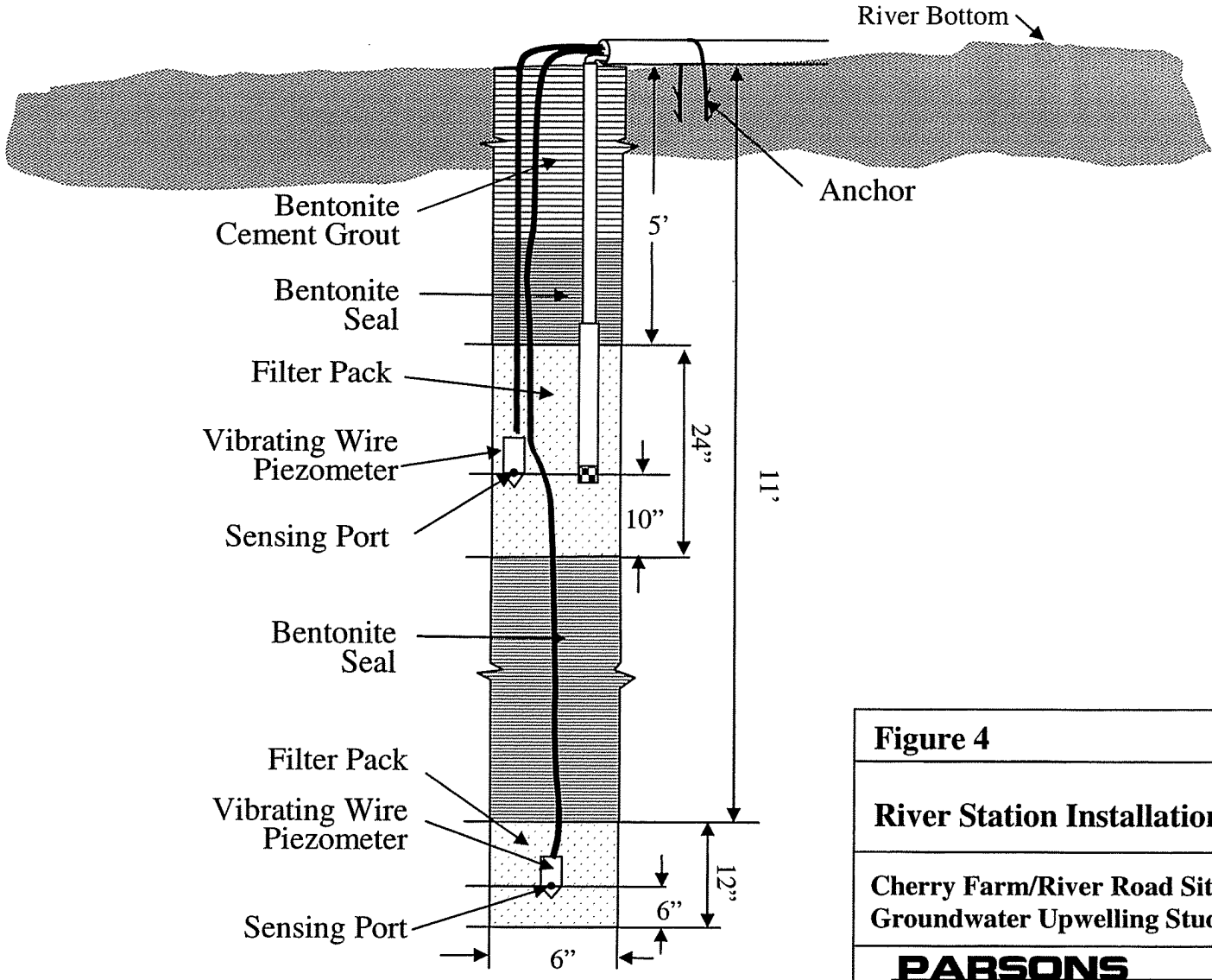

Figure 4

River Station Installation Schematic

Cherry Farm/River Road Site
Groundwater Upwelling Study

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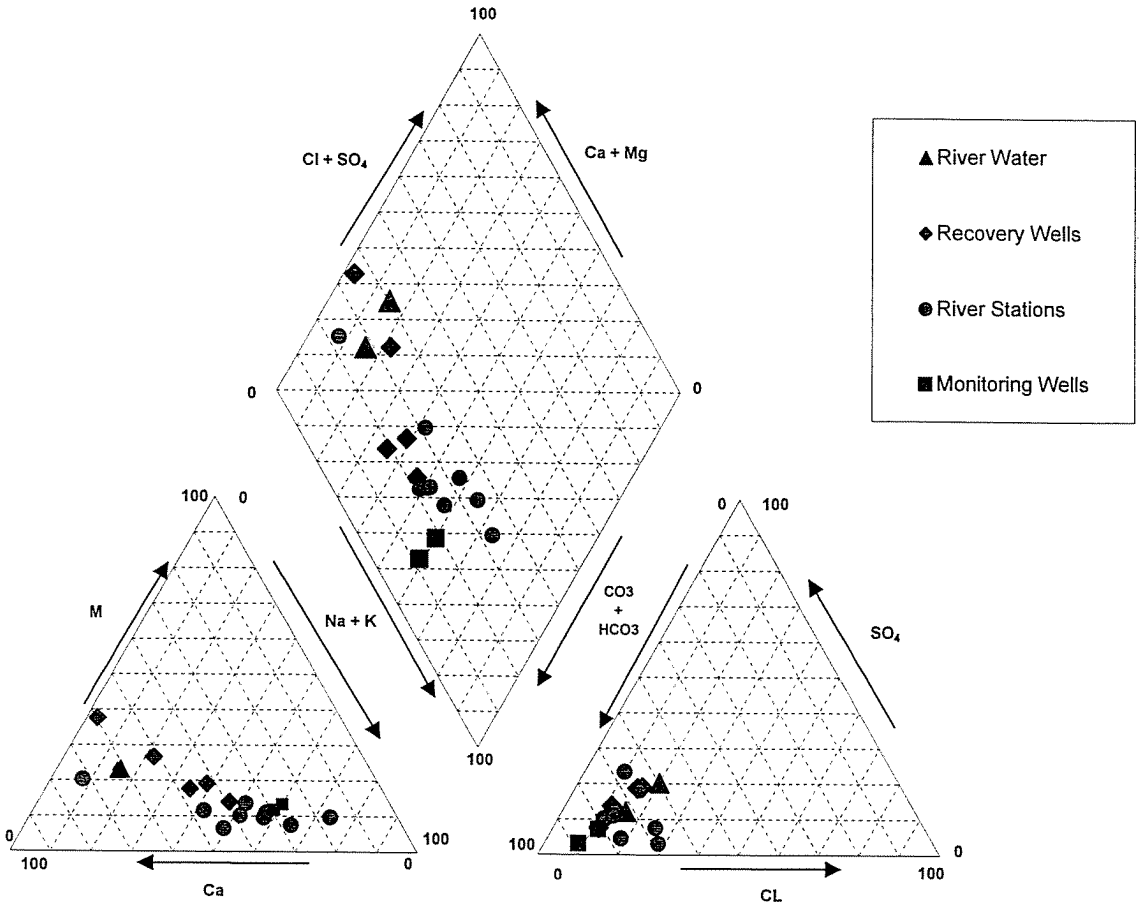
P:\\742539\tech\Fig4 River Station Installation Schematic.ppt



WELL	CATIONS				ANIONS				CATION-ANION
	Ca	Mg	Ca+Mg	Na+K	Cl	SO_4	Cl+SO_4	HCO_3+CO_3	Balance Error
RV-01-P	62%	23%	85%	15%	20%	20%	40%	60%	26%
RW-02-P	60%	38%	97%	3%	16%	19%	35%	65%	24%
RS-01-P	32%	11%	43%	57%	25%	8%	33%	67%	3%
RS-01-1	47%	12%	58%	42%	28%	3%	32%	68%	2%
RS-02-1	17%	10%	26%	74%	10%	23%	33%	67%	2%
RS-03-1	72%	20%	92%	8%	18%	5%	23%	77%	71%
RS-04-1	35%	14%	49%	51%	13%	11%	24%	76%	3%
RV-01-1	61%	23%	84%	16%	16%	12%	28%	72%	173%
RS-06-1	27%	7%	35%	65%	16%	18%	34%	66%	123%
RS-05-1	33%	10%	42%	58%	13%	13%	25%	75%	25%
MW-05-1	27%	13%	40%	60%	12%	7%	19%	81%	37%
MW-04-1	29%	12%	41%	59%	9%	3%	12%	88%	14%
RS-07-1	44%	7%	51%	49%	11%	10%	22%	78%	18%
RW-02-1	51%	27%	78%	22%	15%	19%	34%	66%	6%
RW-03-1	47%	18%	65%	35%	11%	8%	19%	81%	55%
RW-04-1	39%	14%	53%	47%	12%	11%	22%	78%	21%
RW-05-1	42%	19%	61%	39%	12%	14%	25%	75%	21%
RS-08-1	38%	10%	49%	51%	13%	11%	24%	76%	51%

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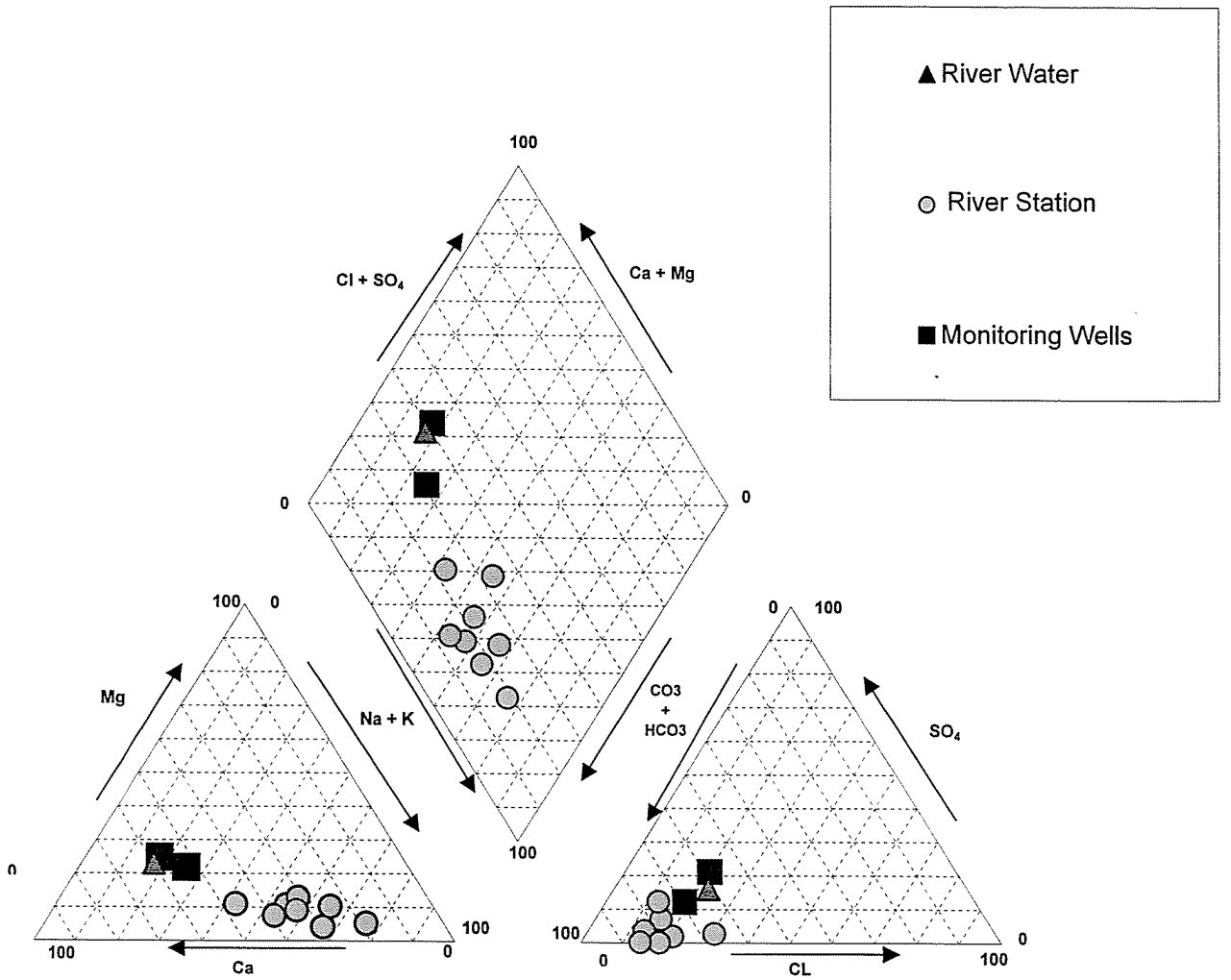
FIGURE 5
Pre System Shutdown Sampling Event
October 2002
Piper Diagram



WELL	CATIONS				ANIONS				CATION-ANION	TDS (approx)
	Ca	Mg	Ca+Mg	Na+K	Cl	SO_4	Cl+SO_4	HCO_3+CO_3	Balance Error	MG/L
MW-04-2	58%	25%	82%	18%	20%	21%	41%	59%	15%	718
MW-05-2	53%	22%	75%	25%	19%	12%	31%	69%	18%	666
RS-01-2	35%	11%	45%	55%	31%	3%	33%	67%	3%	1023
RS-02-2	25%	10%	35%	65%	15%	2%	18%	82%	13%	903
RS-03-2	47%	11%	57%	43%	21%	2%	23%	77%	6%	900
RS-04-2	31%	13%	44%	56%	16%	7%	23%	77%	0%	826
RS-05-2	33%	9%	42%	58%	13%	4%	17%	83%	12%	515
RS-06-2	18%	5%	24%	76%	19%	0%	19%	81%	1%	616
RS-07-2	29%	4%	33%	67%	12%	12%	25%	75%	14%	733
RS-08-2	39%	7%	47%	53%	14%	0%	14%	86%	52%	539
RV-01-2	60%	23%	83%	17%	23%	16%	39%	61%	29%	211

Cherry Farm/River Road Site, Tonawanda, New York

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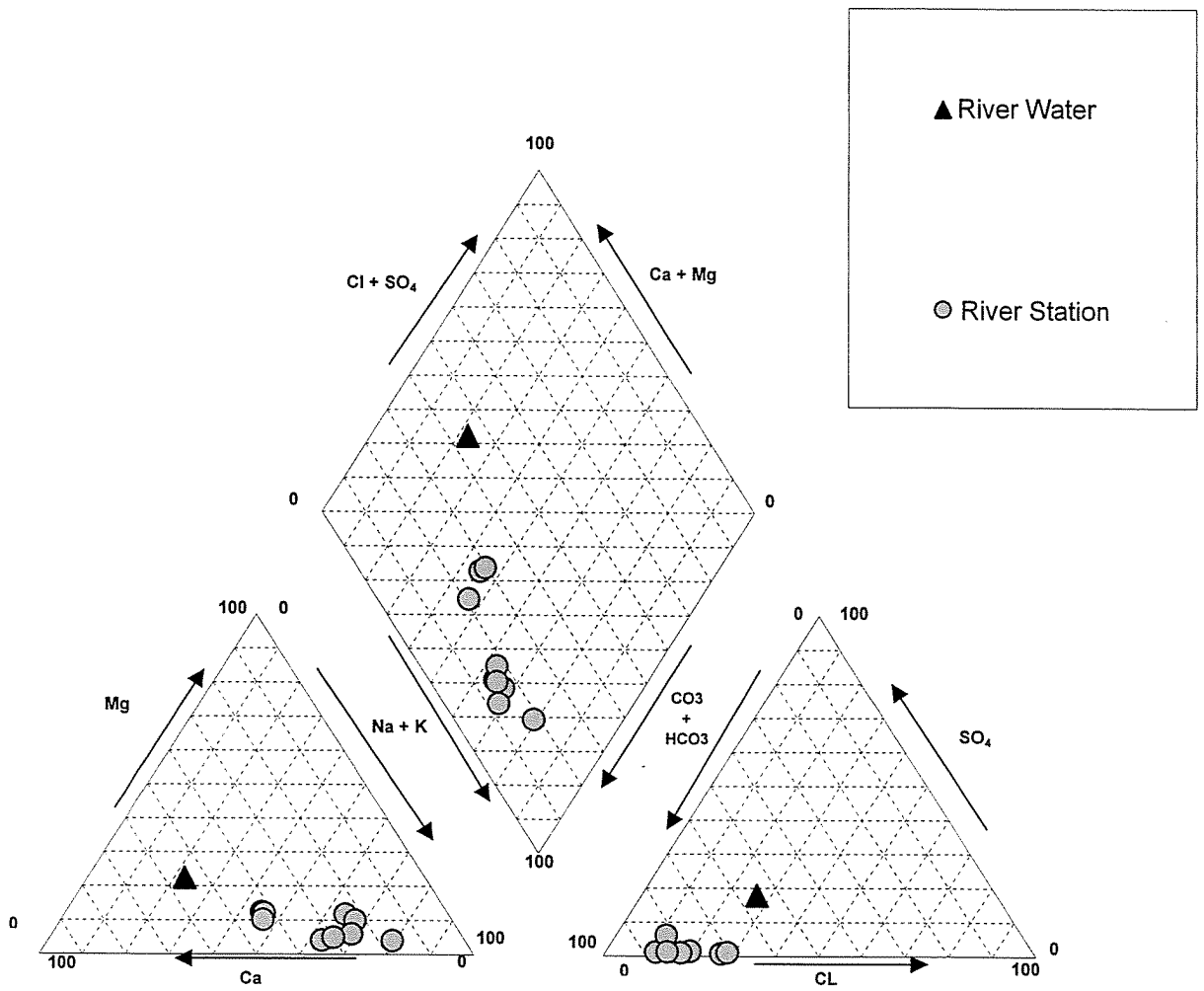
FIGURE 6
1st Quarter Sampling Event
December 2002
Piper Diagram



WELL	CATIONS				ANIONS				CATION-ANION	0
	Ca	Mg	Ca+Mg	Na+K	Cl	SO_4	Cl+SO_4	HCO_3+CO_3	Balance Error	MG/L
RS-01-3	43%	12%	55%	45%	27%	1%	28%	72%	8%	1073
RS-01dp-3	42%	12%	54%	46%	28%	1%	30%	70%	2%	1045
RS-02-3	24%	12%	36%	64%	14%	2%	15%	85%	5%	933
RS-03-3	43%	10%	54%	46%	20%	1%	21%	79%	2%	876
RS-04-3	22%	10%	32%	68%	15%	1%	16%	84%	7%	956
RS-05-3	25%	6%	31%	69%	12%	1%	13%	87%	7%	528
RS-06-3	17%	4%	21%	79%	18%	1%	19%	81%	28%	601
RS-07-3	33%	4%	37%	63%	12%	6%	18%	82%	6%	691
RS-08-3	30%	5%	35%	65%	14%	1%	16%	84%	40%	470
RV-01-3	55%	23%	78%	22%	27%	18%	45%	55%	10%	182

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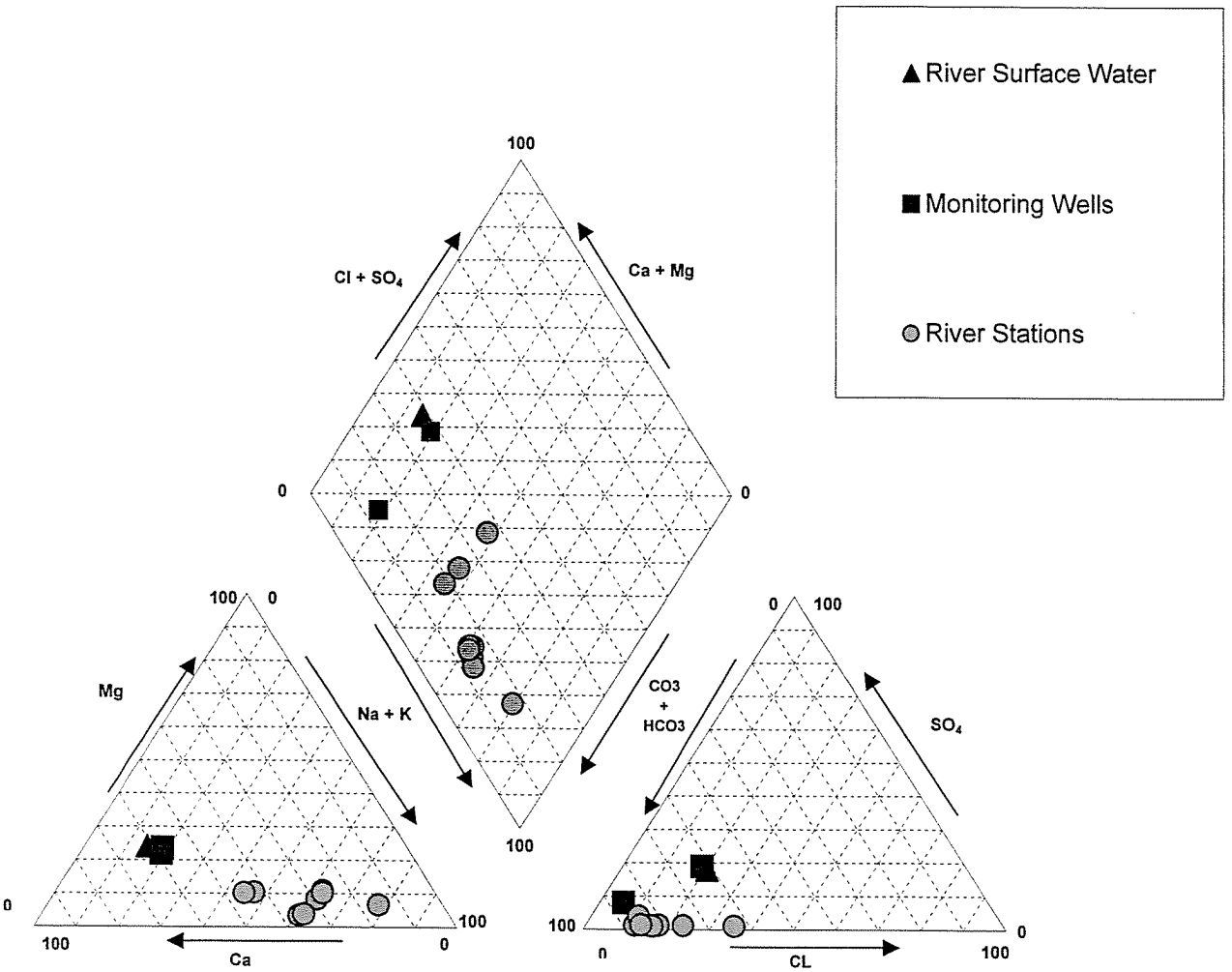
FIGURE 7
2nd Quarter Sampling Event
March 2003
Piper Diagram



WELL	CATIONS				ANIONS				CATION-ANION	TDS (approx)
	Ca	Mg	Ca+Mg	Na+K	Cl	SO_4	Cl+SO_4	HCO_3+CO_3	Balance Error	MG/L
MW-4-4	58%	24%	81%	19%	6%	8%	14%	86%	38%	745
MW-5-4	59%	22%	81%	19%	19%	19%	38%	62%	31%	889
RS-01-4	42%	10%	52%	48%	35%	1%	36%	64%	19%	1249
RS-01dp-4	43%	11%	54%	46%	23%	1%	24%	76%	45%	1133
RS-02-4	27%	10%	37%	63%	13%	2%	14%	86%	46%	1033
RS-03-4	46%	8%	55%	45%	17%	1%	19%	81%	40%	948
RS-04-4	28%	10%	38%	62%	15%	1%	16%	84%	53%	1054
RS-05-4	29%	7%	35%	65%	12%	1%	13%	87%	14%	519
RS-06-4	17%	4%	20%	80%	16%	1%	17%	83%	5%	638
RS-07-4	35%	4%	39%	61%	11%	4%	15%	85%	34%	759
RS-08-4	34%	5%	39%	61%	13%	1%	15%	85%	8%	480
RV-01-4	61%	24%	85%	15%	21%	18%	38%	62%	32%	193

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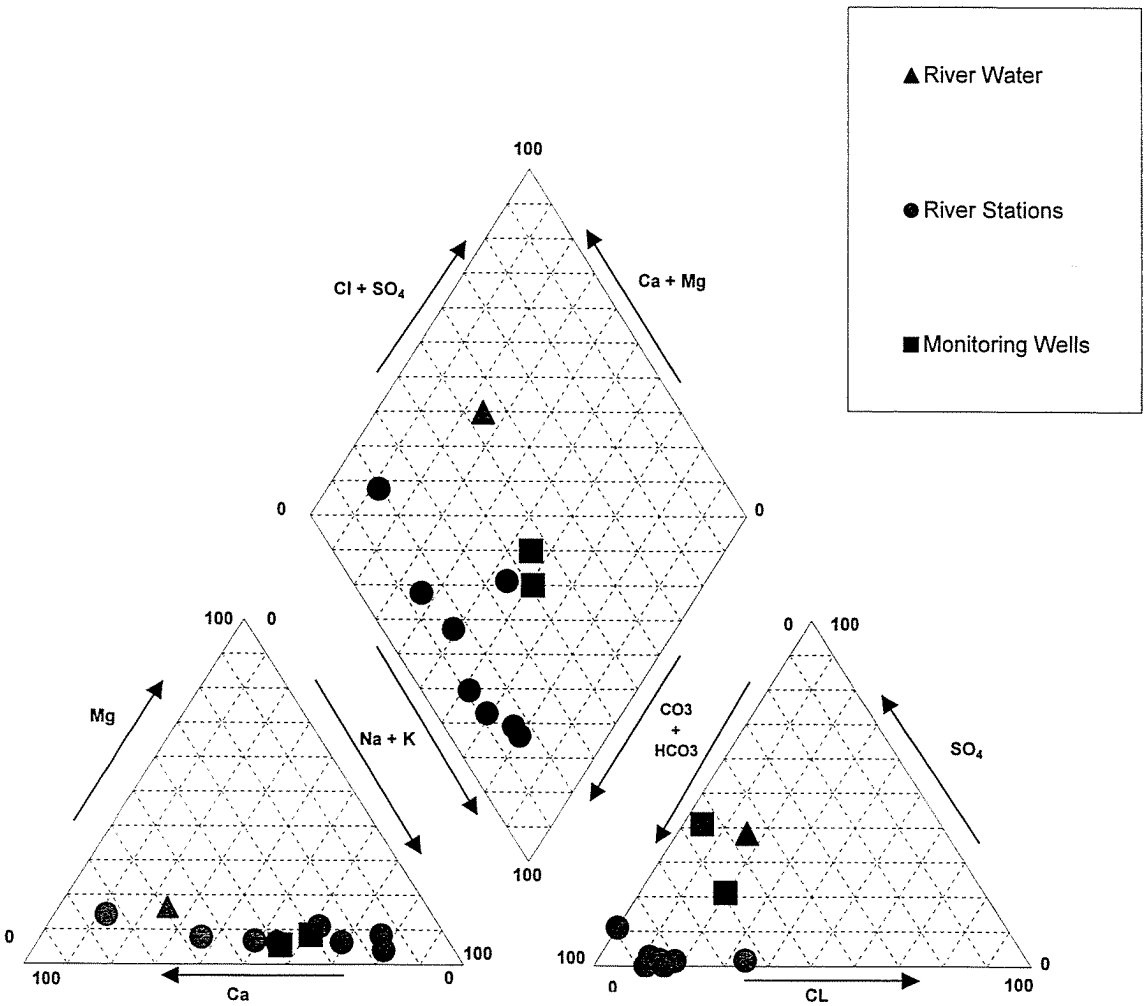
FIGURE 8
3rd Quarter Sampling Event
June 2003
Piper Diagram



WELL	CATIONS				ANIONS				CATION-ANION	TDS (approx)
	Ca	Mg	Ca+Mg	Na+K	Cl	SO_4	Cl+SO_4	HCO_3+CO_3	Balance Error	MG/L
MW-4-5	39%	6%	44%	56%	5%	41%	46%	54%	61%	505
MW-5-5	31%	8%	39%	61%	20%	21%	41%	59%	109%	756
RS-01-5	39%	6%	46%	54%	34%	2%	36%	64%	4%	674
RS-02-5	15%	8%	23%	77%	14%	2%	16%	84%	81%	797
RS-03-5	74%	14%	88%	12%	18%	1%	19%	81%	122%	673
RS-04-5	44%	7%	51%	49%	15%	1%	16%	84%	150%	733
RS-05-5	25%	6%	31%	69%	12%	0%	12%	88%	3%	495
RS-06-5	16%	4%	20%	80%	16%	0%	16%	84%	48%	687
RS-07-5	56%	8%	63%	37%	12%	3%	14%	86%	33%	659
RS-08-5	27%	11%	38%	62%	0%	11%	11%	89%	50%	443
RV-01-5	59%	16%	75%	25%	16%	38%	54%	46%	63%	214

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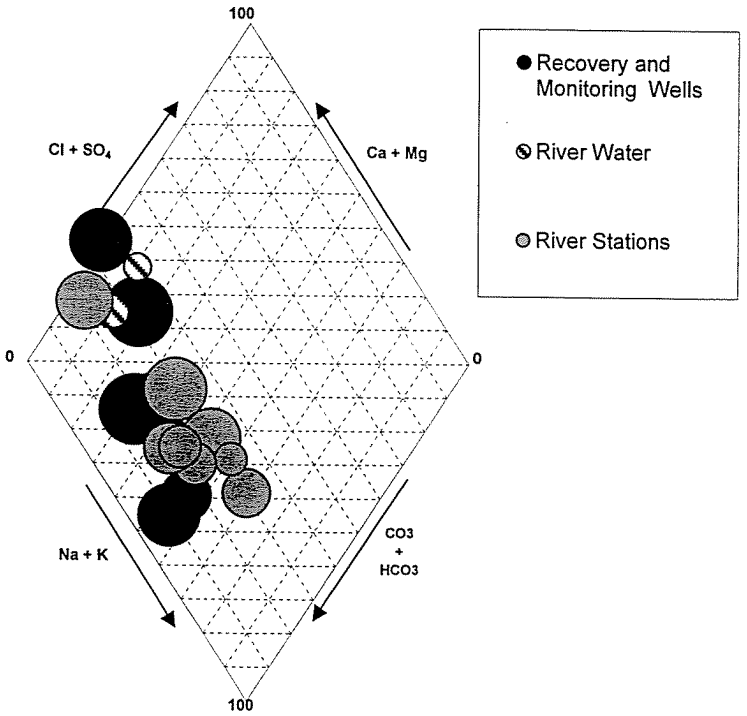
FIGURE 9
4th Quarter Sampling Event
October 2003
Piper Diagram



WELL	CATIONS				ANIONS				CATION-ANION
	Ca	Mg	Ca+Mg	Na+K	Cl	SO_4	$Cl+SO_4$	HCO_3+CO_3	Balance Error
RV-01-P	62%	23%	85%	15%	20%	20%	40%	60%	26%
RW-02-P	60%	38%	97%	3%	16%	19%	35%	65%	24%
RS-01-P	32%	11%	43%	57%	25%	8%	33%	67%	3%
RS-01-1	47%	12%	58%	42%	28%	3%	32%	68%	2%
RS-02-1	17%	10%	26%	74%	10%	23%	33%	67%	2%
RS-03-1	72%	20%	92%	8%	18%	5%	23%	77%	71%
RS-04-1	35%	14%	49%	51%	13%	11%	24%	76%	3%
RV-01-1	61%	23%	84%	16%	16%	12%	28%	72%	173%
RS-06-1	27%	7%	35%	65%	16%	18%	34%	66%	123%
RS-05-1	33%	10%	42%	58%	13%	13%	25%	75%	25%
MW-05-1	27%	13%	40%	60%	12%	7%	19%	81%	37%
MW-04-1	29%	12%	41%	59%	9%	3%	12%	88%	14%
RS-07-1	44%	7%	51%	49%	11%	10%	22%	78%	18%
RW-02-1	51%	27%	78%	22%	15%	19%	34%	66%	6%
RW-03-1	47%	18%	65%	35%	11%	8%	19%	81%	55%
RW-04-1	39%	14%	53%	47%	12%	11%	22%	78%	21%
RW-05-1	42%	19%	61%	39%	12%	14%	25%	75%	21%
RS-08-1	38%	10%	49%	51%	13%	11%	24%	76%	51%

Cherry Farm/River Road Site, Tonawanda, New York

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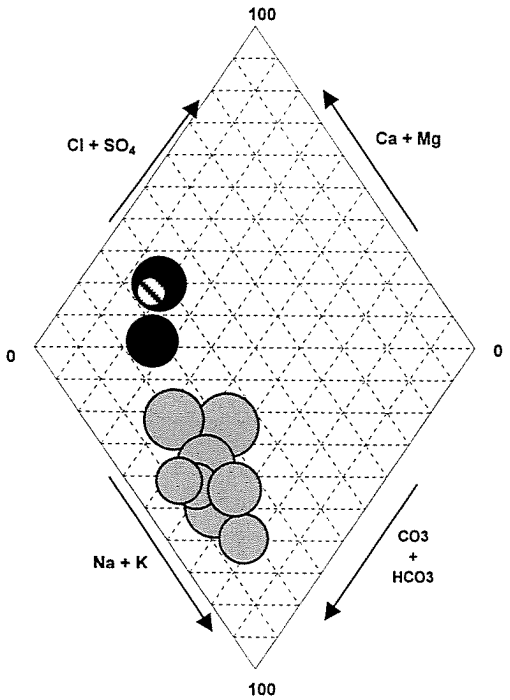
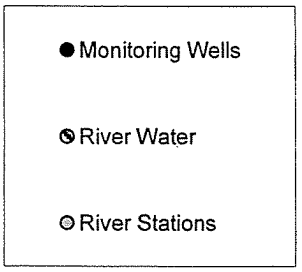
FIGURE 10
Pre System Shutdown Sampling Event
October 2002
Piper Bubble Diagram





WELL	CATIONS				ANIONS				CATION-ANION
	Ca	Mg	Ca+Mg	Na+K	Cl	SO_4	Cl+SO_4	HCO_3+CO_3	Balance Error
MW-04-2	58%	25%	82%	18%	20%	21%	41%	59%	15%
MW-05-2	53%	22%	75%	25%	19%	12%	31%	69%	18%
RS-01-2	35%	11%	45%	55%	31%	3%	33%	67%	3%
RS-02-2	25%	10%	35%	65%	15%	2%	18%	82%	13%
RS-03-2	47%	11%	57%	43%	21%	2%	23%	77%	6%
RS-04-2	31%	13%	44%	56%	16%	7%	23%	77%	0%
RS-05-2	33%	9%	42%	58%	13%	4%	17%	83%	12%
RS-06-2	18%	5%	24%	76%	19%	0%	19%	81%	1%
RS-07-2	29%	4%	33%	67%	12%	12%	25%	75%	14%
RS-08-2	39%	7%	47%	53%	14%	0%	14%	86%	52%
RV-01-2	60%	23%	83%	17%	23%	16%	39%	61%	29%

Radius of Circle in diamond is proportional to TDS.

Cherry Farm/River Road Site, Tonawanda, New York

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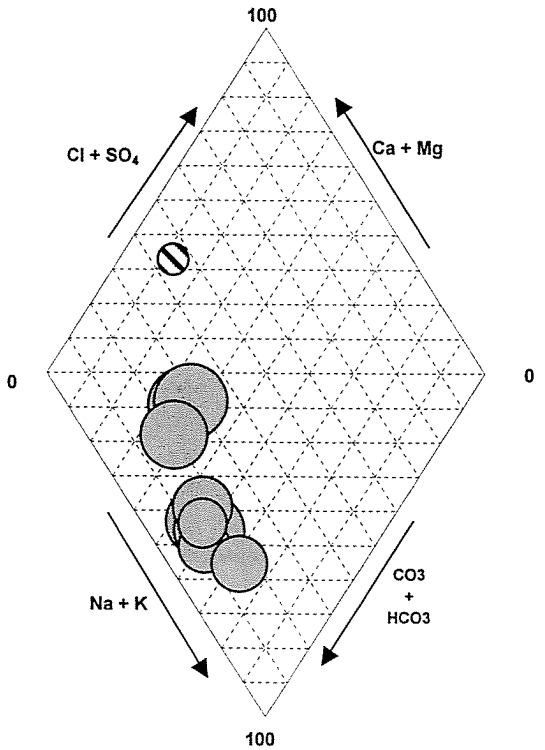
FIGURE 11
1st Quarter Sampling Event
December, 2002
Piper Bubble Diagram



River Stations

River Water

WELL	CATIONS				ANIONS				CATION-ANION
	Ca	Mg	Ca+Mg	Na+K	Cl	SO_4	Cl+SO_4	HCO_3+CO_3	Balance Error
RS-01-3	43%	12%	55%	45%	27%	1%	28%	72%	8%
RS-01dp-3	42%	12%	54%	46%	28%	1%	30%	70%	2%
RS-02-3	24%	12%	36%	64%	14%	2%	15%	85%	5%
RS-03-3	43%	10%	54%	46%	20%	1%	21%	79%	2%
RS-04-3	22%	10%	32%	68%	15%	1%	16%	84%	7%
RS-05-3	25%	6%	31%	69%	12%	1%	13%	87%	7%
RS-06-3	17%	4%	21%	79%	18%	1%	19%	81%	28%
RS-07-3	33%	4%	37%	63%	12%	6%	18%	82%	6%
RS-08-3	30%	5%	35%	65%	14%	1%	16%	84%	40%
RV-01-3	55%	23%	78%	22%	27%	18%	45%	55%	10%

Radius of Circle in diamond is proportional to TDS.

Cherry Farm/River Road Site, Tonawanda, New York

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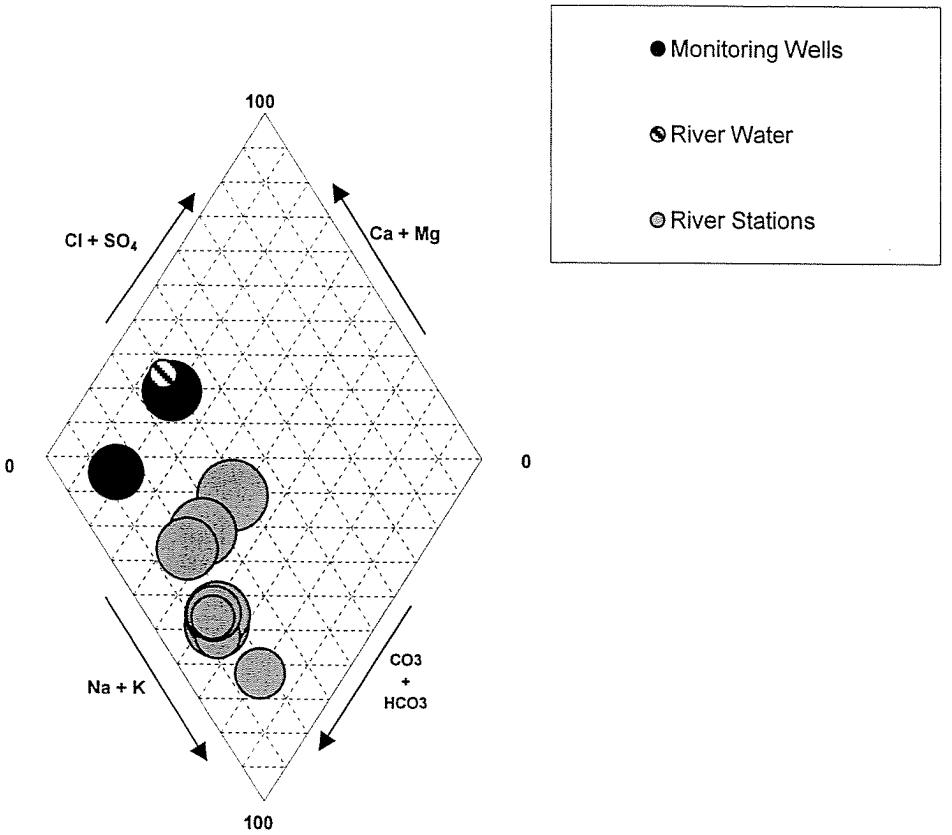
FIGURE 12
2nd Quarter Sampling Event
March 2003
Piper Bubble Diagram



WELL	CATIONS				ANIONS				CATION-ANION
	Ca	Mg	Ca+Mg	Na+K	Cl	SO_4	Cl+SO_4	HCO_3+CO_3	Balance Error
MW-4-4	58%	24%	81%	19%	6%	8%	14%	86%	38%
MW-5-4	59%	22%	81%	19%	19%	19%	38%	62%	31%
RS-01-4	42%	10%	52%	48%	35%	1%	36%	64%	19%
RS-01dp-4	43%	11%	54%	46%	23%	1%	24%	76%	45%
RS-02-4	27%	10%	37%	63%	13%	2%	14%	86%	46%
RS-03-4	46%	8%	55%	45%	17%	1%	19%	81%	40%
RS-04-4	28%	10%	38%	62%	15%	1%	16%	84%	53%
RS-05-4	29%	7%	35%	65%	12%	1%	13%	87%	14%
RS-06-4	17%	4%	20%	80%	16%	1%	17%	83%	5%
RS-07-4	35%	4%	39%	61%	11%	4%	15%	85%	34%
RS-08-4	34%	5%	39%	61%	13%	1%	15%	85%	8%
RV-01-4	61%	24%	85%	15%	21%	18%	38%	62%	32%

Radius of Circle in diamond is proportional to TDS.

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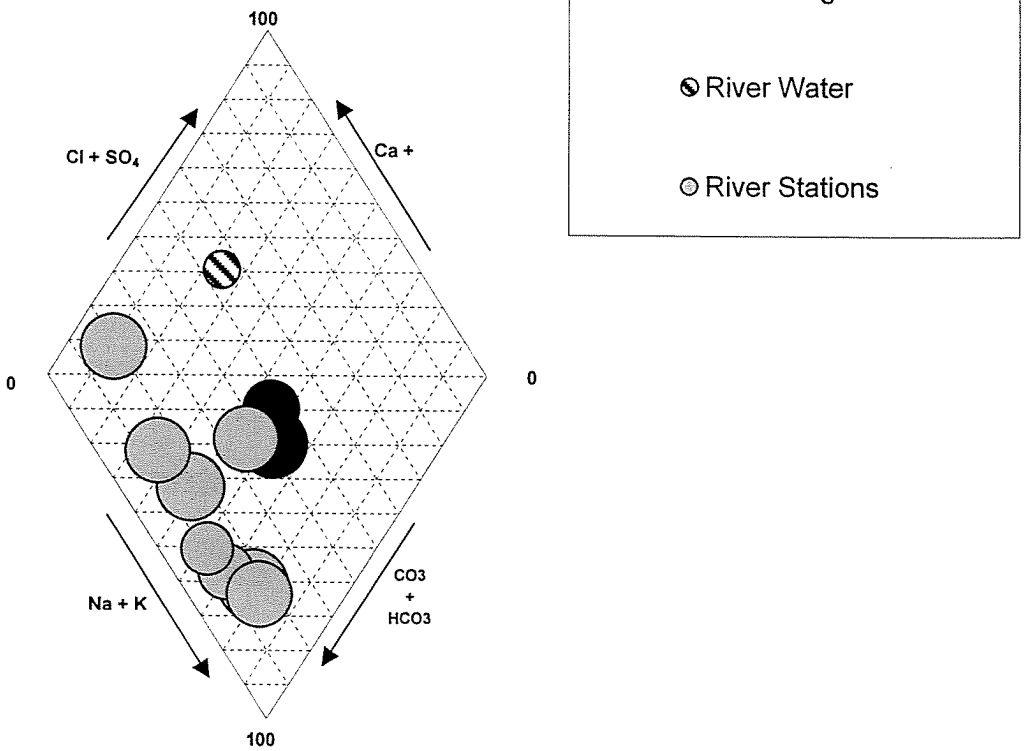
FIGURE 13
3rd Quarter Sampling Event
June 2003
Piper Bubble Diagram



WELL	CATIONS				ANIONS				CATION-ANION
	Ca	Mg	Ca+Mg	Na+K	Cl	SO_4	Cl+SO_4	HCO_3+CO_3	Balance Error
MW-4-5	39%	6%	44%	56%	5%	41%	46%	54%	61%
MW-5-5	31%	8%	39%	61%	20%	21%	41%	59%	109%
RS-01-5	39%	6%	46%	54%	34%	2%	36%	64%	4%
RS-02-5	15%	8%	23%	77%	14%	2%	16%	84%	81%
RS-03-5	74%	14%	88%	12%	18%	1%	19%	81%	122%
RS-04-5	44%	7%	51%	49%	15%	1%	16%	84%	150%
RS-05-5	25%	6%	31%	69%	12%	0%	12%	88%	3%
RS-06-5	16%	4%	20%	80%	16%	0%	16%	84%	48%
RS-07-5	56%	8%	63%	37%	12%	3%	14%	86%	33%
RS-08-5	27%	11%	38%	62%	0%	11%	11%	89%	50%
RV-01-5	59%	16%	75%	25%	16%	38%	54%	46%	63%

Radius of Circle in diamond is proportional to TDS.

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FIGURE 14
4th Quarter Sampling Event
October 2003
Piper Bubble Diagram

Figure 15
Stiff Patterns
October 2002

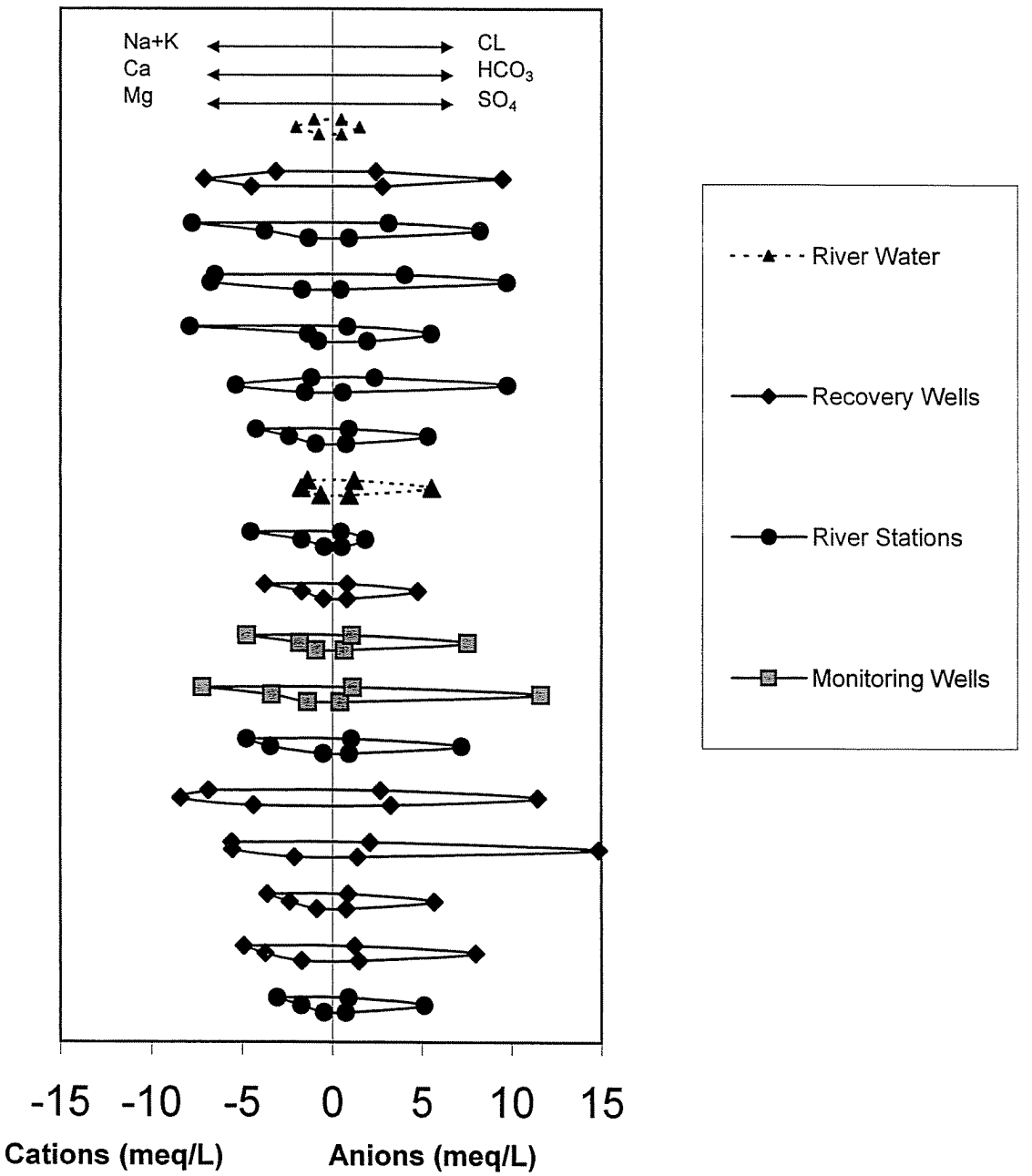

Figure 16
Stiff Patterns
December, 2002

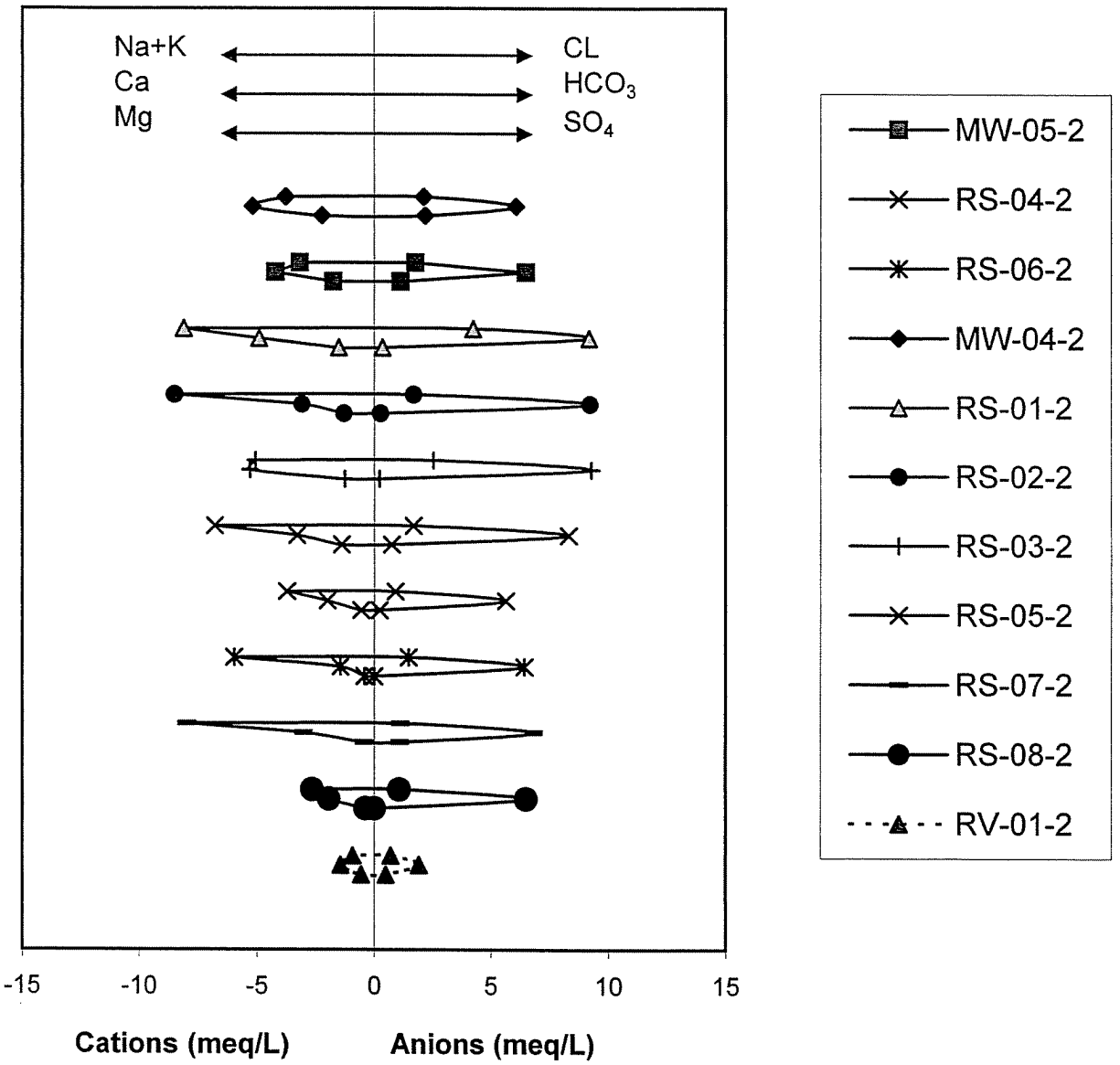

FIGURE 17
Stiff Patterns
March 2003

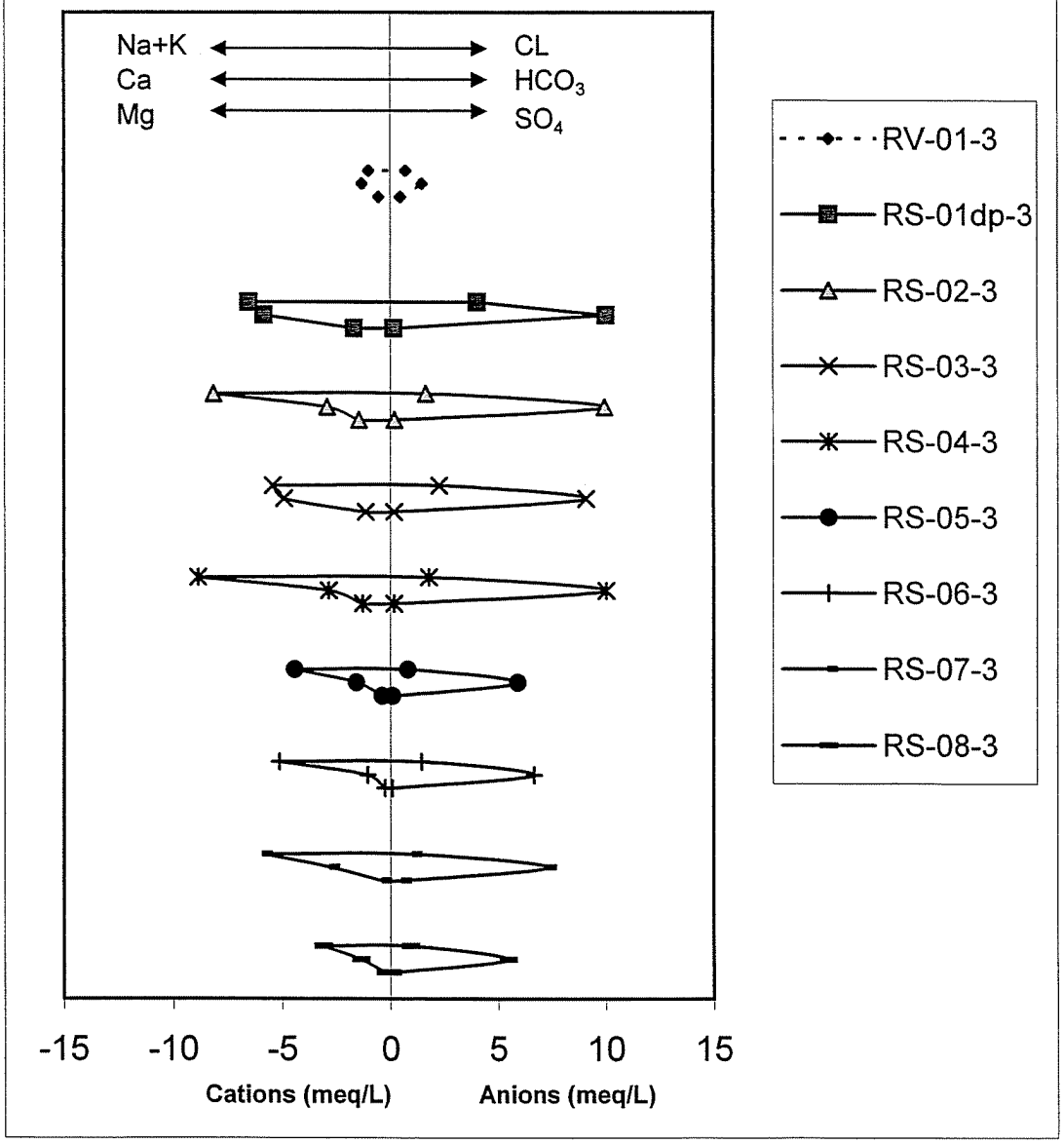

FIGURE 18
Stiff Patterns
June 2003

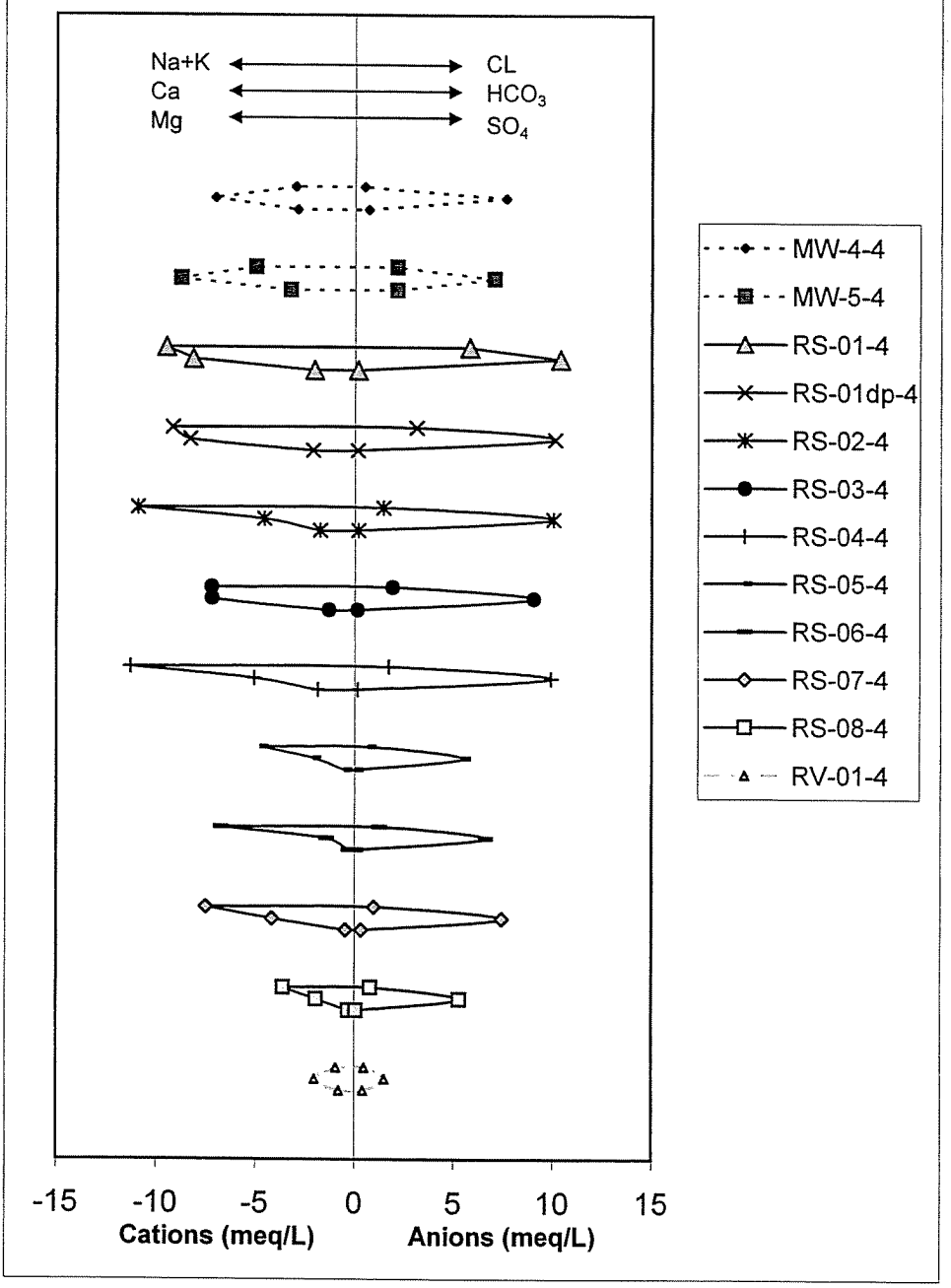

FIGURE 19
Stiff Patterns
October 2003

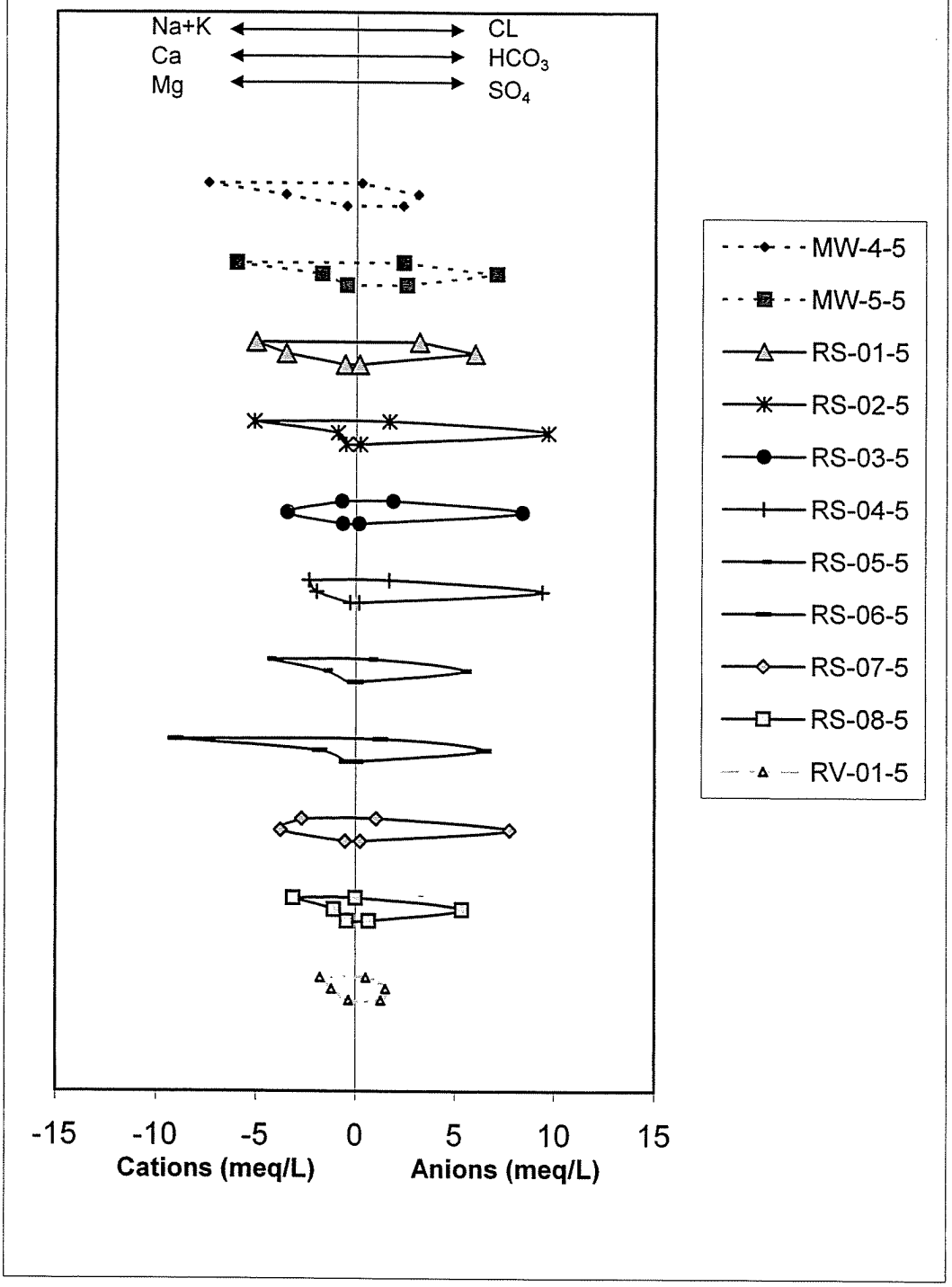

FIGURE 20A
Hydraulic Head Summary Graph
Stations RS-1 and RS-2

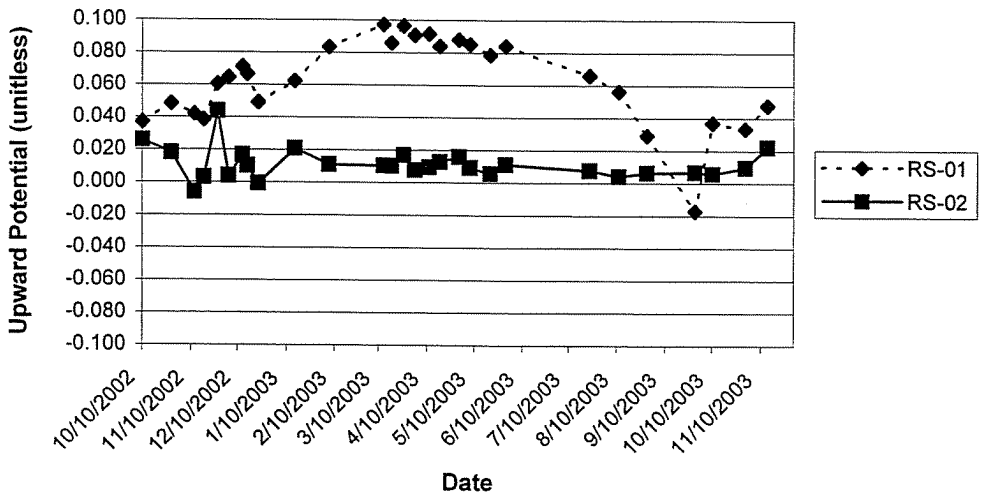

FIGURE 20B
Hydraulic Head Summary Graph
Stations RS-3 and RS-4

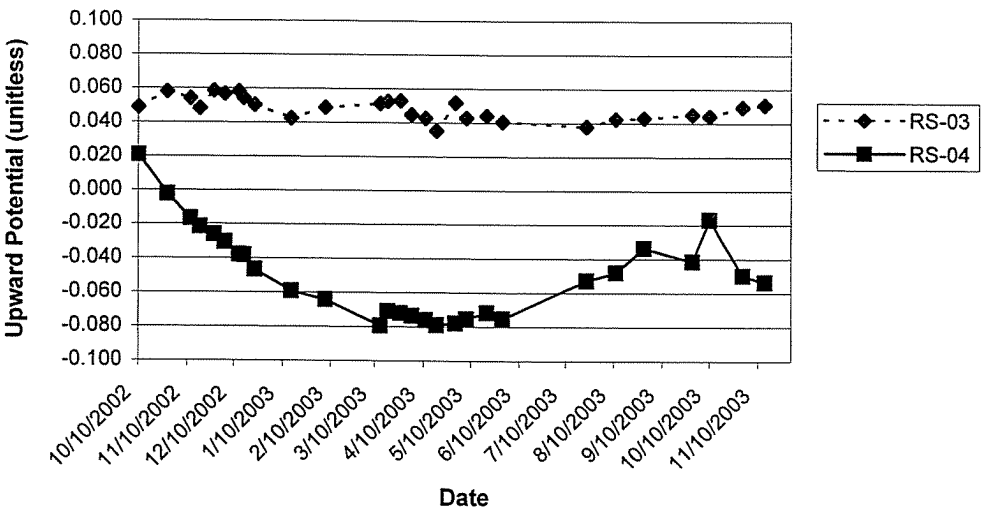

FIGURE 20 (A and B)
Hydraulic Head Summary Graphs
October 2002 through November 2003

FIGURE 20C
Hydraulic Head Summary Graph
Stations RS-5 and RS-6

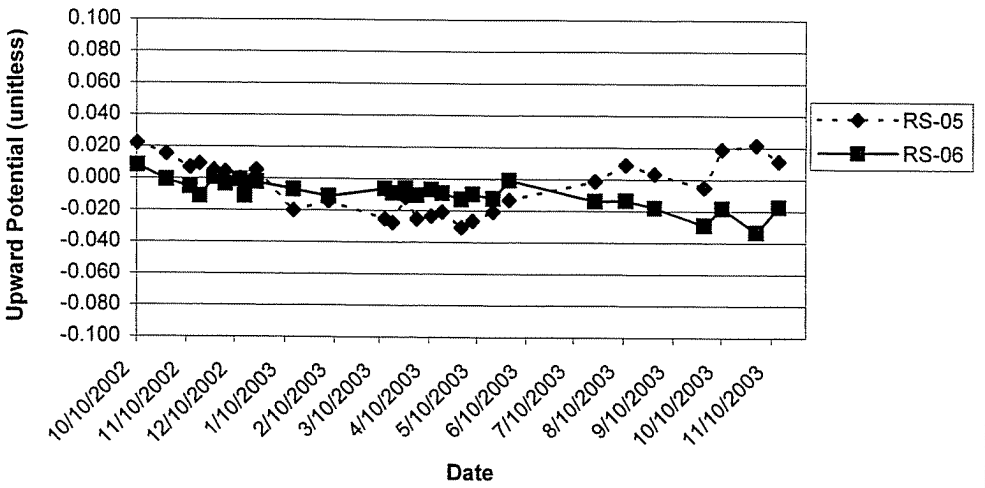

FIGURE 20D
Hydraulic Head Summary Graph
Stations RS-7 and RS-8

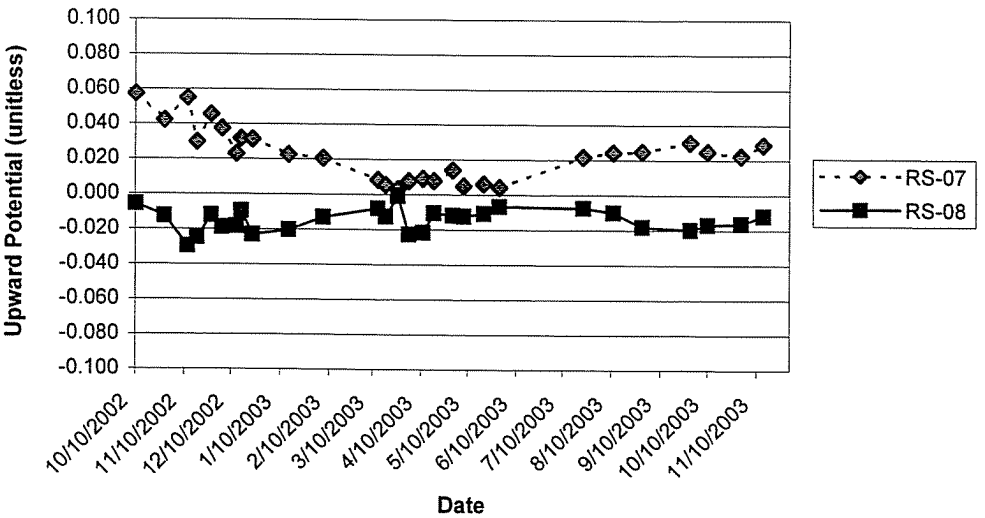

FIGURE 20 (C and D)
Hydraulic Head Summary Graphs
October 2002 through November 2003