2002 Annual Report

Colesville Landfill,
Broome County, New York
NYSDEC Site 704010

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1. Introduction

This 2002 Annual Monitoring Report (Report) was prepared on behalf of Broome County Division of Solid Waste Management for the Colesville Landfill, located in Broome County, New York (site) to evaluate and document long-term monitoring (LTM) activities at the site. Remediation and monitoring activities are being conducted pursuant to the Record of Decision (ROD) and Explanation of Significant Difference (ESD) that were executed in March 1991 and September 2000, respectively. LTM activities (which include environmental effectiveness and remediation system performance monitoring) were performed in accordance with the LTM Plan (ARCADIS G&M, Inc. 2002), which was approved by the United States Environmental Protection Agency (USEPA) and New York State Department of Environmental Conservation (NYSDEC). The LTM Plan provides a detailed description of the LTM program, methodology, and rationale. Where applicable these elements are either summarized or incorporated by reference herein. The LTM discussed in this report includes the baseline event (July 2002) and Quarter Number 1 (September to December 2002). The operation, maintenance, and monitoring (OM&M) performed for the Groundwater Remediation System from September to December 2002 is also discussed in this report.

This report discusses groundwater flow and water quality (groundwater, spring water, and surface water) conditions observed during the Quarter Number 1 and compares the current data to the baseline round, as applicable. In addition, this report describes the OM&M associated with the Groundwater Remediation System through December 2002. Following the detailed data analysis and discussion is a summary of findings, conclusions, and recommendations. The conclusions and recommendations made in this report will continue to be re-evaluated in future reports as additional data become available. Also provided is the LTM and Groundwater Remediation System OM&M schedule for the forthcoming quarter.

2. Summary of Groundwater Remediation Activities

This section provides a chronology of remedial system construction and startup and summarizes the components and function of the Groundwater Remediation System.

The chronology of Groundwater Remediation System construction and startup is as follows: Injection well and monitoring well drilling was conducted between September 11, 2000 and November 3, 2000. Groundwater Remediation System construction was conducted between May 13, 2002 and October 4, 2002. The

Groundwater Remediation System full system startup was completed on September 8, 2002. The final system inspection was conducted on October 4, 2002. All construction activities associated with the Groundwater Remediation System were conducted in accordance with the NYSDEC approved Groundwater Remediation System Technical Design Drawings and Technical Specifications, and as described in the July 2000 report (ARCADIS G&M, Inc. 2000).

The Groundwater Remediation System consists of two components: 1) A groundwater recovery system (i.e., pump and treat [PT] system); and, 2) An automated reagent injection (ARI) system. The PT system consists of wells that pump groundwater at a total rate of approximately 1 gallon per minute (gpm). The wells supply extracted groundwater to the treatment building where it is treated by air stripping and filtration. The treated effluent is then either utilized as part of the ARI process or is discharged to the existing drainage swale that discharges to the North Stream (Figure 1). The ARI system utilizes a molasses and treated groundwater water mixture that is sequentially injected via a line of 17 injection wells (designated as IW-1 through IW-15, PW-6, and GMMW-1). Depending on the results of the effectiveness and performance monitoring conducted (see Sections 6 and 7 of this report, respectively), the amount, location, and frequency of reagent injections varies. The Groundwater Remediation System Engineering Report (ARCADIS G&M, Inc. 2000) provides a complete description of the design criteria and system components of the Groundwater Remediation System. A summary of the methodology and results for system startup of the Groundwater Remediation System is provided in Appendix A of this report.

3. Summary of Monitoring Program

The following sections summarize the environmental effectiveness monitoring and remedial system performance monitoring activities conducted at and near the time of the baseline-sampling event and during Quarter Number 1.

3.1 Environmental Effectiveness Monitoring

The environmental effectiveness monitoring performed includes collection and analysis of water samples collected from monitoring wells, springs, and surface water. The complete list of sampling locations includes 16 monitoring wells, four spring locations, and a single surface water sampling point. Baseline round measurements and laboratory analytical parameters were as follows:

- Water-level (hydraulic) measurements were collected from 16 monitoring wells.

- Groundwater samples collected from 14 monitoring wells were analyzed for volatile organic compounds (VOCs), selected metals, the complete list of general chemistry and field parameters, and dissolved gases.

- Four spring water samples were analyzed for VOCs and selected general chemistry and field parameters.

- A single surface water sample was analyzed for VOCs and selected general chemistry and field parameters.

Quarter Number 1 measurements and laboratory analytical parameters were as follows:

- Water-level (hydraulic) measurements were collected from 16 monitoring wells.

- Five groundwater samples (quarterly list of wells) were collected and analyzed for VOCs, selected metals, general chemistry and field parameters, and dissolved gases.

- Four spring water samples were collected and analyzed for VOCs and field parameters.

- A single surface water sample was collected and analyzed for VOCs.

Section 5 (Groundwater Flow) discusses the hydraulic measurements and groundwater flow conditions during the baseline event and Quarter Number 1. Section 6 of this report discusses the results of the baseline event and evaluates Quarter Number 1 Water Quality Monitoring. Field sampling logs and chain of custody records are provided in Appendix B of this report.

3.2 Groundwater Remediation System Performance Monitoring

Groundwater Remediation System performance monitoring is conducted on a quarterly basis to monitor system performance of the PT and ARI systems. PT system performance monitoring includes OM&M of PT system equipment, the collection of six groundwater samples and one vapor sample, and recording system operating parameters. ARI system performance monitoring includes O&M of ARI system equipment, recording downhole field parameters in select groundwater monitoring wells and injection wells, collecting and analyzing select injection wells for total organic carbon (TOC), and reporting system operating parameters. In addition to the

PT and ARI system performance monitoring tasks listed above, select groundwater analytical data collected as part of the environmental effectiveness monitoring is reviewed on a quarterly basis to assess the overall effectiveness of the Groundwater Remediation System. Baseline (as indicated below) and Quarter Number 1 measurements and laboratory analytical parameters were as follows:

- Six groundwater samples were collected and analyzed for VOCs and total iron for PT system performance monitoring.
- One vapor sample was collected and analyzed for VOCs for PT system performance monitoring.
- Four groundwater samples were collected and analyzed for TOC (three samples collected to establish baseline conditions, one sample collected during the Quarter Number 1 sampling round) to monitor ARI system performance.
- Downhole field parameters were recorded on November 20, 2002 to monitor ARI system performance.
- PT system operating parameters were recorded during the quarterly site visit.
- ARI system operating parameters were recorded during each injection event.

As discussed previously, the Groundwater Remediation System startup methodology and results have been provided in Appendix A, and will not be discussed further in this report.

4. Methodology

The following sections summarize hydraulic measurement methodology, sample collection and analyses methods and procedures, and the remedial system performance monitoring methodology. Details are further provided in the LTM Plan.

4.1 Water-Level Measurements

The depth to groundwater in monitoring wells was measured as follows: the depth to groundwater in each well was measured to the nearest one-hundredth of a foot with an electronic water-level indicator probe from the surveyed measuring point.

4.2 Groundwater Sampling

Monitoring wells (baseline: GMMW-2, GMMW-5, GMMW-6, PW-3, PW-4, PW-5, PW-7, PW-13, W-5, W-6, W-7, W-13, W-14S, W-17S, W-18S, and W-20S) (Q1: GMMW-2, GMMW-5, GMMW-6, PW-4, and W-5) were purged using a variable speed, 2-inch diameter submersible pump following USEPA Micropurge/low-flow protocols. Field parameters including pH, specific conductance, DO, oxidation/reduction potential (ORP), turbidity, and temperature were monitored in a flow-through cell. Following stabilization of field parameters, the purge rate was then reduced to approximately 100 ml/min and the groundwater sample was collected directly from the pump discharge (USEPA 1998).

4.3 Spring Water and Surface Water Sampling

Spring water samples were collected as grab samples directly from Springs SP-2, SP-3, SP-4, and SP-5 (Figure 1). During sampling, pH, temperature, and specific conductivity were tested.

The surface water sample was collected as a grab sample directly from the North Stream (approximately midstream) at Location F-6 (Figure 1). During sampling, pH, temperature, dissolved oxygen, and specific conductivity were tested.

4.4 Remedial System Performance Monitoring

The following sections describe the Groundwater Remediation System performance monitoring (PT and ARI Systems) conducted between August and December 2002.

4.4.1 PT System Performance Monitoring

Groundwater samples were collected as grab samples directly from Production Wells GMPW-3, GMPW-4, and GMPW-5, the combined influent water to the low profile air stripper, the combined effluent from the low profile air stripper prior to entering the cartridge filters, and the combined effluent after the cartridge filters. An effluent air sample was collected as a grab sample directly from the designated point located on the low profile air stripper stack.

4.4.2 ARI System Performance Monitoring

Groundwater samples were collected as grab samples utilizing a hand bailer from Injection Wells IW-3, IW-8, and IW-13 for TOC analysis. Prior to sampling, the pH of the purge water from each injection well was tested. In addition to injection wells, field parameters were recorded from select monitoring wells using a YSI 600XL multi-parameter, down hole, water quality monitor to provide an early indication of the establishment of the IRZ as part of initial evaluation of ARI system performance. During each monitoring event, the YSI multi-probe was placed at the midpoint of each screen interval for the collection of the field measurements. Field parameters were recorded upon stabilization (stabilization assessed based on field judgment) of the various readings.

5. Groundwater Flow

Depth to groundwater measurements were made on July 24, 2002 and December 9, 2002. Water-level elevations data are provided in Table 1. Water-level elevations and the groundwater flow direction in July 2002 and December 2002 are illustrated on Figures 1 and 2, respectively. Based on the hydraulic data collected during these rounds, groundwater flow conditions at the site remain consistent with previous rounds in that groundwater moving within the glacial outwash aquifer beneath the landfill is part of a shallow groundwater subsystem that discharges into nearby surface water bodies. The direction of groundwater flow at the landfill western perimeter (project area) is toward the west and southwest. Further east the groundwater flows directly toward the south/southwest.

6. Water Quality

The following sections describe the results obtained from the July 2002 baseline event, discuss the water quality results obtained from Quarter Number 1 round and, as needed, compares the current data to baseline conditions and background conditions. The analytical results obtained from groundwater, surface water, and spring water sampling events are provided in Tables 2 through 7. Where applicable, the results of performance monitoring of the groundwater remedial systems (PT and ARI systems) are similarly tabulated and are summarized in the sections below. Section 7 of this report provides a complete description and evaluation of performance monitoring conducted during this period.

6.1 Baseline Groundwater Sampling Event

Activities performed during the baseline groundwater sampling event included sampling of 14 monitoring wells. The results and discussion of the findings of the baseline groundwater sampling event are provided in the following sections.

6.1.1 Volatile Organic Compounds

Individual and total VOC concentrations in groundwater samples collected in July 2002 are provided in Table 2. The baseline total VOC (TVOC) concentrations are shown on Figure 3. The areal extent of TVOC plume concentrations is generally consistent with the total VOC plume distribution that was defined in 1996 (Geraghty & Miller, Inc. 1997). Total VOC concentrations greater than 50 micrograms per liter (µg/L) extend approximately from the landfills western perimeter, near Wells PW-7 and W-6 to Well W-18, approximately 1,400 ft downgradient of the landfill western perimeter. Well GMMW-6 (installed in Year 2001) exhibited the highest concentration of total VOCs (2,067 µg/L) and is located approximately 200 ft downgradient of the ARI system injection wells.

Wells GMMW-2, GMMW-5, GMMW-6, PW-3, PW-4, and W-5 exhibited total VOC concentrations more than an order of magnitude greater than wells located further downgradient, with the predominant VOC concentrations ranging as follows: trichloroethene (TCE) (3.9 to 120 µg/L), 1,1-dichloroethane (1,1-DCA) (53 to 550 µg/L), 1,1,1-trichloroethane (1,1,1-TCA) (6.7 to 88 µg/L), chlorobenzene (<1 to 62 µg/L), chloroethane (8.9 to 170 µg/L), cis-1, 2-dichloroethene (1,2-DCE) (38 to 960 µg/L), and vinyl chloride (VC) (1.7 to 160 µg/L). Upgradient wells (PW-7, PW-13, and W-13) and wells further to the south and east (PW-5, W-6, W-7, W-14S, W-16S, W-17S, W-18, and W-20S) exhibited low or non-detectable concentrations of VOCs, with predominant individual VOC concentrations ranging from <1 µg/L to the following maximum values: TCE (19 µg/L), 1,1-DCA (23 µg/L), 1,1,1-TCA (12 µg/L), chlorobenzene (27 µg/L), chloroethane (11 µg/L), and 1,2-DCE (9.8 µg/L). VC was detected in a single well (PW-7 at 1.9 µg/L). VOC concentrations decrease to below the limits of detection prior to discharging to the Susquehanna River, as exhibited by results from Well W-20S.

Concentrations of the various daughter compounds (i.e., 1,1-DCA, 1,2-DCE, chloroethane, and VC) comprise an average total of 76 percent of the total VOCs detected in project area Wells GMMW-2, GMMW-5, GMMW-6, PW-3, PW-4, and W-5.

6.1.2 Indicators of Reducing Conditions

The presence of soluble (ferrous) iron (Fe) and manganese (Mn), the formation of methane, negative oxidation reduction potential (ORP) values, and decreased concentration of dissolved oxygen (DO), sulfate, and nitrate (Table 3) in groundwater provide strong evidence of reducing conditions within the contaminated aquifer segment downgradient of the site, resulting in geochemical conditions that are amenable to enhancing the biodegradation of VOCs. Based on the groundwater data collected in July 2002, the occurrence of geochemical indicators is as follows:

- Wells GMMW-5, GMMW-6, and W-5 exhibited elevated concentrations of dissolved iron and, to a somewhat lesser extent, elevated concentrations of dissolved manganese, relative to background concentrations.
- Wells GMMW-5, GMMW-6, and W-5 exhibited neutral to negative ORP values.
- Wells GMMW-2, GMMW-5, GMMW-6, and W-5 exhibited elevated concentrations of methane.
- Wells within the reducing segment of the aquifer (GMMW-2, GMMW-5, and GMMW-6) exhibited depleted DO values.
- Wells GMMW-2, GMMW-5, GMMW-6, and W-5 exhibited depleted concentrations of nitrate. In a biologically active (reducing) environment, nitrate would be the first electron acceptor to be depleted after oxygen is consumed. This provides a good indication that reducing conditions are occurring within the contaminated segment of aquifer.

The occurrence of geochemical indicators in the monitoring well network is shown on Figure 4. Data collected from Wells GMMW-5, GMMW-6, and W-5, which are located closest to the site, provide the strongest evidence of reducing conditions in the aquifer. The data indicate that the geochemical conditions in the shallow aquifer immediately downgradient of the site are amenable to biodegradation of VOCs.

6.1.3 Evidence of Biodegradation

Increased concentrations of biodegradation end products (Table 3) in monitoring wells provide strong evidence of the occurrence of bioactivity and biodegradation of VOCs within the plume. The occurrence of the biodegradation end products in the

performance monitoring well network is shown on Figure 4. Wells GMMW-2, GMMW-5, GMMW-6, PW-3, and W-5 exhibited increased concentrations of ethane and ethane. Wells GMMW-5 and W-5, which are located closest to the landfill western perimeter, exhibit the highest levels of ethene and ethane concentrations, which indicates that biodegradation processes are acting to degrade VOCs in the segment of aquifer immediately downgradient of the landfill western perimeter. Well PW-3 located near the distal end of the elevated VOC levels within the plume, also exhibited elevated ethane and ethene concentrations.

6.2 Groundwater Monitoring (Quarter Number 1)

Activities performed during the groundwater sampling event performed in December 2002 (Quarter Number 1) included sampling of 14 monitoring wells. The results and discussion of the findings of the baseline groundwater sampling event are provided in the following sections.

6.2.1 Volatile Organic Compounds

The results of sampling PT system Extraction Wells GMPW-3, GMPW-4, and GMPW-5 (Table 4) provide additional evidence that VOC concentrations downgradient of the landfill western perimeter are consistent with prior rounds of data and with the currently defined extent of the VOC plume, with total VOC concentrations as follows: GMPW-3 (162 µg/L) GMPW-4 (193 µg/L) and GMPW-5 (<1.0 µg/L). A complete evaluation of performance monitoring conducted on the PT system is provided in Section 7.1.2 of this report.

Individual and total VOC concentrations in groundwater samples collected in December 2002 are provided in Table 2. In comparison to baseline conditions, Wells GMMW-5, GMMW-6, and PW-4, exhibiting somewhat higher TVOC concentrations (primarily due to increased concentrations of 1,2-DCE, 1,1-DCA, and VC), while Well W-5 exhibited a decrease in TVOC concentration this round. Additional evaluation of VOC concentrations in groundwater relative to Groundwater Remediation System Performance is provided in Section 7.2.2 of this report.

6.2.2 Indicators of Reducing Conditions

Table 3 provides the results of biogeochemical monitoring conducted in Quarter Number 1. Based on the groundwater data collected in December 2002, geochemical conditions at the project area have been modified from that observed in the baseline

round in that wells that are located closest to the landfill western perimeter exhibit early indications of the establishment of the IRZ (i.e., increased TOC concentrations in Wells GMMW-5 and W-5 and overall stronger anerobic and reducing conditions). A comparison of key field parameter readings collected from injection wells monitored between July and December 2002 (interim period) indicate that the ARI system is performing as designed. Further detail on ARI system performance monitoring is provided in Section 7.2.2 of this report.

6.2.3 Evidence of Biodegradation

Table 3 provides the results of biodegradation end product concentrations in monitoring wells and illustrates the continued occurrence of bioactivity and biodegradation of VOCs within the plume. Overall results indicate stable to increasing concentrations of biodegradation end products, particularly carbon dioxide, ethane, and ethene in Wells GMMW-5 and W-5 compared to the baseline round. These wells are located closest to the ARI injection wells and would be expected to be the first wells to exhibit increases in biodegradation end products. Additional details on the results of biogeochemical monitoring as evidence of Groundwater Remediation System performance and effectiveness are discussed in Section 7.2.2 of this report.

6.3 Spring Water Monitoring

Spring water quality analytical results for the baseline and Quarter Number 1 sampling events are summarized in Table 5 and 6. As shown in Table 5, the individual VOCs detected vary from location to location, but generally consist of 1,1-DCA, chlorobenzene, chloroethane, cis-1,2-DCE, VC, and BTEX compounds (benzene, toluene, ethyl benzene, and total xylenes). The results of spring sampling indicated generally lower values at Locations SP-2 and SP-3 in comparison to prior rounds of data collected from 1995 through 2000 (ARCADIS G&M, Inc. 2003). Spring SP-4 total VOC concentrations in July and December 2002 were as follows (541.4 µg/L and 909.5 µg/L, respectively). The results obtained from Spring SP-5 in July and December 2002 were as follows (155.2 µg/L and 113.5 µg/L, respectively). Field parameters collected from spring samples in July and December 2002 are provided in Table 6.

6.4 Surface Water Monitoring

The results of analysis of the downstream surface water sample collected during the baseline round indicated no detectable levels of VOCs (Table 7), which is consistent

with prior rounds of data (Geraghty & Miller, Inc. 1997). Field parameter readings obtained at the time of sampling are provided in Table 8.

7. Groundwater Remediation System Performance

The following section describes the results of the Groundwater Remediation System performance monitoring conducted during Quarter Number 1.

7.1 PT System

The following section describes the results of the PT system performance monitoring conducted during Quarter Number 1.

7.1.1 Summary of Operation, Maintenance, and Monitoring

During the first quarter of system operation, the PT system operated continuously with only minor system shutdowns for routine operation and maintenance. PT system OM&M was conducted on December 9 and 10, 2002 and included operation and maintenance of system equipment, the collection of system performance samples (water and vapor), and recording system operating parameters. Table 9 provides a summary of the recorded system operating parameters. As shown on Table 9, the total influent groundwater recovery rate was approximately 1-gallon per minute (gpm), with individual recovery rates of 0.57-gpm, 0.19-gpm, and 0.34-gpm for recovery wells GMPW-3, GMPW-4, and GMPW-5, respectively. A total of 138,092 gallons of groundwater was recovered during the reporting period and a total of 143,450 gallons of groundwater has been recovered since the beginning of system startup. The low profile air stripper blower discharge pressure was 8.5-inches of water column (i.w.c.), and the low profile air stripper blower flowrate was 26 standard cubic feet per minute (scfm). The low profile air stripper blower flowrate was substantially lower then its recommended operating flowrate (150-acfm) due to the accumulation of iron oxide and bacterial floc on the low profile air stripper trays. The low profile air stripper was immediately cleaned and returned to its normal operating condition. It should also be noted that although the low profile air stripper flowrate was reduced, it did not adversely affect the performance of the PT system as described below.

7.1.2 Results of Performance Sampling

PT system performance sampling was conducted on December 9 and 10 of 2002. On December 9, 2002 six groundwater samples were collected and on December 10, 2002

one vapor sample was collected. Groundwater samples collected included individual recovery well samples (GMPW-3, GMPW-4, and GMPW-5), total influent, total effluent (from low profile air stripper) before the cartridge filters, and total effluent after the cartridge filters. In addition, one vapor sample was collected from the effluent stack of the low profile air stripper.

Table 4 provides a summary of the PT system performance sampling groundwater analytical results. Table 11 provides a summary of the PT system performance sampling vapor analytical results. According to the New York State Department of Environmental Conversation (NYSDEC) Technical and Operational Guidance Series (TOGS) 1.2.1, one of the purposes of the Model Technology Best Professional Judgment (BPJ) limits is to provide guidance to NYSDEC staff responsible for writing requirements equivalent to SPDES permits for discharges from remediation sites. As such, these values have been selected as the effluent design criteria for the PT system. As shown on Table 4, all groundwater COCs were effectively treated to below their respective BPJ limits via the low profile air stripper and cartridge filters. Based on the total groundwater recovered during the reporting period and total influent groundwater concentration, approximately 0.21 pounds (lbs) of mass were removed from the subsurface during the quarterly reporting period, as shown in Table 10. A total of approximately 0.22 lbs of VOCs have been removed from the subsurface since system startup.

As shown on Table 11, effluent vapor concentrations for all COCs were below their respective detection limits. To be conservative, a NYSDEC DAR-1 air model was calculated using the individual vapor analytical detection limits of COCs detected in the influent groundwater. All COCs were below their respective short-term guidance concentrations (SGCs) and annual guidance concentrations (AGCs). Appendix C contains the NYSDEC DAR-1 AGC screening simulation based on the hand calculations provided in the NYSDEC DAR-1 AGC/SGC Tables dated July 12, 2000.

7.2 ARI System

The following section describes the results of the ARI system performance monitoring conducted during Quarter Number 1.

7.2.1 Summary of Operation, Maintenance, and Monitoring

During the first quarter of ARI system operation, the ARI system operated continuously, with only minor system shutdowns for routine operation and

maintenance activities. ARI system OM&M was conducted on a weekly basis (via remote telemetry) during the first quarter and included operation and maintenance of system equipment and recording system operating parameters during each automated injection event. On November 19, 2002, two 615-gallon polyprocessing tanks were installed as a replacement for the existing molasses totes. The installation of the tanks allows for molasses deliveries to be completed with fewer complications. Following startup the molasses concentration and frequency of injection were altered. The concentration of molasses in solutions was adjusted from an initial concentration of 27% to 14% molasses by volume and the frequency of injections was increased to weekly instead of bi-weekly. During Quarter Number 1, nine automated injections were conducted. Each automated injection event consisted of injecting 37-gallons of approximately 14-percent molasses solution to each of the 17 injection wells on a weekly basis. Based on the number of injection events, quantity of molasses solution delivered to each injection well, and molasses solution percentage, approximately 5,661-gallons of molasses solution was delivered to the subsurface during Quarter Number 1. Appendix D provides a summary of the recorded system operating parameters for each of the injection events for this period.

7.2.2 Results of Performance Sampling

ARI system performance sampling was conducted on November 20 and December 10 of 2002 to monitor the performance of the ARI system. As discussed previously, ARI system performance sampling consisted of collecting groundwater samples from Injection Wells IW-3, IW-8, and IW-13 for TOC analysis, and recording groundwater field parameters from select monitoring wells using a YSI 600XL multi-parameter, down hole, water quality monitor. Based on the anticipated hydrogeologic conditions at the site, it was calculated that Monitoring Wells W-5, GMMW-5, and GMMW-6 could have been affected by the ARI system during the reporting period. As such, these wells were selected for interim performance sampling. In addition to performance sampling conducted explicitly for ARI system monitoring, the Quarter Number 1 analytical results of Monitoring Wells W-5, GMMW-5, and GMMW-6 sampled under the environmental effectiveness monitoring program were utilized to determine the effectiveness of the ARI system.

As discussed previously, Tables 2 and 3 summarize the results of VOCs, and inorganic and field parameters, respectively, for the baseline, interim, and first quarterly sampling events. A comparison of the baseline to the interim and first quarterly groundwater monitoring results indicates that the ARI system is performing as designed. Specifically, analytical results and field parameters indicate that

geochemical conditions in the current area of ARI system influence exhibit a lack of DO, negative ORP, increase in TOC, and an increase in chlorinated VOC (CVOC) degradation products (i.e., ethene and ethane).

- As shown in Table 3, DO concentrations in monitoring wells GMMW-5 and W-5 decreased from 3.24 milligrams per liter (mg/L) to 1.36 mg/L and from 6.67 mg/L to 1.40 mg/L, respectively, during the first quarter of operation.

- TOC concentrations in monitoring wells GMMW-5 and W-5 increased from 8.25 mg/L to 56.5 mg/L and from 4.33 to 39.6 mg/L, respectively.

- TOC concentrations in injection wells IW-3 and IW-13 increased from 2.67 mg/L to 1,140 mg/L and from 3.60 to 495 mg/L, respectively.

- CVOC degradation products also increased significantly during the first quarter of operation, as mentioned above.

- Ethene concentrations in monitoring wells GMMW-5 and W-5 increased from 1,000 nanograms per liter (ng/L) to 1,400 ng/L and from 13,000 ng/L to 28,000 ng/L, respectively.

- Ethane concentrations in monitoring wells GMMW-5 and W-5 increased from 56 ng/L to 150 ng/L and from 35,000 ng/L to 53,000 ng/L, respectively.

Total VOC concentrations within the ARI influence area did not change substantially during the first quarter of operation. However, this result is anticipated due to the competing reactions which involve contaminant biodegradation, formation of daughter products, and desorption of adsorbed VOC mass during the initial operation of the IRZ. This can result in VOC concentrations increasing or remaining constant during the short- to mid-term. However, it is anticipated that VOC concentrations will drop significantly over the long-term (i.e., following the desorption period).

8. Conclusions

Based on the data obtained from the baseline, interim OM&M of the Groundwater Remediation System, and Quarter Number 1, ARCADIS concludes the following:

- The groundwater flow direction in the project area (i.e., adjacent to the landfill western perimeter) and site-wide in the July and December 2002 rounds was

consistent with previous rounds. The groundwater flow direction in the project area is toward the southwest from the western perimeter of the landfill. The groundwater flow direction in areas further to the east of the project area is toward the south/southwest.

- The July 2002 baseline results indicate that the extent of the groundwater TVOC plume has remained stable since 1997, with the area of highest TVOC concentrations located in the project area. Wells located upgradient or substantial distances downgradient of the project area continue to exhibit low or non-detectable concentrations of VOCs. The December 2002 TVOC analytical results in wells located close to the ARI injection well line were essentially the same as the July 2002 round. This is likely due to competing reactions which involve contaminant biodegradation, formation of daughter products, and desorption of adsorbed VOC mass during the initial operation of the IRZ.

- Biogeochemical conditions observed in July 2002 and December 2002 are as follows:

  - The July 2002 data indicate conditions amenable to biodegradation of VOCs. Elevated concentrations of biodegradation end products provide additional evidence that biodegradation of VOCs is occurring within the project area.

  - The December 2002 biogeochemical data indicate similar geochemical conditions downgradient and stable to increasing levels of biodegradation end products in key wells closest to the ARI system injection wells.

- The Groundwater Remediation System operated continuously during the reporting period with only minor system shutdowns for operation and maintenance activities.

- The PT system is operating as designed and is treating recovered groundwater to below BPJ limits prior to discharge.

- The ARI system is operating as designed and has established an anaerobic IRZ within the vicinity of the injection wells.

- Groundwater within the current ARI influence area exhibited increased levels of CVOC degradation products.

9. Recommendations

No recommendations for changes to the groundwater monitoring program are made at this time.

10. Project Schedule

Groundwater environmental effectiveness monitoring is scheduled to be conducted in Year 2003 on the quarterly schedule set forth in the LTM Plan. Performance monitoring of the Groundwater Remediation System will also be performed consistent with the LTM Plan. Changes to the monitoring plan for Year 2003 would be considered based on field conditions or the need to refine data collection needs in support monitoring system performance and effectiveness.

11. References

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Table 1. Water-Level Measurements Collected on July 22 and December 9, 2002, Colesville Landfill, Broome County, New York.

Well	MP Elevation (feet above msl)	July 21, 2002 Depth to Water (feet below MP)	July 21, 2002 Water-Level Elevation (feet above msl)	December 9, 2002 Depth to Water (feet below MP)	December 9, 2002 Water-Level Elevation (feet above msl)	MP Description
GMMW-2	1030.95	33.61	997.34	38.11	992.84	Inner casing
GMMW-5	1043.66	48.81	994.85	49.26	994.40	Inner casing
GMMW-6	1033.56	39.94	993.62	40.18	993.38	Inner casing
PW-3	988.92	NA	NA	NA	NA	Inner casing
PW-4	1001.75	17.77	983.98	18.81	982.94	Inner casing
PW-5	986.12	1.27	984.85	52.51	Artesian	Inner casing
W-5	1051.41	52.17	999.24	NA	NA	Inner casing
W-6	1050.38	50.57	999.81	51.54	998.84	Inner casing
PW-7	1042.47	39.45	1003.02	NA	NA	Inner casing
W-7	1049.12	43.48	1005.64	44.61	1004.51	Inner casing
PW-10	1049.29	39.07	1010.22	40.31	1008.98	Inner casing
PW-13	1072.41	62.17	1010.24	63.20	1009.21	Inner casing
W-13	1053.43	47.50	1005.93	48.26	1005.17	Inner casing
W-14S	957.68	9.45	948.23	NA	NA	Inner casing
W-16S	990.33	32.10	958.23	9.30	981.03	Outer casing
W-17S	959.13	10.69	948.44	11.47	947.66	Inner casing
W-18	973.56	11.83	961.73	11.38	962.18	Inner casing
W-20S	952.88	10.11	942.77	8.72	944.16	Inner casing

msl	mean sea level
MP	Measuring Point
NA	Not Accessible

Table 2. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples, Baseline and Quarter Number 1 Sampling Rounds, Colesville Landfill, Broome County, New York.[1,2]

Constituents (units in ug/L)	Sample ID:	GMMW-2	GMMW-5	GMMW-5	GMMW-6	GMMW-6	PW-3	PW-4	PW-4	PW-5	PW-7	PW-10	PW-13	W-5
	Date:	07/25/02	07/25/02	12/10/2002	07/25/02	12/10/2002	07/25/02	07/25/02	12/10/2002	07/25/02	07/23/02	12/10/2002	07/23/02	07/25/02
1,1,1-Trichloroethane		**88 J**	**7.2 J**	<1	**6.7 J**	<10	**31 J**	**69 J**	**62**	<1.0 J	**7.3 J**	<1	**1.5**	**8.5 J**
1,1,2-Trichloroethane		<1.0 J	<1.0 J	<1	**4.8 J**	<10	<1.0 J	<1.0 J	<1	<1.0 J	<1.0 J	<1	<1.0	<1.0 J
1,1-Dichloroethane		**93 J**	**86 J**	**120**	**550 J**	**670**	**53 J**	**62 J**	**73**	<1.0 J	**22 J**	**4.8**	**1.3**	**160 J**
1,1-Dichloroethene		**4.2 J**	**1.5 J**	<1	**8.3 J**	<10	<1.0 J	**2.8 J**	**7.2**	<1.0 J	<1.0 J	<1	<1.0	**1.2 J**
1,2,4-Trimethylbenzene		<1.0 J	<1.0 J	<1	<1.0 J	<10	<1.0 J	<1.0 J	<1	<1.0 J	<1.0 J	<1	<1.0	**1.3 J**
1,2-Dichlorobenzene		<1.0 J	<1.0 J	<1	<1.0 J	<10	<1.0 J	<1.0 J	<1	<1.0 J	<1.0 J	<1	<1.0	<1.0 J
1,2-Dichloroethane		<1.0 J	<1.0 J	**1.1**	**5.6 J**	<10	**1.1 J**	<1.0 J	<1	<1.0 J	<1.0 J	<1	<1.0	**1.3 J**
1,2-Dichloropropane		<1.0 J	<1.0 J	<1	**2.3 J**	<10	<1.0 J	<1.0 J	<1	<1.0 J	<1.0 J	<1	<1.0	<1.0 J
Benzene		**6.9 J**	<1.0 J	<1	**7.4 J**	<10	<1.0 J	<1.0 J	**1.8**	<1.0 J	<1.0 J	**1.9**	<1.0	**2.2 J**
Chlorobenzene		**48 J**	**5.8 J**	**9**	**62 J**	**54**	<1.0 J	<1.0 J	<1	<1.0 J	**4.2 J**	**44**	**4.0**	**15 J**
Chloroethane		**27 J**	**13 J**	**22**	**170 J**	**190**	**8.9 J**	**17 J**	**20**	<1.0 J	**7.2 J**	<1	<1.0	**70 J**
Chloroform		<1.0 J	<1.0 J	<1	**4.5 J**	<10	**1.8 J**	**2.7 J**	<1	<1.0 J	<1.0 J	<1	<1.0	<1.0 J
Chloromethane		<1.0 J	<1.0 J	<1	<1.0 J	<10	<1.0 J	<1.0 J	<1	<1.0 J	<1.0 J	<1	<1.0	<1.0 J
cis-1,2-Dichloroethene		**200 J**	**100 J**	**160**	**960 J**	**1100**	**38 J**	**72 J**	**130**	<1.0 J	**3.4 J**	**4.7**	**1.6**	**53 J**
Dichlorodifluoromethane		<1.0 J	<1.0 J	<1	**10 J**	<10	**1.8 J**	**3.9 J**	<1	<1.0 J	<1.0 J	<1	<1.0	<1.0 J
Ethylbenzene		<1.0 J	<1.0 J	<1	<1.0 J	<10	<1.0 J	<1.0 J	<1	<1.0 J	<1.0 J	<1	<1.0	**1.4 J**
m,p-Xylene		<2.0 J	<2.0 J	<2	<2.0 J	<20	<2.0 J	<2.0 J	<2	<2.0 J	<2.0 J	<2	<2.0	**4.2 J**
Methylene chloride		**2.7 J**	**2.2 J**	**2.1**	**22 J**	<10	**1.8 J**	**5.4 J**	**4.9**	<1.0 J	<1.0 J	<1	<1.0	**3.0 J**
Naphthalene		<1.0 J	<1.0 J	<1	<1.0 J	<10	<1.0 J	<1.0 J	<1	<1.0 J	<1.0 J	<1	**4.4**	<1.0 J
o-Xylene		<1.0 J	<1.0 J	<1	**1.3 J**	<10	<1.0 J	<1.0 J	<1	<1.0 J	<1.0 J	<1	<1.0	**2.2 J**
Tetrachloroethene		**1.0 J**	<1.0 J	<1	**2.2 J**	<10	**3.1 J**	<1.0 J	<1	<1.0 J	<1.0 J	<1	<1.0	<1.0 J
Toluene		<1.0 J	**1.1 J**	**2.4**	<1.0 J	<10	<1.0 J	<1.0 J	<1	<1.0 J	<1.0 J	<1	<1.0	**6.3 J**
trans-1,2-Dichloroethene		<1.0 J	<1.0 J	<1	**3.5 J**	<10	<1.0 J	<1.0 J	<1	<1.0 J	<1.0 J	<1	<1.0	**1.0 J**
Trichloroethene		**120 J**	**3.9 J**	**2.8**	**86 J**	**64**	**19 J**	**38 J**	**82**	<1.0 J	**5.0 J**	<1	**5.3**	**6.0 J**
Vinyl chloride		**29 J**	**12 J**	**15**	**160 J**	**250**	**1.7 J**	**5.4 J**	**6.5**	<1.0 J	**1.9 J**	<1	<1.0	**91 J**
Total VOCs		**619.8**	**232.7**	**334.4**	**2,066.6**	**2328**	**161.2**	**278.2**	**387.4**	0	**51**	**55.4**	**18.1**	**427.6**

See footnotes on last page.

Table 2. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples, Baseline and Quarter Number 1 Sampling Rounds, Colesville Landfill, Broome County, New York.[1,2]

Constituents (units in ug/L)	Sample ID: / Date:	W-5 12/10/2002	W-6 07/25/02	W-7 07/24/02	W-13 07/25/02	W-14S 07/24/02	W-16S 07/24/02	W-17S 07/24/02	W-18S 07/23/02	W-20S 07/23/02
1,1,1-Trichloroethane		**6.6**	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	**12 J**	<1.0 J
1,1,2-Trichloroethane		<1	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
1,1-Dichloroethane		**180**	**23 J**	**10 J**	<1.0 J	<1.0 J	**17 J**	**3.5 J**	**15 J**	<1.0 J
1,1-Dichloroethene		<1	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
1,2,4-Trimethylbenzene		<1	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
1,2-Dichlorobenzene		<1	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
1,2-Dichloroethane		<1	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
1,2-Dichloropropane		<1	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
Benzene		**2.2**	**3.9 J**	<1.0 J	<1.0 J	<1.0 J	**4.8 J**	<1.0 J	<1.0 J	<1.0 J
Chlorobenzene		**16**	**5.5 J**	**13 J**	<1.0 J	<1.0 J	**27 J**	<1.0 J	<1.0 J	<1.0 J
Chloroethane		**82**	**5.2 J**	**7.3 J**	**2.2 J**	<1.0 J	**11 J**	<1.0 J	<1.0 J	<1.0 J
Chloroform		<1	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	**1.0 J**	<1.0 J
Chloromethane		<1	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
cis-1,2-Dichloroethene		**8.2**	**2.8 J**	**2.1 J**	<1.0 J	<1.0 J	**2.4 J**	**1.2 J**	**9.8 J**	<1.0 J
Dichlorodifluoromethane		<1	**4.1 J**	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
Ethylbenzene		<1	**1.9 J**	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
m,p-Xylene		**0.8J**	<2.0 J	<2.0 J	<2.0 J	<2.0 J	<2.0 J	<2.0 J	<2.0 J	<2.0 J
Methylene chloride		**3.7**	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
Naphthalene		<1	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
o-Xylene		<1	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
Tetrachloroethene		<1	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
Toluene		**3.8**	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
trans-1,2-Dichloroethene		<1	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
Trichloroethene		**3.8**	**3.3 J**	**1.6 J**	<1.0 J	<1.0 J	**2.0 J**	**2.5 J**	**19 J**	<1.0 J
Vinyl chloride		**36**	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J	<1.0 J
Total VOCs		**343.1**	**49.7**	**34**	**2.2**	0	**64.2**	**7.2**	**56.8**	0

See footnotes on last page.

Table 2. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples, Baseline and Quarter Number 1 Sampling Rounds, Colesville Landfill, Broome County, New York.[1,2]

Notes:

1. Baseline sampling conducted during the week of July 22, 2002.
2. Groundwater Remediation system startup was completed on September 8, 2002.

Bold Constituent detected above MDL.

J Estimated value
MDL Method detection limit
VOCs Volatile Organic Compounds
ug/L Micrograms per liter

Table 3. Concentrations of Selected Metals, General Chemistry and Field Parameters, and Dissolved Gases Detected in Groundwater Samples, Baseline and Quarter Number 1 Sampling Rounds, Colesville Landfill, Broome County, New York.[1,2]

Parameters	Sample ID:	GMMW-2	GMMW-2	GMMW-5	GMMW-5	GMMW-5	GMMW-6	GMMW-6	GMPW-1	IW-3[3]	IW-3[3]	IW-8[3]
	Date:	7/25/2002	12/10/2002	7/24/2002	11/20/2002	12/10/2002	7/25/2002	12/10/2002	11/20/2002	8/30/2002	12/9/2002	8/30/2002
	UNITS											
METALS												
Iron	mg/L	--	--	--	--	--	--	--	--	--	--	--
Iron, Dissolved	mg/L	0.0579	0.0539	15.7	--	13.1	1.67	1.8	--	--	--	--
Manganese	mg/L	--	--	--	--	--	--	--	--	--	--	--
Manganese, Dissolved	mg/L	0.0139	0.0234	2.07	--	2.04	1.90	2.03	--	--	--	--
GENERAL CHEMISTRY												
Alkalinity, Total (As $CaCO_3$)	mg/L	--	--	--	--	--	--	--	--	--	--	--
Chloride	mg/L	7.00	1.00	8.60	--	8.7	4.20	1.2	--	--	--	--
Nitrogen, Nitrate (As N)	mg/L	<0.2	0.12 J	<0.2	--	<0.2	<0.2	<0.2	--	--	--	--
Nitrogen, Nitrite	mg/L	<0.01	<0.01	0.0410	--	0.084	<0.01	0.036	--	--	--	--
Total Organic Carbon	mg/L	1.81	9.48	8.25	--	56.5	<0.5	26.5	--	2.67	1,140	5.16
Sulfate	mg/L	<2.0	3.43	6.16	--	12.1	<2.0	<2.0	--	--	--	--
Sulfide (field)	mg/L	0.248	--	--	--	--	0.149	--	--	--	--	--
FIELD PARAMETERS												
pH	Standard units	6.34	6.63	6.22	6.76	6.58	6.10	6.79	7.46	7.80	4.85	6.55
Specific Conductance	mmhos/cm	0.427	0.331	0.383	0.352	0.242	0.875	1.01	0.316	--	0.82	--
Turbidity	NTU	46.1	40	63.7	--	28.7	150	550	--	--	--	--
Dissolved Oxygen	mg/L	1.32	2.33	3.24	1.07	1.36	1.40	1.66	1.00	--	2.25	--
Temperature	deg C	13.7	11.9	14.0	9.7	10.5	15.6	10.4	9.6	--	9.5	--
ORP	mV	122	64	-106	-215.5	-74	11	-30	-210.3	--	-435	--
DISSOLVED GASES												
Carbon dioxide	mg/L	130	110	51	--	62	140	140	--	--	--	--
Carbon monoxide	mg/L	<0.40	<0.40	<0.40	--	<0.40	<0.40	<0.40	--	--	--	--
Ethane	ng/L	590	480	56	--	150	720	1,100	--	--	--	--
Ethene	ng/L	4,300	2,300	1,000	--	1,400	29,000	35,000	--	--	--	--
Methane	ug/L	670	660	530	--	180	580	720	--	--	--	--
Nitrogen	mg/L	14	16	17	--	15	13	16	--	--	--	--
Oxygen	mg/L	2.8	5.4	2.7	--	1.6	2.8	5.6	--	--	--	--

See footnotes on last page.

Table 3. Concentrations of Selected Metals, General Chemistry and Field Parameters, and Dissolved Gases Detected in Groundwater Samples, Baseline and Quarter Number 1 Sampling Rounds, Colesville Landfill, Broome County, New York.[1,2]

Parameters	Sample ID:	IW-13[3]	IW-13[3]	PW-2	PW-3	PW-4	PW-4	PW-5	PW-7	PW-10	PW-11	PW-13
	Date:	8/30/2002	12/10/2002	11/20/2002	07/25/02	07/25/02	12/10/2002	07/25/02	7/23/2002	12/10/2002	11/20/2002	7/23/2002
	UNITS											
METALS												
Iron	mg/L	--	--	--	--	--	--	--	--	--	--	--
Iron, Dissolved	mg/L	--	--	--	--	0.0698	0.032 J	--	--	31.8	--	--
Manganese	mg/L	--	--	--	--	--	--	--	--	--	--	--
Manganese, Dissolved	mg/L	--	--	--	--	0.0144	0.0108	--	--	10.4	--	--
GENERAL CHEMISTRY												
Alkalinity, Total (As $CaCO_3$)	mg/L	--	--	--	--	--	--	--	--	--	--	--
Chloride	mg/L	--	--	--	--	8.80	4.2	--	--	5.2	--	--
Nitrogen, Nitrate (As N)	mg/L	--	--	--	--	0.452	0.16 J	--	--	<0.2	--	--
Nitrogen, Nitrite	mg/L	--	--	--	--	<0.01	0.024	--	--	0.045	--	--
Total Organic Carbon	mg/L	3.60	495	--	1.55	1.49	8.97	1.90	--	5.31	--	--
Sulfate	mg/L	--	--	--	--	8.52	11.2	--	--	20.5	--	--
Sulfide (field)	mg/L	--	--	--	0.051	0.025	--	0.244	0.065	--	--	0.005
FIELD PARAMETERS												
pH	Standard units	6.48	6.12	8.06	6.33	5.89	6.09	8.15	6.18	6.47	6.83	5.81
Specific Conductance	mmhos/cm	--	0.646	0.186	0.472	0.361	0.358	0.248	0.219	0.248	0.636	0.172
Turbidity	NTU	--	--	--	37.8	0.6	8.0	231	122	58	--	27
Dissolved Oxygen	mg/L	--	4.10	0.71	7.20	3.50	1.54	0.35	2.30	1.27	0.88	0.40
Temperature	deg C	--	10.0	10.5	12.9	15.6	13.5	10.8	14.5	9.1	9.6	20.8
ORP	mV	--	-399.8	-81.2	292	201	137	105	19	-38	0.636	121
DISSOLVED GASES												
Carbon dioxide	mg/L	--	--	--	140	260	340	0.96	--	140	--	--
Carbon monoxide	mg/L	--	--	--	<0.40	<0.40	<0.40	<0.40	--	<0.40	--	--
Ethane	ng/L	--	--	--	1,100	79	79	<5.0	--	<5.0	--	--
Ethene	ng/L	--	--	--	12,000	480	300	310	--	<5.0	--	--
Methane	ug/L	--	--	--	37	33	18	1.8	--	0.98	--	--
Nitrogen	mg/L	--	--	--	12	12	14	17	--	18	--	--
Oxygen	mg/L	--	--	--	6.2	3.9	4.7	2.7	--	2.7	--	--

See footnotes on last page.

Table 3. Concentrations of Selected Metals, General Chemistry and Field Parameters, and Dissolved Gases Detected in Groundwater Samples, Baseline and Quarter Number 1 Sampling Rounds, Colesville Landfill, Broome County, New York.[1,2]

Parameters	Sample ID:	W-5	W-5	W-5	W-6	W-7	W-13	W-14S	W-16S	W-17S	W-18	W-20S
	Date:	7/24/2002	11/20/2002	12/10/2002	7/24/2002	07/24/02	7/23/2002	07/24/02	07/24/02	07/24/02	07/23/02	07/23/02
	UNITS											
METALS												
Iron	mg/L	--	--	--	--	--	--	--	--	--	--	--
Iron, Dissolved	mg/L	**29.8**	--	**49.5**	--	--	--	<0.035	--	--	--	--
Manganese	mg/L	--	--	--	--	--	--	--	--	--	--	--
Manganese, Dissolved	mg/L	**1.49**	--	**1.31**	--	--	--	<0.005	--	--	--	--
GENERAL CHEMISTRY												
Alkalinity, Total (As $CaCO_3$)	mg/L	--	--	--	--	--	--	--	--	--	--	--
Chloride	mg/L	**4.40**	--	**1.8**	--	--	--	**2.10**	--	--	--	--
Nitrogen, Nitrate (As N)	mg/L	<0.2	--	<0.2	--	--	--	**0.361**	--	--	--	--
Nitrogen, Nitrite	mg/L	**0.0370**	--	**0.068**	--	--	--	<0.01	--	--	--	--
Total Organic Carbon	mg/L	**4.33**	--	**39.6**	**2.03**	**1.54**	--	**1.29**	**2.04**	--	**2.15**	--
Sulfate	mg/L	**5.34**	--	**8.16**	--	--	--	**11.0**	--	--	--	--
Sulfide (field)	mg/L	--	--	--	**0.625**	**0.027**	--	**0.02**	**0.0014**	<0.005	**0.021**	**0.006**
FIELD PARAMETERS												
pH	Standard units	**6.56**	**6.78**	**6.67**	**5.97**	**6.19**	**6.51**	**5.46**	**6.03**	**6.42**	**6.13**	**5.36**
Specific Conductance	mmhos/cm	**0.765**	**0.716**	**0.624**	**0.47**	**0.538**	**1.470**	**0.06**	**0.208**	**0.335**	**0.382**	**0.107**
Turbidity	NTU	**180**	--	**90.8**	**55**	**49.9**	**55.7**	**43.1**	**5.1**	**27.9**	**47.2**	**16**
Dissolved Oxygen	mg/L	**6.67**	**0.87**	**1.40**	**0.20**	**0.96**	**3.56**	**6.54**	**1.80**	**3.47**	**4.90**	**3.80**
Temperature	deg C	**14.2**	**9.7**	**4.9**	**17.7**	**15.5**	**18.4**	**9.2**	**15.4**	**12.9**	**14.9**	**18.8**
ORP	mV	**-103**	**-123.7**	**-73**	**-42**	**-55**	**-85**	**265**	**199**	**213**	**169**	**299**
DISSOLVED GASES												
Carbon dioxide	mg/L	**110**	--	**190**	--	--	--	--	**170**	--	--	--
Carbon monoxide	mg/L	<0.40	--	<0.40	--	--	--	--	<0.40	--	--	--
Ethane	ng/L	**35,000**	--	**53,000**	--	--	--	--	**510**	--	--	--
Ethene	ng/L	**13,000**	--	**28,000**	--	--	--	--	**360**	--	--	--
Methane	ug/L	**1,400**	--	**1,200**	--	--	--	--	**1,800**	--	--	--
Nitrogen	mg/L	**13**	--	**14**	--	--	--	--	**9.5**	--	--	--
Oxygen	mg/L	**1.2**	--	**1.2**	--	--	--	--	**2.8**	--	--	--

See footnotes on last page.

Table 3. Concentrations of Selected Metals, General Chemistry and Field Parameters, and Dissolved Gases Detected in Groundwater Samples, Baseline and Quarter Number 1 Sampling Rounds, Colesville Landfill, Broome County, New York.[1,2]

Notes:

1. Baseline sampling conducted during the week of July 22, 2002.
2. Groundwater Remediation System startup completed on September 8, 2002.
3. Injection wells were sampled in accordance with the schedule set forth in Table 3 of the Long-Term Monitoring Plan (ARCADIS 2002).

J	Estimated value
mg/L	milligrams per liter
mmhos/cm	millimhos per centimeter
NTU	Nephelometric Turbidity Units
deg C	degrees Celsius
mV	millivolts
ng/L	nanograms per liter
--	Not analyzed
ug/L	Micrograms per liter
IW	Injection Well

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Table 4. Concentrations of Volatile Organic Compounds and Selected Metals Detected in Aqueous Samples Collected from the PT System, Quarter Number 1, Colesville Landfill, Broome County, New York.

Constituents	Model Technology BPJ Limits[1,2] (ug/L)	Sample ID: / Date:	GMPW-3 12/9/2002	GMPW-4 12/9/2002	GMPW-5 12/9/2002	INFLUENT 12/9/2002	EFFLUENT-BC 12/9/2002	EFFLUENT-AC 12/9/2002
VOCs (units in ug/L)								
1,1,1-Trichloroethane	10-20		46	41	<1	46	<1	<1
1,1,2-Trichloroethane	10		<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	10		33	36	<1	30	<1	<1
1,1-Dichloroethene	10		4.7	6.8	<1	8.3	<1	<1
1,2,4-Trimethylbenzene	--		<1	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	--		<1	<1	<1	<1	<1	<1
1,2-Dichloroethane	10-30		<1	<1	<1	<1	<1	<1
1,2-Dichloropropane	--		<1	<1	<1	<1	<1	<1
Benzene	5		5	5.6	<1	4.8	<1	<1
Chlorobenzene	--		<1	<1	<1	<1	<1	<1
Chloroethane	--		<1	8.8	<1	15	<1	<1
Chloroform	--		<1	<1	<1	<1	<1	<1
Chloromethane	10		<1	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	10		28	35	<1	25	1.9	2.1
Dichlorodifluoromethane	--		<1	<1	<1	1.4	<1	<1
Ethyl Benzene	5		<1	<1	<1	<1	<1	<1
m+p-Xylenes	5		<2	<2	<2	<2	<1	<1
Methylene Chloride	10-50		11	11	<1	8.8	<1	<1
o-Xylene	5		<1	<1	<1	<1	<1	<1
Tetrachloroethene	10		<1	<1	<1	<1	<1	<1
Toluene	5		<1	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	10-50		<1	<1	<1	<1	<1	<1
Trichloroethene	10		30	42	<1	31	1.4	<1
Vinyl Chloride	10-50		5.1	7.3	<1	6.9	<1	<1
Total VOCs			**162.8**	**193.5**	**<1**	**177.2**	**3.3**	**2.1**

Metals (units in mg/L)	Model Technology BPJ Limits[3,4] (mg/L)	GMPW-3 12/9/2002	GMPW-4 12/9/2002	GMPW-5 12/9/2002	INFLUENT 12/9/2002	EFFLUENT-BC 12/9/2002	EFFLUENT-AC 12/9/2002
Total Iron	1.2 / 0.61	3.61	1.03	0.572	6.35	0.81	0.188

Table 4. Concentrations of Volatile Organic Compounds and Selected Metals Detected in Aqueous Samples Collected from the PT System, Quarter Number 1, Colesville Landfill, Broome County, New York.

Notes:

1. Model Technology Best Professional Judgement (BPJ) Limits recommended for Air Stripping with appropriate pretreatment from Attachment C of TOGS 1.2.1.
2. When a range is listed for the BPJ limit, a variation in available references was found. Recommended daily maximum limits should be in this range.
3. Model Technology BPJ Limits recommended for Lime, Settle and Filter treatment.
4. The recommended daily maximum permit limit is 1.2 mg/L and the recommended daily average permit limit is 0.61 mg/L.
5. Production wells were sampled in accordance with the schedule set forth in Table 3 of the Long-Term Monitoring Plan (ARCADIS 2002).

--	No BPJ limit listed.
J	Estimated value.
ug/L	Micrograms per liter.
mg/L	Milligrams per liter.
VOCs	Volatile Organic Compounds.
AC	After Cartridge Filter.
BC	Before Cartridge Filter.
PT	Pump and Treat.
MDL	Method Detection Limit.

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Table 5. Concentrations of Volatile Organic Compounds Detected in Spring Samples, Baseline and Quarter Number 1 Sampling Rounds, Colesville Landfill, Broome County, New York.[1,2]

Parameters (units in ug/L)	Sample ID: Date:	SP-2 07/25/02	SP-2 12/9/2002	SP-3 07/25/02	SP-3 12/9/2002	SP-4 07/25/02	SP-4 12/9/2002	SP-5 07/25/02	SP-5 12/9/2002	SP-5 (MARSH[3]) 08/22/02	SP-5 (CULVERT) 08/29/02
1,1,1-Trichloroethane		<1.0 J	<1	2.9 J	<1	9.2 J	<1	<1.0 J	<1	<1.0 J	<1.0 J
1,1,2-Trichloroethane		<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1.0 J
1,1-Dichloroethane		36 J	12	46 J	23	200 J	240	45 J	31	<1.0 J	<1.0 J
1,1-Dichloroethene		<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1.0 J
1,2,4-Trimethylbenzene		<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1.0 J
1,2-Dichlorobenzene		<1.0 J	<1	<1.0 J	<1	1.1 J	<1	<1.0 J	<1	<1.0 J	<1.0 J
1,2-Dichloroethane		<1.0 J	<1	<1.0 J	<1	2.6 J	4.3	<1.0 J	<1	<1.0 J	<1.0 J
1,2-Dichloropropane		<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1.0 J
Benzene		<1.0 J	<1	<1.0 J	<1	2.7 J	2	5.5 J	3.9	<1.0 J	<1.0 J
Chlorobenzene		9.9 J	<1	7.9 J	<1	18 J	14	81 J	52	<1.0 J	<1.0 J
Chloroethane		<1.0 J	<1	8.3 J	<1	<1.0 J	30	17 J	23	<1.0 J	<1.0 J
Chloroform		<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1.0 J
Chloromethane		<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	2.1 J	<1.0 J
cis-1,2-Dichloroethene		1.5 J	1.3	2.3 J	1.3	73 J	400	1.4 J	<1	<1.0 J	<1.0 J
Dichlorodifluoromethane		<1.0 J	<1	<1.0 J	<1	3.2 J	<1	<1.0 J	<1	<1.0 J	<1.0 J
Ethylbenzene		2.2 J	<1	<1.0 J	<1	<1.0 J	<1	2.8 J	<1	5.6 J	<1.0 J
m,p-Xylene		<2.0 J	<2	<2.0 J	<2	<2.0 J	<2	<2.0 J	<2	28 J	<2.0 J
Methylene chloride		<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	1.1 J	<1	<1.0 J	<1.0 J
Naphthalene		<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1.0 J
o-Xylene		<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	12 J	<1.0 J
Tetrachloroethene		<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	<1.0 J
Toluene		<1.0 J	<1	<1.0 J	<1	<1.0 J	<1	<1.0 J	3.6	210 J	<1.0 J
trans-1,2-Dichloroethene		<1.0 J	<1	<1.0 J	<1	1.6 J	8.2	<1.0 J	<1	<1.0 J	<1.0 J
Trichloroethene		2.7 J	1.8	3.1 J	2.3	<1.0 J	21	1.4 J	<1	<1.0 J	<1.0 J
Vinyl chloride		<1.0 J	<1	<1.0 J	<1	230 J	190	<1.0 J	<1	<1.0 J	<1.0 J
Total VOCs		**52.3**	**15.1**	**70.5**	**26.6**	**541.4**	**909.5**	**155.2**	**113.5**	**257.7**	**0**

Notes:

J Estimated value.
VOCs Volatile Organic Compounds
ug/L Micrograms per liter.

1. Baseline sampling conducted during the week of July 22, 2002.
2. Groundwater Remediation system brought permanently on-line on September 8, 2002.
3. Sample collected in marsh area between SP-5 and East Windsor Road.

Table 6. Concentrations of Selected General Chemistry and Field Parameters Detected in Spring Samples, Baseline and Quarter Number 1 Sampling Rounds, Colesville Landfill Broome County, New York.[1,2]

Parameters	Sample ID:	SP-2	SP-2	SP-3	SP-3	SP-4	SP-4	SP-4	SP-5	SP-5	SP-5	SP-5
	Date:	7/25/2002	12/9/2002	7/25/2002	12/9/2002	7/25/2002	12/9/2002	2/17/2003	7/25/2002	11/20/2002	12/9/2002	2/17/2003
	UNITS											
GENERAL CHEMISTRY												
Sulfide (field)[3]	mg/L	0.033	--	0.2	--	0.145	--	--	0.035	--	--	--
FIELD PARAMETERS												
pH	pH units	6.53	6.38	7.17	6.37	6.78	6.5	6.63	5.79	6.75	6.06	6.48
Specific Conductance	µmhos/cm	0.249	0.27	0.282	0.198	0.848	0.586	0.753	-0.54	0.584	0.572	0.653
Turbidity	NTU	181	0	395	0.7	203	125	--	60	--	487	--
Dissolved Oxygen	mg/L	8.96	3.89	9.36	8.57	9.26	5.80	1.32	3.00	1.34	4.90	1.76
Temperature	deg C	17.17	4.4	16.92	3.3	19.69	1.8	4.7	15.1	9.51	3.6	4.6
ORP	mV	-24	35	-51	116	-125	17	-49.9	-29	-92.2	51	-19.6

Notes:

1. Baseline sampling conducted during the week of July 22, 2002.
2. Groundwater Remediation System start-up was completed on September 8, 2002.
3. Sulfide analysis was performed on site on the date the samples were collected.

-- Not analyzed.
mg/L milligrams per liter
µmhos/cm micromhos per centimeter
NTU Nephelometric Turbidity Units
deg C degrees Celsius
mV millivolts
ORP Oxidation-Reduction Potential

Table 7. Concentrations of Volatile Organic Compounds Detected in Surface Water, Baseline Sampling Event, Colesville Landfill, Broome County, New York.[1]

Parameters (units in ug/L)	Sample ID: F-6 Date: 07/25/02
1,1,1-Trichloroethane	<1.0 J
1,1,2-Trichloroethane	<1.0 J
1,1-Dichloroethane	<1.0 J
1,1-Dichloroethene	<1.0 J
1,2,4-Trimethylbenzene	<1.0 J
1,2-Dichlorobenzene	<1.0 J
1,2-Dichloroethane	<1.0 J
1,2-Dichloropropane	<1.0 J
Benzene	<1.0 J
Chlorobenzene	<1.0 J
Chloroethane	<1.0 J
Chloroform	<1.0 J
Chloromethane	<1.0 J
cis-1,2-Dichloroethene	<1.0 J
Dichlorodifluoromethane	<1.0 J
Ethylbenzene	<1.0 J
m,p-Xylene	<2.0 J
Methylene chloride	<1.0 J
Naphthalene	<1.0 J
o-Xylene	<1.0 J
Tetrachloroethene	<1.0 J
Toluene	<1.0 J
trans-1,2-Dichloroethene	<1.0 J
Trichloroethene	<1.0 J
Vinyl chloride	<1.0 J
Total VOCs	0

Note:

1. Baseline sampling conducted during the week of July 22, 2002.

J Estimated value.
VOCs Volatile Organic Compounds
ug/L Micrograms per liter.

Table 8. Concentrations of Selected General Chemistry and Field Parameters Detected in Surface Water, Baseline Sampling Event, Colesville Landfill, Broome County, New York.

Parameters		Sample ID: F-6 Date: 7/25/2002
	UNITS	
GENERAL CHEMISTRY		
Sulfide (field)[3]	mg/L	0.001
FIELD PARAMETERS		
pH	pH units	7.12
Specific Conductance	millimhos/cm	0.182
Turbidity	NTU	0.8
Dissolved Oxygen	mg/L	10.01
Temperature	deg C	14.9
ORP	mV	271

Notes:

1. Baseline sampling conducted during the week of July 22, 2002.
2. Groundwater Remediation System start-up was completed on September 8, 2002.
3. Sulfide analysis was performed on site on the date the samples were collected.

-- Not analyzed.
mg/L milligrams per liter
µmhos/cm micromhos per centimeter
NTU Nephelometric Turbidity Units
deg C degrees Celsius
mV millivolts
ORP Oxidation-Reduction Potential

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Table 9. Pump-and-Treat System Quarter Number 1 Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Date	Time Recorded	Air Stripper Measurements: Blower Discharge Pressure PI-301 (i.w.c.)	Air Stripper Measurements: Blower Effluent Flowrate (acfm)	Flow Measurements: Total Effluent Totalizer FQI-401 (gallons)	Flow Measurements: Water Bypass Totalizer FQI-402 (gallons)	Flow Measurements: GMPW-3 Totalizer FQI-101 (gallons)	Flow Measurements: GMPW-4 Totalizer FQI-102 (gallons)	Flow Measurements: GMPW-5 Totalizer FQI-103 (gallons)
9/10/2002	6:20 PM	8.1	147.8	5,357.9	2,858.9	2,837.5	1,269.8	1,949.6
12/10/2002	7:30 PM	8.5	26.2	143,450.0	134,330.0	77,386.0	26,167.6	46,057.5
		Average Daily Flowrate (gpm) =		**1.05**	**1.00**	**0.57**	**0.19**	**0.34**
		Total Groundwater Recovered During Reporting Period (gallons) =		**138,092**	**131,471**	**74,549**	**24,898**	**44,108**

See Notes on Last Page of Table

Notes:

gpm	Gallons per minute.
i.w.c.	Inches of water column
acfm	Actual cubic feet per minute

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Table 10. Pump-and-Treat System Mass Removal Rate of Volatile Organic Compounds, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Date Sampled	Total VOC Influent Concentration (ug/L)	Well Totalizer Reading (gallons)	Total Groundwater Recovered[1] Between Sampling Intervals (gal)	Influent Concentration[2] Geometric Mean (ug/L)	Total Mass[3] Removed (lbs)
9/8/2002	121.1	2,319.0	2319	121.1	0.0023
9/10/2002	203.4	5,357.9	3039	156.9	0.0040
12/10/2002	177.2	143,450.0	138092	189.8	0.2188
				Total Mass Removed (lbs) =	**0.2251**

ug/L	Micrograms per liter.
gal	Gallons.
lbs	Pounds.
VOC	Volatile organic compound.

1. Total Groundwater Recovered Between Sampling Intervals = Well Totalizer Reading for current sampling event -Well Totalizer Reading for prior sampling event
2. Influent Concentration Geometric Mean = (Influent Concentration for prior sampling event x Influent Concentration for current sampling event) (1/2)
3. Total Mass Removed = (Total Groundwater Recovered Between Sampling Intervals) x Influent Concentration Geometric Mean x 3.7854 L/gallon x (1 lb / 453,592,370 ug)

Table 11. Concentrations of Volatile Organic Compounds Detected in Air Stripper Effluent, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Compounds	CAS Numbers	Sample ID: / Date Sampled:	Stripper Effluent 12/10/2002 ppb
Vinyl Chloride	75-01-4		ND
Chloroethane(Ethyl Chloride)	75-00-3		ND
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4		ND
Methylene Chloride(Dichloromethane)	75-09-2		19
1,1-Dichloroethane	75-34-3		50
cis-1,2 - Dichloroethylene	156-59-2		48
Chloroform	67-66-3		ND
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6		53
Benzene	71-43-2		ND
Trichloroethene	79-01-6		36
Toluene	108-88-3		ND
Ethyl benzene	100-41-4		ND
m,p-Xylene	108-38-3/106-42-3		ND
o-Xylene	95-47-6		ND
1,2,4-Trimethylbenzene	95-63-6		ND
2-Propanol (Isopropyl alcohol)	67-63-0		ND
Dichlorodifluoromethane(Freon 12)	75-71-8		ND

ppb: parts per billion
ND: Denotes analyte not detected at or above its laboratory quantification limit.

Notes/Assumptions:

1. Samples collected by ARCADIS personnel on the dates shown and submitted to Air Toxics Laboratories LTD for volatile organic compound (VOC) analyses using a modified USEPA Method TO 14A/15.

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Appendix A

Groundwater Remediation System Startup Summary Report, Colesville Landfill, Broome County, New York.

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Appendix A

Groundwater Remediation System Startup Summary Report

Colesville Landfill, Broome County, New York
NYSDEC Site 704010

ARCADIS

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Appendix A
Groundwater Remediation System Startup Summary Report

Colesville Landfill, Broome County, New York
NYSDEC Site 704010

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15 May 2003

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Attachment

Disclosure Statement

The laws of New York State require that the corporations which render engineering services in New York be owned by individuals licensed to practice engineering in the State. ARCADIS cannot meet that requirement. Therefore, all engineering services rendered to Broome County in New York are being performed by ARCADIS Engineers and Architects of New York, P.C., a New York Professional corporation qualified to render professional engineering in New York. There is no surcharge or extra expense associated with the rendering of professional services by ARCADIS Engineers and Architects of New York, P.C.

ARCADIS is performing all those services that do not constitute professional engineering, and is providing administrative and personnel support to ARCADIS Engineers and Architects of New York, P.C. All matters relating to the administration of the contract with Broome County are being performed by ARCADIS pursuant to its Amended and Restated Services Agreement with ARCADIS Engineers and Architects of New York, P.C.

1. Introduction

ARCADIS was retained by Broome County to design and construct a groundwater remediation system at the Colesville Landfill in Broome County, New York (site). The site location is shown on Figure A-1. The Groundwater Remediation System is comprised of a groundwater pump-and-treat (PT) system combined with an automated reagent injection (ARI) system for in-situ enhanced reductive dechlorination (ERD). The groundwater remediation system design was approved on August 24, 2000 by the New York State Department of Environmental Conservation (NYSDEC). This Groundwater Remediation System Startup Summary Report documents the system startup conducted from August 27, 2002 to September 12, 2002. System startup was conducted in accordance with the Groundwater Remediation System Startup and Performance Analysis Plan which was submitted to the NYSDEC on June 28, 2002.

2. Pre-Startup Injection Well Monitoring

Prior to system startup, groundwater samples were collected from Injection Wells IW-3, IW-8, and IW-13 on August 30, 2002 for field testing of pH and laboratory analysis of total organic carbon (TOC). TOC samples were analyzed using USEPA Method 415.1. TOC and pH results from the three injection wells were used to establish baseline (pre-injection) groundwater conditions along the injection perimeter. Baseline TOC and pH results are provided in Table A-3 of the 2002 Annual Report, the locations of all injection wells are shown on Figure A-2.

3. Groundwater Pump-and-Treat System Startup

The following section describes the startup procedures and system performance monitoring for the PT system.

3.1 PT System Mechanical Testing

Mechanical testing of the PT system was conducted from August 27, 2002 to September 7, 2002. Mechanical testing of the PT system consisted of testing each system component to ensure that it performed in conformance with the Design Drawings and manufacturers specifications. Individual components tested included the pneumatic recovery pumps in recovery wells GMPW-3, GMPW-4 and GMPW-5, air compressor AC-200, low profile air stripper AS-100, blower B-300, transfer pump TP-400, and all associated piping and appurtenances. In addition to testing individual components, the PT system was temporarily operated as a whole to ensure smooth

operation and to test PT system alarms, interlocks, and controls. During the mechanical testing, all system components, alarms, interlocks, and controls operated in conformance with their respective design criteria and manufacturers specifications. The PT system was permanently brought on-line on September 8, 2002.

3.2 PT System Startup Performance Testing

System startup performance testing was conducted from September 8, 2002 to September 12, 2002. System startup performance testing consisted of recording system operating parameters on a daily basis and collecting system performance samples on September 8, 2002 and September 10, 2002.

Table A-1 summarizes the significant PT system operating parameters recorded during startup. System operating parameters were recorded on an hourly basis during the first day of startup and were recorded twice per day thereafter. As shown in Table A-1, individual recovery well average daily flowrates ranged from 0.55 to 0.59 gallons per minute (gpm) for Well GMPW-3, from 0.20 to 0.22 gpm for Well GMPW-4, and from the 0.35 to 0.39 gpm for Well GMPW-5. The total effluent daily average flow-rate ranged from 1.01 to 1.05 gpm. During the PT system performance monitoring, water level measurements were collected from the individual recovery wells; however, the water level fell below the top of each respective pneumatic recovery pump and the water level measuring device was unable to take an accurate reading. Based on water level measurements within the recovery wells, calculated daily average flowrates, and the maximum flowrate capable of each pneumatic pump, groundwater is being extracted from the recovery wells at a rate equal to or greater than the rate of recovery. Low profile air stripper system operating parameters were consistent with the design criteria and the manufacturer's specifications. The low profile air stripper blower B-300 effluent flow-rate ranged from 142.2 to 426.3 standard cubic feet per minute (scfm), while the discharge pressure ranged from 6.0 to 8.2 inches of water column (i.w.c.). The effluent flowrate of 426.3-scfm and discharge pressure of 6.0 i.w.c. were recorded immediately following system startup and do not represent normal operating conditions.

Table A-2 summarizes the PT system performance sampling results. PT system performance samples were collected on September 8, 2002 and September 10, 2002. The collection of PT samples included:

- Individual recovery well samples for Wells GMPW-3, GMPW-4, and GMPW-5.

- Total influent to low profile air stripper AS-100.
- Total effluent from AS-100 prior to entering bag filters BF-400/401; and,
- Total effluent from low profile air stripper AS-100 immediately following bag filters BF-400/401.

All groundwater samples were analyzed for volatile organic compounds (VOCs) using USEPA Method 8260 and total iron following USEPA Method 6010. According to the New York State Department of Environmental Conversation (NYSDEC) Technical and Operational Guidance Series (TOGS) 1.2.1, one of the purposes of the Model Technology Best Professional Judgment (BPJ) limits is to provide guidance to NYSDEC staff responsible for writing requirements equivalent to SPDES permits for discharges from remediation sites. As such, these values have been selected as the effluent design criteria for the PT system. As shown in Table A-2, all groundwater COCs were effectively treated to below their respective BPJ limits via the low profile air stripper and cartridge filters.

As indicated in Table A-2, the majority of the VOC analytical results are denoted as estimated values because of an oversight by the groundwater analytical laboratory. These samples were analyzed outside of the recommended 14-day USEPA holding times. ARCADIS has discussed the exceeded holding times with the analytical laboratory on several occasions who has ensured us that the oversight will not occur again.

In addition to groundwater samples, an effluent vapor samples were collected from the discharge stack of low profile air stripper AS-100 on September 8 and September 10, 2002. All vapor samples were analyzed using a modified (direct-inject) USEPA Method TO-14/15. Vapor analytical results are provided in Table A-3. A NYSDEC Air Guide DAR-1 model was performed utilizing the effluent vapor analytical data. Based on the DAR-1 analysis, all COCs in vapor are well below their respective short-term guidance concentrations (SGCs) and annual guidance concentrations (AGCs). A printout of the DAR-1 results has been provided in Attachment A-1.

4. Automated Reagent Injection System Startup

The following section describes the startup procedures and system performance monitoring for the ARI system.

4.1 System Mechanical Testing and Startup

Mechanical testing of the ARI system was conducted from August 27, 2002 to September 7, 2002. Mechanical testing of the ARI system consisted of testing each system component to ensure that it performed in conformance with the Design Drawings and manufacturer's specifications. Individual components tested included molasses pump MP-700, transfer pumps TP-600 and TP-900, molasses mixer MM-800, and all associated piping and appurtenances. In addition to testing individual components, the automated reagent injection system was temporarily operated as a whole to ensure smooth operation and to test PT system alarms, interlocks, and controls. This consisted of performing manual mixing and injection sequences (20-gallons of molasses solution to each injection well) on September 7, 2002. During the mechanical testing, all system components, alarms, interlocks, and controls operated in conformance with their respective design criteria and manufacturer's specifications. However, it was determined that an electrically actuated ball valve (designated as SV-26, see Figure A-3) was required to control the input of raw molasses during a molasses reagent mixing event. In addition, it was determined that low-flow alarms were required for both the raw molasses-feed line and the molasses solution injection line. The raw molasses feed line low-flow alarm will serve as the indicator that the raw molasses totes are empty. The molasses solution injection line low-flow alarm will serve as a backup to pressure switch high PSH-902 and will assist in shutting the ARI system down in the event of an injection well fouling, pipe break, or pump failure. The ARI system was permanently brought on-line on September 8, 2002.

4.2 System Startup Performance Testing

ARI system startup performance testing was conducted on September 8, 2002. System performance testing consisted of visually observing system operation and recording system operating parameters during the first day of system operation. Prior to initiating the initial ARI sequence, system input parameters were defined to set the molasses solution strength, molasses solution injection volume to each well, rinse water injection volume to each well, and injection frequency. These parameters were defined based on field and analytical data collected from the ERD Pilot Test (ARCADIS Geraghty & Miller 1998). Table A-4 summarizes the initial ARI system input parameters. During the first day of operation, minor system control problems were encountered; therefore, the initial automated mixing and injection sequence was conducted at two intervals during the day in order to test and correct the deficiencies.

Table A-5 summarizes the significant system operating parameters recorded during the first day of automated operation and during the manual injection performed on September 7, 2002. As discussed above, the initial automated injection was conducted over two intervals to correct system control deficiencies; therefore, these injection parameters do not reflect the actual ARI input parameters (Table A-4). Following the third injection interval, all operational deficiencies were corrected. Molasses solution injections thereafter will be conducted in accordance with the input parameters listed in Table A-4 unless otherwise specified in subsequent quarterly monitoring reports.

5. Conclusions

Based on the results of the system mechanical testing and system startup performance testing, the Groundwater Remediation System is performing as designed. The PT system is achieving the maximum possible groundwater recovery rate and is effectively treating impacted groundwater to below BPJ Limits. In addition, low profile air stripper AS-100 air emissions are well below the NYSDEC DAR-1 regulatory standards. Following minor ARI system control problems encountered during the first day of system operation, the ARI system was fully operational and has performed in conformance with its design criteria. Long-term PT system and ARI system monitoring and reporting will be conducted in accordance with the Long-Term Monitoring Plan submitted to the NYSDEC on June 28, 2002.

ARCADIS

Table A-1. Pump-and-Treat System Startup Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Date	Time Recorded	Air Stripper Measurements: Blower Discharge Pressure PI-301 (i.w.c.)	Air Stripper Measurements: Blower Effluent Flowrate (scfm)	Flow Measurements: Total Effluent Totalizer FQI-401 (gallons)	Flow Measurements: Water Bypass Totalizer FQI-402 (gallons)	Flow Measurements: GMPW-3 Totalizer FQI-101 (gallons)	Flow Measurements: GMPW-4 Totalizer FQI-102 (gallons)	Flow Measurements: GMPW-5 Totalizer FQI-103 (gallons)
9/8/2002	8:45 AM	6.0	426.3	1,778.5	14.2	846.2	554.8	691.0
	10:30 AM	8.0	181.7	1,881.1	42.5	891.5	577.5	738.2
	11:30 AM	8.0	175.8	1,944.1	42.5	923.8	589.1	758.5
	12:30 PM	8.2	158.0	2,000.8	40.3	962.8	603.4	782.5
	1:30 PM	8.2	163.6	2,070.7	42.5	996.5	616.2	804.3
	2:30 PM	8.2	166.5	2,133.5	42.5	1,027.5	627.8	824.6
	3:30 PM	8.2	179.4	2,176.0	42.5	1,061.3	640.3	845.9
	4:30 PM	8.2	157.7	2,249.3	42.5	1,094.9	652.7	867.1
	5:30 PM	8.2	166.3	2,319.0	42.5	1,137.5	668.0	894.8
		Average Daily Flowrate (gpm) =		**1.03**	**0.05**	**0.55**	**0.22**	**0.39**
9/9/2002	8:30 AM	8.2	149.4	3,255.2	771.1	1,651.1	852.3	1,216.5
	4:15 PM	8.2	143.3	3,724.9	1,237.2	1,918.2	947.6	1381.0
		Average Daily Flowrate (gpm) =		**1.01**	**1.00**	**0.57**	**0.21**	**0.35**
9/10/2002	7:40 AM	8.2	154.0	4,695.5	2,200.9	2,461.8	1,138.0	1,717.0
	6:20 PM	8.1	147.8	5,357.9	2,858.9	2,837.5	1,269.8	1,949.6
		Average Daily Flowrate (gpm) =		**1.04**	**1.03**	**0.59**	**0.21**	**0.36**
9/11/2002	7:40 AM	8.1	142.2	6,202.2	3,698.1	3,298.0	1,432.3	2,238.0
	5:15 PM	8.2	147.1	6,800.4	4,292.8	3,628.5	1,550.3	2,447.9
		Average Daily Flowrate (gpm) =		**1.04**	**1.03**	**0.57**	**0.21**	**0.37**
9/12/2002	7:40 AM	8.2	154.9	7,698.6	5,186.1	4,118.4	1,725.6	2,760.3
	4:20 PM	8.2	160.6	8,244.5	5,739.3	4,413.1	1,831.0	2,948.9
		Average Daily Flowrate (gpm) =		**1.05**	**1.06**	**0.57**	**0.20**	**0.36**

See Notes on Last Page of Table

Table A-1. Pump-and-Treat System Startup Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Notes:

gpm	Gallons per minute.
i.w.c.	Inches of water column
acfm	Actual cubic feet per minute

Table A-2. Concentrations of Compounds Detected in Groundwater Samples Collected During System Startup, Colesville Landfill Groundwater Remediation System, Broome County, New York.

Constituents	Model Technology BPJ Limits[1,2] (ug/L)	Sample ID: Date:	GMPW-3* 9/8/2002		GMPW-3* 9/10/2002		GMPW-4* 9/8/2002		GMPW-4* 9/10/2002	
VOCs (units in ug/L)										
Chloromethane	10		< 1.0	J	< 1.0	J	< 1.0	J	< 1.0	J
Vinyl Chloride	10-50		12	J	12	J	18	J	17	J
Chloroethane	--		13	J	13	J	22	J	22	J
1,1-Dichloroethene	10		3.6	J	3.4	J	6.3	J	5.6	J
Methylene Chloride	10-50		22	J	20	J	31	J	29	J
trans-1,2-Dichloroethene	10-50		< 1.0	J	< 1.0	J	< 1.0	J	< 1.0	J
1,1-Dichloroethane	10		60	J	59	J	84	J	77	J
cis-1,2-Dichloroethene	10		48	J	48	J	92	J	87	J
Chloroform	--		1.3	J	1.3	J	< 1.0	J	1.0	J
1,1,1-Trichloroethane	10-20		110	J	110	J	140	J	140	J
Benzene	5		11	J	9.9	J	13	J	13	J
1,2-Dichloroethane	10-30		< 1.0	J	< 1.0	J	1.1	J	< 1.0	J
Trichloroethene	10		67	J	58	J	100	J	92	J
Ethyl Benzene	5		< 1.0	J	< 1.0	J	4.4	J	3.6	J
m+p-Xylenes	5		2.8	J	< 2.0	J	15	J	13	J
o-Xylene	5		< 1.0	J	< 1.0	J	4.8	J	3.9	J
1,2,4-Trimethylbenzene	--		< 1.0	J	< 1.0	J	1.1	J	1.1	J
Dichlorodifluoromethane	--		3.0	J	3.4	J	3.8	J	4.0	J
Total VOCs			350.70		338.00		536.50		504.20	

Metals (units in mg/L)	Model Technology BPJ Limits[3,4] (mg/L)	Sample ID: Date:	GMPW-3* 9/8/2002	GMPW-3* 9/10/2002	GMPW-4* 9/8/2002	GMPW-4* 9/10/2002
Total Iron	1.2 / 0.61		1.66	0.653	1.69	0.584

See Notes on Last Page.

Table A-2. Concentrations of Compounds Detected in Groundwater Samples Collected During System Startup, Colesville Landfill Groundwater Remediation System, Broome County, New York.

Constituents	Model Technology BPJ Limits[1] (ug/L)	Sample ID: Date:	GMPW-5* 9/8/2002		GMPW-5* 9/10/2002		Influent 9/8/2002		Influent* 9/10/2002	
VOCs (units in ug/L)										
Chloromethane	10		< 1.0	J	< 1.0	J	2.1	J	< 1.0	J
Vinyl Chloride	10-50		< 1.0	J	< 1.0	J	3.4	J	6.6	J
Chloroethane	--		< 1.0	J	1.6	J	3.9	J	3	J
1,1-Dichloroethene	10		< 1.0	J	< 1.0	J	1.4	J	1.2	J
Methylene Chloride	10-50		1.5	J	< 1.8	J	7.6	J	13	J
trans-1,2-Dichloroethene	10-50		< 1.0	J	< 1.0	J	< 1.0		1.1	J
1,1-Dichloroethane	10		2.6	J	5.1	J	17	J	36	J
cis-1,2-Dichloroethene	10		2.6	J	5.0	J	17	J	32.0	J
Chloroform	--		< 1.0	J	< 1.0	J	< 1.0		< 1.0	J
1,1,1-Trichloroethane	10-20		4	J	8.1	J	32	J	66	J
Benzene	5		< 1.0	J	< 1.0	J	3	J	5.9	J
1,2-Dichloroethane	10-30		< 1.0	J	< 1.0	J	< 1.0		< 1.0	J
Trichloroethene	10		3.1	J	5.6	J	24	J	38	J
Ethyl Benzene	5		< 1.0	J	< 1.0	J	< 1.0	J	< 1.0	J
m+p-Xylenes	5		8.6	J	3.6	J	7.6	J	< 2.0	J
o-Xylene	5		2.4	J	1.4	J	2.1	J	< 1.0	J
1,2,4-Trimethylbenzene	--		< 1.0	J	< 1.0	J	< 1.0		< 1.0	J
Dichlorodifluoromethane	--		< 1.0	J	< 1.0	J	< 1.0		1.7	J
Total VOCs			25.10		25.40		121.10		203.40	

Metals (units in mg/L)	Model Technology BPJ Limits[3,4] (mg/L)	Sample ID: Date:	GMPW-5* 9/8/2002	GMPW-5* 9/10/2002	Influent 9/8/2002	Influent* 9/10/2002
Total Iron	1.2 / 0.61		0.407	1.27	0.590	0.386

See Notes on Last Page.

Table A-2. Concentrations of Compounds Detected in Groundwater Samples Collected During System Startup, Colesville Landfill Groundwater Remediation System, Broome County, New York.

Constituents	Model Technology BPJ Limits[1] (ug/L)	Sample ID: Date:	Effluent-BC 9/8/2002	Effluent-BC 9/10/2002		Effluent-AC 9/8/2002		Effluent-AC* 9/10/2002	
VOCs (units in ug/L)									
Chloromethane	10		--	--		1.8	<	1.0	J
Vinyl Chloride	10-50		--	--	<	1.0	<	1.0	J
Chloroethane	--		--	--	<	1.0	<	1.0	J
1,1-Dichloroethene	10		--	--	<	1.0	<	1.0	J
Methylene Chloride	10-50		--	--	<	1.0	<	1.0	J
trans-1,2-Dichloroethene	10-50		--	--	<	1.0	<	1.0	J
1,1-Dichloroethane	10		--	--	<	1.0	<	1.0	J
cis-1,2-Dichloroethene	10		--	--	<	1.0	<	1.0	J
Chloroform	--		--	--	<	1.0	<	1.0	J
1,1,1-Trichloroethane	10-20		--	--	<	1.0	<	1.0	J
Benzene	5		--	--	<	1.0	<	1.0	J
1,2-Dichloroethane	10-30		--	--	<	1.0	<	1.0	J
Trichloroethene	10		--	--	<	1.0	<	1.0	J
Ethyl Benzene	5		--	--	<	1.0	<	1.0	J
m+p-Xylenes	5		--	--	<	2.0	<	2.0	J
o-Xylene	5		--	--	<	1.0	<	1.0	J
1,2,4-Trimethylbenzene	--		--	--	<	1.0	<	1.0	J
Dichlorodifluoromethane	--		--	--	<	1.0	<	1.0	J
Total VOCs			0.00	0.00		1.8		0.00	

Metals (units in mg/L)	Model Technology BPJ Limits[3,4] (mg/L)	Sample ID: Date:	Effluent-BC 9/8/2002	Effluent-BC 9/10/2002		Effluent-AC 9/8/2002		Effluent-AC* 9/10/2002
Total Iron	1.2 / 0.61		1.47	0.505	<	0.035	<	0.035

See Notes on Last Page.

Table A-2. Concentrations of Compounds Detected in Groundwater Samples Collected During System Startup, Colesville Landfill Groundwater Remediation System, Broome County, New York.

Notes:

1. Model Technology BPJ Limits recommended for Air Stripping with appropriate pretreatment from Attachment C of TOGS 1.2.1.
2. When a range is listed for the BPJ limit, a variation in available references was found. Recommended daily maximum limits should be in this range.
3. Model Technology BPJ Limits recommended for Lime, Settle and Filter treatment.
4. The recommended daily max permit limit is 1.2 mg/L and the recommended daily average permit limit is 0.61 mg/L.
5. Groundwater Remediation System startup completed on September 8, 2002.
6. Production wells were sampled in accordance with the schedule set forth in Table 3 of the Long-Term Monitoring Plan (ARCADIS 2002).

J	Estimated value.
ug/L	Micrograms per liter.
mg/L	Milligrams per liter.
Bold	Constituent detected above method detection limit.
VOCs	Volatile Organic Compounds
*	Indicates sample exceeded the recommended USEPA holding time for VOCs.
AC	After Cartridge Filter
BC	Before Cartridge Filter

Table A-3. Concentrations of Volatile Organic Compounds Detected in Air Stripper Effluent, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Compounds	CAS Numbers	Sample ID: / Date Sampled:	Effluent_ Day 1 9/8/2002 ppb	Effluent_ Day 3 9/10/2002 ppb
Vinyl Chloride	75-01-4		ND	ND
Chloroethane(Ethyl Chloride)	75-00-3		ND	ND
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4		ND	ND
Methylene Chloride(Dichloromethane)	75-09-2		ND	12
1,1-Dichloroethane	75-34-3		ND	ND
cis-1,2 - Dichloroethylene	156-59-2		ND	ND
Chloroform	67-66-3		ND	ND
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6		ND	ND
Benzene	71-43-2		ND	ND
Trichloroethene	79-01-6		ND	ND
Toluene	108-88-3		7.4	5.6
Ethyl benzene	100-41-4		ND	ND
m,p-Xylene	108-38-3/106-42-3		ND	ND
o-Xylene	95-47-6		ND	ND
1,2,4-Trimethylbenzene	95-63-6		ND	ND
2-Propanol (Isopropyl alcohol)	67-63-0		18	10
Dichlorodifluoromethane(Freon 12)	75-71-8		ND	ND

ppb: parts per billion
ND: Denotes analyte not detected at or above it's laboratory quantification limit.

Notes/Assumptions:

1. Samples collected by ARCADIS personnel on the dates shown and submitted to Air Toxics Laboratories LTD. for volatile organic compound (VOC) analyses using a modified USEPA Method TO 14A/15.
2. Compounds listed were detected in influent groundwater and/or air stripper effluent during startup.

Table A-4. Initial Automated Reagent Injection System Input Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Molasses to Water Ratio (%) =	27	Programmed Mixing Time (min.)[1] =	30
Injection Frequency (per week) =	2	PSL-701 Setpoint (i.w.c.) =	NA
PSH-902 Setpoint (psi) =	39	PSN-901 Setpoint (psi) =	20
FAL-701 Setpoint (gpm) =	0.33	FAL-901 Setpoint (gpm) =	1

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[2] Quantity (gal.)	Raw Molasses Per Well (gal.)
PW-6	37	5	10
IW-3	37	5	10
IW-1	37	4	10
IW-2	37	3	10
GMMW-1	37	3	10
IW-4	37	4	10
IW-5	37	5	10
IW-6	37	7	10
IW-7	37	8	10
IW-8	37	9	10
IW-9	37	11	10
IW-10	37	12	10
IW-11	37	13	10
IW-12	37	15	10
IW-13	37	16	10
IW-14	37	18	10
IW-15	37	19	10

Notes:

gal.	Gallons
min.	Minutes
i.w.c.	Inches of water column.
psi	Pounds per square inch.
gpm	Gallons per minute.
NA	Not applicable.
FAL	Flow alarm low.
PSH	Pressure switch high.
PSL	Pressure switch low.
PSN	Pressure switch normal.
1.	Programmed mixing time is calculated from the expiration time of the molasses injection countdown timer to the startup of transfer pump TP-900 during an injection sequence or from the end of transfer pump TP-600 operation to the restart of an injection during a mixing sequence.
2.	Rinse quantity is approximately 1-pipeline volume for each injection well.

Table A-5. Initial Automated Reagent Injection System Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Initial Injection - Injection Number 1a[4]

Injection Date = 9/7/2002

Molasses to Water Ratio (%) = 27

Programmed Mixing Time (min.)[1] = 30

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[2] Quantity (gal.)	Raw Molasses Per Well (gal.)	Max. Injection Flowrate (gpm)	Max. Injection Pressure (psi)
PW-6	20	5	5.40	14.7	31
IW-3	20	5	5.40	16.7	34
IW-1	20	4	5.40	15.5	35
IW-2[3]	18	3	4.86	16.3	33
GMMW-1	20	3	5.40	12.8	36
IW-4	20	4	5.40	15.6	36
IW-5	20	5	5.40	17.1	34
IW-6	20	7	5.40	15.1	34
IW-7	20	8	5.40	13.5	36
IW-8	20	9	5.40	15.8	34
IW-9	20	11	5.40	16.1	33
IW-10	20	12	5.40	16	33
IW-11	20	13	5.40	15.8	34
IW-12	20	15	5.40	15.8	34
IW-13	20	16	5.40	15.9	33
IW-14	20	18	5.40	10.9	36
IW-15	20	19	5.40	12.8	34
Totals (gal.) =	338	157	91.26	NA	NA

Notes:

gal. Gallons
min. Minutes
psi Pounds per square inch.
gpm Gallons per minute.
NA Not applicable.

1. Programmed mixing time is calculated from the expiration time of the molasses injection countdown timer to the startup of transfer pump TP-900 during an injection sequence or from the end of transfer pump TP-600 operation to the restart of an injection during a mixing sequence.
2. Rinse quantity is approximately 1-pipeline volume for each injection well.
3. A reduced quantity of molasses solution injected into well IW-2 because of an unsecured wellhead.
4. Initial injection performed on September 7, 2002 was conducted manually to test system equipment.

Table A-5. Initial Automated Reagent Injection System Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Initial Injection - Injection Number 1b

Injection Date = 9/8/2002

Molasses to Water Ratio (%) = 27

Programmed Mixing Time (min.)[1] = 30

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[2] Quantity (gal.)	Raw Molasses Per Well (gal.)	Max. Injection Flowrate (gpm)	Max. Injection Pressure (psi)
PW-6	5	5	1.35	NM	NM
IW-3	5	5	1.35	NM	NM
IW-1	5	4	1.35	NM	NM
IW-2	5	3	1.35	NM	NM
GMMW-1	5	3	1.35	NM	NM
IW-4	5	4	1.35	NM	NM
IW-5	5	5	1.35	NM	NM
IW-6	5	7	1.35	NM	NM
IW-7	5	8	1.35	NM	NM
IW-8	5	9	1.35	NM	NM
IW-9	5	11	1.35	NM	NM
IW-10	5	12	1.35	NM	NM
IW-11	5	13	1.35	NM	NM
IW-12	5	15	1.35	NM	NM
IW-13	5	16	1.35	NM	NM
IW-14	5	18	1.35	NM	NM
IW-15	5	19	1.35	NM	NM
Totals (gal.) =	85	157	22.95	NA	NA

Notes:

gal.	Gallons
min.	Minutes
psi	Pounds per square inch.
gpm	Gallons per minute.
NM	Not measured.
NA	Not applicable.
1.	Programmed mixing time is calculated from the expiration time of the molasses injection countdown timer to the startup of transfer pump TP-900 during an injection sequence or from the end of transfer pump TP-600 operation to the restart of an injection during a mixing sequence.
2.	Rinse quantity is approximately 1-pipeline volume for each injection well.

Table A-5. Initial Automated Reagent Injection System Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Initial Injection - Injection Number 1c

Injection Date = 9/8/2002

Molasses to Water Ratio (%) = 27 Programmed Mixing Time (min.)[1] = 30

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[2] Quantity (gal.)	Raw Molasses Per Well (gal.)	Max. Injection Flowrate (gpm)	Max. Injection Pressure (psi)
PW-6	12	5	3.24	15.8	34
IW-3	12	5	3.24	15.9	33
IW-1	12	4	3.24	15	35
IW-2	12	3	3.24	15.5	33
GMMW-1	12	3	3.24	15.5	33
IW-4	12	4	3.24	13	35
IW-5	12	5	3.24	14.4	35
IW-6	12	7	3.24	14.6	35
IW-7	12	8	3.24	12.8	35
IW-8	12	9	3.24	11.7	37
IW-9	12	11	3.24	11.6	37
IW-10	12	12	3.24	12.6	36
IW-11	12	13	3.24	13.5	36
IW-12	12	15	3.24	13.5	35
IW-13	12	16	3.24	11	37
IW-14	12	18	3.24	7.6	38
IW-15	12	19	3.24	10.3	37
Totals (gal.) =	204	157	55.08	NA	NA

Notes:

gal. Gallons
min. Minutes
psi Pounds per square inch.
gpm Gallons per minute.
NA Not applicable.
1. Programmed mixing time is calculated from the expiration time of the molasses injection countdown timer to the startup of transfer pump TP-900 during an injection sequence or from the end of transfer pump TP-600 operation to the restart of an injection during a mixing sequence.
2. Rinse quantity is approximately 1-pipeline volume for each injection well.

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Attachment A-1

NYSDEC DAR-1 Results

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Table A1-1. NYSDEC DAR-1 Air Modeling Data, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Parameters for 9/8/2002 Sampling Event				
Discharge Temperature		T	524.67	°R
Ambient Temperature		Ta	529.67	°R
Stack Diameter		D	6	in
Stack Radius		R	0.25	ft
Stack Area		A	0.20	ft^2
Exit Velocity		V	14.03	fps
Exit Flow		Q	165	acfm
Exit Flow		Q	166	scfm
Stack Height		h_s	17	ft
Building Height		h_b	13.25	ft
Ratio of Heights		h_s/h_b	1.28	
Plume rise credit? $h_s/h_b > 1.5$?		(If no, $h_e=h_s$)	(If Yes, $h_e = h_s + 1.1 (F_m)^{1/3}$)	
Momentum Flux	Fm = Ta/T * V2 * R2		n/a	ft^4/s^2
Effective Stack Height		h_e	17.00	ft
Reduction Factor? $2.5 > h_s/h_b > 1.5$?			No, do not reduce impact	
Actual Annual Impact		C_a	$RF*6*Q_a/h_e^{2.25}$	
Mass Flow		Q_a	S lbs emitted for last 12 months	

fps: feet per second
acfm: actual cubic feet per minute
ug/m^3: micrograms per cubic meter
lb/yr: pounds per year
lb/hr: pounds per hour
ppb: parts per billion

Notes/Assumptions:

1. The stack discharge temperature is 65°F based on recorded parameters.
2. The ambient temperature is approximately 70°F, the average temperature during start-up.
3. Calculations assume that the system will run with the maximum allowable concentrations between quarterly readings.
4. AGC refers to the Annual Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated July 12, 2000.
5. To be conservative the lower detection limit was used for compounds that were below the limit of detection, but are found in the influent groundwater of the Groundwater Remediation System.

Table A1-1. NYSDEC DAR-1 Air Modeling Data, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Calculation of AGC based on 9/8/2002 Sampling Event

Compounds	CAS Numbers	Maximum Limit on C_a (AGC[4])	Maximum Mass Flow Q_a	Lab Data 9/8/02	Detection Limit Used[5]	Actual Emissions C_a	Actual Mass Flow per Hour	Actual Mass Flow per Year	**Percent of Annual**
		ug/m^3	lb/yr	ppb		ug/m^3	lb/hr	lb/yr	%
Vinyl Chloride	75-01-4	0.02	1.96	5	*	12.99	8.09E-06	0.07047	**3.60**
Chloroethane(Ethyl Chloride)	75-00-3	10,000	978,044.97	5	*	13.41	8.35E-06	0.07275	**0.00**
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4	0.02	1.96	5	*	20.15	1.26E-05	0.10932	**5.59**
Methylene Chloride(Dichloromethane)	75-09-2	2.10	205.39	5	*	17.66	1.10E-05	0.09578	**0.05**
1,1-Dichloroethane	75-34-3	20	1,956.09	5	*	20.57	1.28E-05	0.11159	**0.01**
cis-1,2 - Dichloroethylene	156-59-2	1,900	185,828.54	5	*	20.15	1.26E-05	0.10932	**0.00**
Chloroform	67-66-3	0.04	4.21	5	*	24.82	1.55E-05	0.13462	**3.20**
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6	1,000	97,804.50	5	*	27.73	1.73E-05	0.15044	**0.00**
Benzene	71-43-2	0.13	12.71	5	*	16.24	1.01E-05	0.08807	**0.69**
Trichloroethene	79-01-6	0.45	44.01	5	*	27.31	1.70E-05	0.14816	**0.34**
Toluene	108-88-3	400	39,121.80	7.4		28.34	1.77E-05	0.15375	**0.00**
Ethyl benzene	100-41-4	1,000	97,804.50	5	*	22.07	1.37E-05	0.11970	**0.00**
m,p-Xylene	108-38-3/106-42-3	700	68,463.15	5	*	21.65	1.35E-05	0.11742	**0.00**
o-Xylene	95-47-6	700	68,463.15	5	*	22.07	1.37E-05	0.11970	**0.00**
1,2,4-Trimethylbenzene	95-63-6	290	28,363.30	5	*	24.98	1.56E-05	0.13552	**0.00**
2-Propanol (Isopropyl alcohol)	67-63-0	7,000	684,631.48	18		44.97	2.80E-05	0.24396	**0.00**
Dichlorodifluoromethane(Freon 12)	75-71-8	12,000	1,173,653.96	5	*	12.49	7.78E-06	0.06777	**0.00**

fps: feet per second
acfm: actual cubic feet per minute
ug/m^3: micrograms per cubic meter
lb/yr: pounds per year
lb/hr: pounds per hour
ppb: parts per billion

Notes/Assumptions:

1. The stack discharge temperature is 65°F based on recorded parameters.
2. The ambient temperature is approximately 70°F, the average temperature during start-up.
3. Calculations assume that the system will run with the maximum allowable concentrations between quarterly readings.
4. AGC refers to the Annual Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated July 12, 2000.
5. To be conservative the lower detection limit was used for compounds that were below the limit of detection, but are found in the influent groundwater of the Groundwater Remediation System.

Table A1-1. NYSDEC DAR-1 Air Modeling Data, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Parameters for 9/10/2002 Sampling Event			
Discharge Temperature	T	524.67	°R
Ambient Temperature	Ta	529.67	°R
Stack Diameter	D	6	in
Stack Radius	R	0.25	ft
Stack Area	A	0.20	ft^2
Exit Velocity	V	12.5	fps
Exit Flow	Q	147	acfm
Exit Flow	Q	148	scfm
Stack Height	h_s	17	ft
Building Height	h_b	13.25	ft
Ratio of Heights	h_s/h_b	1.28	
Plume rise credit? $h_s/h_b > 1.5$?	(If no, $h_e=h_s$)	(If Yes, $h_e = h_s + 1.1 (F_m)^{1/3}$)	
Momentum Flux	Fm = Ta/T * V2 * R2	n/a	ft^4/s^2
Effective Stack Height	h_e	17.00	ft
Reduction Factor? $2.5 > h_s/h_b > 1.5$?		No, do not reduce impact	
Actual Annual Impact	C_a	$RF*6*Q_a/h_e^{2.25}$	ug/m^3
Mass Flow	Q_a	S lbs emitted for last 12 months	

fps: feet per second
acfm: actual cubic feet per minute
ug/m^3: micrograms per cubic meter
lb/yr: pounds per year
lb/hr: pounds per hour
ppb: parts per billion

Notes/Assumptions:

1. The stack discharge temperature is 65°F based on recorded parameters.
2. The ambient temperature is approximately 70°F, the average temperature during start-up.
3. Calculations assume that the system will run with the maximum allowable concentrations between quarterly readings.
4. AGC refers to the Annual Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated July 12, 2000.
5. To be conservative the lower detection limit was used for compounds that were below the limit of detection, but are found in the influent groundwater of the Groundwater Remediation System.

Table A1-1. NYSDEC DAR-1 Air Modeling Data, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Calculation of AGC based on 9/10/2002 Sampling Event

Compounds	CAS Numbers	Maximum Limit on C_a (AGC[4])	Maximum Mass Flow Q_a	Lab Data 9/10/02	Detection Limit Used[5]	Actual Emissions C_a	Actual Mass Flow per Hour	Actual Mass Flow per Year	**Percent of AGC**
		ug/m^3	lb/yr	ppb		ug/m^3	lb/hr	lb/yr	%
Vinyl Chloride	75-01-4	0.02	1.96	5	*	12.99	7.21E-06	0.06277	**3.21**
Chloroethane(Ethyl Chloride)	75-00-3	10,000	978,044.97	5	*	13.41	7.44E-06	0.06480	**0.00**
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4	0.02	1.96	5	*	20.15	1.12E-05	0.09737	**4.98**
Methylene Chloride(Dichloromethane)	75-09-2	2.10	205.39	12		42.37	2.35E-05	0.20474	**0.10**
1,1-Dichloroethane	75-34-3	20	1,956.09	5	*	20.57	1.14E-05	0.09940	**0.01**
cis-1,2 - Dichloroethylene	156-59-2	1,900	185,828.54	5	*	20.15	1.12E-05	0.09737	**0.00**
Chloroform	67-66-3	0.04	4.21	5	*	24.82	1.38E-05	0.11991	**2.85**
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6	1,000	97,804.50	5	*	27.73	1.54E-05	0.13400	**0.00**
Benzene	71-43-2	0.13	12.71	5	*	16.24	9.01E-06	0.07845	**0.62**
Trichloroethene	79-01-6	0.45	44.01	5	*	27.31	1.52E-05	0.13197	**0.30**
Toluene	108-88-3	400	39,121.80	5.6		21.45	1.19E-05	0.10364	**0.00**
Ethyl benzene	100-41-4	1,000	97,804.50	5	*	22.07	1.22E-05	0.10662	**0.00**
m,p-Xylene	108-38-3/106-42-3	700	68,463.15	5	*	21.65	1.20E-05	0.10459	**0.00**
o-Xylene	95-47-6	700	68,463.15	5	*	22.07	1.22E-05	0.10662	**0.00**
1,2,4-Trimethylbenzene	95-63-6	290	28,363.30	5	*	24.98	1.39E-05	0.12071	**0.00**
2-Propanol (Isopropyl alcohol)	67-63-0	7,000	684,631.48	5	*	12.49	6.93E-06	0.06036	**0.00**
Dichlorodifluoromethane(Freon 12)	75-71-8	12,000	1,173,653.96	5	*	12.49	6.93E-06	0.06036	**0.00**

fps: feet per second
acfm: actual cubic feet per minute
ug/m^3: micrograms per cubic meter
lb/yr: pounds per year
lb/hr: pounds per hour
ppb: parts per billion

Notes/Assumptions:

1. The stack discharge temperature is 65°F based on recorded parameters.
2. The ambient temperature is approximately 70°F, the average temperature during start-up.
3. Calculations assume that the system will run with the maximum allowable concentrations between quarterly readings.
4. AGC refers to the Annual Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated July 12, 2000.
5. To be conservative the lower detection limit was used for compounds that were below the limit of detection, but are found in the influent groundwater of the Groundwater Remediation System.

Table A1-2: NYSDEC Dar-1 Air Modeling Data, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Calculation of the Short-Term Guideline Concentration (SGC) for Sampling Event on 9/8/2002

Compounds	CAS Numbers	Maximum Limit (SGC) (ug/m^3)	Analytical Concentration (ppb)	Detection Limit Used	Actual Emissions C_a (ug/m^3)	Mass/hour (lb/hr)	Maximum Potential Impact (Step III.A.3 in DAR-1) (ug/m^3)	Short Term Impact (Step III.A.5 in DAR-1) (ug/m^3)	Percent of the SGC (%)
Vinyl Chloride	75-01-4	180,000	5	*	12.99	8.08E-06	0.0014	0.08973	5.0E-05
Chloroethane(Ethyl Chloride)	75-00-3	--	5	*	13.41	8.34E-06	0.0014	0.09263	NA
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4	--	5	*	20.15	1.25E-05	0.0021	0.13920	NA
Methylene Chloride(Dichloromethane)	75-09-2	14,000	5	*	17.66	1.10E-05	0.0019	0.12195	8.7E-04
1,1-Dichloroethane	75-34-3	--	5	*	20.57	1.28E-05	0.0022	0.14210	NA
cis-1,2 - Dichloroethylene	156-59-2	--	5	*	20.15	1.25E-05	0.0021	0.13920	NA
Chloroform	67-66-3	150	5	*	24.82	1.54E-05	0.0026	0.17141	1.1E-01
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6	68,000	5	*	27.73	1.72E-05	0.0029	0.19156	2.8E-04
Benzene	71-43-2	1,300	5	*	16.24	1.01E-05	0.0017	0.11215	8.6E-03
Trichloroethene	79-01-6	54,000	5	*	27.31	1.70E-05	0.0029	0.18866	3.5E-04
Toluene	108-88-3	37,000	7.4		28.34	1.76E-05	0.0030	0.19577	5.3E-04
Ethyl benzene	100-41-4	54,000	5	*	22.07	1.37E-05	0.0023	0.15242	2.8E-04
m,p-Xylene	108-38-3/106-42-3	4,300	5	*	21.65	1.35E-05	0.0023	0.14952	3.5E-03
o-Xylene	95-47-6	4,300	5	*	22.07	1.37E-05	0.0023	0.15242	3.5E-03
1,2,4-Trimethylbenzene	95-63-6	--	5	*	24.98	1.55E-05	0.0027	0.17256	NA
2-Propanol (Isopropyl alcohol)	67-63-0	120,000	18		44.97	2.80E-05	0.0048	0.31064	2.6E-04
Dichlorofluoromethane(Freon 12)	75-71-8	--	5	*	25.13	1.56E-05	0.0027	0.17358	NA

ug/m^3: Micrograms per cubic meter
ppb: parts per billion
*: Analyte concentration below detection limit, detection limit was used in calculations
lb/hr: pounds per hour
--: No SGC listed for compound

Notes:

1. DAR-1 refers to DAR-1 AGC/SGC Tables dated 12 July 2000
2. SGC refers to the Short-Term Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated July 12, 2000.
3. To be conservative the lower detection limit was used for compounds that were below the limit of detection, but are found in the influent groundwater of the Groundwater Remediation System.

Table A1-2: NYSDEC Dar-1 Air Modeling Data, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

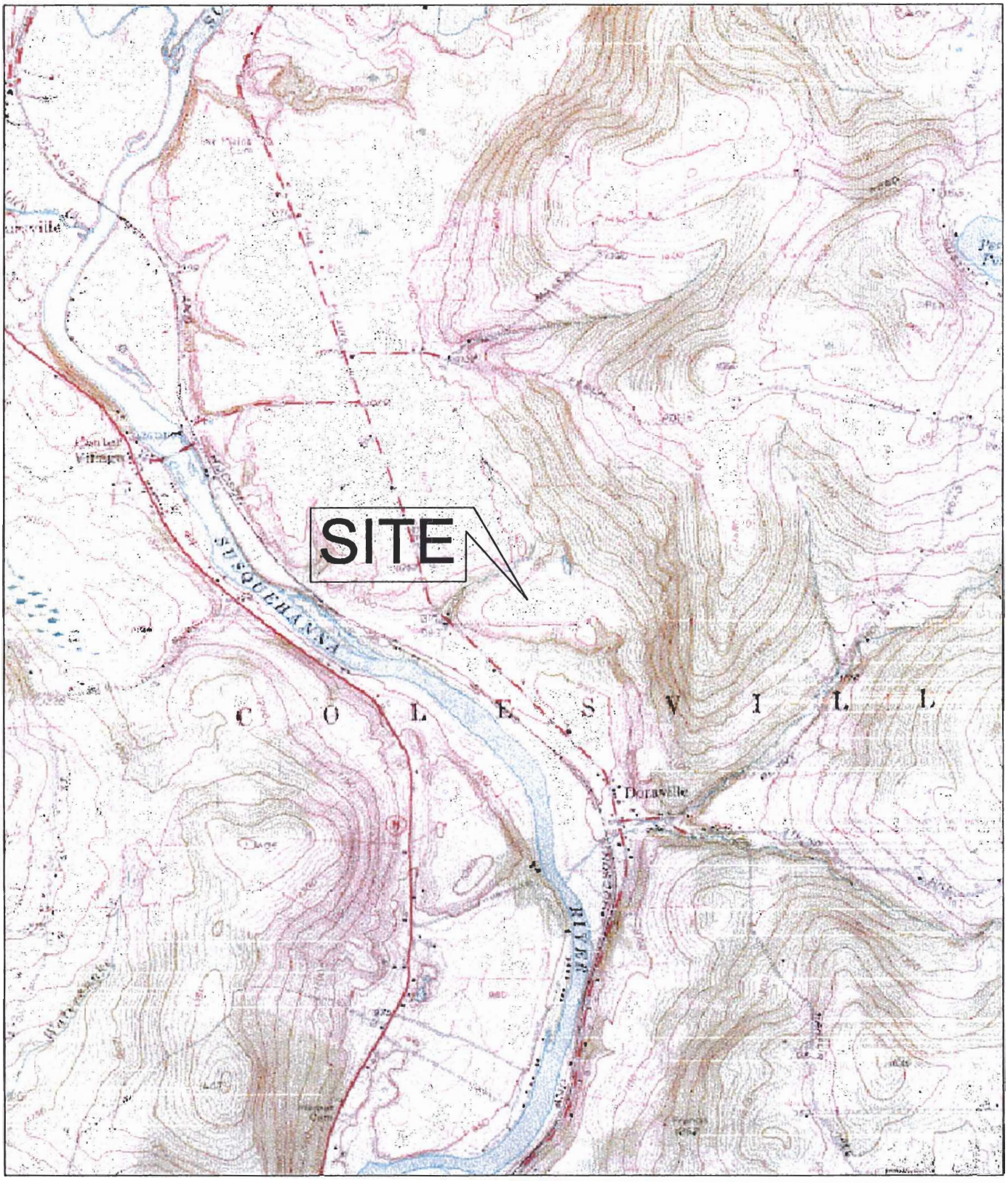
Calculation of the Short-Term Guideline Concentration (SGC) for Sampling Event on 9/10/2002

Compounds	CAS Numbers	Maximum Limit (SGC) (ug/m^3)	Analytical Concentration (ppb)	Detection Limit Used	Actual Emissions C_a (ug/m^3)	Mass/hour (lb/hr)	Maximum Potential Impact (Step III.A.3 in DAR-1) (ug/m^3)	Short Term Impact (Step III.A.5 in DAR-1) (ug/m^3)	Percent of the SGC (%)
Vinyl Chloride	75-01-4	180,000	5	*	12.99	7.20E-06	0.0012	0.08000	4.4E-05
Chloroethane(Ethyl Chloride)	75-00-3	--	5	*	13.41	7.43E-06	0.0013	0.08259	NA
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4	--	5	*	20.15	1.12E-05	0.0019	0.12410	NA
Methylene Chloride(Dichloromethane)	75-09-2	14,000	12		42.37	2.35E-05	0.0040	0.26095	1.9E-03
1,1-Dichloroethane	75-34-3	--	5	*	20.57	1.14E-05	0.0019	0.12669	NA
cis-1,2 - Dichloroethylene	156-59-2	--	5	*	20.15	1.12E-05	0.0019	0.12410	NA
Chloroform	67-66-3	150	5	*	24.82	1.38E-05	0.0024	0.15283	1.0E-01
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6	68,000	5	*	27.73	1.54E-05	0.0026	0.17079	2.5E-04
Benzene	71-43-2	1,300	5	*	16.24	9.00E-06	0.0015	0.09999	7.7E-03
Trichloroethene	79-01-6	54,000	5	*	27.31	1.51E-05	0.0026	0.16820	3.1E-04
Toluene	108-88-3	37,000	5.6		21.45	1.19E-05	0.0020	0.13208	3.6E-04
Ethyl benzene	100-41-4	54,000	5	*	22.07	1.22E-05	0.0021	0.13589	2.5E-04
m,p-Xylene	108-38-3/106-42-3	4,300	5	*	21.65	1.20E-05	0.0021	0.13331	3.1E-03
o-Xylene	95-47-6	4,300	5	*	22.07	1.22E-05	0.0021	0.13589	3.2E-03
1,2,4-Trimethylbenzene	95-63-6	--	5		24.98	1.38E-05	0.0024	0.15385	NA
2-Propanol (Isopropyl alcohol)	67-63-0	120,000	10		24.98	1.39E-05	0.0024	0.15386	1.3E-04
Dichlorofluoromethane(Freon 12)	75-71-8	--	5	*	25.13	1.56E-05	0.0027	0.17358	NA

ug/m^3: Micrograms per cubic meter
ppb: parts per billion
*: Analyte concentration below detection limit, detection limit was used in calculations
lb/hr: pounds per hour
--: No SGC listed for compound

Notes:

1. DAR-1 refers to DAR-1 AGC/SGC Tables dated 12 July 2000
2. SGC refers to the Short-Term Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated July 12, 2000.
3. To be conservative the lower detection limit was used for compounds that were below the limit of detection, but are found in the influent groundwater of the Groundwater Remediation System.



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NO.	DATE	REVISION DESCRIPTION	BY / CKD

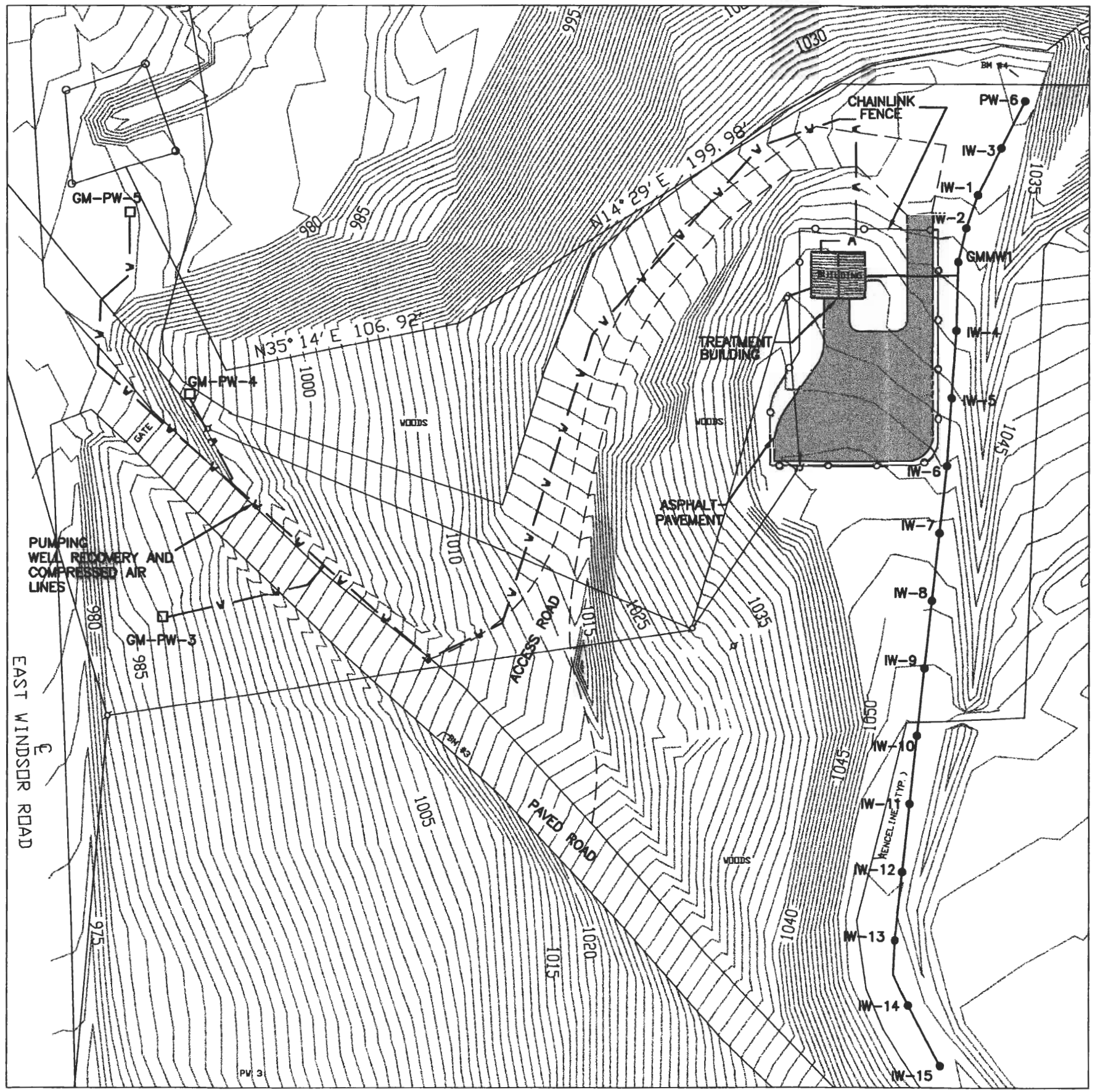
ARCADIS G&M
88 Duryea Road
Melville, NY 11747
Tel: (631) 249-7600 Fax: (631) 249-7610

DRAWN	DATE	PROJECT MANAGER	DEPARTMENT MANAGER
KZ	12/19/02	KZ	NV
LEAD DESIGN PROF.		CHECKED	
CT		KZ	

SITE LOCATION MAP

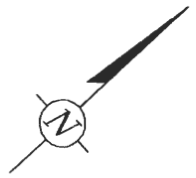
COLESVILLE LANDFILL
BROOME COUNTY, NEW YORK

PROJECT NUMBER	DRAWING NUMBER
NY00949.014	A-1



SITE PLAN

SCALE: 1"=50'-0"



LEGEND

- IW-15 ● – INJECTION WELL
- GM-PW-3 □ – PUMPING WELL
- —v—v— – RECOVERY/PNEUMATIC LINES
- ——— – INJECTION LINES
- —o—o— – FENCELINE
- ——— – EXISTING CONTOURS

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NO.	DATE	REVISION DESCRIPTION	BY / CKD

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COLESVILLE LANDFILL

BROOME COUNTY, NEW YORK

SITE PLAN

ARCADIS

65 Dargea Road
Melville, New York 11747
Tel: 631/249-7600 Fax: 631/249-7610

PROJECT MANAGER	DEPARTMENT MANAGER
S. FELDMAN	N. VALKENBURG
LEAD DESIGN PROF.	CHECKED
C. TUOHY	K. ZEGEL
DRAWN	DATE
LMC	3/11/03
PROJECT NUMBER	DRAWING NUMBER
NY000949	A-2

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ARCADIS

Appendix B

Water-Level Measurement and Groundwater Sampling Logs.

REP-1 + MS/MSD

ARCADIS GERAGHTY & MILLER

Groundwater Sampling Form

Page (SH) 1 of 1

Project/No. NY000949.0014.00004 Well GMMW12 Date 7/28/02

Screen Setting 45-55 Measuring Point Description — Casing Diameter (inches) 2

Static Water Level 37.38 Measured Width — Well Materials + PVC ___ ST. Steel

Total depth 60 Sounded: 56.5 Pump On: 925 Pump Intake: 2' off Sanded Bottom

Purge Method Pump Off: 1015 ~~Volumes Purged~~ Pump Screen is then 3' off Sanded Bottom

Centrifugal ___ Sample Time: 1001

Submersible + Other ___ Bailer Type: — Sampled By: SH/CL Recorded: SH

Time	Minutes Elapsed	Rate (gpm) (ML)	DTW	Gallons Purged	pH	Cond. umhos ms/cm	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C) (F)	REMARKS 3)
930		300	39.32		6.26	440	367	162	2.48	10.99	
935		300	40.41		6.31	435	223	196	1.83	11.13	
940		200	40.33		6.32	430	117	126	1.65	12.14	
945		200	40.25		6.33	430	67.0	121	1.64	12.86	
950		200	40.18		6.34	427	43.5	120	1.57	13.22	
955		200	40.14		6.35	429	47.8	121	1.36	13.40	
1000		200	40.13		6.34	427	46.1	122	1.32	13.65	
		Sulfide	.248								

Lowflo.xls
4/6/01

ARCADIS GERAGHTY & MILLER

Groundwater Sampling Form

Project/No. NY000749.0014.00004 Well GMMW-5 Date 7/24/02

Screen Setting 53-63 Measuring Point Description — Casing Diameter (inches) 2

Static Water Level 48.97 Measured Width — Well Materials ✓ PVC ___ ST. Steel

Total depth 68 Pump On: 1355 Pump Intake: 1' off bottom

Purge Method Pump Off: Volumes Purged

Centrifugal ___ Sample Time:

Submersible ✓

Other Bailer Type: — Sampled By: SH/CL/GW

Time	Minutes Elapsed	Rate (gpm) (ML)	DTW	Gallons Purged	pH	Cond. umhos ms/cm	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C) (F)	REMARKS 3)
1400		500	58.57		6.22	383	63.7	-106	3.24	14.01	
1405			60.90		5.56	157	300	-71	.96	14.02	
1410											
1415											
		Water level Fell below Pump Screen									
		Well was then bailed and sampled with a Bailer by GW									

Lowflo.xls
4/6/01

ARCADIS GERAGHTY & MILLER
Low-Flow Groundwater Sampling Log

Project Number: M000949.P14 Task: 4 Well ID: GMMW-6
Date: 7-25-02 Sampled By: GW/SH/CL
Sampling Time: 11.30 - 12.45 Recorded By: CL
Weather: 85 FC Coded Replicate No.: —

WELL IMFORMATION

Casing Material: PVC Purge Method: Low Flow PEDI FLO
Casing Diameter: 2" Purge Rate: 500 mL/min
Total Depth: SOUNDED: 55.91 Total Volume Purged: —
Depth to Water: 39.98 Pump Intake Depth: 10' screen 50'
Water Column: — Pump on: 11.42 Off: 12.30
Gallons/Foot: — Parameters Sampled: See Below
Gallons in Well: —

FIELD PARAMETER MEASUREMENTS

Time	Rate ml./min)	Gallons Purged	Turbidity (NTUs)	REDOX (mV)	pH (SI Units	Conductivity (µmhos/cm)	Temp (°C)	Depth to Water	Diss. Oxygen	Comments
11.45	500	—	—	2	6.16	875	12.3	43.63	1.6	—
11.50	"	—	—	7	6.15	880	12.5	44.15	1.6	—
11.55	"	—	19.0	4	6.13	879	13.7	43.97	1.5	—
12.00	"	—	200	6	6.12	876	14.7	44.00	1.6	—
12.05	"	—	189	7	6.11	869	15.5	44.00	1.5	—
12.10	"	—	163	13	6.10	876	15.1	44.01	1.5	—
12.15	"	—	150	11	6.10	875	15.6	43.92	1.4	—
		SULFIDE	0.149							

Well Secure: ✓
Color: VERY LIGHT BROWN
SLIGHT ODOR
Purge Water Disposal: OTG
Turbidity(qualitative): MED TURBID

ARCADIS GERAGHTY & MILLER

Groundwater Sampling Form

Page 1 of 1

Project/No. NY000949.0014.0000 Well PW-3 Date 7-25-02

Screen Setting 9.7-29.7 Measuring Point Description PVC Casing Diameter (inches) 2"

Static Water Level 12.31 Measured Width — Well Materials + PVC / ST. Steel

Total depth 30.2 sounded (29.7) Pump On: 1842 Pump Intake: 2' off bottom

Purge Method Pump Off: Volumes Purged —

Centrifugal Sample Time:

Submersible Peristaltic + Bailer Type: — Sampled By: SH/GW/CL

Other

Time	Minutes Elapsed	Rate (gpm) (ML)	DTW	Gallons Purged	pH	Cond. umhos ms/cm	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C) (F)	REMARKS 3)
1845		500	10.44		6.19	508	153	261	8.72	12.35	
1850		500	11.02		6.34	471	184	273	7.21	12.66	
1855		300	11.54		6.34	469	40.8	[illegible]+	7.35	12.66	+ Redox '28 (50)
1900		200	11.80		6.84	470	32.8	285	7.72	12.98	
1905		100	11.90		6.33	470	31.5	288	7.59	12.99	
1910		100	12.00		6.33	472	30.8	291	7.65	12.95	
1915		100	12.09		6.33	472	37.8	292	7.80	12.93	
		Well is bent		6"	BLS	- The well was					
		Cut to CS		and	Sampled	with a Peristaltic Pump.					
											Geo-pump 1)
		SULFIDE: 0.051									

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ARCADIS GERAGHTY & MILLER

Groundwater Sampling Form

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Project/No. M4080949.0014.00004 Well PW-4 Date 7/25/02

Screen Setting 14.7 - 29.7 (17) (SH) Measuring Point Description — Casing Diameter (inches) 2"

Static Water Level 18.73 Measured Width — Well Materials + PVC ___ ST. Steel

Total depth 29.7 Pump On: 15^45 (SH) Pump Intake: 3' off bottom

Purge Method Pump Off: 15^45 Volumes Purged

Centrifugal ___ Sample Time: 15^37

Submersible S

Other ___ Bailer Type: Sampled By: SH/CL Recorded: SH

Time	Minutes Elapsed	Rate (gpm) (ML)	DTW	Gallons Purged	pH	Cond. umhos ms/cm	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C) (F)	REMARKS 3)
15^05		300	18.07		6.03	326	115	206	7.93	13.27	
15^10		300	18.13		5.91	346	37.5	202	4.18	13.13	
15^15		300	18.20		5.89	354	14.6	203	3.37	13.99	
15^20		200	18.31		5.89	354	5.0	202	3.33	15.04	
15^25		200	18.47		5.88	353	2.8	201	3.48	15.48	
15^30		200	18.42		5.88	357	1.8	201	3.55	15.60	
15^35		200	18.43		5.89	361	.6	201	3.50	15.66	
		Sulfide: .025									

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ARCADIS GERAGHTY & MILLER

Groundwater Sampling Form

Page 1 of 1

Project/No. NY000949.00014.00004 Well PW-5 Date 7/25/02

Screen Setting 4.7-29.7 Measuring Point Description — Casing Diameter (inches) 2

Static Water Level 1.02 Measured Width — Well Materials ✓ PVC ___ ST. Steel

Total depth 29.7 Pump On: 13^40 Pump Intake: 5' off Bottom

Purge Method Pump Off: 14^20 Volumes Purged —

Centrifugal ___ Sample Time: 14^15

Submersible ✓ Sampled By: SH/CL

Other ___ Bailer Type: — Recorded: SH

Time	Minutes Elapsed	Rate (gpm) (ML)	DTW	Gallons Purged	pH	Cond. umhos ms/cm	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C) (F)	REMARKS 3)
13^42		500	1.64		7.79	244	620	164	7.09	11.95	
13^47		500	1.77		8.06	249	401	144	.95	10.91	
13^52		400	1.81		8.12	249	438	129	.40	10.66	
13^57		400	1.74		8.14	249	398	124	.37	10.85	
14^02		400	1.73		8.15	249	309	117	.37	10.78	
14^07		400	1.75		8.14	248	266	111	.34	10.96	
14^12		400			8.15	248	231	105	.35	10.76	
					Sulfide: 244						

ARCADIS GERAGHTY & MILLER

Groundwater Sampling Form

Page 1 of 1

Project/No. N1000949.0004.00004 Well PW-7 Date 7/23/02

Screen Setting Not Listed Measuring Point Description — Casing Diameter (inches) 2

Static Water Level 42.25 Measured Width — Well Materials ✓ PVC ___ ST. Steel

Total depth — Not Listed Pump On: 11:27 Pump Intake: 5' off bottom

Purge Method Pump Off: 12:35 Volumes Purged —

Centrifugal ___ Sample Time: 12:26

Submersible ✓ Sampled By: SH

Other ___ Bailer Type: — Recorded: SH

Time	Minutes Elapsed	Rate (gpm) (ML)	DTW	Gallons Purged	pH	Cond. umhos ms/cm	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C) (F)	REMARKS 3)
11:30		500	42.29		6.62	319	705	-43	2.27	16.92	
11:35			42.72		6.33	283	>1000	-28	1.00	14.64	
11:40			42.92		6.31	276	>1000	-27	.92	15.41	
11:45			42.94		6.30	279	546	-24	1.02	15.25	
11:50			43.00		6.90	275	534	-19	1.87	14.44	
11:55		300	43.00		6.27	262	450	-14	1.25	14.40	Lowered Rate
12:00			42.99		6.24	245	297	-2	1.68	14.37	
12:05			42.99		6.22	234	199	6	2.01	14.63	
12:10			42.96		6.20	226	135	12	2.21	14.76	
12:15			42.94		6.19	222	127	16	2.31	14.58	(Reading)
12:20			42.91		6.19	221	132	17	2.33	14.53	
12:25			42.91		6.18	219	122	19	2.30	14.51	
12:30			—		—	—	—	—	—	—	

Sulfide - .065

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ARCADIS GERAGHTY & MILLER
Low-Flow Groundwater Sampling Log

Project Number: M000949 P14 Task: 4 Well ID: PW13
Date: 7-23-02 Sampled By: GW/SH/CL
Sampling Time: 08.10 Recorded By: CL
Weather: 85° HAZY Coded Replicate No.:

WELL IMFORMATION

Casing Material: ~~PVC~~ PVC Purge Method: Low Flow Peri Flo
Casing Diameter: 2" Purge Rate: 500 mL/min
Total Depth: 78.5 Total Volume Purged: —
Depth to Water: 62.17 Pump Intake Depth screen 43.5-78.5
Water Column: — Pump on: 08.45 Off: 09.50
Gallons/Foot: — Parameters Sampled: See below
Gallons in Well: —

FIELD PARAMETER MEASUREMENTS

Time	Rate mL/min	Gallons Purged	Turbidity (NTUs)	REDOX (mV)	pH (SI Units	Conductivity (µmhos/cm)	Temp (°C)	Depth to Water	Diss. Oxygen	Comments
0850	500	—	HIGH	177	6.06	182	15.5	62.22	1.0	MUD/ORANGE
0855	"	—	"	160	6.01	180.5	15.9	62.37	0.9	—
09.00	450	—	>200	144	5.95	179.8	16.6	63.16	0.9	—
09.05	"	—	105	129	5.92	178.1	19.1	62.82	1.3	—
09.10	"	—	76	118	5.89	177.3	20.6	62.78	1.2	—
09.15	"	—	—	115	5.85	174.1	20.2	—	0.9	—
09.20	"	—	52	114	5.84	174.5	20.0	62.85	0.7	—
09.25	"	—	—	117	5.85	174.0	20.5	62.80	0.5	—
09.30	"	—	27	117	5.83	173.6	21.1	62.78	0.6	—
09.35	"	—	—	119	5.82	173.1	21.3	—	0.6	—
09.40	"	—	—	121	5.81	172.0	20.8	62.78	0.4	—
09.45	SAMPLED									
~~09.50~~						SURFACE	.005	mg/L		

Well Secure: ✓ Purge Water Disposal: GROUND
Color: ~~CLEAR~~, NONE Turbidity(qualitative): CLEAR
NO ODOR

ARCADIS GERAGHTY & MILLER

Groundwater Sampling Form

Page 1 of 3

Project/No. N4000949.0014.00004 Well SP-2 Date 7/25/02

Screen Setting — Measuring Point Description — Casing Diameter (inches) —

Static Water Level — Measured Width — Well Materials — PVC / — ST. Steel

Total depth — Pump On: — Pump Intake: —

Purge Method — Pump Off: — Volumes Purged —

Centrifugal — Sample Time: —

Submersible —

Other — Bailer Type: — Sampled By: BW

Time	Minutes Elapsed	Rate (gpm) (ML)	DTW	Gallons Purged	pH	Cond. umhos ms/cm	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C) (F)	REMARKS 3)
					6.53	249	181	-24	8.96	17.17	
	Sul.Fide			0.033							

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ARCADIS GERAGHTY & MILLER
Low-Flow Groundwater Sampling Log

Project Number: 4D00949.0014 Task: 00004 Well ID: SP-3

Date: 7-25-02 Sampled By: _____

Sampling Time: _____ Recorded By: _____

Weather: _____ Coded Replicate No.: _____

WELL IMFORMATION

Casing Material: _____ Purge Method: _____

Casing Diameter: _____ Purge Rate: _____

Total Depth: _____ Total Volume Purged: _____

Depth to Water: _____ Pump Intake Depth _____

Water Column: _____ Pump on: _____ Off: _____

Gallons/Foot: _____ Parameters Sampled: _____

Gallons in Well: _____

FIELD PARAMETER MEASUREMENTS

Time	Rate ml./min)	Gallons Purged	Turbidity (NTUs)	REDOX (mV)	pH (SI Units	Conductivity (µmhos/cm)	Temp (°C)	Depth to Water	Diss. Oxygen	Comments
			395	-51	7.17	282	16.92		9.36	
		SURGE	0.20							

Well Secure: _____ Purge Water Disposal: _____

Color: _____ Turbidity(qualitative): _____

ARCADIS GERAGHTY & MILLER

Groundwater Sampling Form

Page ____ of ____

Project/No. _____ Well SP-4 Date _____

Screen Setting _____ Measuring Point Description _____ Casing Diameter (inches) _____

Static Water Level _____ Measured Width _____ Well Materials ____ PVC ____ ST. Steel

Total depth _____ Pump On: _____ Pump Intake: _____

Purge Method Pump Off: _____ Volumes Purged _____

Centrifugal _____ Sample Time: _____

Submersible _____

Other _____ Bailer Type: _____ Sampled By: _____

Time	Minutes Elapsed	Rate (gpm) (ML)	DTW	Gallons Purged	pH	Cond. umhos ~~ms/cm~~	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C) (F)	REMARKS 3)
					6.78	848	203	-125	9.26	19.69	
	SulFide			.145							

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ARCADIS GERAGHTY & MILLER
Low-Flow Groundwater Sampling Log

Project Number: N1000949.0004 Task: 00004 Well ID: SP5

Date: 7-25-02 Sampled By: _____

Sampling Time: _____ Recorded By: _____

Weather: _____ Coded Replicate No.: _____

WELL IMFORMATION

Casing Material: _____ Purge Method: _____

Casing Diameter: _____ Purge Rate: _____

Total Depth: _____ Total Volume Purged: _____

Depth to Water: _____ Pump Intake Depth _____

Water Column: _____ Pump on: _____ Off: _____

Gallons/Foot: _____ Parameters Sampled: _____

Gallons in Well: _____

FIELD PARAMETER MEASUREMENTS

Time	Rate ml./min)	Gallons Purged	Turbidity (NTUs)	REDOX (mV)	pH (SI Units	Conductivity (µmhos/cm)	Temp (°C)	Depth to Water	Diss. Oxygen	Comments
			6.0	-29	5.79	540.	15.1		3.0	
		SJLBDLC				0.035				

Well Secure: _____ Purge Water Disposal: _____

Color: _____ Turbidity(qualitative): _____

ARCADIS GERAGHTY & MILLER

Groundwater Sampling Form

Project/No. N4000949.0014.00004 Well W-5 Date 7/24/02

Screen Setting 44-54 Measuring Point Description _____ Casing Diameter (inches) 2"

Static Water Level 57.94 Measured Width _____ Well Materials + PVC ___ ST. Steel

Total depth 61.5 Pump On: 12⁴⁵ Pump Intake: 1' off bottom

Purge Method Pump Off: _____ Volumes Purged _____

Centrifugal _____ Sample Time: _____

Submersible + Sampled By: SH

Other _____ Bailer Type: _____

Time	Minutes Elapsed	Rate (gpm) (ML)	DTW	Gallons Purged	pH	Cond. umhos ms/cm	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C) (F)	REMARKS 3)
12 55		100	55.28		6.56	765	180	-103	6.67	14.72	
13 00											
13 05											
13 10											
13 15											
13 20											
13 25											
	- Water Level Fell below Pump Screen										
	After 3 mins of pumping @ 100 mL/min										
	Well was hand bailed and sampled with a bailer										

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ARCADIS GERAGHTY & MILLER
Low-Flow Groundwater Sampling Log

Project Number: M000949.14 Task: 4 Well ID: W-6
Date: 7-24-02 Sampled By: GW/SH/CL
Sampling Time: ~~11:00~~ 4.00pm Recorded By: SH
Weather: 85° PC Coded Replicate No.: —

WELL IMFORMATION

Casing Material: PVC Purge Method: Low-Flow REDI Flo
Casing Diameter: 2" Purge Rate: see below
Total Depth: 59.5 Total Volume Purged: —
Depth to Water: 50.57 Pump Intake Depth (15' screen)
Water Column: — Pump on: 5.30 pm Off: —
Gallons/Foot: — Parameters Sampled: see below
Gallons in Well: —

FIELD PARAMETER MEASUREMENTS

Time	Rate ml./min)	Gallons Purged	Turbidity (NTUs)	REDOX (mV)	pH (S) Units	Conductivity (µmhos/cm)	Temp (°C)	Depth to Water	Diss. Oxygen	Comments
5.25pm	500	—	—	-44	6.03	412	13.4	53.98	2.0	GRAY
5.40	"	—	35	-49	6.01	412	13.7	54.04	0.6	—
5.45	400	—	—	-56	5.98	403	16.7	53.80	0.3	—
5.50	1'	—	—	—	6.01	442	17.3	—	0.3	—
5.55	500	—	—	-29	6.07	473	14.7	54.00	0.3	GRAY
6.00	"	—	—	-34	6.06	475	16.3	53.93	0.3	
6.05	"	—	80	-37	6.06	476	16.8	53.88	0.3	
6.10	300	—	55	-42	5.97	470	17.7	53.46	0.2	SETTING?
6.15	SHOW	—	SAMPLED,							
			SULFIDE:	0.625						

LOWERED PUMP 3.4'

FLOW STOPPED PUMP OFF PUMP ON; FLOW O

Well Secure: ✓ Purge Water Disposal: GROUND
Color: GRAY Turbidity(qualitative): MOD.
MED. ODOR

ARCADIS GERAGHTY & MILLER
Low-Flow Groundwater Sampling Log

Project Number: M000949 P14 Task: 4 Well ID: W-7
Date: 7-24-02 Sampled By: GW/SH/CL
Sampling Time: 16.00 – Recorded By: CL
Weather: 85° PC Coded Replicate No.:

WELL IMFORMATION

Casing Material: PVC Purge Method: Low Flow - REDI FLOW
Casing Diameter: 2" Purge Rate:
Total Depth: 51.5 Total Volume Purged: –
Depth to Water: 43.48 Pump Intake Depth (15' screen)
Water Column: – Pump on: Off:
Gallons/Foot: – Parameters Sampled: See below
Gallons in Well: –

FIELD PARAMETER MEASUREMENTS

Time	Rate ml./min)	Gallons Purged	Turbidity (NTUs)	REDOX (mV)	pH (SI Units	Conductivity (µmhos/cm)	Temp (°C)	Depth to Water	Diss. Oxygen	Comments
1425	500		176	-57	6.24	603	11.75	47.71	4.38	
1430	250		92.4	-38	6.13	433	13.19	47.95	1.64	
1435	↓		75.8	-55	6.20	476	13.51	48.04	.90	
1440			54.9	-56	6.20	545	14.95	48.18	.80	
1445	↓		49.9	-55	6.19	538	15.40	47.31	.96	
1450					Sample Taken					
1455										
					S-2: 0.027					

Well Secure: Needs Lock Purge Water Disposal: Land Surface
Color: Reddish - Brown Sediment Turbidity(qualitative): Some
Water - clear

ARCADIS GERAGHTY & MILLER

Groundwater Sampling Form

Page 1 of 1

Project/No. N4000949.0014.00003 Well W-13 Date 7/23/02

Screen Setting — Measuring Point Description — Casing Diameter (inches) 2

Static Water Level 46.32 — Measured Width — Well Materials ✓ PVC ___ ST. Steel

Total depth 50 — Pump On: — Pump Intake: 6" off Bottom

Actual : approx - 55'

Purge Method — Pump Off: — Volumes Purged —

Centrifugal ___ — Sample Time: —

Submersible ✓ — Sampled By: SH/GW

Other ___ — Bailer Type: —

Recorded: SH

Time	Minutes Elapsed	Rate (gpm) (ML)	DTW	Gallons Purged	pH	Cond. ~~umhos~~ ms/cm	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C) (F)	REMARKS 3)
950		100	—		6.51	1.47 1476	55.7	-75	3.56	18.47	
* Water Level fell below Pump Screen on three Seperate Attempts											
W-13 will be bailed Dry - let Recover - and a Sample will be taken with a bailer by CL											
@ Time of Sample					6.64	1.41 1410	43.9	-75	8.37	16.35	

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ARCADIS GERAGHTY & MILLER

Groundwater Sampling Form

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Project/No. N4000949.0014.00004 Well W-145 Date 7/24/02

Screen Setting 4'1/2'-19'1/2 Measuring Point Description — Casing Diameter (inches) 2"

Static Water Level 9.61 Measured Width — Well Materials ✓ PVC ___ ST. Steel

Total depth 21' Pump On: 8:20 Pump Intake: 7' OFF bottom

Purge Method Pump Off: 9:15 Volumes Purged —

Centrifugal ___ Sample Time: 9:06

Submersible ✓ Sampled By: GW/SH

Other ___ Bailer Type: — Recorder: SH

Time	Minutes Elapsed	Rate (gpm) (ML)	DTW	Gallons Purged	pH	Cond. umhos ms/cm	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C) (F)	REMARKS 3)
8:35		500	9.80		5.75	62	285	230	6.96	9.31	
8:40		↓	9.80		5.62	61	105	240	6.68	9.30	
8:45			—		5.57	61	69.2	247	6.54	9.26	- Temp verified with
8:50			9.81		5.53	61	57.2	252	6.52	9.30	other meter.
8:55		↓	9.81		5.49	61	56.5	256	6.58	9.17	
9:00		"	9.81	"	5.46	61	47.2	261	6.58	9.21	
9:05			9.81	"	5.46	60	43.1	265	6.54	9.22	
Sulfide:				0.02							

ARCADIS GERAGHTY & MILLER
Low-Flow Groundwater Sampling Log

Project Number: M0005949.0014 Task: 4 Well ID: W-16S
Date: 1-24-02 Sampled By: GW/SH/CL
Sampling Time: 11.00 - 12.45 Recorded By: CL
Weather: 80° SUNNY Coded Replicate No.: —

WELL IMFORMATION

Casing Material: CAN'T See Purge Method: LOW FLOW REDI FLO
Casing Diameter: 11 Purge Rate: 500 mL
Total Depth: 23' Total Volume Purged: —
Depth to Water: — Pump Intake Depth 18'
Water Column: — Pump on: 11.33 Off: 12.20
Gallons/Foot: — Parameters Sampled: see below
Gallons in Well: —

FIELD PARAMETER MEASUREMENTS

FROM FOC

Time	Rate mL/min	Gallons Purged	Turbidity (NTUs)	REDOX (mV)	pH (SI Units	Conductivity (µmhos/cm)	Temp (°C)	Depth to Water	Diss. Oxygen	Comments
11.35	500	—	—	223	6.23	230	13.7	11.52	3.5	CLEAR
11.40	"	—	—	215	6.05	227	14.8	11.47	2.0	—
11.45	"	—	—	213	6.02	226	14.3	11.49	1.9	—
11.50	"	—	—	205	6.01	214	15.0	11.44	1.9	—
11.55	"	—	—	202	6.03	214	15.1	11.43	1.9	—
12.00	"	—	—	200	6.02	212	15.3	11.38	1.9	—
12.05	"	—	5.1	199	6.03	208	15.4	11.36	1.8	—

SULFIDE: 0.014 mg/L

CALIBRATED ~~PH METER~~ PARAMETERS METERS PRIOR TO PURGE

Well Secure: ✓ Purge Water Disposal: DRUM
Color: NONE Turbidity(qualitative): CLEAR
NO ODOR

ARCADIS GERAGHTY & MILLER

Groundwater Sampling Form

Page 1 of 1

Project/No. NY000949.0014.00004 Well W-175 Date 7/24/02

Screen Setting 5'-20' Measuring Point Description — Casing Diameter (inches) 2"

Static Water Level 10.52 Measured Width — Well Materials X PVC ___ ST. Steel

Total depth 20' Pump On: 1166 Pump Intake: 3' off bottom

Purge Method Pump Off: 1145 Volumes Purged —

Centrifugal ___ Sample Time: 1137

Submersible X Sampled By: GW/SH

Other ___ Bailer Type: — Recorded: SH

Time	Minutes Elapsed	Rate (gpm) (ML)	DTW	Gallons Purged	pH	Cond. umhos ms/cm	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C) (F)	REMARKS 3)
1105		500	10.87		6.38	334	75.2	238	4.64	12.79	
1110		↓	10.85		6.40	335	39.0	222	3.92	12.80	
1115			—		6.41	335	32.2	216	3.69	13.07	
1120		↓	10.83		6.42	335	28.6	213	3.55	12.96	
1125			—		6.42	335	28.2	213	3.52	12.97	
1130			10.83		6.41	336	27.3	213	3.61	12.49	
1136			10.83		6.42	335	27.9	213	3.47	12.85	
Sulfide:		< .005	(under Range)								

Lowflo.xls
4/6/01

ARCADIS GERAGHTY & MILLER

Low-Flow Groundwater Sampling Log

Project Number: M000949 P14 Task: 4 Well ID: W-18S

Date: 7-23-02 Sampled By: ~~CLW~~ SH/CL

Sampling Time: 15.10 - 16.30 Recorded By: CL

Weather: 80° RAIN Coded Replicate No.: —

WELL IMFORMATION

Casing Material: PVC Purge Method: Low Flow REDI FLOW

Casing Diameter: 2" Purge Rate: —

Total Depth: 23' Total Volume Purged: —

Depth to Water: 11.83 Pump Intake Depth 17' (15' screen)

Water Column: — Pump on: 15.33 Off: 16.20

Gallons/Foot: — Parameters Sampled: see below

Gallons in Well: —

FIELD PARAMETER MEASUREMENTS

Time	Rate ml./min)	Gallons Purged	Turbidity (NTUs)	REDOX (mV)	pH (SI Units	Conductivity (µmhos/cm)	Temp (°C)	Depth to Water	Diss. Oxygen	Comments
15.35	—	—	>1000	169	6.24	377	15.56	11.83	6.12	—
1540			338	182	6.14	375	14.69	11.89	5.15	
1545			88	178	6.14	378	14.68	11.85	5.03	
1550			62	175	6.14	382	14.68	11.85	4.95	
1555			57	167	6.14	382	15.04	11.83	5.01	
1600			51.2	160	6.14	384	14.94	11.82	4.99	
1605			49.5	162	6.14	383	14.96	11.82	4.96	
1610			47.2	169	6.13	382	14.92	11.85	4.90	
1615	SAMPLED									
~~1620~~										
		SULFIDE: 0.021	mg/L							

Well Secure: ✓ Purge Water Disposal: GROUND

Color: NONE Turbidity(qualitative): CLEAR

NO ODOR

ARCADIS GERAGHTY & MILLER
Low-Flow Groundwater Sampling Log

Project Number: MA000949 P14 Task: 4 Well ID: W-20S
Date: 7-23-02 Sampled By: GW/4
Sampling Time: 11.45 – 14.40 Recorded By: CL
Weather: 80° RAIN, LIGHTNING Coded Replicate No.: —

WELL IMFORMATION

Casing Material: PVC Purge Method: Low Flow Redi FLO
Casing Diameter: 2" Purge Rate: 200 mL
Total Depth: 22' Total Volume Purged: —
Depth to Water: 10.10 (TOC) Pump Intake Depth: 5' from bottom screen: 7-22'
Water Column: — Pump on: 12.05 to 12.15 Off: 14.00 to 14.30
Gallons/Foot: — Parameters Sampled: see below
Gallons in Well: —

FIELD PARAMETER MEASUREMENTS

Time	Rate ml./min)	Gallons Purged	Turbidity (NTUs)	REDOX (mV)	pH (SI Units	Conductivity (µmhos/cm)	Temp (°C)	Depth to Water	Diss. Oxygen	Comments
12.05	500	—	—	258	5.62	110.3	14.5	—	4.9	
12.10	"	—	—	262	5.61	110.3	15.1	12.5	4.4	
12.15	400	—	—	270	5.59	109.5	18.6	12.5	4.4	
12.20	~~350~~	—	—	276	5.61	108.2	19.7	—	4.6	
12.25	~~200~~ 350	—	—	276	5.57	108.1	19.8	12.6	4.6	
12.30	200	—	—	275	5.55	107.9	19.7	12.53	4.0	
12.35	"	—	15	269	5.52	107.9	19.6	—	3.8	
12.40	"	—	—	272	—	—	—	12.48	—	
PUMP STOPPED WORKING;										
FIXED PUMP @ 13:30 & PUT PUMP BACK IN WELL TO Attempt Purge										
14.00	500	—	55	294	5.50	108.9	15.5	13.69	4.3	
14.05	500	—	50	295	5.47	108.4	16.9	13.70	4.7	
14.10	"	—	—	295	5.45	107.2	17.7	13.75	4.7	
14.15	450	—	—	298	5.42	107.1	18.1	13.60	4.4	
1420	"	—	27	298	5.40	~~107.1~~ 107.0	18.6	13.56	4.2	
14.25	"	—	16	299	5.36	107.0	18.8	13.56	3.8	
			SULFIDE:	0.006	mg/L					

Well Secure: ✓ Purge Water Disposal: GROUND
Color: CLEAR Turbidity(qualitative): CLEAR
NO ODOR

ARCADIS GERAGHTY & MILLER

Water Sampling Log

Project: Colesville LandFill | Project No. NY003949.0014.TY | Page 1 of 1

Site Location: Broome County, NY | Date 7/25/02

Site/Well No. F-6 | Replicate No. — | Code No. /

Weather | Sampling Time: Begin 7:15 pm | End

Evacuation Data

Measuring Point

MP Elevation (ft)

Land Surface Elevation (ft)

Sounded Well Depth (ft bmp)

Depth to Water (ft bmp)

Water-Level Elevation (ft)

Water Column in Well (ft)

Casing Diameter/Type

Gallons in Well

Gallons Pumped/Bailed Prior to Sampling

Sample Pump Intake Setting (ft bmp)

Purge Time begin ____ end ____

Pumping Rate (gpm)

Evacuation Method

Field Parameters

Color

Odor

Appearance

pH (s.u.) 7.12

Conductivity (mS/cm)

(µmhos/cm) 182

Turbidity (NTU) .8

Temperature (°C) 14.98

Dissolved Oxygen (mg/L) 10.01

~~Salinity (%)~~ ORP (MV) 271

Sampling Method

Remarks SulFidr .001

Constituents Sampled	Container Description	Number	Preservative

Sampling Personnel GW/CL/SH

Well Casing Volumes

Gal./Ft.				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

Laboratory Task Order No./P.O. No. _____ **CHAIN-OF-CUSTODY RECORD** Page ____ of ____

Project Number/Name NY000949.0014.00004

Project Location COLESVILLE NY.

Laboratory BUCK LABS

Project Manager STEVE FELDMAN

Sampler(s)/Affiliation G.W., SH, CL.

Sample ID/Location	Matrix	Date/Time Sampled	Lab ID	40ml VOA TCL VOC 2021 (HCl)	125ml Plastic TOC (H2SO4)	250ml Plastic Dissolved Mn, Fe (HNO3)	500ml Plastic Cl⁻, NO2, NO3, SO4 (unpres)			Remarks	Total
				ANALYSIS / METHOD / SIZE							
PW-13	L	7-23-02		2							2
PW-7		7-23-02		2							2
W-18S		7-23-02		2	1						3
W-20S		7-23-02		2							2
TB-7-23-02		7-23-02		2							2
W-14S		7-24-02		2	1	1	1				5
W-17S		7-24-02		2							2
W-16S		7-24-02		2	1						3
TB-7-24-02		7-24-02		2							2
W-7	↓	7-24-02		2	1						3

Sample Matrix: L = Liquid; S = Solid; A = Air

Total No. of Bottles/ Containers 29

				Seal Intact?
Relinquished by: [signature]	Organization: ARCADIS	Date 7/24/02	Time 6:00	
Received by: _____	Organization: _____	Date / /	Time _____	Yes No N/A
Relinquished by: _____	Organization: _____	Date / /	Time _____	Seal Intact?
Received by: _____	Organization: _____	Date / /	Time _____	Yes No N/A

Special Instructions/Remarks: REPORT TO DAVE STERN 1-631-391-5284

Delivery Method: ☐ In Person ☒ Common Carrier FED EX (SPECIFY) ☐ Lab Courier ☐ Other _____ (SPECIFY)

AG 05-12/01

CHAIN - OF - CUSTODY RECORD

Phone: (412) 826-5245 — **Microseeps, Inc. - 220 William Pitt Way - Pittsburgh, PA 15238** — Fax No. : (412) 826-3433

Company : Arcadis G+M
Co. Address : 88 Duryea Rd
Proj. Manager: Steve Feldman
Proj. Location: Colesville, NY
Proj. Number: NY000949.0014.00004
Phone # : 631 249 7600 Fax # : 631 249 7610

Sampler's signature : Shawn Healey

Parameters Requested: Permanent gases (CO2, O2, N2, CH4, CO), Ethane, Ethene

Results to : David Stern

Invoice to : David Stern

Cooler ID	Cooler Temp.

Sample ID	Sample Description	Date	Time	Comp.	Grab	# Cont.	Remarks
GMMW2	40 ML VOA VIAL	7/25/02			✓	6	
GMMW5					✓	2	
GMMW6					✓	2	
REP-1					✓	2	
PW-3					✓	2	
W-5					✓	2	
PW-4		↓			✓	2	
W165		7/24/02			✓	2	
W185	↓	7/24/02			✓		

Relinquished by :	Company :	Date :	Time :	Received by :	Company :	Date :	Time :
Shawn Healey	Arcadis G+M	7/25/02	1830				
Relinquished by :	Company :	Date :	Time :	Received by :	Company :	Date :	Time :
Relinquished by :	Company :	Date :	Time :	Received by :	Company :	Date :	Time :

WHITE COPY : Accompany Samples YELLOW COPY : Laboratory File PINK COPY : Submitter

Sampling of injection wells performed by Matt Bokus from ARCADIS (Albany office)

8/30/01
MSB
Glenville LF

✓

IW-13

DTW 57.82'
DTB 79.40'

Well Vol 4.316 gal

Vol. #	field pH
1	6.71
2	6.52
3	6.48

1005- Collect sample. Water light brown, silty.

IW-8

DTW 51.14'
DTB 71.59

Well Vol ~4.09 gal

Vol #	field pH
1	7.05
2	6.61
3	6.55

1055- Collect sample. light brown very silty

IW-3

DTW: 49.21'
DTB: 64.59' (Comp tube in well)

Well Vol: 3.47 gal

Vol	field pH
1	7.78
2	7.66
3	7.80

1135- Collect sample. light brown not as silty.

ARCADIS GERAGHTY & MILLER

Water Level/Pumping Test Record

Page 1 of 1

Project N4000949.0014.00004 Well — Site COLESVILLE

Screen Setting — Measuring Point Description — Height Above Ground Surface —

Static Water Level — Measured With — Date/Time 7-22-02

Drawdown ☐ Start of Test — Pumping Well —

Recovery ☐ End of Test —

Distance From Well Measured To Pumping Well® — Discharge Rate — Orifice —

Date & Time	Well Or t (mins)	Hold (ft)	Wet (ft)	Depth to Water (ft)	s (ft)	Dew. 1) Corr. (ft)	Art. 2) s' (ft)	PID	Q (gpm)	Mano-meter (in)	Remarks 3)
~~GMMW-2~~											
~~7-22-02~~	W-13			47.50				0.0			
11	PW-10			39.07				0.0			
15.05	PW-13			62.17				0.0			
15.11	PW-7			39.45				0.0			
15.18	W-6			50.57				0.0			
15.22	W-7			43.48				—	~~TOC~~	TD:	51.20
15.32	PW-4			17.77				0.0			
15.55	W-5			52.17				0.0			
15.59	GMMW-5			48.81				0.0			
	~~PW-15~~ GMMW-6			39.94				0.0			
	GMMW-2			33.61				0.0		4" steel	well }
	?			37.29				0.0		2" steel	well }
	W-20S			~~9.45~~ 10.11				0.0		TOT DEPTH	
	W-14S			9.45				0.0			
	W-16S			~~32.10~~ 32.10				0.0		(33.7~~9~~) - (1.5) = 32.2	
	W-17S			10.69				0.0			
	W-18			11.83 (TOC)				0.0		(TOC) - 1ft to TD	
	PW-5			1.27				0.0			
	PW-3										

1) Dewatering Correction 2) Equivalent Artesian Drawdown 3) pH, Spec. Cond., Temp., Weather, Sand, Turbidity, etc.

ARCADIS GERAGHTY & MILLER

Water Level/Pumping Test Record

Page ____ of ____

Project COLESVILLE LANDFILL Well ____ Site ____

Screen Setting ____ Measuring Point Description ____ Height Above Ground Surface ____

Static Water Level ____ Measured With ____ Date/Time 12-9-02

Drawdown ☐ Start of Test ____ Pumping Well ____

Recovery ☐ End of Test ____

Distance From Well Measured To Pumping Well® ____ Discharge Rate ____ Orifice ____

Date & Time	Well Or t (mins)	Held (ft)	Wet (ft)	Depth to Water (ft)	s (ft)	Dew. 1) Corr. (ft)	Art. 2) s' (ft)		Q (gpm)	Mano-meter (in)	Remarks 3)
	GMW2			38.11							
	GMW3			49.26							
	GMW6			40.18							
	W-5			52.51							
	PW-4			18.81							
	W-13			48.26							
	PW-13			63.20							
	PW-5			—							ARTESIAN
	W-6			51.54							
	W-7			44.61							
	W-18			11.38							
	PW-3			—							NO PVC WELL
	W-16S			9.30							
	W-17S			11.47							
	W-20S			8.72							
	W-14S			—							
	PW-10			40.31							

1) Dewatering Correction 2) Equivalent Artesian Drawdown 3) pH, Spec. Cond., Temp., Weather, Sand, Turbidity, etc.

ARCADIS GERAGHTY & MILLER

Water Sampling Log

Project: Colesville Landfill | Project No.: NY000949.0014.T7 | Page: 1 of 1

Site Location: Broome County, NY | Date: 8-22-02

Site/Well No.: SP-5 (culvert) | Replicate No.: | Code No.:

Weather: Immediately following 1-hour rainstorm | Sampling Time: Begin 7:35pm End 7:40pm

Evacuation Data

Measuring Point	
MP Elevation (ft)	
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	
Water-Level Elevation (ft)	
Water Column in Well (ft)	
Casing Diameter/Type	
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	Grab Sample
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	N/a

Field Parameters

Color	
Odor	
Appearance	
pH (s.u.)	
Conductivity (mS/cm)	
(µmhos/cm)	
Turbidity (NTU)	
Temperature (°C)	
Dissolved Oxygen (mg/L)	
Salinity (%)	
Sampling Method	Grab
Remarks	No flow of water; not enough rain

Constituents Sampled	Container Description	Number	Preservative
See COC			

Sampling Personnel: J. Hime

Well Casing Volumes

Gal./Ft.				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

Laboratory Task Order No./P.O. No. N/A

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

Project Number/Name Colesville Landfill

Project Location Broome County, NY

Laboratory Buck Environmental

Project Manager S. Feldman

Sampler(s)/Affiliation J. Hime

Sample ID/Location	Matrix	Date/Time Sampled	Lab ID	ANALYSIS / METHOD / SIZE: 40ml VOA vial TCL VOC 8021 HCL						Remarks	Total
SP-5 (culvert)	L	8-22-02 7:40pm		2							2
TB <8-22-02>	↓	↓		1							1
		"									

Sample Matrix: L = Liquid; S = Solid; A = Air

Total No. of Bottles/ Containers: 3

Relinquished by: [signature]	Organization: ARCADIS	Date 8/23/02	Time 2:23pm	Seal Intact?	
Received by: [signature]	Organization: Buck Labs	Date 8/23/02	Time 2:23pm	(Yes)	No N/A
Relinquished by:	Organization:	Date / /	Time	Seal Intact?	
Received by:	Organization:	Date / /	Time	Yes	No N/A

Special Instructions/Remarks: Please direct questions to Steve Feldman @ (631) 391-5244

Delivery Method: ☐ In Person ☐ Common Carrier _____ SPECIFY ☒ Lab Courier ☐ Other _____ SPECIFY

AG 05-12/01

ARCADIS GERAGHTY & MILLER

Water Sampling Log

Project: Colesville Landfill | Project No.: NY000949.0014 T7 | Page: 1 of 1

Site Location: Broome County, NY | Date: 8-29-02

Site/Well No.: SP-5 (culvert) | Replicate No.: | Code No.:

Weather: Raining | Sampling Time: Begin 9:15 End 9:25

Evacuation Data

Measuring Point	
MP Elevation (ft)	
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	
Water-Level Elevation (ft)	
Water Column in Well (ft)	
Casing Diameter/Type	
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	Grab Sample
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	n/a

Field Parameters

Color	
Odor	
Appearance	
pH (s.u.)	
Conductivity (mS/cm)	
(µmhos/cm)	
Turbidity (NTU)	
Temperature (°C)	
Dissolved Oxygen (mg/L)	
Salinity (%)	
Sampling Method	Grab
Remarks	

Constituents Sampled	Container Description	Number	Preservative
SEE COC			

Sampling Personnel: J. Hime

Well Casing Volumes

Gal./Ft.				
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

Laboratory Task Order No./P.O. No. K282102

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

Project Number/Name NY000940.0014.00005

Project Location COLESVILLE LANDFILL

Laboratory Buck Labs

Project Manager STEVE FELDMAN

Sampler(s)/Affiliation Arcadis

Sample ID/Location	Matrix	Date/Time Sampled	Lab ID	ANALYSIS / METHOD / SIZE: TOC						Remarks	Total
IW-13	L	8/30/02 1005		1							1
IW-8	L	8/30/02 1055		1							1
IW-3	L	8/30/02 1135		1							1

Sample Matrix: L = Liquid; S = Solid; A = Air

Total No. of Bottles/Containers: 3

Relinquished by: [signature]	Organization: Arcadis	Date 8/30/02	Time 1140	Seal Intact?	
Received by: Diana Hamilton	Organization: Buck Labs	Date 8/30/02	Time 1:10	Yes No (N/A)	
Relinquished by:	Organization:	Date / /	Time	Seal Intact?	
Received by:	Organization:	Date / /	Time	Yes No N/A	

Special Instructions/Remarks:

Delivery Method: ☒ In Person ☐ Common Carrier _____ (SPECIFY) ☐ Lab Courier ☐ Other _____ (SPECIFY)

AG 05-12/01

ARCADIS

Laboratory Task Order No./P.O. No. n/a

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

Project Number/Name: Colesville Landfill

Project Location: Broome County, NY

Laboratory: Buck Environmental

Project Manager: S. Feldman

Sampler(s)/Affiliation: J. Hime

Sample ID/Location	Matrix	Date/Time Sampled	Lab ID	ANALYSIS / METHOD / SIZE: 40mL VOA vial TCL VOC 8021 HCL preserved						Remarks	Total
SP-5 (culvert)	L	8-29-02		2							2
TB (date)	↓	↓		1							1
										Total No. of Bottles/ Containers	3

Sample Matrix: L = Liquid; S = Solid; A = Air

Relinquished by: Joan Fitz	Organization: ARCADIS	Date 8/29/02	Time 11:00am	Seal Intact?	
Received by: Helena Hamilton	Organization: Buck Labs	Date 8/29/02	Time 11:00am	Yes	No N/A
Relinquished by:	Organization:	Date / /	Time	Seal Intact?	
Received by:	Organization:	Date / /	Time	Yes	No N/A

Special Instructions/Remarks:

Delivery Method: ☒ In Person ☐ Common Carrier (SPECIFY) ☐ Lab Courier ☐ Other (SPECIFY)

AG 05-12/01

ARCADIS

Groundwater Sampling Form

Project/No. ______ Well GMMW-5 Date 12/10/02

Screen Setting ______ Measuring Point Description ______ Casing Diameter (inches) ______

Static Water Level 48.78 Measured Width ______ Well Materials PVC / ST. Steel

Total depth ______ Pump On: 7:44 Pump Intake: ______

Purge Method Pump Off: ______ **Volumes Purged** 4 gal

Centrifugal ______ **Sample Time:** 8:30

Submersible X

Other ______ Bailer Type: ______ Sampled By: DD/TM

Time	Minutes Elapsed	Rate (ML)	DTW	Gallons Purged	pH	Cond. ms/sec	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C)	REMARKS
7:44	0	600	53.82		6.48	0.272	76.8	-32	2.73	8.5	Water Clear
	5	400	54.82		6.63	0.291	39.2	-59	1.74	5.8	Strong odor
	10	300	54.97		6.66	0.284	34.0	-63	1.54	4.5	
	15	300	54.99		6.64	0.272	34.9	-66	1.31	4.9	
	20	300	55.52		6.60	0.243	37.4	-69	1.21	8.5	
	25	300	55.90		6.62	0.258	36.4	-71	1.37	7.5	
	30	300	56.59		6.58	0.242	28.7	-74	1.36	10.5	

ARCADIS

Groundwater Sampling Form

Project/No. _____ Well GMMW-5 Date 12/10/02

Screen Setting _____ Measuring Point Description _____ Casing Diameter (inches) _____

Static Water Level 48.78 Measured Width _____ Well Materials PVC / ST. Steel

Total depth _____ Pump On: 7:44 Pump Intake: _____

Purge Method Pump Off: _____ **Volumes Purged** 4 gal

Centrifugal _____ **Sample Time:** 8:30

Submersible X

Other _____ Bailer Type: _____ Sampled By: DD/TM

Time	Minutes Elapsed	Rate (ML)	DTW	Gallons Purged	pH	Cond. ms/sec	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C)	REMARKS
7:44	0	600	53.82		6.48	0.272	76.8	-32	2.73	8.5	Water Clear
	5	400	54.82		6.63	0.291	39.2	-59	1.74	5.8	Strong odor
	10	300	54.97		6.66	0.284	34.0	-63	1.54	4.5	
	15	300	54.99		6.64	0.272	34.9	-66	1.31	4.9	
	20	300	55.52		6.60	0.243	37.4	-69	1.21	8.5	
	25	300	55.90		6.62	0.258	36.4	-71	1.37	7.5	
	30	300	56.59		6.58	0.242	28.7	-74	1.36	10.5	

ARCADIS

Groundwater Sampling Form

Project/No. _____ Well W-5 Date 12/10/02

Screen Setting _____ Measuring Point Description _____ Casing Diameter (inches) _____

Static Water Level 52.52 Measured Width _____ Well Materials PVC / ST. Steel

Total depth _____ Pump On: 9:07 Pump Intake: _____

Purge Method Pump Off: _____ **Volumes Purged**____ 4 gal

Centrifugal _____ **Sample Time:** 9:45

Submersible X

Other _____ Bailer Type: _____ Sampled By: DD/TM

Time	Minutes Elapsed	Rate (ML)	DTW	Gallons Purged	pH	Cond. ms/sec	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C)	REMARKS
9:07	0	300	53.30		6.53	0.577	133	-37	2.80	7.4	Clear
	5	200	54.65		6.63	0.607	96.7	-62	1.57	5.8	
	10	150	54.78		6.64	0.620	93.1	-68	1.41	4.5	
	15	150	54.81		6.67	0.624	90.8	-73	1.40	4.9	

ARCADIS

Groundwater Sampling Form

Project/No. _____ Well GMMW-2 Date 12/10/02

Screen Setting _____ Measuring Point Description _____ Casing Diameter (inches) _____

Static Water Level 38.11 Measured Width _____ Well Materials PVC / ST. Steel

Total depth _____ Pump On: 11:05 Pump Intake: _____

Purge Method Pump Off: _____ **Volumes Purged** 4 gal

Centrifugal _____ **Sample Time:** 11:45

Submersible X

Other _____ Bailer Type: _____ Sampled By: DD/TM

Time	Minutes Elapsed	Rate (ML)	DTW	Gallons Purged	pH	Cond. ms/sec	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C)	REMARKS
11:05	0	600	40.84		7.23	0.351	503	31	4.09	9.2	Clear
	5	520	41.53		6.72	0.338	430	25	1.82	9.7	
	10	500	41.57		6.61	0.326	263	27	1.61	11.2	
	15	500	41.59		6.63	0.326	136	36	2.07	11.8	
	20	500	41.59		6.62	0.328	111	44	2.24	11.6	
	25	500	41.55		6.64	0.331	70.9	52	2.37	11.8	
	30	450	41.53		6.64	0.333	52.9	58	2.39	11.8	
	35	450	41.49		6.63	0.331	41.8	63	2.32	11.8	
	40	450	41.48		6.63	0.331	40.0	64	2.33	11.9	

ARCADIS

Groundwater Sampling Form

Project/No. ____ Well GMMW-6 Date 12/10/02

Screen Setting ____ Measuring Point Description ____ Casing Diameter (inches) ____

Static Water Level 40.63 Measured Width ____ Well Materials PVC / ____ ST. Steel

Total depth ____ Pump On: 10:00 Pump Intake: ____

Purge Method Pump Off: ____ **Volumes Purged** ____ 4 gal

Centrifugal ____ **Sample Time:** 10:35

Submersible ___ X

Other ____ Bailer Type: ____ Sampled By: DD/TM

Time	Minutes Elapsed	Rate (ML)	DTW	Gallons Purged	pH	Cond. ms/sec	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C)	REMARKS
10:00	0	400	43.47		6.74	1.02	>999	-10	2.76	7.8	
	5	400	44.30		6.74	1.04	>999	-20	1.58	8.2	
	10	350	44.66		6.77	1.06	>999	-28	1.43	7.7	
	15	300	44.55		6.78	1.05	>999	-29	1.45	7.4	
	20	300	44.57		6.78	1.02	728	-29	1.46	8.8	
	25	350	44.63		6.78	1.02	550	-30	1.55	8.8	
	30	350	44.69		6.79	1.00	560	-30	1.61	10.0	
	35	350	44.69		6.79	1.01	550	-30	1.66	10.4	

ARCADIS

Groundwater Sampling Form

Project/No. _____ Well PW-4 Date 12/10/02

Screen Setting _____ Measuring Point Description _____ Casing Diameter (inches) _____

Static Water Level 18.78 Measured Width _____ Well Materials PVC / ST. Steel

Total depth _____ Pump On: 12:25 Pump Intake: _____

Purge Method Pump Off: _____ **Volumes Purged** 4 gal

Centrifugal _____ **Sample Time:** 13:00

Submersible X

Other _____ Bailer Type: _____ Sampled By: DD/TM

Time	Minutes Elapsed	Rate (ML)	DTW	Gallons Purged	pH	Cond. ms/sec	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C)	REMARKS
12:25	0	400	19.17		6.26	0.312	173	160	6.39	10.2	
	5	400	19.38		6.09	0.312	80.6	157	4.92	11.0	
	10	400	19.59		6.07	0.316	25.5	154	3.24	12.3	
	15	400	19.74		6.10	0.332	13.0	149	2.40	13.0	
	20	400	19.80		6.10	0.353	12.1	146	1.75	13.1	
	25	400	19.82		6.10	0.359	10.2	140	1.57	13.3	
	30	400	19.82		6.09	0.358	8.0	137	1.54	13.5	

ARCADIS

Groundwater Sampling Form

Project/No. _____ Well PW-10 Date 12/10/02

Screen Setting _____ Measuring Point Description _____ Casing Diameter (inches) _____

Static Water Level 40.30 Measured Width _____ Well Materials PVC / ST. Steel

Total depth _____ Pump On: 15:40 Pump Intake: _____

Purge Method Pump Off: _____ **Volumes Purged** 4 gal

Centrifugal _____ **Sample Time:** 16:20

Submersible X

Other _____ Bailer Type: _____ Sampled By: DD/TM

Time	Minutes Elapsed	Rate (ML)	DTW	Gallons Purged	pH	Cond. ms/sec	TURB (NTUs)	Redox (mV)	Diss. O2 (mg/L)	TEMP. (C)	REMARKS
15:40	0	600	40.32		6.59	0.260	>999	2	3.43	8.3	
	5	600	40.32		6.50	0.258	>999	-19	1.51	8.7	
	10	500	40.32		6.48	0.259	>999	-229	1.32	8.7	
	15	500	40.32		6.47	0.256	237	-32	1.28	8.9	
	20	500	40.32		6.47	0.251	63	-37	1.29	9.1	
	25	500	40.32		6.47	0.248	58	-38	1.27	9.1	

ARCADIS

Infrastructure, buildings, environment, communications

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To: KEN ZEGEL

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ENVIRONMENTAL

Fax: (516) 249-7610

Total pages:

Date: 1/10/03

Subject: COLESVILLE LANDFILL
FIELD LOGS - DEC. 9-10, 2002

ARCADIS Project No.: 7
NY000949.0015

From: DD

Phone Number: x13

If you do not receive all pages, please call to let us know as soon as possible.

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Part of a bigger picture

Jan-10-03 09:29 ARCADIS Geraghty & Miller 518 452 4398 P.02

12/9/02 Colesville

DD/TM

915: Pick up Sample Bottles from Buck Labs

945: DD/TM Arrive on Site, Meet w/ Jason

Go over System Layout

H_2O Levels

GMMW-2:	38.11	W-7:	44.61
GMMW-5:	49.76	W-18:	11.38
GMMW-6:	40.18	PW-3:	No PVC well?
W-5:	52.81	W-16S:	9.30
PW-4:	18.81	W-17S:	11.47
W-8:	48.26	W-20S:	8.72
PW-1:	63.20	W-14S:	
PW-5:	Artesian	PW-10:	40.81
W-6:	51.54		

1354 - SP-5 - Orange Cloudy w/ Odors

Start Pump. Purge out ≈ 5/7.5 gal - Black H_2S w/ Sulfur Odor

Allow to Recharge, and Sample

pH: 6.06

DO: 4.90

Cond: .572

ORP: 51

Temp: 3.6

Turb: 487

- Sample Collected at 1405

Jan-10-03 09:30 ARCADIS Geraghty & Miller 518 452 4398 P.03

12/9/02 — Colesville

1420 Pull IW-3 Pipe
Grab Sample w/ 2" Bailer From Middle of Screened Interval
Sample IW-3 @ 1445

Time	pH	Cond	DO	Temp	ORP
0	4.78	.892	2.32	9.59	-393.9
5	4.81	.867	2.12	9.63	-428.8
10	4.85	.844	2.23	9.51	-433.4
15	4.88	.831	2.26	9.55	-435.8
20	4.85	.822	2.25	7.52	-435.0

1515 Take Field Readings On Stream F-6 Surface Water

pH	Cond	Turb	DO	Temp	ORP
6.45	.110	C	13.55	0.3	127

1610 Sample Stream SF-3

pH	Cond	Turb	DO	Temp	ORP
6.37	.198	0.7	8.57	3.3	116

12/9/02 — Colesville

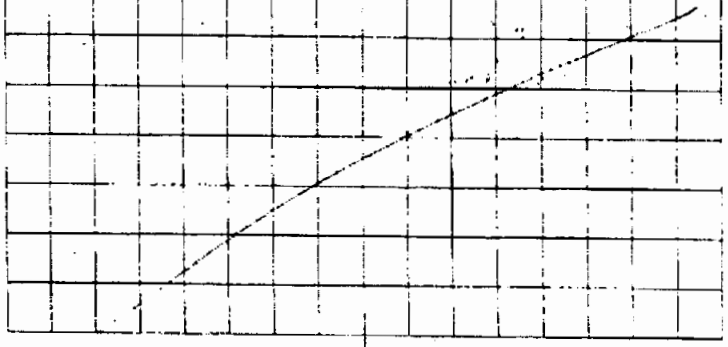
1615 — Sample SF-2 w/ DUP-1

pH	Cond	Turb	DO	Temp	ORP
6.38	.170	C	3.89	4.4	35

1620 - Sample SF-4

pH	Cond	Turb	DO	Temp	ORP
6.50	2.586	125	5.80	1.8	17

1700 Collect Treatment System H2O Sample
1740 Collect Effluent Air Sample w/ Silva Canister
800 Re-do Canister Tomorrow
* Attempted To Sample SMW-5 But Pump Froze Up - Will Try All Tomorrow
1840 Depart Site



12/10/02 — Colesville

WEATHER: SUN 10°F

700 NO/JH/TM ARRIVE ON SITE

TRY OUT PUMP - WARM: WORKS

CALIBRATE U-22 w/ AUTOCAL SOLUTION = OK

GMW-5

DTW: 48.78 INITIAL FLOW: 600

START: 744

pH	Cond	Temp	DO	Turb	ORP	Time	DTW	Flow
6.46	.272	96.8	2.23	8.5	3	0	53.2	44
6.63	.291	39.2	1.74	5.8	-59	5	54.82	300
6.66	.284	34.0	1.54	4.5	-63	10	54.97	300
6.64	.272	34.9	1.31	4.9	-68	15	54.99	300
6.60	.248	32.4	1.21	8.5	-69	20	55.52	300
6.62	.258	34.4	1.37	7.5	-71	25	55.90	300
6.58	.242	28.7	1.34	10.5	-74	30	56.59	300

830 - COLLECT SAMPLES W/ MS/MSD; H2O CLEAR, STRONG ODORS

12/10/02 — COLESVILLE

W-6 BTW 62.62' TOTAL FLOW 300

START: 907

pH	Cond	Temp	DO	Turb	ORP	Time	DTW	Flow
6.53	.572	193	2.80	7.4	-37	0	55.30	300
6.63	.607	96.7	1.57	5.8	-62	5	54.65	300
6.64	.620	98.1	1.41	4.8	-68	10	54.70	150
6.67	.624	98.8	1.40	4.9	-73	15	54.81	150
						20		
						25		
						30		

* TOP OF PUMP IS AT 57.00' = 2.2' OF H2O - FLOW IS SLOWING - WILL SAMPLE AFTER THE WELL RECHARGES

930 → START ROW. PUMP 9:23 DTW 54.84

945 - SAMPLE - H2O IS CLEAR, LT. GREY W/ no/ODOR. DTW AT 945 WAS 53.01

Jan-10-03 09:31 ARCADIS Geraghty & Miller 518 452 4398 P.05

12/16/02 — Crestline

GMW-6 DTW: 40.63 Start Time: 1000

Initial Flow: 600

pH	Cond	Turb	DO	Temp	ORP	Time	Dtw	Flow
6.74	1.02	>999	2.26	7.8	-10	0	43.42	400
6.74	1.04	>999	1.58	8.2	-20	5	44.30	400
6.77	1.05	>999	1.43	7.7	-28	10	44.66	350
6.78	1.05	>999	1.45	7.4	-29	15	44.55	300
6.78	1.02	728	1.46	8.8	-29	20	44.57	300
6.78	1.02	550	1.55	8.8	-30	25	44.63	350
6.79	1.00	560	1.61	10.0	-30	30	44.69	350
6.79	1.01	550	1.66	10.4	-30	35	44.69	350

Sample @ 1035 water is turbid, brown in color Silty, w/ no odors.

Dup-1 Collected

12/10/02 — Sr Crestliner

GMW-3 DTW: 38.11 Initial Flow: 600

Start: 1105

pH	Cond	Turb	DO	Temp	ORP	Time	Dtw	Flow
7.23	.351	503	4.09	9.2	31	0	40.84	600
6.72	.338	430	1.82	9.7	25	5	41.53	520
6.61	.326	265	1.61	11.2	27	10	41.57	500
6.63	.326	136	2.07	11.8	36	15	41.57	500
6.62	.328	111	2.24	11.5	44	20	41.57	500
6.64	.33	70.9	2.37	11.9	52	25	41.55	500
6.64	.335	52.9	2.37	11.8	58	30	41.53	450
6.63	.331	46.8	2.32	11.8	63	35	41.49	450
6.63	.331	40.0	2.33	11.9	64	40	41.48	450

FB-1 Collected @ 1100

FB-1200Z

Sample Collected @ 1145 - H_2O Clear - Sed. Gray w/ No Odor

12/10/02 — Colesville

1200 · IW-13 Drop Tube Pulled And Sampled For TOC by 2" Bailer - Grab Sample

YSI-Readings

Time	Temp	Cond	DO	ORP	pH
1355	9.97	.659	4.3	-449.4	6.10
1400	9.99	.658	4.3	-424.0	6.11
1405	9.99	.654	4.2	-405.4	6.11
1411	9.97	.650	4.1	-410.1	6.11
1418	9.99	.646	4.1	-399.8	6.12

PW-4 · Initial Flow: 400 · Time: 1225

DTW: 18.78

pH	Cond	Turb	DO	Temp	ORP	Time	DTW	Flow
6.26	.312	173	6.39	10.2	160	0	19.17	400
6.09	.312	90.6	4.92	11.9	157	5	19.38	400
6.07	.316	25.5	3.24	12.3	154	10	19.59	400
6.10	.332	13.0	2.40	13.0	149	15	19.74	400
6.10	.353	12.1	1.75	13.1	146	20	19.80	400
6.10	.359	10.2	1.57	13.3	140	25	19.82	400
6.09	.358	8.0	1.54	13.5	137	30	19.82	400

Sample @ 1300 - H_2O slightly yellow w/ sl. organic odor

12/10/02 — Colesville

IW-9 - Drop Tube Removed And Sampled For TOC By 2" Bailer - Grab Sample

YSI Readings

No Readings → Drop Tube Broke on Removal → Depth to Bottom PVC is 32.5'

Insert 30' Apple Stone Attached To Piping → No Sample Taken.

PW-10 · DTW: 40.20 · Start Time: 1540

Initial Flow: 600

pH	Cond	Turb	DO	Temp	ORP	Time	DTW	Flow
6.59	.260	7999	3.43	8.3	2	0	40.32	600
6.50	.258	7999	1.51	8.7	-19	5	40.32	600
6.48	.259	>999	1.32	8.7	-27	10	40.32	500
6.47	.256	237	1.28	8.9	-32	15	40.32	500
6.47	.251	63	1.29	9.1	-37	20	40.32	500
6.47	.248	58	1.27	9.1	-38	25	40.32	500

· Sample @ 1620 - H_2O slt. brown w/ no odor. H_2O was red at start of purging

12/10/02 GANSEVILLE

1745 INSERT IW-8 DEEP TUBE → BREAKS WHEN INSERTING, CATCH BROKEN PIECE; REMOVE, LAY BESIDE FENCE ON GROUND → 10' INSERTED ON PITLESS IN WELL.

1800 SAMPLE "CONDENSATE" FROM SYSTEM 55g DRUM → FE AND SVOC

ACK COOLERS / LOAD CAR

1900 BO DEPARTS - WILL SEND COOLERS

1900 MIXING FOR INJECTION SYSTEMS

GO OVER SYSTEM W/ JH

2015 TH DEPARTS SITE

TH

Memorandum

To: Ken Zegel

Cc: Steve Feldman

From: Jason Hime

Subject: Downhole probe/YSI parameters recorded 11/20/2002 at the Colesville Landfill

On November 20, 2002, between the hours of 3:30pm and 5:30pm, six groundwater locations were sampled at the Colesville Landfill ERD site in Harpursville, NY. The sampling locations were as follows: GMMW-5, GMPW-1, PW-11, W-5, PW-2 and SP-5. The instruments used to record parameters at these locations were the M-scope, downhole probe and the YSI owned by the ARCADIS Melville office. The weather during sampling was clear and the temperature was between 45 and 55 degrees Fahrenheit. Parameters recorded were: Depth to Water, Temperature, pH, Conductivity, REDOX and Dissolved Oxygen. The YSI was allowed to stabilize a minimum of 10 minutes after the downhole probe reached the sampling depth. The field sampler was Jason Hime of the ARCADIS Melville office. One note that must be mentioned is that during calibration the Oxidation Reduction Potential was calibrated at 200 mV at 55 degrees Fahrenheit. The calibration solution was rated as 200 to 275 mV at 77 degrees Fahrenheit.

ARCADIS G&M, Inc.

Low-Flow Groundwater Sampling Log

Project Number: NB949.14 Task: 6 Well ID: GMMW-5
Date: 11/20/02 Sampled By: JH
Sampling Time: 3:30 pm Recorded By: JH
Weather: 55° sunny Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI Serial #:

Purging Information
Casing Material: PVC Purge Method: N/a
Casing Diameter: 2" Screen Interval (ft bmp): Top 53' Bottom 63'
~~Sounded~~ Depth (ft bmp): 68' ~~Pump Intake~~ Probe Depth (ft bmp): 58'
Depth to Water (ft bmp): 49.5' Purge time Start: Finish:

Field Parameter Measurements Taken During Purging

Time	Minutes Elapsed	Rate (mL/min)	Volume Purged	Temp (°C)	pH (SI Units)	Conductivity (mS/cm)	REDOX (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)	Comments
330	—	-	—	9.73	6.72	0.352	-190.5	~~20.0%/17.38~~ 14.2%/159	—	—	
340	-	-	—	9.73	6.75	0.352	-207	12.2%/1.38	—		
345				9.73	6.76	0.352	-215.5	9.5%/107	-	—	

Sample Condition Color: Odor: Appearance:
Sample Collection

Parameter:	Container:	No.	Preservative:

PID Reading —

Comments Calibrated ORP to 200mV at 55°F
Stabilized for 15 minutes

ARCADIS G&M, Inc.

Low-Flow Groundwater Sampling Log

Project Number: NY949.14 Task: 6 Well ID: GMPW-1
Date: 11/20/02 Sampled By: JH
Sampling Time: 4:05 pm Recorded By: JH
Weather: 50°, clear Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI Serial #:

Purging Information
Casing Material: ~~Steel~~ Steel Purge Method: N/A
Casing Diameter: 4" Screen Interval (ft bmp): Top ~~45'~~ Bottom ~~25'~~
Sounded Depth (ft bmp): — ~~Pump Intake~~ Probe Depth (ft bmp): ~~45'~~ 10' from bottom
Depth to Water (ft bmp): 48.12' Purge time Start: Finish:

Field Parameter Measurements Taken During Purging

Time	Minutes Elapsed	Rate (mL/min)	Volume Purged	Temp (°C)	pH (SI Units)	Conductivity (mS/cm)	REDOX (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)	Comments
4:05	—	—	—	9.60	7.46	0.316	210.3	4.48/1mg/L	—	—	

Sample Condition Color: Odor: Appearance:
Sample Collection
Parameter: Container: No. Preservative:

PID Reading

Comments: Let stabilize for 15 minutes

ARCADIS G&M, Inc.

Low-Flow Groundwater Sampling Log

Project Number: NY 949.14 Task: 6 Well ID: PW-11
Date: 11/20/02 Sampled By: JH
Sampling Time: 4:30 pm Recorded By: JH
Weather: 50° clear Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI Serial #:

Purging Information
Casing Material: 2" Purge Method: n/a
Casing Diameter: PVC Screen Interval (ft bmp): Top 33' Bottom 73'
Sounded Depth (ft bmp): 73' ~~Pump Intake~~ Probe Depth (ft bmp): 10' off bottom
Depth to Water (ft bmp): 53.78 Purge time Start: Finish:

Field Parameter Measurements Taken During Purging

Time	Minutes Elapsed	Rate (mL/min)	Volume Purged	Temp (°C)	pH (SI Units)	Conductivity (mS/cm)	REDOX (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)	Comments
4:30	—	—	—	9.64	6.83	0.636	-133.2	7.98 0.88	—	—	

Sample Condition Color: Odor: Appearance:
Sample Collection
Parameter: Container: No. Preservative:

PID Reading
Comments: stabilized 10 minutes

ARCADIS G&M, Inc.

Low-Flow Groundwater Sampling Log

Project Number: NY 949.14 | Task: 6 | Well ID: W-5
Date: 11/20/02 | Sampled By: JH
Sampling Time: 4:40 | Recorded By: JH
Weather: 45° clear | Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI | Serial #:

Purging Information
Casing Material: 2" PVC | Purge Method: N/A
Casing Diameter: | Screen Interval (ft bmp): Top 44 Bottom 59
Sounded Depth (ft bmp): 56.8' | ~~Pump intake~~ probe Depth (ft bmp): 4' off bottom
Depth to Water (ft bmp): 52.7 | Purge time Start: Finish:

Field Parameter Measurements Taken During Purging

Time	Minutes Elapsed	Rate (mL/min)	Volume Purged	Temp (°C)	pH (SI Units)	Conductivity (mS/cm)	REDOX (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)	Comments
4:40	~	~	~	9.70	6.78	0.716	-123.7	7.7%/0.97	~	~	~

Sample Condition | Color: | Odor: | Appearance:
Sample Collection
Parameter: | Container: | No. | Preservative:

PID Reading

Comments: Let stabilize for 10 minutes

ARCADIS G&M, Inc.

Low-Flow Groundwater Sampling Log

Project Number: NY949.14 Task: 6 Well ID: PW-2
Date: 11/20/02 Sampled By: JH
Sampling Time: 5:60 pm Recorded By: JH
Weather: 45° clear Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI Serial #:

Purging Information
Casing Material: 2" PVC Purge Method: n/a
Casing Diameter: Screen Interval (ft bmp): Top 5 Bottom 20
Sounded Depth (ft bmp): 20.63' ~~Pump Intake~~ Probe Depth (ft bmp): 10' off bottom
Depth to Water (ft bmp): 6.6' Purge time Start: Finish:

Field Parameter Measurements Taken During Purging

Time	Minutes Elapsed	Rate (mL/min)	Volume Purged	Temp (°C)	pH (SI Units)	Conductivity (mS/cm)	REDOX (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)	Comments
5:00	—	—	—	10.54	8.06	0.186	-81.2	6.58/0.71	—	—	—

Sample Condition Color: Odor: Appearance:
Sample Collection
Parameter: Container: No. Preservative:

PID Reading

Comments: Stabilized for 5 minutes
Height of stick-up above bad surface was 33"

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Low-Flow Groundwater Sampling Log

Project Number: NY949.14 Task: 6 Well ID: SP-5
Date: 11/20/02 Sampled By: JH
Sampling Time: 5:10 Recorded By: JH
Weather: 45° clear Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI Serial #:

Purging Information
Casing Material: n/a Purge Method: n/a
Casing Diameter: Screen Interval (ft bmp): Top n/a Bottom n/a
Sounded Depth (ft bmp): Pump ~~Intake~~ probe Depth (ft bmp): ~10" below surface
Depth to Water (ft bmp): ↓ Purge time Start: Finish:

Field Parameter Measurements Taken During Purging

Time	Minutes Elapsed	Rate (mL/min)	Volume Purged	Temp (°C)	pH (SI Units)	Conductivity (mS/cm)	REDOX (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)	Comments
5:10	—	—	—	9.51	6.75	0.584	-92.2	1.19%/1.34	—	—	—

Sample Condition Color: Odor: Appearance:
Sample Collection
Parameter: Container: No. Preservative:

PID Reading

Comments: oil coating, orange color let stabilize for 10 minutes

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Appendix C

New York State Department of Environmental Conservation DAR-1 Air Modeling Data

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Table C-1. NYSDEC DAR-1 Air Modeling Data, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Parameters for 12/10/2002 Sampling Event

Discharge Temperature		T	513.67	°R
Ambient Temperature		Ta	494.67	°R
Stack Diameter		D	6	in
Stack Radius		R	0.25	ft
Stack Area		A	0.20	ft^2
Exit Velocity		V	2.17	fps
Exit Flow		Q	26	acfm
Exit Flow		Q	26	scfm
Stack Height		h_s	17	ft
Building Height		h_b	13.25	ft
Ratio of Heights		h_s/h_b	1.28	
Plume rise credit? $h_s/h_b > 1.5$?		(If no, $h_e=h_s$)	(If Yes, $h_e = h_s + 1.1 (F_m)^{1/3}$)	
Momentum Flux	Fm = Ta/T * V2 * R2		n/a	ft^4/s^2
Effective Stack Height		h_e	17.00	ft
Reduction Factor? $2.5 > h_s/h_b > 1.5$?			No, do not reduce impact	
Actual Annual Impact		C_a	$RF*6*Q_a/h_e^{2.25}$	ug/m^3
Mass Flow		Q_a	S lbs emitted for last 12 months	

fps: feet per second
acfm: actual cubic feet per minute
ug/m^3: micrograms per cubic meter
lb/yr: pounds per year
lb/hr: pounds per hour
ppb: parts per billion

Notes/Assumptions:

1. The stack temperature is 54°F based on recorded parameters.
2. The ambient temperature is approximately 35°F, the average temperature during sampling.
3. Calculations assume that the system will run with the maximum allowable concentrations between quarterly readings.
4. AGC refers to the Annual Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated July 12, 2000.
5. To be conservative the lower detection limit was used for compounds that were below the limit of detection, but are found in the influent groundwater of the Groundwater Remediation System.

Table C-1. NYSDEC DAR-1 Air Modeling Data, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Calculation of AGC based on 12/10/2002 Sampling Event

Compounds	CAS Numbers	Maximum Limit on C_a (AGC[4])	Maximum Mass Flow Q_a	Lab Data 12/10/02	Detection Limit Used[5]	Actual Emissions C_a	Actual Mass Flow per Hour	Actual Mass Flow per Year	**Percent of AGC**
		ug/m^3	lb/yr	ppb		ug/m^3	lb/hr	lb/yr	%
Vinyl Chloride	75-01-4	0.02	1.96	12	*	31.18	3.06E-06	0.02612	**1.34**
Chloroethane(Ethyl Chloride)	75-00-3	10,000	978,044.97	12	*	32.19	3.16E-06	0.02696	**0.00**
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4	0.02	1.96	12	*	48.36	4.75E-06	0.04051	**2.07**
Methylene Chloride(Dichloromethane)	75-09-2	2.10	205.39	19		67.09	6.59E-06	0.05620	**0.03**
1,1-Dichloroethane	75-34-3	20	1,956.09	50		205.72	2.02E-05	0.17232	**0.01**
cis-1,2 - Dichloroethylene	156-59-2	1,900	185,828.54	48		193.46	1.90E-05	0.16205	**0.00**
Chloroform	67-66-3	0.04	4.21	12	*	59.56	5.85E-06	0.04989	**1.19**
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6	1,000	97,804.50	53		293.96	2.89E-05	0.24624	**0.00**
Benzene	71-43-2	0.13	12.71	12	*	38.97	3.83E-06	0.03264	**0.26**
Trichloroethene	79-01-6	0.45	44.01	36		196.65	1.93E-05	0.16473	**0.37**
Toluene	108-88-3	400	39,121.80	12	*	45.96	4.51E-06	0.03850	**0.00**
Ethyl benzene	100-41-4	1,000	97,804.50	12	*	52.96	5.20E-06	0.04436	**0.00**
m,p-Xylene	108-38-3/106-42-3	700	68,463.15	12	*	51.95	5.10E-06	0.04352	**0.00**
o-Xylene	95-47-6	700	68,463.15	12	*	52.96	5.20E-06	0.04436	**0.00**
1,2,4-Trimethylbenzene	95-63-6	290	28,363.30	12	*	59.96	5.89E-06	0.05022	**0.00**
2-Propanol (Isopropyl alcohol)	67-63-1	7,000	684,631.48	12	*	29.98	2.95E-06	0.02511	**0.00**
Dichlorodifluoromethane(Freon 12)	75-71-8	12,000	1,173,653.96	12	*	29.98	2.87E-06	0.00213	**0.00**

fps: feet per second
acfm: actual cubic feet per minute
ug/m^3: micrograms per cubic meter
lb/yr: pounds per year
lb/hr: pounds per hour
ppb: parts per billion

Notes/Assumptions:

1. The stack temperature is 54°F based on recorded parameters.
2. The ambient temperature is approximately 35°F, the average temperature during sampling.
3. Calculations assume that the system will run with the maximum allowable concentrations between quarterly readings.
4. AGC refers to the Annual Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated July 12, 2000.
5. To be conservative the lower detection limit was used for compounds that were below the limit of detection, but are found in the influent groundwater of the Groundwater Remediation System.

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Table C-2: NYSDEC Dar-1 Air Modeling Data, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Calculation of the Short-Term Guideline Concentration (SGC) for Sampling Event on 12/10/2002

Compounds	CAS Numbers	Maximum Limit (SGC)	Analytical Concentration	Detection Limit Used	Actual Emissions C_a	Mass/hour	Maximum Potential Impact (Step III.A.3 in DAR-1)	Short Term Impact (Step III.A.5 in DAR-1)	Percent of the SGC
		(ug/m^3)	(ppb)		(ug/m^3)	(lb/hr)	(ug/m^3)	(ug/m^3)	(%)
Vinyl Chloride	75-01-4	180,000	12	*	31.18	1.94E-05	0.0033	0.21536	1.2E-04
Chloroethane(Ethyl Chloride)	75-00-3	--	12	*	32.19	2.00E-05	0.0034	0.22232	NA
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4	--	12	*	48.36	3.01E-05	0.0051	0.33407	NA
Methylene Chloride(Dichloromethane)	75-09-2	14,000	19		67.09	4.17E-05	0.0071	0.46342	3.3E-03
1,1-Dichloroethane	75-34-3	--	50		205.72	1.28E-04	0.0219	1.42096	NA
cis-1,2 - Dichloroethylene	156-59-2	--	48		193.46	1.20E-04	0.0206	1.33628	NA
Chloroform	67-66-3	150	12	*	59.56	3.70E-05	0.0063	0.41139	2.7E-01
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6	68,000	53		293.96	1.83E-04	0.0312	2.03050	3.0E-03
Benzene	71-43-2	1,300	12	*	38.97	2.42E-05	0.0041	0.26915	2.1E-02
Trichloroethene	79-01-6	54,000	36		196.65	1.22E-04	0.0209	1.35833	2.5E-03
Toluene	108-88-3	37,000	12	*	45.96	2.86E-05	0.0049	0.31746	8.6E-04
Ethyl benzene	100-41-4	54,000	12	*	52.96	3.29E-05	0.0056	0.36580	6.8E-04
m,p-Xylene	108-38-3/106-42-3	4,300	12	*	51.95	3.23E-05	0.0055	0.35884	8.3E-03
o-Xylene	95-47-6	4,300	12	*	52.96	3.29E-05	0.0056	0.36580	8.5E-03
1,2,4-Trimethylbenzene	95-63-6	--	12	*	59.96	3.73E-05	0.0064	0.41415	NA
2-Propanol (Isopropyl alcohol)	67-63-0	120,000	12	*	29.98	1.86E-05	0.0032	0.20709	1.7E-04
Dichlorofluoromethane(Freon 12)	75-71-8	--	12	*	60.31	3.75E-05	0.0064	0.41660	NA

ug/m^3: Micrograms per cubic meter
ppb: parts per billion
*: Analyte concentration below detection limit, detection limit was used in calculations
lb/hr: pounds per hour
--: No SGC listed for compound

Notes:

1. DAR-1 refers to DAR-1 AGC/SGC Tables dated 12 July 2000.
2. SGC refers to the Short-Term Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated July 12, 2000.
3. To be conservative the lower detection limit was used for compounds that were below the limit of detection, but are found in the influent groundwater of the Groundwater Remediation System.

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Appendix D

Automated Reagent Injection
System Operating Parameters

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Table D-1. Automated Reagent Injection System Summary Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Summary of Automated Reagant Injections

Date	Total Quantity of Molasses Solution Injected (gal.)	Total Quantity of Molasses Injected (gal.)	Total Quantity of Rinse Water Injected (gal.)
9/19/2002	629	103	157
9/26/2002	629	103	157
10/4/2002	629	103	157
10/11/2002	629	87	157
10/18/2002	629	87	157
10/25/2002	629	87	157
11/21/2002	629	91	157
12/2/2002	629	87	157
12/10/2002	629	87	157
Quarter Totals (gal.) =	**5,661**	**837**	**1,413**
Totals Since Startup (gal.) =	**6,288**	**1,006**	**1,884**

Notes:
gal. Gallons

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Table D-2. Automated Reagent Injection System Quarter Number 1 Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Injection Number 2

Injection Date = 9/19/2002

Molasses to Water Ratio (%) = 16.4

Programmed Mixing Time (min.)[1] = 30

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[2] Quantity (gal.)	Raw Molasses Per Well (gal.)	Min. Injection Flowrate (gpm)	Max. Injection Pressure (psi)
PW-6	37	5	6.07	16.8	31
IW-3	37	5	6.07	13.1	34
IW-1	37	4	6.07	11.2	32
IW-2	37	3	6.07	11.2	35
GMMW-1	37	3	6.07	9.1	36
IW-4	37	4	6.07	9.4	36
IW-5	37	5	6.07	13	33
IW-6	37	7	6.07	11.2	35
IW-7	37	8	6.07	10.1	36
IW-8	37	9	6.07	12	34
IW-9	37	11	6.07	13.5	32
IW-10	37	12	6.07	8.5	35
IW-11	37	13	6.07	13.5	30
IW-12	37	15	6.07	12.8	33
IW-13	37	16	6.07	11.8	33
IW-14	37	18	6.07	8.3	36
IW-15	37	19	6.07	10.6	35
Totals (gal.) =	629	157	103.16	NA	NA

Notes:

gal.	Gallons
min.	Minutes
i.w.c.	Inches of water column.
psi	Pounds per square inch.
gpm	Gallons per minute.
NA	Not applicable.
NM	Not measured.
1.	Programmed mixing time is calculated from the expiration time of the molasses injection countdown timer to the startup of transfer pump TP-900 during an injection sequence or from the end of transfer pump TP-600 operation to the restart of an injection during a mixing sequence.
2.	Rinse quantity is approximately 1-pipeline volume for each injection well.
3.	On 10/11/2002 the volume in the mixing tank was adjusted in the program to accommodate a level switch that was prematurely being triggered due to convection caused by the mixing of solution.
4.	On 11/21/2002 the remainder of molasses in the 275-gallon totes was pumped into the mixing tank before the new molasses tanks were installed causing an elevated molasses concentration in solution on this date.

Table D-2. Automated Reagent Injection System Quarter Number 1 Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Injection Number 3

Injection Date = 9/26/2002

Molasses to Water Ratio (%) = 16.4 Programmed Mixing Time (min.)[1] = 30

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[3] Quantity (gal.)	Raw Molasses Per Well (gal.)	Min. Injection Flowrate (gpm)	Max. Injection Pressure (psi)
PW-6	37	5	6.07	NM	NM
IW-3	37	5	6.07	NM	NM
IW-1	37	4	6.07	NM	NM
IW-2	37	3	6.07	NM	NM
GMMW-1	37	3	6.07	NM	NM
IW-4	37	4	6.07	NM	NM
IW-5	37	5	6.07	NM	NM
IW-6	37	7	6.07	NM	NM
IW-7	37	8	6.07	NM	NM
IW-8	37	9	6.07	NM	NM
IW-9	37	11	6.07	NM	NM
IW-10	37	12	6.07	NM	NM
IW-11	37	13	6.07	NM	NM
IW-12	37	15	6.07	NM	NM
IW-13	37	16	6.07	NM	NM
IW-14	37	18	6.07	NM	NM
IW-15	37	19	6.07	NM	NM
Totals (gal.) =	629	157	103.16	NA	NA

Notes:

gal.	Gallons
min.	Minutes
i.w.c.	Inches of water column.
psi	Pounds per square inch.
gpm	Gallons per minute.
NA	Not applicable.
NM	Not measured.
1.	Programmed mixing time is calculated from the expiration time of the molasses injection countdown timer to the startup of transfer pump TP-900 during an injection sequence or from the end of transfer pump TP-600 operation to the restart of an injection during a mixing sequence.
2.	Rinse quantity is approximately 1-pipeline volume for each injection well.
3.	On 10/11/2002 the volume in the mixing tank was adjusted in the program to accommodate a level switch that was prematurely being triggered due to convection caused by the mixing of solution.
4.	On 11/21/2002 the remainder of molasses in the 275-gallon totes was pumped into the mixing tank before the new molasses tanks were installed causing an elevated molasses concentration in solution on this date.

Table D-2. Automated Reagent Injection System Quarter Number 1 Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Injection Number 4

Injection Date = 10/4/2002

Molasses to Water Ratio (%) = 16.4 Programmed Mixing Time (min.)[1] = 30

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[4] Quantity (gal.)	Raw Molasses Per Well (gal.)	Min. Injection Flowrate (gpm)	Max. Injection Pressure (psi)
PW-6	37	5	6.07	16.7	31
IW-3	37	5	6.07	15.4	33
IW-1	37	4	6.07	12	32
IW-2	37	3	6.07	16.5	32
GMMW-1	37	3	6.07	13	34
IW-4	37	4	6.07	NM	NM
IW-5	37	5	6.07	15.1	30
IW-6	37	7	6.07	13.8	31
IW-7	37	8	6.07	9.95	34
IW-8	37	9	6.07	NM	NM
IW-9	37	11	6.07	NM	NM
IW-10	37	12	6.07	NM	NM
IW-11	37	13	6.07	13.6	33
IW-12	37	15	6.07	14.9	32
IW-13	37	16	6.07	14.3	33
IW-14	37	18	6.07	10.4	35
IW-15	37	19	6.07	8.9	35
Totals (gal.) =	629	157	103.16	NA	NA

Notes:

gal.	Gallons
min.	Minutes
i.w.c.	Inches of water column.
psi	Pounds per square inch.
gpm	Gallons per minute.
NA	Not applicable.
NM	Not measured.
1.	Programmed mixing time is calculated from the expiration time of the molasses injection countdown timer to the startup of transfer pump TP-900 during an injection sequence or from the end of transfer pump TP-600 operation to the restart of an injection during a mixing sequence.
2.	Rinse quantity is approximately 1-pipeline volume for each injection well.
3.	On 10/11/2002 the volume in the mixing tank was adjusted in the program to accommodate a level switch that was prematurely being triggered due to convection caused by the mixing of solution.
4.	On 11/21/2002 the remainder of molasses in the 275-gallon totes was pumped into the mixing tank before the new molasses tanks were installed causing an elevated molasses concentration in solution on this date.

Table D-2. Automated Reagent Injection System Quarter Number 1 Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Injection Number 5

Injection Date = 10/11/2002

Molasses to Water Ratio (%) = 13.9

Programmed Mixing Time (min.)[1] = 30

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[5] Quantity (gal.)	Raw Molasses Per Well (gal.)	Min. Injection Flowrate (gpm)	Max. Injection Pressure (psi)
PW-6	37	5	5.14	NM	NM
IW-3	37	5	5.14	NM	NM
IW-1	37	4	5.14	NM	NM
IW-2	37	3	5.14	NM	NM
GMMW-1	37	3	5.14	NM	NM
IW-4	37	4	5.14	NM	NM
IW-5	37	5	5.14	NM	NM
IW-6	37	7	5.14	NM	NM
IW-7	37	8	5.14	NM	NM
IW-8	37	9	5.14	NM	NM
IW-9	37	11	5.14	NM	NM
IW-10	37	12	5.14	NM	NM
IW-11	37	13	5.14	NM	NM
IW-12	37	15	5.14	NM	NM
IW-13	37	16	5.14	NM	NM
IW-14	37	18	5.14	NM	NM
IW-15	37	19	5.14	NM	NM
Totals (gal.) =	629	157	87.43	NA	NA

Notes:

gal.	Gallons
min.	Minutes
i.w.c.	Inches of water column.
psi	Pounds per square inch.
gpm	Gallons per minute.
NA	Not applicable.
NM	Not measured.
1.	Programmed mixing time is calculated from the expiration time of the molasses injection countdown timer to the startup of transfer pump TP-900 during an injection sequence or from the end of transfer pump TP-600 operation to the restart of an injection during a mixing sequence.
2.	Rinse quantity is approximately 1-pipeline volume for each injection well.
3.	On 10/11/2002 the volume in the mixing tank was adjusted in the program to accommodate a level switch that was prematurely being triggered due to convection caused by the mixing of solution.
4.	On 11/21/2002 the remainder of molasses in the 275-gallon totes was pumped into the mixing tank before the new molasses tanks were installed causing an elevated molasses concentration in solution on this date.

Table D-2. Automated Reagent Injection System Quarter Number 1 Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Injection Number 6

Injection Date = 10/18/2002

Molasses to Water Ratio (%) = 13.9 Programmed Mixing Time (min.)[1] = 30

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[6] Quantity (gal.)	Raw Molasses Per Well (gal.)	Min. Injection Flowrate (gpm)	Max. Injection Pressure (psi)
PW-6	37	5	5.14	NM	NM
IW-3	37	5	5.14	NM	NM
IW-1	37	4	5.14	NM	NM
IW-2	37	3	5.14	NM	NM
GMMW-1	37	3	5.14	NM	NM
IW-4	37	4	5.14	NM	NM
IW-5	37	5	5.14	NM	NM
IW-6	37	7	5.14	NM	NM
IW-7	37	8	5.14	NM	NM
IW-8	37	9	5.14	NM	NM
IW-9	37	11	5.14	NM	NM
IW-10	37	12	5.14	NM	NM
IW-11	37	13	5.14	NM	NM
IW-12	37	15	5.14	NM	NM
IW-13	37	16	5.14	NM	NM
IW-14	37	18	5.14	NM	NM
IW-15	37	19	5.14	NM	NM
Totals (gal.) =	629	157	87.43	NA	NA

Notes:

gal.	Gallons
min.	Minutes
i.w.c.	Inches of water column.
psi	Pounds per square inch.
gpm	Gallons per minute.
NA	Not applicable.
NM	Not measured.
1.	Programmed mixing time is calculated from the expiration time of the molasses injection countdown timer to the startup of transfer pump TP-900 during an injection sequence or from the end of transfer pump TP-600 operation to the restart of an injection during a mixing sequence.
2.	Rinse quantity is approximately 1-pipeline volume for each injection well.
3.	On 10/11/2002 the volume in the mixing tank was adjusted in the program to accommodate a level switch that was prematurely being triggered due to convection caused by the mixing of solution.
4.	On 11/21/2002 the remainder of molasses in the 275-gallon totes was pumped into the mixing tank before the new molasses tanks were installed causing an elevated molasses concentration in solution on this date.

Table D-2. Automated Reagent Injection System Quarter Number 1 Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Injection Number 7

Injection Date = 10/25/2002

Molasses to Water Ratio (%) = 13.9 Programmed Mixing Time (min.)[1] = 30

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[7] Quantity (gal.)	Raw Molasses Per Well (gal.)	Min. Injection Flowrate (gpm)	Max. Injection Pressure (psi)
PW-6	37	5	5.14	NM	NM
IW-3	37	5	5.14	NM	NM
IW-1	37	4	5.14	NM	NM
IW-2	37	3	5.14	NM	NM
GMMW-1	37	3	5.14	NM	NM
IW-4	37	4	5.14	NM	NM
IW-5	37	5	5.14	NM	NM
IW-6	37	7	5.14	NM	NM
IW-7	37	8	5.14	NM	NM
IW-8	37	9	5.14	NM	NM
IW-9	37	11	5.14	NM	NM
IW-10	37	12	5.14	NM	NM
IW-11	37	13	5.14	NM	NM
IW-12	37	15	5.14	NM	NM
IW-13	37	16	5.14	NM	NM
IW-14	37	18	5.14	NM	NM
IW-15	37	19	5.14	NM	NM
Totals (gal.) =	629	157	87.43	NA	NA

Notes:

gal.	Gallons
min.	Minutes
i.w.c.	Inches of water column.
psi	Pounds per square inch.
gpm	Gallons per minute.
NA	Not applicable.
NM	Not measured.
1.	Programmed mixing time is calculated from the expiration time of the molasses injection countdown timer to the startup of transfer pump TP-900 during an injection sequence or from the end of transfer pump TP-600 operation to the restart of an injection during a mixing sequence.
2.	Rinse quantity is approximately 1-pipeline volume for each injection well.
3.	On 10/11/2002 the volume in the mixing tank was adjusted in the program to accommodate a level switch that was prematurely being triggered due to convection caused by the mixing of solution.
4.	On 11/21/2002 the remainder of molasses in the 275-gallon totes was pumped into the mixing tank before the new molasses tanks were installed causing an elevated molasses concentration in solution on this date.

Table D-2. Automated Reagent Injection System Quarter Number 1 Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Injection Number 8

Injection Date = 11/21/2002

Molasses to Water Ratio (%) = 14.5 Programmed Mixing Time (min.)[1] = 30

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[2] Quantity (gal.)	Raw Molasses Per Well (gal.)	Min. Injection Flowrate (gpm)	Max. Injection Pressure (psi)
PW-6	37	5	5.37	15	15.3
IW-3	37	5	5.37	14.8	15
IW-1	37	4	5.37	11	27
IW-2	37	3	5.37	8.53	28
GMMW-1	37	3	5.37	11.7	24
IW-4	37	4	5.37	15.2	14
IW-5	37	5	5.37	15.3	15
IW-6	37	7	5.37	13.6	1
IW-7	37	8	5.37	12	25
IW-8	37	9	5.37	15	21
IW-9	37	11	5.37	13.5	14
IW-10	37	12	5.37	13.4	22
IW-11	37	13	5.37	13.6	26
IW-12	37	15	5.37	13.6	25
IW-13	37	16	5.37	12.7	21
IW-14	37	18	5.37	8.4	28
IW-15	37	19	5.37	10.2	27
Totals (gal.) =	629	157	91.21	NA	NA

Notes:

gal.	Gallons
min.	Minutes
i.w.c.	Inches of water column.
psi	Pounds per square inch.
gpm	Gallons per minute.
NA	Not applicable.
NM	Not measured.
1.	Programmed mixing time is calculated from the expiration time of the molasses injection countdown timer to the startup of transfer pump TP-900 during an injection sequence or from the end of transfer pump TP-600 operation to the restart of an injection during a mixing sequence.
2.	Rinse quantity is approximately 1-pipeline volume for each injection well.
3.	On 10/11/2002 the volume in the mixing tank was adjusted in the program to accommodate a level switch that was prematurely being triggered due to convection caused by the mixing of solution.
4.	On 11/21/2002 the remainder of molasses in the 275-gallon totes was pumped into the mixing tank before the new molasses tanks were installed causing an elevated molasses concentration in solution on this date.

Table D-2. Automated Reagent Injection System Quarter Number 1 Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Injection Number 9

Injection Date = 12/2/2002

Molasses to Water Ratio (%) = 13.9

Programmed Mixing Time (min.)[1] = 30

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[2] Quantity (gal.)	Raw Molasses Per Well (gal.)	Min. Injection Flowrate (gpm)	Max. Injection Pressure (psi)
PW-6	37	5	5.14	16	31
IW-3	37	5	5.14	NM	NM
IW-1	37	4	5.14	12	34
IW-2	37	3	5.14	14	34
GMMW-1	37	3	5.14	14	34
IW-4	37	4	5.14	14	33
IW-5	37	5	5.14	14	34
IW-6	37	7	5.14	11	35
IW-7	37	8	5.14	10	33
IW-8	37	9	5.14	11	33
IW-9	37	11	5.14	13	32
IW-10	37	12	5.14	9	34
IW-11	37	13	5.14	15	31
IW-12	37	15	5.14	14	32
IW-13	37	16	5.14	13	32
IW-14	37	18	5.14	11	34
IW-15	37	19	5.14	8	35
Totals (gal.) =	629	157	87.43	NA	NA

Notes:

gal.	Gallons
min.	Minutes
i.w.c.	Inches of water column.
psi	Pounds per square inch.
gpm	Gallons per minute.
NA	Not applicable.
NM	Not measured.
1.	Programmed mixing time is calculated from the expiration time of the molasses injection countdown timer to the startup of transfer pump TP-900 during an injection sequence or from the end of transfer pump TP-600 operation to the restart of an injection during a mixing sequence.
2.	Rinse quantity is approximately 1-pipeline volume for each injection well.
3.	On 10/11/2002 the volume in the mixing tank was adjusted in the program to accommodate a level switch that was prematurely being triggered due to convection caused by the mixing of solution.
4.	On 11/21/2002 the remainder of molasses in the 275-gallon totes was pumped into the mixing tank before the new molasses tanks were installed causing an elevated molasses concentration in solution on this date.

Table D-2. Automated Reagent Injection System Quarter Number 1 Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Injection Number 10

Injection Date = 12/10/2002

Molasses to Water Ratio (%) = 13.8 Programmed Mixing Time (min.)[1] = 30

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[10] Quantity (gal.)	Raw Molasses Per Well (gal.)	Min. Injection Flowrate (gpm)	Max. Injection Pressure (psi)
PW-6	37	5	5.11	15.5	17
IW-3	37	5	5.11	15.3	17
IW-1	37	4	5.11	16	22
IW-2	37	3	5.11	11.5	27
GMMW-1	37	3	5.11	15.3	22
IW-4	37	4	5.11	17	14
IW-5	37	5	5.11	16.8	17
IW-6	37	7	5.11	14.1	21
IW-7	37	8	5.11	10.2	29
IW-8	37	9	5.11	14.8	23
IW-9	37	11	5.11	13.4	23
IW-10	37	12	5.11	14.6	24
IW-11	37	13	5.11	15.3	21
IW-12	37	15	5.11	14.5	20
IW-13	37	16	5.11	12.6	20
IW-14	37	18	5.11	9.9	25
IW-15	37	19	5.11	10.6	26.5
Totals (gal.) =	629	157	86.80	NA	NA

Notes:

gal.	Gallons
min.	Minutes
i.w.c.	Inches of water column.
psi	Pounds per square inch.
gpm	Gallons per minute.
NA	Not applicable.
NM	Not measured.
1.	Programmed mixing time is calculated from the expiration time of the molasses injection countdown timer to the startup of transfer pump TP-900 during an injection sequence or from the end of transfer pump TP-600 operation to the restart of an injection during a mixing sequence.
2.	Rinse quantity is approximately 1-pipeline volume for each injection well.
3.	On 10/11/2002 the volume in the mixing tank was adjusted in the program to accommodate a level switch that was prematurely being triggered due to convection caused by the mixing of solution.
4.	On 11/21/2002 the remainder of molasses in the 275-gallon totes was pumped into the mixing tank before the new molasses tanks were installed causing an elevated molasses concentration in solution on this date.