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Mr. George Jacob
United States Environmental Protection Agency – Region 2
290 Broadway, 20th Floor
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ENVIRONMENT

Subject:
Operational Year 5 Quarter Number 1 Monitoring Report,
Colesville Landfill, Broome County, New York. (Site No. 704010).

Dear Mr. Jacob:

Date:
July 26, 2007

On behalf of Broome County, ARCADIS is providing the Operational Year 5 Quarter Number 1 Monitoring Report for the Colesville Landfill, Broome County, New York.

Please feel free to contact me if you have any questions or comments.

Sincerely,

ARCADIS of New York, Inc.

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Imagine the result

Broome County
Division of Solid Waste Management

Operational Year 5
Quarter Number 1
Monitoring Report

July 26, 2007

ARCADIS

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Operational Year 5
Quarter Number 1
Monitoring Report

Colesville Landfill,
Broome County, New York
NYSDEC Site 704010

Prepared for:
Broome County Division of Solid Waste Management

Prepared by:
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Our Ref.:
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Date:
July 26, 2007

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1. Introduction

This Monitoring Report (Report) was prepared on behalf of the 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 issued 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), LTM Plan Addendum for Spring Water Remediation Systems (ARCADIS 2003), and Interim Remedial Action Report (ARCADIS 2004), which were approved by the United States Environmental Protection Agency (USEPA) and New York State Department of Environmental Conservation (NYSDEC). These documents provide a detailed description of the LTM program, methodology, and rationale. Where applicable these elements are either summarized or incorporated by reference herein.

This report describes the results of the December 2006 groundwater quality monitoring event conducted during Operational Year 5, Quarter Number 1. A description of the operation, maintenance, and monitoring (OM&M) associated with the Groundwater Remediation System from September 2006 through December 2006 has also been included. In addition, this report describes SP-5 Spring Water Remediation System OM&M activities conducted during this quarter. Following the detailed data analysis and discussion is a summary of findings, conclusions, and recommendations.

As referenced in previous monitoring reports (ARCADIS 2007), damage occurred at the former SP-4 spring area and at recovery well GMPW-5 as a result of flooding of the North Stream. Further discussion of the flood damage is provided herein when applicable to the LTM program and/or OM&M of the Groundwater Remediation System. Repair of the damaged components will be discussed in future Monitoring Reports.

2. Methodology

The following section provides a summary of the environmental effectiveness and remedial system performance monitoring methodology for Operational Year 5, Quarter Number 1. A site plan, which shows the location of environmental effectiveness monitoring, is provided on Figure 1.

2.1 Environmental Effectiveness Monitoring

The environmental effectiveness monitoring performed during Operational Year 5, Quarter Number 1, included the following:

- Groundwater samples were collected from five monitoring wells (Year 5, Q1 list of wells) during the week of December 4, 2006 and were selectively analyzed for volatile organic compounds (VOCs) and select inorganic parameters. Field parameters were also recorded at these monitoring locations.

- Samples (VOCs only) were collected at the SP-4 and F-6 surface water locations on December 13, 2006.

In accordance with the Proposed Modifications to the Long-Term Monitoring Program (ARCADIS 2005), groundwater samples were collected from monitoring wells utilizing passive diffusive bag (PDB) samplers.

2.2 Groundwater Remediation System Performance Monitoring

Groundwater Remediation System performance monitoring activities during Operational Year 5, Quarter Number 1 were as follows:

- Pump-and-treat (PT) system recovery well influent and effluent samples were collected on December 17, 2006. The samples were selectively analyzed for VOCs and total iron.

- One vapor sample from the PT system air stripper effluent was collected on December 17, 2006. The sample was analyzed for VOCs.

- PT system operating parameters were recorded during the quarterly OM&M site visit.

- Total Organic Carbon (TOC) samples were collected from select injection wells during the week of December 4, 2006.

- Automated reagent injection (ARI) system operating parameters were recorded during each injection event.

PT system groundwater samples were collected as grab samples directly from the individual recovery pipelines connected to recovery wells GMPW-3, GMPW-4, GMPW-5, the combined influent water to the low profile air stripper, and the combined effluent after the cartridge filters. The effluent air sample was collected as a grab sample directly from the designated point located on the low profile air stripper stack.

2.3 Spring Water Remediation System Performance Monitoring

SP-5 Spring Water Remediation System OM&M could not be conducted during Operational Year 5, Quarter Number 1 due to clogging of the SP-5 effluent riprap infiltration zone. Maintenance has been scheduled to be conducted in parallel with maintenance of the former SP-4 spring area.

3. Groundwater Flow

A synoptic round of water level measurements will be completed during Quarters 2 and 4 for evaluation of groundwater flow conditions.

4. Groundwater Quality

The following sections describe the analytical results for groundwater samples collected during the December 2006 monitoring round (Operational Year 5, Quarter Number 1). Groundwater analytical results are provided in Tables 1 and 2. Where applicable, the previous round of analytical results for the respective sampling location has been provided in the same table for comparative purposes.

4.1 Volatile Organic Compounds

As shown in Table 1, total VOC (TVOC) concentrations in all monitoring wells sampled during the reporting period were consistent with prior data. Specifically, monitoring well GMMW-5, which is located closest to the IRZ, remained stable at 194.0 micrograms per liter (ug/L) during the current reporting period. Similarly, TVOC concentrations in mid-plume monitoring wells PW-4, W-5, GMMW-2, and GMMW-6 remained stable at 69.7 ug/L, 230.1 ug/L, 324.0 ug/L, and 527.8 ug/L respectively.

PT system analytical VOC results are provided in Table 4. During the current reporting period, the TVOC concentration at recovery wells GMPW-3 and GMPW-4 were consistent with prior rounds of data. Specifically, TVOC concentrations in recovery wells GMPW-3 and GMPW-4 were 281.4 ug/L and 341.8 ug/L, respectively. The

TVOC concentration at recovery well GMPW-5 decreased to 0.0 ug/L. Although this represents a decrease when compared to Operational Year 4, Quarter Number 2 data (353.2 ug/L), it is consistent with historical data collected prior to Operational Year 4, Quarter Number 2. A complete evaluation of performance monitoring conducted on the PT system is provided in Section 8.1.2 of this report.

4.2 Indicators of Reducing Conditions

Groundwater analytical results for biogeochemical parameters and field parameters were collected in accordance with the LTM plan and are provided in Table 2. In summary, field and laboratory groundwater data for Wells GMMW-5 and GMMW-6 indicate that strongly reducing conditions are being maintained within the IRZ. This is evidenced by the presence of reduced forms of alternate electron acceptors (i.e., methane). Further details of the ARI system performance monitoring are provided in Section 8.2.2 of this report.

4.3 Evidence of Biodegradation

Table 2 provides the results of biodegradation end product concentrations in monitoring wells and indicates the continued occurrence of bioactivity and biodegradation of VOCs within the IRZ. Specifically, the concentration of ethene within monitoring wells GMMW-5 and GMMW-6 continue to be elevated when compared to baseline conditions. Finally, similar to Operational Year 4, Quarter Number 4, the concentration of ethane increased significantly within monitoring well GMMW-5 and remained elevated in monitoring well GMMW-6 during the reporting period. Additional details on the results of biogeochemical monitoring as evidence of Groundwater Remediation System performance and effectiveness are discussed in Section 8.2.2 of this report.

5. Spring Water Quality

Spring water samples from the SP-2 and SP-3 spring water locations were not collected during the Operational Year 5, Quarter Number 1 period due to construction activities being conducted in response to the flood damage along the North Stream. Further details regarding the flood damage related activities is provided in Section 7.

6. Surface Water Quality

Surface water quality analytical results for the Operational Year 5, Quarter Number 1 monitoring round are summarized in Table 1. As shown in Table 1, surface water quality at the F-6 and SP-4 sampling locations remains consistent with prior rounds of analytical data. Specifically, TVOC concentrations at the F-6 and SP-4 sampling locations were below the limits of detection at both sampling locations.

7. Status of Flood Related Damages

As referenced in the previous two quarterly monitoring reports, damage was incurred to the former SP-4 spring location and recovery well GMPW-5 as a result of flooding of the North Stream. In addition, the traditionally sampled spring locations (e.g., the SP-2 and SP-3 spring sampling locations) were made inaccessible as a result of dangerous conditions (e.g., unstable side slopes, fallen trees, etc.) along the North Stream.

During the current reporting period, the following actions were taken:

- Broome County began stabilization of the landfill side-slopes adjacent to the North Stream.
- ARCADIS conducted a visual inspection of the SP-2 and SP-3 spring locations during the week of December 11, 2006. It was noted that the SP-2 and SP-3 springs could not be located any longer due to a change in topography resulting from the flood damage. ARCADIS will re-inspect these areas upon completion of the flood related construction activities currently ongoing.
- Recovery well GMPW-5 was redeveloped and the pump replaced during the week of December 4, 2006; and,
- Plans and specifications were developed for maintenance of the former SP-4 spring area.

It is estimated that maintenance related to the former SP-4 spring area will be conducted during the spring of the 2007 construction season.

8. Groundwater Remediation System Performance

The following section describes the results of the Groundwater Remediation System performance monitoring conducted during Operational Year 5, Quarter Number 1.

8.1 PT System

The following section describes the results of the PT system performance monitoring conducted during Operational Year 5, Quarter Number 1.

8.1.1 Summary of Operation, Maintenance, and Monitoring

During Operational Year 5, Quarter Number 1, the PT system operated continuously with the exception of brief system shutdowns as a result of minor system alarms and routine OM&M activities.

PT system OM&M for Operational Year 5, Quarter Number 1 was conducted during the weeks of December 4 and December 11, 2006 and included operation and maintenance of system equipment, the collection of system performance samples (water and vapor), and recording system operating parameters. Table 3 provides a summary of the recorded system operating parameters for the current operating period. As shown in Table 3, the total effluent groundwater recovery rate for Operational Year 5, Quarter Number 1 was approximately 0.37-gallon per minute (gpm), with individual recovery rates of 0.04-gpm, 0.24-gpm, and 0.12-gpm in GMPW-3, GMPW-4, and GMPW-5, respectively. The average individual recovery well rate during Operational Year 5, Quarter Number 1 in recovery well GMPW-3 continued to be lower when compared to previous operation. However, ARCADIS replaced the GMPW-3 well pump with a new, 2-inch diameter well pump during the week of December 4, 2006. As referenced previously, recovery well GMPW-5 was damaged as a result of flooding of the North Stream. Accordingly, the well was redeveloped and the recovery pump replaced during the week of December 4, 2006. Recovery well GMPW-4 operated in a manner consistent with its previous operation.

A total of 46,502 gallons of groundwater was recovered during Operational Year 5, Quarter Number 1 and a total of 1,175,830 gallons of groundwater has been recovered since system startup. The low profile air stripper operated in accordance with the design specifications and had a blower flowrate of 349 standard cubic feet per minute (scfm).

8.1.2 Results of Performance Sampling

PT system performance sampling for Operational Year 5, Quarter Number 1 was conducted on December 17, 2006. As discussed previously, five groundwater samples and one vapor sample were collected. Groundwater samples included collection of individual recovery well samples (GMPW-3, GMPW-4, and GMPW-5), total influent, and total effluent after the cartridge filters. The vapor sample was collected from the effluent stack of the low profile air stripper.

Table 4 provides a summary of the PT system performance groundwater sampling analytical results. As shown in Table 4, all groundwater VOCs were treated to below their respective Best Professional Judgment (BPJ) limits via the low profile air stripper. The total iron concentration after the cartridge filter was below the respective recommended daily average BPJ limit. Based on the total groundwater recovered during the reporting period and total influent groundwater concentration, an estimated 0.10 pounds (lbs) of VOC mass were removed from the subsurface during the quarterly reporting period, as shown in Table 5. A total of approximately 2.13 lbs of VOCs have been removed from the subsurface since system startup.

Table 6 provides a summary of the PT system performance vapor sampling analytical results. As shown in Table 6, VOCs were not detected above their respective detection limits. To be conservative, a NYSDEC DAR-1 air model was calculated using the actual analytical data for detected constituents and the detection limit of all constituents that were not detected but have historically been detected in the influent groundwater. All COCs were below their respective short-term guidance concentrations (SGCs) and annual guidance concentrations (AGCs). Appendix B contains the NYSDEC DAR-1 AGC screening simulation based on the hand calculations provided in the NYSDEC DAR-1 AGC/SGC tables dated December 22, 2003.

8.2 ARI System

The following section describes the results of the ARI system performance monitoring conducted during Operational Year 5, Quarter Number 1.

8.2.1 Summary of Operation, Maintenance, and Monitoring

ARI system OM&M was conducted during the Operational Year 5, Quarter Number 1 OM&M site visit during the week of December 4, 2006 and included operation and

maintenance of system equipment and the collection of samples for analysis of TOC from injection wells IW-3, IW-8, and IW-13. As described in the Hydraulic Injection Test and Alternate Electron Donor Pilot Test Letter Work Plan (ARCADIS 2006), alternate electron donor pilot test reagent injections were completed during the week of December 18, 2007. The reagent injection letter work plan was approved by the NYSDEC in a letter dated December 8, 2006. Therefore, a full-scale reagent injection was not conducted during the current reporting period. Nonetheless, sufficient organic carbon was maintained within the subsurface to maintain the anaerobic IRZ (as described below) as evidenced by the distribution of TOC within the subsurface. A summary of the pilot test results will be provided in the Operational Year 5, Quarter Number 2 monitoring report.

8.2.2 Results of Performance Sampling

ARI system performance sampling was conducted on December 8, 2006. As discussed previously, this event consisted of collecting TOC samples at three injection wells. In addition, analytical results from select monitoring wells under the environmental effectiveness monitoring program were used to determine the effectiveness of the ARI system. A summary of key observations is as follows:

- The TOC concentration at monitoring well GMMW-5 (28.0 mg/L), GMMW-6 (246 mg/L) and injection wells IW-3 (3,780 mg/L), IW-8 (5,890 mg/L), and IW-13 (22.1 mg/L) indicated that sufficient organic carbon is being delivered to the subsurface to maintain the IRZ.

- The methane concentration in monitoring wells GMMW-5 and GMMW-6 remained significantly elevated at 17,000 micrograms per liter (ug/L) and 7,800 ug/L, respectively. These data provide evidence that strongly reducing conditions (methanogenic) are being maintained within the IRZ.

- The ethene concentration in monitoring wells GMMW-5 and GMMW-6 remained elevated at 15,000 nanograms per liter (ng/L) and 120,000 ng/L, respectively.

- The ethane concentration increased significantly in monitoring well GMMW-5 from 41,000 ng/L to 86,000 ng/L when comparing Year 4, Quarter Number 4 data to Year 5, Quarter Number 1 data, respectively.

- The ethane concentration remained stable but elevated at 6,700 ng/L in monitoring well GMMW-6.

- TVOC concentrations remained stable but significantly lower than baseline conditions in monitoring wells GMMW-5 and GMMW-6.

9. Spring Water Remediation System Performance

As referenced previously, SP-5 Spring Water Remediation System OM&M could not be conducted during Operational Year 5, Quarter Number 1 due to clogging of the SP-5 effluent riprap infiltration zone. Maintenance has been scheduled to be conducted in parallel with maintenance to the former SP-4 spring area.

10. Conclusions

Based on the data obtained from the Operational Year 5, Quarter Number 1 monitoring, ARCADIS concludes the following:

- The anaerobic IRZ established downgradient of the injection transect is successfully reducing the concentration of site-related VOCs through enhanced reductive dechlorination.

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

- Sufficient organic carbon was delivered to the subsurface to maintain the IRZ as evidenced through the analytical data.

- Repair of flood related damages caused by flooding of the North Stream are currently underway; and

- Surface water quality continues to be consistent with historical data indicating that impacted groundwater and/or flood related damages are not causing an adverse impact to surface water along the North Stream.

11. Recommendations

The following recommendations are made for Operational Year 5, Quarter Number 1 activities:

- Inspect the SP-2 and SP-3 spring locations following completion of the construction activities (e.g., stabilization of the landfill side slopes along the North Stream) within the immediate vicinity.

- Continue to operate the ARI system without injection well IW-8. Obtain and evaluate data related to the ongoing alternate electron donor pilot program.

- Continue to evaluate the performance of recovery well GMPW-3 and GMPW-5 to determine if the corrective actions referenced herein have resolved the observed decrease in groundwater recovery.

- Perform maintenance of the former SP-4 spring area following completion of the construction activities involving stabilization of the landfill side slopes along the North Stream.

- Perform maintenance of the SP-5 spring water remediation system while mobilized for maintenance of the former SP-4 spring area.

12. Project Schedule

Groundwater environmental effectiveness monitoring is scheduled to be conducted for Operational Year 5 on the quarterly schedule set forth in the Proposed Modifications to Long-Term Monitoring Program (ARCADIS 2005). System OM&M of the Groundwater Remediation System will continue to be performed on a quarterly basis consistent with the LTM Plan. Maintenance of the SP-5 spring water remediation system will be completed concurrently with maintenance activities for the former SP-4 spring location. It is anticipated that these repairs will be completed in the spring of 2007. Repair status of the damaged remedial components will be documented in future Monitoring Reports and through interim correspondence with the NYSDEC and USEPA.

13. References

ARCADIS G&M, Inc. 2002. Long-Term Monitoring Plan, Colesville Landfill, Broome County, New York, NYSDEC Site 704010. June 28, 2002.

ARCADIS G&M, Inc. 2003. Long-Term Monitoring Plan Addendum for Spring Water Remediation Systems, Colesville Landfill, Broome County, New York, NYSDEC Site 704010. November 3, 2003.

ARCADIS G&M, Inc. 2004. Interim Remedial Action Report, Colesville Landfill, Broome County, New York, NYSDEC Site 704010. September 22, 2004.

ARCADIS G&M, Inc. 2005 Proposed Modifications to Long-Term Monitoring Program, Broome County, New York, NYSDEC Site 704010. June 28, 2005.

ARCADIS G&M, Inc. 2006 Operational Year 3 Annual Monitoring Report, Broome County, New York, NYSDEC Site 704010. March 2, 2006.

ARCADIS G&M, Inc. 2006. Hydraulic Injection Test and Alternate Electron Donor Pilot Test, Colesville Landfill, Broome County, New York (Site No. 704010). November 30, 2006.

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Table 1. Concentrations of Volatile Organic Compounds Detected in Groundwater and Surface Water, Operational Year 5, Quarter Number 1, Colesville Landfill, Broome County, New York.

Constituents (units in ug/L)	Sample ID: / Date:	GMMW-02 9/21/2006	GMMW-02 12/082006	GMMW-05 9/21/2006	GMMW-05 12/7/2006	GMMW-05* 12/7/2006	GMMW-06 9/21/2006	GMMW-06 12/7/2006	PW-04 9/21/2006	PW-04 12/7/2006
1,1,1-Trichloroethane		**16**	**14**	<5.0	<5.0	<1.0	**7**	**3.7**	**13**	**13**
1,1,2-Trichloroethane		<5.0	<1.0	<5.0	<5.0	<1.0	**1.8**	**1.2**	<1.0	<1.0
1,1-Dichloroethane		**75**	**76**	<5.0	**23**	**24**	**190**	**200**	**11**	**12**
1,1-Dichloroethene		<5.0	**1.3**	<5.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane		<5.0	<1.0	<5.0	<5.0	**2.6**	**2**	**1.9**	<1.0	<1.0
1,2-Dichloropropane		<5.0	<1.0	<5.0	<5.0	<1.0	**1.3**	**1.2**	<1.0	<1.0
Benzene		<5.0	**2.7**	<5.0	<5.0	**2.4**	**9.5**	**9.8**	<1.0	<1.0
Chlorobenzene		**31**	**32**	**19**	**21**	**23**	**45**	**46**	<1.0	<1.0
Chloroethane		**21**	**23**	**170**	**150**	**150**	**180**	**190**	**3.2**	**3.8**
Chloroform		<5.0	<1.0	<5.0	<5.0	<1.0	<5.0	<1.0	**1.2**	**1.2**
cis-1,2-Dichloroethene		**100**	**110**	**5.8**	<5.0	**2.8**	**64**	**30**	**15**	**14**
Dichlorodifluoromethane		<5.0	<1.0	<5.0	<5.0	<1.0	**6.6**	**5.1**	**2**	**1.7**
Ethylbenzene		<5.0	<1.0	<5.0	<5.0	<1.0	**1.4**	**2.4**	<1.0	<1.0
Methylene chloride		<5.0	<1.0	<5.0	<5.0	**2.9**	**6.8**	**7.6**	<1.0	<1.0
Methyl tert-butyl ether		<5.0	<1.0	<5.0	<5.0	<1.0	<5.0	<1.0	<1.0	<1.0
Naphthalene		<5.0	<1.0	<5.0	<5.0	<1.0	<5.0	<1.0	<1.0	<1.0
o-Xylene		<5.0	<1.0	<5.0	<5.0	**3.6**	**2.8**	**3.1**	<1.0	<1.0
m,p-Xylene		<10	<2.0	<10	<10	<2.0	<10	**5.8**	<2.0	<2.0
Tetrachloroethene		<5.0	<1.0	<5.0	<5.0	<1.0	<5.0	<1.0	<1.0	<1.0
Toluene		<5.0	<1.0	<5.0	<5.0	**4.5**	**3.1**	**3.3**	<1.0	<1.0
trans-1,2-Dichloroethene		<5.0	<1.0	<5.0	<5.0	<1.0	**1.8**	**1.9**	<1.0	<1.0
Trichloroethene		**49**	**52**	<5.0	<5.0	<1.0	**4.1**	**2**	**22**	**24**
Vinyl chloride		**13**	**13**	<5.0	<5.0	**1.9**	**34**	**21**	<1.0	<1.0
Total VOCs		**305.0**	**324.0**	**194.8**	**194.0**	**217.7**	**558.0**	**527.8**	**67.4**	**69.7**

Bold Constituent detected above MDL.

VOCs Volatile Organic Compounds.

ug/L Micrograms per liter.

* Field replicate.

J Estimated value.

MDL Method detection limit.

NA Not analyzed.

Table 1. Concentrations of Volatile Organic Compounds Detected in Groundwater and Surface Water, Operational Year 5, Quarter Number 1, Colesville Landfill, Broome County, New York.

Constituents (units in ug/L)	Sample ID: / Date:	W-05 9/21/2006	W-05 12/8/2006	F-6 9/22/2006	F-6 12/13/2006	SP-4 9/22/06	SP-4 12/13/06	TBV122105 12/7/2006	FBV122105 12/7/2006
1,1,1-Trichloroethane		<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		**70**	**79**	**2.6**	<1.0	**4.8**	<1.0	<1.0	<1.0
1,1-Dichloroethene		<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane		<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene		**5.7**	**6.8**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene		**14**	**16**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		**88**	**120**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform		<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene		**<5.0**	**2.7**	<1.0	<1.0	1.7	<1.0	<1.0	<1.0
Dichlorodifluoromethane		<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride		**<5.0**	**3**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methyl tert-butyl ether		<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Naphthalene		<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
o-Xylene		<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylene		<10	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Tetrachloroethene		<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene		**<5.0**	**1.1**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene		<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene		**<5.0**	**1.5**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride		**<5.0**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total VOCs		**177.7**	**230.1**	**2.6**	**0.0**	**6.5**	**0.0**	**0.0**	**0.0**

Bold Constituent detected above MDL.
VOCs Volatile Organic Compounds.
ug/L Micrograms per liter.
* Field replicate.
J Estimated value.
MDL Method detection limit.
NA Not analyzed.

Table 2. Concentrations of Selected Metals, General Chemistry, Field Parameters, and Dissolved Gases Detected in Groundwater, Operational Year 5, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	GMMW-02 9/21/06	GMMW-02 12/8/06	GMMW-05 9/21/06	GMMW-05 12/7/06
	UNITS				
METALS					
Iron, Dissolved	mg/L	--	--	--	--
Manganese, Dissolved	mg/L	--	--	--	--
GENERAL CHEMISTRY					
Bromide	mg/L	--	--	--	--
Chloride	mg/L	--	--	--	--
Nitrogen, Nitrate (As N)	mg/L	--	--	--	--
Nitrogen, Nitrite	mg/L	--	--	--	--
Total Organic Carbon	mg/L	<2.0	**4.38**	**32**	**28**
Sulfate	mg/L	--	--	--	--
Sulfide (field)	mg/L	--	--	--	--
Iron (field)	mg/L	--	--	--	--
FIELD PARAMETERS					
pH	Standard units	**6.52**	**5.89**	**6.34**	**7.2**
Specific Conductance	mmhos/cm	**0.515**	**0.628**	**0.652**	**0.713**
Turbidity	NTU	--	--	--	--
Dissolved Oxygen	mg/L	--	--	--	--
Temperature	deg C	**10.6**	**7.1**	**13.2**	**6.1**
ORP	mV	--	--	--	--
DISSOLVED GASES					
Carbon dioxide	mg/L	**240**	--	**160**	--
Carbon monoxide	mg/L	<1	--	<1.0	--
Ethane	ng/L	**510**	**740**	**41,000**	**86,000**
Ethene	ng/L	**3,700**	**5,300**	**7,000**	**15,000**
Methane	ug/L	**2,300**	**2,900**	**23,000**	**17,000**
Nitrogen	mg/L	**20**	--	**9**	--
Oxygen	mg/L	**2.3**	--	**2.7**	--

Bold Constituent detected above MDL.

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 or collected.
ug/L	Micrograms per liter.
IW	Injection well.
ORP	Oxidation-reduction potential.
J	Qualifier assigned to analytical data indicating result is estimated.

Table 2. Concentrations of Selected Metals, General Chemistry, Field Parameters, and Dissolved Gases Detected in Groundwater, Operational Year 5, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	GMMW-06 9/21/06	GMMW-06 12/7/06	PW-04 9/21/06	PW-4 12/7/06
	UNITS				
METALS					
Iron, Dissolved	mg/L	--	--	--	--
Manganese, Dissolved	mg/L	--	--	--	--
GENERAL CHEMISTRY					
Bromide	mg/L	--	--	--	--
Chloride	mg/L	--	--	--	--
Nitrogen, Nitrate (As N)	mg/L	--	--	--	--
Nitrogen, Nitrite	mg/L	--	--	--	--
Total Organic Carbon	mg/L	<200	**246**	<2.00	**3.59**
Sulfate	mg/L	--	--	--	--
Sulfide (field)	mg/L	--	--	--	--
Iron (field)	mg/L	--	--	--	--
FIELD PARAMETERS					
pH	Standard units	**6.67**	**6.9**	**6.04**	**5.38**
Specific Conductance	mmhos/cm	**1.235**	**0.814**	**0.85**	**0.961**
Turbidity	NTU	--	--	--	--
Dissolved Oxygen	mg/L	--	--	--	--
Temperature	deg C	**11.8**	**9.4**	**12.5**	**8.6**
ORP	mV	--	--	--	--
DISSOLVED GASES					
Carbon dioxide	mg/L	**260**	--	**240**	--
Carbon monoxide	mg/L	<1.0	--	<1.0	--
Ethane	ng/L	**6,300**	**6,700**	**27**	**52**
Ethene	ng/L	**100,000**	**120,000**	**47**	**290**
Methane	ug/L	**4,300**	**7,800**	**7.1**	**12**
Nitrogen	mg/L	**20**	--	**20**	--
Oxygen	mg/L	**4.2**	--	**6.1**	--

Bold Constituent detected above MDL.

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 or collected.
ug/L	Micrograms per liter.
IW	Injection well.
ORP	Oxidation-reduction potential.
J	Qualifier assigned to analytical data indicating result is estimated.

Table 2. Concentrations of Selected Metals, General Chemistry, Field Parameters, and Dissolved Gases Detected in Groundwater, Operational Year 5, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	W-05 9/21/06	W-05 12/8/06	IW-03 9/21/06	IW-03 12/8/06
	UNITS				
METALS					
Iron, Dissolved	mg/L	--	--	--	--
Manganese, Dissolved	mg/L	--	--	--	--
GENERAL CHEMISTRY					
Bromide	mg/L	--	--	--	--
Chloride	mg/L	--	--	--	--
Nitrogen, Nitrate (As N)	mg/L	--	--	--	--
Nitrogen, Nitrite	mg/L	--	--	--	--
Total Organic Carbon	mg/L	5.75	**7.81**	**21,200**	**3,780**
Sulfate	mg/L	--	--	--	--
Sulfide (field)	mg/L	--	--	--	--
Iron (field)	mg/L	--	--	--	--
FIELD PARAMETERS					
pH	Standard units	**6.64**	**6.19**	**4.76**	**4.06**
Specific Conductance	mmhos/cm	**0.903**	**1.059**	--	**1.81**
Turbidity	NTU	--	--	--	--
Dissolved Oxygen	mg/L	--	--	--	--
Temperature	deg C	**12.50**	**7.2**	--	**9.3**
ORP	mV	--	--	--	--
DISSOLVED GASES					
Carbon dioxide	mg/L	**260**	--	--	--
Carbon monoxide	mg/L	<1.0	--	--	--
Ethane	ng/L	**19,000**	**18,000**	--	--
Ethene	ng/L	**5,900**	**4,600**	--	--
Methane	ug/L	**2,600**	**2,000**	--	--
Nitrogen	mg/L	**21**	--	--	--
Oxygen	mg/L	**4.9**	--	--	--

Bold Constituent detected above MDL.

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 or collected.
ug/L	Micrograms per liter.
IW	Injection well.
ORP	Oxidation-reduction potential.
J	Qualifier assigned to analytical data indicating result is estimated.

Table 2. Concentrations of Selected Metals, General Chemistry, Field Parameters, and Dissolved Gases Detected in Groundwater, Operational Year 5, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	IW-08 9/21/06	IW-08 12/8/06	IW-13 9/21/06	IW-13 12/8/06
	UNITS				
METALS					
Iron, Dissolved	mg/L	--	--	--	--
Manganese, Dissolved	mg/L	--	--	--	--
GENERAL CHEMISTRY					
Bromide	mg/L	--	--	--	--
Chloride	mg/L	--	--	--	--
Nitrogen, Nitrate (As N)	mg/L	--	--	--	--
Nitrogen, Nitrite	mg/L	--	--	--	--
Total Organic Carbon	mg/L	**5,240**	**5,890**	**23**	**22.1**
Sulfate	mg/L	--	--	--	--
Sulfide (field)	mg/L	--	--	--	--
Iron (field)	mg/L	--	--	--	--
FIELD PARAMETERS					
pH	Standard units	**4.97**	**3.51**	**6.21**	**5.89**
Specific Conductance	mmhos/cm	--	**2.19**	--	**0.722**
Turbidity	NTU	--	--	--	--
Dissolved Oxygen	mg/L	--	--	--	--
Temperature	deg C	--	**6.6**	--	**6.2**
ORP	mV	--		--	
DISSOLVED GASES					
Carbon dioxide	mg/L	--	--	--	--
Carbon monoxide	mg/L	--	--	--	--
Ethane	ng/L	--	--	--	--
Ethene	ng/L	--	--	--	--
Methane	ug/L	--	--	--	--
Nitrogen	mg/L	--	--	--	--
Oxygen	mg/L	--	--	--	--

Bold Constituent detected above MDL.

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 or collected.
ug/L	Micrograms per liter.
IW	Injection well.
ORP	Oxidation-reduction potential.
J	Qualifier assigned to analytical data indicating result is estimated.

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Table 3. PT System Operating Parameters, Operational Year 5, Quarter Number 1, 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)
9/20/2006	12:27 PM	8.7	252	1,129,328.1	984,979.0	374,144.5	77,787.1	384,860.0
12/17/2006	10:00 AM	NM	349	1,175,830.0	1,023,400.0	379,055.0	108,500.0	399,822.0
Average Daily Flowrate (gpm) =				**0.37**	**0.30**	**0.04**	**0.24**	**0.12**
Total Groundwater Recovered During Reporting Period (gallons) =				**46,502**	**38,421**	**4,911**	**30,713**	**14,962**

NM Not measured.
gpm Gallons per minute.
i.w.c. Inches of water column.
scfm Standard cubic feet per minute.

Notes:
1. GMPW-4 totalizing flow meter malfuctioned and was replaced on 12/23/2005.

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Table 4. Concentrations of Volatile Organic Compounds and Selected Metals Detected in Aqueous Samples Collected from the PT System, Operational Year 5, Quarter Number 1, Colesville Landfill, Broome County, New York[5,6].

Constituents	Model Technology BPJ Limits[1,2] (ug/L)	Sample ID: / Date:	GMPW-3 INF 12/17/2006	GMPW-4 INF 12/17/2006	GMPW-5 INF 12/17/2006	COMBINED INF 12/17/2006	EFFLUENT AC II 12/17/2006
1,1,1-Trichloroethane	10-20		**32**	**27**	<1.0	**21**	<1.0
1,1,2-Trichloroethane	10		<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	10		**56**	**82**	<1.0	**48**	<1.0
1,1-Dichloroethene	10		**2.7**	**2.5**	<1.0	**1.8**	<1.0
1,2-Dichloroethane	10-30		<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	NA		<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	5		**4.5**	**4.6**	<1.0	**3.1**	<1.0
Chlorobenzene	NA		<1.0	**5.8**	<1.0	**1.8**	<1.0
Chloroethane	NA		**20**	**34**	<1.0	**18**	<1.0
Chloroform	NA		<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	10		**84**	**77**	<1.0	**58**	<1.0
Dichlorodifluoromethane	NA		<1.0	**<1.0**	<1.0	<1.0	<1.0
Ethylbenzene	5		<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	10-50		**2.8**	**2.9**	<1.0	**2.1**	<1.0
Methyl tert-butyl ether	50		<1.0	<1.0	<1.0	<1.0	<1.0
Naphthalene	10		<1.0	<1.0	<1.0	<1.0	<1.0
o-Xylene	5		<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	10		<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	5		<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	10-50		<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	10		**67**	**68**	<1.0	**47**	<1.0
Vinyl Chloride	10-50		**9.7**	**38**	<1.0	**15**	<1.0
Total VOCs			**278.7**	**341.8**	**0.0**	**215.8**	**0**
Metals (units in mg/L)	Model Technology BPJ Limits[3,4] (mg/L)						
Total Iron	1.2 / 0.61		**0.272**	**6.7**	**0.575**	**1.52**	**0.442**

See Notes on Last Page.

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

Notes:

1. Model Technology Best Professional Judgment (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).
6. Bold values indicate compound detected above method detection limit.

NA	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.
–	Not Analyzed or Collected.
<	Analyte Below Detection Limit.

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Table 5. PT System Mass Removal Rate of Volatile Organic Compounds, Operational Year 5, Quarter Number 1, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Date Sampled	Total VOC Influent Concentration (ug/L)	Total Effluent Totalizer FQI-401 (gallons)	Total Groundwater Recovered[1] Between Sampling Intervals (gal)	Influent Concentration[2] Geometric Mean (ug/L)	Total Estimated Mass[3] Removed (lbs)
9/20/2006	292.3	1,129,328.1	NA	NA	NA
12/17/2006	215.8	1,175,830.0	46,502	251	0.10
			Total Estimated Mass Removed During Operational Year 5, Quarter Number 1 (lbs) =		**0.10**
			Total Estimated Mass Removed Since System Startup (lbs) =		**2.13**

Notes:

NA	Not applicable.
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).

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Table 6. Concentrations of Volatile Organic Compounds Detected in Air Stripper Effluent, Operational Year 5, Quarter Number 1, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Compounds	CAS Numbers	Sample ID: Date Sampled:	Effluent 12/17/2006 ppbv
Vinyl Chloride	75-01-4		<7.2
Chloroethane(Ethyl Chloride)	75-00-3		<7.2
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4		<7.2
Methylene Chloride(Dichloromethane)	75-09-2		<7.2
1,1-Dichloroethane	75-34-3		<7.2
cis-1,2-Dichloroethylene	156-59-2		<7.2
Chloroform	67-66-3		<7.2
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6		<7.2
Benzene	71-43-2		<7.2
Trichloroethene	79-01-6		<7.2
Toluene	108-88-3		<7.2
Ethyl benzene	100-41-4		<7.2
m,p-Xylene	108-38-3/106-42-3		<7.2
o-Xylene	95-47-6		<7.2
1,2,4-Trimethylbenzene	95-63-6		<7.2
2-Propanol (Isopropyl alcohol)	67-63-0		<7.2
Dichlorodifluoromethane(Freon 12)	75-71-8		<7.2

Bold Constituent detected above MDL.
ppbv: parts per billion by volume

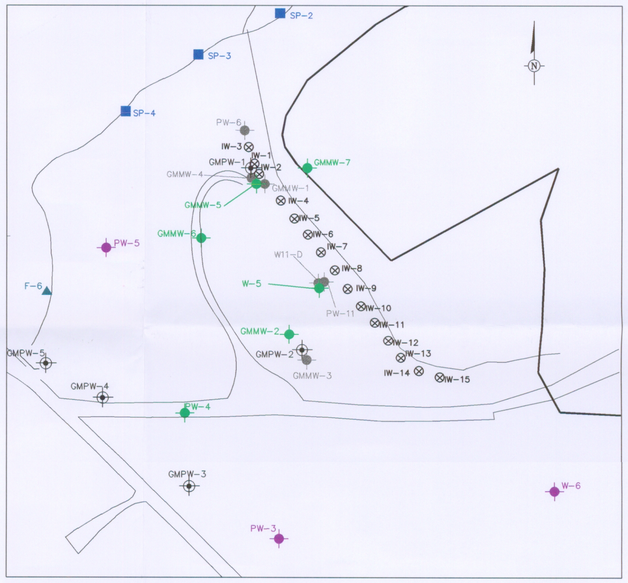
Notes/Assumptions:

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.

EXPLANATION

LONG-TERM MONITORING PLAN DESIGNATIONS

- W-24 — LOCATION AND DESIGNATION OF RI MONITORING WELL
- SCOTT — LOCATION AND DESIGNATION OF EXISTING HOMEOWNER WELL
- HILL — LOCATION AND DESIGNATION OF FORMER HOMEOWNER WELL
- IW-2 — LOCATION AND DESIGNATION OF INJECTION WELL
- GMPW-2 — LOCATION AND DESIGNATION OF PRODUCTION WELL
- W-5 — LOCATION AND DESIGNATION OF QUARTERLY MONITORING WELL
- W-6 — LOCATION AND DESIGNATION OF SEMI-ANNUAL MONITORING WELL
- W-16S — LOCATION AND DESIGNATION OF ANNUAL MONITORING WELL
- F-6 — LOCATION AND DESIGNATION OF SURFACE WATER SAMPLE LOCATION
- SP-2 — LOCATION AND DESIGNATION OF SPRING SAMPLE LOCATION
- W-13 — LOCATION AND DESIGNATION OF WELLS INCLUDED IN HYDRAULIC MEASUREMENT PROGRAM



SITE PLAN SHOWING PROJECT AREA

0 100 200
SCALE IN FEET

NO.	ISSUED DATE	REVISION DESCRIPTION	BY/CKD

KEYPLAN

SEAL

ARCADIS OF NEW YORK, INC.
Two Huntington Quadrangle
Suite 1S10
Melville, NY 11747
Tel: 631-249-7600 Fax: 631-249-7610
www.arcadis-us.com

PROJECT TITLE
COLESVILLE LANDFILL
COLESVILLE, NEW YORK

PROJECT MANAGER	DEPARTMENT MANAGER	LEAD DESIGN PROF.	CHECKED BY
S. FELDMAN	M. WOLFERT	S. FELDMAN	K. ZEGEL

SHEET TITLE
LONG-TERM EFFECTIVENESS MONITORING LOCATIONS

TASK/PHASE NUMBER	DRAWN BY
00004	A. SANCHEZ
PROJECT NUMBER	DRAWING NUMBER
NY000949.0019	1

Appendix A

Groundwater Sampling Logs

VOC'S
TOC
METHANE, ETHANE
ETHENE

ARCADIS G&M
Low Flow Groundwater Sampling Form

Page ____ of ____

Project/No. NY000949.0019.0003A   Well PW-4   Date 12-7-06

Total depth (ft bmp) ____   Screen Setting (ft bmp) ____   Casing Diameter (inches) ____

Measuring Point Description TOC   Static Water Level (ft bmp) ____

Pump Intake (ft bmp) ____   Sampling Time: Begin ____ End ____

Weather Cloudy/- Snow

Sampled by : D. [illegible]

Date/Time	Rate (ml/min)	DTW (ft bmp)	pH (s.u.)	TEMP. (C)	Cond. umhos or ms/cm	Redox (mV)	DO (mg/L)	TURB (NTU)	Notes
12-7-06	PDB-Bailer	16.85	5.38	8.6 6	961				

VOC's
TOC
METHANE, ETHANE,
ETHENE

ARCADIS G&M

Low Flow Groundwater Sampling Form

Page ____ of ____

Project/No. NY000944-0019-0003A Well GMMW-2 Date 12-8-06

Total depth (ft bmp) ____ Screen Setting (ft bmp) ____ Casing Diameter (inches) 4"

Measuring Point Description ____ Static Water Level (ft bmp) ____

Pump Intake (ft bmp) ____ Sampling Time: Begin ____ End ____

Weather Cold-Snow

Sampled by : D. McCreary

Date/Time	Rate (ml/min)	DTW (ft bmp)	pH (s.u.)	TEMP. (C)	Cond. umhos or ms/cm	Redox (mV)	DO (mg/L)	TURB (NTU)	Notes
12-8-06		38.20	5.89	7.1	628				

TBC.
VOC's
METHANE
ETHANE
ETHENE

REP V07 1206 OFF GM MW 5

ARCADIS G&M
Low Flow Groundwater Sampling Form

Project/No. NY000944.0009.00003A Well GM MW-5 Date 12-7-06

Total depth (ft bmp) ____ Screen Setting (ft bmp) ____ Casing Diameter (inches) 4"

Measuring Point Description TOC Static Water Level (ft bmp) 47.19

Pump Intake (ft bmp) ____ Sampling Time: Begin ____ End ____

Weather Cloudy - Snowy

Sampled by : D. McCARREN

REP V07 1206 IS OFF GM MW 5

Date/Time	Rate (ml/min)	DTW (ft bmp)	pH (s.u.)	TEMP. (C)	Cond. umhos or ms/cm	Redox (mV)	DO (mg/L)	TURB (NTU)	Notes
12-7-06	P.D.B. Bailer	47.19	7.20	6.1	713				

VOC's
TOC
METHANE
ETHANE
ETHENE

MS/MSD OFF GWMW-6

ARCADIS G&M

Low Flow Groundwater Sampling Form

Page ____ of ____

Project/No. 114929 Well GWMW-6 Date 12-7-06

Total depth (ft bmp) ____ Screen Setting (ft bmp) ____ Casing Diameter (inches) 4"

Measuring Point Description TOC Static Water Level (ft bmp) ____

Pump Intake (ft bmp) ____ Sampling Time: Begin ____ End ____

Weather Cloudy · Snow

Sampled by : D. McCafferty

MS/MSD OFF GWMW-6

Date/Time	Rate (ml/min)	DTW (ft bmp)	pH (s.u.)	TEMP. (C)	Cond. umhos or ms/cm	Redox (mV)	DO (mg/L)	TURB (NTU)	Notes
12-7-06	PDB: Bailed	40.16	6.90	9.4	814				

G:\TECHNICL\FIELD LOGS\Low Flow Samling Form.XLS- Sheet1

VOC's
TOC
METHANE
ETHANE
ETHENE

ARCADIS G&M

Low Flow Groundwater Sampling Form

Page ____ of ____

Project/No. 14000449.9.00038 Well W-5 Date 12-806

Total depth (ft bmp) ____ Screen Setting (ft bmp) ____ Casing Diameter (inches) ____

Measuring Point Description ____ Static Water Level (ft bmp) ____

Pump Intake (ft bmp) ____ Sampling Time: Begin ____ End ____

Weather Cold - Snow

Sampled by : D. McCarthy

Date/Time	Rate (ml/min)	DTW (ft bmp)	pH (s.u.)	TEMP. (C)	Cond. umhos or ms/cm	Redox (mV)	DO (mg/L)	TURB (NTU)	Notes
12.806		52.41	6.09	7.2	1059				

ARCADIS G&M

Low Flow Groundwater Sampling Form

Page ____ of ____

Project/No. NY0CR949.19003.1 Well IW-3 Date 12-8-05

Total depth (ft bmp) ____ Screen Setting (ft bmp) ____ Casing Diameter (inches) ____

Measuring Point Description ____ Static Water Level (ft bmp) ____

Pump Intake (ft bmp) ____ Sampling Time: Begin ____ End ____

Weather cold-snow

Sampled by : D. McCafferty

Date/Time	Rate (ml/min)	DTW (ft bmp)	pH (s.u.)	TEMP. (C)	Cond. umhos or ms/cm	Redox (mV)	DO (mg/L)	TURB (NTU)	Notes
			4.06	9.3	1.81				

T.O.C. Sample

ARCADIS G&M

Low Flow Groundwater Sampling Form

Page ____ of ____

Project/No. A1Y00094.0019-0003A   Well I-W8   Date 12-8-06

Total depth (ft bmp) ____   Screen Setting (ft bmp) ____   Casing Diameter (inches) ____

Measuring Point Description ____   Static Water Level (ft bmp) ____

Pump Intake (ft bmp) ____   Sampling Time: Begin ____ End ____

Weather SNOW-COLD

Sampled by : D. McCAFFERTY

Date/Time	Rate (ml/min)	DTW (ft bmp)	pH (s.u.)	TEMP. (C)	Cond. umhos or ms/cm	Redox (mV)	DO (mg/L)	TURB (NTU)	Notes
12-5-06	Bailed		3.51	6.6	2.19				

TOC · Sample

ARCADIS G&M

Low Flow Groundwater Sampling Form

Page ______ of ______

Project/No. AC400549-0019-0003A   Well FW-13   Date 12-8-00

Total depth (ft bmp) ______   Screen Setting (ft bmp) ______   Casing Diameter (inches) ______

Measuring Point Description ______   Static Water Level (ft bmp) ______

Pump Intake (ft bmp) ______   Sampling Time: Begin ______ End ______

Weather Cold - Snow

Sampled by : D. McCafferty

Date/Time	Rate (ml/min)	DTW (ft bmp)	pH (s.u.)	TEMP. (C)	Cond. umhos or ms/cm	Redox (mV)	DO (mg/L)	TURB (NTU)	Notes
12800			5.89	6.2	722				

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Low Flow Groundwater Sampling Form

Page ______ of ______

Project/No. N1{illegible}8949.19.0003A ~~STR~~ ~~Well~~ STREAM SAMPLE F-6 Date ______

Total depth (ft bmp) ______ Screen Setting (ft bmp) ______ Casing Diameter (inches) ______

Measuring Point Description ______ Static Water Level (ft bmp) ______

Pump Intake (ft bmp) ______ Sampling Time: Begin ______ End ______

Weather ______

Sampled by : D. McElhaney

Date/Time	Rate (ml/min)	DTW (ft bmp)	pH (s.u.)	TEMP. (C)	Cond. umhos or ms/cm	Redox (mV)	DO (mg/L)	TURB (NTU)	Notes
12/13/06			6.65	6.2	1560				

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Low Flow Groundwater Sampling Form

Page ____ of ____

Project/No. ANUCO819.19.00317 ~~Well~~ STREAM SAMPLE SP-4 Date 12/12/06

Total depth (ft bmp) ____ Screen Setting (ft bmp) ____ Casing Diameter (inches) ____

Measuring Point Description ____ Static Water Level (ft bmp) ____

Pump Intake (ft bmp) ____ Sampling Time: Begin ____ End ____

Weather Cool Clear

Joe's

Sampled by : A. McCafferty

Date/Time	Rate (ml/min)	DTW (ft bmp)	pH (s.u.)	TEMP. (C)	Cond. umhos or ms/cm	Redox (mV)	DO (mg/L)	TURB (NTU)	Notes
12/12/06			6.39	6.0	240				

Appendix B

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

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Table B-1. NYSDEC DAR-1 Air Modeling Data, Operational Year 5, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters for 12/17/2006 Sampling Event			
Discharge Temperature	T	520	°R
Ambient Temperature	Ta	492	°R
Stack Diameter	D	6	in
Stack Radius	R	0.25	ft
Stack Area	A	0.20	ft^2
Exit Velocity	V	29.1	fps
Exit Flow	Q	343	acfm
Exit Flow	Q	349	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	17.0	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 60 °F based on recorded parameters.
2. The ambient temperature is approximately 32 °F based on recorded conditions.
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 December 22, 2003.
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 B-2. NYSDEC DAR-1 Air Modeling Data, Operational Year 5, Quarter Number 1, Colesville Landfill, Broome County, New York.

Calculation of the Short-Term Guideline Concentration (SGC) for Sampling Event on 12/17/2006

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	7.2	*	18.71	2.63E-05	0.0045	0.29191	1.6E-04
Chloroethane(Ethyl Chloride)	75-00-3	--	7.2	*	19.31	2.71E-05	0.0046	0.30134	NA
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4	--	7.2	*	29.02	4.08E-05	0.0070	0.45280	NA
Methylene Chloride(Dichloromethane)	75-09-2	14,000	7.2	*	25.42	3.57E-05	0.0061	0.39671	2.8E-03
1,1-Dichloroethane	75-34-3	--	7.2	*	29.62	4.16E-05	0.0071	0.46224	NA
cis-1,2 - Dichloroethylene	156-59-2	--	7.2	*	29.02	4.08E-05	0.0070	0.45280	NA
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6	68,000	7.2	*	39.93	5.61E-05	0.0096	0.62314	9.2E-04
Trichloroethene	79-01-6	54,000	7.2	*	39.33	5.52E-05	0.0094	0.61370	1.1E-03
Dichlorofluoromethane(Freon 12)	75-71-8	--	7.2	*	36.19	5.08E-05	0.0087	0.56466	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
NA: Not applicable

Notes:

1. DAR-1 refers to DAR-1 AGC/SGC Tables dated December 22, 2003.
2. SGC refers to the Short-Term Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated December 22, 2003.
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 B-3. NYSDEC DAR-1 Air Modeling Data, Operational Year 4, Quarter Number 4, Colesville Landfill, Broome County, New York.

Calculation of AGC based on 12/17/2006 Sampling Event

Compounds	CAS Numbers	Maximum Limit on C_a (AGC[4]) ug/m^3	Maximum Mass Flow Q_a lb/yr	Lab Data ppb	Detection Limit Used[5]	Actual Emissions C_a ug/m^3	Actual Mass Flow per Hour lb/hr	Actual Mass Flow per Year lb/yr	Percent of Annual %
Vinyl Chloride	75-01-4	0.11	10.76	7.2	*	18.71	2.44E-05	0.21067	**1.96**
Chloroethane(Ethyl Chloride)	75-00-3	10,000	978,044.97	7.2	*	19.31	2.52E-05	0.21748	**0.00**
1,1-Dichloroethene(Vinylidene Chloride)	75-35-4	70	6,846.31	7.2	*	29.02	3.79E-05	0.32680	**0.00**
Methylene Chloride(Dichloromethane)	75-09-2	2.1	205.39	7.2	*	25.42	3.32E-05	0.28632	**0.14**
1,1-Dichloroethane	75-34-3	0.63	61.62	7.2	*	29.62	3.87E-05	0.33361	**0.54**
cis-1,2-Dichloroethylene	156-59-2	1,900	185,828.54	7.2	*	29.02	3.79E-05	0.32680	**0.00**
1,1,1-Trichloroethane(Methyl Chloroform)	71-55-6	1,000	97,804.50	7.2	*	39.93	5.21E-05	0.44973	**0.00**
Trichloroethene	79-01-6	0.5	48.90	7.2	*	39.33	5.13E-05	0.44292	**0.91**
Dichlorodifluoromethane(Freon 12)	75-71-8	12,000	1,173,653.96	7.2	*	17.99	2.35E-05	0.20258	**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 62 °F based on recorded parameters.
2. The ambient temperature is approximately 65 °F based on recorded conditions.
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 December 22, 2003.
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.

Appendix C

Automated Reagent Injection System
Operating Parameters

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Table C-1. Automated Reagent Injection System Summary of Operational Year 5, Quarter Number 1 Injection Quantities, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

NO INJECTIONS COMPLETED DURING REPORTING PERIOD

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Table C-2. Automated Reagent Injection System, Operational Year 5, Quarter Number 1 Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

NO INJECTIONS COMPLETED DURING THE REPORTING PERIOD