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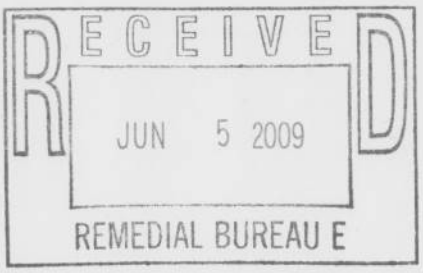

Broome County
Division of Solid Waste Management

Operational Year 7
Quarter Number 1
Monitoring Report

June 2, 2009

ARCADIS

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Operational Year 7
Quarter Number 1
Monitoring Report

Colesville Landfill,
Broome County, New York
NYSDEC Site 704010

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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 and Explanation of Significant Difference 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), Interim Remedial Action Report (ARCADIS 2004), and the Proposed Modifications to the Long Term Monitoring Program (ARCADIS 2005) 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 2008 groundwater quality monitoring event conducted during Operational Year 7, Quarter Number 1. A description of the operation, maintenance, and monitoring (OM&M) associated with the Groundwater Remediation System from October 2008 through December 2008 has also been provided. Following the detailed data analysis and discussion is a summary of findings, conclusions, and recommendations.

2. Methodology

The following section provides a summary of the environmental effectiveness and remedial system performance monitoring methodology for Operational Year 7, Quarter Number 1. A site plan showing the environmental effectiveness monitoring locations is provided on Figure 1.

2.1 Environmental Effectiveness Monitoring

The environmental effectiveness monitoring performed during Operational Year 7, Quarter Number 1 included the following:

- Groundwater samples were collected from six monitoring wells (Year 7, Q1 list of wells plus alternate electron donor test well TW-1) during the week of December

15, 2008. The samples were selectively analyzed for volatile organic compounds (VOCs), dissolved gases, and total organic carbon (TOC). 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 17, 2008.

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 samplers.

2.2 Groundwater Remediation System Performance Monitoring

Groundwater Remediation System performance monitoring activities during Operational Year 7, Quarter Number 1, were as follows:

- Pump-and-treat (PT) system recovery well influent, combined influent, and effluent samples were collected on December 17, 2008. 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, 2008. The sample was analyzed for VOCs.

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

- TOC samples were collected from select injection wells during the week of December 15, 2008.

- A TOC sample was collected from alternate electron donor monitoring well TW-1 on December 16, 2008.

- 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 was conducted on December 17, 2008. System OM&M was conducted in accordance with the LTM Plan Addendum for Spring Water Remediation Systems (ARCADIS 2003) and consisted of the collection of influent and effluent spring water samples for analysis of VOCs. Discharge flow rate and depth to water in the treatment unit were also recorded. The influent sample was collected after removing three well volumes from the influent monitoring well, which is located within the SP-5 treatment unit and screened below the liquid phase granular activated carbon (LPGAC) zone. The treatment system effluent sample was collected as a grab sample from the discharge pipe prior to entering the outfall stone apron. All spring water samples were analyzed for VOCs using USEPA Method 8260.

3. Groundwater Flow

A synoptic round of water level measurements will be conducted 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 2008 monitoring round (Operational Year 7, 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 remained generally consistent when compared to analytical results from the previous round. Specifically, the TVOC concentration in monitoring wells GMMW-2, GMMW-5, W-5, GMMW-6, and PW-4 were 301.7 micrograms per liter (ug/L), 146.0 ug/L, 199.6 ug/L, 383.8 ug/L, and 55.7 ug/L, respectively. The TVOC concentration in monitoring well TW-1 (160.8 ug/L) increased when compared to September 2008 data but remained consistent with historical monitoring data.

During the current reporting period, the TVOC concentration at recovery wells GMPW-3, GMPW-4, and GMPW-5 were consistent with prior rounds of data. Specifically, TVOC concentrations in recovery wells GMPW-3, GMPW-4, and GMPW-5 were 102.0 ug/L, 212.5 ug/L, and 0.0 ug/L, respectively. A complete evaluation of performance monitoring conducted on the PT system is provided in Section 7.1.2 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 TW-1, GMMW-5, and GMMW-6 indicate that reducing conditions are being maintained within the IRZ. This is evidenced by the presence of reduced forms of alternate electron acceptors (i.e., methane) at a concentration significantly higher than baseline conditions. Further details of the ARI system performance monitoring are provided in Section 7.2.2 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 concentrations of ethene at monitoring wells GMMW-2 and GMMW-6 continue to be elevated when compared to baseline conditions. Similarly, the concentration of ethane remained elevated at monitoring wells GMMW-5 and 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 7.2.2 of this report.

5. Spring Water Quality

Spring water locations SP-2 and SP-3 were observed during the OM&M site visit on December 15, 2008. Springs were not observed at the SP-2 area and a small amount of stagnant water was present at the SP-3 location. No flowing springs were present that could be sampled.

6. Surface Water Quality

Surface water quality analytical results for the Operational Year 7, Quarter Number 1 monitoring round are summarized in Table 1. As shown in Table 1, surface water quality at the SP-4 and F-6 sampling locations remained generally consistent when compared to analytical results from the previous round. Specifically, the TVOC concentration at the SP-4 and F-6 sampling locations were both 0.0 ug/L. The data indicate that surface water quality is not being adversely impacted by the landfill.

7. Groundwater Remediation System Performance

The following sections describe the results of the Groundwater Remediation System performance monitoring conducted during Operational Year 7, Quarter Number 1.

7.1 PT System

The following section describes the results of the PT system performance monitoring conducted during Operational Year 7, Quarter Number 1.

7.1.1 Summary of Operation, Maintenance, and Monitoring

During Operational Year 7, 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. In addition, the PT system was offline between October 8, 2008 and October 23, 2008 due to a failure of the low profile air stripper blower motor. The motor was replaced and the system was restarted on October 23, 2008.

PT system OM&M for Operational Year 7, Quarter Number 1 was conducted during the week of December 15, 2008 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 7, Quarter Number 1 was approximately 0.64 gallons per minute (gpm), with individual recovery rates of 0.12 gpm, 0.17 gpm, and 0.25 gpm in GMPW-3, GMPW-4, and GMPW-5, respectively. The average individual recovery well pumping rates during Operational Year 7, Quarter Number 1 were consistent with previous data (i.e., Operational Year 6, Quarter Number 4) but were still slightly lower than baseline (startup) conditions.

A total of 80,824 gallons of groundwater was recovered during Operational Year 7, Quarter Number 1 and a total of 1,701,025 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 flow rate of 218 standard cubic feet per minute.

7.1.2 Results of Performance Sampling

PT system performance sampling for Operational Year 7, Quarter Number 1 was conducted on December 17, 2008. 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. Based on the total groundwater recovered during the reporting period and total influent groundwater concentration, an estimated 0.09 pounds (lbs) of VOC mass were removed from the subsurface during the quarterly reporting period, as shown in Table 5. A total of approximately 3.12 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 guideline concentrations (SGCs) and annual guideline 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 September 10, 2007.

7.2 ARI System

The following section describes the results of the ARI system performance monitoring conducted during Operational Year 7, Quarter Number 1.

7.2.1 Summary of Operation, Maintenance, and Monitoring

ARI system OM&M was conducted during the Operational Year 7, Quarter Number 1 OM&M site visit during the week of December 15, 2008. The visit included operation and maintenance of system equipment and the collection of samples for analysis of TOC from injection wells IW-3 and IW-13. In addition, a TOC sample was collected from injection well IW-8 and monitoring well TW-1 to evaluate the long-term performance of the alternate electron donor in providing TOC to the subsurface.

One reagent injection was conducted during Operational Year 7, Quarter Number 1. The injection was initiated on September 22, 2008 and was completed on November 13, 2008. As described in the Hydraulic Injection Test and Alternate Electron Donor Pilot Test Letter Work Plan (ARCADIS 2006), a slow-release alternate electron donor (e.g., emulsified edible oil [EOS]) was injected into existing injection well IW-8 during the week of December 18, 2006. Accordingly, IW-8 was not included in the current reagent injection to allow for long-term groundwater monitoring of the alternate electron donor.

Based on the number of injection events, quantity of molasses solution delivered to each injection well, and molasses solution percentage, approximately 13,705-gallons of molasses solution were delivered to the subsurface during Operational Year 7, Quarter Number 1. A total of 185,752-gallons of molasses solution have been injected since system startup. Appendix C provides a summary of the recorded system operating parameters for each of the injection events for Operational Year 7, Quarter Number 1.

7.2.2 Results of Performance Sampling

ARI system performance sampling was conducted during the week of December 15, 2008. As discussed previously, this event consisted of collecting TOC samples at two 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 concentrations at injection wells IW-3 and IW-13 were 230 mg/L and 1,100 mg/L, which indicate that sufficient organic carbon is being delivered to the subsurface to maintain the IRZ.

- The TOC in monitoring well TW-1 was 160 mg/L. The TOC in injection well IW-8 was 1,200 mg/L. The data continue to indicate that the slow-release alternate electron donor (EOS) is providing sufficient organic carbon to the subsurface following the one time injection in injection well IW-8.

- VOC data for monitoring well TW-1 increased when compared to September 2008 data but remained lower when compared to historical data (i.e., prior to September 2008). The data indicate a stable to decreasing trend in the concentration of VOCs in the vicinity of the alternate electron donor pilot test.

- Monitoring wells in close proximity to the anaerobic IRZ (i.e., GMMW-5, W-5 and GMMW-6) exhibited stable VOC concentrations and remain significantly lower than baseline conditions.

- The concentration of TVOCs at monitoring well GMMW-2, located approximately 100 feet hydraulically downgradient of the anaerobic IRZ, is 60 percent lower than baseline conditions.

- The methane concentration in monitoring wells GMMW-5 and TW-1 remained elevated at 12,000 ug/L and 15,000 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-2 and GMMW-6 remained elevated at 16,000 nanograms per liter (ng/L) and 26,000 ng/L, respectively.

- The ethane concentration remained elevated in monitoring wells GMMW-5 and GMMW-6 at 32,000 ng/L and 8,000 ng/L, respectively.

8. Spring Water Remediation System Performance

SP-5 Spring Water Remediation System OM&M was conducted on December 17, 2008 in accordance with the LTM Plan Addendum for Spring Water Remediation Systems (ARCADIS 2003). SP-5 remediation system analytical results are provided in Table 7. As shown in Table 7, all effluent COCs, excluding 1,1-dichloroethene, were treated to below their respective BPJ limits via the LPGAC. 1,1-dichloroethene was detected at 12 ug/L in the effluent which is slightly above its BPJ limit. The LPGAC unit will be replaced with fresh media during the spring of 2009. Influent TVOC analytical

data (72.3 ug/L) remained consistent with historical analytical data. Table 8 provides the SP-5 Spring Water Remediation System field parameters recorded during Operational Year 7, Quarter Number 1. As shown in Table 8, the SP-5 remedial system treated approximately 41,964 gallons of spring water during the operating period. An estimated 0.03 lbs of VOCs was removed by the SP-5 remedial system during the same period. An estimated 1,151,437 gallons of spring water have been treated and an estimated 0.84 lbs of VOC mass have been recovered since system startup.

9. Conclusions

Based on the data obtained from the Operational Year 7, 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 VOCs in the recovered groundwater to below BPJ limits prior to discharge.
- Sufficient organic carbon was delivered to the subsurface to maintain the IRZ.
- Surface water quality continues to be consistent with historical data indicating that groundwater is being remediated and is not causing an adverse impact to surface water along the North Stream.
- Ongoing TOC data from the alternate electron donor pilot test indicate the EOS is an effective product to provide sufficient organic carbon to the subsurface over long periods of time. VOC data from monitoring well TW-1 continues to indicate stable to decreasing VOCs in the alternate electron donor pilot test area.
- SP-5 remediation system operating parameters are consistent with historical operation and indicate that the maintenance activities completed in September 2008 and discussed in the Operational Year 6 Annual Monitoring Report (ARCADIS 2009) were successful in mitigating the presence of tailwater.

10. Recommendations

The following recommendations are made for Operational Year 7, Quarter Number 2 activities:

- Continue to inspect the former spring locations and the side slopes of the North Stream.
- Continue to operate the ARI system without injection well IW-8. Continue to obtain and evaluate data related to the ongoing slow-release alternate electron donor pilot program. If data are favorable, consider transitioning to the alternate electron donor EOS™ on a full-scale basis.
- Replace the SP-5 LPGAC unit with fresh media.

11. Project Schedule

Groundwater environmental effectiveness monitoring is scheduled to be conducted for Operational Year 7 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. Replacement of the SP-5 remediation system LPGAC is scheduled for the spring of 2009.

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

ARCADIS of New York, Inc. 2009. Operational Year 6 Annual Monitoring Report, Colesville Landfill, Broome County, New York (Site No. 704010). April 30, 2009.

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Table 1. Concentrations of Volatile Organic Compounds Detected in Groundwater and Surface Water, Operational Year 7, Quarter Number 1, Colesville Landfill, Broome County, New York.

Constituents (units in ug/L)	Sample ID: / Date:	GMMW-02 9/18/2008	GMMW-02 12/16/2008	GMMW-05 9/18/2008	GMMW-05 12/16/2008	GMMW-05* 12/16/2008	GMMW-06 9/18/2008	GMMW-06 12/16/2008	PW-04 9/18/2008	PW-04 12/16/2008
1,1,1-Trichloroethane		**7.3**	**7.1**	<1.0	<1.0	<1.0	<5.0	**2.2**	**9.7**	**8.4 J**
1,1,2-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		**110**	**120**	**17**	**31**	**31**	**96**	**140**	**13**	**7.8 J**
1,1-Dichloroethene		<1.0	**1.1**	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0
1,2-Dichloroethane		<1.0	<1.0	**1.5**	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0
Benzene		**2.6**	**2.5**	**2**	**1.5**	**1.4**	**7.1**	**7.4**	<1.0	<1.0
Carbon Tetrachloride		<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	**1.6 J**
Chlorobenzene		**30**	**27**	**19**	**16**	**16**	**30**	**32**	<1.0	<1.0
Chloroethane		**23**	**22**	**89**	**91**	**91**	**89**	**160**	**2.9**	**1.8 J**
Chloroform		<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	**1.1 J**
cis-1,2-Dichloroethene		**98**	**89**	**1.9**	**2.1**	**2.2**	**10**	**7.2**	**23**	**13 J**
Dichlorodifluoromethane		**1.2**	<1.0	<1.0	<1.0	<1.0	<5.0	**2.8**	**1.2**	**1.0 J**
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	**2.2**	<1.0	<1.0
Methylene chloride		<1.0	<1.0	**1.6**	**1.5**	**1.4**	**5.5**	**6.7**	<1.0	<1.0
Methyl tert-butyl ether		<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0
Naphthalene		<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0
o-Xylene		<1.0	<1.0	**1.7**	**1.3**	**1.4**	<5.0	**1.2**	<1.0	<1.0
m,p-Xylene		<2.0	<2.0	<1.0 J	<2.0	**1.0 J**	<10	**4.2**	<2.0	<2.0
Tetrachloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0
Toluene		<1.0	<1.0	**2.4**	**1.6**	**1.6**	<5.0	**2.4**	<1.0	<1.0
trans-1,2-Dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	**1.2**	<1.0	<1.0
Trichloroethene		**26**	**21**	<1.0	<1.0	<1.0	<5.0	**7.8**	**25**	**21 J**
Vinyl chloride		**14**	**12**	<1.0	<1.0	<1.0	**5.4**	**6.5**	<1.0	<1.0
Total VOCs		**312.1**	**301.7**	**136.1**	**146.0**	**147.0 J**	**243.0**	**383.8**	**74.8**	**55.7 J**

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 7, Quarter Number 1, Colesville Landfill, Broome County, New York.

Constituents (units in ug/L)	Sample ID: / Date:	W-05 9/18/2008	W-05 12/16/2008	TW-1 9/18/2008	TW-1 12/16/2008	SP-4 9/18/2008	SP-4 12/17/2008	F-6 6/25/2008	F-6 12/17/2008	TBV121608 12/16/2008	TBV121708 12/17/2008
1,1,1-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		**54**	**55**	<1.0	<1.0	**2.7**	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		**1.1**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene		<1.0	**5.8**	**1.8**	**2.5**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon Tetrachloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene		**8.7**	**7.7**	**8.0**	**6.5**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		**98**	**120**	**29**	**63**	**1.2**	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene		**2.6**	**3.0**	**2.9**	**2.3**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dichlorodifluoromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride		**2.8**	**3.1**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methyl tert-butyl ether		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Naphthalene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
o-Xylene		**2.7**	**1.7**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylene		<1.0 J	**1.0 J**	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Tetrachloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene		<1.0	<1.0	**37**	**85**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene		<1.0	**1.2**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride		**1.1**	**1.1**	**1.1**	**1.5**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total VOCs		**171.0**	**199.6 J**	**79.8**	**160.8**	**3.9**	**0.0**	**0.0**	**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 7, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	GMMW-02 9/18/08	GMMW-02 12/16/08	GMMW-05 9/18/08	GMMW-05 12/16/08	GMMW-06 9/18/08	GMMW-06 12/16/08
	Units						
GENERAL CHEMISTRY							
Total Organic Carbon	mg/L	**1.9**	**4.2**	**26**	**18**	**5.4**	**5.4**
FIELD PARAMETERS							
pH	Standard units	**6.47**	**6.85**	**6.25**	**6.37**	**6.28**	**6.48**
Specific Conductance	mmhos/cm	**0.634**	**0.773**	**0.710**	**0.530**	**1.087**	**1.133**
Turbidity	NTU	**3.4**	--	**20.8**	--	**25.0**	--
Dissolved Oxygen	mg/L	**1.43**	**2.08**	**0.41**	**1.26**	**1.45**	**2.10**
Temperature	deg C	**11.01**	**6.72**	**11.69**	**7.76**	**11.04**	**7.35**
ORP	mV	--	**-40**	--	**-30**	--	**-1**
DISSOLVED GASES							
Carbon dioxide	mg/L	<5.00	**140**	<5.00	**110**	<5.00	**250**
Carbon monoxide	mg/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Ethane	ng/L	**540**	**600**	**20,000**	**32,000**	**18,000**	**8,000**
Ethene	ng/L	**14,000**	**16,000**	**690**	**500**	**25,000**	**26,000**
Methane	ug/L	**3,800**	**3,300**	**16,000**	**12,000**	**26,000**	**4,900**
Nitrogen	mg/L	**16.00**	**19.00**	**8.00**	**9.60**	**15.00**	**14.00**
Oxygen	mg/L	**2.50**	**3.70**	**2.30**	**2.10**	**1.90**	**2.30**

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 7, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	PW-04 9/18/08	PW-04 12/16/08	W-05 9/18/08	W-05 12/16/08	IW-03 9/18/08	IW-03 12/16/08
	Units						
GENERAL CHEMISTRY							
Total Organic Carbon	mg/L	**0.9**	**1.1**	**6.3**	**7.1**	**100**	**230**
FIELD PARAMETERS							
pH	Standard units	**5.34**	**5.91**	**6.18**	**6.48**	**6.03**	**5.98**
Specific Conductance	mmhos/cm	**2.080**	**1.049**	**0.955**	**1.086**	--	**0.823**
Turbidity	NTU	**46.1**	--	**47.1**	--	--	--
Dissolved Oxygen	mg/L	**4.92**	**5.92**	**1.21**	**2.17**	--	**1.84**
Temperature	deg C	**11.63**	**6.55**	**12.32**	**4.74**	--	**6.84**
ORP	mV	--	**36**	--	**-11**	--	**73**
DISSOLVED GASES							
Carbon dioxide	mg/L	<5.00	**200**	<5.00	**290**	--	--
Carbon monoxide	mg/L	<1.00	<1.00	<1.00	<1.00	--	--
Ethane	ng/L	**3 J**	<25	**11,000**	**14,000**	--	--
Ethene	ng/L	<25	**18 J**	**1,200**	**1,100**	--	--
Methane	ug/L	**0.96**	**0.14**	**6,500**	**8,300**	--	--
Nitrogen	mg/L	**15.00**	**15.00**	**14.00**	**12.00**	--	--
Oxygen	mg/L	**6.00**	**6.50**	**2.70**	**2.10**	--	--

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 7, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters	Sample ID: / Date:	IW-08 9/18/08	IW-08 12/16/08	IW-13 9/18/08	IW-13 12/16/08	TW-01 9/18/08	TW-01 12/16/08
	Units						
GENERAL CHEMISTRY							
Total Organic Carbon	mg/L	**1,400**	**1,200**	**580**	**1,100**	**1,100**	**160**
FIELD PARAMETERS							
pH	Standard units	**6.07**	**4.67**	**4.79**	**4.80**	**6.40**	**6.48**
Specific Conductance	mmhos/cm	--	**2.070**	--	**1.550**	**3.810**	**1.800**
Turbidity	NTU	--	--	--	--	**60.4**	--
Dissolved Oxygen	mg/L	--	**2.86**	--	**2.03**	**0.23**	**1.21**
Temperature	deg C	--	**2.46**	--	**5.65**	**11.55**	**5.43**
ORP	mV	--	**96**	--	**71**	--	**-24**
DISSOLVED GASES							
Carbon dioxide	mg/L	--	--	--	--	**0.48**	**400**
Carbon monoxide	mg/L	--	--	--	--	<1.00	<1.00
Ethane	ng/L	--	--	--	--	**46**	**520**
Ethene	ng/L	--	--	--	--	**130**	**480**
Methane	ug/L	--	--	--	--	**16,000**	**15,000**
Nitrogen	mg/L	--	--	--	--	**4.70**	**4.90**
Oxygen	mg/L	--	--	--	--	**2.20**	**1.70**

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 7, 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[1] Effluent Totalizer FQI-401 (gallons)	Flow Measurements: Water Bypass[2] Totalizer FQI-402 (gallons)	Flow Measurements: GMPW-3[3] Totalizer FQI-101 (gallons)	Flow Measurements: GMPW-4[3] Totalizer FQI-102 (gallons)	Flow Measurements: GMPW-5[3] Totalizer FQI-103 (gallons)
9/18/2008	4:40 PM	8.9	251	444,371.8	64,465.5	25,788.6	21,641.8	28,059.2
12/15/2008	2:10 PM	9.0	218	525,195.7	101,677.2	41,136.7	43,394.3	59,388.8
		Average Daily Flowrate (gpm) =		**0.64**	**0.29**	**0.12**	**0.17**	**0.25**
		Total Groundwater Recovered During Reporting Period (gallons) =		**80,824**	**37,212**	**15,348**	**21,753**	**31,330**

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

Notes:

1. Total effluent totalizer replaced on 12/23/2005.
2. Water bypass totalizer damaged as a result of freezing in February, 2007. Totalizer replaced on June 25, 2008.
3. Individual well totalizers replaced on June 26, 2008.

Table 4. Concentrations of Volatile Organic Compounds and Selected Metals Detected in Aqueous Samples Collected from the PT System, Operational Year 7, 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 12/17/2008	GMPW-4 INF 12/17/2008	GMPW-5 INF 12/17/2008	COMBINED INF 12/17/2008	COMBINED EFF 12/17/2008
1,1,1-Trichloroethane	10-20		**4.2**	**9.6**	<1.0	**6.7**	<1.0
1,1,2-Trichloroethane	10		<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	10		**34**	**67**	<1.0	**46**	<1.0
1,1-Dichloroethene	10		<1.0	**1.2**	<1.0	<1.0	<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		**1.4**	**2.6**	<1.0	**1.8**	<1.0
Carbon Tetrachloride	NA		<1.0	**1.7**	<1.0	**1.2**	<1.0
Chlorobenzene	NA		**4.2**	**7.3**	<1.0	**5.1**	<1.0
Chloroethane	NA		**11**	**26**	<1.0	**16**	<1.0
Chloroform	NA		<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	10		**21**	**38**	<1.0	**26**	<1.0
Dichlorodifluoromethane	NA		<1.0	**1.5**	<1.0	**1.0**	<1.0
Ethylbenzene	5		<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	10-50		**1.2**	**1.7**	<1.0	**1.3**	<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		**22**	**47**	<1.0	**32**	<1.0
Vinyl Chloride	10-50		**3.0**	**8.9**	<1.0	**6.2**	<1.0
Total VOCs			**102.0**	**212.5**	**0.0**	**142.3**	**0.0**
Metals (units in mg/L)	Model Technology BPJ Limits[3,4] (mg/L)						
Total Iron	1.2 / 0.61		**2.58**	**0.924**	**0.0667**	**1.02**	**0.193**

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 7, Quarter Number 1, Colesville Landfill, Broome County, New York[5,6].

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 7, 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)
9/18/2008	123.1	444,372	NA	NA	NA
12/15/2008	142.3	525,196	80,824	132.4	0.09
			Total Estimated Mass Removed During Operational Year 7, Quarter Number 1 (lbs) =		**0.09**
			Total Estimated Mass Removed Since System Startup (lbs) =		**3.12**

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).

Table 6. Concentrations of Volatile Organic Compounds Detected in Air Stripper Effluent, Operational Year 7, Quarter Number 1, Groundwater Remediation System, Colesville Landfill, Broome County, New York[1].

Compounds	CAS Numbers	Sample ID: Sampled:	Effluent 12/17/2008 ppbv
Vinyl Chloride	75-01-4		<7.8
Chloroethane (Ethyl Chloride)	75-00-3		<7.8
1,1-Dichloroethene (Vinylidene Chloride)	75-35-4		<7.8
Methylene Chloride (Dichloromethane)	75-09-2		<7.8
1,1-Dichloroethane	75-34-3		<7.8
cis-1,2-Dichloroethylene	156-59-2		<7.8
Chloroform	67-66-3		<7.8
1,1,1-Trichloroethane (Methyl Chloroform)	71-55-6		<7.8
Benzene	71-43-2		<7.8
Trichloroethene	79-01-6		<7.8
Toluene	108-88-3		<7.8
Ethyl benzene	100-41-4		<7.8
m,p-Xylene	108-38-3/106-42-3		<7.8
o-Xylene	95-47-6		<7.8
1,2,4-Trimethylbenzene	95-63-6		<7.8
2-Propanol (Isopropyl alcohol)	67-63-0		<7.8
Dichlorodifluoromethane (Freon 12)	75-71-8		<7.8

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

Notes:

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 United States Environmental Protection Agency Method TO-14A.

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Table 7. Concentrations of Volatile Organic Compounds Detected in Aqueous Samples Collected from the SP-5 Spring Water Remediation System, Operational Year 7, Quarter Number 1, Colesville Landfill, Broome County, New York.

Constituents	Model Technology BPJ Limits[1,2] (ug/L)	Sample ID: Date:	SP-5 INF. 12/17/2008	SP-5 EFF. 12/17/2008
VOCs (units in ug/L)				
1,1,1-Trichloroethane	10		<1.0	<1.0
1,1-Dichloroethane	10		**24**	**12**
1,2-Dichloroethane	10-100		<1.0	<1.0
Benzene	5		**2.1**	<1.0
Chlorobenzene	10-25		**36**	**17**
Chloroethane	10		**6.4**	**4.7**
cis-1,2-Dichloroethene	10		**1.4**	<1.0
Dichlorodifluoromethane	NA		<1.0	<1.0
Ethylbenzene	5		<1.0	<1.0
Toluene	5		<1.0	<1.0
trans-1,2-Dichloroethene	10-100		<1.0	<1.0
Trichloroethene	10		**2.4**	**1.4**
Vinyl Chloride	10		<1.0	<1.0
Total VOCs			**72.3**	**35.1**

Bold Constituent detected above MDL.

ug/L	Micrograms per liter.
VOCs	Volatile organic compounds.
<	Analyte below detection limit.
INF.	Influent.
EFF.	Effluent.
NA	No BPJ limit listed.

Notes:

1. Model Technology Best Professional Judgment (BPJ) Limits recommended for carbon adsorption 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.

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Table 8. Spring Water Remediation System Mass Removal Rate of Volatile Organic Compounds, Operational Year 7, Quarter Number 1, Colesville Landfill, Broome County, New York.

Date Sampled	Total VOC Influent Concentration (ug/L)	Effluent Flowrate (gpm)	Depth to Water (feet btc)	Total Groundwater Treated[1] Between Sampling Intervals (gal)	Influent Concentration[2] Geometric Mean (ug/L)	Total Estimated Mass[3] Removed (lbs)
9/18/2008	72.9	0.79	0.3	NA	NA	NA
12/17/2008[4]	72.3	0.13	0.0	41,964	72.6	0.03
				Total Estimated Mass Removed During Current Quarter (lbs) =		**0.03**
				Total Estimated Mass Removed Since System Startup (lbs) =		**0.84**
				Total Effluent Treated Since System Startup (gallons) =		**1,151,437**

Notes:

NA	Not applicable.
ug/L	Micrograms per liter.
gpm	Gallons per minute.
btc	Below top of casing.
gal	Gallons.
lbs	Pounds.
VOC	Volatile organic compound.

1. Total Spring Water Treated Between Sampling Intervals = Effluent Flowrate x 1440 min/day x days between sampling events.
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 Treated Between Sampling Intervals) x Influent Concentration Geometric Mean x 3.7854 L/gallon x (1 lb / 453,592,370 ug).
4. Original field data sheet lost; flow rate and depth to water measurement inferred from operator memory.

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Appendix A

Groundwater Sampling Logs

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Water Sampling Log

Project: Colesville Landfill | Project No.: NY000949.0021 | Page 1 of 1

Site Location: Harpursville, NY | Date: 12/16/08

Site/Well No.: GMMW-2 | Replicate No.: — | Code No.: —

Weather: Cloudy 25° | Sampling Time: Begin 1345 End 1356

Evacuation Data

Measuring Point	—
MP Elevation (ft)	—
Land Surface Elevation (ft)	—
Sounded Well Depth (ft bmp)	—
Depth to Water (ft bmp)	37.54
Water-Level Elevation (ft)	—
Water Column in Well (ft)	—
Casing Diameter/Type	2"
Gallons in Well	—
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Purge Time	begin ____ end ____
Pumping Rate (gpm)	—
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Clear
Odor	Slight
Appearance	Cloudy
pH (s.u.)	6.85
Conductivity (mS/cm)	0.773
(µmhos/cm)	
Turbidity (NTU)	—
Temperature (°C)	6.72
Dissolved Oxygen (mg/L)	2.08
ORP	-40
Sampling Method	Bailer / PDB
Remarks	

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML Vials	2	
TOC	40 ml amber vials	2	Unpres.
Total Iron	250 ML Plastic		HNO3

Sampling Personnel: KA

olumes

2" = 0.16 | 3" = 0.37 | 4" = 0.65

2-½" = 0.26 | 3-½" = 0.50 | 6" = 1.47

ml	milliliter	NTU	Nephelometric Turbidity Units
mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
msl	mean sea-level	s.u.	Standard units
N/A	Not Applicable	umhos/cm	Micromhos per centimeter
NR	Not Recorded	VOC	Volatile Organic Compounds

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	12/16/08
Site/Well No.	PW-4	Replicate No.	—	Code No.	—
Weather	Cloudy 25°	Sampling Time: Begin	1138	End	1145

Evacuation Data

Measuring Point	—
MP Elevation (ft)	—
Land Surface Elevation (ft)	—
Sounded Well Depth (ft bmp)	—
Depth to Water (ft bmp)	18.46
Water-Level Elevation (ft)	—
Water Column in Well (ft)	—
Casing Diameter/Type	2"
Gallons in Well	—
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Clear
Odor	None
Appearance	Little debris
pH (s.u.)	5.91
Conductivity (mS/cm)	1.049
(µmhos/cm)	
Turbidity (NTU)	—
Temperature (°C)	6.55
Dissolved Oxygen (mg/L)	5.92
ORP	36
Sampling Method	Bailer / PDB
Remarks	

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML Vials	2	
TOC	40 ml amber vials	2	Unpres.
Total Iron	250 ML Plastic		HNO3

Sampling Personnel: KA / Fran

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

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	12/16/08
Site/Well No.	W-5	Replicate No.	—	Code No.	—
Weather	Cloudy	Sampling Time: Begin	1301	End	1310

Evacuation Data

Measuring Point	—
MP Elevation (ft)	—
Land Surface Elevation (ft)	—
Sounded Well Depth (ft bmp)	—
Depth to Water (ft bmp)	52.64
Water-Level Elevation (ft)	—
Water Column in Well (ft)	—
Casing Diameter/Type	2"
Gallons in Well	—
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	gray
Odor	Med
Appearance	cloudy
pH (s.u.)	6.48
Conductivity (mS/cm)	1.086
(µmhos/cm)	
Turbidity (NTU)	—
Temperature (°C)	4.74
Dissolved Oxygen (mg/L)	2.17
ORP	-11
Sampling Method	Bailer / PDB
Remarks	

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML Vials	2	
TOC	40 ml amber vials	2	Unpres.
Total Iron	250 ML Plastic		HNO3

Sampling Personnel: KA / Fran

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

Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	12/16/08
Site/Well No.	GMW-5	Replicate No.	REP 121608	Code No.	
Weather	Cloudy 25°	Sampling Time:	Begin 1035	End	1042

Evacuation Data

Measuring Point	—
MP Elevation (ft)	—
Land Surface Elevation (ft)	—
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	49.85
Water-Level Elevation (ft)	—
Water Column in Well (ft)	—
Casing Diameter/Type	2"
Gallons in Well	—
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Purge Time	begin — end —
Pumping Rate (gpm)	—
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Lt Brown
Odor	Strong
Appearance	Little debris
pH (s.u.)	6.37
Conductivity (mS/cm)	0.530
(µmhos/cm)	
Turbidity (NTU)	—
Temperature (°C)	7.76
Dissolved Oxygen (mg/L)	1.26
ORP	-30
Sampling Method	Bailer / PDB
Remarks	

Constituents Sampled	Container Description	Number (Dup)	Preservative
8021 VOLATILES	40 ML VOA VIALS	2 / 2	HCL
Ethene, Ethane, Methane	40 ML Vials	2 / ~~2~~	
TOC	40 ml amber vials	2 / ~~2~~	Unpres.
Total Iron	250 ML Plastic		HNO3

Sampling Personnel: KA / FRAN

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

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	12/16/08
Site/Well No.	GMMW-6	Replicate No.	MS/MSD	Code No.	—
Weather	Cloudy 25°	Sampling Time: Begin	1115	End	1126

Evacuation Data

Measuring Point	—
MP Elevation (ft)	
Land Surface Elevation (ft)	
Sounded Well Depth (ft bmp)	
Depth to Water (ft bmp)	39.24
Water-Level Elevation (ft)	
Water Column in Well (ft)	
Casing Diameter/Type	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Slight cloudiness
Odor	Slight
Appearance	Little debris
pH (s.u.)	6.48
Conductivity (mS/cm)	1.133
(µmhos/cm)	
Turbidity (NTU)	—
Temperature (°C)	7.35
Dissolved Oxygen (mg/L)	2.10
ORP	-1
Sampling Method	Bailer / PDB
Remarks	

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2/2/2	HCL
Ethene, Ethane, Methane	40 ML Vials	2	
TOC	40 ml amber vials	2	Unpres.
Total Iron	250 ML Plastic		HNO3

Sampling Personnel: KA

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

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	12/17/08
Site/Well No.	GMPW-3	Replicate No.		Code No.	
Weather	—	Sampling Time:	Begin 1225	End	1235

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	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Clear
Odor	
Appearance	
pH (s.u.)	7.01
Conductivity (mS/cm)	0.637
(µmhos/cm)	
Turbidity (NTU)	—
Temperature (°C)	12.14
Dissolved Oxygen (mg/L)	4.79
ORP	43
Sampling Method	~~Bailer~~ grab Sample
Remarks	

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML Vials	—	
TOC	40 ml amber vials	—	Unpres.
Total Iron	250 ML Plastic	1	HNO3

Sampling Personnel: KA

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

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Water Sampling Log

Project: Colesville Landfill | Project No.: NY000949.0021 | Page: 1 of 1

Site Location: Harpursville, NY | Date: 12/17/08

Site/Well No.: GMPW-4 | Replicate No.: — | Code No.: —

Weather: — | Sampling Time: Begin 1239 End 1246

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	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Clear
Odor	
Appearance	
pH (s.u.)	6.50
Conductivity (mS/cm)	0.612
(µmhos/cm)	
Turbidity (NTU)	—
Temperature (°C)	10.35
Dissolved Oxygen (mg/L)	2.74
ORP	57
Sampling Method	~~Bailer~~ grab Sample
Remarks	

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML Vials	—	
TOC	40 ml amber vials	—	Unpres.
Total Iron	250 ML Plastic	1	HNO3

Sampling Personnel: KA

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	Millisiemens 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

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	12/17/08
Site/Well No.	GMPW-5	Replicate No.	—	Code No.	—
Weather	—	Sampling Time:	Begin 1247	End	1250

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	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	~~2" Disposable poly bailer~~

Field Parameters

Color	Clear
Odor	
Appearance	
pH (s.u.)	7.22
Conductivity (mS/cm)	0.224
(µmhos/cm)	—
Turbidity (NTU)	—
Temperature (°C)	9.48
Dissolved Oxygen (mg/L)	2.04
ORP	36
Sampling Method	~~Bailer~~
Remarks	grab sample

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML Vials	—	
TOC	40 ml amber vials	—	Unpres.
Total Iron	250 ML Plastic	1	HNO3

Sampling Personnel: KA

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

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	12/17/08
Site/Well No.	Combined influent	Replicate No.	—	Code No.	—
Weather	—	Sampling Time:	Begin 1252	End	1258

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	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Clear
Odor	
Appearance	
pH (s.u.)	
Conductivity (mS/cm)	
(µmhos/cm)	
Turbidity (NTU)	
Temperature (°C)	
Dissolved Oxygen (mg/L)	
ORP	
Sampling Method	~~Bailer~~
Remarks	direct grab System Sampling

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML Vials	—	
TOC	40 ml amber vials	—	Unpres.
Total Iron	250 ML Plastic	1	HNO3

Sampling Personnel: KA

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	mililiter	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

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	12/17/08
Site/Well No.	Effluent water	Replicate No.	—	Code No.	
Weather	—	Sampling Time:	Begin 1303	End	1304

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	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Clear
Odor	
Appearance	
pH (s.u.)	
Conductivity (mS/cm)	
(µmhos/cm)	
Turbidity (NTU)	
Temperature (°C)	
Dissolved Oxygen (mg/L)	
ORP	
Sampling Method	Bailer
Remarks	Direct grab System Sampling

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML Vials	2	
TOC	40 ml amber vials	1	Unpres.
Total Iron	250 ML Plastic	1	HNO3

Sampling Personnel: KA

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

Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	12/22/08
Site/Well No.	SP-5 effluent	Replicate No.	—	Code No.	
Weather	Cloudy 25°	Sampling Time: Begin	0950	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	2"
Gallons in Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	~~2" Disposable~~ poly bailer

Field Parameters

Color	Clear
Odor	none
Appearance	Iron deposits
pH (s.u.)	6.41
Conductivity (mS/cm)	0.524
(µmhos/cm)	
Turbidity (NTU)	—
Temperature (°C)	8.05
Dissolved Oxygen (mg/L)	4.47
ORP	-5
Sampling Method	~~Bailer~~ Direct grab
Remarks	

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML VOA Vials	—	
TOC	250 ML Plastic	—	Unpres.
Total Iron	250 ML Plastic	—	HNO3

Sampling Personnel: KA

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

Water Sampling Log

Project: Colesville Landfill | Project No.: NY000949.0021 | Page 1 of 1

Site Location: Harpursville, NY | Date: 12/16/08

Site/Well No.: TW-1 | Replicate No.: — | Code No.: ____

Weather: Cloudy 25° | Sampling Time: Begin 1315 | End ____

Evacuation Data

Measuring Point	—
MP Elevation (ft)	—
Land Surface Elevation (ft)	—
Sounded Well Depth (ft bmp)	—
Depth to Water (ft bmp)	51.85
Water-Level Elevation (ft)	—
Water Column in Well (ft)	—
Casing Diameter/Type	2"
Gallons in Well	—
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Purge Time	begin ____ end ____
Pumping Rate (gpm)	—
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	yellow Brown
Odor	Strong
Appearance	Little debris
pH (s.u.)	6.48
Conductivity (mS/cm)	1.80
(µmhos/cm)	
Turbidity (NTU)	—
Temperature (°C)	5.43
Dissolved Oxygen (mg/L)	1.21
ORP	-24
Sampling Method	Bailer / PDB
Remarks	

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	2	HCL
Ethene, Ethane, Methane	40 ML Vials	2	
TOC	40 ml amber vials	2	Unpres.
Total Iron	250 ML Plastic		HNO3

Sampling Personnel: KA / FCar

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

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	12/16/08
Site/Well No.	TW-3	Replicate No.	—	Code No.	
Weather	Cloudy 25°	Sampling Time:	Begin 1420	End	1430

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	2"
Gallons In Well	
Gallons Pumped/Bailed Prior to Sampling	
Sample Pump Intake Setting (ft bmp)	
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	yellow
Odor	strong
Appearance	
pH (s.u.)	5.98
Conductivity (mS/cm)	0.823
(µmhos/cm)	
Turbidity (NTU)	—
Temperature (°C)	6.84
Dissolved Oxygen (mg/L)	1.84
ORP	2.3
Sampling Method	Bailer
Remarks	

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	—	HCL
Ethene, Ethane, Methane	40 ML Vials	—	
TOC	40 ml amber vials	2	Unpres.
Total Iron	250 ML Plastic		HNO3

Sampling Personnel: KA

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

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	12/16/08
Site/Well No.	IW-13	Replicate No.	—	Code No.	
Weather	Cloudy 25	Sampling Time:	Begin 1448	End	1451

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	2"
Gallons in Well	—
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Purge Time	begin ____ end ____
Pumping Rate (gpm)	—
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Dark yellow
Odor	Strong
Appearance	—
pH (s.u.)	4.80
Conductivity (mS/cm)	1.55
(µmhos/cm)	
Turbidity (NTU)	—
Temperature (°C)	5.65
Dissolved Oxygen (mg/L)	2.03
ORP	71
Sampling Method	Bailer
Remarks	

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	—	HCL
Ethene, Ethane, Methane	40 ML Vials	—	
TOC	40 ml amber vials	2	Unpres.
Total Iron	250 ML Plastic	—	HNO3

Sampling Personnel: KA

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

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Water Sampling Log

Project	Colesville Landfill	Project No.	NY000949.0021	Page	1 of 1
Site Location	Harpursville, NY			Date	12/16/08
Site/Well No.	IW-8	Replicate No.	—	Code No.	
Weather	Cloudy	Sampling Time: Begin	1505	End	1513

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	2"
Gallons in Well	—
Gallons Pumped/Bailed Prior to Sampling	—
Sample Pump Intake Setting (ft bmp)	—
Purge Time	begin ____ end ____
Pumping Rate (gpm)	
Evacuation Method	2" Disposable poly bailer

Field Parameters

Color	Brown
Odor	Strong
Appearance	
pH (s.u.)	4.67
Conductivity (mS/cm)	2.07
(µmhos/cm)	
Turbidity (NTU)	—
Temperature (°C)	2.46
Dissolved Oxygen (mg/L)	2.86
ORP	96
Sampling Method	Bailer
Remarks	

Constituents Sampled	Container Description	Number	Preservative
8021 VOLATILES	40 ML VOA VIALS	—	HCL
Ethene, Ethane, Methane	40 ML Vials	—	
TOC	40 ml amber vials	2	Unpres.
Total Iron	250 ML Plastic	—	HNO3

Sampling Personnel: KA

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	Milligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

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Appendix B

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

Table B-1. NYSDEC DAR-1 Air Modeling Data, Operational Year 7, Quarter Number 1, Colesville Landfill, Broome County, New York.

Parameters for 12/17/08 Sampling Event			
Discharge Temperature[1]	T	510	^{o}R
Ambient Temperature[2]	Ta	509	^{o}R
Stack Diameter	D	6	in
Stack Radius	R	0.25	ft
Stack Area	A	0.20	ft^2
Exit Velocity	V	17.8	fps
Exit Flow	Q	210	acfm
Exit Flow	Q	218	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	$F_m = T_a/T * V2 * R2$	n/a	ft^4/s^2
Effective Stack Height	h_e	17	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	

^{o}R: degrees Rankine
in: inches
ft: feet
ft^2: square feet
fps: feet per second
acfm: actual cubic feet per minute
scfm: standard cubic feet per minute
ft^4/s^2: feet to the fourth per square second

Notes/Assumptions:

1. The stack discharge temperature is 50 ^{o}F based on recorded parameters.
2. The ambient temperature is approximately 49^{o}F based on recorded conditions.
3. Calculations assume that the system will run with the maximum allowable concentrations between quarterly readings.

Table B-2. NYSDEC DAR-1 Air Modeling Data, Operational Year 7, Quarter Number 1, Colesville Landfill, Broome County, New York.

Calculation of the Short-Term Guideline Concentration (SGC) for Sampling Event on 12/17/2008

Compounds	CAS Numbers	Maximum Limit (SGC[2]) (ug/m^3)	Analytical Concentration (ppb)	Detection Limit Used[3]	Actual Emissions C_a (ug/m^3)	Mass/hour (lb/hr)	Maximum Potential Impact (Step III.A.3 in DAR-1)[1] (ug/m^3)	Short Term Impact (Step III.A.5 in DAR-1)[1] (ug/m^3)	Percent of the SGC (%)
Vinyl Chloride	75-01-4	180,000	7.8	*	20.27	2.85E-05	0.0049	0.31623	1.8E-04
Chloroethane (Ethyl Chloride)	75-00-3	--	7.8	*	20.92	2.94E-05	0.0050	0.32645	NA
1,1-Dichloroethene (Vinylidene Chloride)	75-35-4	--	7.8	*	31.44	4.42E-05	0.0075	0.49054	NA
Methylene Chloride (Dichloromethane)	75-09-2	14,000	7.8	*	27.54	3.87E-05	0.0066	0.42977	3.1E-03
1,1-Dichloroethane	75-34-3	--	7.8	*	32.09	4.51E-05	0.0077	0.50076	NA
cis-1,2 - Dichloroethylene	156-59-2	--	7.8	*	31.44	4.42E-05	0.0075	0.49054	NA
1,1,1-Trichloroethane (Methyl Chloroform)	71-55-6	68,000	7.8	*	43.26	6.08E-05	0.0104	0.67507	9.9E-04
Trichloroethene	79-01-6	14,000	7.8	*	42.61	5.98E-05	0.0102	0.66484	4.7E-03
m,p-Xylene	108-38-3/106-42-3	4,300	7.8	*	33.77	4.74E-05	0.0081	0.52692	1.2E-02
Dichlorofluoromethane (Freon 12)	75-71-8	--	7.8	*	39.20	5.51E-05	0.0094	0.61172	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 September 10,2007.
2. SGC refers to the Short-Term Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated September 10, 2007.
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-2. NYSDEC DAR-1 Air Modeling Data, Operational Year 7, Quarter Number 1, Colesville Landfill, Broome County, New York.

Calculation of AGC based on 12/17/2008 Sampling Event

Compounds	CAS Numbers	Maximum Limit on C_a (AGC[1]) ug/m^3	Maximum Mass Flow Q_a lb/yr	Lab Data ppb	Detection Limit Used[2]	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	7.8	*	20.27	1.65E-05	0.13971	**1.30**
Chloroethane (Ethyl Chloride)	75-00-3	10,000	978,044.97	7.8	*	20.92	1.70E-05	0.14422	**0.00**
1,1-Dichloroethene (Vinylidene Chloride)	75-35-4	70	6,846.31	7.8	*	31.44	2.56E-05	0.21671	**0.00**
Methylene Chloride (Dichloromethane)	75-09-2	2.1	205.39	7.8	*	27.54	2.24E-05	0.18987	**0.09**
1,1-Dichloroethane	75-34-3	0.63	61.62	7.8	*	32.09	2.61E-05	0.22123	**0.36**
cis-1,2-Dichloroethylene	156-59-2	63	6,161.68	7.8	*	31.44	2.56E-05	0.21671	**0.00**
1,1,1-Trichloroethane (Methyl Chloroform)	71-55-6	1,000	97,804.50	7.8	*	43.26	3.52E-05	0.29823	**0.00**
Trichloroethene	79-01-6	0.5	48.90	7.8	*	42.61	3.47E-05	0.29372	**0.60**
m,p-Xylene	108-38-3/106-42-3	100	9,780.45	7.8	*	33.77	2.75E-05	0.23278	**0.00**
Dichlorodifluoromethane (Freon 12)	75-71-8	12,000	1,173,653.96	7.8	*	19.49	1.59E-05	0.13434	**0.00**

ug/m^3: micrograms per cubic meter
lb/yr: pounds per year
lb/hr: pounds per hour
ppb: parts per billion
*: analyte concentration below detection limit, detection limit was used in calculations

Notes/Assumptions:

1. AGC refers to the Annual Guideline Concentration as determined using the hand calculations in the DAR-1 AGC/SGC Tables dated September 10, 2007.
2. 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 C

Automated Reagent Injection System
Operating Parameters

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Table C-1. Automated Reagent Injection System Summary of Operational Year 7, Quarter Number 1 Injection Quantities, 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.)
11/13/2008	13,705	137	148
Quarter Totals (gal.) =	**13,705**	**137**	**148**
Totals Since Startup (gal.) =	**185,752**	**9,150**	**8,719**

Notes:

gal. Gallons

Table C-2. Automated Reagent Injection System, Operational Year 7, Quarter Number 1 Operating Parameters, Groundwater Remediation System, Colesville Landfill, Broome County, New York.

Injection Number 59

Injection Start Date = 9/22/2008
Injection Completion Date = 11/13/2008

Molasses to Water Ratio (%) = 1.0 Programmed Mixing Time (min.)[1] = 60

Injection Well ID	Molasses Solution Injection Quantity (gal.)	Rinse[2] Quantity (gal.)	Raw Molasses Per Well (gal.)	Min. Injection[3] Flowrate (gpm)	Max. Injection Pressure (psi)
PW-6	530	5	5.3	NM	26
IW-3	530	5	5.3	NM	26
IW-1	210	4	2.1	NM	26
IW-2	210	3	2.1	NM	26
GMMW-1	140	3	1.4	NM	9
IW-4	989	4	9.9	NM	26
IW-5	989	5	9.9	NM	26
IW-6	989	7	9.9	NM	27
IW-7	989	8	9.9	NM	27
IW-8[4]	0	0	0.0	NM	0
IW-9	1,230	11	12.3	NM	0[3]
IW-10	1,230	12	12.3	NM	29
IW-11	1,230	13	12.3	NM	28
IW-12	1,230	15	12.3	NM	27
IW-13	1,230	16	12.3	NM	28
IW-14	989	18	9.9	NM	28
IW-15	989	19	9.9	NM	28
Totals (gal.) =	13,705	148	137.1	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 was injected manually at 20 gpm for 1 minute.
3.	Parameter not measured due to SCADA system malfunction.
4.	Injection not conducted into IW-8 for ongoing Alternate Electron Donor Pilot test evaluation.