Dvirka and Bartilucci Consulting Engineers
A Division of D&B Engineers and Architects, P.C.

CIRCUITRON CORPORATION SITE PILOT SOURCE AREA TREATMENT SYSTEM

Latitude 40.749787 °,
Longitude -73.418753 °

REPORT TITLE

Site Management Report No. 01

REPORTING PERIOD

August 2011 - January 2012

CLIENT

New York State Department of Environmental Conservation

Jeffrey E. Trad, P.E., Project Manager
email: jetrad@gw.dec.state.ny.us

CONSULTANT

Dvirka and Bartilucci Consulting Engineers

Frank DeVita, Project Manager
email: fdevita@db-eng.com

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation
625 Broadway, 12th Floor, Albany, New York 12233

Site

NYSDEC Site No. 152082, Circuitron Corporation Site, Pilot Source Area Treatment System. East Farmingdale, Town of Babylon, Suffolk County, New York. Refer to *Figure 1* for a site location map.

Project Background and Site Description

The Circuitron Corporation Site (Site) Pilot Source Area Treatment System (PSTS) consists of a single integrated groundwater circulation well with an in-well vapor stripping and soil vapor extraction (GCW/IVS/SVE) system. The system was placed into operation by the United States Environmental Protection Agency (USEPA) in March 2008 to address moderate levels of residual contamination (chlorinated solvents) within soil and groundwater in the southwest corner of the Site. The GCW/IVS/SVE system was operated and maintained by the USEPA through June 2011 when site management responsibilities were transferred to the New York State Department of Environmental Conservation (NYSDEC) consistent with Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) requirements. Site management activities are now performed by the NYSDEC with funds allocated under the New York State Superfund Program. A copy of the Site Transfer Agreement is provided in *Appendix A*. The NYSDEC issued a Work Assignment (WA D004446-16) to Dvirka and Bartilucci Consulting Engineers (D&B) in July 2011 under D&B's State Superfund Contract with the NYSDEC to perform site management activities at the Site.

A timeline identifying project-related milestones is presented below.

Project Milestone Description	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12
NYSDEC Issuance of "QuickStart" Work Assignment---------->	❖						
Transition of Project Records/Site Management Responsibilities from USEPA to NYSDEC	■	■	■				
Routine (Bi-Monthly) System Monitoring/Sampling Activities		(1)	■	■	■	■	■
NYSDEC Approval of Site Management Work Plan			❖				
USEPA relocation of In-Well Air Stripping System, including utility installations (i.e., electric & telephone)			■	■			
USEPA Shutdown of In-Well Air Stripping System to allow for planned site demolition activities				■			
System Maintenance Subcontractor Procurement and NYSDEC Approval					■	■	■

NOTES:
1. Routine system monitoring/sampling activities began on August 24, 2011 as per the direction of the NYSDEC.

Pilot Source Area Treatment System Overview

The PSTS consists of a single integrated groundwater circulation well with an in-well vapor stripping and soil vapor extraction system. The overall process, which is an extension of the air sparging technology, involves the creation of groundwater circulation cells around a well through which contaminated groundwater is cycled. As can be seen on *Figure 2*, the groundwater circulation well installed at the Site consists of a single well with separate upper and lower screened intervals. Nitrogen is injected at the base of the well, decreasing the density of the groundwater, driving it upward and out of the upper screened zone into the vadose and/or saturated zones while simultaneously drawing groundwater in through the lower screened zone. In the process, groundwater contaminants are transferred from the dissolved phase to the vapor phase by the rising air bubbles via air stripping. Once discharged, the air stripped groundwater flows downward, eventually reaching the lower portion of the saturated zone where it is cycled back through the well, replacing the water that rose due to the density gradient. This process creates a circulation pattern or cell that allows continuous cycling of groundwater through the well and air stripping process.

The portion of the well screen above the saturated zone is utilized by the SVE system to extract contaminants stripped from the groundwater. Extracted vapor is directed through a moisture knockout drum to remove any entrained water/moisture. Extracted soil vapor is subsequently processed through a series of vapor phase carbon adsorption vessels to remove targeted contaminant prior to being discharged to the atmosphere. It should be noted, however, that the process piping was reconfigured in August 2011 to bypass the vapor phase carbon adsorption vessels per the direction of the NYSDEC based on historic low contaminant concentrations detected in extracted soil vapor.

All treatment system components are located on-site within a mobile trailer. The treatment system is equipped with instrumentation and controls to allow for automated start-up and operation, as well as an autodial remote notification system. Refer to *Figure 3* for a schematic of the PSTS. Refer to *Figure 4* for a Process and Instrumentation Diagram of the PSTS.

Regulatory Requirements/Cleanup Goals

In line with the objectives and requirements of the Operable Unit 1 (OU-1) Record of Decision (ROD) and Operable Unit 2 (OU-2) ROD included in *Appendix B*, the PSTS was constructed and put into routine operation focusing on the following goals:

OU-1 ROD

- Reduce the concentrations of contaminants in Site soils and sediments to levels which are protective of human health and the environment; and,
- Prevent further deterioration of the area groundwater.

OU-2 ROD

- Prevent potential future ingestion of site-related contaminated groundwater;
- Restore the quality of the groundwater contaminated from the site-related activities to levels consistent with the Federal and State drinking water and groundwater quality standards; and,
- Mitigate the off-site migration of the site-related contaminated groundwater.

System Performance Summary

The treatment system performance during the current reporting period is summarized below:

In-Well Air Stripping System, SVE Component Performance Summary		
Average Groundwater Circulation Well Head Vacuum (in. H2O)	24.25	
Average Groundwater Circulation Well Head Flow Rate (SCFM)	467	
Average SVE System Discharge Pressure (in. H2O)	- -	
Average SVE System Discharge Flow Rate (SCFM)	488	
Average Total VOC Removal Rate (Lbs./Hour)	5.99E-04	
Total VOC Removal, Current Reporting Period (Lbs.)	4.07	
Cumulative VOC Removal (Lbs.)	20.76	
Cumulative SVE System Discharge Flow (SCF)	227,627,328	
Average Soil Vapor Monitoring Probe Vacuum Readings		
Soil Vapor Monitoring Probe Vacuum Readings	Min.	Max.
❖ N07D, Located approximately 07 ft. from GCW (in. H2O)	-0.11	-0.44
❖ N30S, Located approximately 30 ft. from GCW (in. H2O)	-0.24	-0.41
❖ N30D, Located approximately 30 ft. from GCW (in. H2O)	-0.02	-0.5
❖ N45S, Located approximately 45 ft. from GCW (in. H2O)	-0.16	-0.28
❖ N45D, Located approximately 45 ft. from GCW (in. H2O)	-0.09	-0.34
❖ SE07, Located approximately 07 ft. from GCW (in. H2O)	-0.18	-0.96
❖ SE15S, Located approximately 15 ft. from GCW (in. H2O)	-0.27	-0.49
❖ SE15D, Located approximately 15 ft. from GCW (in. H2O)	-0.37	-0.61

In-Well Air Stripping System, Nitrogen Sparging Component Performance Summary	
Combined Nitrogen Flow Rate, Nitrogen Compressor Outlet (SCFM)	3.08
Average Nitrogen Flow - Groundwater Circulation Well (SCFM)	1.14
Average Nitrogen Flow - AS-SW07 (SCFM)	0.58
Average Nitrogen Flow - AS-SE07 (SCFM)	0.65
Average Nitrogen Flow - AS-N07 (SCFM)	0.71

System Runtime/Downtime Summary

The total elapsed time for this reporting period was 3,848 hours (August 24, 2011 through January 31, 2012). Of this amount, the SVE component of the PSTS operated for 3,315 hours or approximately 86 percent of the total elapsed time. The nitrogen sparging component of the PSTS operated for 2,855 hours or approximately 67 percent of the total elapsed time. System runtime/downtime per component is summarized below. Refer to *Table 3* for treatment system operation and maintenance logs, which identify specific information regarding alarm conditions, downtime and repairs.

In-Well Air Stripping System, SVE Component Runtime/Downtime Summary

	(Hours)	(Percentage)
SVE System Runtime - Current Reporting Period [1]	3,315	86.15%
SVE System Downtime - Current Reporting Period [1][3]	533	13.85%
Total SVE System Runtime To Date [2]	22,202	--

Notes:
1. Reported value based on the following: System start-up date of 8/24/2011; and total elapsed time 3,848 hours for the current reporting period.
2. Reported value reflects system runtime since inception in July 2008, as recorded by the USEPA.
3. The PSTS was shut down by the USEPA during the entire month of October 2011 to allow for planned site demolition activities.

In-Well Air Stripping System, Nitrogen Sparging Component Runtime/Downtime Summary

	(Hours)	(Percentage)
System Runtime - Current Reporting Period [1]	2,855	66.75%
System Downtime - Current Reporting Period [1][3]	1,422	33.25%
Total System Runtime To Date [2]	19,373	--

Notes:
1. Reported value based on the following: System start-up date of 8/24/2011; and total elapsed time 3,848 hours for the current reporting period.
2. Reported value reflects system runtime since inception in July 2008, as recorded by the USEPA.
3. The PSTS was shut down by the USEPA during the entire month of October 2011 to allow for planned site demolition activities.

A tentative schedule for the performance of routine system maintenance next reporting period is presented below.

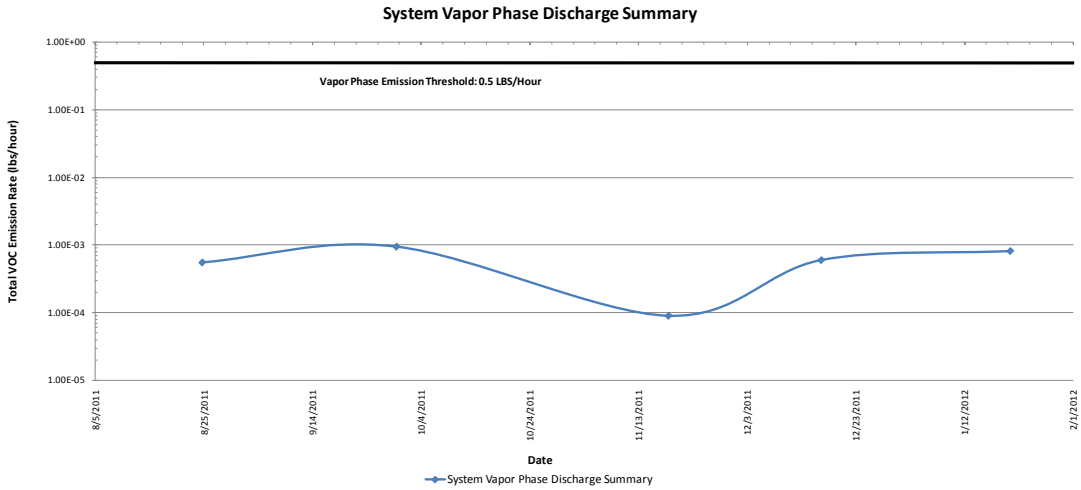
Major System Component	Manufacturer	Model Number	Maintenance Frequency	Current Reporting Period [1]					
				Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12
Air Sparge Compressor	Quincy Compressor	QR-25® Series, Model F325	Bi-Monthly						
High Temperature Refrigerated Dryer	Parker	ZDHHT15-100 (60Hz)	Every Four Months						
Nitrogen Generator	O2N2 SITE Gas Systems	NM Model	Quarterly						
Vacuum Blower	Ametek	EN909BG72WL	Bi-Monthly						
Vapor Phase Carbon Adsorption Vessels	Carbtrol Corporation	G-3	As Needed						

Major System Component	Manufacturer	Model Number	Maintenance Frequency	Subsequent Reporting Periods [2]					
				Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12
Air Sparge Compressor	Quincy Compressor	QR-25® Series, Model F325	Bi-Monthly	⌛		⌛		⌛	
High Temperature Refrigerated Dryer	Parker	ZDHHT15-100 (60Hz)	Every Four Months	⌛				⌛	
Nitrogen Generator	O2N2 SITE Gas Systems	NM Model	Quarterly	⌛			⌛		
Vacuum Blower	Ametek	EN909BG72WL	Bi-Monthly	⌛		⌛		⌛	
Vapor Phase Carbon Adsorption Vessels	Carbtrol Corporation	G-3	As Needed						

Notes:
1. Visual inspection of major system equipment only performed throughout reporting period. Performance of preventive maintenance activities (i.e., lubrication, filter replacements) was completed for all major system components starting February 2012, upon competitive selection and approval of standby maintenance subcontractor.
2. The following represents tentative schedules for performance of routine maintenance of major system components.

Vapor Phase Discharge Summary

Five vapor-phase discharge samples were collected for laboratory analysis via Method TO-15 this reporting period. Sample results were evaluated using DAR-1 modeling software. All samples exhibited VOCs well below the site-specific effluent limit of 0.5 lbs/hr. The site-specific effluent limit of 0.5 lbs/hr was developed in consultation with the NYSDEC as a means to monitor the discharge of vapor-phase VOCs by the GCW/IVS/SVE. Refer to *Table 2* for analytical results.

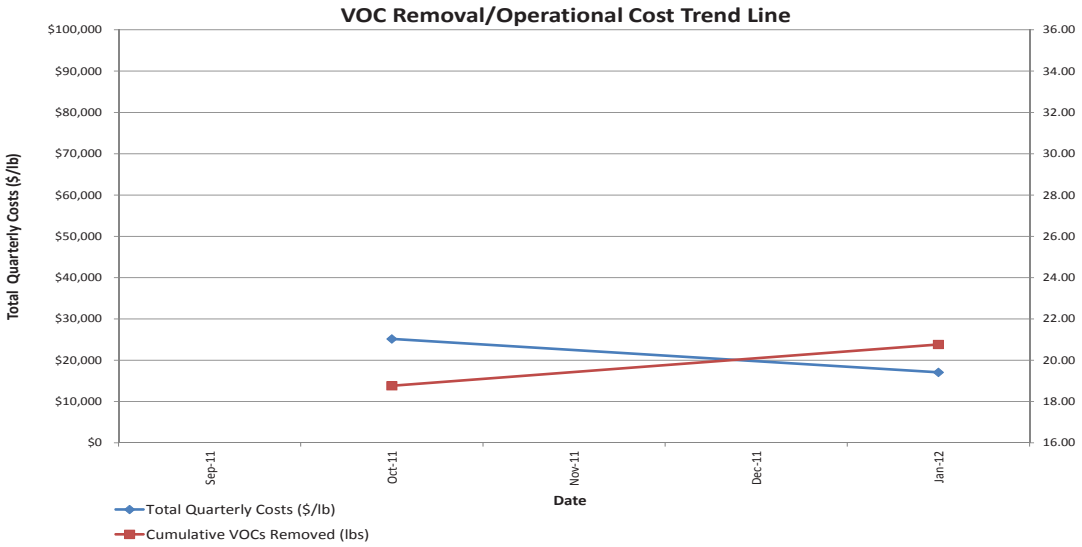


Operational Cost Summary

A figure illustrating project costs associated with operation and maintenance of the GCW/IVS/SVE system over the six month period from August 2011 through January 2012 is provided below. The figure presents operational costs on a quarterly basis relative to pounds of volatile organic compounds removed from the Site. Operational costs include monthly utility, maintenance, and engineering charges. Capitol construction costs and NYSDEC project management effort are not included in the evaluation.

The total operational cost incurred during the period from August 2011 through January 2012 was approximately $69,500. Of this amount, $64,000 was related to engineering charges and $5,500 was related to laboratory charges. Utility costs were paid for by the USEPA throughout the reporting period. Based on 4.07 pounds of VOC contaminants removed from the Site during this reporting period, the average cost of VOC removal was approximately $21,100 per pound.

It should be noted that the treatment system operational costs were estimated to be approximately $100,000 annually during initial alternative analyses conducted by the USEPA in 2007. Since inception, the PSTS yearly operating costs (including utility, maintenance and engineering costs) have been found to be more than initially projected estimates. Additionally, it should be noted that total project costs over the six month period from August 2011 through January 2012 was $69,500. At this time, it appears that actual operational costs may be trending higher than previous estimates. If actual operation costs continue to increase, a remedial system optimization evaluation may be warranted to identify means for reducing cost and time to site closure. Operational costs will be monitored during future reporting periods to evaluate efficiency and effectiveness of the treatment system.



Groundwater Monitoring Summary

Eighteen on-site groundwater monitoring wells were sampled in September 2011 to determine groundwater quality at the Site, as well as the overall performance of the PSTS. Groundwater samples were collected from six monitoring wells (GW-N15S, GW-N15M, GW-N15D, GW-N45S, GW-N45M, and GW-N45D) located upgradient of the GCW/IVS/SVE system, nine monitoring wells (MW-4S, MW-4D, GW-SW45S, GW-SW45M, GW-SW45D, GCW-SPY-S, GCW-SPY-D, GW-SE07S, and GW-SE15S) in the vicinity of the GCW/IVS/SVE system, and three monitoring wells (GW-SE30S, GW-SE30M, and GW-SE30D) downgradient of the GCW/IVS/SVE system. Groundwater samples were collected from shallow, intermediate, and deep zones. All samples were analyzed for VOCs. The location of the groundwater monitoring wells and GCW/IVS/CVE system are depicted on *Figure 5*.

VOCs were detected in excess of SCGs in eight of the eighteen groundwater samples collected in September 2011. In particular, cis-1,2-dichloroethene, 1,1,1-trichloroethane, and chlorobenzene were detected in excess of SCGs in at least one of the samples at concentrations ranging from 5.2 µg/L to 120 µg/L. The VOCs were detected in samples collected from the shallow, intermediate and deep groundwater zones. cis-1,2-Dichloroethene was detected in excess of its SCG (5 µg/L) in one upgradient shallow well (GW-N45S) at a concentration of 12 µg/L and two upgradient deep wells (GW-N15D and GW-N45D) at concentrations of 8.3 µg/L and 6.9 µg/L, respectively. 1,1,1-Trichloroethane was detected in excess of its SCG (5 µg/L) in two shallow wells (MW-4S and GW-SE07S) in the vicinity of the GCW/IVS/SVE system at concentrations of 120 µg/L and 34 µg/L, respectively. cis-1,2-Dichloroethene was detected in excess of its SCG (5 µg/L) in one downgradient shallow well (GW-SE30S) at a concentration of 8.3 µg/L and one downgradient intermediate well (GW-SE30M) at concentrations of 8.4 µg/L. Chlorobenzene was detected in excess of its SCG (5 µg/L) in one deep well (GW-SE30D) at concentrations of 5.2 µg/L. *Table 4* presents tabulated analytical results relative to SCGs. *Figure 5* summarizes exceedances of SCGs in groundwater by well location.

Data Validation Summary

Five vapor phase samples and eighteen groundwater samples were collected this reporting period. All vapor phase samples were analyzed by Con-test Analytical Laboratory in accordance with USEPA Method TO-15 for VOCs and all groundwater samples were analyzed by Spectrum Analytical, Inc. in accordance with USEPA 8260 for VOCs. The data packages were reviewed for contract and method compliance to determine the usability of the sample results. The findings of the review process are summarized below:

Vapor Phase Samples

1. August 24, 2011
   - The case narrative stated that hexachlorobutadiene did not meet method specifications for the continuing calibrations. Hexachlorobutadiene was qualified as estimated (UJ) in the sample results.
2. November 18, 2011
   - The percent recoveries were above quality control (QC) limits for hexachlorobutadiene and 1,2,4-trichlorobenzene in the sample. The compounds were not detected in the sample, therefore qualification of the data was not necessary; and,
   - The relative percent difference (RPD) was above QC limits for benzene. Benzene was qualified as estimated (J) in the sample results.
3. December 16, 2011
   - Acetone was detected in the method blank. Acetone was qualified as non-detect (U) in CarbEff; and,
   - The percent recoveries were above QC limits for acetone, hexachlorobutadiene and 1,2,4-trichlorobenzene in the sample. The compounds were not detected in the sample, therefore qualification of the data was not necessary.
4. January 12, 2012
   - The percent recovery was above QC limit for 1,2,4-trichlorobenzene in the sample. The compound was not detected in the sample therefore, qualification of the data was not necessary.

Groundwater Samples

1. September 22, 2011
   - The percent recoveries for iodomethane and bromomethane were below the QC limits in both matrix spike (MS) and matrix spike duplicate (MSD) samples. Iodomethane RPD was also above QC limits in the MS/MSD samples. The compounds were not detected in the associated samples and were qualified as estimated (UJ) in all samples;
   - The percent recovery for total xylene was below the QC limit in the laboratory control sample associated with GCW-SPY-S, GW-SE15S, GW-SW45D, GW-SE30S, GW-SW45M, GW-SW45S, GW-SE30D and GW-SE30M. The percent recovery for total xylene and 1,1-dichloroethene were below the QC limit in the laboratory control sample associated with GW-SE07S, TRIPBLANK, GW-N45M, GW-N45D, GW-N45S, MW-4D, GW-N15M, GW-N15D, MW-4S, GW-N15S and GW-SPY-D. The above compounds were qualified as estimated (J/UJ) in the associated samples results; and,
   - Tetrachloroethene was reported in the laboratory instrument report as 0.59 µg/L, 0.58 µg/L, 0.56 µg/L and 0.64 µg/L for samples GW-SE15S, MW-4D, GW-N15D and GW-SPY-D, respectively. These results were not reported on the Form I's since concentrations were less than 1µg/L. The Form I's were corrected to show the correct tetrachloroethene results.

No other problems were found with the sample results and all results are deemed usable for environmental assessment purposes as qualified above.

All analytical data associated with the Site have been submitted to the NYSDEC in the required EQuIS format and within 30 days of receipt of the data from the laboratory.

Findings, Conclusion and Recommendations

Findings:

- Since July 2008, total SVE system runtime is 22,202 hours and total nitrogen sparging system runtime is 19,373 hours. Total elapsed time for this reporting period is 3,848 hours. The SVE system operated for 3,315 hours or approximately 86 percent of the time and the nitrogen sparging component operated for 2,855 hours or approximately 67 percent of the time.
- The system was shut-down on several occasions this reporting period for non-routine maintenance. Repairs were made to the nitrogen generator, SVE system and autodial notification. The system was also shut-down on separate occasions for system relocation and groundwater sampling.
- The PSTS was shut down by the USEPA during the entire month of October 2011 to allow for planned site demolition activities.
- The average VOC removal rate this reporting period was 0.000599 lbs/hrs. The total VOCs removed this reporting was 4.07 lbs. Total VOCs removed since system inception is 20.76 lbs.
- Five vapor phase discharge samples were collected from the treatment system and analyzed for VOCs via method TO-15. Total VOC concentrations ranged from 48.44 µg/m^3 to 517.42 µg/m^3. The total VOC emissions rate was consistently below the NYSDEC threshold of 0.5 lbs/hour.
- Total operational cost during the period from August 2011 through January 2012 was approximately $69,500. Treatment system operational costs were estimated to be approximately $100,000 by the USEPA and approximately $125,000 annually by NYSDEC. Based on 4.07 pounds of VOCs removed this reporting period, the average cost of removal was approximately $21,000 per pound. Based on cost data for this reporting period, actual system operational costs appear to be trending slightly higher than estimates established by the USEPA during initial alternative analyses in 2007.
- Eighteen groundwater samples were collected and analyzed for VOCs in September 2011. The VOCs cis-1,2-dichloroethene, 1,1,1-trichloroethane, and chlorobenzene were detected in excess of SCGs in at least one of the samples at concentrations ranging 5.2 µg/L to 120 µg/L. VOCs were detected in excess of SCGs in samples collected from the shallow, intermediate, and deep zones.

Conclusions:

- Excluding scheduled system downtime and unscheduled system downtime due to events such as inclement weather, the GCW/IVS/SVE is relatively reliable.
- The cleanup time for the GCW/IVS/SVE system was estimated to be at least three years to remediate 1,1,1-trichloroethane levels from hundreds of parts per million (ppm) to low ppm levels in the vadose and saturated zone soil and down to low part per billion (ppb) levels in groundwater. To date, the system has operated for approximately 2.5 years. Chlorinated VOC concentrations in groundwater remain elevated above the Site cleanup criteria. 1,1,1-Trichloroethane was detected at a concentration of 120 ppb in MW-4S or two orders of magnitude higher than the cleanup standard.

Recommendations:

- Operation of the PSTS should continue until site-specific cleanup criteria is achieved, or until analytical/operational data demonstrates that asymptomatic conditions are reached for contaminant mass removal.
- Operational costs and cleanup interval should continue to be closely monitored. If operational costs and/or cleanup interval consistently exceed estimates established by the USEPA during initial alternative analyses in 2007, a remedial site optimization evaluation may be necessary to: 1) develop improvements in remedy effectiveness; 2) reduce operation and maintenance costs; 3) identify technical improvements; 4) recommend alternative remedial technologies; and, 4) gain site closure.

- Routine equipment maintenance should be performed consistent with manufacturer suggestions to improve system reliability and avoid unscheduled downtime.
- On-site and off-site monitoring wells associated with the PSTS should be sampled routinely consistent with the approved monitoring program to ensure a reliable and consistent data set suitable for assessing groundwater conditions at the Site.

Reclassification/Delisting Evaluation

USEPA finalized the NPL Listing for the Site on March 31, 1989. Since that time, completion of the following project phases has occurred, as summarized below:

Project Phase	Completion Dates
Operable Unit 01A	
IRM Waste Removal	**04/1989**
Operable Unit 01	
Remedial Investigation	**03/1991**
Remedial Design	**09/1994**
Remedial Action	**01/1997**
Operable Unit 02	
Remedial Investigation	**09/1994**
Remedial Design	**09/1996**
Remedial Action	**06/2000**

Given the above, NYSDEC reclassified the Site pursuant to the requirements identified in 6 NYCRR §375-2.7 as a Class 4 Site on July 21, 2011 since the residual contamination does not appear to constitute a significant threat to public health or the environment based on remedial efforts performed to date. Site delisting is not feasible at this time, as all remediation and post-remediation activities have not been completed.

Report Certification:

I have personally examined and am familiar with the information submitted in the referenced Report. To the best of my knowledge and belief, and based upon my inquiry of those individuals immediately responsible for obtaining the information reported therein, I certify that the submitted information is true, accurate, and complete.

Project Director: Richard M. Walka — Senior Vice President — 8-13-12 — Date

Project Manager: Frank DeVita — Associate — 8-13-12 — Date