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. 03

REPORTING PERIOD

August 2012 - January 2013

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

Robbin Petrella, Project Manager
email: rpetrella@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*. Under D&B's State Superfund Contract with the NYSDEC, D&B has been authorized to perform site management activities at the Site. During this reporting period the only activities occurring at the site are routine (bi-monthly) system monitoring and sampling.

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 resulting from 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 contaminants 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)	525	
Average SVE System Discharge Pressure (in. H2O)	- -	
Average SVE System Discharge Flow Rate (SCFM)	504	
Average Total VOC Removal Rate (Lbs./Hour)	1.32E-03	
Total VOC Removal, Current Reporting Period (Lbs.)	6.03	
Cumulative VOC Removal (Lbs.)	31.93	
Cumulative SVE System Discharge Flow (SCF)	432,181,378	
Average Soil Vapor Monitoring Probe Vacuum Readings		
Soil Vapor Monitoring Probe Vacuum Readings	Min.	Max.
❖ N07D, Located approximately 07 ft. from GCW (in. H2O)	-18.4	-19.57
❖ N30S, Located approximately 30 ft. from GCW (in. H2O)	-0.18	-0.47
❖ N30D, Located approximately 30 ft. from GCW (in. H2O)	-0.35	-0.83
❖ N45S, Located approximately 45 ft. from GCW (in. H2O)	-0.5	-1.07
❖ N45D, Located approximately 45 ft. from GCW (in. H2O)	-0.38	-0.81
❖ SE07, Located approximately 07 ft. from GCW (in. H2O)	-0.19	-0.35
❖ SE15S, Located approximately 15 ft. from GCW (in. H2O)	-0.46	-1.97
❖ SE15D, Located approximately 15 ft. from GCW (in. H2O)	-0.93	-1.14

In-Well Air Stripping System, Nitrogen Sparging Component Performance Summary	
Combined Nitrogen Flow Rate, Nitrogen Compressor Outlet (SCFM)	2.21
Average Nitrogen Flow - Groundwater Circulation Well (SCFM)	0.56
Average Nitrogen Flow - AS-SW07 (SCFM)	0.56
Average Nitrogen Flow - AS-SE07 (SCFM)	0.54
Average Nitrogen Flow - AS-N07 (SCFM)	0.54

System Runtime/Downtime Summary

The total elapsed time for this reporting period was 4,392 hours (August 1, 2012 through January 31, 2013). Of this amount, the SVE component of the PSTS operated for 4,216 hours or approximately 96 percent of the total elapsed time. The nitrogen sparging component of the PSTS operated for 3,528 hours or approximately 80 percent of the total elapsed time. The sparge component operation runtime was lower than the SVE component due to the compressor pump being replaced. System runtime/downtime per component is summarized below. Refer to *Table 1* 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]	4,216	96.00%
SVE System Downtime - Current Reporting Period [1]	176	4.00%
Total SVE System Runtime To Date [2]	30,644	--

Notes:
1. Reported value based on the following: System start-up date of 8/24/2011; and total elapsed time 4,392 hours for the current reporting period
2. Reported value reflects system runtime since inception in July 2008, as recorded by the USEPA.

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

	(Hours)	(Percentage)
System Runtime - Current Reporting Period [1]	3,552	80.33%
System Downtime - Current Reporting Period [1]	864	19.67%
Total System Runtime To Date [2]	26,945	--

Notes:
1. Reported value based on the following: System start-up date of 8/24/2011; and total elapsed time 4,354 hours for the current reporting period
2. Reported value reflects system runtime since inception in July 2008, as recorded by the USEPA.

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

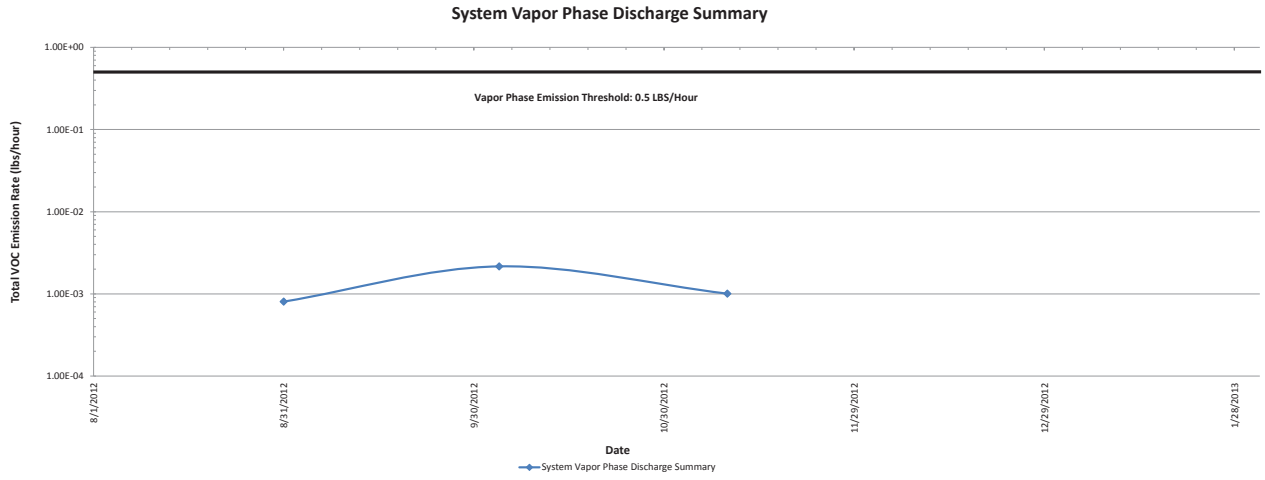
Major System Component	Manufacturer	Model Number	Maintenance Frequency	Current Reporting Period [1]					
				Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13
Air Sparge Compressor	Quincy Compressor	QR-25® Series, Model F325	Bi-Monthly	♦		♦		♦	
High Temperature Refrigerated Dryer	Parker	ZDHHT15-100 (60Hz)	Every 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-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13
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. Preventive maintenance activities (i.e., lubrication, filter replacements) were completed for major system components as noted.
2. The following represents tentative schedules for performance of routine maintenance of major system components.

Vapor Phase Discharge Summary

Three 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 vapor-phase VOCs by the GCW/IVS/SVE. Refer to *Table 2* for analytical results, samples were not collected during the last three months due to the system being down in an effort to evaluate rebounding.

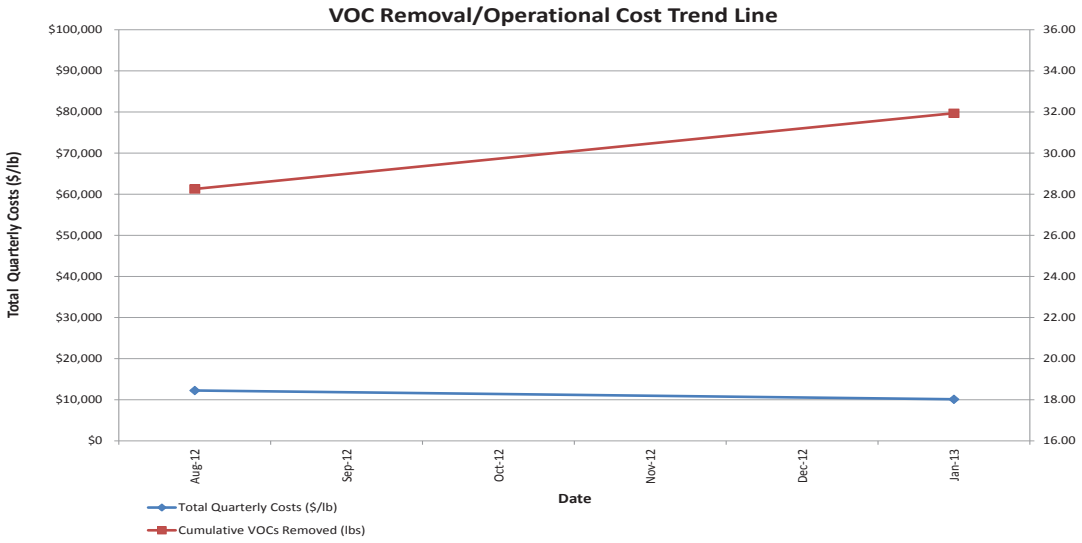


Operational Cost Summary

A figure illustrating project costs associated with operation and maintenance of the GCW/IVS/SVE system over the six month period from August 2012 through January 2013 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. Capital construction costs and NYSDEC project management effort are not included in the evaluation.

The total operational cost incurred during the period from August 2012 through January 2013 was approximately $32,734. Of this amount, approximately $27,859 was related to engineering charges and approximately $6,553 was related to utilities and laboratory charges. Based on approximately 6.08 pounds of VOC contaminants removed from the Site during this reporting period, the average cost of VOC removal was approximately $11,085 per pound.

It should be noted that the treatment system operational costs were estimated to be approximately $100,000 annually during the initial alternative analysis 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 2012 through January 2013 was $32,734. At this time, it appears that actual operational costs may be trending lower than previous estimates. 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 during this monitoring period on November 19, 2012 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/SVE system are depicted on *Figure 5*.

A single VOC (1,1,1-trichloroethane) was detected in excess of SCGs in three of the eighteen "on-site" groundwater samples at concentrations ranging from 8.9 µg/L to 72 µg/L. 1,1,1-Trichloroethane was detected in excess of its SCG (5 µg/L) in three shallow wells (MW-4S, GW-SE07S, and GCW-SPY-S) in the vicinity of the GCW/IVS/SVE system at concentrations of 23 µg/L, 72 µg/L, and 8.9 µg/L, respectively. *Table 3* presents tabulated analytical results relative to SCGs. *Figure 5* summarizes exceedances of SCGs in groundwater by well location.

Data Validation Summary

Three 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 31, 2012
   - 1,1,1-Trichloroethane was reported from a secondary dilution and was qualified with a "D".
   - The 2-hexanone, 4-methyl-2pentanone and isopropanol percent recoverys (%Rs) were below the quality control

(QC) limit in the LCS. 2-Hexanone, ethanol and isopropanol had the percent difference (%Ds) outside the QC limits in the continuing calibration associated with the sample. 2-Hexanone, 4-methyl-2pentanone, ethanol and isopropanol were not detected in the sample and therefore, the compounds were qualified as an estimated detection limit (UJ) in the sample.

2. October 4, 2012
   - 1,1,1-Trichloroethane was reported from a secondary dilution and was qualified with a "D".
   - The 2-hexanone %R was below the QC limit in the LCS. 2-Hexanone and naphthalene had the %Ds outside the QC limits in the continuing calibration associated with the sample. 2-Hexanone and naphthalene were not detected in the sample and therefore, the compounds were qualified as an estimated detection limit (UJ) in the sample.
3. November 9, 2012
   - 1,1,1-Trichloroethane was reported from a secondary dilution and was qualified with a "D".
   - The isopropanol and acetone %Rs were above the quality control (QC) limit in the LCS. The 2-hexanone %R was below the quality control (QC) limit in the LCS. Isopropanol was not detected in the sample; therefore, qualification of the data was not required. Acetone was qualified as estimated (J). 2-Hexanone was not detected in the sample; therefore, 2-hexanone was qualified as an estimated detection limit (UJ) in the sample.
   - 2-Hexanone, naphthalene, acetone and chloroethane had the %Ds outside the QC limits in the continuing calibration associated with the sample. Acetone was qualified as estimated (J). The remaining compounds were not detected in the sample; therefore, the compounds were qualified as an estimated detection limit (UJ) in the sample.

Groundwater Samples

1. November 19, 2012
   - No performance issues were noted.

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 has been submitted to the NYSDEC in the required EQuIS format and within 30 days of receipt of the data from the laboratory.

Findings, Conclusions and Recommendations

Findings:

- Since July 2008, total SVE system runtime is 30,653 hours and total nitrogen sparging system runtime is 26,955 hours. Total elapsed time for this reporting period is 4,416 hours. The SVE system operated for 4,239 hours or approximately 96 percent of the time and the nitrogen sparging component operated for 3,552 hours or approximately 80 percent of the time.
- The system was shut-down on several occasions this reporting period for routine and non-routine maintenance. The system was shut-down in October and November for routine maintenance. The system was shut-down in November, December, and January 2013 for non-routine maintenance. The system was also shut-down on a separate occasion in November for groundwater sampling.
- The average VOC removal rate this reporting period was approximately 0.001324 lbs/hrs. The total VOCs removed this reporting was approximately 6.08 lbs. Total VOCs removed since system inception is approximately 31.93 lbs.

- Three vapor phase discharge samples were collected from the treatment system and analyzed for VOCs via method TO-15. Total VOC concentrations ranged from 426.63 µg/m3 to 1114.05 µg/m3. The total VOC emissions rate was consistently below the NYSDEC threshold of 0.5 lbs/hour.
- Total operational cost during the period from August 2012 through January 2013 was approximately $32,997. Treatment system operational costs were estimated to be approximately $100,000 annually by the USEPA. Based on 6.08 pounds of VOCs removed this reporting period, the average cost of removal was approximately $11,085 per pound. Based on cost data for this reporting period, actual system operational costs appear to be trending slightly lower than estimates established by the USEPA during the initial alternative analyses in 2007.
- Eighteen groundwater samples were collected and analyzed for VOCs in November 2012 from "on-site" wells. The VOC 1,1,1-trichloroethane was detected in excess of SCGs in three samples at concentrations ranging from 8.9 µg/L to 72 µg/L. The VOC was detected in samples collected from the shallow groundwater zone.
- During the monthly inspection in January if was noted that the compressor for the sparge system was not running. Upon consultation with the DEC it was determined that the sparge system will remain off to evaluate if rebounding is occurring. The SVE system is operating.

Conclusions:

- Excluding scheduled system downtime, the GCW/IVS/SVE is reliable. Performance of routine maintenance has improved system reliability.
- 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 level in the vadose and saturated zone soil and down to low part per billion (ppb) level in groundwater. To date, the system has operated for approximately 4 years. Chlorinated VOC concentrations in groundwater remain elevated above the Site cleanup criteria.
- Analytical and operational data indicate a steady increase in contaminant mass removal. Asymptotic conditions have not been reached.

Recommendations:

- Operation of the SVE portion of the PSTS should continue until the next round of sampling is completed to determine if the analytical and operational data indicate asymptotic conditions are reached for contaminant mass removal.
- Operational costs and cleanup time should continue to be closely monitored. If operational costs and/or cleanup time consistently exceed estimates, 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.
- All monitoring wells associated with the PSTS should be sampled as part of the monitoring program to ensure a reliable and consistent data set suitable for assessing groundwater conditions at the Site.
- The next round of monitoring well sampling both on-site and off-site is scheduled to be conducted in May 2013.

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 — Date: 4.5.13
Senior Vice President

Project Manager: Robbin Petrella — Date: 4/5/13
Associate