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Northrop Grumman Systems Corporation

2016 ANNUAL SUMMARY REPORT

Operation, Maintenance, and Monitoring Report for the Bethpage Park Soil Gas Containment System

Operable Unit 3 (Former Grumman Settling Ponds)
Bethpage, New York
NYSDEC ID # 1-30-003A

March 23, 2017

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Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York
NYSDEC ID # 1-30-003A

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NY001496.1616

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March 23, 2017

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2016 ANNUAL SUMMARY REPORT
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Bethpage, New York
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1 INTRODUCTION

Pursuant to the Administrative Order on Consent (AOC) Index #W1-0018-04-01 (New York State Department of Environmental Conservation [NYSDEC] 2005) and the Operable Unit 3 (OU3) Record of Decision (NYSDEC 2013), ARCADIS of New York, Inc. (ARCADIS), on behalf of Northrop Grumman Systems Corporation (Northrop Grumman), has prepared this OU3 Bethpage Park Soil Gas Containment System (BPSGCS) Annual Summary Report for submittal to the NYSDEC. The present-day Bethpage Community Park property (Park), the McKay Field, and Plant 24 Access Road, which the NYSDEC has termed the "Former Grumman Settling Ponds Area" and designated as OU3, are referred to herein as the Site Area. Figure 1 provides a Site Area location map.

The BPSGCS (previously referred to as the Soil Gas Interim Remedial Measure [IRM]) has operated since February 18, 2008. The operation, maintenance, and monitoring (OM&M) activities performed during 2016 (i.e., January 1 through December 31, 2016 [the "annual reporting period"]) are summarized in this Annual Summary Report. The OM&M activities performed during the fourth quarter of 2016 (i.e., October 1 through December 31, 2016 [the "fourth quarter reporting period"]) are included in the summary of the annual reporting period. Data summaries for the previous three 2016 operational quarterly periods are available in the following letter reports:

- Results of First Quarter 2016 Operation and Monitoring for the Bethpage Park Soil Gas Containment System, May 2016 (Arcadis 2016b)
- Results of Second Quarter 2016 Operation and Monitoring for the Bethpage Park Soil Gas Containment System, August 2016 (Arcadis 2016c)
- Results of Third Quarter 2016 Operation and Monitoring for the Bethpage Park Soil Gas Containment System, November 2016 (Arcadis 2016d)

During 2016, the BPSGCS system OM&M was conducted in accordance with the NYSDEC-approved OU3 Soil Gas IRM OM&M Manual (Arcadis 2016a) and the NYSDEC-approved Sampling and Analysis Plan (SAP) (Arcadis 2008).

As discussed in the OU3 Remedial Investigation Report (Site Area) [Arcadis 2011], Northrop Grumman does not take responsibility for certain compounds (e.g., Freon 12 and Freon 22) present in the Site Area. Throughout this report, a distinction is made between the "Project" and "Non-project" volatile organic compounds (VOCs), which are defined as follows:

- Project VOCs: VOCs that may be related to former Northrop Grumman historical activities. For this report, Project VOCs include 1,1,1-trichloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; trichloroethene; vinyl chloride; cis-1,2-dichloroethene; trans-1,2-dichloroethene; benzene; toluene; and total xylenes.
- Non-project VOCs: VOCs, such as Freon 12 and Freon 22, which are understood to be unrelated to former Northrop Grumman activities but have been detected in the Site Area. As noted in the Site Area RI Report (Arcadis 2011), a groundwater sub-plume of Freon 22 has been identified originating

from the area of the Town of Oyster Bay's (Town's) former ice rink. Based on Town information (Zervos 2007), Freon 22 was used by the Town and released to the environment.

2 BETHPAGE PARK SOIL GAS CONTAINMENT SYSTEM OBJECTIVES

The remedial action objectives (RAOs) of the BPSGCS are as follows:

- To mitigate the off-site migration of Project VOCs in the on-site soil gas through the implementation of a soil gas containment system installed along the Plant 24 Access Road and McKay Field Access Road, south and west of the Park, respectively, and;
- To comply with applicable NYSDEC Standards, Criteria, and Guidelines (SCGs)

The compliance objectives of the BPSGCS are as follows:

- To mitigate the off-site migration of soil gas, the system was designed to maintain -0.1 inch of water column (iwc) within a negative pressure curtain established within the vadose zone along the Plant 24 Access Road and along the McKay Field Access Road, from the boundary of the Plant 24 Access Road to approximately 400 feet north along the MacKay Field Access Road, based on a 12-month rolling average.
- To treat extracted vapors until it is demonstrated that all VOCs in the influent (untreated) vapor stream are present at concentrations lower than the NYSDEC Division of Air Resources Guide-1 (DAR-1) Annual Guidance Concentrations (AGCs) on a 12-month rolling average and Short-Term Guidance Concentrations (SGCs) for any given grab sample (NYSDEC 2014). On December 29, 2008, NYSDEC approved removal of vapor phase treatment (NYSDEC 2008).
- To collect and transfer condensate to the Nassau County Department of Public Works (NCDPW) sanitary sewer, in accordance with the requirements set forth by the NCDPW (NCDPW 2007, 2008), or treat at the Bethpage Park Groundwater Containment System (BPGWCS) and discharged, or dispose off-site at a NYSDEC-permitted disposal facility. The sanitary sewer ultimately discharges to the Town of Oyster Bay's Cedar Creek treatment facility.

3 BETHPAGE PARK SOIL GAS CONTAINMENT SYSTEM DESCRIPTION

Following review and approval of the Soil Gas IRM 95% Design Report and Design Drawings by the NYSDEC (Arcadis 2007b), the design package was finalized and the BPSGCS constructed. A general site plan (Figure 2) shows the treatment building, which houses the major process equipment, including two 20-horsepower [hp] and one 30 hp regenerative-type depressurization blowers, three 52-gallon moisture separators and associated transfer pumps. Remaining system components are located outside the treatment building and include one 33-foot tall by 16-inch diameter stack, the heat exchanger, the 18 depressurization wells, and the 47 induced vacuum monitoring wells, also shown on Figure 2. Monitoring

well vacuum measurements collected during 2016 are also provided on Figure 2. A process flow diagram that shows sampling and monitoring locations is provided as Figure 3. A detailed description of the system and a complete set of record drawings are provided in the OM&M Manual (Arcadis 2016a).

4 OPERATION AND MAINTENANCE ACTIVITIES

The following subsections provide a summary of the routine and non-routine operation and maintenance (O&M) activities completed during the annual reporting period to meet requirements outlined in the OM&M Manual (Arcadis 2016a), as well as a performance evaluation of the BPSGCS. Finally, overall conclusions and recommendations regarding O&M for the Site are included in this section.

4.1 Summary of O&M Completed During the Annual Reporting Period

The O&M of the BPSGCS was conducted in accordance with the OM&M Manual (Arcadis 2016a). This consisted of the following:

- Continuous monitoring by the Supervisory Control and Data Acquisition (SCADA) system.
- Weekly site checks to monitor and record key process parameters to confirm proper system operation, to assess whether a process parameter is changing or is out of range, and to provide information that may be helpful later in case there is an operation problem.
- Quarterly monitoring events to monitor and record key process parameters, including induced vacuums, to confirm proper system operation, make adjustments as needed, and to collect compliance samples. A summary of the quarterly monitoring data collected for the BPSGCS is provided in Tables 1, 2, 3 and 4.
- Routine maintenance of equipment was generally performed in accordance with the manufacturers' specifications as needed.
- Non-routine maintenance of equipment and system components in response to alarm conditions or system parameters operating outside of their normal operating ranges. The most notable non-routine maintenance activities during the annual reporting period were due to minor system modifications, repairs and power anomalies. These conditions did not have a significant impact on system performance and have been proactively addressed to minimize system downtime.

4.2 Performance Evaluation

The OU3 BPSGCS operated continuously during the annual reporting period with the exception of brief shutdown events for routine and non-routine system maintenance. An operational summary of the depressurization wells, monitoring wells, flow rates and vacuums for the annual reporting period is provided in Tables 1 and 2. In summary:

- The system operated during the annual reporting period for approximately 352 days out of a total 365 days (approximately 96% uptime).
- During the annual reporting period, condensate removal was conducted due to instantaneous induced vacuum measurements slightly lower than -0.1 iwc at VMWC-18A in September 2016 and at VMWC-7A and VMWC-7B in December 2016, as well as during routine BPSGCS maintenance. Collected condensate is treated at the BPGWCS and discharged. As of 2015, condensate removal is conducted as needed by manipulating manifold vacuums and flow rates for brief periods of time. This process does not entirely vacate the below grade lines of condensate, though it enables the system to maintain adequate flow and vacuum at the manifolds without requiring a vacuum truck and a full day shutdown event.

4.3 Conclusions and Recommendations for O&M

The O&M activities conducted during the annual reporting period met the requirements of the O&M Manual.

5 MONITORING

The following subsections provide a summary of the monitoring completed during the annual reporting period to meet requirements outlined in the OM&M Manual (Arcadis 2016a). The following subsections also provide summaries of 2016 monitoring data, comparisons of the results with applicable AGCs and SGC's, and additional data evaluations describing the performance effectiveness of the OU3 BPSGCS. Finally, overall conclusions and recommendations regarding monitoring for the Site are included.

5.1 Summary of Monitoring Completed

In general, the monitoring of the OU3 BPSGCS was completed in accordance with the OU3 BPSGCS OM&M Manual (Arcadis 2016a). A summary of the monitoring completed during this annual reporting period is provided below:

- Quarterly system performance monitoring:
  - Instantaneous vacuum measurements at compliance measurement points and system operating measurements at influent manifolds, blower inlet and outlet, and system effluent were collected to assess the system performance. Summaries of the measurements are provided in Tables 1 and 2.
- Quarterly system compliance monitoring:
  - Containment system air quality monitoring was completed to monitor the performance of the containment system and to compare the levels to applicable AGC's and SGC's. Summaries of the results are provided in Tables 3, 4, 5 and 6.

5.2 Summary of Monitoring Results

5.2.1 Containment System Performance Monitoring

5.2.1.1 Annual Reporting Period System Operating Parameters

System operating parameters measured during the annual reporting period are summarized in Tables 1 and 2. Overall throughout the annual reporting period, the system components generally operated within their recommended ranges.

5.2.1.2 Vapor Samples

The total effluent screening level vapor samples (i.e., photoionization detector [PID] reading) measured during the fourth quarter reporting period and the annual reporting period are provided in Table 1. The screening results throughout the annual reporting period ranged from 0.0 parts per million by volume (ppmv) June, September, and December 2016) to 0.1 ppmv (March 2016), which is consistent with historic data.

5.2.2 Containment System Compliance Monitoring

5.2.2.1 System Operating Parameters

Instantaneous vacuum measurements in compliance monitoring wells from the fourth quarter reporting period and annual time-weighted rolling averages are summarized in Table 2. Quarterly vacuum measurement data from the annual reporting period are also shown on Figure 2.

As shown on Table 2, during the annual reporting period, the instantaneous induced vacuum at all compliance-related monitoring points met or exceeded the minimum performance standard (greater than or equal to -0.1 iwc), with the exceptions of VMWC-7A, VMWC-7B, and VMWC-18A. Although instantaneous induced vacuum measurements were slightly lower than -0.1 iwc at VMWC-18A in September 2016 and at VMWC-7A and VMWC-7B in December 2016, the annual time-weighted rolling average of induced vacuum readings at all compliance-related monitoring points were maintained at greater than or equal to -0.1 iwc, demonstrating that the BPSGCS is operating as designed.

5.2.2.2 Vapor Sample

Effluent vapor samples were collected on a quarterly basis throughout the annual reporting period. As shown in the laboratory results in Tables 3, 4, and 6, the total volatile organic compound (TVOC) concentrations ranged from 737 micrograms per cubic meter (µg/m^3) in June 2016 to 1,354 µg/m^3 in March 2016. The Project TVOC concentrations ranged from 591 µg/m^3 in June 2016 to 1,173 µg/m^3 in March 2016. The Non-project TVOC concentrations ranged from 134 µg/m^3 in December 2016 to 304 µg/m^3 in September 2016.

The TVOC concentration in effluent vapor has generally declined since system startup. Figure 4 provides an overview of the concentration trend over the report period. The containment system has removed a total of 325 pounds of TVOCs, with 258 pounds of Project TVOCs (79.4%) and 67 pounds of Non-project TVOCs (20.6%) as shown on Figure 5. Figure 6 presents the mass removal rate, which has declined since system startup.

Benzene, carbon tetrachloride, trichloroethene and vinyl chloride, environmentally "A"-rated compounds (as defined in DAR-1 AGC/SGC tables, revised August 10, 2016), were detected in the effluent vapor sample during the annual reporting period; the concentrations were consistent with historical data. Historically, these are the only four environmentally "A"-rated compounds detected in the effluent vapor samples.

The concentrations of the tentatively identified compounds (TICs) were consistent with data collected throughout the annual reporting period. A total of 27 TICs were identified during the annual reporting period. The three most commonly identified TICs over the annual reporting period were alkane, carbon dioxide, and cycloalkane/alkene.

5.2.2.3 Condensate Sample

Collection of a compliance monitoring condensate sample was not required during the annual reporting period.

5.2.3 Air Emissions Model

Influent concentrations for the annual period were compared with the degree of cleaning required pursuant to 6NYCRR III A Part 212-2.3(b). As shown on Table 3, concentrations of all compounds detected were less than 43,130 $\mu g/m^3$ (concentration equivalent to 0.1 pounds per hour at a flow rate of 615 cubic feet per minute). Therefore, air dispersion modeling is necessary to demonstrate that the maximum off-site air concentration is less than the NYSDEC DAR-1 annual and short-term guideline concentrations (AGC/SGC) values issued August 10, 2016.

The U.S. Environmental Protection Agency (USEPA) air quality dispersion model AERMOD was executed to estimate the highest ambient air concentration of the compounds on Table 3. AERMOD is the USEPA's recommended best state-of-the-art practice Gaussian plume dispersion model. Gaussian models are the most widely used techniques for estimating the impact of non-reactive pollutants, per Appendix W of Title 40 Code of Federal Regulations (CFR) 51 – Guideline of Air Quality Models.

The following parameters were used for the AERMOD model analysis:

- Urban dispersion coefficients
- AERMAP base and terrain elevations, processed using National Elevation Dataset (NED) digitized terrain data
- Surface and upper air observations measured at the Nation Weather Service stations located at Farmingdale and Brookhaven airports for calendar years 2011-2015, in accordance with NYSDEC's DAR-10 Air Dispersion Modeling Guidance Document. This longer period of time was reviewed for

the model run, to provide a conservative estimate of atmospheric impacts on the off-site concentrations.

- Discrete receptor grids, per the following methodology:
  - Receptors were located along the property boundary at distances not exceeding 25 meters;
  - A 1.5 km x 1.5 km Cartesian grid receptors with distances of 50 meters between the receptors; and
  - A 3.0 km x 3.0 km Cartesian grid receptors with distances of 100 meters between the receptors.
- Emission rate: 1 gram per second (g/s)

Based on the model, the maximum one-hour ambient air impact from all the years was 462.83 [$\mu g/m^3$]/[g/s] and the maximum annual ambient air impact was 20.02 [$\mu g/m^3$]/[g/s]. Table 5 provides the compound specific scaled hourly ambient air impact and the scaled annual ambient air impact for the fourth quarter sampling event. As shown, the scaled ambient air impacts for the BPSGCS are below the corresponding SGCs and AGCs.

Based on the ambient modeling analysis, the BPSGCS currently meets all of the requirements for DAR-1 and is below the Rule 212 requirements without add on controls.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The following conclusions are provided regarding the performance and ability of the OU3 BPSGCS to comply with the remedial action and compliance objectives for the Site:

- OM&M requirements of the OU3 BPSGCS OM&M Manual were met at the Site during the annual reporting period.
- The BPSGCS generally operated as designed during the annual reporting period to mitigate the off-site migration of soil gas.
  - The BPSGCS operated continuously with the exception of brief shutdown periods for routine and non-routine maintenance (approximately 96% uptime).
  - A total of 27 pounds of VOCs were removed from the subsurface during the annual reporting period, and a total of 325 pounds of VOCs were removed since system startup in 2008.
  - An annual rolling average vacuum of -0.1 iwc or greater was maintained at all induced vacuum monitoring points throughout the annual reporting period. While data recorded at several wells indicated that vacuum induced at the well heads was slightly less than the targeted -0.1 iwc, during September and December 2016, the issues causing the reduced vacuums (most notably a build-up of condensation water in the vacuum distribution piping) were corrected. Northrop Grumman will continue to proactively manage this issue through condensate removal.

- The operation of the BPSGCS complied with applicable NYSDEC SCGs during the annual reporting period.
- Effluent vapor emissions met applicable AGC and SGC air discharge criteria during the annual reporting period.

6.2 Recommendations

Based on the information provided herein, Arcadis recommends to continue operation of the BPSGCS, to maintain compliance with the RAOs. No modifications or upgrades are needed at this time.

7 CERTIFICATION

Statement of Certification

On behalf of Northrop Grumman Systems Corporation, I hereby certify and attest that the Operable Unit 3 Bethpage Park Soil Gas Containment System is operated in compliance with the remedial action objectives provided within the NYSDEC approved Soil Gas Interim Remedial Measure Work Plan (Arcadis 2007a), which was prepared pursuant to NYSDEC Administrative Order on Consent Index # W1-0018-04-01 referencing the Former Grumman Settling Ponds Site and dated July 4, 2005.

Christopher Engler, P.E.
Engineer of Record
License # 069748

8 REFERENCES

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TABLES

Table 1
General System Operating Parameters
Northrop Grumman Operable Unit 3
Bethpage Park Soil Gas Containment System
Former Grumman Settling Ponds, Bethpage, New York.

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	DW-7S Parameters			DW-7D Parameters			DW-3S Parameters			DW-3D Parameters			DW-5S Parameters			DW-5D Parameters			DW-6S Parameters			DW-6D Parameters		
	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum
Date	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc
03/08/16	95	-27	-1.6	5.0	-10	-0.55	8.0	-6.0	-0.24	24	-21	-0.58	83	-20	-1.8	13	-12	-2.7	65	-17	-1.5	7.5	-6.0	-1.4
06/01/16	81	-13	-1.7	7.0	-12	-0.50	9.0	-5.8	-0.29	16	-8.0	-0.48	109	-18	-1.7	14	-11	-2.2	79	-15	-1.5	6.6	-5.2	-1.2
09/07/16	79	-12	-1.6	8.0	-24	-0.56	9.0	-6.0	-0.30	11	-6.0	-0.39	92	-15	-1.7	13	-26	-3.7	84	-15	-1.7	6.1	-5.2	-1.3
12/19/16	111	-25	-2.0	8.0	-8.5	-0.56	6.0	-5.3	-0.20	12	-6.1	-0.36	95	-18	-1.7	15	-9.2	-2.5	82	-16	-1.8	6.9	-5.4	-1.3

Notes and abbreviations on last page.

Table 1
General System Operating Parameters
Northrop Grumman Operable Unit 3
Bethpage Park Soil Gas Containment System
Former Grumman Settling Ponds, Bethpage, New York.

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	DW-1S Parameters			DW-1D Parameters			DW-4S Parameters			DW-4D Parameters			DW-8S Parameters			DW-9S Parameters			DW-2S Parameters			DW-2D Parameters		
	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum
Date	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc
03/08/16	82	-24	-2.4	6.3	-3.9	-2.1	63	-15	-1.5	9.0	-7.0	-0.76	59	-18	-1.8	40	-15	-1.6	22	-21	-1.5	35	-24	-2.3
06/01/16	79	-24	-1.7	6.3	-6.0	-1.7	76	-14	-1.4	5.0	-6.3	-0.58	72	-19	-2.0	38	-14	-1.4	29	-23	-1.6	36	-22	-2.1
09/07/16	83	-24	-1.8	6.2	-2.5	-1.7	71	-14	-1.4	6.0	-6.5	-0.65	60	-17	-1.7	35	-14	-1.5	21	-19	-1.3	32	-19	-2.0
12/19/16	88	-25	-2.4	5.0	-2.5	-1.4	71	-14	-1.5	6.8	-6.8	-0.64	60	-19	-1.8	35	-13	-1.5	27	-27	-2.0	33	-19	-1.4

Notes and abbreviations on last page.

Table 1
General System Operating Parameters
Northrop Grumman Operable Unit 3
Bethpage Park Soil Gas Containment System
Former Grumman Settling Ponds, Bethpage, New York.

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	DW-10S Parameters			DW-11S Parameters			Knock Out Tank Parameters - Vacuum			Condensate Water Collected(1)	Blower Parameters BL-200			Blower Parameters BL-300			Blower Parameters BL-400			Combined Effluent Parameters				
	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Wellhead Vacuum	Influent KO-200	Influent KO-300	Influent KO-400	Influent ST-510	Influent Vacuum	Effluent Pressure	Blower Speed	Influent Vacuum	Effluent Pressure	Blower Speed	Influent Vacuum	Effluent Pressure	Blower Speed	Total Effluent Flow Rate(2)	Total Effluent PID	Heat Exchanger Influent Temp.	Total Effluent Pressure	Heat Exchanger Effluent Temp.
Date	scfm	iwc	iwc	scfm	iwc	iwc	iwc	iwc	iwc	Gallons	iwc	iwc	Hz	iwc	iwc	Hz	iwc	iwc	Hz	scfm	ppmv	°F	iwc	°F
03/08/16	48	-19	-2.6	31	-24	-2.2	--	-40	--	106	--	--	--	-43	2.0	60	--	--	--	719	0.1	105	2.5	98
06/01/16	33	-14	-2.0	33	-23	-2.3	--	--	-32	110	--	--	--	--	--	--	-38	1.5	60	727	0.0	110	2.5	101
09/07/16	46	-6.0	-2.6	28	-24	-2.2	--	-30	--	100	--	--	--	-38	2.5	60	--	--	--	709	0.0	122	0.5	110
12/19/16	30	-14	-1.8	31	-27	-2.1	--	-35	--	100	--	--	--	-36	2.1	60	--	1.9	--	626	0.0	100	2.0	89

Notes and abbreviations on last page.

Notes and Abbreviations:

°F	degrees Fahrenheit
DW	depressurization well
gal	gallons
Hz	Hertz
iwc	inches of water column
--	not applicable
PID	photoionization detector
ppmv	parts per million by volume
scfm	standard cubic feet per minute

1. Total gallons of water accumulated at storage tank ST-510 per quarter. Values for 3Q and 4Q 2016 are estimated based on average volume collected during condensate removal events.
2. Total effluent air velocity in feet per minute was measured using a hand-held anemometer at the stack effluent location. The total effluent flow rate in scfm was calculated by multiplying the measured air velocity by the pipe area, the ratio of the standard air temperature to the measured air temperature, and the ratio of the measured air pressure to the standard air pressure.

Table 2
Induced Vacuum Readings at Compliance Monitoring Points
Northrop Grumman Operable Unit 3
Bethpage Park Soil Gas Containment System
Former Grumman Settling Ponds, Bethpage, New York. [1,2]

ARCADIS Design & Consultancy for natural and built assets

Well ID:	DW-7S		DW-7D	DW-3S	DW-3D	DW-5S		DW-5D	DW-1S			DW-1D	DW-4D	DW-8S		DW-2S		DW-2D		DW-11S	
MP ID:	VMWC-14A	VMWC-14B	VMWC-14D	VMWC-11B	VMWC-12D	VMWC-15A	VMWC-15B	VMWC-15D	VMWC-3A	VMWC-3B	VMWC-3C	VMWC-3D	VMWC-16D	VMWC-16A	VMWC-16B	VMWC-7A	VMWC-7B	VMWC-13D	VMWC-17D	VMWC-18A	VMWC-18B
Date	iwc	iwc	iwc	iwc	iwc	iwc	iwc	iwc	iwc	iwc	iwc	iwc	iwc	iwc	iwc	iwc	iwc	iwc	iwc	iwc	iwc
03/08/16	-0.11	-0.15	-0.15	-0.12	-0.14	-0.14	-0.14	-0.15	-0.15	-0.16	-0.17	-0.18	-0.16	-0.15	-0.15	-0.14	-0.13	-0.10	-0.15	-0.11	-0.13
06/01/16	-0.10	-0.15	-0.17	-0.15	-0.17	-0.16	-0.16	-0.15	-0.20	-0.13	-0.13	-0.20	-0.18	-0.16	-0.17	-0.13	-0.15	-0.11	-0.18	-0.11	-0.11
09/07/16	-0.12	-0.19	-0.20	-0.12	-0.11	-0.16	-0.16	-0.14	-0.13	-0.13	-0.13	-0.15	-0.15	-0.12	-0.14	-0.10	-0.15	-0.11	-0.11	-0.096	-0.11
12/19/16	-0.12	-0.19	-0.20	-0.12	-0.11	-0.12	-0.12	-0.13	-0.13	-0.14	-0.20	-0.19	-0.14	-0.12	-0.15	-0.09	-0.09	-0.14	-0.18	-0.20	-0.10
Time Weighted Rolling Average[3]	**-0.12**	**-0.18**	**-0.18**	**-0.14**	**-0.14**	**-0.16**	**-0.16**	**-0.15**	**-0.16**	**-0.15**	**-0.15**	**-0.18**	**-0.17**	**-0.15**	**-0.16**	**-0.12**	**-0.13**	**-0.11**	**-0.17**	**-0.10**	**-0.11**

Gross Average Compliance Points [4]	
09/07/16	-0.13

Notes and Abbreviations:

DW	depressurization well
VMWC	vapor monitoring well cluster
iwc	inches of water column

1 All induced vacuum measurements units in iwc. Values shown have been rounded to two significant figures.

2 Compliance goal is -0.1 iwc of vacuum at all compliance monitoring points, based on a twelve-month rolling average.

3 Time weighted rolling average calculated by summing the products of the instantaneous induced vacuum readings and the number of days between readings for a 12-month monitoring period, and dividing by the total time period between the first and last quarterly induced vacuum readings.

4 Gross average compliance points calculated by summing the induced vacuum values for the noted monitoring event and dividing by the number of readings.

Table 3
Total Effluent Vapor Sample Analytical Results
Northrop Grumman Operable Unit 3
Bethpage Park Soil Gas Containment System
Former Grumman Settling Ponds, Bethpage, New York.[1]

ARCADIS Design & Consultancy for natural and built assets

Compound (units in µg/m³)	Sample ID: Sample Date:		VSP-601 3/8/2016	VSP-601 6/1/2016	VSP-601 9/7/2016	VSP-601 12/22/2016
Project VOCs	CAS No	SGC				
1,1,1-Trichloroethane	71-55-6	9,000	**11**	**8.2**	**13**	**8.7**
1,1-Dichloroethane	75-34-3	NS	**9.7**	**6.1**	**11**	**9.7**
1,1-Dichloroethene	75-35-4	19,800[3]	**1.5**	**0.87**	**0.83**	< 3.2 U
1,2-Dichloroethane	107-06-2	NS	**137**	<0.81 U	< 0.81 U	< 3.2 U
Benzene	71-43-2	1,300	**9.3**	**0.38 J**	**13**	**18**
cis-1,2-Dichloroethene	156-59-2	190,000[4]	**488 D**	**268 D**	**395**	**322**
Tetrachloroethene	127-18-4	300	**11**	**12**	**25**	**6.7**
Toluene	108-88-3	37,000	**38**	**0.75**	**0.53 J**	< 3.0 U
trans-1,2-Dichloroethene	156-60-5	190,000[4]	**2.1**	**1.7**	**4.4**	**2.5**
Trichloroethylene	79-01-6	14,000	**461 D**	**284 D**	**559**	**291**
Vinyl chloride	75-01-4	180,000	**3.8**	**0.89**	**0.66**	< 0.41 U
Xylene-O	95-47-6	22,000	<0.87 U	**2.8**	< 0.87 U	< 3.5 U
Xylenes - M,P	1330-20-7	22,000	<0.87 U	**5.2**	< 0.87 U	**9.1**
Subtotal Project VOCs			**1173**	**591**	**1022**	**668**
Non-Project VOCs						
1,1,2,2-Tetrachloroethane	79-34-5	NS	<0.69 U	<0.69 U	< 0.69 U	< 2.7 U
1,1,2-Trichloroethane	79-00-5	NS	<0.55 U	<0.55 U	< 0.55 U	< 2.2 U
1,2-Dichloropropane	78-87-5	NS	<0.92 U	<0.92 U	< 0.92 U	< 3.7 U
1,3-Butadiene	106-99-0	NS	<0.44 U	<0.44 U	< 0.44 U	< 1.8 U
2-Butanone	78-93-3	13,000	**0.97**	**0.65**	**1.7**	**7.1**
2-Hexanone	591-78-6	4,000	<0.82 U	<0.82 U	< 0.82 U	< 3.3 U
4-Methyl-2-Pentanone	108-10-1	31,000	<0.82 U	<0.82 U	< 0.82 U	< 3.3 U
1-Chloro-1,1-difluoroethane (Freon 142b)	75-68-3	NS	**140**	**124**	**269**	**71**
Acetone	67-64-1	180,000	**8.6**	**4.0**	**8.8**	**26**
Bromodichloromethane	75-27-4	NS	<0.67 U	<0.67 U	< 0.67 U	< 2.7 U
Bromoform	75-25-2	NS	**9.3**	<0.41 U	< 0.41 U	< 1.7 U
Bromomethane	74-83-9	3,900	<0.78 U	<0.78 U	< 0.78 U	< 3.1 U
Carbon Disulfide	75-15-0	6,200	**1.6**	<0.62 U	< 0.62 U	< 2.5 U
Carbon Tetrachloride	56-23-5	1,900	**0.62**	**0.63**	**1.3**	< 1.0 U
Chlorobenzene	108-90-7	NS	<0.92 U	<0.92 U	< 0.92 U	< 3.7 U
Chlorodibromomethane	124-48-1	NS	**2.6**	<0.85 U	< 0.85 U	< 3.4 U

Notes and abbreviations on last page.

Table 3
Total Effluent Vapor Sample Analytical Results
Northrop Grumman Operable Unit 3
Bethpage Park Soil Gas Containment System
Former Grumman Settling Ponds, Bethpage, New York.[1]

ARCADIS Design & Consultancy for natural and built assets

Compound (units in µg/m³)	Sample ID: Sample Date:		VSP-601 3/8/2016	VSP-601 6/1/2016	VSP-601 9/7/2016	VSP-601 12/22/2016
Non-Project VOCs	CAS No.	SGC				
Chloroethane	75-00-3	NS	<0.53 U	<0.53 U	< 0.53 U	< 2.1 U
Chlorodifluoromethane (Freon 22)	75-45-6	NS	<0.70 U	**1.3**	< 0.70 U	< 2.8 U
Chloroform	67-66-3	150	**11**	**7.3**	**17**	**11**
Chloromethane	74-87-3	22,000	<0.41 U	<0.41 U	< 0.41 U	< 1.7 U
cis-1,3-Dichloropropene	10061-01-5	NS	<0.91 U	<0.91 U	< 0.91 U	< 3.6 U
Dichlorodifluoromethane (Freon 12)	75-71-8	NS	**3.3**	**2.2**	**3.1**	< 4.0 U
Ethylbenzene	100-41-4	NS	<0.87 U	**0.39 J**	< 0.87 U	**6.5**
Trichlorotrifluoroethane (Freon 113)	76-13-1	960,000	<0.77 U	<0.77 U	< 0.77 U	< 3.1 U
Methyl Tert-Butyl Ether	1634-04-4	NS	<0.72 U	<0.72 U	< 0.72 U	< 2.9 U
Methylene Chloride	75-09-2	14,000	**1.1**	**3.1**	**1.2**	**12**
Styrene	100-42-5	17,000	<0.85 U	<0.85 U	< 0.85 U	< 3.4 U
Trans-1,3-Dichloropropene	10061-02-6	NS	<0.91 U	<0.91 U	< 0.91 U	< 3.6 U
Trichlorofluoromethane (Freon 11)	75-69-4	9,000	**1.7**	**2.0**	**1.9**	< 2.2 U
Subtotal Non-Project VOCs			**181**	**146**	**304**	**134**
TVOC[2]			**1,354**	**737**	**1,326**	**801**

Notes and abbreviations on last page.

Table 3
Total Effluent Vapor Sample Analytical Results
Northrop Grumman Operable Unit 3
Bethpage Park Soil Gas Containment System
Former Grumman Settling Ponds, Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

Bold	Bold data indicates that the analyte was detected at or above its reporting limit.
ELAP	Environmental Laboratory Approval Program.
CAS No.	Chemical Abstracts Service list number.
NYSDOH	New York State Department of Health.
TVOC	total volatile organic compounds
D	Based on diluted sample analysis
J	Estimated.
--	Not analyzed.
U	Compound was analyzed for but not detected
USEPA	U.S. Environmental Protection Agency.
VOC	volatile organic compound
$\mu g/m^3$	micrograms per cubic meter
<	Compound not detected above its laboratory quantification limit.

1. Vapor samples collected by Arcadis on the dates shown and submitted to a NYSDOH ELAP certified laboratory for VOC analyses per Modified USEPA Method TO-15.
2. TVOC determined by summing individual detections and rounding to the nearest whole number.

Table 4
Total Effluent Vapor Sample Analytical Results,
Tentatively Identified Compounds
Northrop Grumman Operable Unit 3
Bethpage Park Soil Gas Containment System
Bethpage, New York.[1,2,3]

Sample ID: / Sample Date: / Units:	VSP-001 3/6/2016 ppbv	VSP-001 6/1/2016 ppbv	VSP-001 9/7/2016 ppbv	VSP-001 12/22/2016 ppbv
1,2-Dibromoethane	170 JN	--	--	--
1-Bromo-2-chloroethane	22 JN	--	--	--
2-Phenyl-2-propanol	--	--	1.6 JN	--
Acetophenone	--	--	2.5 JN	--
alkane	--	31 J	1.3 J	9.4 J
alkane	--	21 J	--	8.9 J
alkane	--	--	--	8.4 J
alkane	--	--	--	8.1 J
alkane	--	--	--	6.6 J
alkane	--	--	--	5.4 J
Bromobenzene	2.8 JN	--	--	--
Carbon Dioxide	--	420 JNB	--	700 JNB
Cycloalkane/alkene	--	--	--	100 J
Cycloalkane/alkene	--	--	--	7.1 J
Cycloalkane/alkene	--	--	--	5.8 J
Cycloalkane/alkene	--	--	--	5.0 J
Cycloalkane/alkene	--	--	--	37 J
Cycloalkane/alkene	--	--	--	18 J
Cycloalkane/alkene	--	--	--	17 J
Cycloalkane/alkene	--	--	--	16 J
Cycloalkane/alkene	--	--	--	16 J
Cycloalkane/alkene	--	--	--	10 J
Cycloalkane/alkene	--	--	--	9.5 J
Cycloalkane/alkene	--	--	--	8.2 J
Ethyl Acetate	--	4.9 JN	--	--
Methyl styrene (alpha)	1.8 JN	--	--	--
Vinyl bromide	3.1 JN	--	--	--

Notes and Abbreviations:

--	Not analyzed.
B	Indicates analyte found in associated method blank
ELAP	Environmental Laboratory Approval Program.
J	Indicates an estimated value.
JN	Compound tentatively identified, concentration is estimated.
NYSDOH	New York State Department of Health.
ppbv	parts per billion by volume
USEPA	U.S. Environmental Protection Agency.
VOC	volatile organic compound

1. Vapor samples collected by Arcadis on the dates shown and submitted to a NYSDOH ELAP certified laboratory for VOC analyses per Modified USEPA Method TO-15.
2. Tentatively identified compounds are identified based on review of mass spectrometry results via a comprehensive library search of all organic compounds.
3. All results are estimated.

Table 5
Air Quality Impact Analysis
Northrop Grumman Operable Unit 3
Bethpage Park Soil Gas Containment System
Former Grumman Settling Ponds, Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Toxic Air Contaminant	CAS#	VSP-601 Vapor Effluent (ug/m3)	Emission Rate[1]			Scaled Impact - Hourly[2] (ug/m^3)	Scaled Impact - Annual[2] (ug/m^3)	SGC[3] (ug/m^3)	AGC[3] (ug/m^3)	% of SGC	% of AGC
		12/22/2016[4]	lb/yr	lb/hr	g/s						
1,1,1 - Trichloroethane	00071-55-6	8.7	1.8E-01	2.0E-05	2.5E-06	1.2E-03	5.1E-05	9,000	5,000	0.0%	0.0%
1,1 - Dichloroethane	00075-34-3	9.7	2.0E-01	2.2E-05	2.8E-06	1.3E-03	5.7E-05	--	0.63	--	0.0%
Tetrachloroethene	00127-18-4	6.7	1.4E-01	1.6E-05	2.0E-06	9.1E-04	3.9E-05	300	4	0.0%	0.0%
Trichloroethene	00079-01-6	291	5.9E+00	6.7E-04	8.5E-05	3.9E-02	1.7E-03	20	0.20	0.2%	0.9%
cis 1,2-Dichloroethene	00156-59-2	332	6.7E+00	7.7E-04	9.7E-05	4.5E-02	1.9E-03	--	63	--	0.0%
trans 1,2-Dichloroethene	00156-60-5	2.5	5.1E-02	5.8E-06	7.3E-07	3.4E-04	1.5E-05	--	63	--	0.0%
Benzene	00071-43-2	18	3.7E-01	4.2E-05	5.3E-06	2.4E-03	1.1E-04	1,300	0.13	0.0%	0.1%
Xylenes - M,P	01330-20-7	9.1	1.8E-01	2.1E-05	2.7E-06	1.2E-03	5.3E-05	22,000	100	0.0%	0.0%
2-Butanone	00078-93-3	7.1	1.4E-01	1.6E-05	2.1E-06	9.6E-04	4.2E-05	13,000	5,000	0.0%	0.0%
Acetone	00067-64-1	26	5.3E-01	6.0E-05	7.6E-06	3.5E-03	1.5E-04	180,000	30,000	0.0%	0.0%
Chloroform	00067-66-3	11	2.2E-01	2.6E-05	3.2E-06	1.5E-03	6.4E-05	150	14.7	0.0%	0.0%
Methylene Chloride	00075-09-2	12	2.4E-01	2.8E-05	3.5E-06	1.6E-03	7.0E-05	14,000	60	0.0%	0.0%
Ethylbenzene	00100-41-4	6.5	1.8E-02	2.0E-06	2.5E-07	1.2E-04	5.1E-06	--	1,000	--	0.0%
1-Chloro-1,1-difluoroethane (Freon 142b)	00075-68-3	71	1.4E+00	1.6E-04	2.1E-05	9.6E-03	4.2E-04	--	50,000	--	0.0%

Notes

(1) Emission rate calculated based on VSP-601 effluent concentration and an exit air flow rate of 614.78 cfm

1,1,1-Trichloroethane (lb/hr) = (2.4 ug/m^3) x (614.78 ft^3/min) x (1 m^3/35 ft^3) x (60 min/hr) x (0.000001 g/1 ug) x (0.0022 lb/g)

lb/yr = lb/hr x 8,760 hrs/yr

g/s = lb/hr x 1 hr/ 3,600 sec x 453.59 g/lb

(2) Ambient impact based on AERMOD modeling using normalized rate of 1 g/s is scaled to the actual emission rate of the pollutant. Modeling was performed using the representative meteorological data from the nearest station (Farmingdale) for the years 2011 through 2015. The maximum impact from all the years was used for the calculations.

Scaled hourly impact (ug/m^3) = AERMOD predicted hourly ambient impact at 1 g/s ([ug/m^3]/[g/s]) x Actual emission rate (g/s)

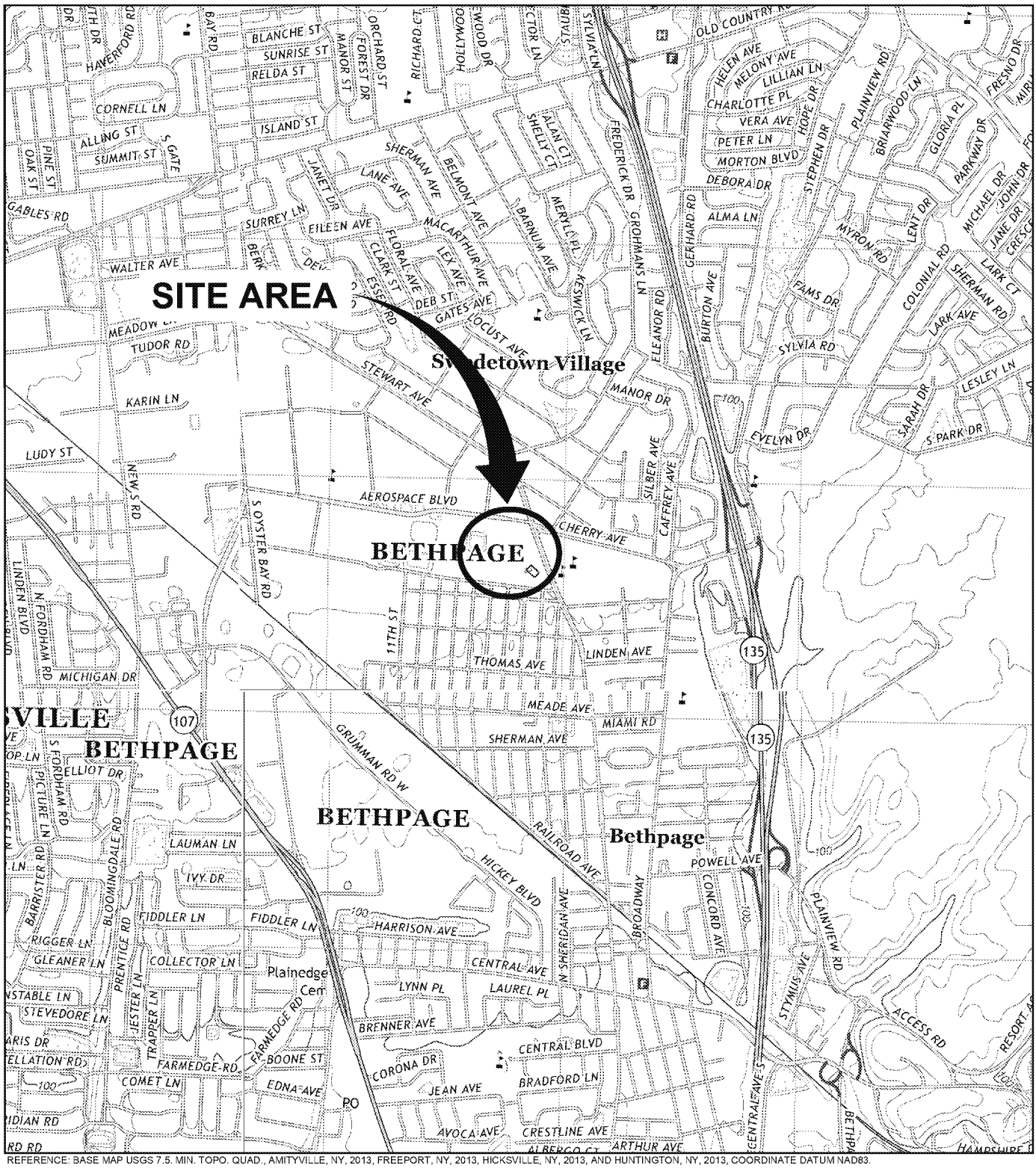
Scaled annual impact (ug/m^3) = AERMOD predicted annual ambient impact at 1 g/s ([ug/m^3]/[g/s]) x Actual emission rate (g/s)

AERMOD Normalized Ambient Impact at 1 g/s	
Hourly ([ug/m^3]/[g/s])	Annual ([ug/m^3]/[g/s])
462.83	20.02

(3) Short-term and annual guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised August 10, 2016.

(4) Only contaminants with detected concentrations are included in the table.

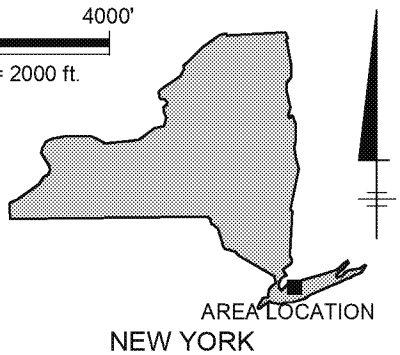
FIGURES



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., AMITYVILLE, NY, 2013, FREEPORT, NY, 2013, HICKSVILLE, NY, 2013, AND HUNTINGTON, NY, 2013, COORDINATE DATUM NAD83.

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.



NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE PARK SOIL GAS CONTAINMENT SYSTEM
BETHPAGE, NEW YORK
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1

CITY:SYRACUSE-NY DIV/GROUP:ENV DB:A.SANCHEZ LD:ALS PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
Z:\ENVCAD\SYRACUSE\ACT\NY0014986\Site_Loc\Map.dwg LAYOUT: BP SAVED: 3/15/2017 9:38 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 3/15/2017 9:38 AM BY: SANCHEZ, ADRIAN

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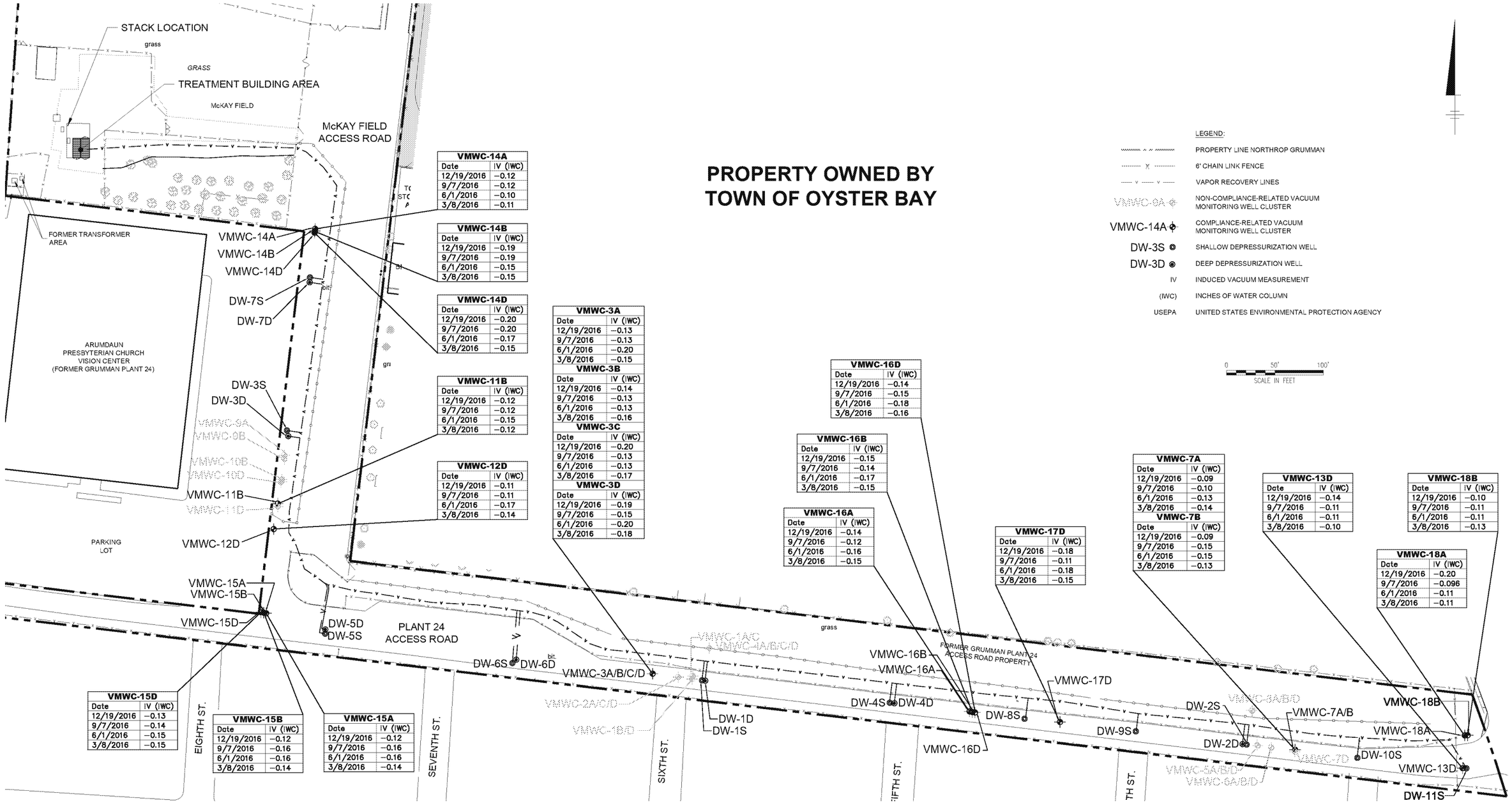
2013Freeport.jpg
2013Hicksville.jpg
2013Huntington.jpg



VMWC-14A	
Date	IV (IWC)
12/19/2016	−0.12
9/7/2016	−0.12
6/1/2016	−0.10
3/8/2016	−0.11

VMWC-14B	
Date	IV (IWC)
12/19/2016	−0.19
9/7/2016	−0.19
6/1/2016	−0.15
3/8/2016	−0.15

VMWC-14D	
Date	IV (IWC)
12/19/2016	−0.20
9/7/2016	−0.20
6/1/2016	−0.17
3/8/2016	−0.15

VMWC-11B	
Date	IV (IWC)
12/19/2016	−0.12
9/7/2016	−0.12
6/1/2016	−0.15
3/8/2016	−0.12

VMWC-12D	
Date	IV (IWC)
12/19/2016	−0.11
9/7/2016	−0.11
6/1/2016	−0.17
3/8/2016	−0.14

VMWC-3A	
Date	IV (IWC)
12/19/2016	−0.13
9/7/2016	−0.13
6/1/2016	−0.20
3/8/2016	−0.15

VMWC-3B	
Date	IV (IWC)
12/19/2016	−0.14
9/7/2016	−0.13
6/1/2016	−0.13
3/8/2016	−0.16

VMWC-3C	
Date	IV (IWC)
12/19/2016	−0.20
9/7/2016	−0.13
6/1/2016	−0.13
3/8/2016	−0.17

VMWC-3D	
Date	IV (IWC)
12/19/2016	−0.19
9/7/2016	−0.15
6/1/2016	−0.20
3/8/2016	−0.18

VMWC-16D	
Date	IV (IWC)
12/19/2016	−0.14
9/7/2016	−0.15
6/1/2016	−0.18
3/8/2016	−0.16

VMWC-16B	
Date	IV (IWC)
12/19/2016	−0.15
9/7/2016	−0.14
6/1/2016	−0.17
3/8/2016	−0.15

VMWC-16A	
Date	IV (IWC)
12/19/2016	−0.14
9/7/2016	−0.12
6/1/2016	−0.16
3/8/2016	−0.15

VMWC-17D	
Date	IV (IWC)
12/19/2016	−0.18
9/7/2016	−0.11
6/1/2016	−0.18
3/8/2016	−0.15

VMWC-7A	
Date	IV (IWC)
12/19/2016	−0.09
9/7/2016	−0.10
6/1/2016	−0.13
3/8/2016	−0.14

VMWC-7B	
Date	IV (IWC)
12/19/2016	−0.09
9/7/2016	−0.15
6/1/2016	−0.15
3/8/2016	−0.13

VMWC-13D	
Date	IV (IWC)
12/19/2016	−0.14
9/7/2016	−0.11
6/1/2016	−0.11
3/8/2016	−0.10

VMWC-18B	
Date	IV (IWC)
12/19/2016	−0.10
9/7/2016	−0.11
6/1/2016	−0.11
3/8/2016	−0.13

VMWC-18A	
Date	IV (IWC)
12/19/2016	−0.20
9/7/2016	−0.096
6/1/2016	−0.11
3/8/2016	−0.11

VMWC-15D	
Date	IV (IWC)
12/19/2016	−0.13
9/7/2016	−0.14
6/1/2016	−0.15
3/8/2016	−0.15

VMWC-15B	
Date	IV (IWC)
12/19/2016	−0.12
9/7/2016	−0.16
6/1/2016	−0.16
3/8/2016	−0.14

VMWC-15A	
Date	IV (IWC)
12/19/2016	−0.12
9/7/2016	−0.16
6/1/2016	−0.16
3/8/2016	−0.14

NOTES:

1. USEPA'S RADON GUIDANCE RECOMMENDS NEGATIVE PRESSURE OF 0.035 INCHES OF WATER FOR THE CONTROL OF SOIL VAPOR (EPA 625/R-93-011, 1993).
2. SYSTEM DESIGN OBJECTIVE IS TO MAINTAIN -0.1 IWC OF INDUCED VACUUM AT ALL COMPLIANCE-RELATED VACUUM MONITORING WELLS ON A 12-MONTH ROLLING AVERAGE (ARCADIS 2007).
3. DATA SHOWN HEREIN ARE COLLECTED FROM COMPLIANCE-RELATED VACUUM MONITORING WELLS ONLY.

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE PARK SOIL GAS CONTAINMENT SYSTEM
BETHPAGE, NEW YORK
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)

GENERAL SITE PLAN AND MONITORING WELL VACUUM MEASUREMENTS ANNUAL 2016

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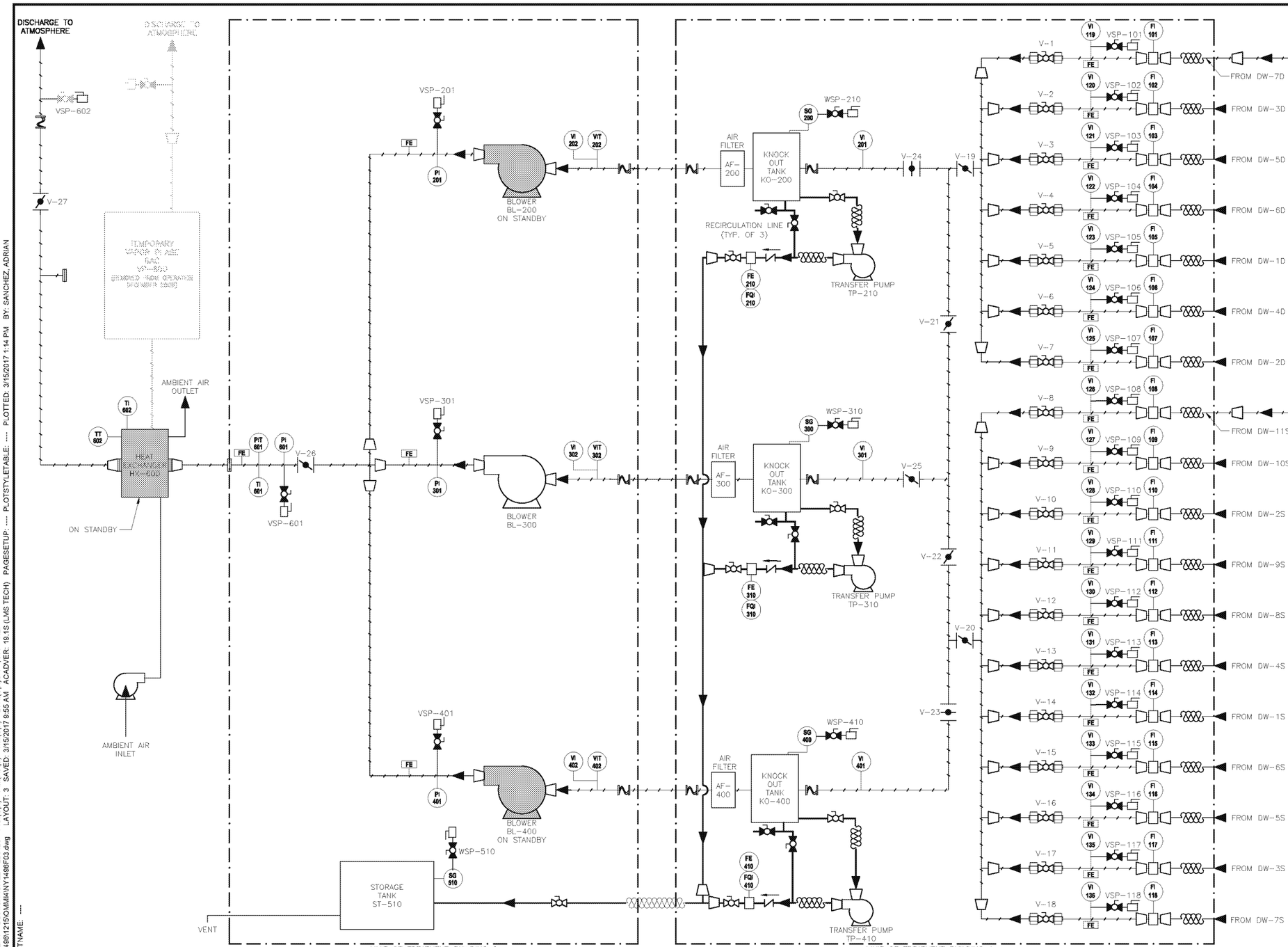
FIGURE
2

CITY:SYRACUSE-NY DIV/GROUP:ENV DB:A.SANCHEZ LD:ALS PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
Z:\ENVCAD\SYRACUSE\ACT\NY0014981215\OMM4\NY1498F02-4g.dwg LAYOUT: 2 SAVED: 3/15/2017 9:51 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 3/15/2017 9:55 AM BY: SANCHEZ, ADRIAN
XREFS: X1498X01 X\BDR-DL IMAGES: PROJECTNAME: ----



LEGEND:

- CONDENSATE LINE
- LIMITS OF TREATMENT BUILDING
- PROCESS VAPOR LINE
- BALL VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY CLOSED)
- BUTTERFLY VALVE (NORMALLY OPEN)
- BUTTERFLY VALVE (NORMALLY CLOSED)
- CHECK VALVE
- UNION
- SAMPLE PORT/DRAIN
- REDUCER
- FERNICO
- FLEXIBLE HOSE
- FLANGE
- FE — FLOW ELEMENT ACCESS
- VI 108 — 1/4" BARB INDUCED VACUUM MONITORING CONNECTION
- INLINE INSTRUMENT
- ISOLATED INSTRUMENT CONNECTED TO PROCESS LINE
- INSTRUMENT CONNECTED TO PROCESS LINE

FE	FLOW MONITORING ELEMENT
FI	FLOW RATE INDICATOR
FQI	FLOW TOTALIZER INDICATOR
PI	PRESSURE INDICATOR
PIT	PRESSURE INDICATING TRANSMITTER
SG	SIGHT GLASS
TT	TEMPERATURE TRANSMITTER
VI	VACUUM INDICATOR
VIT	VACUUM INDICATING TRANSMITTER
VSP	VAPOR SAMPLE POINT
WSP	WATER SAMPLE POINT

NOTE:

SYSTEM OPERATED WITH BLOWER BL-300 ONLINE FOR THE ENTIRE 2016 REPORTING PERIOD.

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PROCESS FLOW DIAGRAM

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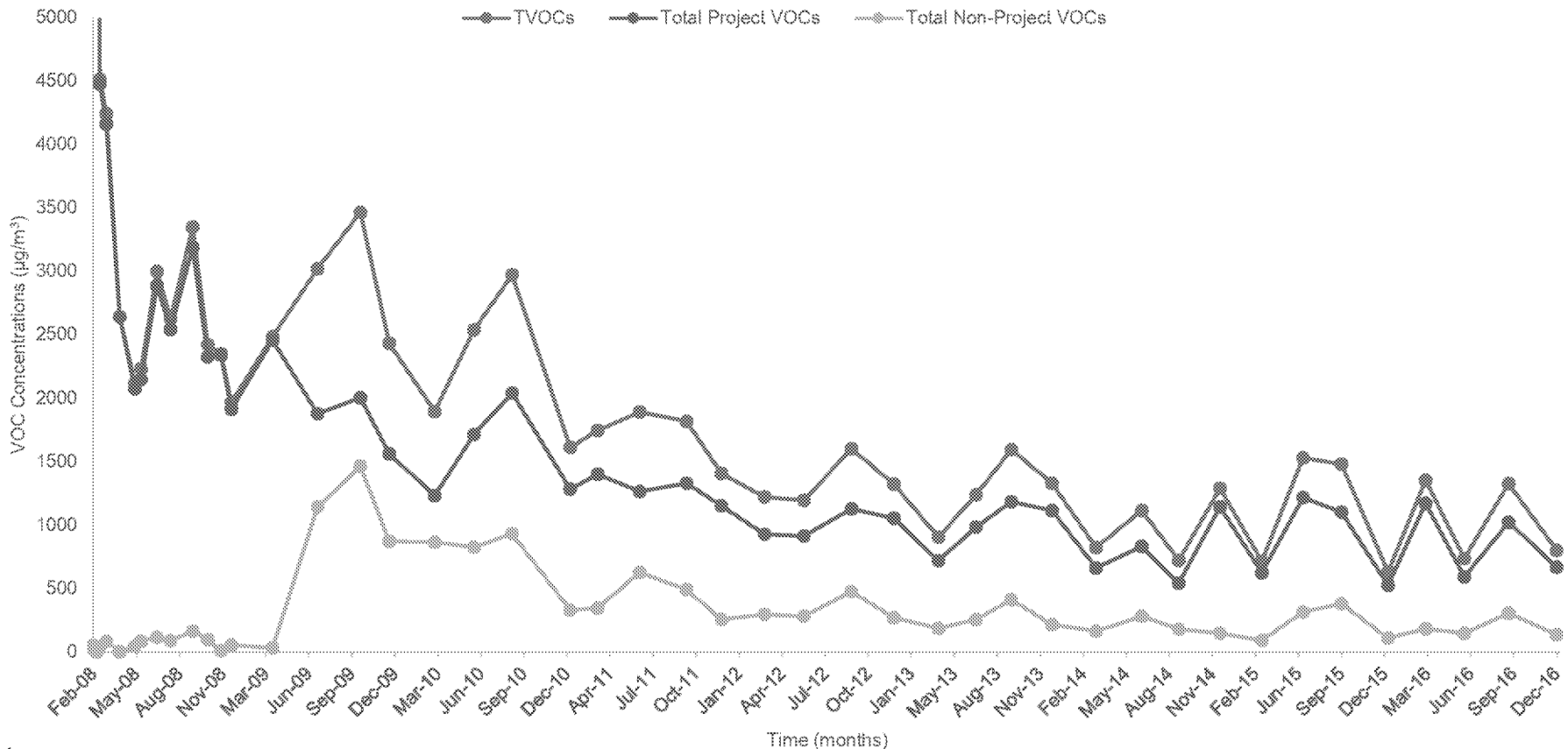
FIGURE
3

CITY:SYRACUSE-NY DIV/GROUP:ENV DB:A.SANCHEZ LD:ALS PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
Z:\ENVCAD\SYRACUSE\ACT\NY0014861215\OM\MAINY1496F03.dwg LAYOUT: 3 SAVED: 3/15/2017 9:55 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 3/15/2017 1:14 PM BY: SANCHEZ, ADRIAN
XREFS: IMAGES: PROJECTNAME: ----
XFBDR-DL



Notes:

µg/m^3 = micrograms per cubic meter
TVOCs = total VOCs detected
VOCs = volatile organic compounds
Total Project VOCs = Sum of 1,1,1-trichloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; trichloroethene; vinyl chloride; cis-1,2-dichloroethene; trans-1,2-dichloroethene; benzene; toluene; and total xylenes.
Total Non-Project VOCs = Sum of VOCs that are not Project VOCs.

1. Samples were collected at Vapor Sample Port-601 (VSP-601); refer to Figure 3 of this OM&M report for the location of VSP-601.
2.Results prior to March 3, 2008 are not shown to improve figure clarity. The TVOC concentrations and sample dates are as follows: February 18, 2008 - 20,622 µg/m^3, February 19, 2008 - 14,519 µg/m^3, and February 25, 2008 - 8,196 µg/m^3.
3. The sample results from December 3, 2010 were not consistent with historical data and is not included in this figure. The TVOC concentration for December 3, 2010 was 13 µg/m^3.

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SOIL GAS VOC CONCENTRATIONS THROUGH DECEMBER 2016

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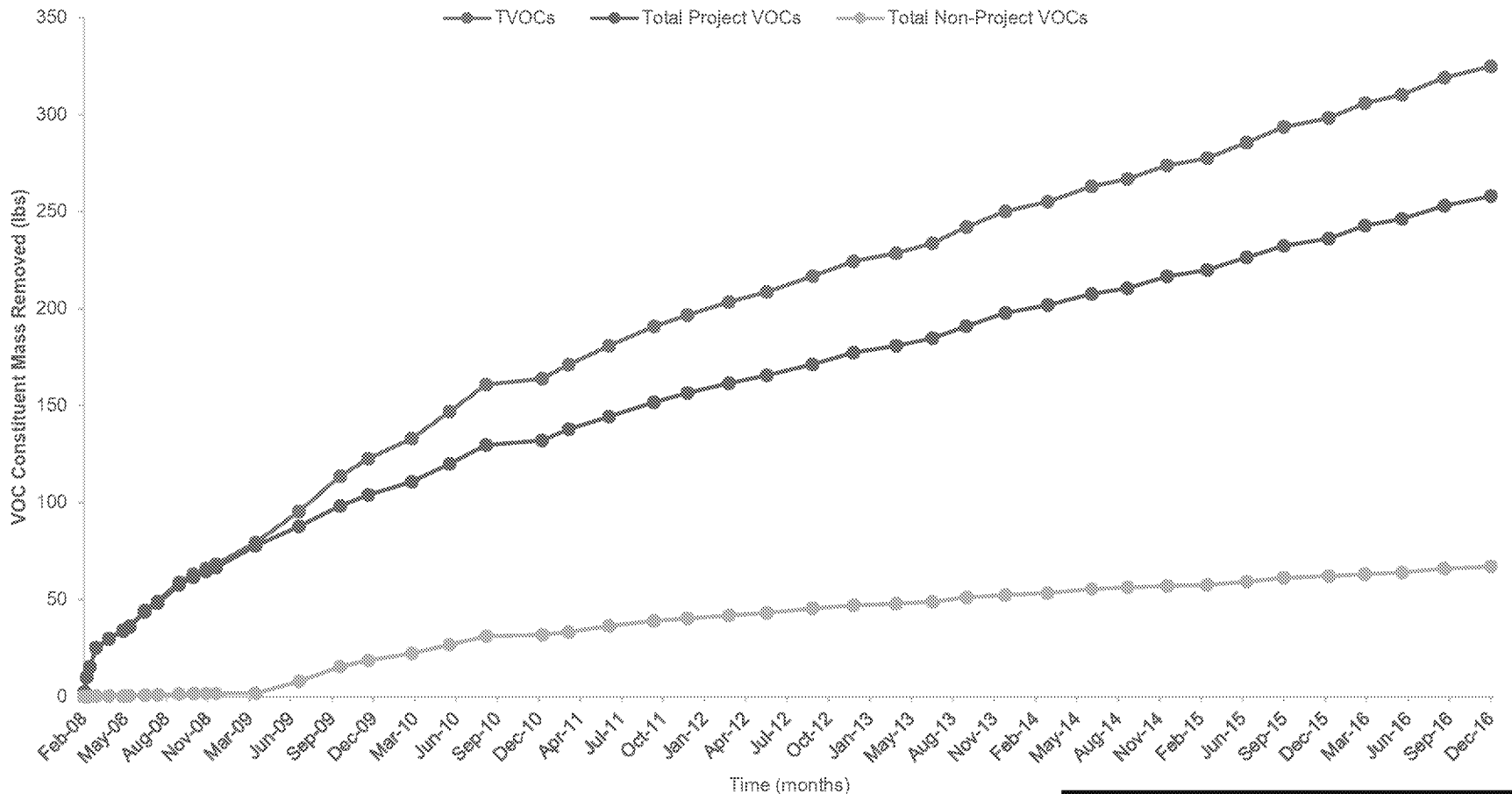
FIGURE
4



Notes:

TVOCs = total VOCs detected

VOCs = volatile organic compounds

Total Project VOCs = Sum of 1,1,1-trichloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; trichloroethene; vinyl chloride; cis-1,2-dichloroethene; trans-1,2-dichloroethene; benzene; toluene; and total xylenes.

Total Non-Project VOCs = Sum of VOCs that are not Project VOCs.

1. The sample results from December 3, 2010 were not consistent with historical data and thus, the recovery rate is not included in this table.

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CUMULATIVE TOTAL, PROJECT, AND NON-PROJECT VOC MASS REMOVED THROUGH DECEMBER 2016

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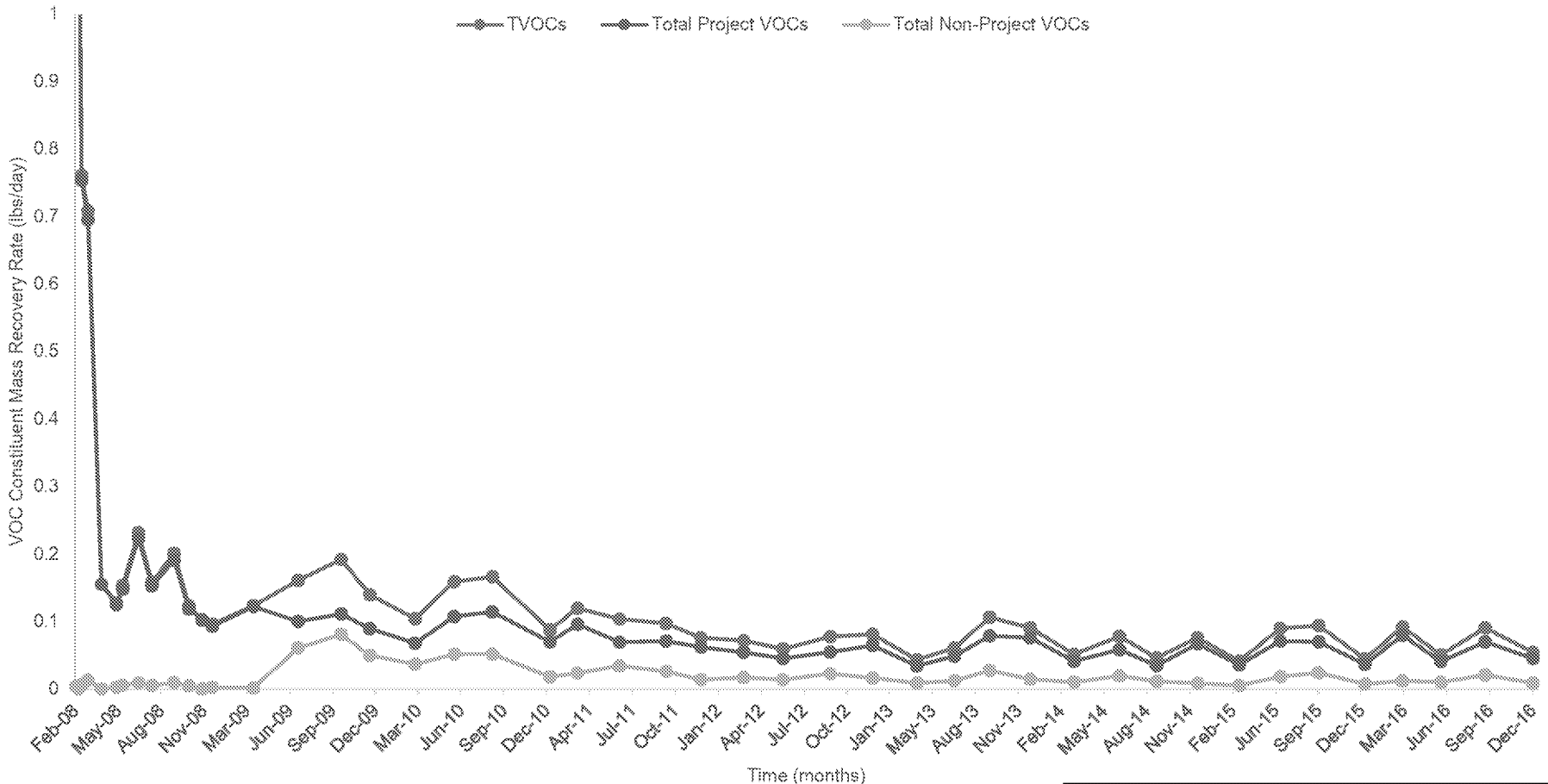
FIGURE
5



Notes:

TVOCs = total VOCs detected.
VOCs = volatile organic compounds
Total Project VOCs = Sum of 1,1,1-trichloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; trichloroethene; vinyl chloride; cis-1,2-dichloroethene; trans-1,2-dichloroethene; benzene; toluene; and total xylenes.
Total Non-Project VOCs = Sum of VOCs that are not Project VOCs.

1. Results prior to March 3, 2008 are not shown to improve figure clarity. The TVOC concentrations and sample dates are as follows: February 19, 2008 - 2.2 lbs/day and February 25, 2008 1.3 lbs/day.
2. The sample results from December 3, 2010 were not consistent with historical data and thus the recovery rate is not included in this figure. The TVOC concentration for December 3, 2010 was 13 µg/L.

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VOC MASS RECOVERY RATES THROUGH DECEMBER 2016

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FIGURE
6

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