

Mr. Steven Scharf, P.E.
New York State Department of Environmental Conservation
Remedial Action, Bureau A
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7015

Arcadis of New York, Inc.
Two Huntington Quadrangle
Suite 1S10
Melville
New York 11747
Tel 631 249 7600
Fax 631 249 7610
www.arcadis.com

Subject:
Results of First Quarter 2016 System Operation and Monitoring,
Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York,
NYSDEC Site #1-30-003A.

ENVIRONMENT

Date:
May 13, 2016

Contact:
David E. Stern

Phone:
631.391.5284

Email:
David.E.Stern@arcadis.com

Our ref:
NY001496.1215.OMMI4

Dear Steve:

Enclosed are the results of the Operable Unit 3 Bethpage Park Soil Gas Containment System (OU3 BPSGCS) operation and monitoring, performed in accordance with the NYSDEC-approved OU3 Soil Gas IRM OM&M Manual (ARCADIS 2009) and the NYSDEC-approved Sampling and Analysis Plan (SAP; ARCADIS 2008). As we have transitioned to electronic submittals (via PDF) as part of ongoing sustainability and cost savings efforts, hard copies of the report can be provided on request.

If you have any questions, please do not hesitate to contact us.

Sincerely,

Arcadis of New York, Inc.



David E. Stern

Senior Hydrogeologist

Enclosure

Steven Scharf, P.E.

May 13, 2016

Copies:

Steven Karpinski, NYS Dept. of Health

Joseph DeFranco, Nassau County Dept. of Health

Robert Alvey, USEPA Region 2

Carol Stein, USEPA Region 2

Fred Weber, Northrop Grumman Corporation

Edward Hannon, Northrop Grumman Corporation, w/o enclosure

Repository

File

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.

Date	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
	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc
06/11/15	120	-23	-2.0	4.0	-16	-0.38	5.0	-6.2	-0.22	10	-8.0	-0.32	90	-17	-1.4	13	-12	-2.3	70	-17	-1.4	6.8	-6.0	-1.4
09/04/15	105	-21	-1.8	4.0	-10	-0.40	5.5	-6.0	-0.23	13	-7.5	-0.34	95	-17	-1.6	13	-11	-2.2	82	-17	-1.6	6.4	-5.6	-1.3
12/16/15	105	-26	-1.3	8.0	-13	-0.54	8.0	-7.5	-0.27	4.0	-16	-0.23	108	-21	-1.9	14	-12	-2.5	69	-17	-1.6	2.6	-4.5	-0.63
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

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.

Date	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
	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc	scfm	iwc	iwc
06/11/15	85	-21	-1.7	6.2	-3.8	-1.7	68	-15	-1.2	6.0	-6.2	-0.57	60	-18	-1.6	35	-14	-1.4	30	-23	-1.5	33	-22	-2.1
09/04/15	85	-22	-1.7	2.6	-2.3	-1.8	70	-15	-1.3	3.5	-5.0	-0.47	60	-18	-1.7	32	-13	-1.2	28	-24	-1.6	34	-23	-2.2
12/16/15	111	-25	-2.4	2.4	-2.5	-0.79	75	-16	-1.5	5.0	-7.5	-0.64	57	-20	-1.8	37	-15	-1.5	22	-21	-1.4	34	-23	-2.2
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

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.

Date	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.
	scfm	iwc	iwc	scfm	iwc	iwc	iwc	iwc	iwc	Gallons	iwc	iwc	Hz	iwc	iwc	Hz	iwc	iwc	Hz	scfm	ppmv	°F	iwc	°F
06/11/15	30	-14	-1.5	33	-24	-2.2	--	--	-40	115	--	--	--	--	--	--	-44	1.0	60.00	688	0.2	115	2.0	120
09/04/15	32	-16	-1.7	33	-24	-2.3	--	--	-38	105	--	--	--	--	--	--	-37	1.0	60.00	664	0.0	107	2.0	104
12/16/15	35	-16	-1.8	26	-23	-2.3	--	--	-38	0	--	--	--	--	--	--	-41	1.5	60.00	763	0.0	105	2.5	87
03/08/16	48	-19	-2.6	31	-24	-2.2	--	-40	--	0	--	--	--	-43	2.0	60.00	--	--	--	719	0.1	105	2.5	98

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.

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.
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)

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
06/11/15	-0.11	-0.20	-0.20	-0.13	-0.20	-0.12	-0.11	-0.13	-0.20	-0.13	-0.12	-0.19	-0.17	-0.13	-0.15	-0.11	-0.10	-0.15	-0.23	-0.10	-0.13
09/04/15	-0.11	-0.18	-0.19	-0.12	-0.13	-0.15	-0.15	-0.15	-0.13	-0.14	-0.13	-0.18	-0.18	-0.13	-0.14	-0.11	-0.10	-0.25	-0.30	-0.099	-0.11
12/16/15	-0.14	-0.23	-0.19	-0.16	-0.13	-0.18	-0.17	-0.16	-0.17	-0.17	-0.18	-0.19	-0.20	-0.16	-0.17	-0.098	-0.096	-0.13	-0.25	-0.095	-0.11
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
Time Weighted Rolling Average⁽³⁾	-0.12	-0.19	-0.18	-0.13	-0.15	-0.15	-0.14	-0.15	-0.16	-0.15	-0.15	-0.19	-0.18	-0.14	-0.15	-0.11	-0.16	-0.16	-0.23	-0.10	-0.12

Gross Average Compliance Points ⁽⁴⁾	
03/08/16	-0.14

Notes and Abbreviations:

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

- All induced vacuum measurements units in iwc. Values shown have been rounded to two significant figures.
- Compliance goal is -0.1 iwc of vacuum at all compliance monitoring points, based on a twelve-month rolling average.
- 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.
- 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⁾

Compound (units in µg/m ³)	Sample ID: Sample Date:	VSP-601 6/11/2015	VSP-601 9/4/2015	VSP-601 12/16/2015	VSP-601 3/8/2016
Project VOCs	CAS No.	SGC			
1,1,1-Trichloroethane	71-55-6	9,000	9.8	13	8.7
1,1-Dichloroethane	75-34-3	NS	9.7	11	8.5
1,1-Dichloroethene	75-35-4	380 ⁽³⁾	<3.2 U	1.0	0.83
1,2-Dichloroethane	107-06-2	NS	<3.2 U	<0.81 U	<0.81 U
Benzene	71-43-2	1,300	<2.6 U	23	0.38 J
cis-1,2-Dichloroethene	156-59-2	190,000 ⁽⁴⁾	646 D	424 D	251 D
Tetrachloroethene	127-18-4	300	26	24	12
Toluene	108-88-3	37,000	1.7 J	24	4.5
trans-1,2-Dichloroethene	156-60-5	190,000 ⁽⁴⁾	3.4	4.8	2.4
Trichloroethylene	79-01-6	14,000	514	513 D	233 D
Vinyl chloride	75-01-4	180,000	3.6	0.84	0.77
Xylene-O	95-47-6	22,000	<3.5 U	11	<0.87 U
Xylenes - M,P	1330-20-7	22,000	1.7 J	51	0.83 J
Subtotal Project VOCs			1,216	1,101	523
Non-Project VOCs					
1,1,2,2-Tetrachloroethane	79-34-5	NS	<5.5 U	<1.4 U	<1.4 U
1,1,2-Trichloroethane	79-00-5	NS	<4.4 U	<1.1 U	<1.1 U
1,2-Dichloropropane	78-87-5	NS	<3.7 U	<0.92 U	<0.92 U
1,3-Butadiene	106-99-0	NS	<1.8 U	<0.44 U	<0.44 U
2-Butanone	78-93-3	13,000	<2.4 U	1.1	<0.59 U
2-Hexanone	591-78-6	4,000	<3.3 U	1.8	<0.82 U
4-Methyl-2-Pentanone	108-10-1	31,000	<3.3 U	<0.82 U	<0.82 U
1-Chloro-1,1-difluoroethane (Freon 142b)	75-68-3	NS	298	337 D	88
Acetone	67-64-1	180,000	2.3	3.3	<0.48 U
Bromodichloromethane	75-27-4	NS	<5.4 U	<1.3 U	<1.3 U
Bromoform	75-25-2	NS	<8.3 U	<2.1 U	<2.1 U
Bromomethane	74-83-9	3,900	<3.1 U	<0.78 U	<0.78 U
Carbon Disulfide	75-15-0	6,200	<2.5 U	<0.62 U	<0.62 U
Carbon Tetrachloride	56-23-5	1,900	<5.0 U	1.1 J	<1.3 U
Chlorobenzene	108-90-7	NS	<3.7 U	<0.92 U	<0.92 U
Chlorodibromomethane	124-48-1	NS	<6.8 U	<1.7 U	<1.7 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⁾

Compound (units in $\mu\text{g}/\text{m}^3$)	Sample ID: Sample Date:	VSP-601 6/11/2015	VSP-601 9/4/2015	VSP-601 12/16/2015	VSP-601 3/8/2016
Non-Project VOCs	CAS No.	SGC			
Chloroethane	75-00-3	NS	<2.1 U	<0.53 U	<0.53 U
Chlorodifluoromethane (Freon 22)	75-45-6	NS	<2.8 U	2.0	<0.70 U
Chloroform	67-66-3	150	11	21	15
Chloromethane	74-87-3	22,000	<1.7 U	<0.41 U	<0.41 U
cis-1,3-Dichloropropene	10061-01-5	NS	<3.6 U	<0.91 U	<0.91 U
Dichlorodifluoromethane (Freon 12)	75-71-8	NS	2.3 J	4.1	2.2
Ethylbenzene	100-41-4	NS	<3.5 U	4.8	<0.87 U
Trichlorotrifluoroethane (Freon 113)	76-13-1	960,000	<6.1 U	<1.5 U	<1.5 U
Methyl Tert-Butyl Ether	1634-04-4	NS	<2.9 U	<0.72 U	<0.72 U
Methylene Chloride	75-09-2	14,000	<2.8 U	0.80	1.3
Styrene	100-42-5	17,000	<3.4 U	<0.85 U	<0.85 U
Trans-1,3-Dichloropropene	10061-02-6	NS	<3.6 U	<0.91 U	<0.91 U
Trichlorofluoromethane (Freon 11)	75-69-4	9,000	<4.5 U	1.9	1.2
Subtotal Non-Project VOCs			314	379	107
TVOC⁽²⁾			1,530	1,480	630

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.

Notes and Abbreviations:

Bold	Bold data indicates that the analyte was detected at or above its reporting limit.
ELAP	Environmental Laboratory Approval Program.
NS	Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables, revised February 28, 2014. An interim SGC was not developed for these compounds because they have low toxicity ratings, as specified in the NYSDEC DAR-1 AGC/SGC tables, revised February 28, 2014.
CAS No.	Chemical Abstracts Service list number.
DAR-1	Division of Air Resources-1 Air Guide-1.
NYSDEC	New York State Department of Environmental Conservation.
NYSDOH	New York State Department of Health.
AGC	Allowable Annual Guideline Concentration.
SGC	Short-term Guideline Concentrations.
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
µg/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.
3.	An SGC was not provided in the DAR-1 AGC/SGC Tables, revised February 28, 2014. An interim SGC was developed based on guidance provided in Section IV.A.2.b.1 of the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for 1,1- dichloroethene, which is not defined as a high-toxicity compound, the Interim SGC = (smaller of Time Weighted Average [TWA] - Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2. or $1,600 \mu\text{g}/\text{m}^3 / 4.2 = \text{approximately } 380 \mu\text{g}/\text{m}^3$. An interim SGC was developed for this compound because it has a moderate toxicity rating, as specified in the DAR-1 AGC/SGC Tables, revised February 28, 2014.
4.	An SGC was not provided in the DAR-1 AGC/SGC Tables, revised February 28, 2014. An interim SGC was developed based on guidance provided in Section IV.A.2.b.1 of the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for cis-1,2 dichloroethene and trans-1,2 dichloroethene, which are not defined as a high-toxicity compounds, the interim SGC = (smaller of Time Weighted Average [TWA] - Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or $790,000 \mu\text{g}/\text{m}^3 / 4.2 = \text{approximately } 190,000 \mu\text{g}/\text{m}^3$. An interim SGC was developed for these compounds because they have moderate toxicity ratings, as specified in the DAR-1 AGC/SGC Tables, revised February 28, 2014.

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-601 6/11/2015 ppbv	VSP-601 9/4/2015 ppbv	VSP-601 12/16/2015 ppbv	VSP-601 3/8/2016 ppbv
1,2,4-Trimethylbenzene	--	2.9 JN	--	--
2,3-Dimethylpentane	--	--	1.4 JN	--
2-Methylbutane	--	--	2.3 JN	--
2-Methylpentane	--	--	3.8 JN	--
1,2-Dibromoethane				170 JN
1-Bromo-2-chloroethane	--	--	--	22 JN
Bromobenzene	--	--	--	2.8 JN
Methyl styrene (alpha)	--	--	--	1.8 JN
Vinyl bromide	--	--	--	3.1 JN
3-Methylhexane	--	--	1.4 JN	--
3-Methylpentane	--	--	2.2 JN	--
Alkane	--	3.8 JN	2.5 JN	--
Carbon Dioxide	--	1.3 JN	300 JN	--
C3 Alkyl Benzene	--	1.4 JN	--	--
Methylcyclopentane	--	--	3.8 JN	--
Pentane	--	1.8 JN	1.5 JN	--
Unknown Alkene	--	2.4 JN	--	--
Unknown Alkene	--	1.3 JN	--	--
Unknown Alkene	--	1.3 JN	--	--

Notes and Abbreviations:

- Not analyzed.
 - ELAP Environmental Laboratory Approval Program.
 - 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
Summary of SCREEN3 Model Input and Outputs
Northrop Grumman Operable Unit 3, Bethpage Park Soil Gas Containment System
Former Grumman Settling Ponds, Bethpage, New York.

Parameters	Date Sampled:	06/11/15	09/04/15	12/16/15	03/08/16
SCREEN3 Model Input					
Source Type		Point	Point	Point	Point
Emission Rate (g/s)		1	1	1	1
Stack Height (m)		10.1	10.1	10.1	10.1
Stack Inside Diameter (m)		0.41	0.41	0.41	0.41
Air Flow Rate (scfm, 460 degrees) ⁽¹⁾		688	664	763	719
Air Flow Rate (acfm @ stack temp) ⁽²⁾		752	706	787	757
Stack Gas Exit Temperature (K) ⁽¹⁾		322	313	304	310
Ambient Air Temperature (K) ⁽³⁾		297	297	281	282
Receptor Height (m) ⁽⁴⁾		1.5	1.5	1.5	1.5
Urban/Rural		Urban	Urban	Urban	Urban
Building Height (m)		2.4	2.4	2.4	2.4
Min Horizontal Bldg Dim (m)		4.9	4.9	4.9	4.9
Max Horizontal Bldg Dim (m)		5.0	5.0	5.0	5.0
Consider Bldg Downwash?		Yes	Yes	Yes	Yes
Simple/Complex Terrain Above Stack		Simple	Simple	Simple	Simple
Simple/Complex Terrain Above Stack Base		Simple	Simple	Simple	Simple
Meteorology		Full	Full	Full	Full
Automated Distances Array		Yes	Yes	Yes	Yes
Terrain Height Above Stack Base		0	0	0	0
SCREEN3 Model Output					
1-HR Max Concentration at Receptor Height ($\mu\text{g}/\text{m}^3$) ⁽⁵⁾		1194	1248	1183	1121
Annualization Factor ⁽⁶⁾		0.08	0.08	0.08	0.08
Average Annual Concentration at Receptor Height ($\mu\text{g}/\text{m}^3$) ⁽⁷⁾		95.5	99.8	94.6	89.7
Distance To Max Concentration (m) ⁽⁸⁾		47	46	47	48

Notes and abbreviations on last page.

Table 5
Summary of SCREEN3 Model Input and Outputs
Northrop Grumman Operable Unit 3, Bethpage Park Soil Gas Containment System
Former Grumman Settling Ponds, Bethpage, New York.

Notes and Abbreviations:

acfm	actual cubic feet per minute
ft	feet
g/s	grams per second
°K	degrees Kelvin
m	meter
scfm	standard cubic feet per minute
µg/m ³	micrograms per cubic meter
USEPA	U.S. Environmental Protection Agency

1. The stack air flow rate (in scfm) and exit temperature were measured using a handheld thermo-anemometer. Values were measured at the stack effluent location.
2. The stack air flow rate at the stack temperature (in acfm) was calculated by dividing the stack air flow rate in scfm by the ratio of the standard temperature to the actual stack gas exit temperature.
3. The ambient temperature was recorded from the weather.newday.com website for Islip, New York. The mean actual temperature from the website was used in model calculation.
4. The receptor height corresponds to the average inhalation level.
5. SCREEN3 calculated constituent concentration at listed conditions at the specified inhalation level.
6. A USEPA time averaging conversion factor of 0.08 was used to convert the 1-hour maximum concentration output to an annual average.
7. Average annual constituent concentration at the receptor height was calculated by multiplying the one hour maximum concentration by the annualization factor.
8. SCREEN3 calculated distance to the 1-hour maximum concentration.

Table 6
Summary of Maximum Allowable Stack Concentration Calculations
Northrop Grumman Operable Unit 3, Bethpage Park Soil Gas Containment System,
Former Grumman Settling Ponds, Bethpage, New York.

Compound	Actual Effluent Concentrations ⁽¹⁾ (µg/m ³)			
	6/11/2015	9/4/2015	12/16/2015	3/8/2016
1,1,1-Trichloroethane	9.8	13	8.7	11
1,1-Dichloroethane	9.7	11	8.5	9.7
1,1-Dichloroethene	0	1.0	0.83	1.5
1,2-Dichloroethane	0	0	0	137
1-Chloro-1,1-difluoroethane (Freon 142b)	298	337	87.5	140
2-Butanone	0	1.1	0	0.97
2-Hexanone	0	1.8	0	0
Acetone	2.3	3.3	0	8.6
Benzene	0	23	0.38	9.3
Bromoform	0	0	0	9.3
Carbon disulfide	0	0	0	1.6
Carbon tetrachloride	0	1.1	0	0.62
Chlorodibromomethane	0	0	0	2.6
Chlorodifluoromethane (Freon 22)	0	2.0	0	0
Chloroform	11	21	15	11
cis-1,2-Dichloroethene	646	424	251	488
Dichlorodifluoromethane (Freon 12)	2.3	4.1	2.2	3.3
Ethylbenzene	0	4.8	0	0
Methylene Chloride	0	0.8	1.3	1.1
Tetrachloroethene	26	24	12	11
Toluene	1.7	24	4.5	38.4
trans-1,2-Dichloroethene	3.4	4.8	2.4	2.1
Trichloroethylene	514	513	233	461
Trichlorofluoromethane (Freon 11)	0	1.9	1.2	1.7
Vinyl chloride	3.6	0.84	0.77	3.8
Xylene-O	0	11	0	0
Xylenes - M,P	1.7	51.3	0.83	0

Notes and abbreviations on last page.

Table 6
Summary of Maximum Allowable Stack Concentration Calculations
Northrop Grumman Operable Unit 3, Bethpage Park Soil Gas Containment System,
Former Grumman Settling Ponds, Bethpage, New York.

Compound	AGC ⁽²⁾ (µg/m ³)	Annual MASC ⁽³⁾ (µg/m ³)			
		6/11/2015	9/4/2015	12/16/2015	3/8/2016
1,1,1-Trichloroethane	5,000	1.5E+08	1.5E+08	1.4E+08	1.6E+08
1,1-Dichloroethane	0.63	1.9E+04	1.9E+04	1.8E+04	2.0E+04
1,1-Dichloroethene	200	5.9E+06	6.0E+06	5.7E+06	6.2E+06
1,2-Dichloroethane	0.038	1.1E+03	1.1E+03	1.1E+03	1.2E+03
1-Chloro-1,1-difluoroethane (Freon 142b)	50,000	1.5E+09	1.5E+09	1.4E+09	1.6E+09
2-Butanone	5,000	1.5E+08	1.5E+08	1.4E+08	1.6E+08
2-Hexanone	30	8.9E+05	9.0E+05	8.5E+05	9.4E+05
Benzene	0.13	3.8E+03	3.9E+03	3.7E+03	4.1E+03
Bromoform	0.91	2.7E+04	2.7E+04	2.6E+04	2.8E+04
Carbon disulfide	700	2.1E+07	2.1E+07	2.0E+07	2.2E+07
Carbon tetrachloride	0.17	5.0E+03	5.1E+03	4.8E+03	5.3E+03
Chlorodibromomethane	NS	--	--	--	--
Chlorodifluoromethane (Freon 22)	50,000	1.5E+09	1.5E+09	1.4E+09	1.6E+09
Chloroform	14.7	4.3E+05	4.4E+05	4.2E+05	4.6E+05
cis-1,2-Dichloroethene	63	1.9E+06	1.9E+06	1.8E+06	2.0E+06
Dichlorodifluoromethane (Freon 12)	12,000	3.5E+08	3.6E+08	3.4E+08	3.7E+08
Ethylbenzene	1,000	3.0E+07	3.0E+07	2.8E+07	3.1E+07
Methylene Chloride	60	1.8E+06	1.8E+06	1.7E+06	1.9E+06
Tetrachloroethene	4.0	1.2E+05	1.2E+05	1.1E+05	1.2E+05
Toluene	5,000	1.5E+08	1.5E+08	1.4E+08	1.6E+08
trans-1,2-Dichloroethene	63	1.9E+06	1.9E+06	1.8E+06	2.0E+06
Trichloroethylene	0.2	5.9E+03	6.0E+03	5.7E+03	6.2E+03
Trichlorofluoromethane (Freon 11)	5,000	1.5E+08	1.5E+08	1.4E+08	1.6E+08
Vinyl chloride	0.068	2.0E+03	2.0E+03	1.9E+03	2.1E+03
Xylene-O	100	3.0E+06	3.0E+06	2.8E+06	3.1E+06
Xylenes - M,P	100	3.0E+06	3.0E+06	2.8E+06	3.1E+06

Notes and abbreviations on last page.

Table 6
Summary of Maximum Allowable Stack Concentration Calculations
Northrop Grumman Operable Unit 3, Bethpage Park Soil Gas Containment System,
Former Grumman Settling Ponds, Bethpage, New York.

Compound	Percent of Annual MASC ⁽⁴⁾				Cumulative % MASC ⁽⁵⁾
	6/11/2015	9/4/2015	12/16/2015	3/8/2016	
1,1,1-Trichloroethane	0.0%	0.0%	0.0%	0.0%	0.0%
1,1-Dichloroethane	0.052%	0.058%	0.047%	0.049%	0.052%
1,1-Dichloroethene	0.0%	0.0%	0.0%	0.0%	0.0%
1,2-Dichloroethane	0.0%	0.0%	0.0%	12%	2.6%
1-Chloro-1,1-difluoroethane (Freon 142b)	0.0%	0.0%	0.0%	0.0%	0.0%
2-Butanone	0.0%	0.0%	0.0%	0.0%	0.0%
2-Hexanone	0.0%	0.0%	0.0%	0.0%	0.0%
Benzene	0.0%	0.59%	0.01%	0.23%	0.2%
Bromoform	0.0%	0.0%	0.0%	0.033%	0.0075%
Carbon disulfide	0.0%	0.0%	0.0%	0.0%	0.0%
Carbon tetrachloride	0.0%	0.022%	0.0%	0.012%	0.0077%
Chlorodibromomethane	--	--	--	--	--
Chlorodifluoromethane (Freon 22)	0.0%	0.0%	0.0%	0.0%	0.0%
Chloroform	0.0025%	0.0048%	0.0036%	0.0024%	0.0033%
cis-1,2-Dichloroethene	0.035%	0.022%	0.014%	0.025%	0.024%
Dichlorodifluoromethane (Freon 12)	0.0%	0.0%	0.0%	0.0%	0.0%
Ethylbenzene	0.0%	0.0%	0.0%	0.0%	0.0%
Methylene Chloride	0.0%	0.0%	0.0001%	0.0001%	0.0%
Tetrachloroethene	0.022%	0.020%	0.011%	0.0088%	0.015%
Toluene	0.0%	0.0%	0.0%	0.0%	0.0%
trans-1,2-Dichloroethene	0.0002%	0.0003%	0.0001%	0.0001%	0.0002%
Trichloroethylene	8.7%	8.5%	4.1%	7.4%	7.1%
Trichlorofluoromethane (Freon 11)	0.0%	0.0%	0.0%	0.0%	0.0%
Vinyl chloride	0.18%	0.04%	0.04%	0.2%	0.11%
Xylene-O	0.0%	0.0004%	0.0%	0.0%	0.0001%
Xylenes - M,P	0.0%	0.0%	0.0%	0.0%	0.0%

Notes and abbreviations on last page.

Table 6
Summary of Maximum Allowable Stack Concentration Calculations
Northrop Grumman Operable Unit 3, Bethpage Park Soil Gas Containment System,
Former Grumman Settling Ponds, Bethpage, New York.

Notes and Abbreviations:

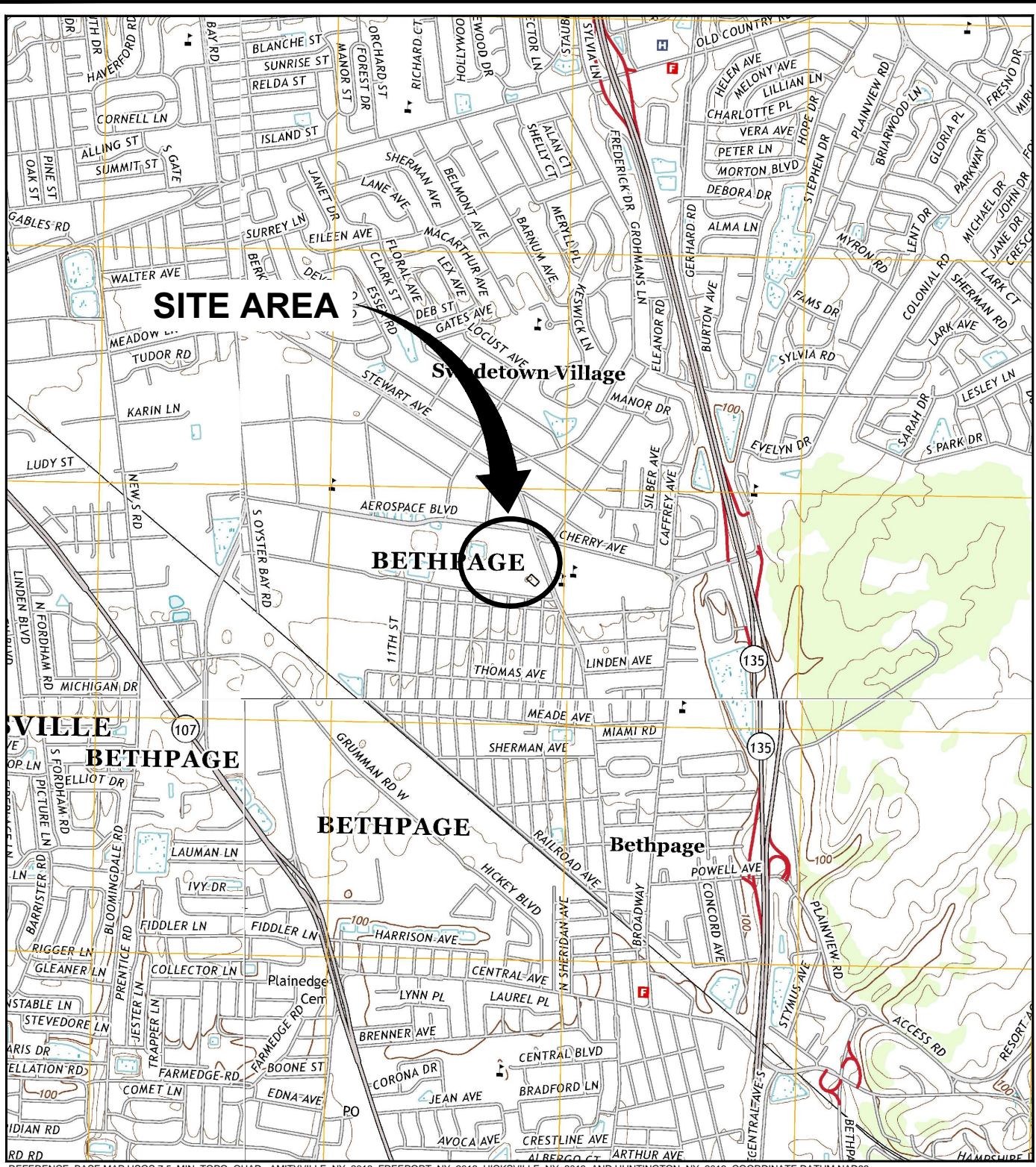
AGC	Allowable Annual Guideline Concentration
DAR-1	Division of Air Resources Air Guide-1
MASC	Maximum Allowable Stack Concentration
$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
NS	Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables, revised February 28, 2014.
NYSDEC	New York State Department of Environmental Conservation
SGC	Short-term Guideline Concentration
%	percent

1. Actual effluent concentrations are analytical results from air samples collected on the dates shown. Data in this table corresponds to the past year of system operation. Table summarizes detected compounds only.
2. AGC refers to the compound-specific AGC per the NYSDEC DAR-1 AGC/SGC tables, revised February 28, 2014.
3. Annual MASC was calculated by dividing the product of the AGC of a compound and the ratio of the SCREEN3 gas emission rate and the SCREEN 3 average annual concentration at receptor height by the air flow rate at the stack temperature and multiplying by the appropriate conversion factors.
4. Percent of MASC was calculated by dividing the actual effluent concentration by the MASC for the past four quarters of operation.
5. Cumulative percent of the MASC was calculated using a time-weighted average of the percent MASC per event. Values shown have been rounded to include two significant figures.

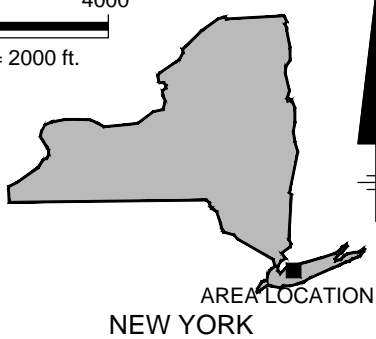
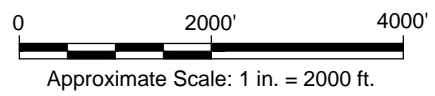
FIGURES



CITY:SYRACUSE-NY DIV:GROUP:ENV DBA:SANCHEZ L:AL:PIC:(Op) LDALS PIC:(Op) PM:(Reg) TM:(Op) L:Y:(Op)N:OFF-REF: Z:NEWCAD:STRACUSE:ACT:NT:00149:Site:01map.dwg LAYOUT:BP - SAVED: 2/15/2016 11:01 AM ACADVER: 19.15 (LMS TECH) PAGES: 1 PAGESETUP: PLOTSTYLETABLE: PLT:FULL.CTB PLOTTED: 2/25/2016 2:21 PM BY: SANCHEZ, ADRIAN



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.



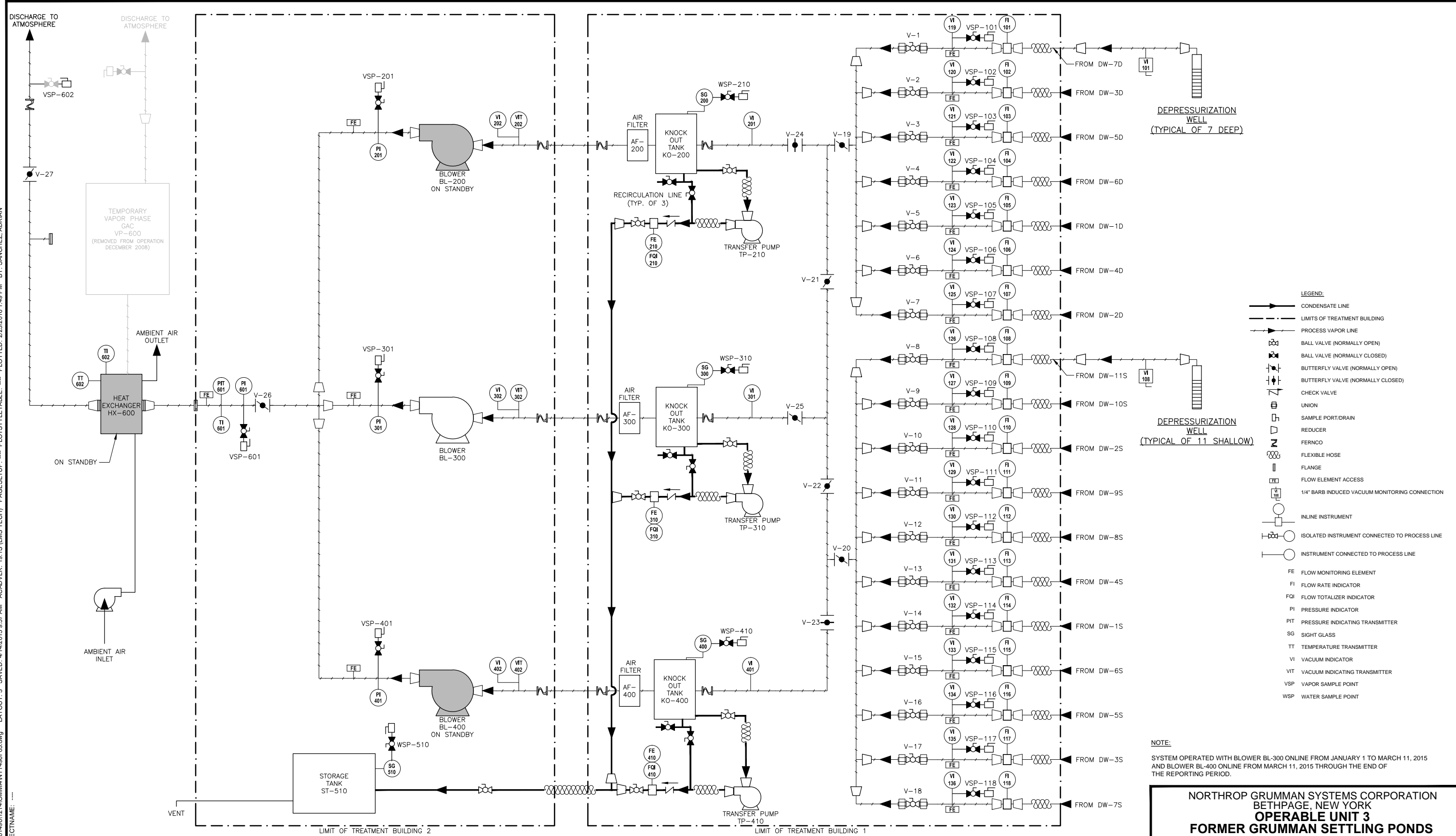
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)

SITE LOCATION MAP



FIGURE
1

CITY:SYRACUSE,NY DIV:GROUP:ENV DB:ASANCHEZ LD:ALS P:G:Opti PM:Regd TM:Opti LY:OptiON="OFF=REF" PLOTTED: 2/25/2016 1:49 PM BY: SANCHEZ,ADRIAN
 Z:\ENVCAD\SYRACUSE\ACT\N\Y001496121\COMM\MIN\1486\F03.dwg LAYOUT: 3 SAVED: 4/14/2015 9:57 AM ACADVER: 19.1S (LMS TECH) PAGES: 3
 PROJECTNAME: XREFS: XIBDR-DL

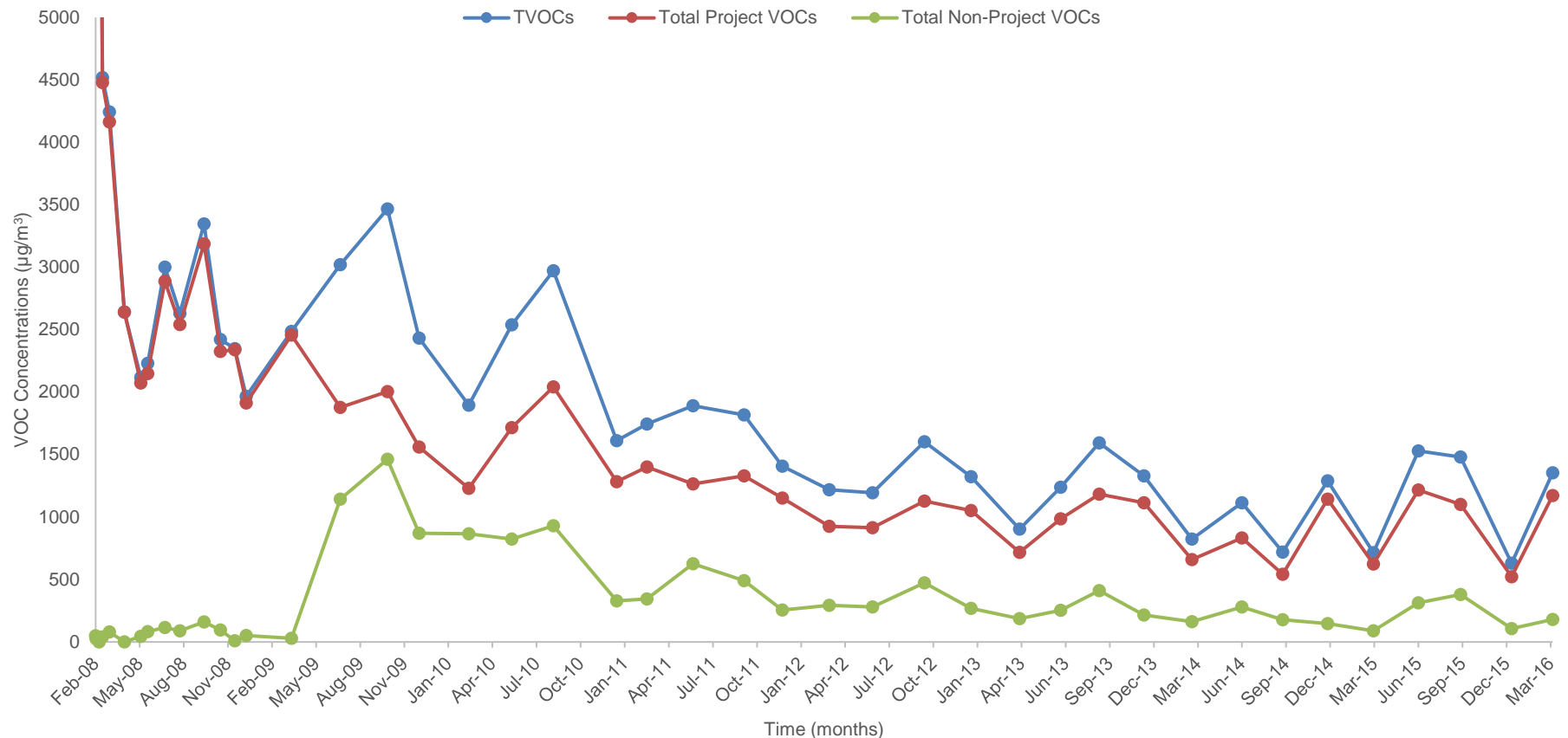


- LEGEND:**
- CONDENSATE LINE
 - LIMITS OF TREATMENT BUILDING
 - PROCESS VAPOR LINE
 - BALL VALVE (NORMALLY OPEN)
 - ◻ BALL VALVE (NORMALLY CLOSED)
 - ◻ BUTTERFLY VALVE (NORMALLY OPEN)
 - ◻ BUTTERFLY VALVE (NORMALLY CLOSED)
 - ◻ CHECK VALVE
 - ◻ UNION
 - ◻ SAMPLE PORT/DRAIN
 - ◻ REDUCER
 - ◻ FERNCO
 - ◻ FLEXIBLE HOSE
 - ◻ FLANGE
 - ◻ FLOW ELEMENT ACCESS
 - ◻ 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 FROM JANUARY 1 TO MARCH 11, 2015 AND BLOWER BL-400 ONLINE FROM MARCH 11, 2015 THROUGH THE END OF THE REPORTING PERIOD.

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 3
FORMER GRUMMAN SETTLING PONDS
PROCESS FLOW DIAGRAM
BETHPAGE PARK SOIL GAS
CONTAINMENT SYSTEM





Notes:

µg/m³ = 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/m³, February 19, 2008 - 14,519 µg/m³, and February 25, 2008 - 8,196 µg/m³.

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/m³.

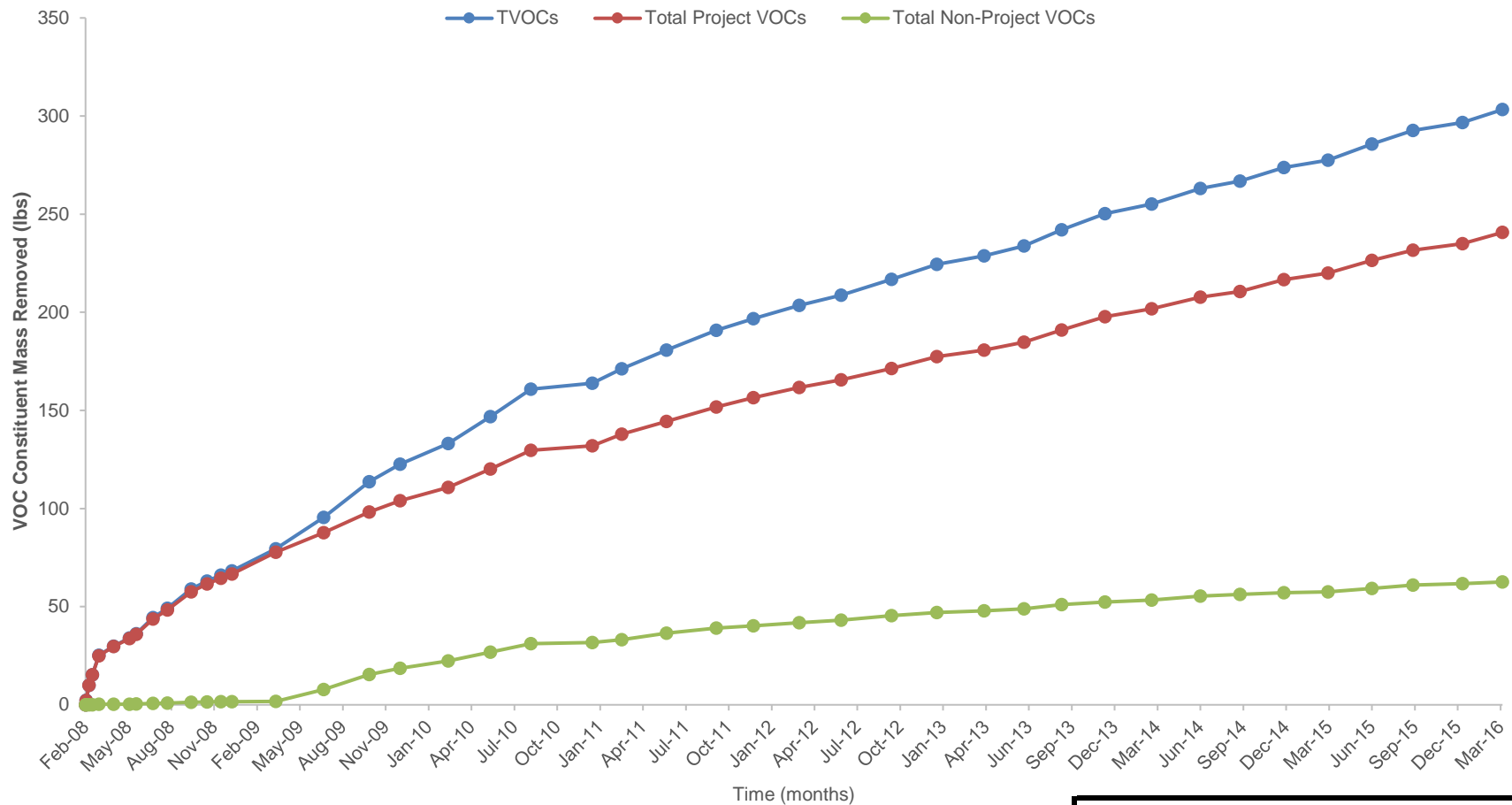
BETHPAGE PARK SOIL GAS
CONTAINMENT SYSTEM, OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
BETHPAGE, NEW YORK

**SOIL GAS VOC CONCENTRATIONS
THROUGH MARCH 2016**



FIGURE

4



Notes:

TVOCs = total VOCs detected

VOCs = volatile organic compounds

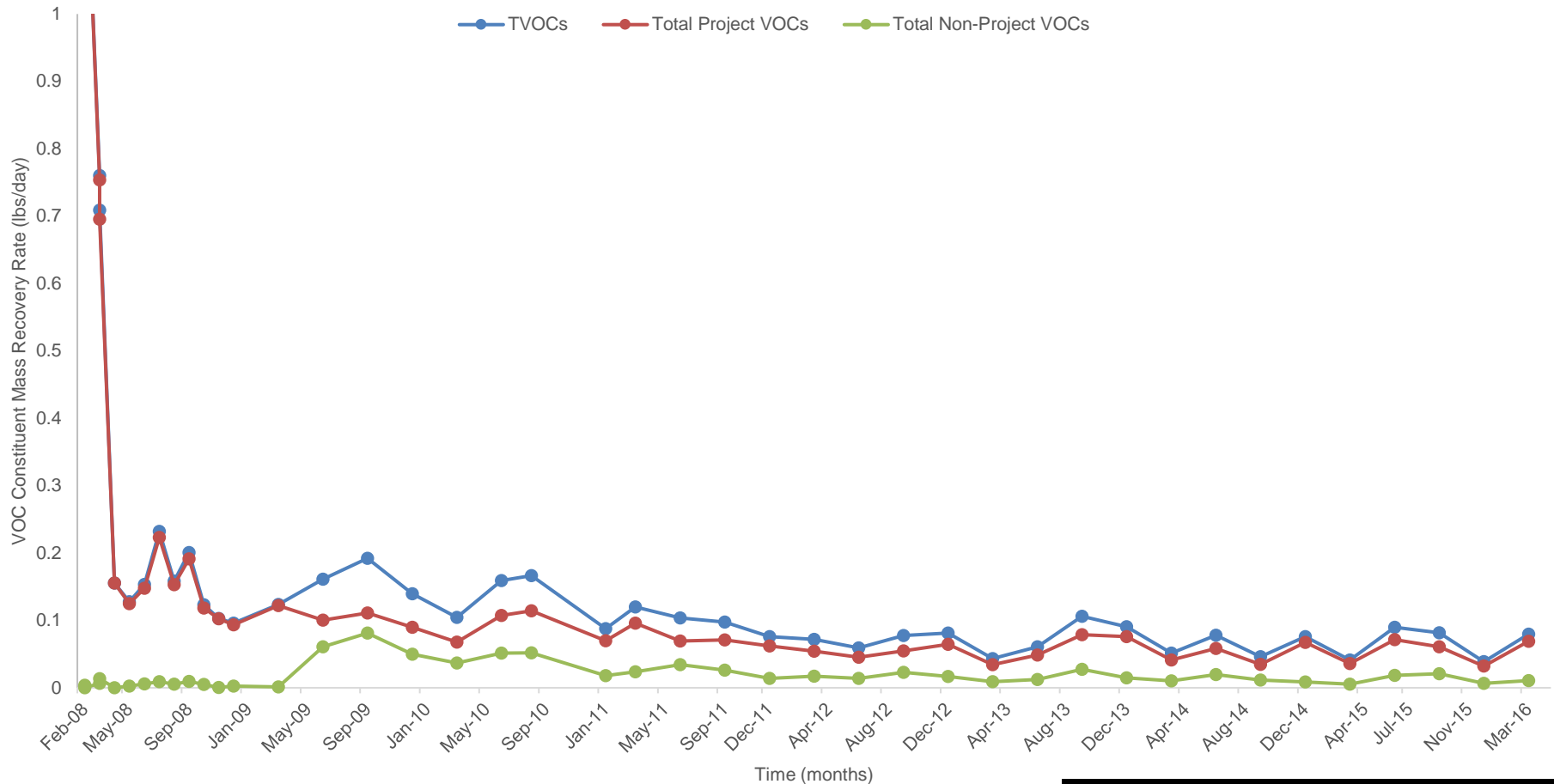
Total Project VOCs = Sum of 1,1,1-trichloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; trichloroethene; vinyl chloride; cis-1,2-dichloroethene; trans-1,2-dichloroethene; benzene; toluene; and total xylenes.

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.

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

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



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.

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

**VOC MASS RECOVERY RATES
THROUGH
MARCH 2016**



FIGURE

6