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**

ENVIRONMENT

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

Date:
November 11, 2016

Contact:
David E. Stern

Phone:
631.391.5284

Email:
David E. Stern@arcadis.com

Our ref:
NY001496.1616.RPTI4

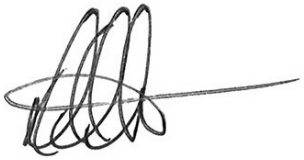
Dear Steve:

Enclosed is one CD copy of the results of 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 2016) and the NYSDEC-approved Sampling and Analysis Plan (SAP; Arcadis 2016). 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

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

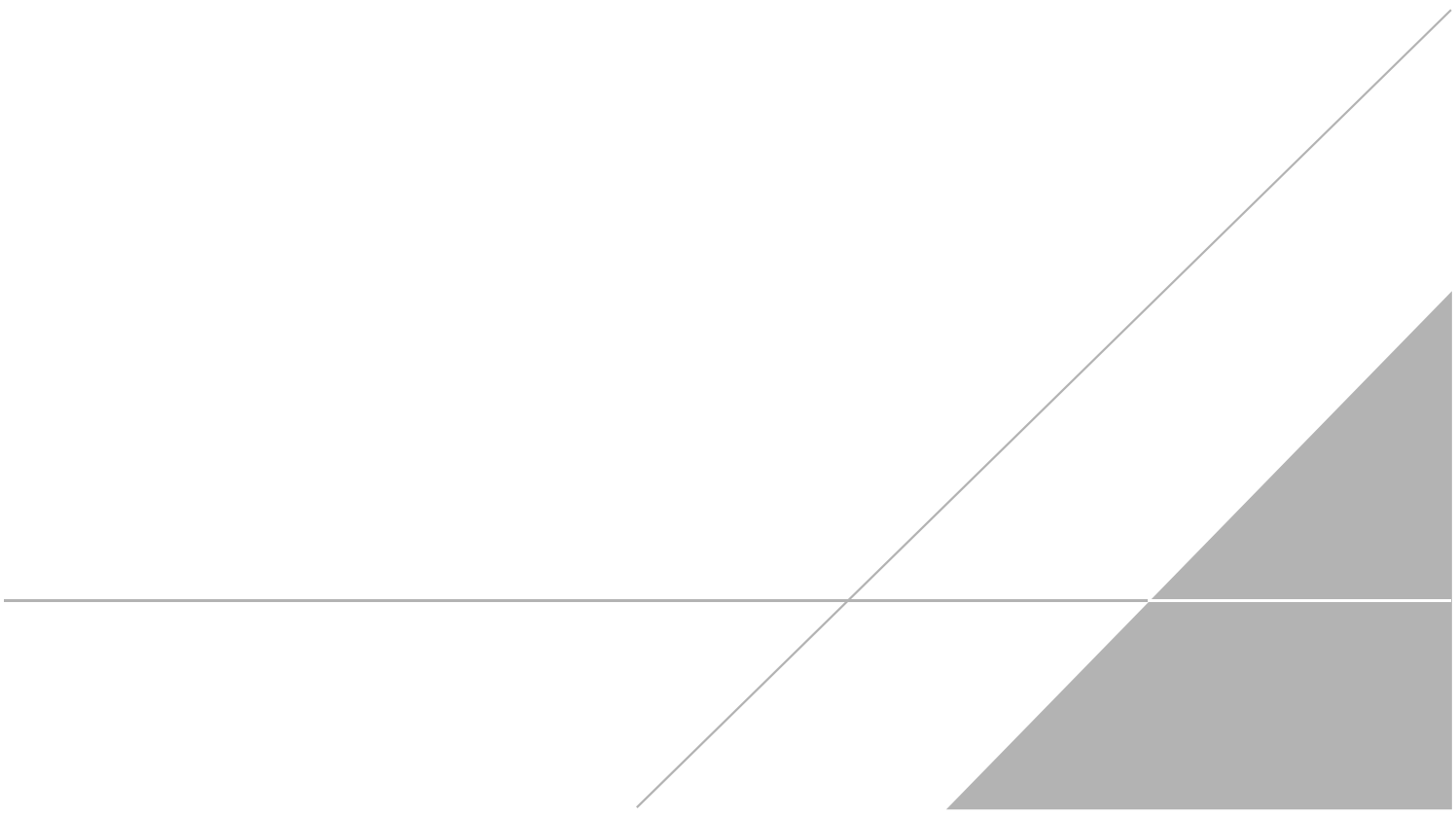


**Table 1**
**General System Operating Parameters**
**Northrop Grumman Operable Unit 3**
**Bethpage Park Soil Gas Containment System**
**Former Grumman Settling Ponds, Bethpage, New York.**

| | 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 |
| 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 |
| 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 |

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.**

| | 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 |
| 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 |
| 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 |

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.**

| | 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 |
| 12/16/15 | 35 | -16 | -1.8 | 26 | -23 | -2.3 | -- | -- | -38 | 0.0 | -- | -- | -- | -- | -- | -- | -41 | 1.5 | 60 | 763 | 0.0 | 105 | 2.5 | 87 |
| 03/08/16 | 48 | -19 | -2.6 | 31 | -24 | -2.2 | -- | -40 | -- | 0.0 | -- | -- | -- | -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 | -- | 0.0 | -- | -- | -- | -38 | 2.5 | 60 | -- | -- | -- | 709 | 0.0 | 122 | 0.5 | 110 |

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 |
| 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 |
| 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 |
| **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/m$^3$) | Sample ID: Sample Date: | VSP-601 12/16/2015 | VSP-601 3/8/2016 | VSP-601 6/1/2016 | VSP-601 9/7/2016 |
|---|---|---|---|---|---|
| **Project VOCs** | CAS No. | | | | |
| 1,1,1-Trichloroethane | 71-55-6 | **8.7** | **11** | **8.2** | **13** |
| 1,1-Dichloroethane | 75-34-3 | **8.5** | **9.7** | **6.1** | **11** |
| 1,1-Dichloroethene | 75-35-4 | **0.83** | **1.5** | **0.87** | **0.83** |
| 1,2-Dichloroethane | 107-06-2 | <0.81 U | **137** | <0.81 U | < 0.81 U |
| Benzene | 71-43-2 | **0.38 J** | **9.3** | **0.38 J** | **13** |
| cis-1,2-Dichloroethene | 156-59-2 | **251 D** | **488 D** | **268 D** | **395** |
| Tetrachloroethene | 127-18-4 | **12** | **11** | **12** | **25** |
| Toluene | 108-88-3 | **4.5** | **38** | **0.75** | **0.53 J** |
| trans-1,2-Dichloroethene | 156-60-5 | **2.4** | **2.1** | **1.7** | **4.4** |
| Trichloroethylene | 79-01-6 | **233 D** | **461 D** | **284 D** | **559** |
| Vinyl chloride | 75-01-4 | **0.77** | **3.8** | **0.89** | **0.66** |
| Xylene-O | 95-47-6 | <0.87 U | <0.87 U | **2.8** | < 0.87 U |
| Xylenes - M,P | 1330-20-7 | **0.83 J** | <0.87 U | **5.2** | < 0.87 U |
| **Subtotal Project VOCs** | | **523** | **1173** | **591** | **1022** |
| **Non-Project VOCs** | | | | | |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | <1.4 U | <0.69 U | <0.69 U | < 0.69 U |
| 1,1,2-Trichloroethane | 79-00-5 | <1.1 U | <0.55 U | <0.55 U | < 0.55 U |
| 1,2-Dichloropropane | 78-87-5 | <0.92 U | <0.92 U | <0.92 U | < 0.92 U |
| 1,3-Butadiene | 106-99-0 | <0.44 U | <0.44 U | <0.44 U | < 0.44 U |
| 2-Butanone | 78-93-3 | <0.59 U | **0.97** | **0.65** | **1.7** |
| 2-Hexanone | 591-78-6 | <0.82 U | <0.82 U | <0.82 U | < 0.82 U |
| 4-Methyl-2-Pentanone | 108-10-1 | <0.82 U | <0.82 U | <0.82 U | < 0.82 U |
| 1-Chloro-1,1-difluoroethane (Freon 142b) | 75-68-3 | **88** | **140** | **124** | **269** |
| Acetone | 67-64-1 | <0.48 U | **8.6** | **4.0** | **8.8** |
| Bromodichloromethane | 75-27-4 | <1.3 U | <0.67 U | <0.67 U | < 0.67 U |
| Bromoform | 75-25-2 | <2.1 U | **9.3** | <0.41 U | < 0.41 U |
| Bromomethane | 74-83-9 | <0.78 U | <0.78 U | <0.78 U | < 0.78 U |
| Carbon Disulfide | 75-15-0 | <0.62 U | **1.6** | <0.62 U | < 0.62 U |
| Carbon Tetrachloride | 56-23-5 | <1.3 U | **0.62** | **0.63** | **1.3** |
| Chlorobenzene | 108-90-7 | <0.92 U | <0.92 U | <0.92 U | < 0.92 U |
| Chlorodibromomethane | 124-48-1 | <1.7 U | **2.6** | <0.85 U | < 0.85 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/m$^3$) | Sample ID: Sample Date: | VSP-601 12/16/2015 | VSP-601 3/8/2016 | VSP-601 6/1/2016 | VSP-601 9/7/2016 |
|---|---|---|---|---|---|
| **Non-Project VOCs** | CAS No. | | | | |
| Chloroethane | 75-00-3 | <0.53 U | <0.53 U | <0.53 U | < 0.53 U |
| Chlorodifluoromethane (Freon 22) | 75-45-6 | <0.70 U | <0.70 U | **1.3** | < 0.70 U |
| Chloroform | 67-66-3 | **15** | **11** | **7.3** | **17** |
| Chloromethane | 74-87-3 | <0.41 U | <0.41 U | <0.41 U | < 0.41 U |
| cis-1,3-Dichloropropene | 10061-01-5 | <0.91 U | <0.91 U | <0.91 U | < 0.91 U |
| Dichlorodifluoromethane (Freon 12) | 75-71-8 | **2.2** | **3.3** | **2.2** | **3.1** |
| Ethylbenzene | 100-41-4 | <0.87 U | <0.87 U | **0.39 J** | < 0.87 U |
| Trichlorotrifluoroethane (Freon 113) | 76-13-1 | <1.5 U | <0.77 U | <0.77 U | < 0.77 U |
| Methyl Tert-Butyl Ether | 1634-04-4 | <0.72 U | <0.72 U | <0.72 U | < 0.72 U |
| Methylene Chloride | 75-09-2 | **1.3** | **1.1** | **3.1** | **1.2** |
| Styrene | 100-42-5 | <0.85 U | <0.85 U | <0.85 U | < 0.85 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | <0.91 U | <0.91 U | <0.91 U | < 0.91 U |
| Trichlorofluoromethane (Freon 11) | 75-69-4 | **1.2** | **1.7** | **2.0** | **1.9** |
| **Subtotal Non-Project VOCs** | | **107** | **181** | **146** | **304** |
| **TVOC[2]** | | **630** | **1,354** | **737** | **1,326** |

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. |
| 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:<br>Sample Date:<br>Units: | VSP-601<br>12/16/2015<br>ppbv | VSP-601<br>3/8/2016<br>ppbv | VSP-601<br>6/1/2016<br>ppbv | VSP-601<br>9/7/2016<br>ppbv |
|---|---|---|---|---|
| 1,2-Dibromoethane | -- | **170 JN** | -- | -- |
| 1-Bromo-2-chloroethane | -- | **22 JN** | -- | -- |
| 2,3-Dimethylpentane | **1.4 JN** | -- | -- | -- |
| 2-Methyl butane | **2.3 JN** | -- | -- | -- |
| 2-Methylpentane | **3.8 JN** | -- | -- | -- |
| Benzenemethanol,α,α-dimethyl | -- | -- | -- | **1.6 JN** |
| 3-Methylhexane | **1.4 JN** | -- | -- | -- |
| 3-Methylpentane | **2.2 JN** | -- | -- | -- |
| Acetophenone | -- | -- | -- | **2.5 JN** |
| alkane | **2.5 JN** | -- | **31 J** | **1.3 J** |
| alkane | -- | -- | **21 J** | -- |
| Bromobenzene | -- | **2.8 JN** | -- | -- |
| Ethyl Acetate | -- | -- | **4.9 JN** | -- |
| Methyl styrene (alpha) | -- | **1.8 JN** | -- | -- |
| Methylcyclopentane | **3.8 JN** | -- | -- | -- |
| Pentane | **1.5 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.**

| Toxic Air Contaminant | CAS# | VSP-601 Vapor Effluent (ug/m3) 9/7/2016[4] | Emission Rate[1] | | | Scaled Impact -Hourly [2] ($ug/m^3$) | Scaled Impact -Annual [2] ($ug/m^3$) | SGC [3] ($ug/m^3$) | AGC[3] ($ug/m^3$) | Modeled Impacts < SGC and AGC (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | lb/yr | lb/hr | g/s | | | | | |
| 1,1,1 - Trichloroethane | 00071-55-6 | 13 | 2.6E-01 | 3.0E-05 | 3.8E-06 | 1.8E-03 | 7.6E-05 | 9000 | 5000 | Yes |
| 1,1 - Dichloroethane | 00075-34-3 | 11 | 2.2E-01 | 2.6E-05 | 3.2E-06 | 1.5E-03 | 6.4E-05 | -- | 0.63 | Yes |
| 1,1 - Dichloroethene | 00075-35-4 | 0.83 | 1.7E-02 | 1.9E-06 | 2.4E-07 | 1.1E-04 | 4.9E-06 | -- | 200 | Yes |
| Tetrachloroethene | 00127-18-4 | 25 | 5.1E-01 | 5.8E-05 | 7.3E-06 | 3.4E-03 | 1.5E-04 | 300 | 4 | Yes |
| Trichloroethene | 00079-01-6 | 559 | 1.1E+01 | 1.3E-03 | 1.6E-04 | 7.6E-02 | 3.3E-03 | 20 | 0.20 | Yes |
| Vinyl Chloride | 00075-01-4 | 0.66 | 1.3E-02 | 1.5E-06 | 1.9E-07 | 8.9E-05 | 3.9E-06 | 180000 | 0.11 | Yes |
| cis 1,2-Dichloroethene | 00156-59-2 | 395 | 8.0E+00 | 9.2E-04 | 1.2E-04 | 5.4E-02 | 2.3E-03 | -- | 63 | Yes |
| trans 1,2-Dichloroethene | 00156-60-5 | 4.4 | 9.0E-02 | 1.0E-05 | 1.3E-06 | 6.0E-04 | 2.6E-05 | -- | 63 | Yes |
| Benzene | 00071-43-2 | 13 | 2.6E-01 | 3.0E-05 | 3.8E-06 | 1.8E-03 | 7.6E-05 | 1300 | 0.13 | Yes |
| Toluene | 00108-88-3 | 0.53 | 1.1E-02 | 1.2E-06 | 1.6E-07 | 7.2E-05 | 3.1E-06 | 37000 | 5000 | Yes |
| 2-Butanone | 00078-93-3 | 1.7 | 3.5E-02 | 3.9E-06 | 5.0E-07 | 2.3E-04 | 1.0E-05 | 13000 | 5000 | Yes |
| Acetone | 00067-64-1 | 8.8 | 1.8E-01 | 2.0E-05 | 2.6E-06 | 1.2E-03 | 5.2E-05 | 180000 | 30000 | Yes |
| Carbon Tetrachloride | 00056-23-5 | 1.3 | 2.6E-02 | 3.0E-06 | 3.8E-07 | 1.8E-04 | 7.6E-06 | 1900 | 0.17 | Yes |
| Chloroform | 00067-66-3 | 17 | 3.5E-01 | 3.9E-05 | 5.0E-06 | 2.3E-03 | 1.0E-04 | 150 | 14.7 | Yes |
| Dichlorodifluoromethane (Freon 12) | 00075-71-8 | 3.1 | 6.3E-02 | 7.2E-06 | 9.1E-07 | 4.2E-04 | 1.8E-05 | -- | 12000 | Yes |
| Dichloromethane | 00075-09-2 | 1.2 | 2.4E-02 | 2.8E-06 | 3.5E-07 | 1.6E-04 | 7.0E-06 | 14000 | 60 | Yes |
| Trichlorofluoromethane (Freon 11) | 00075-69-4 | 1.9 | 3.9E-02 | 4.4E-06 | 5.6E-07 | 2.6E-04 | 1.1E-05 | 9000 | 5000 | Yes |
| 1-Chloro-1,1-difluoroethane (Freon 142b) | 00075-68-3 | 269 | 5.5E+00 | 6.3E-04 | 7.9E-05 | 3.6E-02 | 1.6E-03 | -- | 50000 | Yes |

**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)

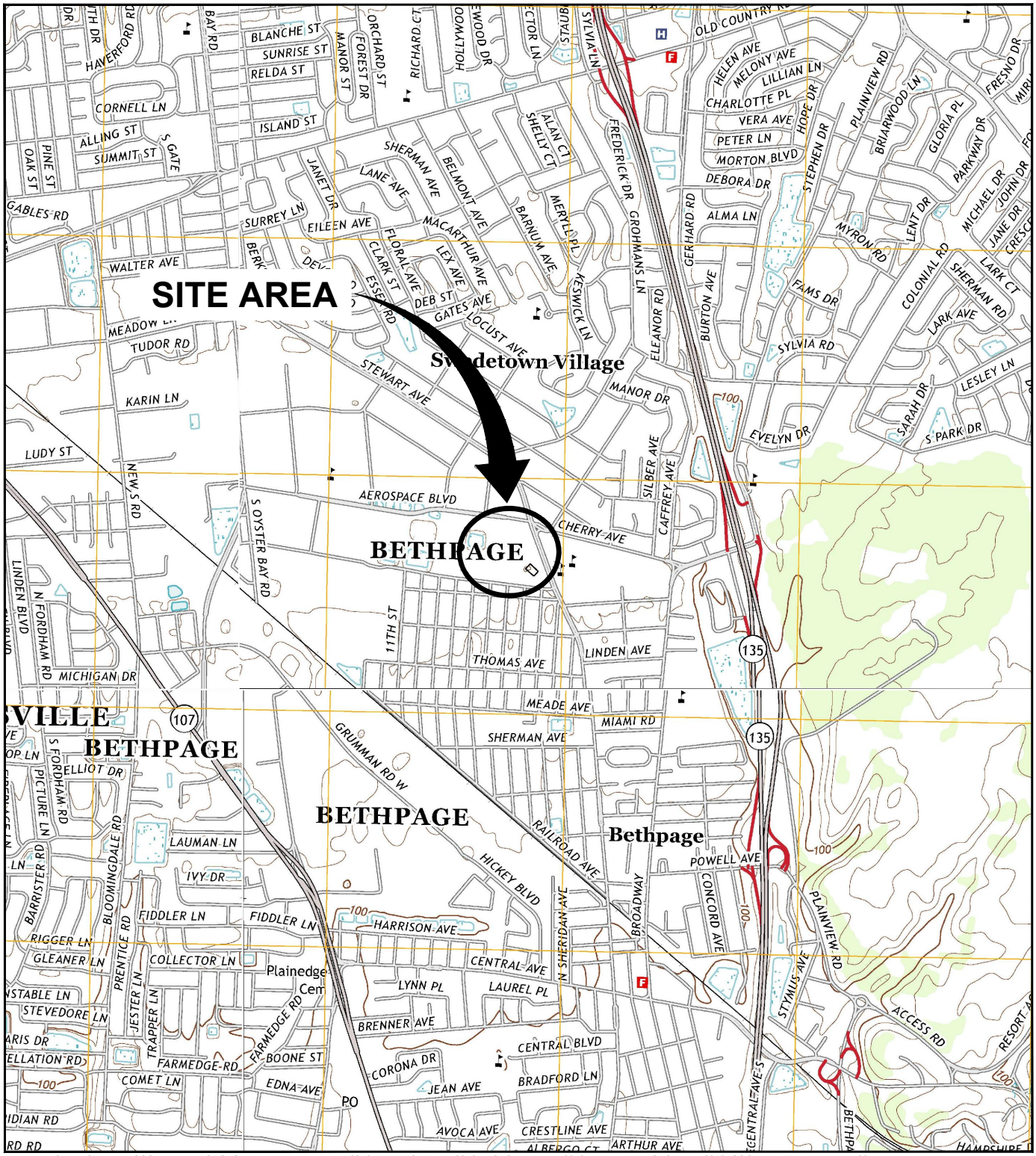
Scaled annual impact ($ug/m^3$) = AERMOD predicted annual ambient impact at 1 g/s ([$ug/m^3$]/[g/s]) x Actual emission rate (g/s)

| 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.

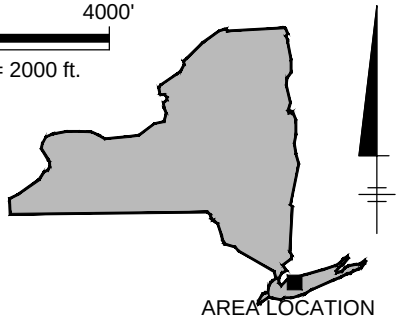
# FIGURES




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, 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\ACTIVY001496\SiteLocMap.dwg LAYOUT: BP SAVED: 2/15/2016 1:16 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 2/25/2016 2:21 PM BY: SANCHEZ, ADRIAN
XREFS: IMAGES: PROJECTNAME: ----
2013Amityville.jpg
2013Freeport.jpg
2013Hicksville.jpg
2013Huntington.jpg

# PROPERTY OWNED BY TOWN OF OYSTER BAY

STACK LOCATION
grass
GRASS
TREATMENT BUILDING AREA
McKAY FIELD
McKAY FIELD ACCESS ROAD
FORMER TRANSFORMER AREA
ARUMDAUN PRESBYTERIAN CHURCH VISION CENTER (FORMER GRUMMAN PLANT 24)
PARKING LOT
PLANT 24 ACCESS ROAD
FORMER GRUMMAN PLANT 24 ACCESS ROAD PROPERTY
EIGHTH ST.
SEVENTH ST.
SIXTH ST.
FIFTH ST.
TH ST.
bit.
grass

| VMWC-14A | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.12 |

| VMWC-14B | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.19 |

| VMWC-14D | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.20 |

| VMWC-11B | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.12 |

| VMWC-12D | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.11 |

| VMWC-15D | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.14 |

| VMWC-15B | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.16 |

| VMWC-15A | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.16 |

| VMWC-3A | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.13 |

| VMWC-3B | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.13 |

| VMWC-3C | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.13 |

| VMWC-3D | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.15 |

| VMWC-16D | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.15 |

| VMWC-16B | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.14 |

| VMWC-16A | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.12 |

| VMWC-17D | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.11 |

| VMWC-7A | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.10 |

| VMWC-7B | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.15 |

| VMWC-13D | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.11 |

| VMWC-18B | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.11 |

| VMWC-18A | |
|---|---|
| Date | IV (IWC) |
| 9/7/2016 | −0.096 |

VMWC-14A
VMWC-14B
VMWC-14D
DW-7S
DW-7D
DW-3S
DW-3D
VMWC-9A
VMWC-9B
VMWC-10B
VMWC-10D
VMWC-11B
VMWC-11D
VMWC-12D
VMWC-15A
VMWC-15B
VMWC-15D
DW-5D
DW-5S
DW-6S
DW-6D
VMWC-1A/C
VMWC-4A/B/C/D
VMWC-3A/B/C/D
VMWC-2A/C/D
VMWC-1B/D
DW-1D
DW-1S
DW-4S
DW-4D
VMWC-16B
VMWC-16A
VMWC-16D
DW-8S
VMWC-17D
DW-9S
DW-2S
DW-2D
VMWC-8A/B/D
VMWC-7A/B
VMWC-7D
VMWC-5A/B/D
VMWC-6A/B/D
DW-10S
VMWC-18B
VMWC-18A
VMWC-13D
DW-11S

LEGEND:

- PROPERTY LINE NORTHROP GRUMMAN
- 6' CHAIN LINK FENCE
- VAPOR RECOVERY LINES
- VMWC-9A — NON-COMPLIANCE-RELATED VACUUM MONITORING WELL CLUSTER
- VMWC-14A — COMPLIANCE-RELATED VACUUM MONITORING WELL CLUSTER
- DW-3S — SHALLOW DEPRESSURIZATION WELL
- DW-3D — DEEP DEPRESSURIZATION WELL
- IV — INDUCED VACUUM MEASUREMENT
- (IWC) — INCHES OF WATER COLUMN
- USEPA — UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

0 50' 100'
SCALE IN FEET

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, NEW YORK
**OPERABLE UNIT 3**
**FORMER GRUMMAN SETTLING PONDS**

**GENERAL SITE PLAN AND MONITORING WELL VACUUM MEASUREMENTS BETHPAGE PARK SOIL GAS CONTAINMENT SYSTEM, THIRD QUARTER 2016**

ARCADIS Design & Consultancy for natural and built assets

FIGURE
**2**

CITY:SYRACUSE-NY DIV/GROUP:ENV DB:A.SANCHEZ LD:ALS PIC:(Opt) PM:(Req'd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
Z:\ENVCAD\SYRACUSE\ACTNY\0014961215\0MMI4\NY1496F02-3q.dwg LAYOUT: 2 SAVED: 10/10/2016 11:34 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 10/26/2016 3:03 PM BY: SANCHEZ, ADRIAN
XREFS: X:\1496X01 X\BDR-DL IMAGES: PROJECTNAME: ----

DISCHARGE TO ATMOSPHERE

DISCHARGE TO ATMOSPHERE

VSP-602

V-27

TEMPORARY VAPOR PHASE GAC VP-600 (REMOVED FROM OPERATION DECEMBER 2008)

AMBIENT AIR OUTLET

TI 602

TT 602

HEAT EXCHANGER HX-600

ON STANDBY

AMBIENT AIR INLET

FE

PIT 601

PI 601

TI 601

V-26

VSP-601

VSP-201

PI 201

BLOWER BL-200 ON STANDBY

VI 202

VIT 202

VSP-301

PI 301

BLOWER BL-300

VI 302

VIT 302

VSP-401

PI 401

BLOWER BL-400 ON STANDBY

VI 402

VIT 402

WSP-510

SG 510

STORAGE TANK ST-510

VENT

AIR FILTER AF-200

KNOCK OUT TANK KO-200

WSP-210

SG 200

VI 201

RECIRCULATION LINE (TYP. OF 3)

FE 210

FQI 210

TRANSFER PUMP TP-210

AIR FILTER AF-300

KNOCK OUT TANK KO-300

WSP-310

SG 300

VI 301

FE 310

FQI 310

TRANSFER PUMP TP-310

AIR FILTER AF-400

KNOCK OUT TANK KO-400

WSP-410

SG 400

VI 401

FE 410

FQI 410

TRANSFER PUMP TP-410

V-24

V-19

V-21

V-25

V-22

V-20

V-23

LIMIT OF TREATMENT BUILDING 2

LIMIT OF TREATMENT BUILDING 1

V-1 VI 119 VSP-101 FI 101 FE — FROM DW-7D

V-2 VI 120 VSP-102 FI 102 FE — FROM DW-3D

V-3 VI 121 VSP-103 FI 103 FE — FROM DW-5D

V-4 VI 122 VSP-104 FI 104 FE — FROM DW-6D

V-5 VI 123 VSP-105 FI 105 FE — FROM DW-1D

V-6 VI 124 VSP-106 FI 106 FE — FROM DW-4D

V-7 VI 125 VSP-107 FI 107 FE — FROM DW-2D

V-8 VI 126 VSP-108 FI 108 FE — FROM DW-11S

V-9 VI 127 VSP-109 FI 109 FE — FROM DW-10S

V-10 VI 128 VSP-110 FI 110 FE — FROM DW-2S

V-11 VI 129 VSP-111 FI 111 FE — FROM DW-9S

V-12 VI 130 VSP-112 FI 112 FE — FROM DW-8S

V-13 VI 131 VSP-113 FI 113 FE — FROM DW-4S

V-14 VI 132 VSP-114 FI 114 FE — FROM DW-1S

V-15 VI 133 VSP-115 FI 115 FE — FROM DW-6S

V-16 VI 134 VSP-116 FI 116 FE — FROM DW-5S

V-17 VI 135 VSP-117 FI 117 FE — FROM DW-3S

V-18 VI 136 VSP-118 FI 118 FE — FROM DW-7S

VI 101

DEPRESSURIZATION WELL (TYPICAL OF 7 DEEP)

VI 108

DEPRESSURIZATION WELL (TYPICAL OF 11 SHALLOW)

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
- FE — FLOW ELEMENT ACCESS
- 1/4" BARB — 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:

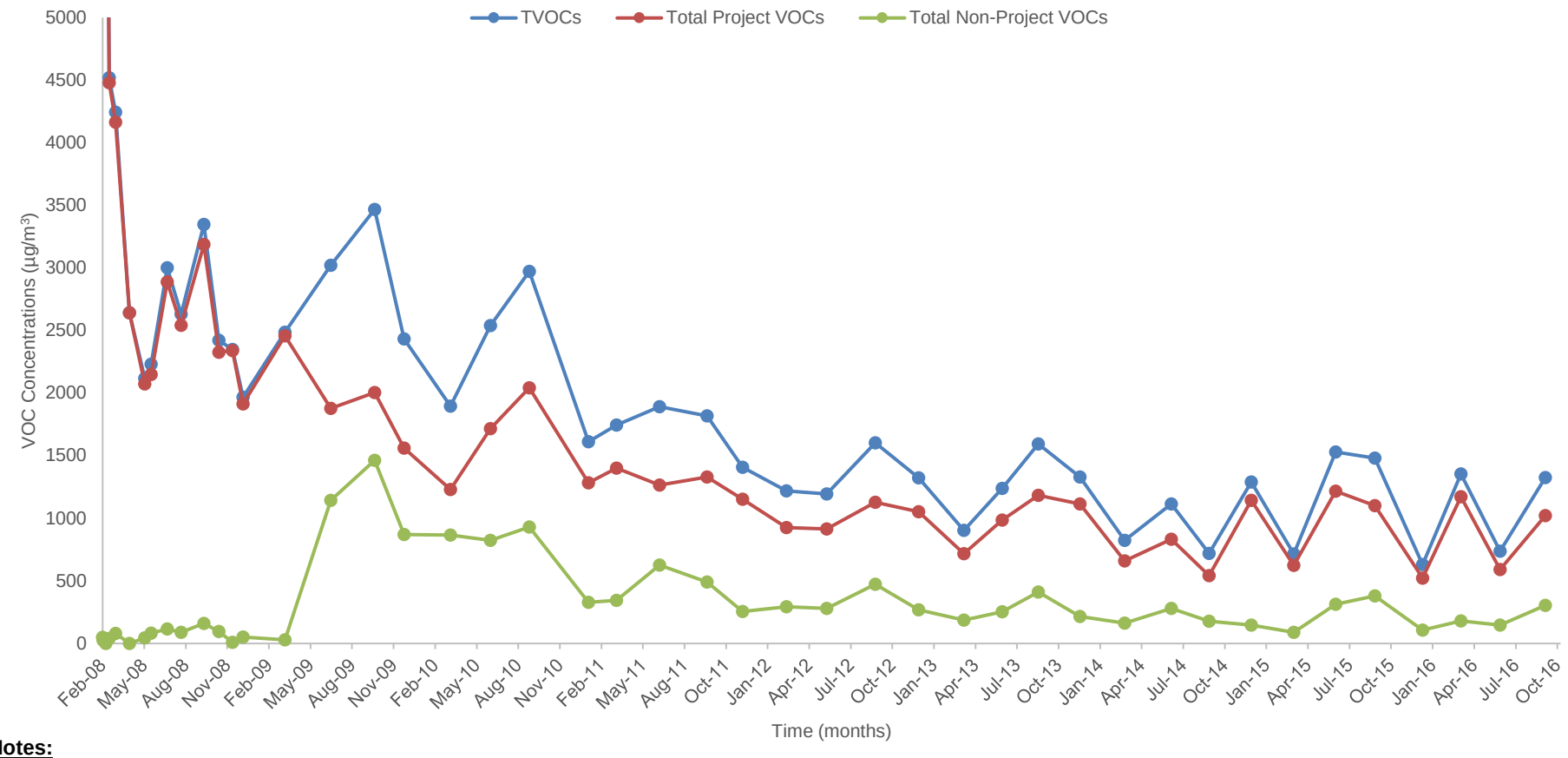
SYSTEM OPERATED WITH BLOWER BL-300 ONLINE FROM JANUARY 1 TO MARCH 11, 2015 AND BLOWER BL-400 ONLINE FROM MARCH 11, 2015 THROUGH THE END OF THE REPORTING PERIOD.

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

# PROCESS FLOW DIAGRAM BETHPAGE PARK SOIL GAS CONTAINMENT SYSTEM

ARCADIS Design & Consultancy for natural and built assets

FIGURE 3




**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.

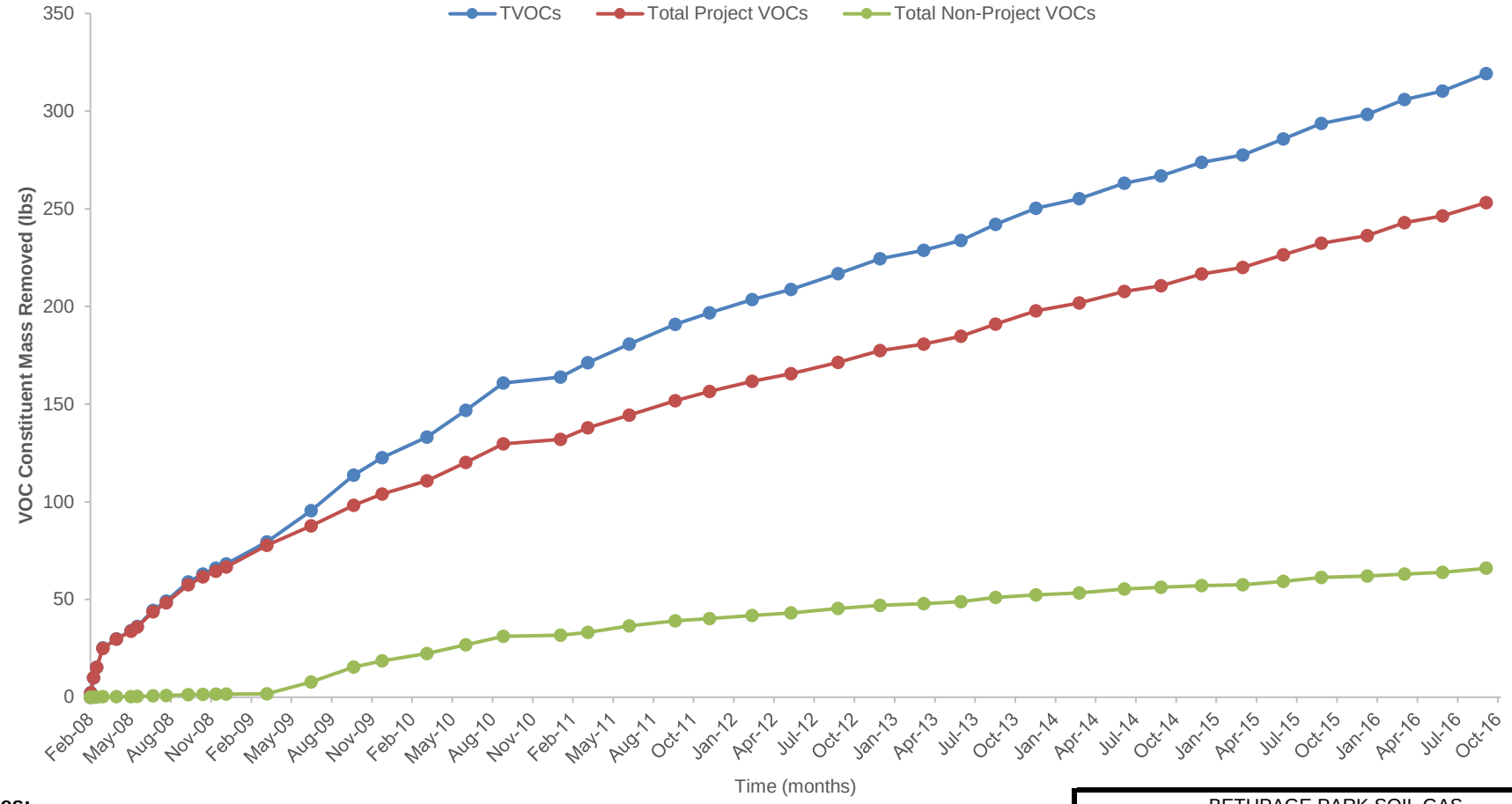
1. Samples were collected at Vapor Sample Port-601 (VSP-601); refer to Figure 3 of this OM&M report for the location of VSP-601.
2.Results prior to March 3, 2008 are not shown to improve figure clarity. The TVOC concentrations and sample dates are as follows: February 18, 2008 - 20,622 µg/m³, February 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 OCTOBER 2016

ARCADIS Design & Consultancy for natural and built assets

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.

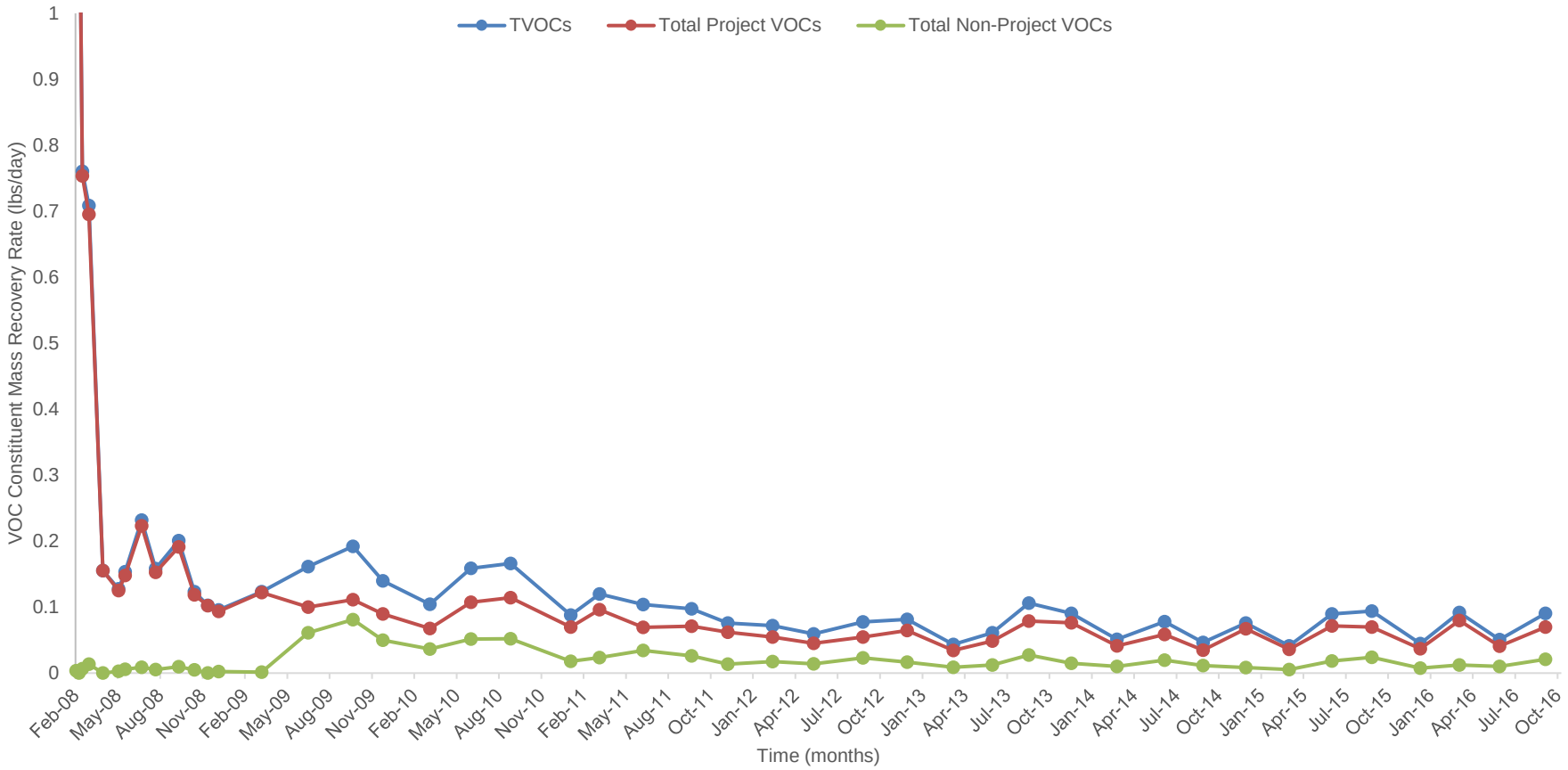
1. The sample results from December 3, 2010 were not consistent with historical data and thus, the recovery rate is not included in this table.

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 OCTOBER 2016

ARCADIS Design & Consultancy for natural and built assets

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.

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

# VOC MASS RECOVERY RATES THROUGH OCTOBER 2016

ARCADIS Design & Consultancy for natural and built assets

FIGURE
6