ARCADIS Design & Consultancy for natural and built assets

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ENVIRONMENT

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

Date:
August 26, 2016

Contact:
David E. Stern

Phone:
631.391.5284

Email:
David E. Stern@arcadis.com

Our ref:
NY001496.115I.OMMI4

Dear Steve:

Enclosed are the results of Operable Unit 3 Bethpage Park Groundwater Containment System (OU3 BPGWCS) operation and monitoring, performed in accordance with the NYSDEC-approved OU3 Groundwater IRM OM&M Manual (ARCADIS 2009) and the NYSDEC-approved Sampling and Analysis Plan (SAP; ARCADIS 2009). 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
Operational Summary, Bethpage Park
Groundwater Containment System, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

MONTH	DAY 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Days Operational (1)
2009 Total																																160
2010 Total																																352
2011 Total																																351
2012 Total																																353
2013 Total																																354
2014 Total																																349
2015 Total																																348
Jan-16		b				(3)														b							(9)b					31
Feb-16	#b								b				(6)b		b					(7)	b					b			#			29
Mar-16	b	b							b					b						(8)bb	bb		(9)			(10)			b			31
1Q 2016																																91
Apr-16	#/##/*/** (11)		b		b	(12)						b					b	#				b					(13)b					30
May-16		b				b				(14)	(15)	bb	b				b	#			b				b		b				b	29
Jun-16	b				b				b	#/##/*/**				b				b		(16)		(17)b						b	(18)	b		30
2Q 2016																																89
2016 Total																																180
TOTAL																																**2,447**

Legend:

- Indicates system online for at least the majority of the day.
- Indicates system operated with reduced flow rates.
- Indicates system off-line for at least the majority of the day.
- # Indicates water compliance samples were collected.
- ## Indicates water performance samples were collected.
- ** Indicates vapor compliance samples were collected.
- * Indicates vapor performance samples were collected.
- b Indicates filter bag unit changed over.
- K Indicates PPZ change-out.
- C Indicates carbon change-out.

Acronyms\Key:

1Q	first quarter
ECU	emission control unit
VPGAC	vapor phase granular activated carbon
PPZ	potassium permanganate-impregnated zeolite
RW	recovery well

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Notes:

(1) Days in which the system was operational for the majority of the day are counted as one day.
(2) Spent bag filters are stored in DOT certified 55-gallon drums and disposed of by a subcontractor as non-hazardous waste.

First Quarter 2016

(3) The system shut down at 7:32 pm on January 6, 2016 due to a motor overload condition at RW-2. After an attempt to restart by resetting the breaker at RW-2, the system was left offline. The alarm was cleared and the system was restarted at 8:40 am on January 7, 2016, however RW-2 was left offline. The system was offline for approximately 13 hours.
(4) The system shut down at 9:09 pm on January 16, 2016 due to a motor overload condition at RW-3. The breaker at RW-3 was reset, the alarm was cleared, and the system was restarted at 11:18 am on January 17, 2016. The system was offline for approximately 14 hours.
(5) The system was shut down at 9:00 am on January 27, 2016 to install a new pump and motor in RW-2. The system was restarted at 3:50 pm the same day and was offline for approximately 7 hours. RW-2 was offline for a total of 21 days.
(6) The system shut down at 6:40 pm on February 13, 2016 due to overvoltage from the power supply. The system was restarted at 7:10 am on February 14, 2016 following voltage normalization and was offline for approximately 12.5 hours.
(7) The system shut down at 9:50 am on February 20, 2016 due to overvoltage from the power supply. The system was restarted at 11:50 am on the same day following voltage normalization and was offline for approximately 2 hours.
(8) The system shut down at 4:33 pm on March 20, 2016 due to a bag filter differential high pressure alarm resulting from multiple bag filter changes. The alarm was cleared, both of the bag filters changed and the system restarted at 10:12 am on March 21, 2016. The system was offline for approximately 18 hours.
(9) The system shut down at 7:11 am on March 23, 2016 due to a low flow alarm at the RW-2 influent manifold. The alarm was cleared and the system was restarted at 8:08 am on the same day, however RW-2 was left offline. The system was offline for approximately 1 hour.
(10) The system shut down at 4:00 am on March 26, 2016 due to a low pressure alarm at the RW-2 influent manifold. The system was restarted at 10:45 am the same day, and was offline for approximately 7 hours.
(11) First quarter air and water sampling was completed on April 1, 2016 due to downtime associated with RW-2 in March.

Second Quarter 2016

(12) The system was shut down at 7:15 am on April 6, 2016 for flow control verification. The system was restarted at 11:20 am on the same day and was offline for approximately 4 hours.
(13) The system was shut down at 8:30 am on April 27, 2016 for calibration activities. The system was restarted at 10:46 am on the same day and was offline for approximately 2 hours.
(14) The system shut down at 3:47 pm on May 10, 2016 due to a low pressure alarm at the RW-2 influent manifold. The alarm was cleared and the system was restarted at 4:45 pm on the same day, however RW-2 was left offline. The system was offline for approximately 1 hour.
(15) The system was shut down at 11:25 am on May 11, 2016 to replace the pumps in RW-2 and RW-3. When the new pump was installed in RW-2, an issue was noted with the newly installed pump. New pumps were ordered and installed in RW-2 and RW-3 on May 12, 2016. The system was restarted at 12:00 pm on May 12, 2016. The system was offline for approximately 13 hours. RW-2 was offline for approximately 44 hours.
(16) The system shut down at 12:59 pm on June 20, 2016 due to a low flow alarm at the RW-2 influent manifold. The alarm was cleared and the system was restarted at 4:30 pm on the same day. The system was offline for approximately 3.5 hours.
(17) The system shut down at 4:15 pm on June 22, 2016 due to an air stripper high pressure alarm. The alarm was cleared and the system was restarted at 5:20 pm on the same day. The system was offline for approximately 1 hour.
(18) RW-2 was shut down at 9:00 am on June 29, 2016 to install a new pump in RW-2. RW-2 was restarted at 1:15 pm on the same day and was offline for approximately 3 hours.

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Table 2
Influent Water Sample Analytical Results,
Bethpage Park Groundwater Containment System,
Operable Unit 3 (Former Grumman Settling Ponds),
Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Compound	08/19/15 (µg/L)	11/30/15 (µg/L)	4/1/2016 [2] (µg/L)	06/10/16 (µg/L)
Project VOCs				
1,1,1 - Trichloroethane	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,1 - Dichloroethane	**0.26 J**	**0.36 J**	**0.55 J**	**0.39 J**
1,2 - Dichloroethane	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,1 - Dichloroethene	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Tetrachloroethene	< 1.0 U	< 1.0 U	< 1.0 U	**0.30 J**
Trichloroethene	**3.4**	**3.9**	**3.7**	**4.0**
Vinyl Chloride	**10**	**15**	**29**	**16**
cis 1,2-Dichloroethene	**8.3**	**19**	**18**	**12**
trans 1,2-Dichloroethene	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Benzene	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Toluene	**2.5**	**7.6**	**9.1**	**6.1**
Xylenes	< 1.0 U	**0.82**	**1.2**	**0.85 J**
Subtotal Project VOCs	**25**	**47**	**62**	**39**

Compound	08/19/15 (µg/L)	11/30/15 (µg/L)	4/1/2016 [2] (µg/L)	06/10/16 (µg/L)
Non-Project VOCs				
1,1,2,2-Tetrachloroethane	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,1,2-Trichloroethane	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,2-Dichloropropane	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
2-Butanone	< 10 U	< 10 U	< 10 U	< 10 U
4-Methyl-2-Pentanone	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Acetone	< 10 U	< 10 U	< 10 U	< 10 U
Bromodichloromethane	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Bromoform	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Bromomethane	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Carbon Disulfide	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Carbon Tetrachloride	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chlorobenzene	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chlorodibromomethane	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chlorodifluoromethane (Freon 22)	**6.2**	**5.5**	**3.9 J**	**4.2 J**
Chloroethane	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chloroform	**3.9**	**2.7**	**2.4**	**1.8**
Chloromethane	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
cis-1,3-Dichloropropene	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Dichlorodifluoromethane (Freon 12)	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Dichloromethane	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Ethylbenzene	**0.34 J**	**0.59 J**	**0.98 J**	**0.62 J**
Methyl N-Butyl Ketone	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Methyl-Tert-Butylether	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Styrene (Monomer)	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
trans-1,3-Dichloropropene	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Trichlorofluoromethane (Freon 11)	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Trichlorotrifluoroethane (Freon 113)	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Subtotal Non-Project VOCs	**10**	**8.8**	**7.3**	**6.6**
Total VOCs [1]	**35**	**56**	**69**	**46**
1,4-Dioxane	**0.36**	**0.33**	**0.62**	**0.47**

Notes and abbreviations on last page.

Table 2
Influent Water Sample Analytical Results,
Bethpage Park Groundwater Containment System,
Operable Unit 3 (Former Grumman Settling Ponds),
Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Compound	08/19/15 (µg/L)	11/30/15 (µg/L)	4/1/2016 (3) (µg/L)	06/10/16 (µg/L)
Inorganics				
Dissolved Cadmium	--	< 3.0 U	--	--
Total Cadmium	--	< 3.0 U	--	--
Dissolved Chromium	--	< 10 U	--	--
Total Chromium	--	**12**	--	--
Dissolved Iron	**248**	**195**	**317**	**220**
Total Iron	**981**	**2,050**	**606**	**328**
Total Mercury	--	--	--	--
pH (2)	5.6	5.7	5.9	5.8

Notes and Abbreviations:

(1) "Total VOCs" represents the sum of individual concentrations of the compounds detected. The values used in calculations referenced in this report have been rounded to the nearest whole number.

(2) Influent pH samples collected and measured in the field by Arcadis personnel on the dates listed using an Oakton Model 300 pH/conductivity meter. pH units are standard units.

(3) First Quarter samples were collected on April 1, 2016 due to RW-2 downtime in March.

700 Bold value indicates a detection.
-- not analyzed
J Compound detected below its reporting limit; value is estimated.
SPDES State Pollutant Discharge Elimination System
VOC volatile organic compound
µg/L micrograms per liter
< 5 U Compound not detected above its laboratory quantification limit.

Table 3
Effluent Water Sample Analytical Results,
Bethpage Park Groundwater Containment System,
Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Compound	Discharge Limit [1] (µg/L)	07/22/15 (µg/L)	08/19/15 (µg/L)	09/28/15 (µg/L)	10/13/15 (µg/L)	11/23/15 (µg/L)	12/22/15 (µg/L)	2/1/2016[5] (µg/L)	02/23/16 (µg/L)	4/1/2016[5] (µg/L)	04/18/16 (µg/L)	05/18/16 (µg/L)	06/10/16 (µg/L)
Project VOCs													
1,1,1-Trichloroethane	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,1-Dichloroethane	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,2-Dichloroethane	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,1-Dichloroethene	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Tetrachloroethene	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Trichloroethene	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Vinyl Chloride	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
cis 1,2-Dichloroethene	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
trans 1,2-Dichloroethene	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Benzene	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Toluene	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Xylenes	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Subtotal Project VOCs	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes and abbreviations on last page.

Table 3
Effluent Water Sample Analytical Results,
Bethpage Park Groundwater Containment System,
Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Compound	Discharge Limit [1] (µg/L)	07/22/15 (µg/L)	08/19/15 (µg/L)	09/28/15 (µg/L)	10/13/15 (µg/L)	11/23/15 (µg/L)	12/22/15 (µg/L)	2/1/2016[5] (µg/L)	02/23/16 (µg/L)	4/1/2016[5] (µg/L)	04/18/16 (µg/L)	05/18/16 (µg/L)	06/10/16 (µg/L)
Non-Project VOCs													
1,1,2,2-Tetrachloroethane	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,1,2-Trichloroethane	1	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,2-Dichloropropane	0.6	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
2-Butanone	50	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U
4-Methyl-2-Pentanone	50	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Acetone	50	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U
Bromodichloromethane	50	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Bromoform	50	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Bromomethane	5	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Carbon Disulfide	60	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Carbon Tetrachloride	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chlorobenzene	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chlorodibromomethane	50	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chlorodifluoromethane (Freon 22)	50	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Chloroethane	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chloroform	7	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chloromethane	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
cis-1,3-Dichloropropene	0.4	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Dichlorodifluoromethane (Freon 12)	5	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Dichloromethane	5	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Ethylbenzene	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Methyl N-Butyl Ketone	50	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Methyl-Tert-Butylether	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Styrene (Monomer)	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
trans-1,3-Dichloropropene	0.4	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Trichlorofluoromethane (Freon 11)	5	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Trichlorotrifluoroethane (Freon 113)	5	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Subtotal Non-Project VOCs	--	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total VOCs [2]	--	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Treatment Efficiency [3]	--	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%

Notes and abbreviations on last page.

Table 3
Effluent Water Sample Analytical Results,
Bethpage Park Groundwater Containment System,
Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Compound	Discharge Limit [1] (µg/L)	07/22/15 (µg/L)	08/19/15 (µg/L)	09/28/15 (µg/L)	10/13/15 (µg/L)	11/23/15 (µg/L)	12/22/15 (µg/L)	2/1/2016[5] (µg/L)	02/23/16 (µg/L)	4/1/2016[6] (µg/L)	04/18/16 (µg/L)	05/18/16 (µg/L)	06/10/16 (µg/L)
Inorganics													
Dissolved Cadmium	5	--	< 3.0 U	--	--	< 3.0 U	--	--	--	< 3.0 U	--	--	< 3.0 U
Total Cadmium	5	--	< 3.0 U	--	--	< 3.0 U	--	--	--	< 3.0 U	--	--	< 3.0 U
Dissolved Chromium	50	--	< 10 U	--	--	< 10 U	--	--	--	< 10 U	--	--	< 10 U
Total Chromium	50	--	< 10 U	--	--	< 10 U	--	--	--	< 10 U	--	--	< 10 U
Dissolved Iron	600	**250**	**251**	**266**	**235**	**184**	**209**	**156**	**216**	**281**	**195**	**202**	**205**
Total Iron	600	**259**	**299**	**325**	**297**	**275**	**288**	**226**	**262**	**490**	**228**	**229**	**266**
Total Mercury	250	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U
1,4-Dioxane	--	--	0.36	0.32	0.34	0.34	0.38	0.24	0.53	0.56	0.61	< 0.11 U	0.53
pH [4]	5.5 - 8.5	**6.9**	**6.9**	**6.6**	**6.9**	**7.1**	**6.0**	**5.9**	**6.8**	**7.0**	**6.8**	**6.7**	**6.9**

Notes and Abbreviations:

(1) Discharge limits per the interim SPDES equivalency program or Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) Quality Standards and Guidance Values and Groundwater Effluent Limitations, if the compound is not part of the interim SPDES equivalency program.

(2) "Total VOCs" represents the sum of individual concentrations of compounds detected. The values used in calculations referenced in this report have been rounded to the nearest whole number.

(3) Treatment efficiency was calculated by dividing the difference between the influent and effluent total VOC concentrations by the influent total VOC concentration.

(4) Effluent pH samples collected and measured in the field by ARCADIS personnel on the dates listed using an Oakton Model 300 pH/conductivity meter. pH units are standard units.

(5) Samples representing the month of January were collected on February 1, 2016 due to RW-2 downtime in January.

(6) Samples representing the month of March were collected on April 1, 2016 due to RW-2 downtime in March.

700 Bold value indicates a detection.
SPDES State Pollutant Discharge Elimination System
VOC volatile organic compound
µg/L micrograms per liter
-- not analyzed
< 5 U Compound not detected above its laboratory quantification limit.

Table 4
Influent Vapor Sample Analytical Results,
Bethpage Park Groundwater Containment System,
Operable Unit 3 (Former Grumman Settling Ponds),
Bethpage, New York. [1]

ARCADIS Design & Consultancy for natural and built assets

Compound	08/19/15 (µg/m³)	11/23/15 (µg/m³)	4/1/2016 [2] (µg/m³)	06/10/16 (µg/m³)
Project VOCs				
1,1,1 - Trichloroethane	**0.82**	**0.82**	**0.87**	**0.71**
1,1 - Dichloroethane	**4.5**	**5.3**	**7.7**	**4.9**
1,2 - Dichloroethane	< 0.81 U	**0.45 J**	< 0.81 U	**0.45 J**
1,1 - Dichloroethene	**1.4**	**2.0**	**2.5**	**1.5**
Tetrachloroethene	**3.6**	**4.5**	**3.2**	**3.5**
Trichloroethene	**59**	**55**	**45**	**53**
Vinyl Chloride	**125 D**	**181 D**	**458**	**184**
cis 1,2-Dichloroethene	**147**	**290 D**	**272**	**165**
trans 1,2-Dichloroethene	**0.40 J**	**0.59 J**	**0.67 J**	**0.44 J**
Benzene	**4.8**	**0.77**	**1.3**	**1.5**
Toluene	**49**	**131**	**139**	**90**
Xylenes	**10**	**11**	**24**	**12**
Subtotal Project VOCs	**405**	**683**	**954**	**517**
Compound	**08/19/15 (µg/m³)**	**11/23/15 (µg/m³)**	**4/1/2016 [2] (µg/m³)**	**06/10/16 (µg/m³)**
Non-Project VOCs				
1,1,2,2-Tetrachloroethane	< 0.69 U	< 0.69 U	< 0.69 U	< 0.69 U
1,1,2-Trichloroethane	< 0.55 U	< 0.55 U	< 0.55 U	< 0.55 U
1,2-Dichloropropane	< 0.92 U	< 0.92 U	< 0.92 U	**0.60 J**
2-Butanone	**1.0**	**2.2**	**2.6**	**0.88**
4-Methyl-2-Pentanone	< 0.82 U	< 0.82 U	< 0.82 U	< 0.82 U
Acetone	**17**	**5.0**	**9.3**	< 0.48 U
Bromodichloromethane	< 0.67 U	< 0.67 U	< 0.67 U	< 0.67 U
Bromoform	< 0.41 U	< 0.41 U	< 0.41 U	< 0.41 U
Bromomethane	< 0.78 U	< 0.78 U	< 0.78 U	< 0.78 U
Carbon Disulfide	< 0.62 U	< 0.62 U	< 0.62 U	< 0.62 U
Carbon Tetrachloride	< 0.25 U	< 0.25 U	< 0.25 U	< 0.25 U
Chlorobenzene	< 0.92 U	< 0.92 U	< 0.92 U	< 0.92 U
Chlorodibromomethane	< 0.85 U	< 0.85 U	< 0.85 U	< 0.85 U
Chlorodifluoromethane (Freon 22)	**69**	**48**	**46**	**28**
Chloroethane	< 0.53 U	< 0.53 U	< 0.53 U	< 0.53 U
Chloroform	**54**	**41**	**34**	**22**
Chloromethane	**2.7**	**1.0**	**1.8**	**1.2**
cis-1,3-Dichloropropene	< 0.91 U	< 0.91 U	< 0.91 U	< 0.91 U
Dichlorodifluoromethane (Freon 12)	**2.7**	**2.4**	**2.8**	**2.3**
Dichloromethane	**0.69**	**0.52 J**	**1.9**	**2.5**
Ethylbenzene	**7.8**	**7.8**	**15**	**9.6**
Methyl N-Butyl Ketone	< 0.82 U	**0.53 J**	< 0.82 U	< 0.82 U
Methyl-Tert-Butylether	**0.72**	**0.76**	**4.0**	< 0.72 U
Styrene (Monomer)	< 0.85 U	< 0.85 U	< 0.85 U	< 0.85 U
trans-1,3-Dichloropropene	< 0.91 U	< 0.91 U	< 0.91 U	< 0.91 U
Trichlorofluoromethane (Freon 11)	**1.6**	**1.5**	**1.6**	**1.6**
Trichlorotrifluoroethane (Freon 113)	**2.5**	**2.5**	**2.5**	**2.2**
Subtotal Non-Project VOCs	**159**	**113**	**122**	**71**
Total VOCs [2]	**564**	**796**	**1076**	**588**

Notes and abbreviations on last page.

Table 4
Influent Vapor Sample Analytical Results,
Bethpage Park Groundwater Containment System,
Operable Unit 3 (Former Grumman Settling Ponds),
Bethpage, New York. (1)

ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

(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. A VOC analyte list is provided in the Groundwater IRM OM&M Manual (ARCADIS 2009). Influent samples were collected at Vapor Sampling Port-1 (VSP-1); refer to Figure 3 of this OM&M Report for the location of VSP-1.

(2) "Total VOCs" represents the sum of individual concentrations of compounds detected. The values used in calculations referenced in this report have been rounded to the nearest whole number.

(3) First Quarter samples were collected on April 1, 2016 due to RW-2 downtime in March.

700	Bold value indicates a detection.
D	Compound identified from secondary dilution.
ELAP	Environmental Laboratory Approval Program
IRM	interim remedial measure
J	Compound detected below its reporting limit; value
ND	Analyte not detected at or above its laboratory reporting limit.
NYSDOH	New York State Department of Health
OM&M	operation, maintenance, and monitoring
SPDES	State Pollutant Discharge Elimination System
TIC	tentatively identified compound
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
$\mu g/m^3$	micrograms per cubic meter
< 5 U	Compound not detected above its laboratory quantification limit.

Table 5
Effluent Vapor Sample Analytical Results,
Bethpage Park Groundwater Containment System,
Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1]

ARCADIS Design & Consultancy for natural and built assets

Compound	Discharge Limit [2] (µg/m³)	08/19/15 (µg/m³)	11/23/15 (µg/m³)	4/1/2016 [3] (µg/m³)	06/10/16 (µg/m³)
Project VOCs					
1,1,1 - Trichloroethane	9,000	< 0.55 U	< 0.55 U	< 0.55 U	< 0.55 U
1,1 - Dichloroethane	NS	< 0.81 U	**2.3**	**7.7**	**4.0**
1,2 - Dichloroethane	1,000[4]	< 0.81 U	< 0.81 U	< 0.81 U	< 0.81 U
1,1 - Dichloroethene	19,800[4]	< 0.79 U	**0.79**	**0.83**	**0.48 J**
Tetrachloroethene	300	**0.4**	**1.8**	**0.68**	**2.0**
Trichloroethene	14,000	**1.8**	**1.5**	**7.5**	**1.7**
Vinyl Chloride	180,000	**14**	**4.3**	**3.3**	**2.8**
cis 1,2-Dichloroethene	190,000[4]	**3.3**	**2.6**	**11**	**7.1**
trans 1,2-Dichloroethene	190,000	< 0.79 U	< 0.79 U	< 0.79 U	< 0.79 U
Benzene	1,300	**37**	**29**	**5.8**	**3.1**
Toluene	37,000	**7.5**	**15**	**14**	**9.0**
Xylenes	4,300	**4.3**	**3.1**	**2.5**	**2.1**
Subtotal Project VOCs	NA	**68**	**60**	**53**	**32**

Compound	Discharge Limit [2] (µg/m³)	08/19/15 (µg/m³)	11/23/15 (µg/m³)	4/1/2016 [3] (µg/m³)	06/10/16 (µg/m³)
Non-Project VOCs					
1,1,2,2-Tetrachloroethane	2,000[4]	< 0.69 U	< 0.69 U	< 0.69 U	< 0.69 U
1,1,2-Trichloroethane	11,000[4]	< 0.55 U	< 0.55 U	< 0.55 U	< 0.55 U
1,2-Dichloropropane	83,000[4]	< 0.92 U	< 0.92 U	< 0.92 U	< 0.92 U
2-Butanone	13,000	**44**	**40**	**9.1**	**6.2**
4-Methyl-2-Pentanone	31,000	< 0.82 U	< 0.82 U	< 0.82 U	< 0.82 U
Acetone	180,000	**337**	**1060 D**	**87**	**107**
Bromodichloromethane	NS	< 0.67 U	< 0.67 U	< 0.67 U	< 0.67 U
Bromoform	1,000[4]	< 0.41 U	< 0.41 U	< 0.41 U	< 0.41 U
Bromomethane	3,900[4]	< 0.78 U	< 0.78 U	< 0.78 U	< 0.78 U
Carbon Disulfide	6,200	< 0.62 U	< 0.62 U	< 0.62 U	< 0.62 U
Carbon Tetrachloride	1,900	< 0.25 U	< 0.25 U	< 0.25 U	< 0.25 U
Chlorobenzene	83,000[4]	**0.46 J**	< 0.92 U	< 0.92 U	< 0.92 U
Chlorodibromomethane	NS	< 0.85 U	< 0.85 U	< 0.85 U	< 0.85 U
Chlorodifluoromethane (Freon 22)	NS	**69**	**52**	**46**	**23**
Chloroethane	NS	**0.82**	< 0.53 U	< 0.53 U	< 0.53 U
Chloroform	150	**7.8**	**6.8**	**42**	**32**
Chloromethane	22,000	**20**	**5.8**	**10**	**2.9**
cis-1,3-Dichloropropene	NS	< 0.91 U	< 0.91 U	< 0.91 U	< 0.91 U
Dichlorodifluoromethane (Freon 12)	NS	**3.0**	**2.6**	**2.8**	**2.6**
Dichloromethane	14,000	**1.1**	< 0.69 U	**1.4**	**9.0**
Ethylbenzene	100,000[4]	**0.83 J**	**0.83 J**	**1.4**	**0.56 J**
Methyl N-Butyl Ketone	4,000	**0.70 J**	**2.2**	< 0.82 U	< 0.82 U
Methyl-Tert-Butylether	43,000[4]	< 0.72 U	< 0.72 U	< 0.72 U	< 0.72 U
Styrene (Monomer)	17,000	< 0.85 U	< 0.85 U	< 0.85 U	< 0.85 U
trans-1,3-Dichloropropene	NS	< 0.91 U	< 0.91 U	< 0.91 U	< 0.91 U
Trichlorofluoromethane (Freon 11)	9,000	**2.0**	**1.9**	**1.9**	**2.9**
Trichlorotrifluoroethane (Freon 113)	960,000	< 0.77 U	< 0.77 U	< 0.77 U	< 0.77 U
Subtotal Non-Project VOCs	NA	**487**	**1172**	**201**	**186**
Total VOCs [5]	NA	**555**	**1232**	**255**	**218**

Notes and abbreviations on last page.

Table 5
Effluent Vapor Sample Analytical Results,
Bethpage Park Groundwater Containment System,
Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1)

ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

(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. A VOC analyte list is provided in the Groundwater IRM OM&M Manual (ARCADIS 2009). Effluent samples were collected at Vapor Sampling Port-5 (VSP-5); refer to Figure 3 of this OM&M Report for the location of VSP-5.

(2) Discharge limit is compound-specific SGC per the NYSDEC DAR-1 AGC/SGC tables revised Februaury 28, 2014.

(3) First Quarter samples were collected on April 1, 2016 due to RW-2 downtime in March.

(4) An SGC was not provided in the DAR-1 AGC/SGC Tables, dated February 28, 2014. An interim SGC was developed based on guidance of the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Interim SGC = (smaller of Time Weighted Average [TWA] - Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2.

(5) "Total VOCs" represents the sum of individual concentrations of all compounds detected. The values used in calculations referenced in this report have been rounded to the nearest whole number.

700	Bold data indicates that the analyte was detected at or above its reporting limit.	NYSDEC	New York State Department of Environmental Conservation
< 5 U	Compound not detected above its laboratory quantification limit.	NYSDOH	New York State Department of Health
AGC	Annual Guideline Concentration	OM&M	operation, maintenance, and monitoring
DAR-1	Division of Air Resources Air Guidance-1	SGC	Short-term Guidance Concentration
ELAP	Environmental Laboratory Approval Program	SPDES	State Pollutant Discharge Elimination System
J	Compound detected below its reporting limit;		
IRM	interim remedial measure	USEPA	United States Environmental Protection Agency
NA	not applicable		
ND	Analyte not detected at or above its laboratory rep	VOC	volatile organic compound
NS	Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables. An interim SGC was not developed for these compounds because they have low toxicity ratings in the NYSDEC DAR-1 AGC/SGC tables revised February 28, 2014.	µg/m^3	micrograms per cubic meter

Table 6
Effluent Vapor Tentatively Identified Compounds,
Bethpage Park Groundwater Containment System, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. [1]

ARCADIS Design & Consultancy for natural and built assets

Compound	08/19/15 (ppbv)	11/23/15 (ppbv)	4/1/2016 [2] (ppbv)	06/10/16 (ppbv)
Tentatively Identified Compounds				
2,6-Dimethylundecane	--	30 JN	--	--
2-butyl-1,1,3-trimethyl-cyclohexane	--	9.9 JN	--	--
2-Ethyl-1-hexanol	3.4 JN	--	--	--
2-Methylundecane	--	43 JN	--	--
2-Phenyl-2-propanol	--	--	--	2.2 JN
3-Methylundecane	--	36 JN	--	--
4-Methylundecane	--	31 JN	--	--
Acetaldehyde	--	--	--	15 JN
Acetophenone	9.1 JN	22 JN	--	6.8 JN
alkane	--	51 JN	6.4 J	6.7 J
alkane	--	28 JN	6.3 J	2.0 J
alkane	--	24 JN	5.4 J	1.8 J
alkane	--	17 JN	4.5 J	1.4 J
alkane	--	17 JN	3.7 J	--
alkane	--	16 JN	3.3 J	--
alkane	--	14 JN	3.2 J	--
alkane	--	--	3.1 J	--
alkene	--	11 JN	--	--
C3 alkyl benzene	3.0 J	--	--	--
cycloalkane/alkene	--	--	--	1.5 J
Methylcyclohexane	--	--	3.0 JN	--
Methylcyclopentane	--	--	4.9 JN	--
Naphthalene decahydro-methyl- isomer	--	--	5.5 J	--
N-Undecane	--	36 JN	4.3 JN	--
Pentane	--	--	3.1 JN	--
Pentyl-Cyclohexane	--	--	4.7 JN	--
Silanol, trimethyl-	42 JN	--	--	--
Unknown	--	21 JN	5.8 J	1.9 J
Unknown	--	9.4 JN	4.5 J	--
Unknown	--	--	3.6 J	--
Unknown	--	--	2.9 J	--
UNKNOWN VOA ALKENE1	--	29 JN	--	--
UNKNOWN VOA ALKENE2	--	22 JN	--	--
UNKNOWN VOA ALKENE3	--	18 JN	--	--

Notes and abbreviations on last page.

Table 6
Effluent Vapor Tentatively Identified Compounds,
Bethpage Park Groundwater Containment System, Operable Unit 3
(Former Grumman Settling Ponds), Bethpage, New York. (1)

ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

(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. A VOC analyte list is provided in the DRAFT Groundwater IRM OM&M Manual (ARCADIS 2009). Effluent samples were collected at Vapor Sampling Port-5 (VSP-5); refer to Figure 3 of this OM&M Report for the location of VSP-5.

(2) First Quarter samples were collected on April 1, 2016 due to RW-2 downtime in March.

700 Bold data indicates that the analyte was detected at or above its reporting limit.
ELAP Environmental Laboratory Approval Program
J Compound detected below its reporting limit; value is estimated.
B Compound was also detected in the associated field blank.
IRM interim remedial measure
N Indicates presumptive evidence of a compound.
NYSDOH New York State Department of Health
OM&M operation, maintenance, and monitoring
USEPA United States Environmental Protection Agency
VOC volatile organic compound
ppbv parts per billion by volume

Table 7
System Parameters,
Bethpage Park Groundwater Containment System,
Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Date [1]	Water Flow Rates						Water Pressures [2]					Air Flow Rate [2]	Air Pressures [5]					Air Temp. [5]
	Remedial Well [2]				Combined Influent [3]	Effluent [2]	Remedial Well Effluent [4]				Effluent	Effluent	ECU Influents				Effluent	Effluent
	RW-1	RW-2	RW-3	RW-4			RW-1	RW-2	RW-3	RW-4			GAC-501	GAC-502	PPZ-601	PPZ-602		
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(psi)	(psi)	(psi)	(psi)	(psi)	(scfm)	(iwc)	(iwc)	(iwc)	(iwc)	(iwc)	(°R)
07/22/15	29.6	75.0	75.6	29.7	210	214	57	28	44	56	12	1,835	6.5	3.2	1.0	2.0	0.0	544
08/19/15	30.2	72.6	77.8	30.1	211	217	57	26	40	56	10	1,790	6.5[7]	2.5[7]	0.6[7]	2.0[7]	0.0[7]	544[7]
09/28/15	29.4	74.6	74.3	29.6	208	221	57	21	37	56	11	1,872	6.7[8]	2.8[8]	0.5[8]	2.0[8]	0.0[8]	540[8]
10/13/15	29.7	75.1	74.9	29.9	210	212	57	13	30	56	20	1,778	6.5[9]	2.6[9]	0.6[9]	2.0[9]	0.0[9]	540[9]
11/23/15	30.4	78.0	75.2	30.2	214	214	56	12	30	55	14	1,919	6.7	3.0	1.8	1.6	0.0	532
12/22/15	30.4	74.5	75.7	30.6	211	207	56	10	25	55	18	1,912	7.0[10]	3.3[10]	0.5[10]	2.3[10]	0.0[10]	534[10]
02/01/16	30.2	75.6	74.8	30.0	211	214	56	33	24	55	17	1,880	6.9[11]	3.2[11]	2.1[11]	2.5[11]	0.0[11]	535[11]
02/23/16	30.5	74.9	75.7	29.6	211	216	56	32	18	56	11	1,961	6.9[12]	3.2[12]	2.0[12]	2.0[12]	0.0[12]	526[12]
04/01/16	30.8	78.4	75.2	30.0	214	227	56	23	17	55	13	1,891	6.5[13]	3.0[13]	1.0[13]	2.0[13]	0.0[13]	528[13]
04/18/16	30.9	75.8	75.7	29.9	212	216	55	30	14	55	11	1,814	5.8	3.4	0.5	2.0	0.0	532
05/18/16	29.9	75.4	75.7	30.2	211	224	56	22	20	55	12	1,973	6.5[14]	3.4[14]	1.0[14]	2.0[14]	2.0[14]	532[14]
06/10/16	30.2	73.7	75.2	30.3	209	211	56	11	22	54	11	1,827	7.0[15]	3.5[15]	1.0[15]	2.2[15]	0.0[15]	537[15]

Notes and abbreviations on last page.

ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

(1) Operational data collected by Arcadis on days noted. Parameters listed were typically recorded during compliance monitoring events. Data in this table correspond to approximately the past year of system operation.
(2) Instantaneous parameters obtained from the SCADA HMI: Water Flow Rate, Water Pressure, Air Flow Rate.
(3) Combined influent water-flow rate is the sum of individual well flow rates via the SCADA System.
(4) Remedial Well effluent pressure readings measured at the influent manifold within the treatment system building.
(5) Instantaneous values from field-mounted instruments
(6) Values collected on April 27, 2015 during the weekly site visit. No values collected on day of sampling.
(7) Values collected on August 24, 2015 during the weekly site visit. No values collected on day of sampling.
(8) Values collected on October 5, 2015 during the weekly site visit. No values collected on day of sampling.
(9) Values collected on October 12, 2015 during the weekly site visit. No values collected on day of sampling.
(10) Values collected on December 23, 2015 during the weekly site visit. No values collected on day of sampling.
(11) Values collected on February 2, 2016 during the weekly site visit. No values collected on day of sampling.
(12) Values collected on February 22, 2016 during the weekly site visit. No values collected on day of sampling.
(13) Values collected on April 5, 2016 during the weekly site visit. No values collected on day of sampling.
(14) Values collected on May 16, 2016 during the weekly site visit. No values collected on day of sampling.
(15) Values collected on June 6, 2016 during the weekly site visit. No values collected on day of sampling.

ECU	emission control unit
gpm	gallons per minute
HMI	human-machine interface
iwc	inches of water column
psi	pounds per square inch
^{o}R	degrees Rankine
SCADA	Supervisory Control and Data Acquisition
scfm	standard cubic feet per minute
Temp.	temperature

Table 8
Groundwater Recovered, VOC Mass Recovered, and VOC Mass Recovery Rates
Bethpage Park Groundwater Containment System, Operable Unit 3
(Former Grumman Settling Ponds) Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Operating Period [1]	Volume of Groundwater Recovered (x1,000 gal) [2]					VOC Mass Recovered (lbs) [3]															VOC Mass Recovery Rate (lbs/day) [4]													
						Total VOCs [5]					Project VOCs [6]					Non-Project VOCs [7]					Total VOCs [5]					Project VOCs [6]					Non-Project VOCs [7]				
	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total
System Pilot Test, Shakedown and Startup Totals [8]	137	270	251	150	808	NA	NA	NA	NA	1.1	NA	NA	NA	NA	1.0	NA	NA	NA	NA	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2009 Totals	6,592	13,838	16,445	6,574	43,449	0.17	275	53	14	342	0.17	273	19	0.20	293	<0.01	0.56	35	13	48	<0.01	1.7	0.33	0.086	2.1	<0.01	1.7	0.12	<0.01	1.8	<0.01	<0.01	0.22	0.080	0.30
2010 Totals	15,726	35,127	38,160	15,689	104,702	0.56	172	412	89	672	0.56	171	28	0.10	200	<0.01	0.17	383	89	469	<0.01	0.46	1.1	0.24	1.8	<0.01	0.46	0.075	<0.01	0.54	<0.01	<0.01	1.0	0.24	1.3
2011 Totals	15,218	36,570	37,682	15,196	104,666	0.36	167	271	78	516	0.36	167	35	0.090	203	<0.01	1.1	236	78	314	<0.01	0.45	0.73	0.21	1.4	<0.01	0.45	0.095	<0.01	0.55	<0.01	<0.01	0.64	0.21	0.85
2012 Totals	15,260	35,178	36,111	15,336	101,885	0.28	114	113	40	267	0.25	113	12	0.39	126	<0.01	1.5	101	40	141	<0.01	0.31	0.31	0.11	0.73	<0.01	0.31	0.032	<0.01	0.35	<0.01	<0.01	0.28	0.11	0.39
2013 Totals	15,968	37,514	36,622	16,036	106,140	0.14	111	41	18	171	0.14	110	4.3	0.36	113	<0.01	1.6	37	18	57	<0.01	0.30	0.11	0.050	0.47	<0.01	0.30	0.012	<0.01	0.31	<0.01	<0.01	0.10	0.049	0.16
2014 Totals	15,690	33,222	31,199	15,691	95,802	0.063	67	9.9	8.1	85	0.063	65	2.0	0.20	67	<0.01	1.5	8.1	7.9	17	<0.01	0.19	0.028	0.023	0.24	<0.01	0.18	<0.01	<0.01	0.19	<0.01	<0.01	0.023	0.022	0.047
2015 Totals	15,859	38,082	34,961	14,755	103,657	0.028	47	7.1	4.5	57	0.021	45	1.5	0.20	45	<0.01	1.7	5.6	4.2	12	<0.01	0.13	0.019	0.012	0.16	<0.01	0.12	<0.01	<0.01	0.12	<0.01	<0.01	0.015	0.012	0.032
January 2016 through March 2016 Totals																																		
01/01/16 - 02/01/16	1,360	1,122	3,202	1,360	7,044	<0.01	1.8	0.34	0.21	2.3	<0.01	1.7	0.13	0.019	1.8	<0.01	0.065	0.21	0.19	0.47	<0.01	0.056	0.011	<0.01	0.074	<0.01	0.055	<0.01	<0.01	0.060	<0.01	<0.01	<0.01	<0.01	0.015
02/01/16 - 03/01/16	1,247	3,118	3,118	1,247	8,730	<0.01	4.9	0.33	0.19	5.4	<0.01	4.7	0.12	0.017	4.8	<0.01	0.18	0.21	0.18	0.57	<0.01	0.17	0.011	<0.01	0.19	<0.01	0.16	<0.01	<0.01	0.17	<0.01	<0.01	<0.01	<0.01	0.020
03/01/16 - 04/01/16	1,348	2,391	3,370	1,348	8,457	<0.01	3.7	0.36	0.21	4.3	<0.01	3.6	0.13	0.018	3.7	<0.01	0.14	0.22	0.19	0.55	<0.01	0.12	0.012	<0.01	0.14	<0.01	0.12	<0.01	<0.01	0.12	<0.01	<0.01	<0.01	<0.01	0.018
Subtotal Jan - Mar 2016 [9]	3,955	6,631	9,690	3,955	24,231	<0.01	10	1.0	0.61	12	<0.01	10	0.38	0.054	10	<0.01	0.39	0.64	0.56	1.6	<0.01	0.11	0.011	<0.01	0.13	<0.01	0.11	<0.01	<0.01	0.11	<0.01	<0.01	<0.01	<0.01	0.018
April 2016 through June 2016 Totals																																		
04/01/16 - 05/01/16	1,368	3,421	3,421	1,368	9,578	<0.01	4.1	0.19	0.20	4.5	<0.01	3.9	0.12	0.016	4.1	<0.01	0.16	0.070	0.19	0.42	<0.01	0.14	<0.01	<0.01	0.15	<0.01	0.13	<0.01	<0.01	0.14	<0.01	<0.01	<0.01	<0.01	0.014
05/01/16 - 06/01/16	1,379	3,361	3,437	1,379	9,556	<0.01	4.0	0.19	0.21	4.4	<0.01	3.8	0.12	0.016	4.0	<0.01	0.15	0.070	0.19	0.41	<0.01	0.13	<0.01	<0.01	0.14	<0.01	0.12	<0.01	<0.01	0.13	<0.01	<0.01	<0.01	<0.01	0.013
06/01/16 - 07/01/16	1,373	3,024	3,431	1,373	9,201	<0.01	3.6	0.19	0.20	4.0	<0.01	3.5	0.12	0.016	3.6	<0.01	0.14	0.070	0.19	0.40	<0.01	0.12	<0.01	<0.01	0.13	<0.01	0.12	<0.01	<0.01	0.12	<0.01	<0.01	<0.01	<0.01	0.013
Subtotal Apr - Jun 2016 [10]	4,120	9,806	10,289	4,120	28,335	<0.01	12	0.60	0.61	13	<0.01	11	0.36	0.048	12	<0.01	0.45	0.21	0.57	1.2	<0.01	0.13	<0.01	<0.01	0.14	<0.01	0.12	<0.01	<0.01	0.13	<0.01	<0.01	<0.01	<0.01	0.013
2016 Totals	8,075	16,437	19,979	8,075	52,566	<0.01	22.0	1.60	1.22	25.0	<0.01	21.0	0.74	0.102	22.0	<0.01	0.84	0.85	1.13	2.80	<0.01	0.24	0.01	<0.01	0.27	<0.01	0.23	<0.01	<0.01	0.24	<0.01	<0.01	<0.01	<0.01	0.031

Notes and abbreviations on last page.

Notes and Abbreviations:

(1) Represents operating period between consecutive monitoring events.

(2) Volume of groundwater recovered is based on individual local well totalized flow readings. Listed value is the difference between totalized flow values recorded between consecutive monitoring events. The total groundwater recovered during a given operating period is the sum of the individual well flow totals. Values shown are rounded to the nearest gallon, but should only be considered accurate to two significant figures to account for error associated with field measurements.

(3) Mass recovered per well was calculated by multiplying the Total VOC concentration from the most recent sampling event by the number of gallons extracted during the reporting period. The total amount recovered during a given operating period is the sum of masses recovered from each of the individual wells. Values less than ten pounds are presented using two significant figures and values greater than ten pounds have been rounded to the nearest whole number; however, these values should only be considered accurate to two significant figures to account for error associated with field measurements and analytical data.

(4) Mass recovery rates were calculated by dividing the total mass recovered for each well and for the system by the number of days in the respective operating period. Values are presented using two significant figures.

(5) "Total VOCs" represents the sum of individual concentrations of the VOCs detected.

(6) "Project VOCs" represents the sum of individual compound concentrations of 1,1,1-trichloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; trichloroethelyene; vinyl chloride; cis-1,2-dichloroethene; trans-1,2-dichloroethene; benzene; toluene; and xylenes-o,m, p.

(7) "Non-Project VOCs" represents the difference between Total VOCs and Project VOCs.

(8) Values based on operational data recorded prior to system startup on July 21, 2009.

(9) The volume of groundwater recovered and mass recovered calculations represent the operational period between January 1, 2016 and April 1, 2016.

(10) The volume of groundwater recovered and mass recovered calculations represent the operational period between April 1, 2016 and July 1, 2016.

(11) "Total" refers to the amounts removed by the Operable Unit 3 Bethpage Park Groundwater Containment System.

gal gallons
HMI human-machine interface
lbs pounds
lbs/day pounds per day
-- not applicable

Table 9
SCREEN3 Model Input and Outputs,
Bethpage Park Groundwater Containment System,
Operable Unit 3 (Former Grumman Settling Ponds),
Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Parameters / Date Sampled:	8/19/2015	11/23/2015	4/1/2016	6/10/2016
SCREEN3 Model Input				
Source Type	Point	Point	Point	Point
Emission Rate (g/s)	1	1	1	1
Stack Height (ft)	13.5	13.5	13.5	13.5
Stack Height (m)	4.1	4.1	4.1	4.1
Stack Inside Diameter (m)	0.36	0.36	0.36	0.36
Air Flow Rate (scfm)(1)	1,790	1,919	1,891	1,827
Air Flow Rate (acfm @ stack temp)(2)	1,836	1,923	1,882	1,849
Stack Gas Exit Temperature (K)(1)	302	295(9)	293(10)	298(11)
Ambient Air Temperature (K)(3)	300	276	288	292
Receptor Height (m)(4)	1.5	1.5	1.5	1.5
Urban/Rural	Urban	Urban	Urban	Urban
Building Height (m)	2.6	2.6	2.6	2.6
Min Horizontal Bldg Dim (m)	7.9	7.9	7.9	7.9
Max Horizontal Bldg Dim (m)	9.8	9.8	9.8	9.8
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 ($\mu g/m^3$) (5)	2,203	2,109	2,145	2,191
Annualization Factor(6)	0.08	0.08	0.08	0.08
Average Annual Concentration at Receptor Height ($\mu g/m^3$)(7)	176	169	172	175
Distance To Max Concentration (m)(8)	8	8	8	8

Notes and abbreviations on last page.

Notes and Abbreviations:

(1)	The stack air flow rate (in scfm) and temperature were measured using inline instrumentation. Stack air flow rate was measured at the blower effluent location. Temperature was measured at the ECU 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 in degrees Rankine.
(3)	The ambient temperature was recorded from the weather underground (www.wunderground.com) websites for Islip, New York. The mean actual temperature from the website(s) 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 1/0.08 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.
(9)	This data was not recorded for the 8/19/2015 event. Data from 8/24/2015 was used.
(10)	This data was not recorded for the 4/1/2016 event. Data from 4/5/2016 was used.
(11)	This data was not recorded for the 6/10/2016 event. Data from 6/6/2016 was used.
$\mu g/m^3$	micrograms per cubic meter
acfm	actual cubic feet per minute
ft	feet
g/s	grams per second
K	Kelvin
m	meters
scfm	standard cubic feet per minute
USEPA	United States Environmental Protection Agency

Table 10
Maximum Allowable Stack Concentration Calculations
Bethpage Groundwater Containment System
Operable Unit 3 (Former Grumman Settling Ponds),
Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Compound	Actual Effluent Concentrations[1] (µg/m³)			
	8/19/2015	11/23/2015	4/1/2016	6/10/2016
1,1 - Dichloroethane	0	2.3	7.7	4.0
1,1 - Dichloroethene	0	0.79	0.83	0.48
2-Butanone	44	40	9.1	6.2
Acetone	337	1,060	87	107
Chloroform	7.8	6.8	42	32
Ethylbenzene	0.83	0.83	1.4	0.56
Xylene - o	1.9	1.0	0.69	0.56
Xylenes - m,p	2.4	2.1	1.8	1.5
Chloromethane	20	5.8	10	2.9
Chloroethane	0.82	0	0	0
Methylene Chloride	1.1	0	1.4	9.0
Tetrachloroethene	0.40	1.8	0.68	2.0
Trichloroethene	1.8	1.5	7.5	1.7
Vinyl Chloride	14	4.3	3.3	2.8
cis 1,2-Dichloroethene	3.3	2.6	11	7.1
Benzene	37	29	5.8	3.1
Chlorobenzene	0.46	0	0	0
Toluene	7.5	15	14	9.0
2-Hexanone	0.70	2.2	0	0
Trichlorofluoromethane (Freon 11)	2.0	1.9	1.9	2.9
Dichlorodifluoromethane (Freon 12)	3.0	2.6	2.8	2.6
Chlorodifluoromethane (Freon 22)	69	52	46	23

Notes and abbreviations on last page.

Table 10
Maximum Allowable Stack Concentration Calculations
Bethpage Groundwater Containment System
Operable Unit 3 (Former Grumman Settling Ponds),
Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Compound	AGC[2] (µg/m³)	MASC[1] (µg/m³)			
		8/19/2015	11/23/2015	4/1/2016	6/10/2016
1,1 - Dichloroethane	0.630	4.13E+03	4.11E+03	4.13E+03	4.12E+03
1,1 - Dichloroethene	200	1.31E+06	1.31E+06	1.31E+06	1.31E+06
2-Butanone	5,000	3.27E+07	3.27E+07	3.28E+07	3.27E+07
Acetone	30,000	1.96E+08	1.96E+08	1.97E+08	1.96E+08
Chloroform	14.7	9.63E+04	9.60E+04	9.64E+04	9.61E+04
Ethylbenzene	1,000	6.55E+06	6.53E+06	6.56E+06	6.54E+06
Xylene - o	100	6.55E+05	6.53E+05	6.56E+05	6.54E+05
Xylenes - m,p	100	6.55E+05	6.53E+05	6.56E+05	6.54E+05
Chloromethane	90	5.89E+05	5.88E+05	5.90E+05	5.88E+05
Chloroethane	10,000	6.55E+07	6.53E+07	6.56E+07	6.54E+07
Methylene Chloride	60	3.93E+05	3.92E+05	3.94E+05	3.92E+05
Tetrachloroethene	4.0	2.62E+04	2.61E+04	2.62E+04	2.61E+04
Trichloroethene	0.20	1.31E+03	1.31E+03	1.31E+03	1.31E+03
Vinyl Chloride	0.068	4.45E+02	4.44E+02	4.46E+02	4.45E+02
cis 1,2 Dichloroethene	63	4.13E+05	4.11E+05	4.13E+05	4.12E+05
Benzene	0.13	8.51E+02	8.49E+02	8.53E+02	8.50E+02
Chlorobenzene	60	3.93E+05	3.92E+05	3.94E+05	3.92E+05
Toluene	5,000	3.27E+07	3.27E+07	3.28E+07	3.27E+07
2-Hexanone	30	1.96E+05	1.96E+05	1.97E+05	1.96E+05
Trichlorofluoromethane (Freon 11)	5,000	3.27E+07	3.27E+07	3.28E+07	3.27E+07
Dichlorodifluoromethane (Freon 12)	12,000	7.86E+07	7.84E+07	7.87E+07	7.84E+07
Chlorodifluoromethane (Freon 22)	50,000	3.27E+08	3.27E+08	3.28E+08	3.27E+08

Notes and abbreviations on last page.

Table 10
Maximum Allowable Stack Concentration Calculations
Bethpage Groundwater Containment System
Operable Unit 3 (Former Grumman Settling Ponds),
Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Compound	Percent of MASC[1]			
	8/19/2015	11/23/2015	4/1/2016	6/10/2016
1,1 - Dichloroethane	0.00%	0.06%	0.19%	0.10%
1,1 - Dichloroethene	0.00%	0.00%	0.00%	0.00%
2-Butanone	0.00%	0.00%	0.00%	0.00%
Acetone	0.00%	0.00%	0.00%	0.00%
Chloroform	0.01%	0.01%	0.04%	0.03%
Ethylbenzene	0.00%	0.00%	0.00%	0.00%
Xylene - o	0.00%	0.00%	0.00%	0.00%
Xylenes - m,p	0.00%	0.00%	0.00%	0.00%
Chloromethane	0.00%	0.00%	0.00%	0.00%
Chloroethane	0.00%	0.00%	0.00%	0.00%
Methylene Chloride	0.00%	0.00%	0.00%	0.00%
Tetrachloroethene	0.00%	0.01%	0.00%	0.01%
Trichloroethene	0.14%	0.11%	0.57%	0.13%
Vinyl Chloride	3.14%	0.97%	0.74%	0.63%
cis 1,2 Dichloroethene	0.00%	0.00%	0.00%	0.00%
Benzene	4.31%	3.42%	0.68%	0.36%
Chlorobenzene	0.00%	0.00%	0.00%	0.00%
Toluene	0.00%	0.00%	0.00%	0.00%
2-Hexanone	0.00%	0.00%	0.00%	0.00%
Trichlorofluoromethane (Freon 11)	0.00%	0.00%	0.00%	0.00%
Dichlorodifluoromethane (Freon 12)	0.00%	0.00%	0.00%	0.00%
Chlorodifluoromethane (Freon 22)	0.00%	0.00%	0.00%	0.00%

Notes and abbreviations on last page.

ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

(1)	Actual effluent concentrations are analytical results from air samples collected on the dates shown.
(2)	Compound-specific AGC values per the NYSDEC DAR-1 AGC/SGC tables, revised February 28, 2014.
(3)	Maximum allowable stack concentrations were calculated by dividing the product of the annual guideline concentration of a compound and the ratio of the SCREEN3 gas emission rate and the SCREEN3 average 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 a given monitoring event.
$\mu g/m^3$	micrograms per cubic meter
AGC	annual guideline concentration
MASC	maximum allowable stack concentration

Table 11
Concentrations of Volatile Organic Compounds in Groundwater
Samples Collected from Remedial Wells,
Bethpage Park Groundwater Containment System, Operable Unit 3, (Former Grumman Settling Ponds)
Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

COMPOUND (ug/L)	NYSDEC SCGs	Sample Location: Sample Date:	RW-1 8/19/2015	RW-1 11/23/2015	RW-1 4/1/2016	RW-1 6/10/2016	RW-2 8/19/2015	RW-2 11/23/2015	RW-2 4/1/2016	RW-2 6/10/2016	RW-3 8/19/2015	RW-3 11/23/2015	RW-3 4/1/2016	RW-3 6/10/2016	RW-4 8/19/2015	RW-4 11/23/2015	RW-4 4/1/2016	RW-4 6/10/2016
1,1,1-Trichloroethane	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,1,2,2-Tetrachloroethane	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,1,2-Trichloroethane	1		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,1-Dichloroethane	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**0.94 J**	**0.84 J**	**1.3**	**1.1**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**0.36 J**	**0.30 J**	**0.28 J**	**0.30 J**
1,1-Dichloroethene	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**0.35 J**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,2-Dichloroethane	0.6		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
1,2-Dichloropropane	1		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
2-Butanone	NE		< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U
4-methyl-2-pentanone	50		< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Acetone	NE		< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U
Benzene	1		< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Bromodichloromethane	50		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Bromoform	50		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Bromomethane	5		< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Carbon Disulfide	60		< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Carbon tetrachloride	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chlorobenzene	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chlorodibromomethane	50		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chlorodifluoromethane (Freon 22)	NE		< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	**9.6**	**7.1**	**4.9 J**	< 5.0 U	**30**	**25**	**17**	**17**
Chloroethane	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Chloroform	7		**0.20 J**	< 1.0 U	< 1.0 U	< 1.0 U	**3.3**	**3.1**	**4.2**	**3.2**	**9.9**	**5.2**	**3.1**	**2.5**	**0.38 J**	**0.28 J**	**0.26 J**	< 1.0 U
Chloromethane	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
cis-1,2-dichloroethene	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**30**	**59**	**53**	**40**	**1.9**	**1.8**	**2.2**	**1.8**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
cis-1,3-dichloropropene	0.4		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Dichlorodifluoromethane (Freon 12)	5		< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Dichloromethane	5		< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Ethylbenzene	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**1.4**	**1.9**	**2.8**	**2.3**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Methyl N-Butyl Ketone	50		< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Methyl tert-Butyl Ether	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Styrene	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Tetrachloroethene	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**0.25 J**	**0.61 J**	**0.62 J**	**0.64 J**	**0.49 J**
Toluene	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**9.5**	**28**	**28**	**22**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
trans-1,2-dichloroethene	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
trans-1,3-dichloropropene	0.4		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Trichloroethylene	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**10**	**9.9**	**8.6**	**11**	**2.2**	**2.2**	**2.6**	**2.2**	**0.54 J**	**0.61 J**	**0.72 J**	**0.57 J**
Trichlorofluoromethane (Freon 11)	5		< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Trichlorotrifluoroethane (Freon 113)	5		< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Vinyl Chloride	2		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**37**	**50**	**87**	**59**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Xylene-o	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**0.52 J**	**0.95 J**	**1.5**	**1.1**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Xylenes - m,p	5		< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**0.97 J**	**1.8**	**1.9**	**1.9**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Total VOCs (2)			**0.20**	**0**	**0**	**0**	**94**	**155**	**187**	**143**	**24**	**16**	**13**	**6.8**	**32**	**27**	**19**	**18**
Project VOCs (3)			**0**	**0**	**0**	**0**	**89**	**150**	**180**	**137**	**4.1**	**4.0**	**4.8**	**4.3**	**1.5**	**1.5**	**1.6**	**1.4**
1,4-Dioxane			**0.29**	**0.21 J**	**0.44**	**0.35**	**0.80**	**0.54**	**1.5**	**1.2**	**0.16 J**	**0.12 J**	**0.31**	**0.22**	**0.08 J**	**0.22**	< 0.11 U	< 0.11 U

Notes and abbreviations on last page.

Table 11
Concentrations of Volatile Organic Compounds in Groundwater
Samples Collected from Remedial Wells,
Bethpage Park Groundwater Containment System, Operable Unit 3, (Former Grumman Settling Ponds)
Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

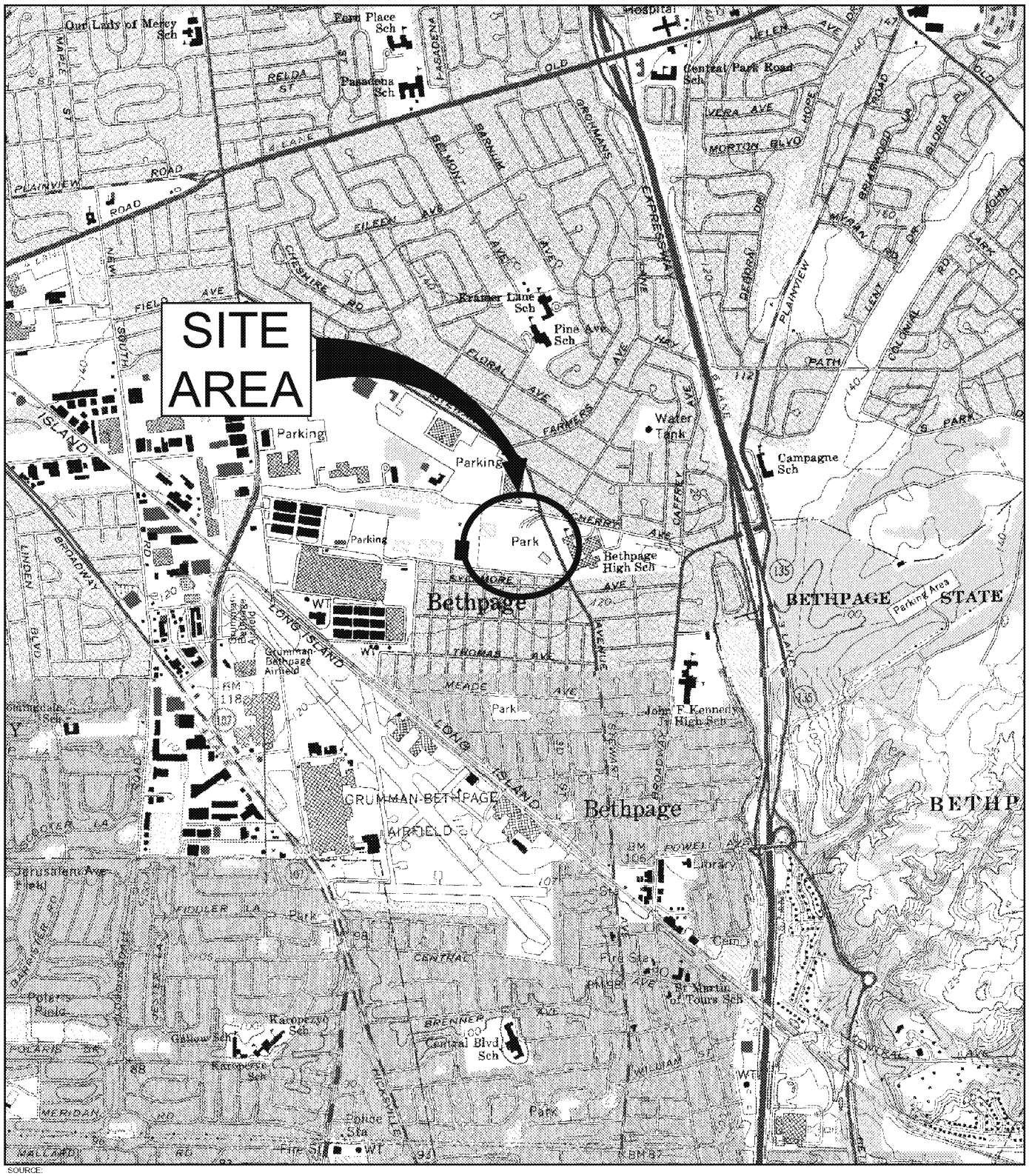
(1) Water samples collected by ARCADIS on the dates shown and submitted to a NYSDOH ELAP certified laboratory for VOC analyses per NYSDEC ASP 2005, Method OLM 4.3 (prior to September 1, 2014) and per USEPA Method 8260C (after September 1, 2014). Results validated following protocols specified in Sampling and Analysis Plan in the December 2009 OM&M Manual (ARCADIS 2009). See previous quarterly reports for historical analytical results.

(2) "Total VOCs" represents the sum of individual concentrations of the VOCs detected.

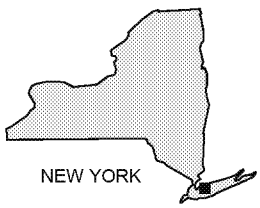
(3) "Project VOCs" represents the sum of individual compound concentrations of 1,1,1-trichloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; trichloroethene; vinyl chloride; cis-1,2-dichloroethene; trans-1,2-dichloroethene; benzene; toluene; and xylenes-o,m, and p.

	Indicates an exceedance of an SCG.
700	Bold data indicates a detection.
ASP	analytical services protocol
ELAP	Environmental Laboratory Approval Program
NYSDEC	New York State Department of Environmental Conservation.
NYSDOH	New York State Department of Health
SCGs	standards, criteria, and guidance values
VOC	volatile organic compound
µg/L	micrograms per liter
--	not analyzed
NE	not established
J	Compound detected below its reporting limit; value is estimated.
< 5; <5 U	Compound not detected above its laboratory quantification limit.

FIGURES



SOURCE:
USGS 7.5 MIN. AMITYVILLE QUADRANGLE, AMITYVILLE, N.Y., 1994, FREEPORT QUADRANGLE, FREEPORT, N.Y., 1994,
HICKSVILLE QUADRANGLE, HICKSVILLE, N.Y., 1967, PHOTOREVISED 1979, HUNTINGTON, N.Y., 1967, PHOTOREVISED 1979



0 2000' 4000'
SCALE IN FEET

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

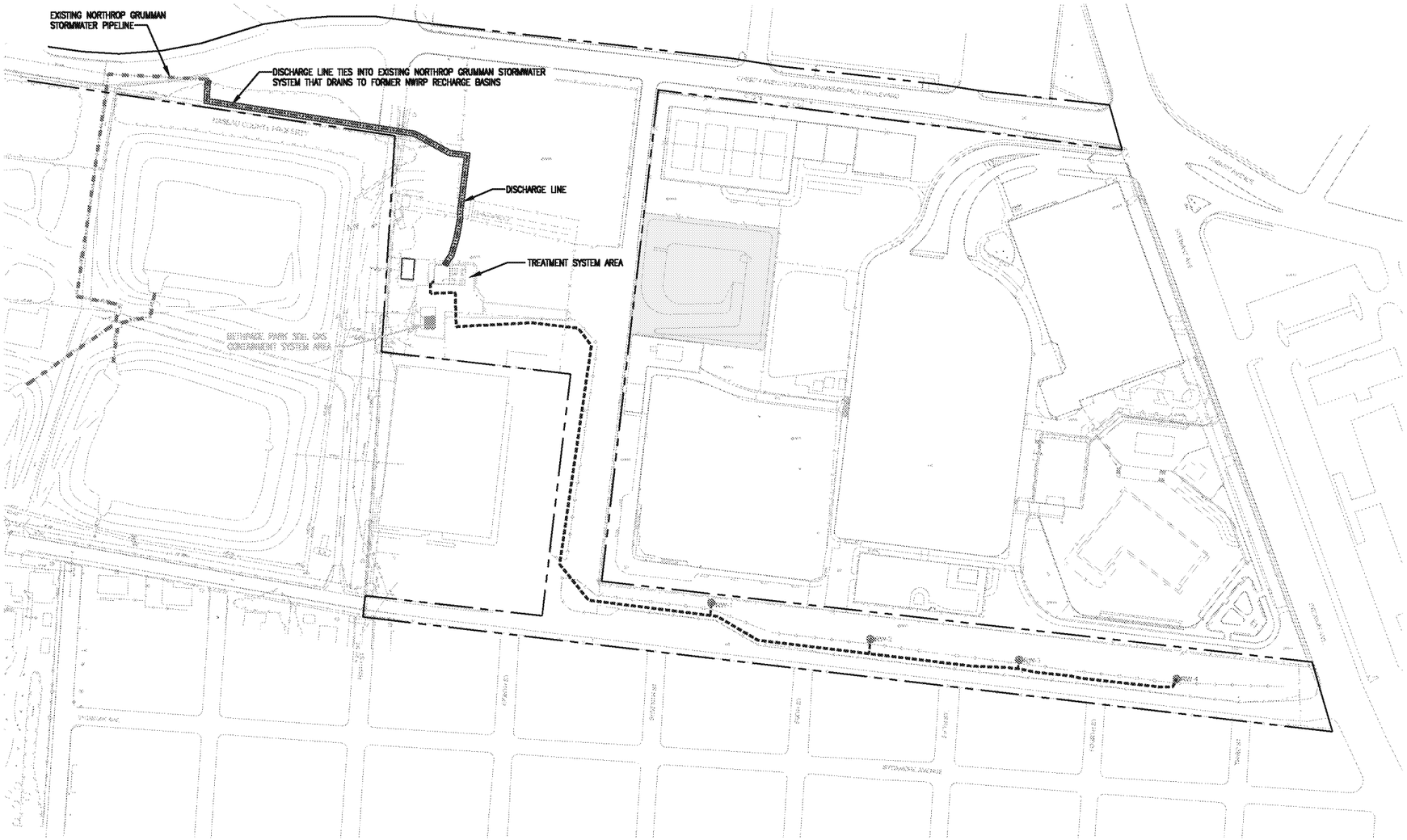
SITE LOCATION

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1

CITY:SYRACUSE-NY DIV/GROUP:ENV DB:A.SANCHEZ LD: PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\NY0014986\114\IOM\M4\NY1496_B01.dwg LAYOUT: BETHPAGE PARK SAVED: 11/11/2015 4:51 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 11/11/2015 4:54 PM BY: STOWELL, GARY

XREFS: IMAGES: AMITYVILLE.TIF FREEPORT.TIF HICKSVILLE.TIF HUNTINGTON.TIF PROJECTNAME: ----



LEGEND:

- NORTHROP GRUMMAN PROPERTY LINE
- FENCE
- BITUMINOUS PAVEMENT
- INFLUENT PIPELINE AND ELECTRICAL CONDUITS
- EFFLUENT PIPELINE
- EXISTING NORTHROP GRUMMAN STORMWATER PIPELINE
- EW-4 REMEDIAL WELL
- NWIRP NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NOW OWNED BY NASSAU COUNTY)

0 200' 400'

SCALE IN FEET

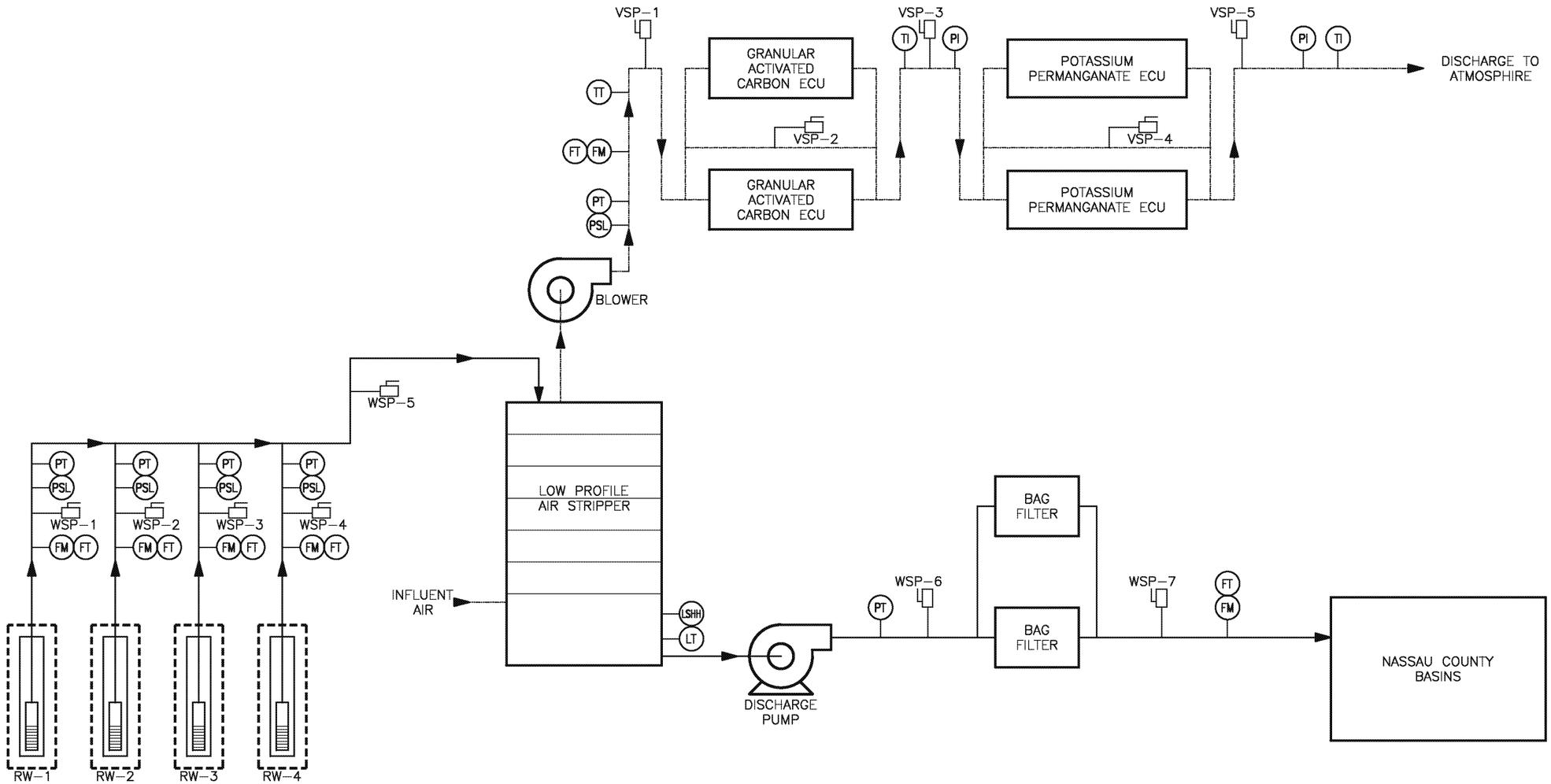
BETHPAGE PARK GROUNDWATER CONTAINMENT SYSTEM
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
BETHPAGE, NEW YORK

SITE AND GROUNDWATER CONTAINMENT SYSTEM

ARCADIS Design & Consultancy for natural and built assets

FIGURE 2

CITY:SYRACUSE-NY DIV/GROUP:ENV DB:A.SANCHEZ LD:AS PIC:(Opt) PW:(Reqd) TM:(Opt) LYR:(Opt)N=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\NY001498\1141\GMMA\NY1498B01.DWG LAYOUT: 2 SAVED: 11/11/2015 4:26 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 11/11/2015 4:54 PM BY: STOWELL, GARY
XREFS: X1498X00 X1498X01 IMAGES: PROJECTNAME: ----



LEGEND:

	PROCESS WATER
	PROCESS AIR
FM	INSTRUMENT
	SAMPLE PORT
	FLOW DIRECTION
FM	FLOW METER
FT	FLOW RATE TRANSMITTER
PSL	PRESSURE SWITCH LOW
PT	PRESSURE TRANSMITTER
PI	PRESSURE INDICATOR
LSHH	LEVEL SWITCH HIGH HIGH
LT	LEVEL TRANSMITTER
TT	TEMPERATURE TRANSMITTER
TI	TEMPERATURE INDICATOR
WSP	WATER SAMPLE PORT
VSP	VAPOR SAMPLE PORT
ECU	EMISSION CONTROL UNIT

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

GROUNDWATER TREATMENT SYSTEM PROCESS SCHEMATIC AND MONITORING LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3

CITY:SYRACUSE-NY DIV/GROUP:ENV DB:A.SANCHEZ LD:AS PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
\\arcadis-us.com\officedata\Syracuse-NYEN\CAD\SYRACUSE\ACT\NY001486\114\IO\MM\NY1486D02.dwg LAYOUT: 3 SAVED: 11/11/2015 2:57 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 5/13/2016 12:13 PM BY: HARRIS, JESSICA
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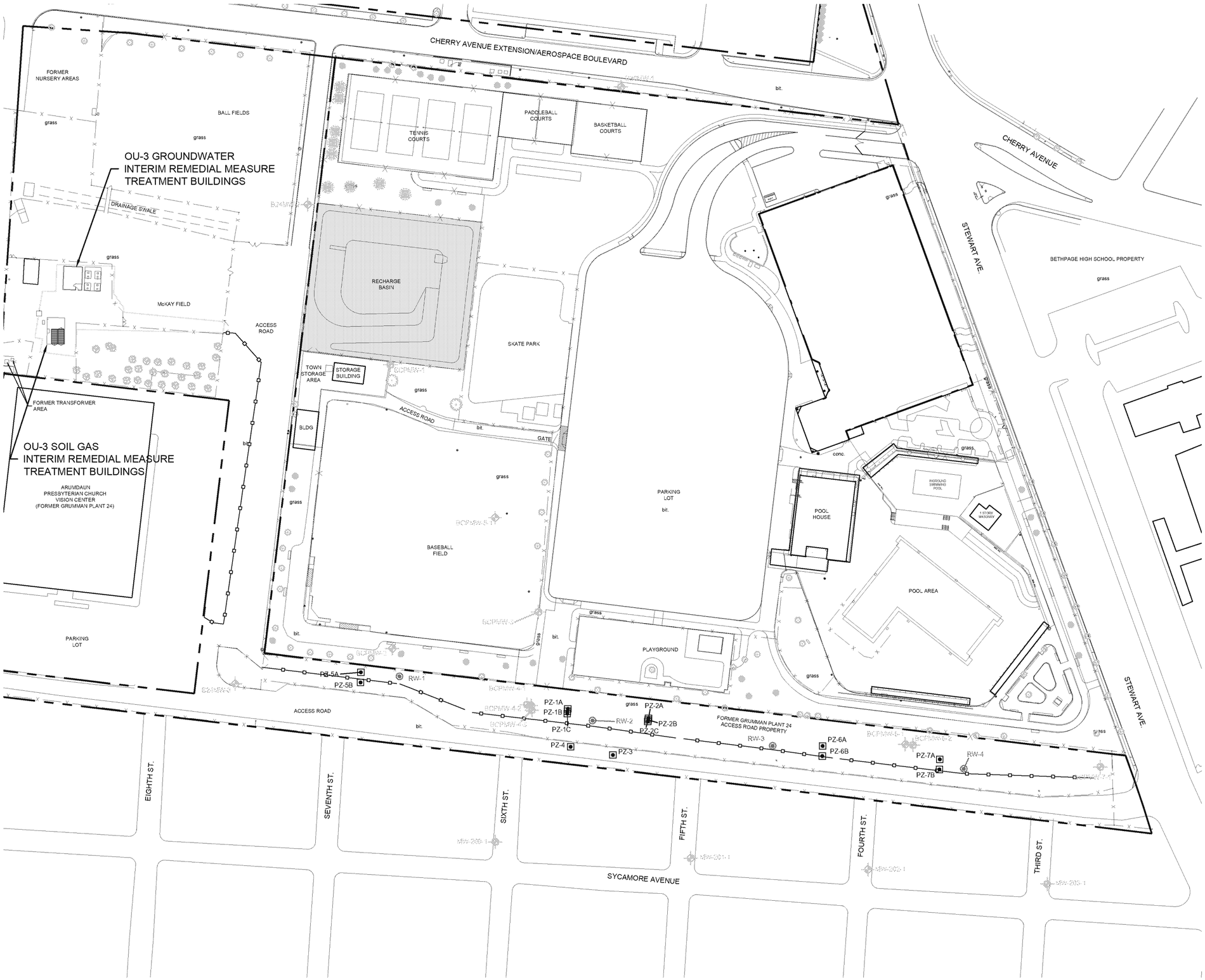


EXPLANATION:

- NORTHROP GRUMMAN PROPERTY LINE
- FENCE
- BASIN
- bit. BITUMINOUS PAVEMENT
- MONITORING WELL
- RW-2 REMEDIAL WELL
- PZ-2C PIEZOMETER

NOTES:

1. MONITORING WELLS, REMEDIAL WELLS, AND PIEZOMETERS SURVEYED TO NORTH AMERICAN DATUM (NAD) 83.
2. PARK FEATURES SHOWN WERE PRESENT PRIOR TO TOWN OF OYSTER BAY REDEVELOPMENT IN 2005.

0 100' 200'
SCALE IN FEET

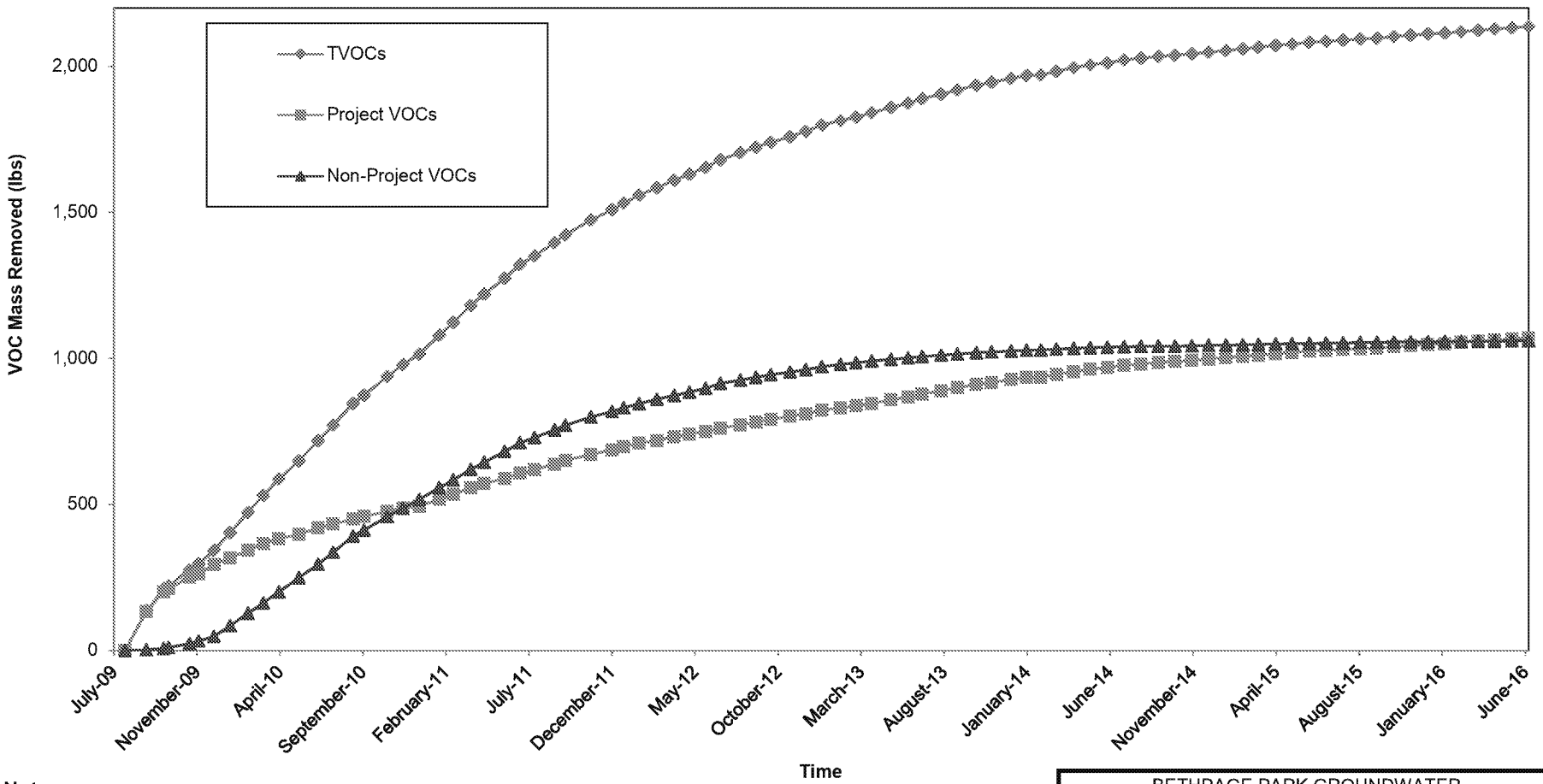
BETHPAGE PARK GROUNDWATER CONTAINMENT SYSTEM
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
BETHPAGE, NEW YORK

GROUNDWATER MONITORING NETWORK SITE PLAN

ARCADIS Design & Consultancy for natural and built assets

FIGURE 4

CITY:(Read) DIV:(GROUP:(Read) DB:(Read) LD:(Opt) PIC:(Opt) PM:(Read) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIVI\00146\114\OU\Mx11466W02.dwg LAYOUT: 4 SAVED: 11/11/2015 4:33 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: PDF PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 11/11/2015 4:54 PM BY: STOWELL, GARY
XREFS: IMAGES: PROJECTNAME: ----
X114SBX01



Notes:

VOC = volatile organic compound

lbs = pounds

TVOCs = total VOCs detected

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.

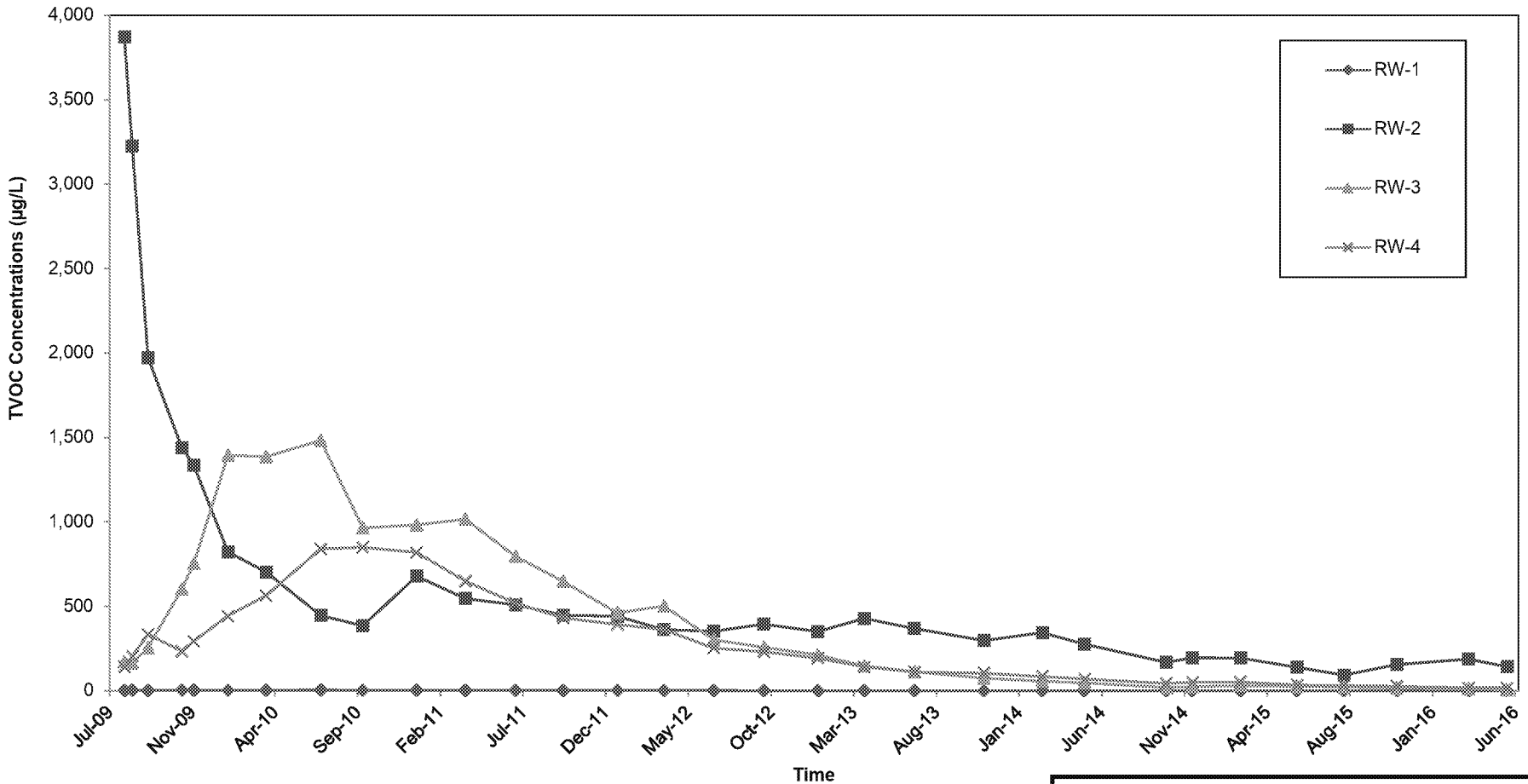
Non-Project VOCs = sum of VOCs that are not Project VOCs.

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

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

ARCADIS

FIGURE 5



Notes:

VOC = volatile organic compound

µg/L = micrograms per liter

TVOCs = total VOCs detected

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

REMEDIAL WELL TVOC CONCENTRATIONS THROUGH JUNE 2016

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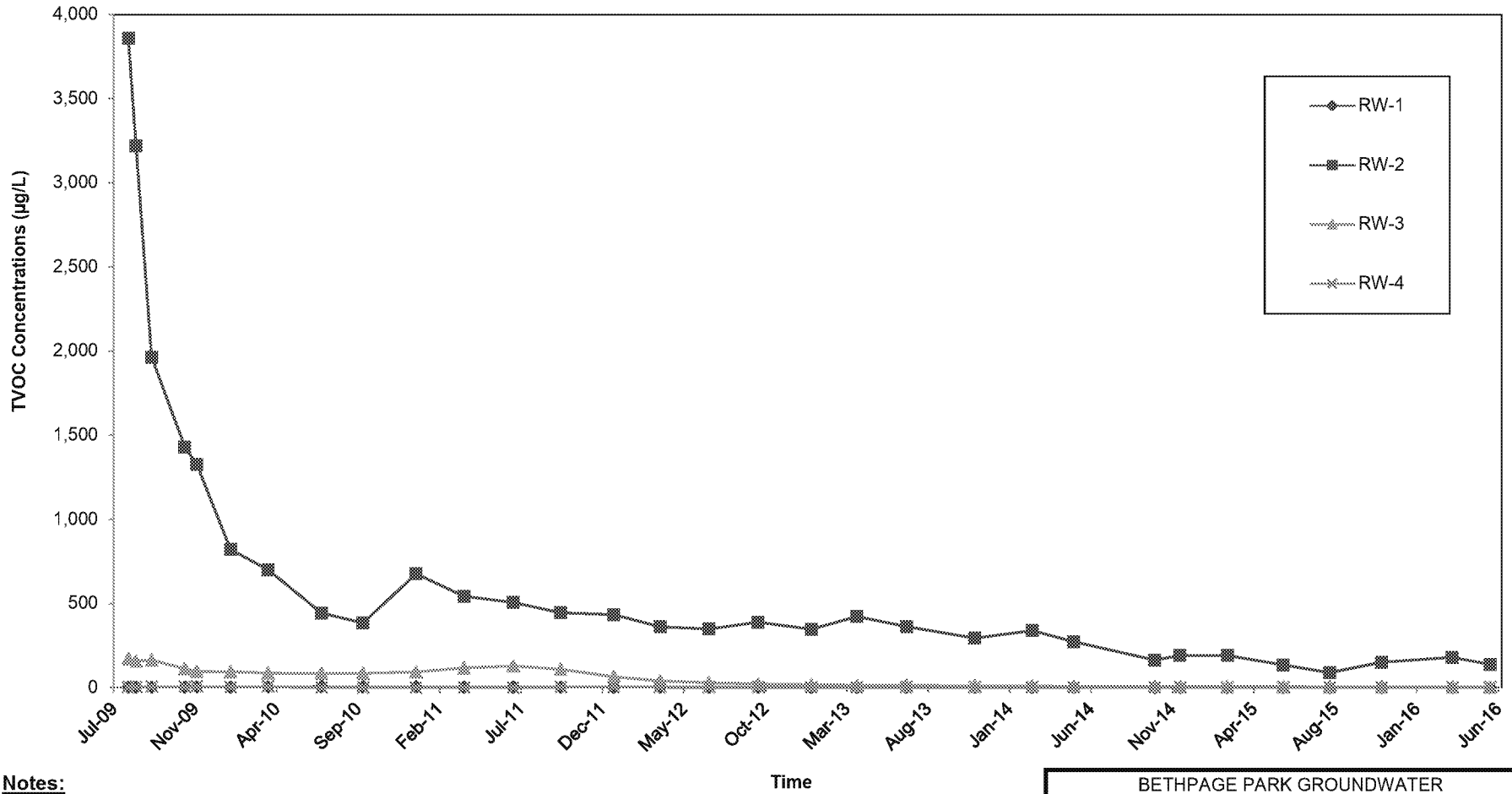
FIGURE **6A**



Notes:

VOC = zolatile organic compound

µg/L = micrograms per liter

TVOCs = total VOCs detected

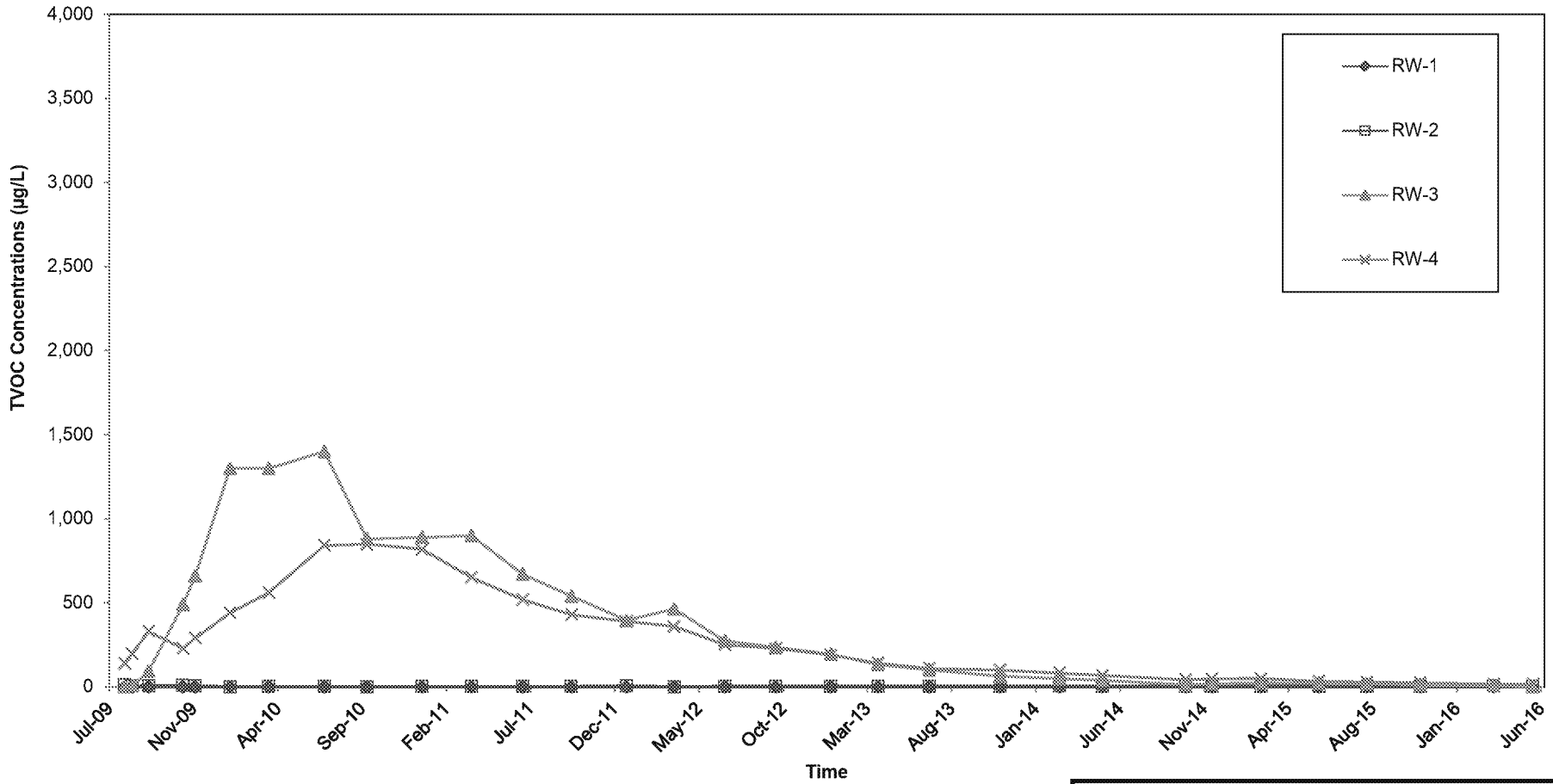
Project VOCs = sum of 1,1,1-trichloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; trichloroethene; vinyl chloride; cis-1,2-dichloroethene; trans-1,2-dichloroethene; benzene; toluene and total xylenes.

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

REMEDIAL WELL PROJECT VOC CONCENTRATIONS THROUGH JUNE 2016

ARCADIS

FIGURE
6B



Notes:

VOC = volatile organic compound

µg/L = micrograms per liter.

TVOCs = total VOCs detected.

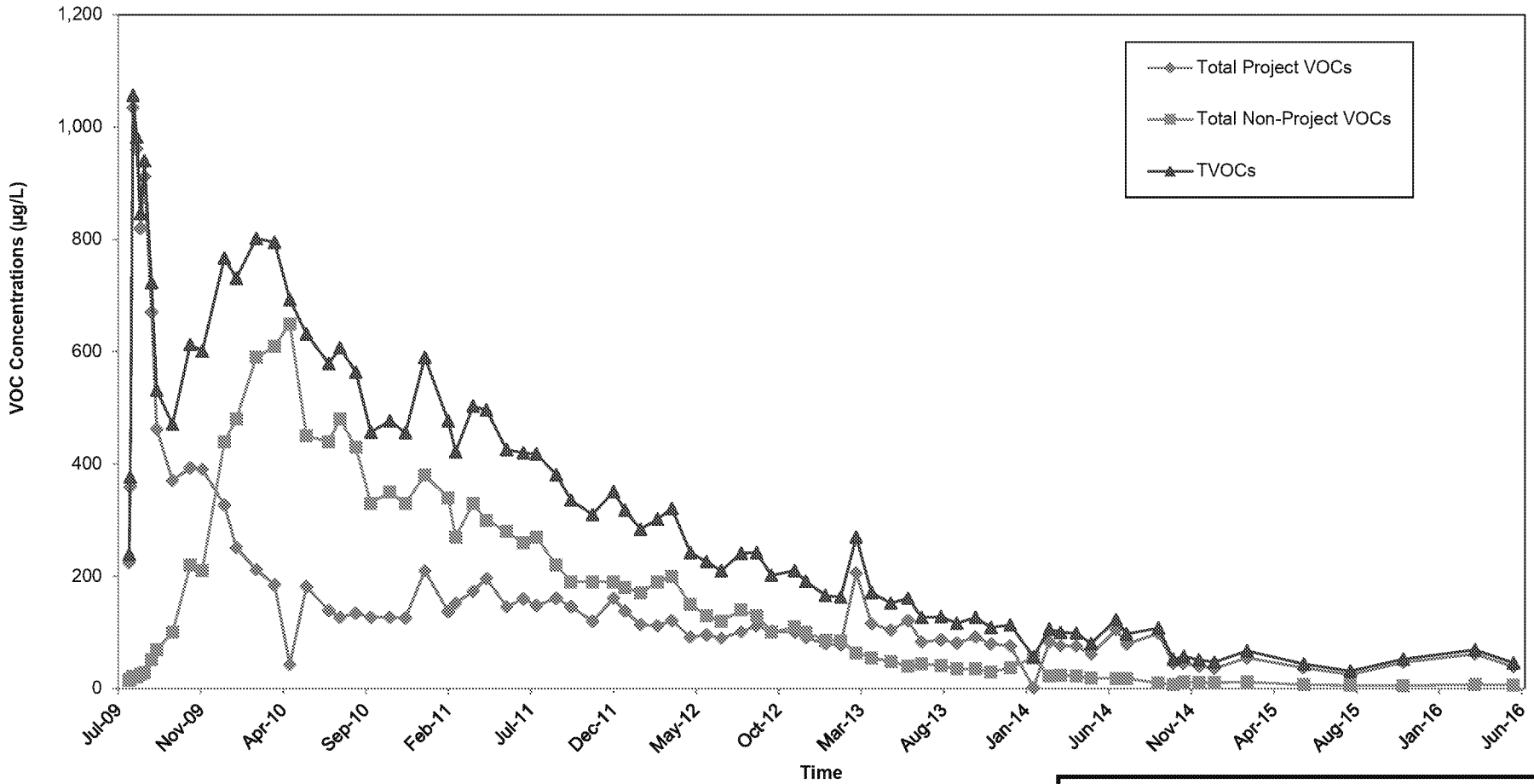
Non-Project VOCs = sum of TVOCs that are not Project VOCs.

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

REMEDIAL WELL NON-PROJECT VOC CONCENTRATIONS THROUGH JUNE 2016

ARCADIS

FIGURE
6C



Notes:

VOC = volatile organic compound

µg/L = micrograms per liter

TVOCs = total VOCs detected.

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.

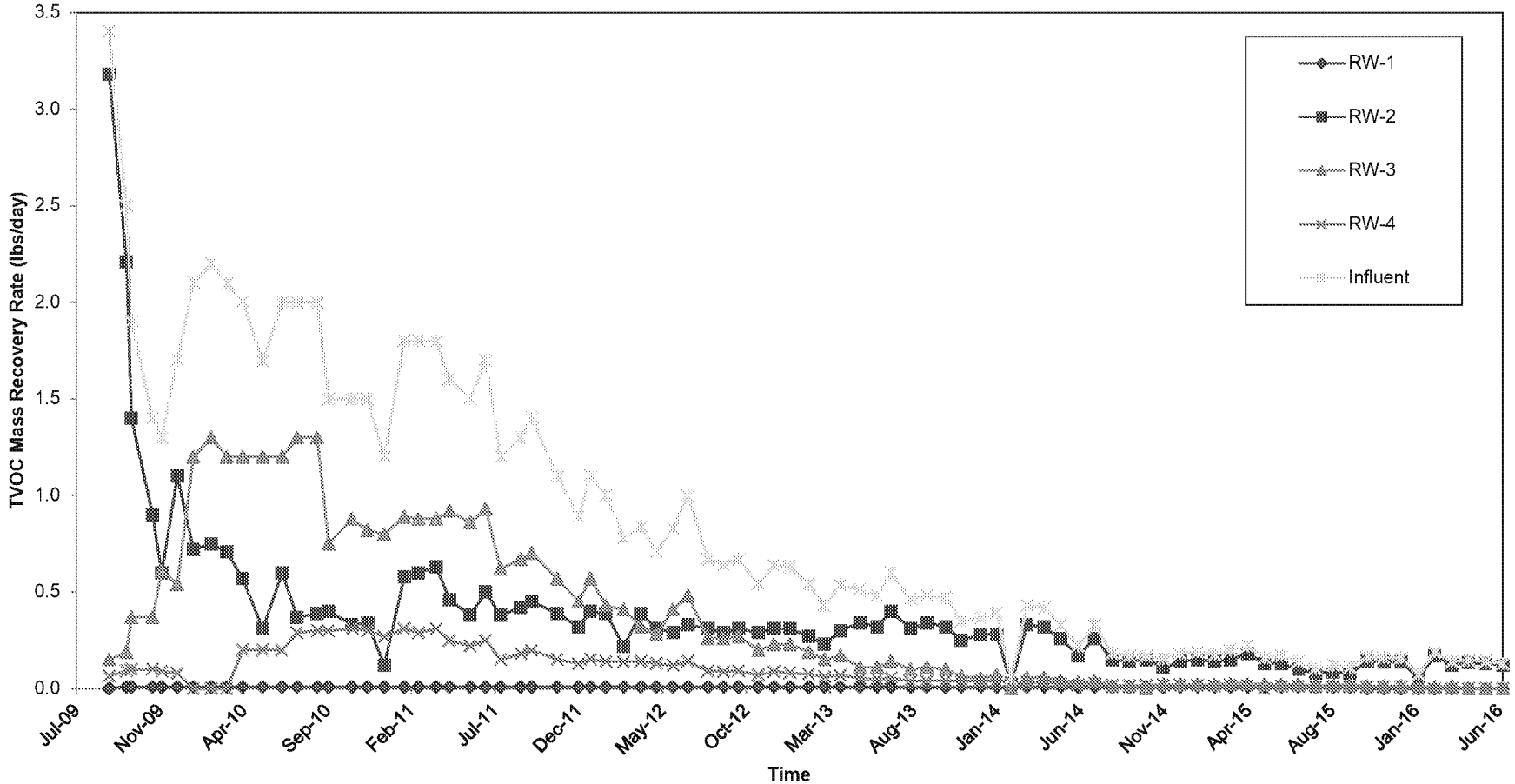
Non-Project VOCs = sum of VOCs that are not Project VOCs.

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

INFLUENT TOTAL, PROJECT AND NON-PROJECT VOC CONCENTRATIONS THROUGH JUNE 2016

ARCADIS

FIGURE 7



Notes:

VOC = volatile organic compound

lbs/day = pounds per day

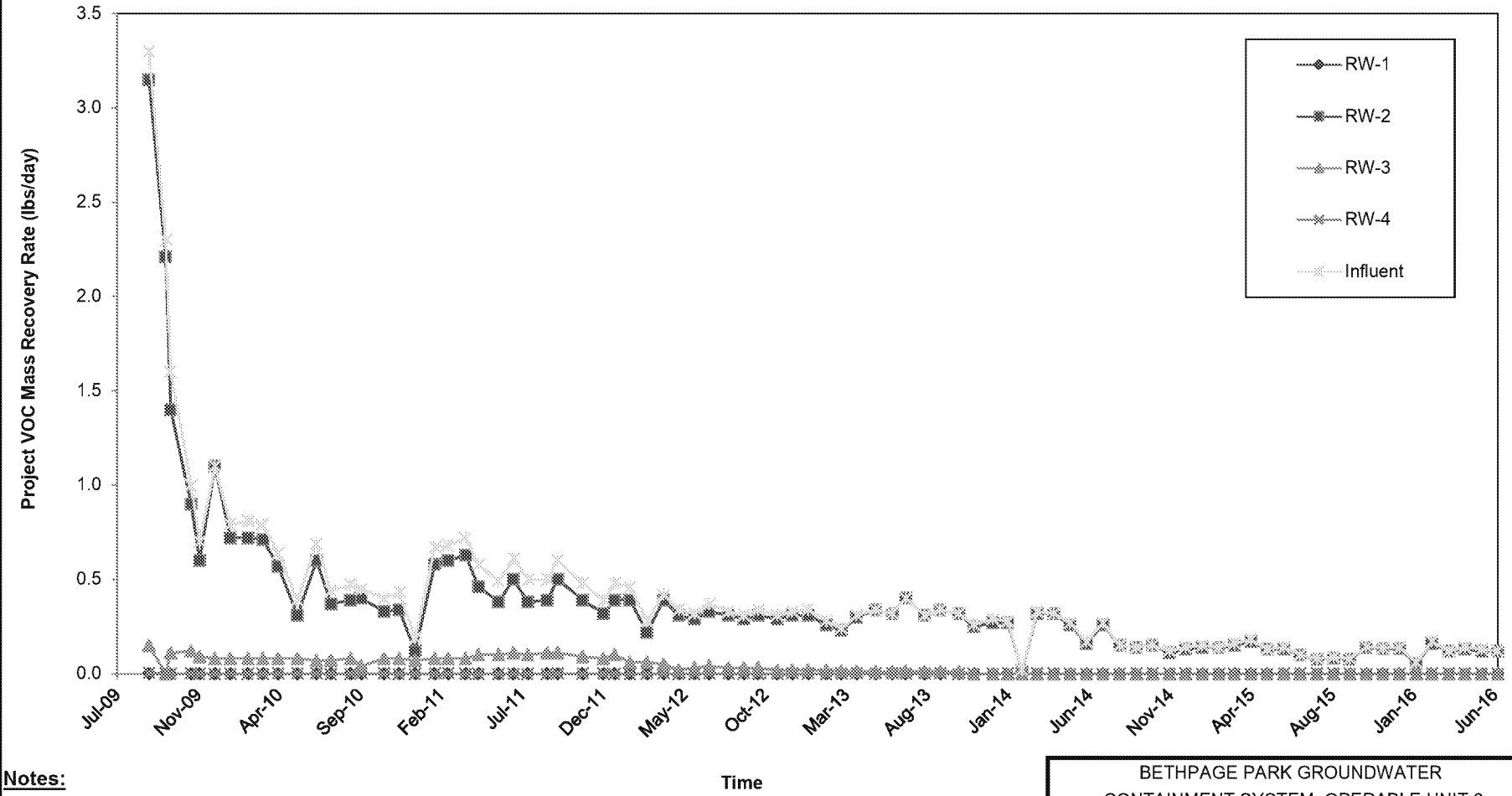
TVOCs = total VOCs detected

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

TVOC MASS RECOVERY RATES THROUGH JUNE 2016

ARCADIS

FIGURE
8A



Notes:

VOC = volatile organic compound

lbs/day = pounds per day.

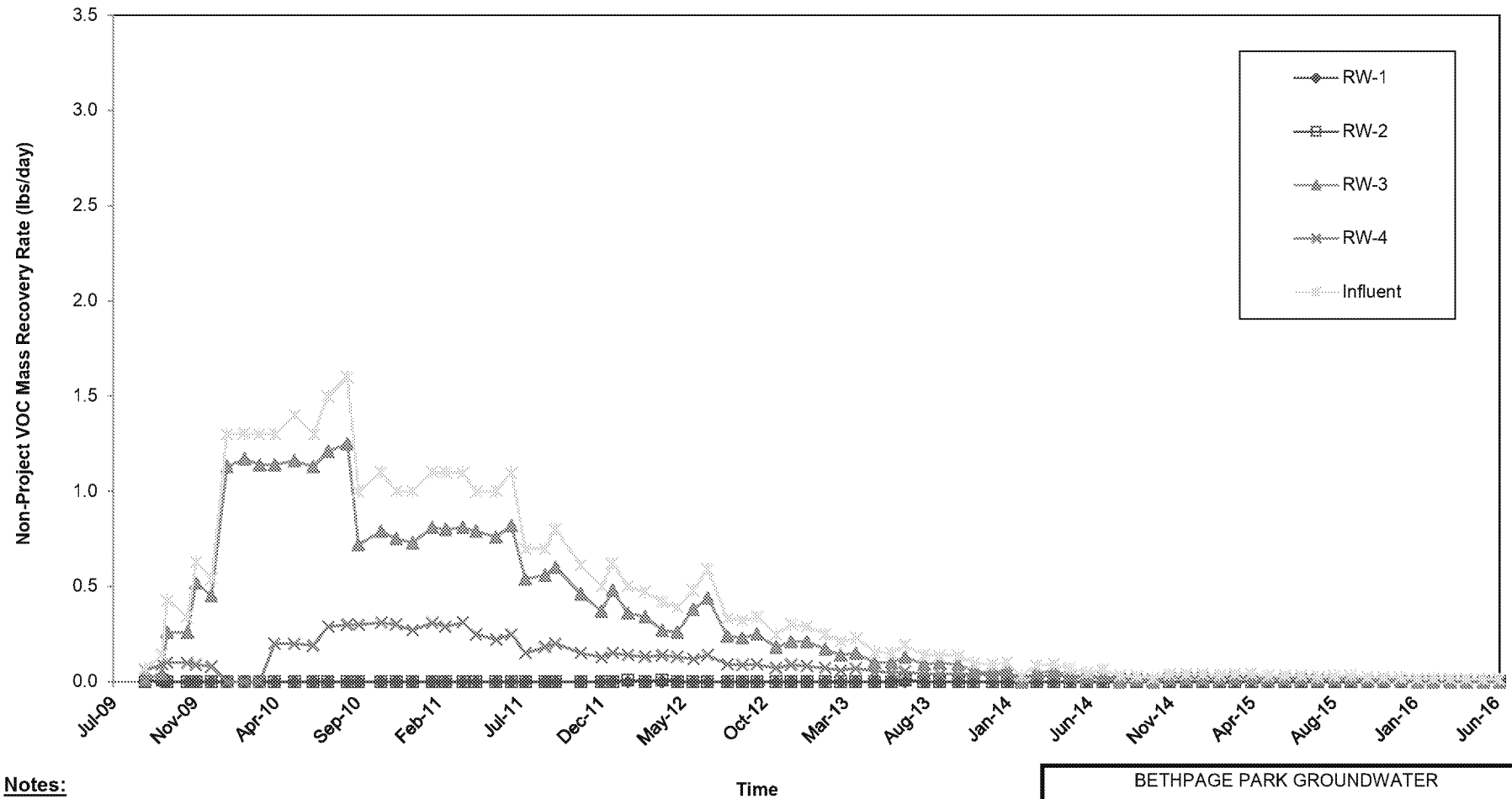
Project VOCs = Sum of 1,1,1-trichloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; trichloroethene; vinyl chloride; cis-1,2-dichloroethene; trans-1,2-dichloroethene; benzene; toluene; and total xylenes

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

PROJECT VOC MASS RECOVERY RATES THROUGH JUNE 2016

ARCADIS

FIGURE **8B**



Notes:

VOC = volatile organic compound

lbs/day = pounds per day

Non-Project VOCs = sum of VOCs that are not Project VOCs.

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

NON-PROJECT VOC MASS RECOVERY RATES THROUGH JUNE 2016

ARCADIS

FIGURE **8C**