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Subject:

Results of Second Quarter 2018 System Operation and Monitoring, Bethpage Park Groundwater Containment System (BPGWCS), Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York, NYSDEC Site #1-30-003A.

ENVIRONMENT

Date:

August 28, 2018

Contact:

Christopher Engler

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Our ref:

NY001496.32TM.RPTI4

Dear Jason:

Enclosed is one electronic PDF copy of the second quarter results of the 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) in line with NYSDEC's paper reduction program, 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.



Christopher Engler, PE
New York PE-069748

Vice President

Enclosure

Mr. Jason Pelton
August 28, 2018

Copies:

Edward Hannon, Northrop Grumman Corporation
Donald Hesler, NYSDEC
Steven Karpinski, NYS Dept. of Health
John Lovejoy, Nassau County Dept. of Health
Lorenzo Thantu, USEPA
Carlo San Giovanni, Arcadis
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TABLES



Table 1
Operational Summary
Bethpage Park Groundwater Containment System
Operable Unit 3 (Former Grumman Settling Ponds)
Bethpage, New York

MONTH	DAY																															Days Operational ¹	
	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		
2009 Total																																160	
2010 Total																																352	
2011 Total																																351	
2012 Total																																353	
2013 Total																																354	
2014 Total																																349	
2015 Total																																348	
2016 Total																																351	
2017 Total																																354	
1Q 2018																																90	
Apr 2018													²																			25	
May 2018			³																														30
June 2018																	⁴									⁵						26	
2Q 2018																																81	
2018 total																																171	
TOTAL																																3053	

Legend:

-  Indicates system online the majority or all of the day.
-  Indicates system operated with reduced flow rates.
-  Indicates system off-line the majority or all of the day.

Abbreviations, Notes, and Units on last page.

Table 1
Operational Summary
Bethpage Park Groundwater Containment System
Operable Unit 3 (Former Grumman Settling Ponds)
Bethpage, New York

Notes:

1. Days the system was operational for the majority of the day are counted as one day.

Second Quarter 2018

2. System was shut down for approximately 5 days. Shutdown precursor is unknown due to internet failure causing a loss in connectivity. The internet was restored on April 14, 2018. System was brought back online on April 17, 2018.
3. System shutdown for PSEG switchgear changeout.
4. System shutdown for approximately 4 days due to PLC failure. PLC was replaced on June 22, 2018 and system was brought back online.
5. RW-3 pump failed and was replaced on July 5, 2018.

Abbreviations/Units:

1Q	First Quarter
2Q	Second Quarter
PLC	Programmable Logic Controller
PSEG	Public Service Enterprise Group
RW	Recovery Well
gpm	gallons per minute

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

Compound	08/16/17 (µg/L)	11/29/17 (µg/L)	02/01/18 (µg/L)	04/04/18 (µg/L)
Project VOCs				
1,1,1 - Trichloroethane	< 1.0	< 1.0	< 1.0	< 0.50
1,1 - Dichloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,2 - Dichloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,1 - Dichloroethene	< 1.0	< 1.0	< 1.0	< 0.50
Tetrachloroethene	< 1.0	< 1.0	< 1.0	< 0.50
Trichloroethene	3.3	3.9	2.8	2.9
Vinyl Chloride	2.1	4.3	3.0	6.3
cis 1,2-Dichloroethene	4.1	6.2	6.5	7.5
trans 1,2-Dichloroethene	< 1.0	< 1.0	< 1.0	< 0.50
Benzene	< 0.50	< 0.50	< 0.50	< 0.50
Toluene	< 1.0	< 1.0	< 1.0	< 1.0
Xylene-O	< 1.0	< 1.0	< 1.0	< 1.0
Xylenes - M,P	< 1.0	< 1.0	< 1.0	< 1.0
Subtotal Project VOCs	9.5	14.4	12.3	16.7
Non-Project VOCs				
1,1,1,2-Tetrachloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Butanone	< 5.0	< 5.0	< 5.0	< 5.0
2-Butanone	< 10	< 10	< 10	< 10
4-Methyl-2-Pentanone	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	< 10	< 10	< 10	< 10
Bromodichloromethane	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0 J	< 1.0	< 1.0
Bromomethane	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	< 1.0	< 1.0	< 1.0	< 1.0
Chlorodibromomethane	< 1.0	< 1.0	< 1.0	< 1.0
Chlorodifluoromethane (Freon 22)	< 5.0	< 5.0	< 5.0	< 5.0
Chloroethane	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	0.71 J	0.65 J	0.47 J	0.54
Chloromethane	< 1.0	< 1.0	< 1.0 J	< 1.0
cis-1,3-Dichloropropene	< 1.0	< 1.0	< 1.0	< 1.0

Abbreviations, Notes, Qualifiers, and Units on last page.

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

Compound	08/16/17 (µg/L)	11/29/17 (µg/L)	02/01/18 (µg/L)	04/04/18 (µg/L)
<u>Non-Project VOCs</u>				
Dichlorodifluoromethane (Freon 12)	< 2.0	< 2.0	< 2.0 J	< 2.0
Dichloromethane	< 2.0	< 2.0	< 2.0	< 0.50
Ethylbenzene	< 1.0	< 1.0	< 1.0	< 1.0
Methyl N-Butyl Ketone	< 5.0	< 5.0	< 5.0	< 5.0
Methyl Tert-Butyl Ether	< 1.0	< 1.0	< 1.0	< 1.0
Styrene (Monomer)	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-Dichloropropene	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane (Freon 11)	< 2.0	< 2.0	< 2.0 J	< 2.0
Trichlorotrifluoroethane (Freon 113)	< 5.0	< 5.0	< 5.0	< 0.50
1-Chloro-1,1-difluoroethane (Freon 142b)	< 5.0	< 5.0	< 5.0	< 5.0
Subtotal Non-Project VOCs	0.71	0.65	0.47	0.54
Total VOCs¹	10	15	13	17
1,4-Dioxane ²	0.665	0.848	0.910	1.08
Compound	08/16/17 (µg/L)	11/29/17 (µg/L)	02/01/18 (µg/L)	04/04/18 (µg/L)
<u>Inorganics</u>				
Dissolved Cadmium	< 3.0	--	--	--
Total Cadmium	< 3.0	--	--	--
Dissolved Chromium	12	--	--	--
Total Chromium	11	--	--	--
Dissolved Iron	151	225	--	--
Total Iron	195	1080	--	--
pH³	5.6	5.7	5.6	5.7

Abbreviations, Notes, Qualifiers, and Units:

-- Not Analyzed

USEPA United States Environmental Protection Agency

VOC Volatile Organic Compound

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. 1,4-Dioxane samples analyzed using USEPA Method 522.

3. Influent pH samples collected and measured in the field by Arcadis personnel on the dates listed using a field calibrated pH/conductivity meter. pH units are standard units.

6.5 Bold value indicates a detection.

< 1.0 Compound not detected at or above the laboratory quantification limit.

J Compound detected below laboratory reporting limit; result is estimated.

µg/L micrograms per liter

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

Compound	Discharge Limit ¹ (µg/L)	01/11/18 (µg/L)	02/01/18 (µg/L)	03/01/18 (µg/L)	04/04/18 (µg/L)	05/11/18 (µg/L)	06/07/18 (µg/L)
Project VOCs							
1,1,1-Trichloroethane	5 ²	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1-Dichloroethene	5 ²	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Tetrachloroethene	5 ²	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Trichloroethene	5 ²	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Vinyl Chloride	5 ²	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
cis 1,2-Dichloroethene	5 ²	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
trans 1,2-Dichloroethene	5 ²	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Subtotal Project VOCs		0.0	0.0	0.0	0.0	0.0	0.0
Compound	Discharge Limit ¹ (µg/L)	01/11/18 (µg/L)	02/01/18 (µg/L)	03/01/18 (µg/L)	04/04/18 (µg/L)	05/11/18 (µg/L)	06/07/18 (µg/L)
Non-Project VOCs							
Chloroform	5 ²	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Dichloromethane	5 ²	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Trichlorotrifluoroethane (Freon 113)	5 ²	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Subtotal Non-Project VOCs		0.0	0.0	0.0	0.0	0.0	0.0
Total VOCs³		0	0	0	0	0	0
Treatment Efficiency⁴		> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%

Abbreviations, Notes, Qualifiers, and Units on last page.

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

Compound	Discharge Limit ¹ (µg/L)	01/11/18 (µg/L)	02/01/18 (µg/L)	03/01/18 (µg/L)	04/04/18 (µg/L)	05/11/18 (µg/L)	06/07/18 (µg/L)
<u>Inorganics</u>							
Dissolved Cadmium	5	--	< 3.0	--	< 3.0	--	--
Total Cadmium	5	--	< 3.0	--	< 3.0	--	--
Dissolved Chromium	50	--	< 10	--	< 10	--	--
Total Chromium	50	--	< 10	--	< 10	--	--
Dissolved Iron	600	150	116	181	172	158	< 100
Total Iron	600	204	183	229	218	106	< 100
Total Mercury	250	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
1,4-Dioxane ⁵	NE	0.819	0.997	1.45	0.997	0.984	0.646
pH ⁶	5.5 - 8.5	6.8	6.6	6.7	6.6	7.1	7.0

Abbreviations, Notes, Qualifiers, and Units:

MS	Matrix Spike
MSD	Matrix Spike Duplicate
--	Not Analyzed
NE	Not Established
NYSDEC	New York State Department of Environmental Conservation
SPDES	State Pollutant Discharge Elimination System
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

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 SPDES Permit Equivalency.
2. As of September 2017, the 10 SPDES VOCs discharge limits are per Site Number 1-30-003A Operable Unit 3 SPDES Permit Equivalency.
3. "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.
4. Treatment efficiency was calculated by dividing the difference between the influent and effluent total VOC concentrations by the influent total VOC concentration.
5. Samples collected were analyzed for 1,4-Dioxane using USEPA Method 522.
6. Effluent pH measured on site using an HACH Pocket Pro meter. pH units are standard units.

229 Bold value indicates a detection.
 < 1.0 Compound not detected above the laboratory quantification limit.
 µg/L micrograms per liter

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

Compound ¹	08/16/17 (µg/m ³)	11/29/17 (µg/m ³)	02/01/18 (µg/m ³)	04/05/18 (µg/m ³)
Project VOCs				
1,1,1 - Trichloroethane	0.71	0.65	0.46	0.87
1,1 - Dichloroethane	4.0	3.6	2.8	4.9
1,2 - Dichloroethane	< 0.81	< 0.81	< 0.65	0.45 J
1,1 - Dichloroethene	2.3	2.1	1.2	1.7
Tetrachloroethene	20	5.2	2.4	3.0
Trichloroethene	74.7	70.4	47	73.1
Vinyl Chloride	52.1	71.8	48.6	81.8
cis 1,2-Dichloroethene	93.6	122	105	137
trans 1,2-Dichloroethene	0.48 J	< 0.79	0.28 J	0.44 J
Benzene	< 0.64	0.32 J	0.45 J	0.61
Toluene	0.60 J	2.4	0.94	3.6
Xylene-O	< 0.87	< 0.87	< 0.69	0.74
Xylenes - M,P	< 0.87	0.69 J	0.48 J	1.1
Subtotal Project VOCs	248	279	210	309
Non-Project VOCs				
1,1,1,2-Tetrachloroethane	< 0.69	< 0.69	< 0.55	< 0.55
1,1,2-Trichloroethane	< 0.55	< 0.55	< 0.44	< 0.44
1,2-Dichloropropane	< 0.92	< 0.92	0.25 J	0.45 J
1,3-Butadiene	< 0.44	< 0.44	< 0.35	< 0.35
2-Butanone	0.65	0.62	0.41 J	4.7
4-Methyl-2-Pentanone	< 0.82	< 0.82	< 0.66	< 0.66
Acetone	4.3	7.1	4.0	22
Bromodichloromethane	< 0.67	< 0.67	< 0.54	< 0.54
Bromoform	< 0.41	< 0.41	< 0.33	< 0.33
Bromomethane	< 0.78	< 0.78	< 0.62	< 0.62
Carbon Disulfide	0.72	< 0.62	< 0.50	7.5
Carbon Tetrachloride	< 0.25	< 0.25	0.47	0.62
Chlorobenzene	< 0.92	< 0.92	< 0.74	< 0.74
Chlorodibromomethane	< 0.85	< 0.85	< 0.68	< 0.68
Chlorodifluoromethane (Freon 22)	26	16	14	14
Chloroethane	< 0.53	< 0.53	< 0.42	< 0.42
Chloroform	18	13	8.8	11
Chloromethane	1.3	1.3	1.3	1.2
cis-1,3-Dichloropropene	< 0.91	< 0.91	< 0.73	< 0.73
Dichlorodifluoromethane (Freon 12)	3.0	2.4	2.4	2.5
Dichloromethane	1.8	< 0.69	0.97	< 0.56
Ethylbenzene	0.42 J	< 0.87	0.37 J	1.1
Methyl N-Butyl Ketone	< 0.82	< 0.82	< 0.65	< 0.65
Methyl Tert-Butyl Ether	0.72	0.35 J	0.36 J	0.43 J
Styrene (Monomer)	< 0.85	< 0.85	< 0.68	< 0.68
trans-1,3-Dichloropropene	< 0.91	< 0.91	< 0.73	< 0.73
Trichlorofluoromethane (Freon 11)	1.9	1.9	1.7	1.9
Trichlorotrifluoroethane (Freon 113)	2.5	2.1	2.0	2.1
1-Chloro-1,1-difluoroethane (Freon 142b)	< 0.82	< 0.82	0.32 J	< 0.66
Subtotal Non-Project VOCs	61	45	37	70
Total VOCs²	309	324	247	379

Abbreviations, Notes, Qualifiers, and Units 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

Abbreviations, Notes, Qualifiers, and Units:

ELAP	Environmental Laboratory Approval Program
NYSDOH	New York State Department of Health
OM&M	Operation, Maintenance, and Monitoring
USEPA	United States 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. A VOC analyte list is provided in the DRAFT Bethpage Park Groundwater Containment System OM&M Manual (Arcadis 2016). 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.

105	Bold value indicates a detection.
< 1.0	Compound not detected above the laboratory quantification limit.
J	Compound detected below laboratory reporting limit; result is estimated.
$\mu\text{g}/\text{m}^3$	micrograms per cubic meter

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

Compound ¹	08/16/17 (µg/m ³)	12/1/2017 ³ (µg/m ³)	02/01/18 (µg/m ³)	04/05/18 (µg/m ³)
Project VOCs				
1,1,1 - Trichloroethane	< 0.55	< 0.55	< 0.44	0.60
1,1 - Dichloroethane	3.9	3.9	3.6	4.5
1,2 - Dichloroethane	< 0.81	< 0.81	0.32 J	0.36 J
1,1 - Dichloroethene	< 0.79	0.83	1.1	1.3
Tetrachloroethene	1.8	0.47	0.68	1.7
Trichloroethene	2.1	4.2	4.0	32
Vinyl Chloride	1.6	8.9	16	51.1
cis 1,2-Dichloroethene	10	31	51.9	100
trans 1,2-Dichloroethene	< 0.79	< 0.79	< 0.63	< 0.63
Benzene	5.8	1.6	1.5	1.1
Toluene	1.8	< 0.75	0.60	5.7
Xylene-O	< 0.87	< 0.87	< 0.69	0.34 J
Xylenes - M,P	0.87	< 0.87	0.40 J	0.69
Subtotal Project VOCs	28	51	80	199
Non-Project VOCs				
1,1,2,2-Tetrachloroethane	< 0.69	< 0.69	< 0.55	< 0.55
1,1,2-Trichloroethane	< 0.55	< 0.55	< 0.44	< 0.44
1,2-Dichloropropane	< 0.92	< 0.92	< 0.74	< 0.74
1,3-Butadiene	< 0.44	< 0.44	< 0.35	< 0.35
2-Butanone	4.4	1.1	5.0	5.6
4-Methyl-2-Pentanone	< 0.82	< 0.82	< 0.66	< 0.66
Acetone	72	43	82.7 D	23
Bromodichloromethane	< 0.67	< 0.67	< 0.54	< 0.54
Bromoform	< 0.41	< 0.41	< 0.33	< 0.33
Bromomethane	< 0.78	< 0.78	< 0.62	< 0.62
Carbon Disulfide	0.72	< 0.62	17	< 0.50
Carbon Tetrachloride	< 0.25	< 0.25	< 0.20	0.45
Chlorobenzene	< 0.92	< 0.92	< 0.74	< 0.74
Chlorodibromomethane	< 0.85	< 0.85	< 0.68	< 0.68
Chlorodifluoromethane (Freon 22)	22	17	15	< 0.56
Chloroethane	< 0.53	< 0.53	< 0.42	< 0.42
Chloroform	19	20	18	13
Chloromethane	1.6	1.2	1.8	1.1
cis-1,3-Dichloropropene	< 0.91	< 0.91	< 0.73	< 0.73
Dichlorodifluoromethane (Freon 12)	3.3	2.3	2.4	2.5
Dichloromethane	1.8	< 0.69	0.76	< 0.56
Ethylbenzene	0.43 J	< 0.87	< 0.69	0.43 J
Methyl N-Butyl Ketone	< 0.82	< 0.82	< 0.65	< 0.65
Methyl Tert-Butyl Ether	< 0.72	< 0.72	< 0.58	< 0.58
Styrene (Monomer)	< 0.85	< 0.85	< 0.68	< 0.68
trans-1,3-Dichloropropene	< 0.91	< 0.91	< 0.73	< 0.73
Trichlorofluoromethane (Freon 11)	2.2	1.9	1.9	1.9
Trichlorotrifluoroethane (Freon 113)	2.4	2.5	2.6	2.3
1-Chloro-1,1-difluoroethane (Freon 142b)	< 0.82	< 0.82	0.36 J	< 0.66
Subtotal Non-Project VOCs	130	89	148	50
Total VOCs²	158	140	228	250

Abbreviations, Notes, Qualifiers, and Units on last page.

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

Abbreviations, Notes, Qualifiers, and Units:

ELAP	Environmental Laboratory Approval Program
NYSDOH	New York State Department of Health
OM&M	Operation, Maintenance, and Monitoring
USEPA	United States 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. A VOC analyte list is provided in the DRAFT Bethpage Park Groundwater Containment System OM&M Manual (Arcadis 2016). 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. "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.

3. 2017 fourth quarter effluent vapor sample collected two days after the influent vapor sample.

15 Bold data indicates that the analyte was detected at or above the reporting limit.

< 1.0 Compound not detected above the laboratory quantification limit.

J Compound detected below laboratory reporting limit; result is estimated.

$\mu\text{g}/\text{m}^3$ micrograms per cubic meter

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

Compound ¹	08/16/17 (ppbv)	12/01/17 (ppbv)	02/01/18 (ppbv)	04/05/18 (ppbv)
Tentatively Identified Compounds				
alkane	14 JN	--	--	--
alkane	9.4 JN	--	--	--
alkane	9.2 JN	--	--	--
alkane	8.3 JN	--	--	--
alkane	7.8 JN	--	--	--
alkane	7.6 JN	--	--	--
alkane	7.4 JN	--	--	--
alkane	7.0 JN	--	--	--
alkane	7.0 JN	--	--	--
Carbon Dioxide	--	290 JNB	--	--
Pentyl-Cyclohexane	11 JN	2.4 JN	--	290 JNB
trans-2-methyl decalin	--	3.0 JN	--	--
Unknown	8.8 JN	--	--	--
Unknown	8.1 JN	--	--	--
Unknown	6.3 JN	--	--	--
Unknown	5.4 JN	--	--	--
Unknown	4.4 JN	--	--	--
Unknown Alkane	6.5 JN	--	--	--
Unknown Alkane	6.1 JN	--	--	--
Unknown Alkane	5.1 JN	--	--	--
Unknown Alkane	5.0 JN	--	--	--
Unknown Alkene	7.9 JN	--	--	--
Unknown Alkene	--	--	--	19 JN
Total VOC TICs	152 JN	5.4 JN	0	19 JN

Abbreviations, Notes, Qualifiers, and Units:

ELAP	Environmental Laboratory Approval Program
NYSDOH	New York State Department of Health
OM&M	Operation, Maintenance, and Monitoring
TIC	Tentatively Identified Compound
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

- 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 Bethpage Park Groundwater Containment System OM&M Manual (Arcadis 2016). 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.
- The ECUs were placed in a parallel configuration on 3/1/2018 to test for performance gain.
- VSP-5 sample location moved to location parallel ECUs near effluent stack.

290	Bold data indicates that the TIC was detected at or above the reporting limit.
--	TIC not detected.
B	TIC was detected in the associated field blank.
J	TIC detected below the laboratory reporting limit; result is estimated.
N	Indicates presumptive evidence of a compound.

ppbv parts per billion by volume

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

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 Influent				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)
08/01/17	30.7	77.1	74.6	29.5	212	242	55	50	25	55	10	1,607	4.9	2.5	1.0	1.5	0.0	538
08/16/17	30.3	75.0	75.0	30.8	211	234	55	67	17	54	10	1,549	6.0	2.9	1.0	1.8	0.0	542
09/09/17	29.2	61.2	75.3	29.8	196	226	56	16	18	55	13	1,596	6.0	2.9	1.0	1.7	0.0	540
10/12/17	30.4	74.0	74.4	29.9	209	239	55	69	19	55	15	1,577	6.0	2.9	1.0	1.6	0.0	539
11/29/17	30.8	84.3	62.8	30.2	208	240	54	51	50	54	13	1,571	5.5	2.5	0.5	1.5	0.0	532
12/20/17	31.0	80.5	63.6	30.4	205	237	54	53	46	54	14	1,551	5.5	2.5	0.5	1.5	0.0	532
01/11/18	31.0	78.8	63.6	30.0	203	231	54	53	45	54	20	1,591	5.5	2.5	0.5	1.5	0.0	528
02/01/18	30.9	61.5	69.8	29.5	192	224	54	11	23	55	17	1,563	5.9	2.5	0.5	1.5	0.0	530
03/01/18	30.5	97.0 ⁶	60.0	29.4	217 ⁸	248	55	7	52	55	19	1,555	0.6 ⁷	0.0 ⁷	0.2 ⁷	0.0 ⁷	0.2	532
04/04/18	30.4	88.5	59.7	29.8	208	239	55	6	51	55	23	1,522	0.5	0.0	0.0	0.0	0.0	532
05/11/18	30.1	80.4	76.0	30.3	217	219	54	6	7	54	20	1,888	0.0	0.0	0.0	0.0	0.0	531
06/07/18	30.1	60.0	75.6	30.0	196	201	54	5	6	55	13	1,859	0.0	0.0	0.0	0.0	0.0	535

Abbreviations, Notes, and Units on last page.

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

Abbreviations, Notes, and Units:

ECU	Emission Control Unit
GAC	Granular Activated Carbon
HMI	Human-Machine Interface
PPZ	Potassium Permanganate-impregnated Zeolite
RW	Remedial Well
SCADA	Supervisory Control and Data Acquisition
Temp	Temperature

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 recorded from field-mounted instruments during weekly site visits.
6. RW-2 flow rate was increased on 2/15/2018 to test for performance and life cycle gains.
7. The ECUs were placed in a parallel configuration on 3/1/2018 to test for performance gain.
8. Combined influent on 3/01/2018 was erroneously reported as 120 gpm in the 1Q OMM Report.

gpm	gallons per minute
iwc	inches of water column
psi	pounds per square inch
°R	degrees Rankine
scfm	standard cubic feet per minute

Table 8
Summary of 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



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 Totals⁸	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
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
2016 Totals	15,826	34,539	39,349	15,826	105,540	< 0.01	38	3.2	2.2	44	< 0.01	37	1.4	0.20	39	< 0.01	1.5	1.7	2.0	5.2	< 0.01	0.10	< 0.01	< 0.01	0.12	< 0.01	0.10	< 0.01	< 0.01	0.11	< 0.01	< 0.01	< 0.01	< 0.01	0.014
2017 Totals	16,005	31,600	37,614	15,965	101,184	< 0.01	13	2.2	1.2	17	< 0.01	13	1.1	0.16	14	< 0.01	0.56	1.1	1.1	2.7	< 0.01	0.037	< 0.01	< 0.01	0.05	< 0.01	0.035	< 0.01	< 0.01	0.038	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
January 2018 through March 2018 Totals																																			
01/01/18 - 02/01/18	1,368	3,184	1,951	1,324	7,828	< 0.01	1.5	0.053	0.067	1.6	< 0.01	1.5	0.042	< 0.01	1.5	< 0.01	0.029	0.011	0.058	0.098	< 0.01	0.048	< 0.01	< 0.01	0.052	< 0.01	0.048	< 0.01	< 0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
02/01/18 - 03/01/18	1,192	2,913	1,207	1,159	6,471	< 0.01	1.4	0.033	0.059	1.5	< 0.01	1.3	0.026	< 0.01	1.3	< 0.01	0.027	< 0.01	0.051	0.078	< 0.01	0.049	< 0.01	< 0.01	0.052	< 0.01	0.046	< 0.01	< 0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
03/01/18 - 04/01/18	1,343	4,300	1,828	1,322	8,794	< 0.01	2.0	0.050	0.067	2.1	< 0.01	2.0	0.040	< 0.01	2.0	< 0.01	0.039	0.010	0.058	0.11	< 0.01	0.065	< 0.01	< 0.01	0.068	< 0.01	0.065	< 0.01	< 0.01	0.07	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Subtotal Jan - Mar 2018⁹	3,904	10,397	4,986	3,806	23,093	< 0.01	4.9	0.14	0.19	5.2	< 0.01	4.8	0.11	< 0.01	4.9	< 0.01	0.10	0.021	0.17	0.28	< 0.01	0.054	< 0.01	< 0.01	0.058	< 0.01	0.053	< 0.01	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
April 2018 through June 2018 Totals																																			
04/01/18 - 05/01/18	1,132	3,140	2,376	1,105	7,754	< 0.01	1.5	0.059	0.057	1.6	< 0.01	1.5	0.044	< 0.01	1.5	< 0.01	0.026	0.015	0.052	0.093	< 0.01	0.050	< 0.01	< 0.01	0.054	< 0.01	0.049	< 0.01	< 0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
05/01/18 - 06/01/18	1,168	2,864	2,910	1,169	8,111	< 0.01	1.4	0.073	0.061	1.5	< 0.01	1.3	0.054	< 0.01	1.4	< 0.01	0.024	0.019	0.055	0.097	< 0.01	0.044	< 0.01	< 0.01	0.048	< 0.01	0.043	< 0.01	< 0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
06/01/18 - 07/01/18	1,128	2,762	2,233	1,105	7,228	< 0.01	1.3	0.056	0.057	1.4	< 0.01	1.3	0.041	< 0.01	1.3	< 0.01	0.023	0.014	0.052	0.089	< 0.01	0.044	< 0.01	< 0.01	0.048	< 0.01	0.043	< 0.01	< 0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Subtotal Apr - Jun 2018¹⁰	3,429	8,765	7,519	3,379	23,092	< 0.01	4.2	0.19	0.18	4.5	< 0.01	4.1	0.14	< 0.01	4.2	< 0.01	0.073	0.048	0.16	0.28	< 0.01	0.046	< 0.01	< 0.01	0.050	< 0.01	0.045	< 0.01	< 0.01	0.047	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2018 Totals	7,333	19,162	12,505	7,185	46,185	< 0.01	9.0	0.33	0.37	9.7	< 0.01	8.9	0.25	< 0.01	9.2	< 0.01	0.17	0.069	0.33	0.56	< 0.01	0.050	< 0.01	< 0.01	0.054	< 0.01	0.049	< 0.01	< 0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total¹¹	139,614	315,102	320,899	138,403	914,018	1.6	1,014	913	255	2,182	1.6	1,002	104	1.9	1,110	< 0.01	10	809	253	1,066	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Abbreviations, Notes, Qualifiers, and Units

NA Not Applicable
VOC Volatile Organic Compound.

- Represents operating period between consecutive monitoring events.
- 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.
- 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.
- 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.
- "Total VOCs" represents the sum of individual concentrations of the VOCs detected.
- "Project VOCs" represents the sum of individual compound concentrations of 1,1,1-trichloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; tetrachloroethene; trichloroethylene; vinyl chloride; cis-1,2-dichloroethene; trans-1,2-dichloroethene; benzene; toluene; and xylenes-o,m,p.
- "Non-Project VOCs" represents the difference between Total VOCs and Project VOCs.
- Values based on operational data recorded prior to system startup on July 21, 2009.
- The volume of groundwater recovered and mass recovered calculations represent the operational period between January 1, 2018 and April 1, 2018.
- The volume of groundwater recovered and mass recovered calculations represent the operational period between April 1, 2018 and July 1, 2018.
- "Total" refers to the amounts removed by the Operable Unit 3 Bethpage Park Groundwater Containment System.

< Less than
gal Gallons
lbs Pounds
lbs/day Pounds per day

Table 9
Summary of Air Quality Impact Analysis
Bethpage Park Groundwater Containment System
Operable Unit 3 (Former Grumman Settling Ponds)
Bethpage, New York

Toxic Air Contaminant	VSP-05 Vapor Effluent (µg/m ³)	Emission Rate ¹			Scaled Impact - Hourly ² (µg/m ³)	Scaled Impact - Annual ² (µg/m ³)	SGC ³ (µg/m ³)	AGC ³ (µg/m ³)	% of SGC	% of AGC
		4/5/2018	lb/yr	lb/hr						
Project VOCs										
1,1-Dichloroethane	4.5	0.23	2.62E-05	3.3E-06	1.0E-02	3.2E-04	--	0.63	--	0.1%
1,1-Dichloroethene	1.3	0.07	7.57E-06	9.53E-07	3.01E-03	9.2E-05	--	200	--	0.0%
1,2-Dichloroethane	0.36	0.02	2.10E-06	2.64E-07	8.32E-04	2.55E-05	--	3.8E-02	--	0.1%
Benzene	1.1	0.06	6.40E-06	8.1E-07	2.5E-03	7.8E-05	1,300	0.13	0.0%	0.1%
cis-1,2-Dichloroethene	100	5.10	5.82E-04	7.3E-05	2.3E-01	7.1E-03	--	63	--	0.0%
Tetrachloroethene	1.7	0.09	9.89E-06	1.2E-06	3.9E-03	1.2E-04	300	4	0.0%	0.0%
Toluene	5.7	0.29	3.32E-05	4.2E-06	1.3E-02	4.0E-04	37,000	5,000	0.0%	0.0%
Trichloroethene	32	1.63	1.86E-04	2.3E-05	7.4E-02	2.3E-03	20	0.20	0.4%	1.1%
Vinyl Chloride	51.1	2.61	2.97E-04	3.7E-05	1.2E-01	3.6E-03	180,000	0.11	0.0%	3.3%
Xylenes - M,P	0.69	0.04	4.02E-06	5.1E-07	1.6E-03	4.9E-05	22,000	100	0.0%	0.0%
Non-Project VOCs										
2-Butanone	5.6	0.29	3.26E-05	4.1E-06	1.3E-02	4.0E-04	13,000	5,000	0.0%	0.0%
Acetone	23	1.2	1.34E-04	1.7E-05	5.3E-02	1.6E-03	180,000	30,000	0.0%	0.0%
Chloroform	13	0.7	7.57E-05	9.5E-06	3.0E-02	9.2E-04	150	15	0.0%	0.0%
Chloromethane	1.1	0.06	6.40E-06	8.1E-07	2.5E-03	7.8E-05	22,000	90	0.0%	0.0%
Dichlorodifluoromethane (Freon 12)	2.5	0.13	1.45E-05	1.8E-06	5.8E-03	1.8E-04	--	12,000	--	0.0%
Trichlorofluoromethane (Freon 11)	1.9	0.10	1.11E-05	1.4E-06	4.4E-03	1.3E-04	9,000	5,000	0.0%	0.0%
Trichlorotrifluoroethane (Freon 113)	2.3	0.12	1.34E-05	1.7E-06	5.3E-03	1.6E-04	960,000	180,000	0.0%	0.0%

Abbreviations, Notes, and Units on last page.

Table 9
Summary of Air Quality Impact Analysis
Bethpage Park Groundwater Containment System
Operable Unit 3 (Former Grumman Settling Ponds)
Bethpage, New York



Abbreviations, Notes, and Units:

AGC	Annual Guideline Concentration
CAS#	Chemical Abstracts Service Registry Number
DAR-1	Division of Air Resources-1
--	None Specified
NYSDEC	New York State Department of Environmental Conservation
SGC	Short-term Guideline Concentration
VSP	Vapor Sampling Point

- Emission rate calculated based on VSP-05 effluent concentration and a daily average exit air flow rate of 1,557 ft³/min for 4/5/2018.
 $1,1,1\text{-Trichloroethane (lb/hr)} = \text{TCE } [\mu\text{g}/\text{m}^3] \times \text{Air Flow Rate } [\text{ft}^3/\text{min}] \times (1 \text{ m}^3/35.3147 \text{ ft}^3) \times (60 \text{ min/hr}) \times (0.000001 \text{ g}/1 \mu\text{g}) \times (0.0022 \text{ lb/g})$
 $\text{lb/yr} = \text{lb/hr} \times 8,760 \text{ hrs/yr}$
 $\text{g/s} = \text{lb/hr} \times \text{hr}/3,600 \text{ sec} \times 453.59 \text{ g/lb}$
- 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 (Brookhaven/Farmingdale) for the years 2011 through 2015. The maximum impact from all the year used for the calculations.
 $\text{Scaled hourly impact } (\mu\text{g}/\text{m}^3) = \text{AERMOD predicted hourly ambient impact at 1 g/s } ([\mu\text{g}/\text{m}^3]/[\text{g/s}]) \times \text{Actual emission rate (g/s)}$
 $\text{Scaled annual impact } (\mu\text{g}/\text{m}^3) = \text{AERMOD predicted annual ambient impact at 1 g/s } ([\mu\text{g}/\text{m}^3]/[\text{g/s}]) \times \text{Actual emission rate (g/s)}$

AERMOD Normalized Ambient Impact at 1 g/s	
Hourly ([\mu\text{g}/\text{m}^3]/[\text{g/s}])	Annual ([\mu\text{g}/\text{m}^3]/[\text{g/s}])
3,153.03	96.49

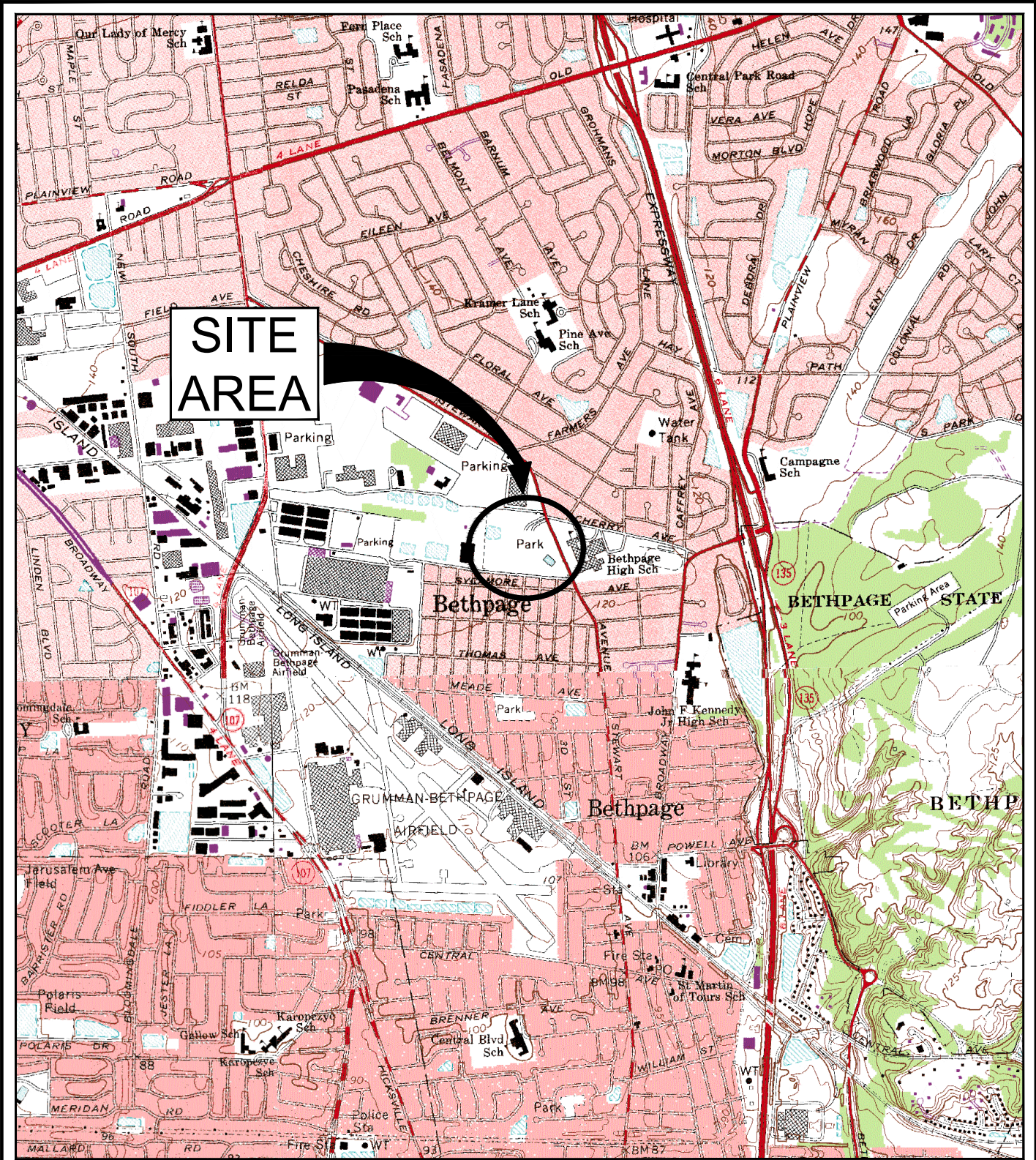
- Short-term and annual guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised August 10, 2016.
- Compounds not detected above the laboratory reporting limit are excluded from the air quality impact analysis summary.

cfm	cubic feet per minute
g/s	grams per second
lb/hr	pounds per hour
lb/yr	pounds per year
$\mu\text{g}/\text{m}^3$	micrograms per cubic meter

FIGURES



CITY:SYRACUSE-NY DIV:GROUP:ENV DB:A.SANCHEZ LD: PIC:(Opt) PM:(Read) TM:(Opt) LVR:(Opt)ON:"OFF"-REF.
 G:\ENV\CAD\STRACUSE\ACT\100149611\4\0\MIN\MIN\1496_BUI.dwg LAYOUT: BETHPAGE PARK. SAVED: 11/11/2015 4:53 PM ACADVER: 19.1S (LMS TECH) PAGES: 19. PAGESETUP: PLOTSTYLETABLE: PLOTTED: 11/11/2015 4:54 PM BY: STOWELL, GARY

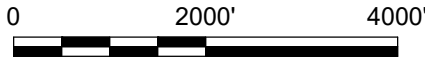


SITE AREA

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



NEW YORK



SCALE IN FEET

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

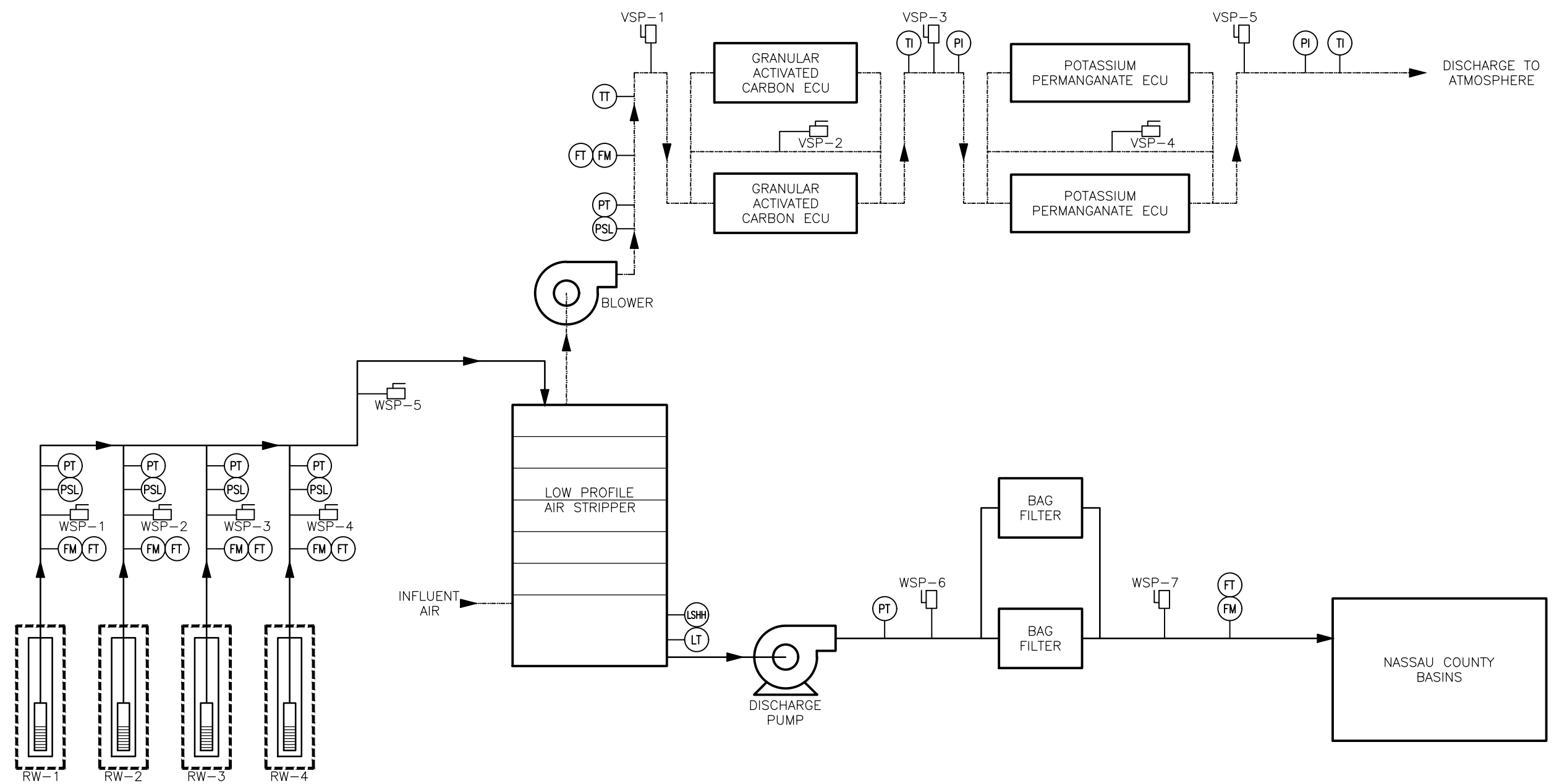
SITE LOCATION



FIGURE

1

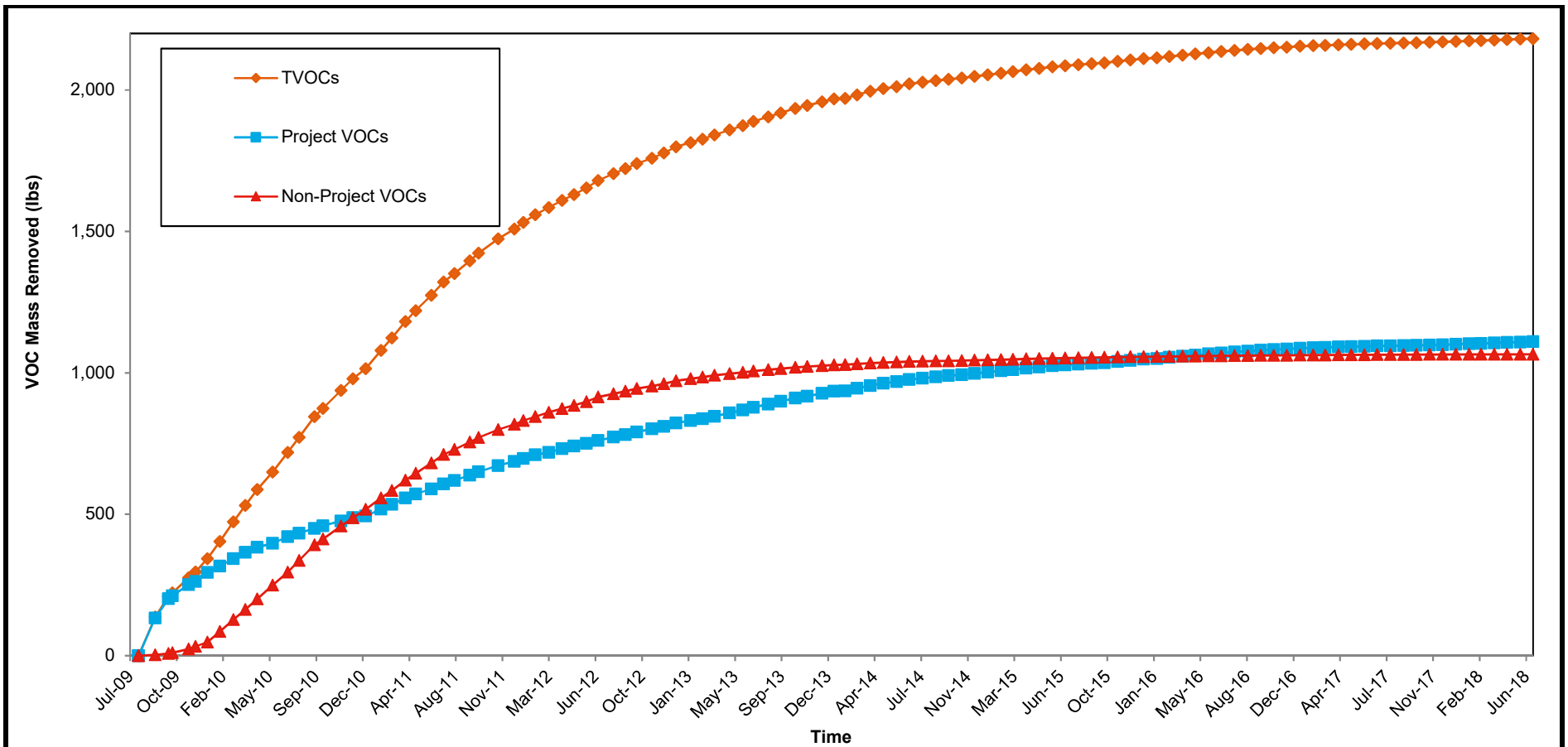
CITY:SYRACUSE-ENV DIV\GROUP:ENV DB:A-SANCHEZ LD:AS PIC:(Opt) PM:(Read) TM:(Opt) Lyr:(Option)-OFF=REF- PLOT:11/11/2015 4:57 PM ACADVER:21.05 (LMS TECH) PAGES:3 LAYOUT:3 SAVED:11/11/2015 4:57 PM BY: SANCHEZ, ADRIAN



- LEGEND:**
- PROCESS WATER
 - - - PROCESS AIR
 - ⊗ INSTRUMENT
 - SAMPLE PORT
 - ▶ FLOW DIRECTION
 - FM FLOW METER
 - FT FLOW RATE TRANSMITTER
 - PSL PRESSURE VACUUM 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

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**GROUNDWATER TREATMENT SYSTEM
 PROCESS SCHEMATIC AND
 MONITORING LOCATIONS**



Abbreviations, Notes, and Units:

VOC = Volatile Organic Compound
 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.

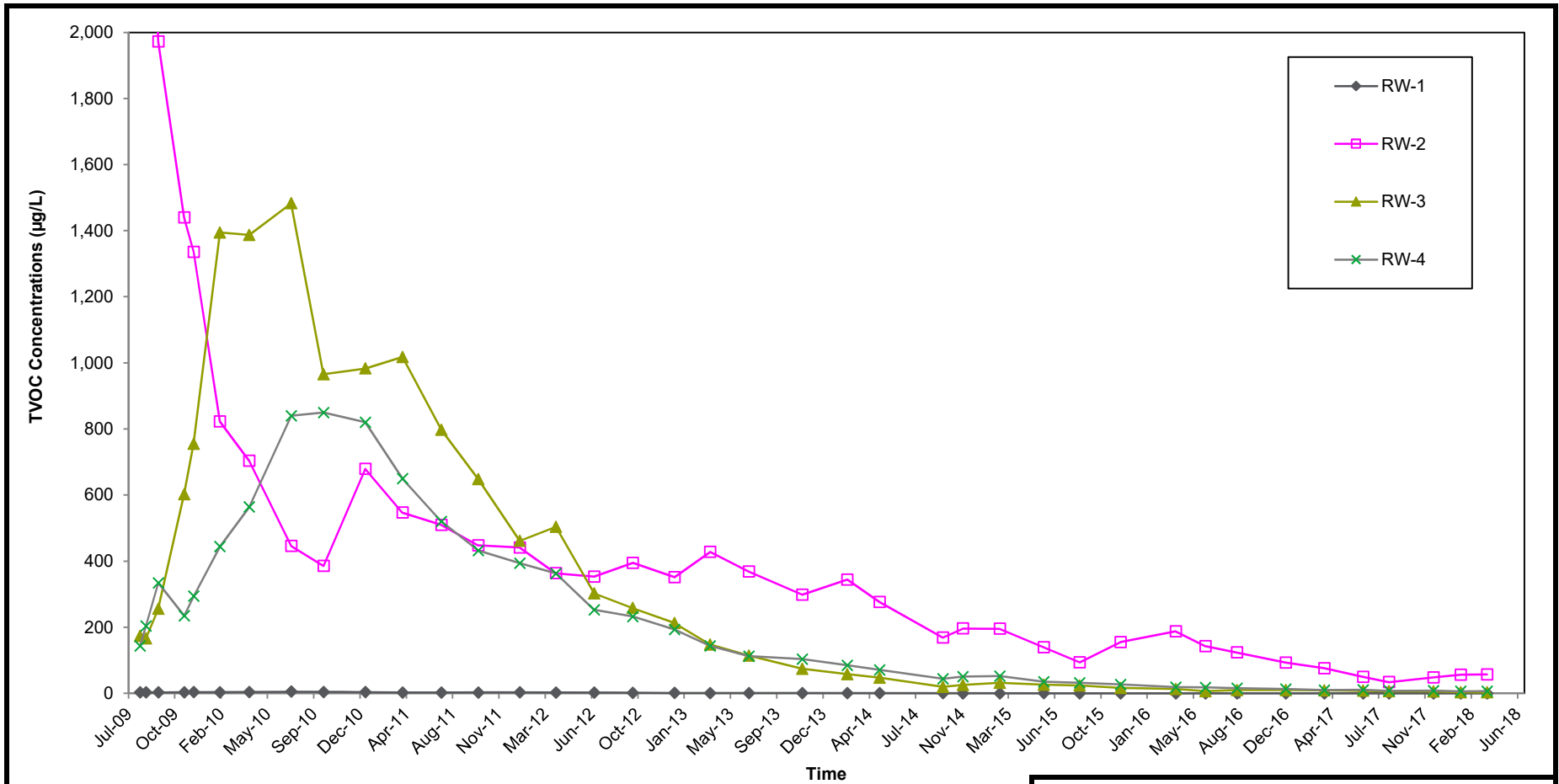
lbs = pounds

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**CUMULATIVE TOTAL, PROJECT, AND
 NON-PROJECT VOC MASS REMOVED**



FIGURE
5



Abbreviations, Notes, and Units:

VOC = Volatile Organic Compound
 TVOCs = Total VOCs detected

1. Results prior to September 10, 2009 are not shown to improve figure clarity. The TVOC concentrations are greater than 2,000 µg/L. See previous reports for full data set.

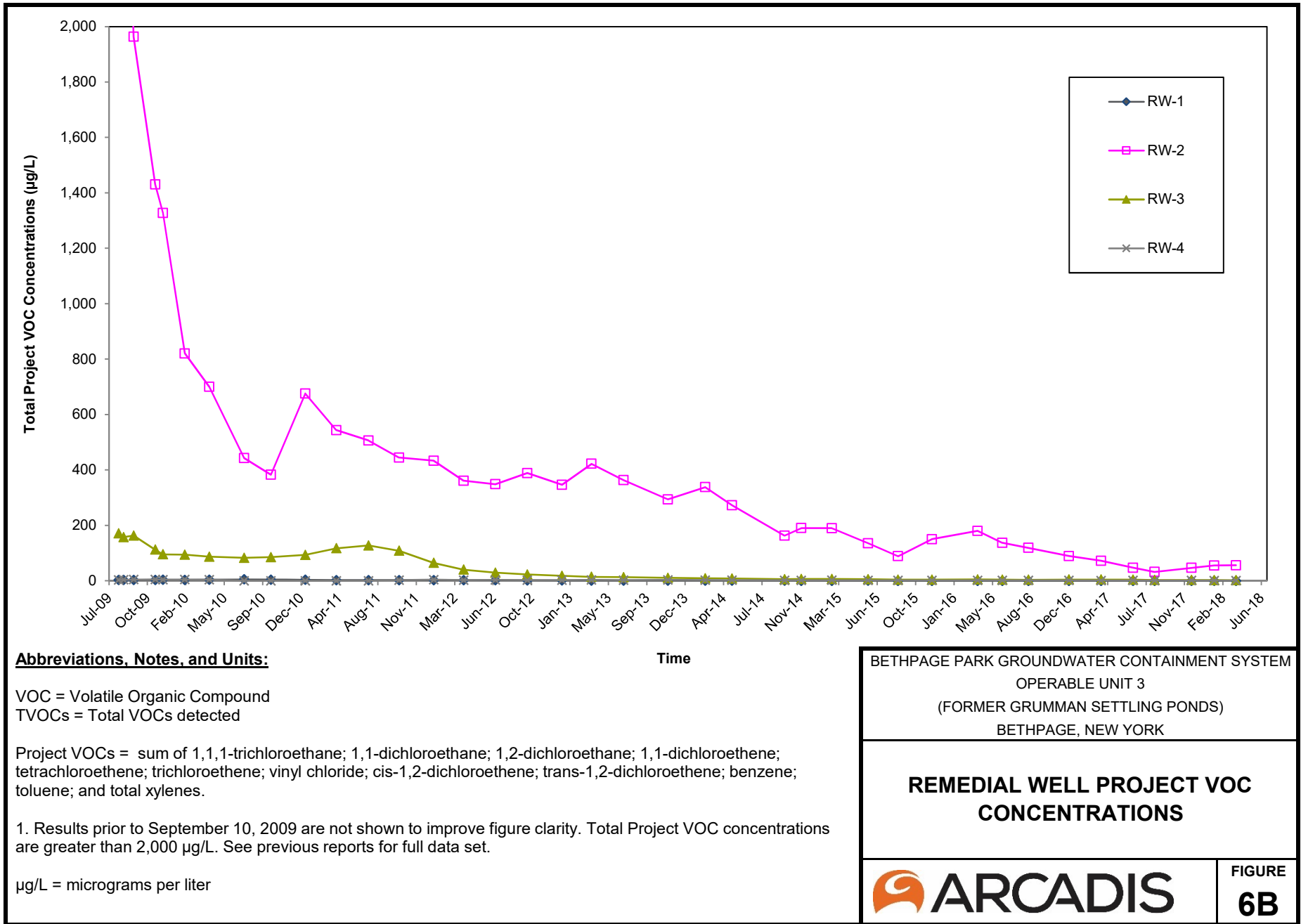
µg/L = micrograms per liter

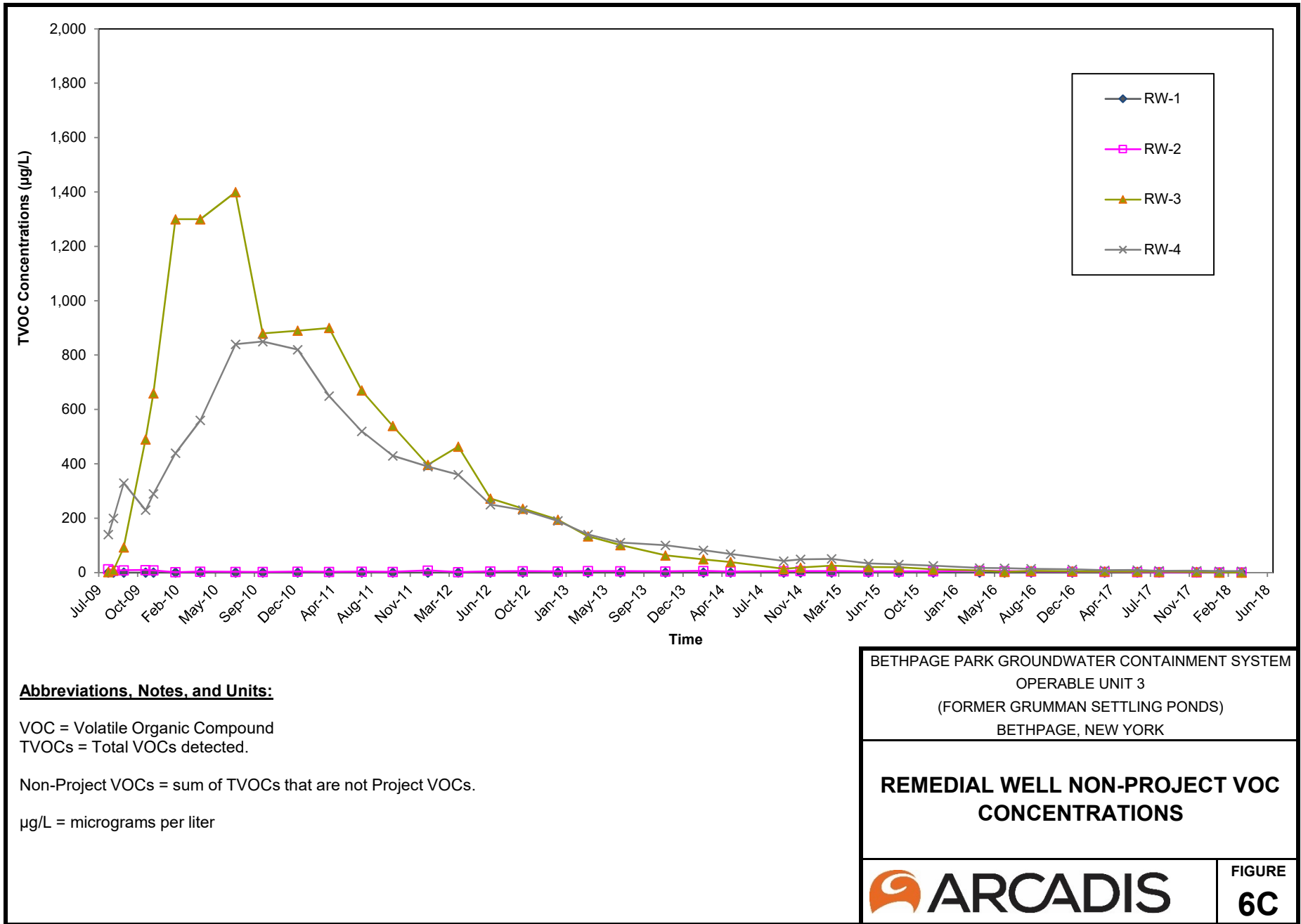
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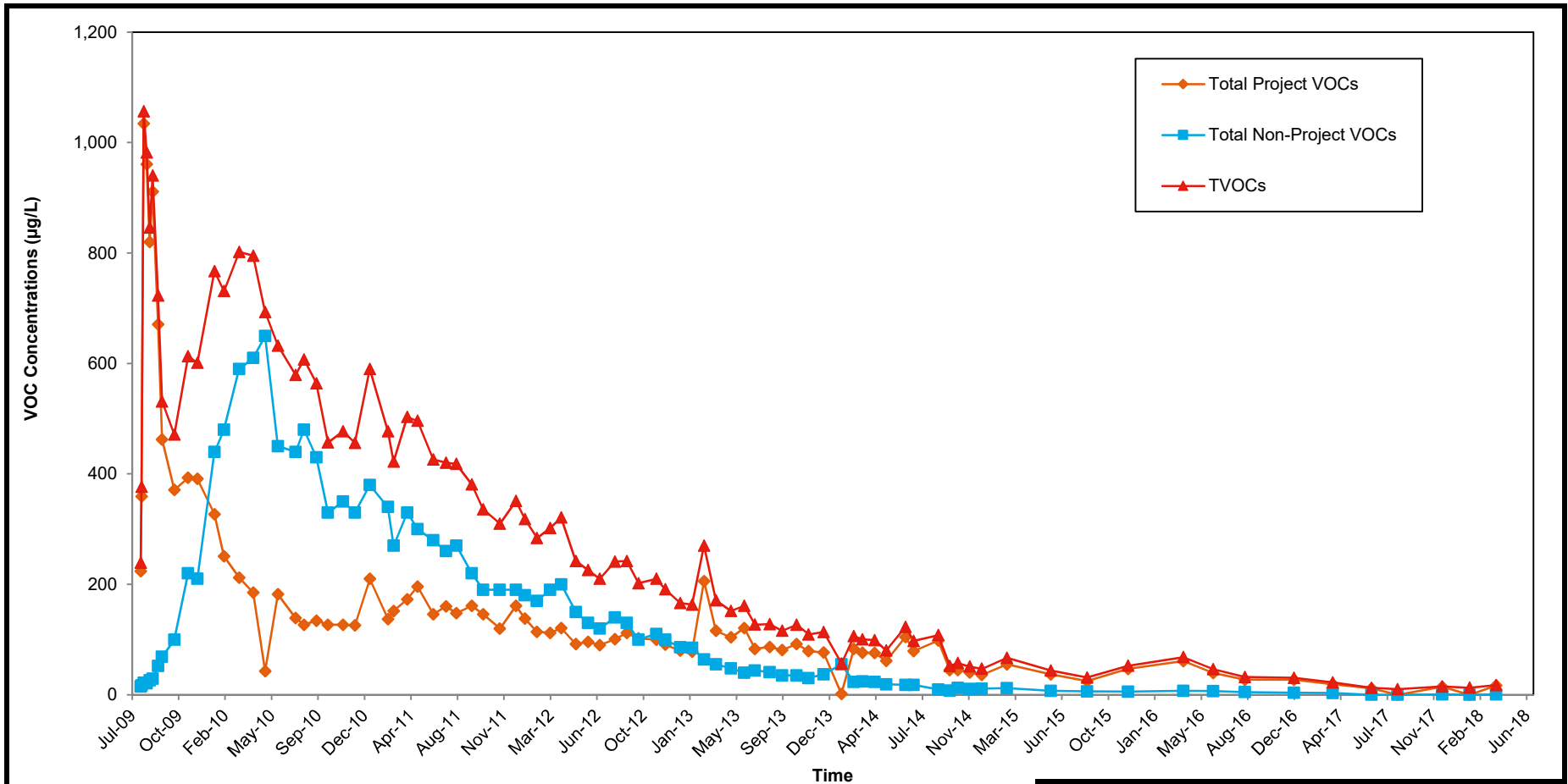
**REMEDIAL WELL TOTAL VOC
 CONCENTRATIONS**



FIGURE
6A







Abbreviations, Notes, and Units:

VOC = Volatile Organic Compound
 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.

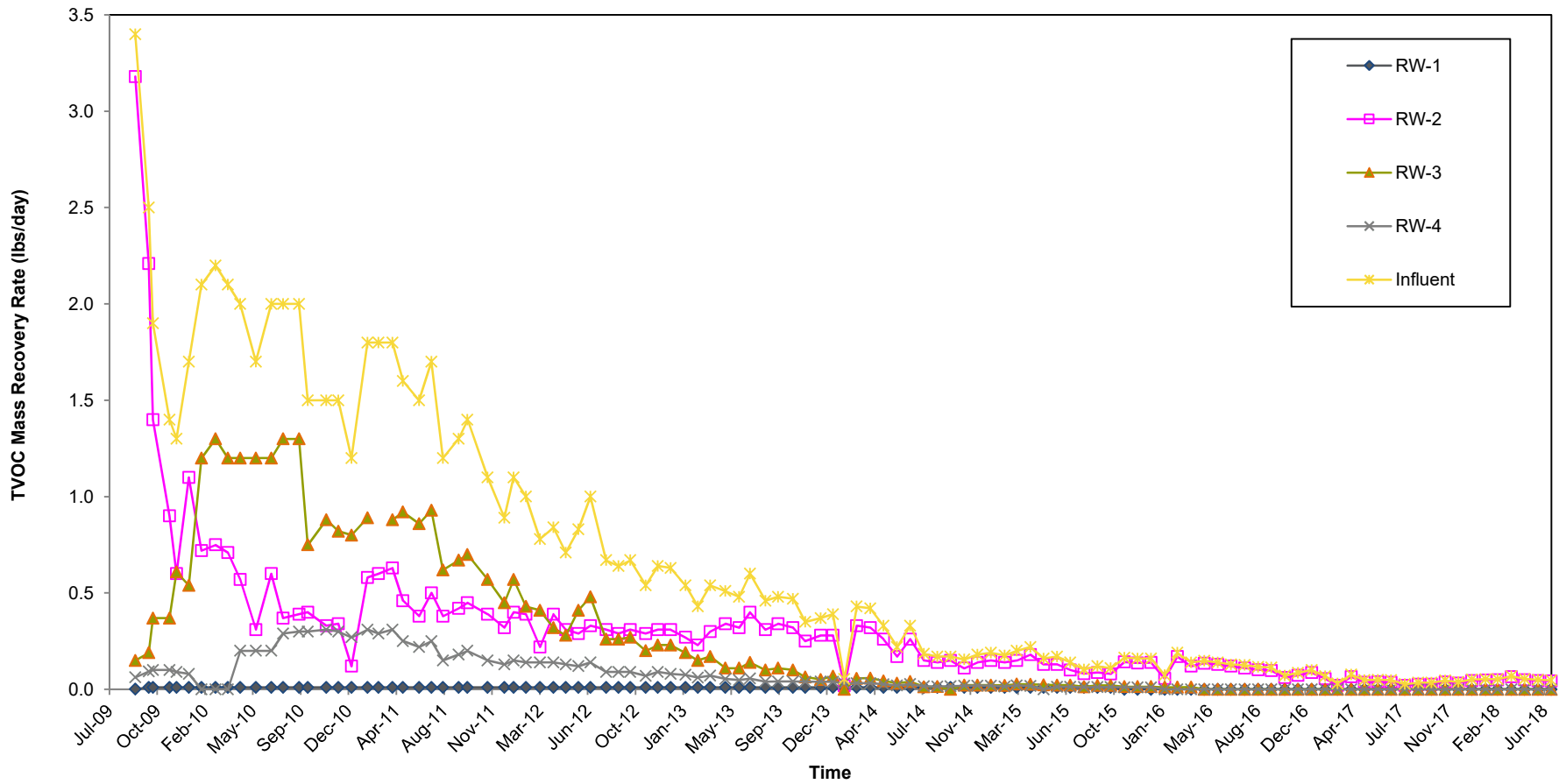
µg/L = micrograms per liter

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**INFLUENT TOTAL, PROJECT
 AND NON-PROJECT
 VOC CONCENTRATIONS**



FIGURE
7



Abbreviation, Notes, and Units:

VOC = Volatile Organic Compound
 TVOCs = Total VOCs detected

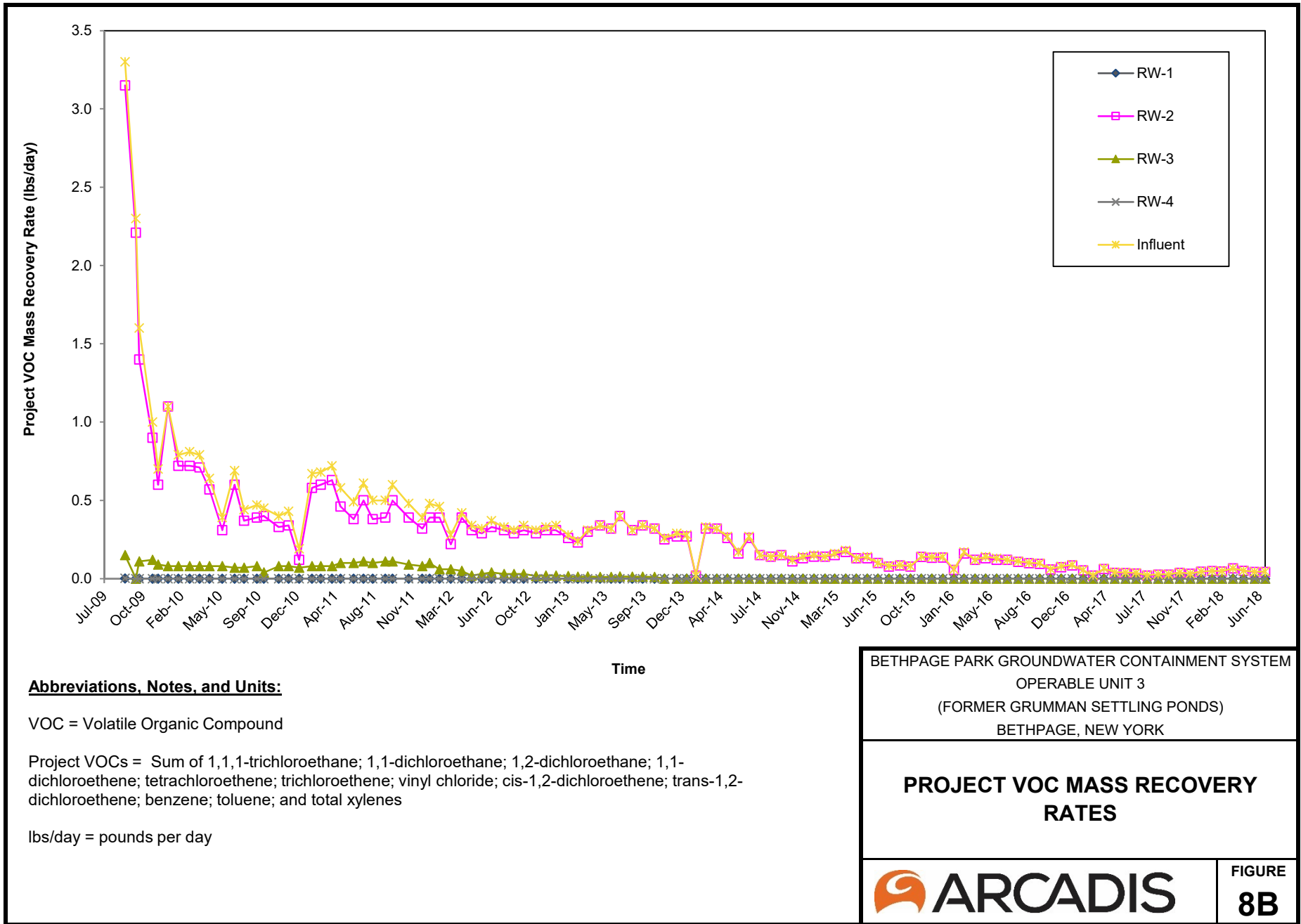
lbs/day = pounds per day

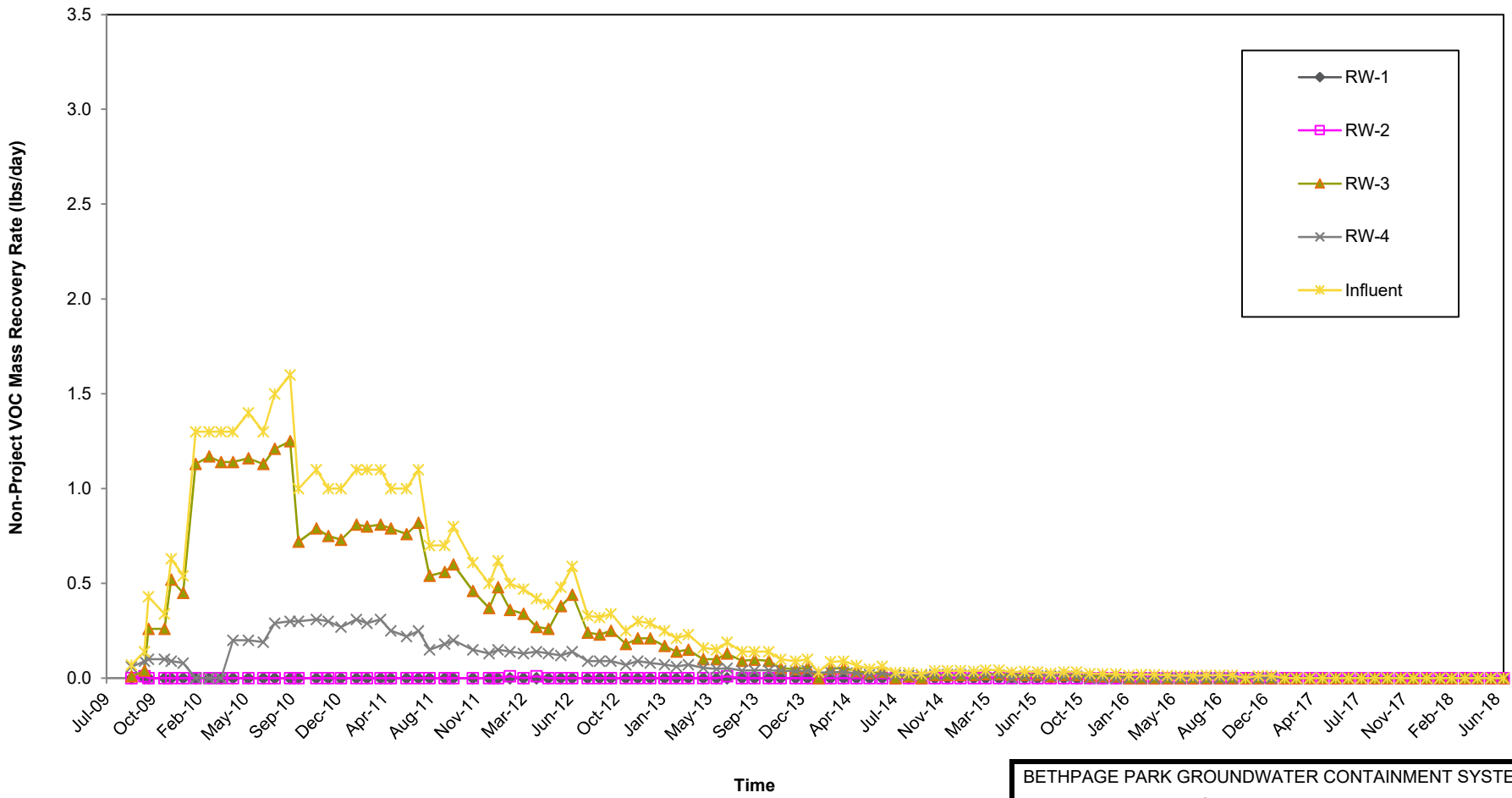
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TOTAL VOC MASS RECOVERY RATES



FIGURE
8A





Abbreviations, Notes, and Units:

VOC = Volatile Organic Compound

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

lbs/day = pounds per day

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NON-PROJECT VOC MASS RECOVERY RATES



FIGURE
8C