ARCADIS Design & Consultancy for natural and built assets

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Our ref:
NY001496.315I.GWMI4

Subject:

2016 Second Quarter Operation Maintenance and Monitoring Report, Operable Unit 2, Northrop Grumman Systems Corporation and Naval Weapons Industrial Reserve Plant (NWIRP) Sites, Bethpage, New York. (NYSDEC Site #s 1-30-003A and B)

Dear Henry and Steve:

On behalf of Northrop Grumman Systems Corporation (Northrop Grumman), Arcadis is providing the NYSDEC with the 2016 Second Quarter Operation Maintenance and Monitoring Report (Report). This Report was prepared to document the operation, maintenance, and monitoring (OM&M) activities conducted for the on-site portion of the Operable Unit 2 (OU2) groundwater remedy and the results of ongoing volatile organic compound (VOC) and inorganic monitoring in groundwater to meet the remedial objectives set forth in the March 2001 OU2 Record of Decision (ROD).

Table 1 summarizes OU2 remedial system performance operational data and water balance. Tables 2 and 3 provide the analytical results for remedial system water and vapor samples for this period. Tables 4 and 5 provide the air modeling

inputs and outputs and resulting analyses, based on vapor samples collected from the Tower 96 and Tower 102 systems, respectively, for this period.

Tables 6, 7 and 8 provide the validated analytical results of groundwater monitoring for this period. Figures 1 through 4 show the Locations of Wells and Onsite Groundwater Remedy, Locations of Treatment Systems and Discharges, ONCT Groundwater Extraction and Treatment System Site Plan and the ONCT Groundwater Extraction and Treatment System Schematic, respectively.

Please contact us if you have any questions or comments.

Sincerely,

Arcadis of New York, Inc.

David E. Stern
Senior Hydrogeologist

Carlo San Giovanni

Carlo San Giovanni
Project Manager

Copies:

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Table 1
Operational Summary for the On-Site Portion of the OU2 Groundwater Remedy, Second Quarter 2016 [1]
Operable Unit 2, Northrop Grumman Systems Corporation,
Bethpage, New York

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	Quarterly Flow Rates (gpm)		Quarterly Flow Volumes (MG)			Quarterly VOC Concentrations (µg/L)		VOC Mass Removed (lbs) [7]	
	Design [2]	Average [2,4]	Design [2]	Actual [2,4]	% of Design	TCE [5]	TVOC [5,6]	Quarterly	Cumulative
Influent Groundwater									
Well 1 [11], [12]	800	845	107.1	103.0	96%	615	650	559	42,155
Well 3R [11], [12]	700	998	93.7	123.0	131%	487	540	543	87,926
Well 17 [12]	1,000	1,047	133.9	127.6	95%	129	160	167	52,096
Well 18 [12]	600	984	80.4	114.7	143%	47	68	64	6,012
Well 19 [12]	700	795	93.7	99.0	106%	129	160	130	7,701
Total [14]	**3,800**	**4,669**	**509**	**567**	**111%**	--	--	**1,463**	**195,890**
Effluent Groundwater [8]									
Calpine	100 - 400	228	--	29.9	--	--	--	--	--
OXY Biosparge [10]	2 - 42	0	--	0	--	--	--	--	--
West Recharge Basins	1,112 - 1,455	1,568	--	210.0	--	--	2.9	--	--
South Recharge Basins	2,231	2,445	298.8	327.4	110%	--	1.8	--	--
Total [13]	--	**4,241**	--	**567**	--				
Additional Flow to South Recharge Basins									
Storm Water Runoff Contributing to South Recharge Basins Flow Volume [14]	--	--	--	18.2	--	--	--	--	--
Total Flow Volume to South Recharge Basins [13,15]			**299**	**346**	**116%**				

Treatment Efficiencies [9]	
Tower 96 System:	99.5%
Tower 102 System:	>99.9%

Notes and abbreviations on last page.

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Notes and Abbreviations:

(1) Quarterly reporting period: April 04, 2016 through July 06, 2016.
(2) "Design" flow rates were determined for the five remedial wells and for the South Recharge Basins based on computer modeling (ARCADIS G&M, Inc. 2003c, modified in April 2005). Flow rates for Calpine, OXY Biosparge and West Recharge Basins are typical flow rates and are provided for reader information. "Design" flow volumes represent the volume of water that should be pumped/discharged during the reporting period and is calculated by multiplying the design rate by the reporting period duration
(3) "Average" flow rates for the remedial wells represent the average actual pumping rates when the pumps are operational and do not take into account the time that a well is not operational. During this quarterly reporting period, the remedial wells operated for the following percentage of the time: Well 1 (91%), Well 3R (92%), Well 17 (91%), Well 18 (87%), and Well 19 (93%). "Actual" volumes are determined via totalizing flow meters.
(4) "Average" flow rates for the system discharges represent the average flow rate during the entire reporting period and are determined by dividing the total flow during the reporting period by the reporting period duration. The Calpine and South Recharge Basins flow volumes are determined via totalizing flow meters. The West Recharge Basin flow is calculated by subtracting the cumulative flow to the other discharges from the total influent flow. Actual flow to the recharge basins is greater, as shown, because storm water combines with the plant effluent prior to discharge to the recharge basins.
(5) The TCE and TVOC concentrations for the remedial wells are from the quarterly sampling event performed during this reporting period on May 12, 2016 (Table 2).
(6) The TVOC concentration for the two sets of recharge basins are their respective average monthly SPDES concentration for the current quarter.
(7) TVOC mass removed for the reporting period is calculated by multiplying the TVOC concentration from the quarterly sampling event and the quantity of water pumped during the reporting period.
(8) There are four discharges for the effluent groundwater: South Recharge Basins, West Recharge Basins, Calpine and OXY Biosparge system. Treated water is continuously discharged to the south and west recharge basins, and is available "on-demand" to both the Calpine Power Plant (Calpine) for use as make-up water, and the biosparge remediation system operated by Occidental Chemical (OXY Biosparge).
(9) Treatment System Efficiencies are calculated by dividing the difference between the remedial well flow weighted influent and effluent TVOC concentrations by the remedial well flow weighted influent concentration.
(10) Occidental Chemical reported in May 2016 that the OXY Biosparge system required no water usage in the 1st Quarter of 2016, and no planned usage for the remainder of 2016.
(11) Wells 1 and 3R were shut down on April 14 and 15, 2016 for Occidental blower repair at Tower 96.
(12) The majority of downtime during Second Quarter 2016 was due to communication failures at both systems and some downtime at Tower 102 was due to a low compressed air condition. The low compressed air condition was remedied and a radiofrequency survey is planned for ONCT to investigate the cause of communication failures.
(13) Total pumpage/recharge rates are accurate to ±15% due to limitations in metering. Flow meter calibration is scheduled.
(14) Storm Water Runoff Volume is calculated by multiplying the adjusted tributary area and NOAA precipitation data for the reporting periods. The adjusted tributary area is tributary area that is adjusted by the runoff coefficient to exclude the infiltration volume from the total rainfall volume. The tributary area, runoff coeficient, and adjusted tributary area are from Dvirka and Bartilucci Consulting Engineers' Storm Water Permit Evaluation Report (January, 28, 2010). The NOAA precipitation data are calculated as a sum of NOAA daily precipitation data for the reporting period. NOAA precipitation data are retrieved from Station GHCND:USW00054787 - FARMINGDALE REPUBLIC AIRPORT, NY US.
(15) Total Flow Volume to South Recharge Basins is estimated as a sum of flow volumes contributed from the Effluent Groundwater to South Recharge Basins and from Storm Water Runoff to South Recharge Basins.

--	not applicable	NOAA	National Oceanic and Atmospheric Administration
µg/L	micrograms per liter	SPDES	State Pollution Discharge Elimination System
gpm	gallons per minute	TCE	trichloroethene
lbs	pounds	TVOC	total volatile organic compounds
MG	million gallons	VOC	volatile organic compounds

Table 2
Concentrations of Constituents in Remedial Wells and Treatment System Effluents, Second Quarter 2016, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

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Constituents (units in µg/L)	Location ID: Sample ID: Sample Date:	WELL 1 WELL 1 5/12/2016	WELL 3R WELL 3R 5/12/2016	96 EFFLUENT T96 EFFLUENT (GW) 5/12/2016	WELL 17 WELL 17 5/12/2016
Volatile Organic Compounds (VOCs)[1,2]					
1,1,1-Trichloroethane		< 4.0	**0.77 J**	< 1.0	**0.39 J**
1,1,2,2-Tetrachloroethane		< 4.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane		< 4.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane		**0.85 J**	**1.5**	< 1.0	**0.89 J**
1,1-Dichloroethene		**1.0 J**	**4.1**	< 1.0	**1.6**
1,2-Dichloroethane		< 4.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane		**4.1**	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)		< 40	< 10	< 10	< 10
2-Hexanone (MBK)		< 20	< 5.0	< 5.0	< 5.0
4-methyl-2-pentanone (MIK)		< 20	< 5.0	< 5.0	< 5.0
Acetone		< 40	< 10	< 10	< 10
Benzene		< 2.0	< 0.50	< 0.50	< 0.50
Bromodichloromethane		< 4.0	< 1.0	< 1.0	< 1.0
Bromoform		< 4.0	< 1.0	< 1.0	< 1.0
Bromomethane		< 8.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide		< 8.0	< 2.0	< 2.0	< 2.0
Carbon tetrachloride		< 4.0	< 1.0	< 1.0	< 1.0
Chlorobenzene		< 4.0	< 1.0	< 1.0	< 1.0
Chloroethane		< 4.0	< 1.0	< 1.0	< 1.0
Chloroform		< 4.0	**0.24 J**	< 1.0	**0.39 J**
Chloromethane		< 4.0	< 1.0	< 1.0	< 1.0
cis-1,2-dichloroethene		**4.4**	**5.3**	< 1.0	**3.1**
cis-1,3-dichloropropene		< 4.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane		< 4.0	< 1.0	< 1.0	< 1.0
Ethylbenzene		< 4.0	< 1.0	< 1.0	< 1.0
Methylene Chloride		< 8.0	< 2.0	< 2.0	< 2.0
Styrene		< 4.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene		**24**	**29**	< 1.0	**23**
Toluene		< 4.0	< 1.0	< 1.0	< 1.0
trans-1,2-dichloroethene		< 4.0	< 1.0	< 1.0	< 1.0
trans-1,3-dichloropropene		< 4.0	< 1.0	< 1.0	< 1.0
Trichloroethylene		**615**	**487**	**3.0**	**129**
Trichlorotrifluoroethane (Freon 113)		< 20	**2.1 J**	< 5.0	**4.2 J**
Vinyl Chloride		< 4.0	**7.6**	< 1.0	< 1.0
Xylene-o		< 4.0	< 1.0	< 1.0	< 1.0
Xylenes - m,p		< 4.0	< 1.0	< 1.0	< 1.0
Total VOCs[3]		**650**	**540**	**3.0**	**160**
1,4-Dioxane[1,2]		**6.30**	**13.5**	**2.64**	**4.18**

Notes and abbreviations on last page.

Table 2
Concentrations of Constituents in Remedial Wells and Treatment System Effluents, Second Quarter 2016, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

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Constituents (units in µg/L)	Well 18 Well 18 5/12/2016	WELL 18 REP-051216-KV-1 5/12/2016	WELL 19 WELL 19 5/12/2016	102 EFFLUENT T102 EFFLUENT (GW) 5/12/2016
Volatile Organic Compounds (VOCs)[1,2]				
1,1,1-Trichloroethane	**0.64 J**	**0.54 J**	**0.35 J**	< 1.0
1,1,2,2-Tetrachloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	**1.3**	**1.2**	**0.75 J**	< 1.0
1,1-Dichloroethene	**3.3**	**1.5**	**1.3**	< 1.0
1,2-Dichloroethane	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	< 10	< 10	< 10	< 10
2-Hexanone (MBK)	< 5.0	< 5.0	< 5.0	< 5.0
4-methyl-2-pentanone (MIK)	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	< 10	< 10	< 10	< 10
Benzene	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0	< 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
Chloroethane	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	< 1.0	< 1.0	**0.42 J**	< 1.0
Chloromethane	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-dichloroethene	**2.1**	**2.1**	**18**	< 1.0
cis-1,3-dichloropropene	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	< 1.0	< 1.0	< 1.0	< 1.0
Methylene Chloride	< 2.0	< 2.0	< 2.0	< 2.0
Styrene	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	**12**	**12**	**6.2**	< 1.0
Toluene	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-dichloroethene	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-dichloropropene	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethylene	**47**	**46**	**129**	< 1.0
Trichlorotrifluoroethane (Freon 113)	**1.8 J**	**1.7 J**	< 5.0	< 5.0
Vinyl Chloride	< 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
Total VOCs[3]	68	65	160	0
1,4-Dioxane[1,2]	4.57	2.53	4.36	3.58

Notes and abbreviations on last page.

Notes and Abbreviations:

(1) VOC samples analyzed using USEPA Method 8260C. 1,4-Dioxane samples analyzed using USEPA Method 8270 SIM.
(2) Results for the program are validated at 20% frequency, per protocols specified in OU2 Groundwater Monitoring Plan (Arcadis 2016).
(3) Total VOC results rounded to two significant figures.

2.4 Bold value indicates a detection.
< 5.0 Compound is not detected above its laboratory quantification limit.
µg/L micrograms per liter
J Constituent value is estimated.
NYSDEC New York State Department of Conservation
REP blind replicate sample
SIM selective ion monitoring
VOC volatile organic compounds

Table 3
Vapor Sample Analytical Results for Treatment Systems,
Second Quarter 2016, Northrop Grumman Systems Corporation,
Operable Unit 2, Bethpage, New York

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Location ID: / Sample ID: / Constituents (Units in µg/m³) / Date:	96 INFLUENT T96 INFLUENT (AA) 5/12/2016	96 MID-EFFLUENT T96 MIDTRAIN (AA) 5/12/2016	96 EFFLUENT T96 EFFLUENT (AA) 5/12/2016	102 INFLUENT T102 INFLUENT (AA) 5/12/2016	102 EFFLUENT T102 EFFLUENT (AA) 5/12/2016
Volatile Organic Compounds (VOCs)[1]					
1,1,1-Trichloroethane	**31**	**13**	< 0.55	**9.8**	< 0.55
1,1,2,2-Tetrachloroethane	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69
1,1,2-Trichloroethane	**2.9**	**0.60**	< 0.55	**1.0**	< 0.55
1,1-Dichloroethane	**58**	**49**	< 0.81	**32**	**7.7**
1,1-Dichloroethylene	**139**	**161**	**0.56**	**73**	**33**
1,2-Dichloroethane	**2.8**	**1.4**	< 0.81	**2.5**	< 0.81
1,2-Dichloropropane	**101**	**26**	< 0.92	**2.2**	< 0.92
Benzene	**2.6**	**0.70**	**0.24**	**0.73**	< 0.64
Bromodichloromethane	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67
Bromoform	< 0.41	< 0.41	< 0.41	< 0.41	< 0.41
Bromomethane	< 0.78	< 0.78	< 0.78	< 0.78	< 0.78
Carbon disulfide	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62
Carbon tetrachloride	**6.0**	**2.5**	< 0.25	**3.0**	< 0.25
Chlorobenzene	**3.4**	**0.46**	< 0.92	< 0.92	< 0.92
Chloroethane	**7.7**	**8.4**	**6.9**	< 0.53	< 0.53
Chloroform	**13**	**9.3**	< 0.98	**11**	**1.6**
Chloromethane	**1.1**	**0.99**	**3.9**	**1.3**	**1.0**
cis-1,3-Dichloropropene	< 0.91	< 0.91	< 0.91	< 0.91	< 0.91
Dibromochloromethane	< 0.85	< 0.85	< 0.85	< 0.85	< 0.85
Ethylbenzene	< 0.87	< 0.87	< 0.87	< 0.87	< 0.87
Methylene chloride	**1.7**	**1.4**	**19**	**2.4**	**11**
Styrene	< 0.85	< 0.85	< 0.85	< 0.85	< 0.85
Tetrachloroethylene	**1,230**	**224**	**1.4**	**327**	**5.2**
Toluene	**1.0**	< 0.75	**0.36**	**1.7**	< 0.75
trans-1,3-Dichloropropene	< 0.91	< 0.91	< 0.91	< 0.91	< 0.91
Trichloroethylene	**23,600**	**6,660**	**15**	**2,340**	**83**
Trichlorotrifluoroethane (Freon 113)	**205**	**132**	< 0.77	**61**	**6.7**
Vinyl chloride	**132**	**164**	**0.79**	**0.23**	< 0.10
Xylene-o	**0.61**	< 0.87	< 0.87	< 0.87	< 0.87
Xylenes - m,p	< 0.87	< 0.87	**0.48**	**0.78**	< 0.87
Total VOCs [2]	**25,539**	**7,455**	**49**	**2,870**	**150**

Notes and abbreviations on last page.

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.
(2)	"Total VOCs" represents the sum of individual concentrations of compounds detected rounded to the nearest whole number.

24	Bold data indicates that the analyte was detected at or above its reporting limit.
D	Concentration is based on a diluted sample analysis.
ELAP	Environmental Laboratory Approval Program
J	Compound detected below its reporting limit; value is estimated.
NYSDOH	New York State Department of Health
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
$\mu g/m^3$	micrograms per cubic meter

Table 4A
Summary of SCREEN3 Model Input and Outputs
Tower 96 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

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Parameters	Date Sampled:	9/9/2015	12/15/2015	3/14/2016	5/12/2016
SCREEN3 Model Input					
Source Type		Point	Point	Point	Point
Emission Rate (g/s)		1	1	1	1
Stack Height (ft)		55	55	55	55
Stack Height (m)		16.8	16.8	16.8	16.8
Stack Inside Diameter (m)		0.508	0.508	0.508	0.508
Air Flow Rate (scfm@stack temp)(1)		4,581	4,610	4,631	4,584
Air Flow Rate (acfm)(2), (3)		4,840	4,810	4,800	4,826
Stack Gas Exit Temperature (K)(2)		311	307	305	310
Ambient Air Temperature (K)(4)		293	275	277	287
Receptor Height (m)(5)		1.5	1.5	1.5	1.5
Urban/Rural		Urban	Urban	Urban	Urban
Building Height (m)		6.7	6.7	6.7	6.7
Min Horizontal Bldg Dim (m)		9.8	9.8	9.8	9.8
Max Horizontal Bldg Dim (m)		12.8	12.8	12.8	12.8
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 ($\mu g/m^3$)(6)		199	196	198	190
Annualization Factor(7)		0.08	0.08	0.08	0.08
Average Annual Concentration at Receptor Height ($\mu g/m^3$)(8)		15.9	15.7	15.8	15.2
Distance To Max Concentration (m)(9)		109	110	110	112

Notes and abbreviations on last page.

Table 4A
Summary of SCREEN3 Model Input and Outputs
Tower 96 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

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Notes and Abbreviations:

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

$\mu g/m^3$	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 4B
Summary of Air Emissions Model Output
Tower 96 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Compound	SCG[1] (µg/m³)	Actual Effluent Concentrations[2] (µg/m³)			
		9/9/2015	12/15/2015	3/14/2016	5/12/2016
1,1-Dichloroethane	95,000 [3]	**34**	**5.3**	**4.5**	0
1,1-Dichloroethene	19,800 [3]	**60.7**	**56.7**	**21**	**0.56**
Benzene	1,300	0	0	0	**0.24**
Chloroethane	619,000 [3]	**13**	**8.2**	**7.4**	**6.9**
Chloroform	150	**2.5**	0	0	0
Chloromethane	22,000	**1.6**	**2.7**	**2.7**	**3.9**
Methylene Chloride	14,000	**1.7**	**0.87**	**2.3**	**19**
Tetrachloroethene	300	**0.37**	**0.61**	**1.2**	**1.4**
Toluene	37,000	0	0	0	**0.36**
Trichloroethene	14,000	**3.8**	**9.7**	**9.1**	**15**
Trichlorotrifluoroethane (Freon 113)	960,000	**2.6**	0	0	0
Vinyl chloride	180,000	**28.4**	**44.5**	**1.4**	**0.79**
Xylenes-m&p		0	0	0	**0.48**

Notes and abbreviations on last page.

Table 4B
Summary of Air Emissions Model Output
Tower 96 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Compound	AGC[4] (µg/m³)	Annual MASC[5] (µg/m³)			
		9/9/2015	12/15/2015	3/14/2016	5/12/2016
1,1-Dichloroethane	0.63	1.73E+04	1.77E+04	1.76E+04	1.82E+04
1,1-Dichloroethene	200	5.51E+06	5.61E+06	5.59E+06	5.78E+06
Benzene	0.13	3.58E+03	3.65E+03	3.63E+03	3.76E+03
Chloroethane	10,000	2.75E+08	2.81E+08	2.79E+08	2.89E+08
Chloroform	14.7	4.05E+05	4.12E+05	4.11E+05	4.25E+05
Chloromethane	90	2.48E+06	2.53E+06	2.51E+06	2.60E+06
Methylene Chloride	60	1.65E+06	1.68E+06	1.68E+06	1.73E+06
Tetrachloroethene	4	1.10E+05	1.12E+05	1.12E+05	1.16E+05
Toluene	5,000	1.38E+08	1.40E+08	1.40E+08	1.44E+08
Trichloroethene	0.2	5.51E+03	5.61E+03	5.59E+03	5.78E+03
Trichlorotrifluoroethane (Freon 113)	180,000	4.96E+09	5.05E+09	5.03E+09	5.20E+09
Vinyl chloride	0.068	1.87E+03	1.91E+03	1.90E+03	1.96E+03
Xylenes-m&p	100	2.75E+06	2.81E+06	2.79E+06	2.89E+06

Notes and abbreviations on last page.

Table 4B
Summary of Air Emissions Model Output
Tower 96 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Compound	AGC[4] (µg/m³)	Percent of Annual MASC[5]				Cumulative % MASC[7]
		9/9/2015	12/15/2015	3/14/2016	5/12/2016	
1,1-Dichloroethane	0.63	0.20%	0.03%	0.03%	0.00%	0.08%
1,1-Dichloroethene	200	0.0%	0.0%	0.0%	0.0%	0.00%
Benzene	0.13	0.0%	0.0%	0.0%	0.0%	0.00%
Chloroethane	10,000	0.0%	0.0%	0.0%	0.0%	0.00%
Chloroform	14.7	0.0%	0.0%	0.0%	0.0%	0.00%
Chloromethane	90	0.0%	0.0%	0.0%	0.0%	0.00%
Methylene Chloride	60	0.0%	0.0%	0.0%	0.0%	0.00%
Tetrachloroethene	4	0.0%	0.0%	0.0%	0.0%	0.00%
Toluene	5,000	0.0%	0.0%	0.0%	0.0%	0.00%
Trichloroethene	0.2	0.07%	0.17%	0.16%	0.26%	0.15%
Trichlorotrifluoroethane (Freon 113)	180,000	0.0%	0.0%	0.0%	0.0%	0.00%
Vinyl chloride	0.068	1.52%	2.33%	0.07%	0.04%	1.14%
Xylenes-m&p	100	0.00%	0.00%	0.00%	0.00%	0.00%

Notes and abbreviations on last page.

Table 4B
Summary of Air Emissions Model Output
Tower 96 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

(1) Refers to the compound-specific SGC per the NYSDEC DAR-1 AGC/SGC tables revised February 28, 2014.

(2) Only VOCs that were detected in the effluent vapor sample (T96 EFF) over the past year of system operation are included in this table.

(3) An SGC was not provided in the DAR-1 AGC/SGC Tables, dated February 28, 2014. An interim SGC was developed based on guidelines provided in Section IV.A.2.b.1 of the NYSDEC DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition.

(4) AGC refers to the compound-specific annual guideline concentration per the NYSDEC DAR-1 AGC/SGC tables, revised February 28, 2014. NYSDEC DAR-1 AGCs were scaled using the results of a site-specific annual USEPA SCREEN 3 model to calculate the annual MASC per monitoring event.

(5) Annual MASC was calculated by dividing the product of the AGC of a compound and the ratio of the SCREEN3 gas emission rate and the SCREEN 3 average annual concentration at receptor height by the air flow rate at the stack temperature and multiplying by the appropriate conversion factors.

(6) Percent of MASC was calculated by dividing the actual effluent concentration by the MASC for the past four quarters of operation. Percentages have been rounded to two digits.

(7) Cumulative percent of the MASC was calculated using a time-weighted average of the percent MASC per event. Percentages have been rounded to two digits.

$\mu g/m^3$	micrograms per cubic meter
0.57	bold value indicates a detection
AGC	annual guideline concentration
DAR-1	Division of Air Resources-1
MASC	maximum allowable stack concentration
NYSDEC	New York State Department of Environmental Conservation
SGC	short-term guideline concentration

Table 5A
Summary of SCREEN3 Model Input and Outputs
Tower 102 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Parameters	Date Sampled	9/9/2015	12/14/2015	3/14/2016	5/12/2016
SCREEN3 Model Input					
Source Type		Point	Point	Point	Point
Emission Rate (g/s)		1	1	1	1
Stack Height (ft)		69.52	69.52	69.52	69.52
Stack Height (m)		21.19	21.19	21.19	21.19
Stack Inside Diameter (m)		0.61	0.61	0.61	0.61
Air Flow Rate (scfm@stack temp)(1)		7,930	7,655	7,873	7,750
Air Flow Rate (acfm)(2), (3)		8,080	7,800	8,000	7,928
Stack Gas Exit Temperature (K)(2)		300	300	299	301
Ambient Air Temperature (K)(4)		293	275	277	288
Receptor Height (m)(5)		1.5	1.5	1.5	1.5
Urban/Rural		Urban	Urban	Urban	Urban
Building Height (m)		7.62	7.62	7.62	7.62
Min Horizontal Bldg Dim (m)		12.5	12.5	12.5	12.5
Max Horizontal Bldg Dim (m)		15.54	15.54	15.54	15.54
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 ($\mu g/m^3$)(6)		111	114	111	111
Annualization Factor(7)		0.08	0.08	0.08	0.08
Average Annual Concentration at Receptor Height ($\mu g/m^3$)(8)		8.8	9.1	8.9	8.8
Distance To Max Concentration (m)(9)		144	142	143	144

Notes and abbreviations on last page.

Table 5A
Summary of SCREEN3 Model Input and Outputs
Tower 102 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

(1) The stack air flow rate at the stack temperature (in scfm) was calculated by multiplying the stack air flow rate in acfm by the ratio of the standard temperature to the actual stack gas exit temperature in degrees Kelvin.

(2) The stack air flow rate (in acfm) and temperature were measured using inline instrumentation. Values were measured at the blower effluent location.

(3) The stack air flow rate is taken from the actual stack air flow rate on the day of sampling.

(4) The ambient temperature was recorded from wunderground.com website for Islip, New York. The mean actual temperature from the website was used in the model calculation.

(5) The receptor height corresponds to the average inhalation level.

(6) SCREEN3 calculated constituent concentration at listed conditions at the specified inhalation level.

(7) A USEPA time averaging conversion factor of 1/0.08 was used to convert the 1-hour maximum concentration output to an annual average.

(8) Average annual constituent concentration at the receptor height was calculated by multiplying the one hour maximum concentration by the annualization

(9) SCREEN3 calculated distance to the 1-hour maximum concentration.

$\mu g/m^3$	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 5B
Summary of Air Emissions Model Output,
Tower 102 Treatment System, Opearable Unit 2
Northrop Grumman Systems Corporation,
Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Compound	SCG[1] (µg/m³)	Acual Effluent Concentrations[2] (µg/m³)			
		9/9/2015	12/14/2015	3/14/2016	5/12/2016
1,1-Dichloroethane	95,000 (3)	**8.1**	**1.1**	**6.1**	**7.7**
1,1-Dichloroethene	19,800 (3)	**35**	**4.4**	**28**	**33**
Benzene	1,300	**0.51**	0	0	0
Carbon Disulfide	6,200	0	0	**0.50**	0
Chloroform	150	**1.6**	0	**1.0**	**1.6**
Chloromethane	22,000	**1.3**	**0.74**	**1.3**	**1.0**
Ethylbenzene	20,700(3)	**0.69**	0	0	0
Methylene Chloride	14,000	**1.5**	**3.1**	0	**11**
Tetrachloroethene	300	**3.7**	0	**1.8**	**5.2**
Toluene	37,000	**21**	0	0	0
Trichloroethene	14,000	**12**	**4.9**	**31**	**83**
Trichlorotrifluoroethane (Freon 113)	960,000	**7.7**	0	**7.4**	**6.7**
Vinyl Chloride	180,000	0	0	**0.54**	0
Xylene-m,p	22,000	**1.9**	0	0	0
Xylene-o	22,000	**0.56**	0	0	0

Notes and abbreviations on last page.

Table 5B
Summary of Air Emissions Model Output,
Tower 102 Treatment System, Opearable Unit 2
Northrop Grumman Systems Corporation,
Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Compound	AGC[4] (µg/m³)	Annual MASC[3] (µg/m3)			
		9/9/2015	12/14/2015	3/14/2016	5/12/2016
1,1-Dichloroethane	0.63	1.88E+04	1.88E+04	1.87E+04	1.91E+04
1,1-Dichloroethene	200	5.96E+06	5.97E+06	5.95E+06	6.07E+06
Benzene	0.13	3.87E+03	3.88E+03	3.87E+03	3.95E+03
Carbon Disulfide	700	2.09E+07	2.09E+07	2.08E+07	2.13E+07
Chloroform	14.7	4.38E+05	4.39E+05	4.37E+05	4.46E+05
Chloromethane	90	2.68E+06	2.69E+06	2.68E+06	2.73E+06
Ethylbenzene	1,000	2.98E+07	2.99E+07	2.98E+07	3.04E+07
Methylene Chloride	60	1.79E+06	1.79E+06	1.79E+06	1.82E+06
Tetrachloroethene	4	1.19E+05	1.19E+05	1.19E+05	1.21E+05
Toluene	5,000	1.49E+08	1.49E+08	1.49E+08	1.52E+08
Trichloroethene	0.2	5.96E+03	5.97E+03	5.95E+03	6.07E+03
Trichlorotrifluoroethane (Freon 113)	180,000	5.36E+09	5.37E+09	5.36E+09	5.47E+09
Vinyl Chloride	0.068	2.03E+03	2.03E+03	2.02E+03	2.07E+03
Xylene-m,p	100	2.98E+06	2.99E+06	2.98E+06	3.04E+06
Xylene-o	100	2.98E+06	2.99E+06	2.98E+06	3.04E+06

Notes and abbreviations on last page.

Table 5B
Summary of Air Emissions Model Output,
Tower 102 Treatment System, Opearable Unit 2
Northrop Grumman Systems Corporation,
Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Compound	AGC[(4)] (µg/m³)	Percent of Annual MASC[(3)]				Cumulative % MASC[(1)]
		9/9/2015	12/14/2015	3/14/2016	5/12/2016	
1,1-Dichloroethane	0.63	0.04%	0.01%	0.03%	0.04%	0.03%
1,1-Dichloroethene	200	0.0%	0.0%	0.0%	0.0%	0.0%
Benzene	0.13	0.01%	0.0%	0.0%	0.0%	0.0%
Carbon Disulfide	700	0.0%	0.0%	0.0%	0.0%	0.0%
Chloroform	14.7	0.0%	0.0%	0.0%	0.0%	0.0%
Chloromethane	90	0.0%	0.0%	0.0%	0.0%	0.0%
Ethylbenzene	1,000	0.0%	0.0%	0.0%	0.0%	0.0%
Methylene Chloride	60	0.0%	0.0%	0.0%	0.0%	0.0%
Tetrachloroethene	4	0.0%	0.0%	0.0%	0.0%	0.0%
Toluene	5,000	0.0%	0.0%	0.0%	0.0%	0.0%
Trichloroethene	0.2	0.20%	0.1%	0.52%	1.37%	0.4%
Trichlorotrifluoroethane (Freon 113)	180,000	0.0%	0.0%	0.0%	0.0%	0.0%
Vinyl Chloride	0.068	0.0%	0.0%	0.03%	0.00%	0.0%
Xylene-m,p	100	0.0%	0.0%	0.0%	0.0%	0.0%
Xylene-o	100	0.0%	0.0%	0.0%	0.0%	0.0%

Notes and abbreviations on last page.

ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

(1) Refers to the compound-specific SGC per the NYSDEC DAR-1 AGC/SGC tables revised February 28, 2014.

(2) Only VOCs that were detected in the effluent vapor sample (T102 EFF) over the past year of system operation are included in this table.

(3) An SGC was not provided in the DAR-1 AGC/SGC Tables, dated February 28, 2014. An interim SGC was developed based on guidelines provided in Section IV.A.2.b.1 of the NYSDEC DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition.

(4) AGC refers to the compound-specific annual guideline concentration per the NYSDEC DAR-1 AGC/SGC tables, revised February 28, 2014. NYSDEC DAR-1 AGCs were scaled using the results of a site-specific annual USEPA SCREEN 3 model to calculate the annual MASC per monitoring event.

(5) Annual MASC was calculated by dividing the product of the AGC of a compound and the ratio of the SCREEN3 gas emission rate and the SCREEN 3 average annual concentration at receptor height by the air flow rate at the stack temperature and multiplying by the appropriate conversion factors.

(6) Percent of MASC was calculated by dividing the actual effluent concentration by the MASC for the past four quarters of operation. Percentages have been rounded to two digits.

(7) Cumulative percent of the MASC was calculated using a time-weighted average of the percent MASC per event. Percentages have been rounded to two digits.

$\mu g/m^3$	micrograms per cubic meter
0.55	Bold value indicates a detection
--	Compound not reported, unable to compute MASC
AGC	annual guideline concentration
DAR-1	Division of Air Resources-1
MASC	maximum allowable stack concentration
NYSDEC	New York State Department of Environmental Conservation
SCG	short-term guideline concentration

Table 6
Concentrations of Volatile Organic Compounds and 1,4 Dioxane in Monitoring Wells, Second Quarter 2016, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Constituent (units in µg/L)	Well / Sample ID / Date	FW-03 / FW-03 / 4/27/2016	GM-13D / GM-13D / 5/11/2016	GM-15SR / GM-15S / 4/13/2016	GM-15I / GM15I / 6/30/2016	GM-15D / GM15D / 6/30/2016	GM-15D2 / GM15D2 / 4/13/2016
Volatile Organic Compounds (VOCs)[1, 2]							
1,1,1-Trichloroethane		<1.0	**1.1**	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		<1.0	**3.7**	<1.0	<1.0	<1.0	**0.23 J**
1,1-Dichloroethene		<1.0	**5.0**	<1.0	<1.0	<1.0	**0.56 J**
1,2-Dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone		<10	<10	<10	<10	<10	<10
4-methyl-2-pentanone		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone		<10	<10	<10	<10	<10	<10
Benzene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon Disulfide		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon tetrachloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform		<1.0	<1.0	<1.0	<1.0	<1.0	**0.22 J**
Chloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-dichloroethene		<1.0	**9.1**	<1.0	<1.0	<1.0	<1.0
cis-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene		**4.4**	**100**	<1.0	<1.0	**0.28 J**	**5.6**
Toluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene		**2.2**	**39.6**	**2.7**	**3.1**	<1.0	**8.8**
Trichlorotrifluoroethane (Freon 113)		<5.0	**2.6 J**	<5.0	<5.0	<5.0	**0.83 J**
Vinyl Chloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylene-o		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes - m,p		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total VOCs [3]		**6.6**	**160**	**2.7**	**3.1**	**0.28**	**16**
1,4 Dioxane [1,2]		**0.156**	**2.98**	**1.21**	< 0.10	< 0.10	**3.50**

See notes on last page

Table 6
Concentrations of Volatile Organic Compounds and 1,4 Dioxane in Monitoring Wells, Second Quarter 2016, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Constituent (units in µg/L)	Well / Sample ID / Date	GM-17I / GM-17I / 5/2/2016	GM-17D / GM-17D / 5/2/2016	GM-18I / GM-18I / 5/14/2016	GM-18D / GM-18D / 5/14/2016	GM-20I / GM-20I / 5/14/2016	GM-20D / GM-20D / 5/14/2016
Volatile Organic Compounds (VOCs)[1, 2]							
1,1,1-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone		<10	<10	<10	<10	<10	<10
4-methyl-2-pentanone		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone		<10	<10	<10	<10	<10	<10
Benzene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon Disulfide		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon tetrachloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene		**0.65 J**	**0.61 J**	**0.56 J**	**0.39 J**	**0.85 J**	**0.94 J**
Trichlorotrifluoroethane (Freon 113)		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl Chloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylene-o		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes - m,p		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total VOCs [3]		**0.65**	**0.61**	**0.56**	**0.39**	**0.85**	**0.94**
1,4 Dioxane [1,2]		**7.34**	**8.63**	**4.39**	**4.81**	**2.28**	**3.47**

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Table 6
Concentrations of Volatile Organic Compounds and 1,4 Dioxane in Monitoring Wells, Second Quarter 2016, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Constituent (units in µg/L)	Well / Sample ID / Date	GM-21S GM-21S 4/29/2016	GM-21I GM-21I 5/17/2016	GM-21D GM-21D 5/5/2016	GM-21D2 GM-21D2 5/5/2016	GM-33D2 GM-33D2 5/10/2016	GM-34D GM-34D 4/27/2016
Volatile Organic Compounds (VOCs)[1, 2]							
1,1,1-Trichloroethane		<1.0	<1.0	<1.0	**0.92 J**	<1.0	<1.0
1,1,2,2-Tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		<1.0	<1.0	<1.0	**1.9**	<1.0	**0.69 J**
1,1-Dichloroethene		<1.0	<1.0	<1.0	**5.2**	<1.0	**3.4**
1,2-Dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone		<10	<10	<10	<10	<10	<10
4-methyl-2-pentanone		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone		<10	<10	<10	<10	<10	<10
Benzene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon Disulfide		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon tetrachloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform		<1.0	<1.0	<1.0	**0.24 J**	<1.0	**0.59 J**
Chloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-dichloroethene		<1.0	<1.0	<1.0	**5.4**	<1.0	**10**
cis-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene		<1.0	<1.0	<1.0	**6.0**	**3.2**	**9.1**
Toluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene		**0.58 J**	**0.71 J**	**1.7**	**71.9**	**13.8**	**428**
Trichlorotrifluoroethane (Freon 113)		<5.0	<5.0	<5.0	**2.5 J**	**5.3**	**9.4**
Vinyl Chloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylene-o		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes - m,p		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total VOCs [3]		**0.58**	**0.71**	**1.7**	**94**	**22**	**460**
1,4 Dioxane [1,2]		**2.59**	**2.60**	**3.48**	**4.14**	**4.14**	**8.52**

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Table 6
Concentrations of Volatile Organic Compounds and 1,4 Dioxane in Monitoring Wells, Second Quarter 2016, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Constituent (units in µg/L)	Well / Sample ID / Date	GM-34D2 GM-34D2 4/27/2016	GM-35D2 GM35D2 4/20/2016	GM-36D GM-36D 5/9/2016	GM-36D2 GM-36D2 5/9/2016	GM-37D GM-37D 4/14/2016	GM-37D2 GM-37D2 4/14/2016
Volatile Organic Compounds (VOCs)[1, 2]							
1,1,1-Trichloroethane		<1.0	<1.0	<1.0	**0.42 J**	<1.0	**0.67 J**
1,1,2,2-Tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		<1.0	<1.0	<1.0	**0.98 J**	**0.52 J**	**2.1**
1,1-Dichloroethene		**0.62 J**	<1.0	<1.0	**0.80 J**	<1.0	**0.95 J**
1,2-Dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone		<10	<10	<10	<10	<10	<10
4-methyl-2-pentanone		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone		<10	<10	<10	<10	<10	<10
Benzene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon Disulfide		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon tetrachloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform		<1.0	<1.0	**0.56 J**	**0.27 J**	<1.0	**0.31 J**
Chloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-dichloroethene		**2.5**	**0.34 J**	<1.0	<1.0	<1.0	**0.29 J**
cis-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene		**6.9**	**5.7**	<1.0	<1.0	<1.0	**0.79 J**
Toluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene		**142**	**60**	<1.0	**2.7**	**1.1**	**2.8**
Trichlorotrifluoroethane (Freon 113)		**1.1 J**	**1.1 J**	<5.0	<5.0	<5.0	<5.0
Vinyl Chloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylene-o		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes - m,p		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total VOCs [3]		**150**	**67**	**0.56**	**5.2**	**1.6**	**7.9**
1,4 Dioxane [1,2]		**8.96**	**7.52**	**2.00 B**	**10.9 B**	**0.360**	**0.745**

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Table 6
Concentrations of Volatile Organic Compounds and 1,4 Dioxane in Monitoring Wells, Second Quarter 2016, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Constituent (units in µg/L)	Well / Sample ID / Date	REP041416MO1 GM-37D2 4/14/2016	GM-38D GM38D 4/20/2016	GM-38D2 GM38D2 4/20/2016	GM-39DA GM-39DA 5/3/2016	GM-39DB GM-39DB 5/3/2016	GM-70D2 GM-70D2 4/28/2016
Volatile Organic Compounds (VOCs)[1, 2]							
1,1,1-Trichloroethane		**0.71 J**	**0.62 J**	**1.2**	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<1.0	<1.0	**0.48 J**	<1.0	<1.0	<1.0
1,1-Dichloroethane		**2.3**	**1.1**	**2.3**	<1.0	<1.0	<1.0
1,1-Dichloroethene		**0.98 J**	**1.0**	**2.1**	<1.0	<1.0	<1.0
1,2-Dichloroethane		<1.0	**0.40 J**	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone		<10	<10	<10	<10	<10	<10
4-methyl-2-pentanone		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone		<10	<10	<10	<10	<10	<10
Benzene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon Disulfide		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon tetrachloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform		**0.33 J**	**0.26 J**	**0.43 J**	<1.0	<1.0	<1.0
Chloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-dichloroethene		**0.28 J**	**0.68 J**	**2.3**	<1.0	<1.0	<1.0
cis-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene		**0.80 J**	**4.2**	<1.0	<1.0	<1.0	**2.7**
Toluene		<1.0	<1.0	<1.0	<1.0	<1.0	**0.51 J**
trans-1,2-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene		**3**	**111**	**202 D**	**6.1**	**21**	**8.9**
Trichlorotrifluoroethane (Freon 113)		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl Chloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylene-o		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes - m,p		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total VOCs [3]		**8.4**	**120**	**210**	**6.1**	**21**	**12**
1,4 Dioxane [1,2]		**0.720**	**1.70**	**2.22**	**3.01**	**2.99**	**4.62**

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Table 6
Concentrations of Volatile Organic Compounds and 1,4 Dioxane in Monitoring Wells, Second Quarter 2016, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Constituent (units in µg/L)	Well / Sample ID / Date	GM-71D2 / GM71D2 / 4/12/2016	GM-73D / GM-73D / 5/9/2016	GM-73D2 / GM-73D2 / 5/6/2016	GM-73D3 / GM-73D3 / 5/6/2016	GM-74I / GM74I / 4/13/2016	GM-74D / GM-74D / 4/13/2016
Volatile Organic Compounds (VOCs)[1, 2]							
1,1,1-Trichloroethane		**2.2**	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		**6.6**	<1.0	**0.43 J**	<1.0	<1.0	<1.0
1,1-Dichloroethene		**3.6**	<1.0	**0.65 J**	<1.0	<1.0	<1.0
1,2-Dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone		<10	<10	<10	<10	<10	<10
4-methyl-2-pentanone		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone		<10	<10	<10	<10	<10	<10
Benzene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon Disulfide		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon tetrachloride		**0.24 J**	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform		**0.60 J**	<1.0	**0.39 J**	<1.0	<1.0	<1.0
Chloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-dichloroethene		**0.76 J**	<1.0	**0.51 J**	<1.0	<1.0	<1.0
cis-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene		<1.0	<1.0	**1.8**	**0.70 J**	<1.0	<1.0
Toluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene		**12.5**	**7.9**	**33.2**	**1.6**	**0.62 J**	**1.2**
Trichlorotrifluoroethane (Freon 113)		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl Chloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylene-o		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes - m,p		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total VOCs [3]		**27**	**7.9**	**37**	**2.3**	**0.62**	**1.2**
1,4 Dioxane [1,2]		**1.32**	**3.42**	**3.08**	**0.667**	**5.33**	**4.37**

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Table 6
Concentrations of Volatile Organic Compounds and 1,4 Dioxane in Monitoring Wells, Second Quarter 2016, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Constituent (units in µg/L)	Well / Sample ID / Date	GM-74D2 / GM-74D2 / 5/5/2016	GM-74D3 / GM-74D3 / 5/5/2016	GM-75D2 / GM-75D2 / 5/10/2016	GM-78S / GM-78S / 4/28/2016	GM-78I / GM-78I / 4/28/2016	GM-78D[2] / GM-78D / 5/3/2016
Volatile Organic Compounds (VOCs)[1, 2]							
1,1,1-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		**0.47 J**	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene		**0.75 J**	**0.41 J**	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone		<10	<10	<10	<10	<10	<10
4-methyl-2-pentanone		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone		<10	<10	<10	<10	<10	<10
Benzene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon Disulfide		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon tetrachloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform		**0.30 J**	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-dichloroethene		**0.32 J**	**0.35 J**	<1.0	<1.0	<1.0	<1.0
cis-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene		**3.7**	**3.4**	**0.90 J**	**0.82**	<1.0	<1.0
Toluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene		**7.2**	**5.8**	**18.8**	**0.45 J**	**0.38 J**	**3.8**
Trichlorotrifluoroethane (Freon 113)		**0.67 J**	**0.65 J**	<5.0	<5.0	<5.0	<5.0
Vinyl Chloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylene-o		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes - m,p		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total VOCs[3]		**13**	**11**	**20**	**1.3**	**0.38**	**3.8**
1,4 Dioxane[1,2]		**2.34**	**1.89**	**2.85**	**3.08**	**2.42**	**4.75**

See notes on last page

Table 6
Concentrations of Volatile Organic Compounds and 1,4 Dioxane in Monitoring Wells, Second Quarter 2016, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Constituent (units in µg/L)	Well / Sample ID / Date	GM-78D2 / GM-78D2 / 5/3/2016	GM-79I / GM-79I / 4/13/2016	GM-79D / GM-79D / 4/13/2016	HN-24 / HN-24 / 4/28/2016	HN-40S / HN-40S / 4/13/2016
Volatile Organic Compounds (VOCs)[1, 2]						
1,1,1-Trichloroethane		<1.0	<1.0	<1.0	**0.87 J**	<1.0
1,1,2,2-Tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		<1.0	<1.0	<1.0	**1.5**	<1.0
1,1-Dichloroethene		<1.0	<1.0	<1.0	**5.2**	<1.0
1,2-Dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone		<10	<10	<10	<10	<10
4-methyl-2-pentanone		<5.0	<5.0	<5.0	<5.0	<5.0
Acetone		<10	<10	<10	<10	<10
Benzene		<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform		<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane		<2.0	<2.0	<2.0	<2.0	<2.0
Carbon Disulfide		<2.0	<2.0	<2.0	<2.0	<2.0
Carbon tetrachloride		<1.0	<1.0	<1.0	**0.30 J**	<1.0
Chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform		<1.0	<1.0	<1.0	**1.1**	**2.7**
Chloromethane		<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-dichloroethene		<1.0	<1.0	**0.44 J**	**0.77 J**	<1.0
cis-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane		<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride		<2.0	<2.0	<2.0	<2.0	<2.0
Styrene		<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene		<1.0	<1.0	**0.42 J**	**24.6**	<1.0
Toluene		<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene		**1.3**	<1.0	**25.9**	**15**	<1.0
Trichlorotrifluoroethane (Freon 113)		<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl Chloride		<1.0	<1.0	<1.0	<1.0	<1.0
Xylene-o		<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes - m,p		<1.0	<1.0	<1.0	<1.0	<1.0
Total VOCs [3]		**1.3**	0	**27**	**40**	**2.7**
1,4 Dioxane [1,2]		**6.75**	**4.08**	**6.03**	**4.20**	**1.21**

See notes on last page

Table 6
Concentrations of Volatile Organic Compounds and 1,4 Dioxane in Monitoring Wells, Second Quarter 2016, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Constituent (units in µg/L)	Well / Sample ID / Date	HN-40I / HN-40I / 4/13/2016	HN-42S / HN-42S / 4/26/2016	HN-42I / HN-42I / 4/26/2016	MW-3-1 / MW-3-1 / 5/11/2016	N-10624 / N-10624 / 7/1/2016	N-10627 / N-10627 / 5/10/2016
Volatile Organic Compounds (VOCs)[1, 2]							
1,1,1-Trichloroethane		<1.0	<1.0	<1.0	**0.75 J**	<1.0	<1.0
1,1,2,2-Tetrachloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane		<1.0	<1.0	<1.0	**2.9**	<1.0	<1.0
1,1-Dichloroethene		<1.0	<1.0	<1.0	**2.0**	<1.0	<1.0
1,2-Dichloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone		<10	<10	<10	<10	<10	<10
4-methyl-2-pentanone		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone		<10	<10	<10	<10	<10	<10
Benzene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon Disulfide		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon tetrachloride		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform		<1.0	<1.0	<1.0	**0.28 J**	<1.0	<1.0
Chloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-dichloroethene		<1.0	<1.0	<1.0	**8.9**	<1.0	<1.0
cis-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Styrene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene		<1.0	<1.0	<1.0	**16.1**	<1.0	<1.0
Toluene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-dichloroethene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-dichloropropene		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene		<1.0	<1.0	**0.71 J**	**86.7**	<1.0	**0.41 J**
Trichlorotrifluoroethane (Freon 113)		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl Chloride		<1.0	<1.0	<1.0	**16.3**	<1.0	<1.0
Xylene-o		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes - m,p		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total VOCs [3]		0	0	**0.71**	**130**	0	**0.41**
1,4 Dioxane [1,2]		<0.11	<0.11	**0.289**	**4.28**	**2.25**	**2.52**

See notes on last page

Table 6
Concentrations of Volatile Organic Compounds and 1,4 Dioxane in Monitoring Wells, Second Quarter 2016, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Constituent (units in µg/L)	Well Sample ID Date	N-10631 N-10641 4/29/2016
Volatile Organic Compounds (VOCs)[1, 2]		
1,1,1-Trichloroethane		<1.0
1,1,2,2-Tetrachloroethane		<1.0
1,1,2-Trichloroethane		<1.0
1,1-Dichloroethane		<1.0
1,1-Dichloroethene		<1.0
1,2-Dichloroethane		<1.0
1,2-Dichloropropane		<1.0
2-Butanone		<10
4-methyl-2-pentanone		<5.0
Acetone		<10 B
Benzene		<0.50
Bromodichloromethane		<1.0
Bromoform		<1.0
Bromomethane		<2.0
Carbon Disulfide		<2.0
Carbon tetrachloride		<1.0
Chlorobenzene		<1.0
Chloroethane		<1.0
Chloroform		<1.0
Chloromethane		<1.0
cis-1,2-dichloroethene		<1.0
cis-1,3-dichloropropene		<1.0
Dibromochloromethane		<1.0
Ethylbenzene		<1.0
Methylene Chloride		<2.0
Styrene		<1.0
Tetrachloroethene		<1.0
Toluene		<1.0
trans-1,2-dichloroethene		<1.0
trans-1,3-dichloropropene		<1.0
Trichloroethylene		**1.4**
Trichlorotrifluoroethane (Freon 113)		<5.0
Vinyl Chloride		<1.0
Xylene-o		<1.0
Xylenes - m,p		<1.0
Total VOCs [3]		**1.4**
1,4 Dioxane [1,2]		**3.76**

See notes on last page

Table 6
Concentrations of Volatile Organic Compounds
and 1,4 Dioxane in Monitoring Wells,
Second Quarter 2016, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

(1)	Samples were analyzed for VOCs using USEPA Method 8260 C; samples were analyzed for 1,4-Dioxane using USEPA Method 8270D SIM.
(2)	Results for the program are validated at 20% frequency, per protocols specified in OU2 Groundwater Monitoring Plan (Arcadis 2016).
(3)	Total VOCs rounded to two significant figures.
Bold	Constituent detected
J	Constituent value is estimated
D	Concentration is based on a diluted sample analysis
B	Blank Contamination
REP	Replicate Sample
µg/L	Micrograms per liter
VOCs	Volatile Organic Compounds
<5.0	Compound not detected above its laboratory quanitfication limit.

Table 7
Concentrations of Metals and 1,4-Dioxane in Monitoring Wells
Second Quarter 2016, Operable Unit 2
Northrop Grumman Systems Corporation
Bethpage, New York.

ARCADIS Design & Consultancy for natural and built assets

Constituent (units in mg/L)	Well: Sample ID: Date:	GM-15SR GM-15S 4/13/2016	GM-78I GM-78I 4/20/2016	GM-78S GM-78S 4/20/2016	MW-01GF MW-1GF 4/19/2016	MW-02GF MW-2GF 4/19/2016	N-10631 N-10631 4/20/2016	PLT1 MW-04 PLT1 MW04 5/2/2016	PLT1 MW-05 PLT1 MW05 4/19/2016	PLT1 MW-06 PLT1 MW-06 5/2/2016	PLT1 MW-06 REP050216MO1 5/2/2016
Metals (1)											
Cadmium		--	<3.0	<3.0	<3.0	<3.0	**13.2**	--	--	--	--
Cadmium (Dissolved)		--	<3.0	<3.0	<3.0	<3.0	**16.7**	--	--	--	--
Chromium		**640**	<10	<10	<10	**29.2**	**36.1**	<10	**552**	**191**	**197**
Chromium (Dissolved)		**641**	<10	<10	<10	**30.1**	**45.6**	<10	**555**	**196**	**195**
1,4-dioxane (1,2)		**1.21**	**2.42**	**3.08**	**4.06**	**3.75**	**3.76**	**0.248**	**0.433**	ND	**0.132**

Notes and Abbreviations:

(1) Results for the program are validated at 20% frequency, per protocols specified in OU2 Groundwater Monitoring Plan (Arcadis 2016).

(2) Samples were analyzed for 1,4-Dioxane using USEPA Method 8270D SIM.

Bold Constituent detected

ND Not Detected

REP Blind duplicate sample

mg/L Milligrams per liter

-- Not analyzed

Table 8
Concentrations of Volatile Organic Compounds and 1,4 Dioxane in Outpost Wells [1]
Second Quarter 2016, Operable Unit 2,
Northrop Grumman Systems Corporation
Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Constituents units in (ug/L)	Well ID Sample ID Sample Date	BPOW 1-1 BPOW 1-1 6/6/2016	BPOW 1-2 BPOW 1-2 6/7/2016	BPOW 1-3 BPOW 1-3 6/10/2016	BPOW 1-4 BPOW 1-4 6/21/2016	BPOW 1-5 BPOW 1-5 6/17/2016	BPOW 1-6 BPOW 1-6 6/17/2016	BPOW 2-1 BPOW 2-1 6/10/2016	BPOW 2-2 BPOW 2-2 6/2/2016	BPOW 2-3 BPOW 2-3 6/16/2016
Volatile Organic Constituents [2, 4]										
1,1,1-Trichloroethane		**0.25 J**	**0.34 J**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethane		<0.50	**0.13 J**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene		**0.18 J**	**0.26 J**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dichloropropane		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
2-Butanone (MEK)		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methyl N-Butyl Ketone (2-Hexanone)		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
4-Methyl-2-Pentanone		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Acetone		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**0.080 J**	<0.50	<0.50
Bromodichloromethane		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromoform		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromomethane		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Carbon Disulfide		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Carbon Tetrachloride		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chlorobenzene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chloroethane		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chloroform		**0.11 J**	**0.066 J**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chloromethane		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,2-Dichloroethene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,3-Dichloropropene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dibromochloromethane		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methylene Chloride		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Styrene (Monomer)		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
trans-1,2-Dichloroethene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
trans-1,3-Dichloropropene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethene		**1.1**	**0.85**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichlorotrifluoroethane (Freon)		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
o-Xylene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
m,p-Xylene		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
TVOCs [5]		**1.6**	**1.7**	**0**	**0**	**0**	**0**	**0.08**	**0**	**0**
1,4 Dioxane [2,4]		**0.165 J**	**0.160 J**	**0.167 J**	**0.093 J**	**0.043 J**	**0.0406 J**	**0.474 J**	**0.338 J**	**3.94**

Table 8
Concentrations of Volatile Organic Compounds and 1,4 Dioxane in Outpost Wells [1]
Second Quarter 2016, Operable Unit 2,
Northrop Grumman Systems Corporation
Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Constituents units in (ug/L)	BPOW 2-1 BPOW 3-1 6/16/2016	BPOW 2-2 BPOW 3-2 6/16/2016	BPOW 2-3 BPOW 3-3 6/21/2016	BPOW 2-4 BPOW 3-4 6/22/2016	REP062216MO1 BPOW 3-4 6/22/2016	BPOW 4-1R[7] BPOW 4-1R 5/31/2016	BPOW 4-2R[7] BPOW 4-2R 6/1/2016
Volatile Organic Constituents [2, 4]							
1,1,1-Trichloroethane	<0.50	<0.50	<0.50	**0.074 J**	<0.50	<0.50	<1.0
1,1,2,2-Tetrachloroethane	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
1,1,2-Trichloroethane	<0.50	<0.50	<0.50	**0.62 J**	**0.63 J**	<1.0	<1.0
1,1-Dichloroethane	<0.50	<0.50	<0.50	**0.69**	**0.67**	<1.0	<1.0
1,1-Dichloroethene	<0.50	<0.50	<0.50	**0.13 J**	**0.12 J**	<1.0	<1.0
1,2-Dichloroethane	<0.50	<0.50	<0.50	**0.79**	**0.7**	<1.0	<1.0
1,2-Dichloropropane	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
2-Butanone (MEK)	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10
Methyl N-Butyl Ketone (2-Hexanone)	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0	<5.0
4-Methyl-2-Pentanone	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0	<5.0
Acetone	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<10
Benzene	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
Bromoform	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
Bromomethane	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<2.0
Carbon Disulfide	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<2.0
Carbon Tetrachloride	<0.50	<0.50	<0.50	**0.46 J**	**0.39 J**	**0.22 J**	**0.20 J**
Chlorobenzene	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
Chloroethane	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
Chloroform	<0.50	<0.50	<0.50	**1.2**	**1.1**	**0.13 J**	**0.10 J**
Chloromethane	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
cis-1,2-Dichloroethene	<0.50	<0.50	<0.50	**0.98**	**0.94**	<1.0	**0.26 J**
cis-1,3-Dichloropropene	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
Dibromochloromethane	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
Ethylbenzene	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
Methylene Chloride	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0	<2.0
Styrene (Monomer)	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
Tetrachloroethene	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	**0.10 J**
Toluene	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
trans-1,2-Dichloroethene	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
trans-1,3-Dichloropropene	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
Trichloroethene	<0.50	<0.50	<0.50	**63**	**60**	**1.1**	**1.9**
Trichlorotrifluoroethane (Freon)	<1.0	<1.0	<1.0	**0.62 J**	**0.62 J**	**17**	**13**
Vinyl chloride	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
o-Xylene	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
m,p-Xylene	<0.50	<0.50	<0.50	<0.50	<0.50	<1.0	<1.0
TVOCs [5]	0	0	0	68	65	18	15
1,4 Dioxane [2,4]	**0.882**	**4.54**	**6.16**	**3.91**	**4.54**	**2.32**	**1.80**

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Second Quarter 2016, Operable Unit 2,
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ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

(1) These outpost wells have been recently repurposed for use as plume monitoring wells per the June 2015 Groundwater Monitoring Plan Addendum (ARCADIS of New York, Inc., 2015) as conditionally approved by the NYSDEC (August 25, 2015). Therefore, TVOC trigger levels that may have been previously established are no longer shown

(2) Samples were analyzed for VOCs using USEPA Method 524.2; samples were analyzed for 1,4-Dioxane using USEPA Method 522

(3) The NAVY abandoned original Wells BPOW4-1 and BPOW4-2 and installed replacement Wells BPOW4-1R and BPOW4-2R between August, 2014 and October, 2014

(4) Results for the program are validated at 20% frequency, per protocols specified in OU2 Groundwater Monitoring Plan (Arcadis 2016)

(5) TVOCs are rounded to two significant figures

Bold value indicates constituent detected.

REP	Blind Duplicate Sample
TVOCs	Total Volatile Organic Compounds
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds
µg/L	micrograms per liter
<0.5	Compound not detected above its laboratory quantification limit.
J	Value is estimated concentration

CITY:(Reqd) DIV/GROUP:(Reqd) DB:(Reqd) LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
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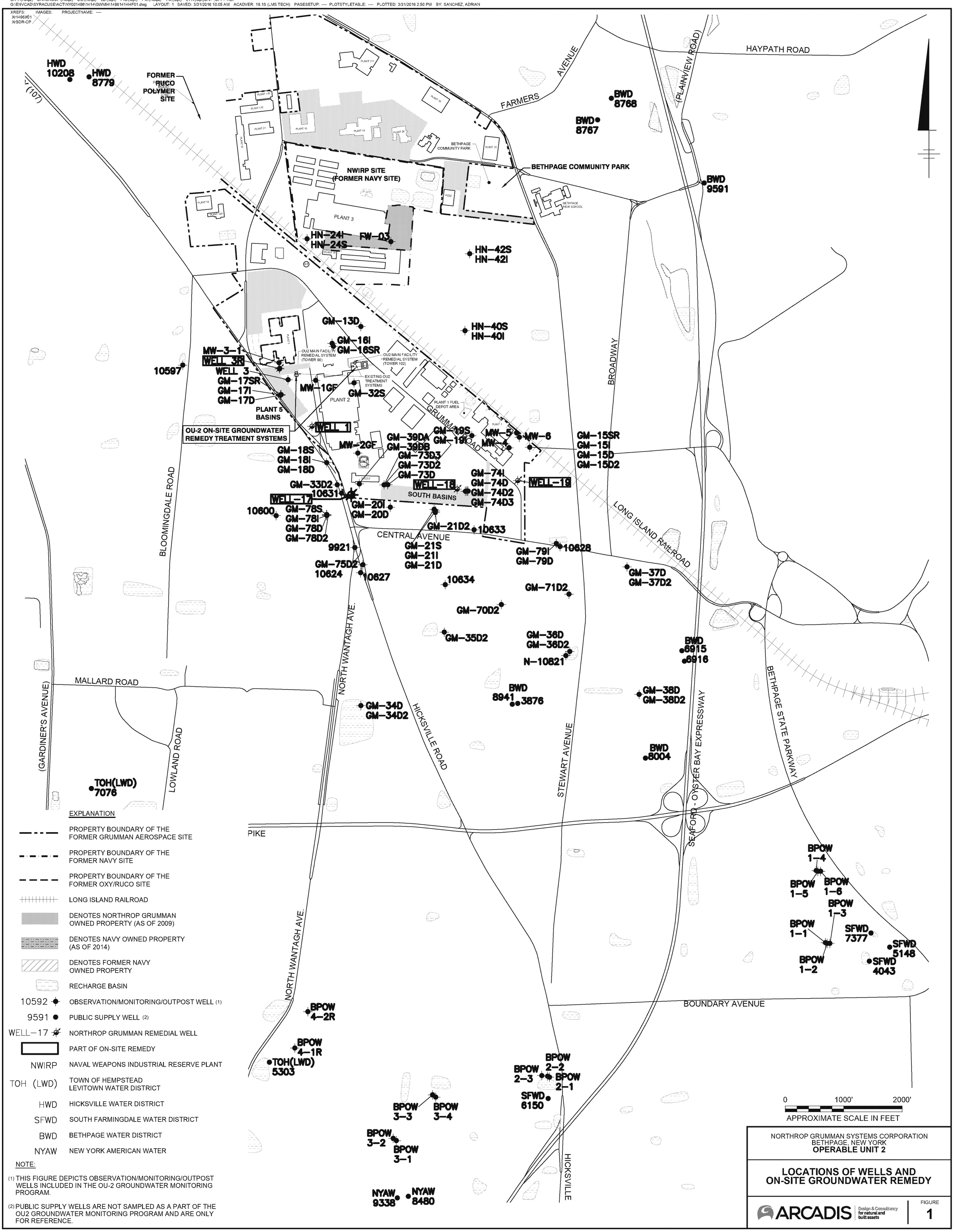


EXPLANATION

- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- PROPERTY BOUNDARY OF THE FORMER NAVY SITE
- PROPERTY BOUNDARY OF THE FORMER OXY/RUCO SITE
- LONG ISLAND RAILROAD
- DENOTES NORTHROP GRUMMAN OWNED PROPERTY (AS OF 2009)
- DENOTES NAVY OWNED PROPERTY (AS OF 2014)
- DENOTES FORMER NAVY OWNED PROPERTY
- RECHARGE BASIN
- 10592 — OBSERVATION/MONITORING/OUTPOST WELL (1)
- 9591 — PUBLIC SUPPLY WELL (2)
- WELL-17 — NORTHROP GRUMMAN REMEDIAL WELL
- PART OF ON-SITE REMEDY
- NWIRP — NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
- TOH (LWD) — TOWN OF HEMPSTEAD LEVITOWN WATER DISTRICT
- HWD — HICKSVILLE WATER DISTRICT
- SFWD — SOUTH FARMINGDALE WATER DISTRICT
- BWD — BETHPAGE WATER DISTRICT
- NYAW — NEW YORK AMERICAN WATER

NOTE:

(1) THIS FIGURE DEPICTS OBSERVATION/MONITORING/OUTPOST WELLS INCLUDED IN THE OU-2 GROUNDWATER MONITORING PROGRAM.

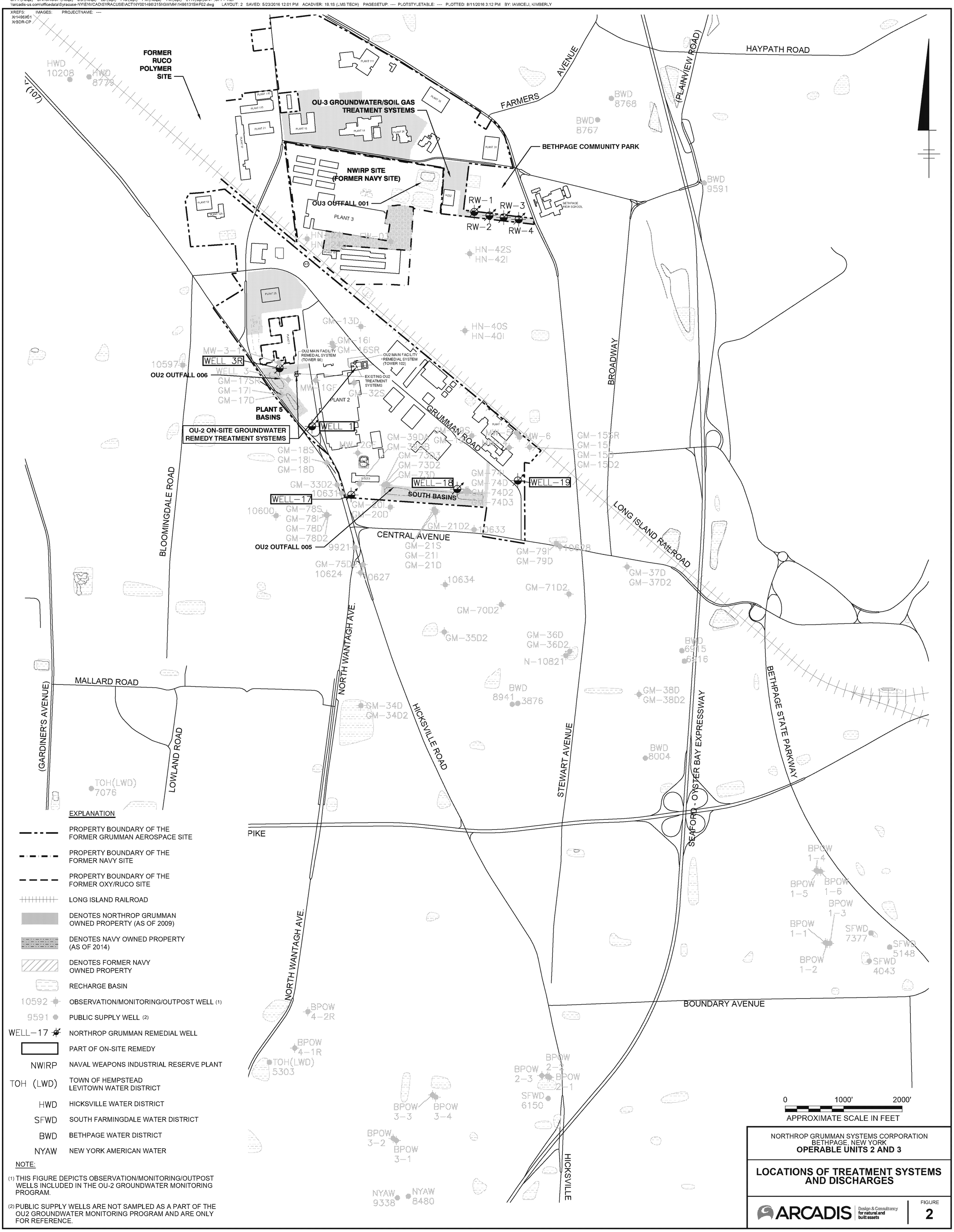
(2) PUBLIC SUPPLY WELLS ARE NOT SAMPLED AS A PART OF THE OU2 GROUNDWATER MONITORING PROGRAM AND ARE ONLY FOR REFERENCE.

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

LOCATIONS OF WELLS AND ON-SITE GROUNDWATER REMEDY

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1



EXPLANATION

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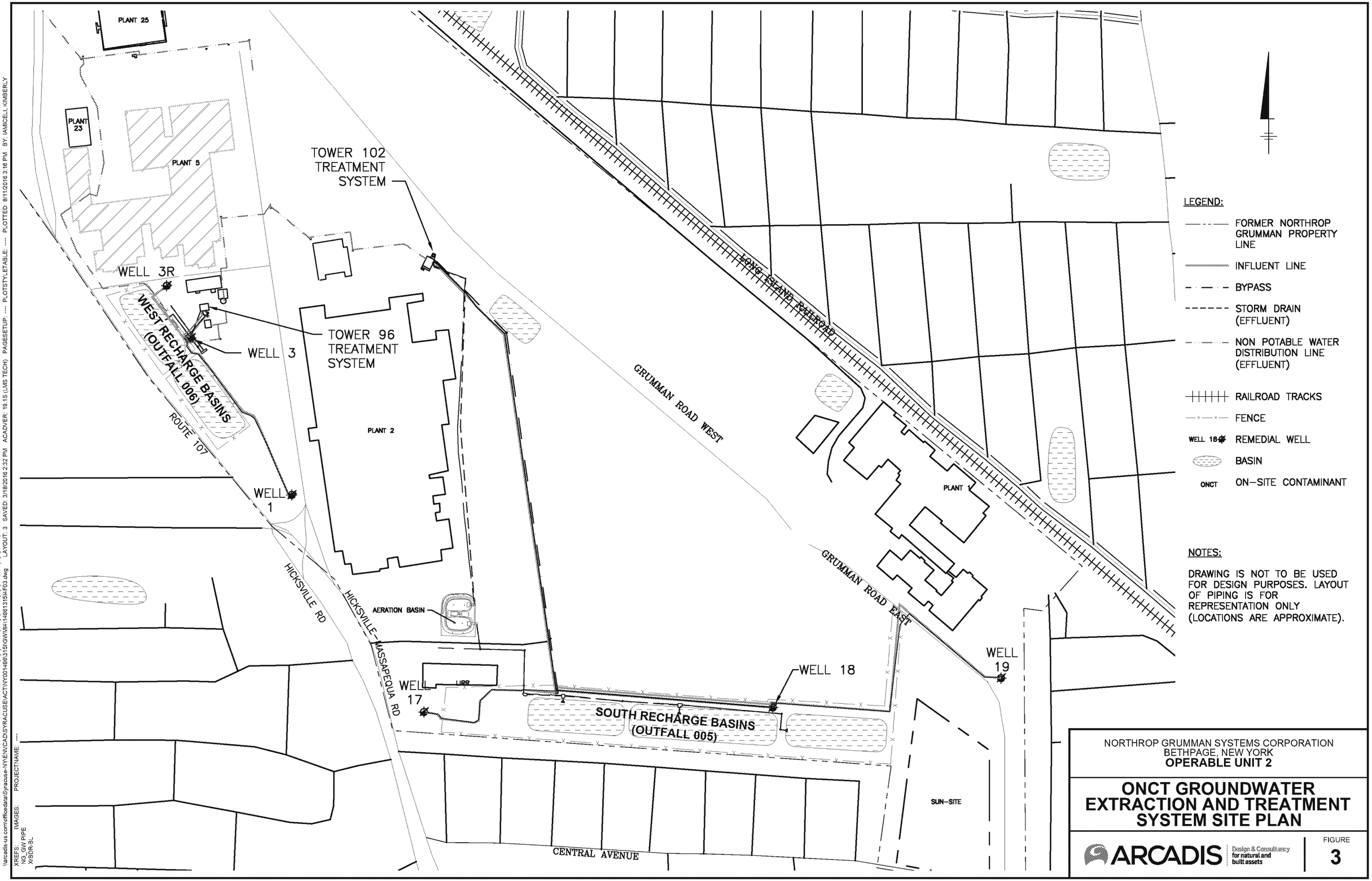
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNITS 2 AND 3

LOCATIONS OF TREATMENT SYSTEMS AND DISCHARGES

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2



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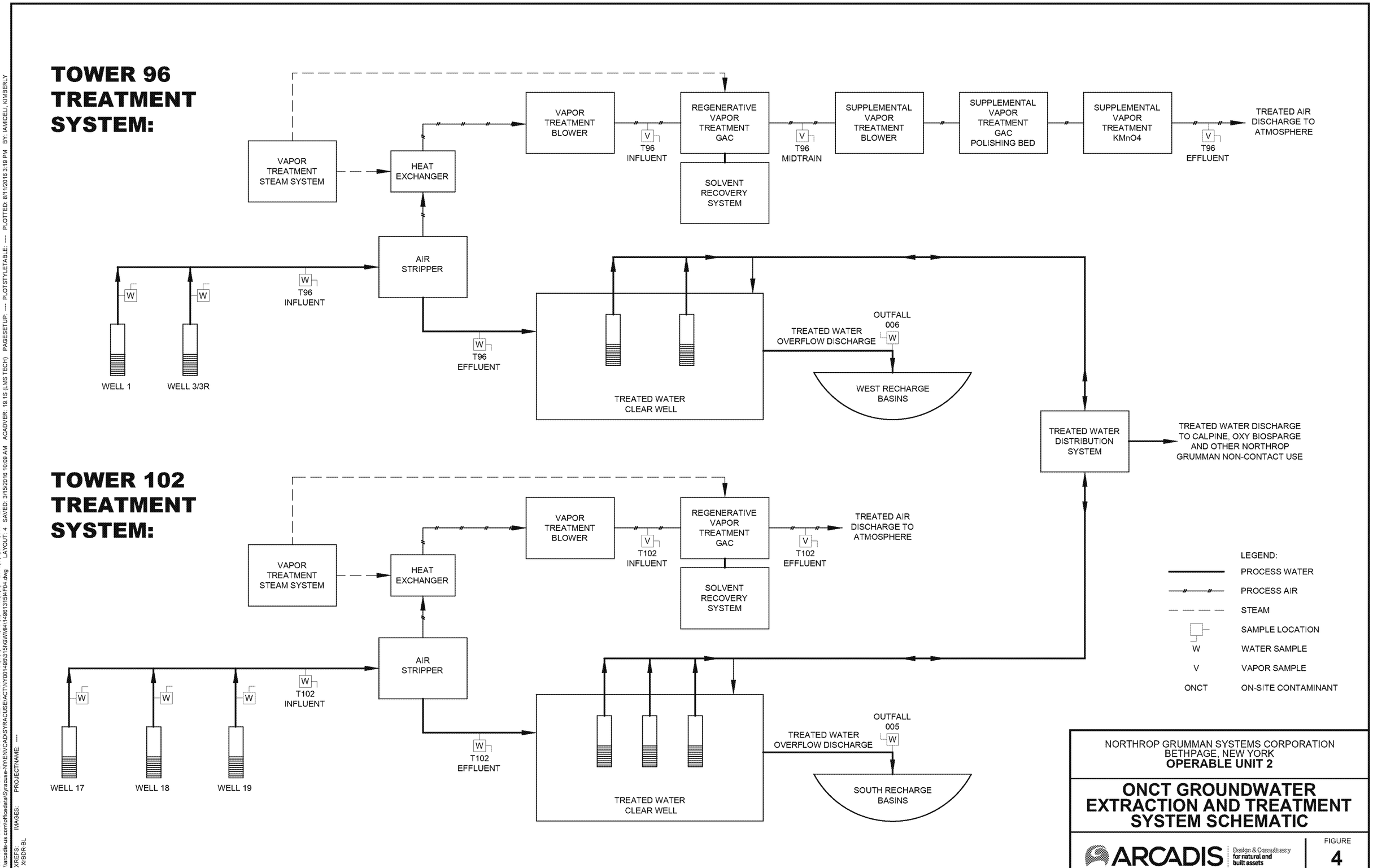

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

ONCT GROUNDWATER EXTRACTION AND TREATMENT SYSTEM SCHEMATIC

ARCADIS Design & Consultancy for natural and built assets

FIGURE 4

CITY:SYRACUSE-NY DIV/GROUP:ENV DB:A.SANCHEZ LD:ALS PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
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