ARCADIS Design & Consultancy for natural and built assets

Mr. Jason Pelton
Project Manager
New York State Department of Environmental Conservation
Remedial Bureau D
625 Broadway
Albany, New York 12233-7015

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

ENVIRONMENT

Subject:

2019 First 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)

Date:
May 31, 2019

Contact:
Christopher Engler

Phone:
315.409.6579

Email:
christopher.engler@arcadis.com

Our ref:
NYNG2019.22TM.RPTI4
NYNG2019.23TM.NAVI4

Dear Jason:

On behalf of Northrop Grumman Systems Corporation (Northrop Grumman), Arcadis is providing the NYSDEC with the 2019 First 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, total mass removal, and water balance. Tables 2, 3A and 3B provide the analytical results for remedial system water and vapor samples for this period, respectively. Tables 4A and 4B provide the air modeling inputs and outputs and resulting analyses, based on quarterly vapor samples collected from the Tower 96 and Tower 102 systems, respectively, for this period. Tables 5A and 5B provide a summary of percent mass emittance of TCE from first quarter 2018 through first quarter 2019. Table 6 provides the validated analytical results of groundwater monitoring for this period. Figures 1 through 3 show the Locations of Wells and Onsite Groundwater Remedy, 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.

Christopher Engler, PE
New York PE-069748

Engineer of Record

Copies:

Ed Hannon, Northrop Grumman
Walter Parish, NYSDEC Region 1
Donald Hesler, NYSDEC
Steven Scharf, NYSDEC
Steven Karpinski, New York State Department of Health
John Lovejoy, Nassau County Department of Health
Brian S. Murray, NAVFAC Midlant Environmental
David Brayack, TetraTech NUS, Inc.
Roger Smith, Glenn Springs Holdings, Inc.
Manfred Bohms, Steel Equities
Mike Negrelli, USEPA
Carol Stein, USEPA
Matthew Russo, Town of Oyster Bay
Stan Carey, Massapequa Water District
Richard Kern, New York American Water
Frank Koch, South Farmingdale Water District
John Reinhardt, Town of Hempstead Water District
Michael Boufis, Bethpage Water District
Bethpage Public Library
File

TABLES

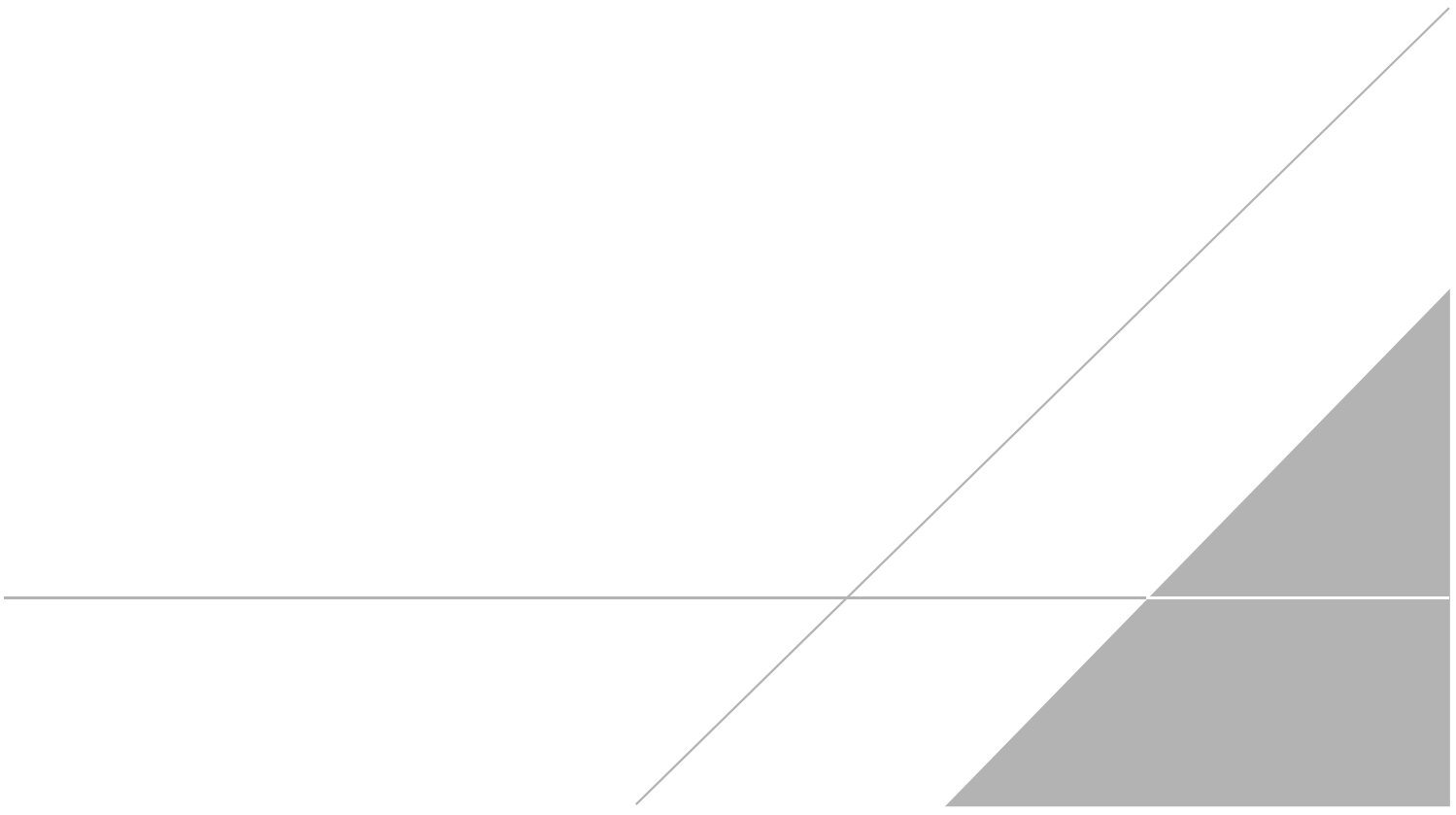


Table 1
Operational Summary for the On-Site Portion of the OU2 Groundwater Remedy, First Quarter 2019[1] Reporting Period
Operable Unit 2, Northrop Grumman Systems Corporation,
Bethpage, New York

	Quarterly Flow Rates (gpm)		Quarterly Flow Volumes (MG)			Quarterly VOC Concentrations (µg/L)		VOC Mass Removed (lbs) [7]	
	Design [2]	Average [3,4]	Design [2]	Actual [3,4]	% of Design	TCE [5]	TVOC [5,6]	Quarterly	Cumulative
Influent Groundwater									
Well 1 [11]	800	814	103.7	105.5	102%	589	620	547	50,284
Well 3R [11]	700	707	90.7	91.6	101%	333	380	291	92,718
Well 17 [11]	1,000	1,002	129.6	124.7	96%	108	130	135	54,268
Well 18 [11]	600	804	77.8	103.9	134%	41	65	56	6,873
Well 19 [11]	700	507	90.7	65.4	72%	112	140	77	9,043
Total [13]	**3,800**	**3,834**	**493**	**491**	**100%**	**--**	**--**	**1,106**	**213,186**
Effluent Groundwater [8]									
Calpine	100 - 400	86	--	11.2	--	--	--	--	--
OXY Biosparge [10]	2 - 42	0	--	0	--	--	--	--	--
West Recharge Basins	1,112 - 1,455	2,567	--	332.7	--	--	0.6	--	--
South Recharge Basins [12]	2,231	1,136	289.1	147.2	51%	--	1.1	--	--
Total [14]	**--**	**3,789**	**--**	**491**	**--**				
Additional Flow to South Recharge Basins									
Storm Water Runoff Contributing to South Recharge Basins Flow Volume [14]	--	--	--	17.0	--	--	--	--	--
Total Flow Volume to South Recharge Basins [12,14,15]			**289**	**164**	**57%**				

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

Notes and abbreviations on last page.

Table 1
Operational Summary for the On-Site Portion of the OU2 Groundwater Remedy, First Quarter 2019[(1)] Reporting Period
Operable Unit 2, Northrop Grumman Systems Corporation,
Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

(1) Quarterly reporting period: January 01, 2019 through March 31, 2019

(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 (100%), Well 3R (100%), Well 17 (96%), Well 18 (99.7%), and Well 19 (99.7%). "Actual" volumes are determined via totalized values computed by SCADA using the instantaneous flow rates transmitted from local 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 totalized values computed by SCADA using the instantaneous flow rates transmitted from local 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 Febuary 13, 2019.

(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 Power Plant (Calpine), and Occidental Chemical Biosparge system (OXY Biosparge). Treated water is continuously discharged to the south and west recharge basins, and is available "on-demand" to both Calpine for use as make-up water, and the biosparge remediation system operated by OXY.

(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 has not reported any water usage for the OXY Biosparge system since May 2016.

(11) The downtime during First Quarter 2019 was minor and due to typical operation and maintenance. Well 17, of Tower 102 of the ONCT System, was shut down on March 15 through March 18, 2019 due to a variable frequency drive (VFD) fault. The VFD cabinet ventilation fan was unable to be repaired, therefore it was replaced and Well 17 was restarted.

(12) Flow was diverted from the South Basins to the West Basins to accommodate basin rehabilitation work at the center most of the South Basins. On March 28, 2019, South Basin and West Basin discharge rates returned to typical operating values following the western most and central South Basin maintenance completion.

(13) Total pumpage/recharge rates are accurate to ±15% due to limitations in metering.

(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 coefficient, 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 for October and December; Station GHCND:US1NYNS0030 - PLAINEDGE, NY US for November as data was not available for the typical

(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	SCADA	Supervisory Controls and Data Acquisition
gpm	gallons per minute	SPDES	State Pollution Discharge Elimination System
lbs	pounds	TCE	trichloroethene
MG	million gallons	TVOC	total volatile organic compounds
		VOC	volatile organic compounds

Table 2
Concentrations of Constituents in Remedial Wells and Treatment System Effluents, First Quarter 2019, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

Constituents[1] (units in µg/L)	Location ID: Sample ID: Sample Date:	WELL 1 WELL 1 2/13/2019	WELL 3R WELL 3R 2/13/2019	96 EFFLUENT 96 EFFLUENT 2/13/2019
Volatile Organic Compounds (VOCs)[2]				
1,1,1-Trichloroethane		< 1.3	**0.64**	< 0.50
1,1,2,2-Tetrachloroethane		< 2.5	< 1.0	< 1.0
1,1,2-Trichloroethane		< 2.5	< 1.0	< 1.0
1,1-Dichloroethane		< 2.5	**1.4**	< 1.0
1,1-Dichloroethene		**2.0**	**3.8**	< 0.50
1,2-Dichloroethane		< 2.5	< 1.0	< 1.0
1,2-Dichloropropane		**4.4**	< 1.0	< 1.0
2-Butanone (MEK)		< 25	< 10	< 10
2-Hexanone (MBK)		< 13	< 5.0	< 5.0
4-methyl-2-pentanone (MIK)		< 13	< 5.0	< 5.0
Acetone		< 25	< 10	< 10
Benzene		< 1.3	< 0.50	< 0.50
Bromodichloromethane		< 2.5	< 1.0	< 1.0
Bromoform		< 2.5	< 1.0	< 1.0
Bromomethane		< 5.0	< 2.0	< 2.0
Carbon Disulfide		< 5.0	< 2.0	< 2.0
Carbon Tetrachloride		< 2.5	< 1.0	< 1.0
Chlorobenzene		< 2.5	< 1.0	< 1.0
Chloroethane		< 2.5	< 1.0	< 1.0
Chloroform		< 1.3	< 0.50	< 0.50
Chloromethane		< 2.5	< 1.0	< 1.0
cis-1,2-Dichloroethene		**5.4**	**4.0**	< 0.50
cis-1,3-Dichloropropene		< 2.5	< 1.0	< 1.0
Dibromochloromethane		< 2.5	< 1.0	< 1.0
Ethylbenzene		< 2.5	< 1.0	< 1.0
Methylene Chloride		< 1.3	< 0.50	< 0.50
Styrene		< 2.5	< 1.0	< 1.0
Tetrachloroethene		**16.6**	**30.8**	< 0.50
Toluene		< 2.5	< 1.0	< 1.0
trans-1,2-Dichloroethene		< 1.3	< 0.50	< 0.50
trans-1,3-Dichloropropene		< 2.5	< 1.0	< 1.0
Trichloroethylene		**589 D**	**333 EJ** [4]	< 0.50
Trichlorotrifluoroethane (Freon 113)		**2.2**	**3.4**	< 0.50
Vinyl Chloride		< 1.3	**1.7**	< 0.50
Xylene-o		< 2.5	< 1.0	< 1.0
Xylene-m,p		< 2.5	< 1.0	< 1.0
Total VOCs[3]		**620**	**380**	0
1,4-Dioxane[2]		**8.1**	**10**	**9.8**

Notes and abbreviations on last page.

Table 2
Concentrations of Constituents in Remedial Wells and Treatment System Effluents, First Quarter 2019, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Constituents[1] (units in µg/L)	Location ID: Sample ID: Sample Date:	WELL 17 WELL 17 2/13/2019	WELL 18 WELL 18 2/13/2019	WELL 19 WELL 19 2/13/2019	WELL 19 REP-021319-RM-1 2/13/2019	102 EFFLUENT 102 EFFLUENT 2/13/2019
Volatile Organic Compounds (VOCs)[2]						
1,1,1-Trichloroethane		< 0.50	**0.35 J**	**0.25 J**	< 0.50	< 0.50
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		**0.75 J**	**1.3**	**0.62 J**	**0.64 J**	< 1.0
1,1-Dichloroethene		**1.4**	**3.0**	**1.3**	**1.3**	< 0.50
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 (MEK)		< 10	< 10	< 10	< 10	< 10
2-Hexanone (MBK)		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
4-methyl-2-pentanone (MIK)		< 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	< 1.0	< 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		< 0.50	< 0.50	**0.38 J**	< 0.50	< 0.50
Chloromethane		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene		**2.5**	**2.6**	**15.0**	**15.4**	< 0.50
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		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Styrene		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene		**18.9**	**15.0**	**6.8**	**6.7**	< 0.50
Toluene		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
trans-1,3-Dichloropropene		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethylene		**108**	**41.1**	**112**	**112**	< 0.50
Trichlorotrifluoroethane (Freon 113)		**2.9**	**1.4**	**1.0**	< 0.50	< 0.50
Vinyl Chloride		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Xylene-o		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Xylene-m,p		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total VOCs[3]		**130**	**65**	**140**	**140**	0
1,4-Dioxane[2]		**7.3**	**5.7**	**4.6 J [5]**	**3.2 J [5]**	**5.7**

Notes and abbreviations on last page.

Table 2
Concentrations of Constituents in Remedial Wells and Treatment System Effluents, First Quarter 2019, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

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

(2) VOC samples analyzed using USEPA Method 8260C. 1,4-dioxane samples analyzed using USEPA Method 8270D-SIM.

(3) Total VOC results rounded to two significant figures.

(4) Due to laboratory error a diluted analysis could not be run for the WELL 3R quarterly sample, which resulted in a reported value for TCE of 333 ug/L which exceeds the calibration range of the instrument; the associated result was qualified as estimated. The February estimated sample result is similar to results for monthly samples taken on January 10 and March 13, 2019 (301 ug/L and 304 ug/L, respectively). Additionally, the Febuary estimated sample result is within the typical range of TCE recorded from 2017 through 2019 of 272 ug/L to 498 ug/L.

(5) The compound 1,4-Dioxane associated with samples WELL 19 and REP-021319-RM-1 exhibited a field duplicate RPD greater than the control limit. The associated sample results for the listed compound were qualified as estimated.

2.0 Bold value indicates a detection.

< 1.3 Compound is not detected above its laboratory quantification limit.

D Concentration is based on a diluted sample analysis.

E Indicates value exceeds calibration range.

J Constituent value is estimated.

µg/L micrograms per liter

OU2 Operable Unit 2

REP Blind Replicate Sample

USEPA United States Environmental Protection Agency

VOC Volatile Organic Compound

Table 3A
Vapor Sample Analytical Results First Quarter 2019,
Tower 96 Treatment System
Northrop Grumman Systems Corporation
Operable Unit 2, Bethpage, New York

Location ID: / Sample ID: / Constituents (Units in µg/m^3)	96 INFLUENT T96 INFLUENT (AA) 2/13/2019	96 MID-EFFLUENT T96 MIDTRAIN (AA) 2/13/2019	96 EFFLUENT T96 EFFLUENT (AA) 2/13/2019
Volatile Organic Compounds (VOCs)[1]			
1,1,1-Trichloroethane	**17**	**4.5**	**4.5**
1,1,2,2-Tetrachloroethane	< 0.55	< 0.55	< 0.55
1,1,2-Trichloroethane	**2.6**	< 0.44	< 0.44
1,1-Dichloroethane	**46.1**	**27**	**21**
1,1-Dichloroethene	**105**	**98.3**	**65.4**
1,2-Dichloroethane	**2.6**	**0.77**	**0.73**
1,2-Dichloropropane	**108**	**19**	**2.5**
Benzene	**1.2**	**0.38 J**	**0.64**
Bromodichloromethane	< 0.54	< 0.54	< 0.54
Bromoform	< 0.33	< 0.33	< 0.33
Bromomethane	< 0.62	< 0.62	< 0.62
Carbon Disulfide	< 0.50	**3.7**	< 0.50
Carbon Tetrachloride	**3.1**	< 0.20	< 0.20
Chlorobenzene	**1.1**	< 0.74	< 0.74
Chloroethane	**2.4**	**2.3**	**1.6**
Chloroform	**17**	**8.3**	**6.8**
Chloromethane	**0.97**	**1.0**	**1.7**
cis-1,2-Dichloroethene	**145**	**90.0**	**105**
cis-1,3-Dichloropropene	< 0.73	< 0.73	< 0.73
Dibromochloromethane	< 0.68	< 0.68	< 0.68
Ethylbenzene	< 0.69	< 0.69	< 0.69
Dichloromethane	**0.83**	**0.83**	**0.87**
Styrene	< 0.68	< 0.68	< 0.68
Tetrachloroethene	**685**	**95.6**	**0.75**
Toluene	**0.33 J**	**1.3**	**39.6**
trans-1,2-Dichloroethene	**1.8**	**1.2**	**0.87**
trans-1,3-Dichloropropene	< 0.73	< 0.73	< 0.73
Trichloroethylene	**16,700**	**4,270**	**1,270**
Trichlorotrifluoroethane (Freon 113)	**125**	**50**	**58**
Vinyl Chloride	**24**	**22**	**16**
Xylene-o	< 0.69	< 0.69	< 0.69
Xylene-m,p	< 0.69	< 0.69	**0.52 J**
Total VOCs [2]	**17,989**	**4,696**	**1,596**

Notes and abbreviations on last page.

Table 3A
Vapor Sample Analytical Results First Quarter 2019,
Tower 96 Treatment System
Northrop Grumman Systems Corporation
Operable Unit 2, Bethpage, New York

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.
17	bold value indicates a detection
< 0.54	Compound is not detected above its laboratory quantification limit.
J	Compound detected below its reporting limit; value is estimated.
$\mu g/m^3$	micrograms per cubic meter
ELAP	Environmental Laboratory Approval Program
NYSDOH	New York State Department of Health
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

Table 3B
Vapor Sample Analytical Results First Quarter 2019,
Tower 102 Treatment System,
Northrop Grumman Systems Corporation,
Operable Unit 2, Bethpage, New York

Location ID: Sample ID: Constituents (Units in µg/m^3)	102 INFLUENT T102 INFLUENT (AA) 2/13/2019	102 EFFLUENT T102 EFFLUENT (AA) 2/13/2019
Volatile Organic Compounds (VOCs)[1]		
1,1,1-Trichloroethane	**8.2**	**0.71**
1,1,2,2-Tetrachloroethane	< 0.55	< 0.55
1,1,2-Trichloroethane	**0.98**	< 0.44
1,1-Dichloroethane	**31**	**27**
1,1-Dichloroethene	**63.0**	**66.6**
1,2-Dichloroethane	**2.5**	< 0.65
1,2-Dichloropropane	**5.5**	< 0.74
Benzene	**0.67**	< 0.51
Bromodichloromethane	< 0.54	< 0.54
Bromoform	< 0.33	< 0.33
Bromomethane	< 0.62	< 0.62
Carbon Disulfide	< 0.50	< 0.50
Carbon Tetrachloride	**3.3**	< 0.20
Chlorobenzene	< 0.74	< 0.74
Chloroethane	< 0.42	< 0.42
Chloroform	**8.8**	**4.2**
Chloromethane	**0.83**	**0.74**
cis-1,2 Dichloroethene	**187**	**44.8**
cis-1,3-Dichloropropene	< 0.73	< 0.73
Dibromochloromethane	< 0.68	< 0.68
Ethylbenzene	< 0.69	< 0.69
Dichloromethane	**0.63**	**1.6**
Styrene	< 0.68	< 0.68
Tetrachloroethene	**272**	< 0.22
Toluene	**0.49 J**	**0.49 J**
trans-1,2-Dichloroethene	**1.9**	**0.63**
trans-1,3-Dichloropropene	< 0.73	< 0.73
Trichloroethylene	**2,230**	**16**
Trichlorotrifluoroethane (Freon 113)	**47**	**61**
Vinyl Chloride	< 0.082	**0.21**
Xylene-o	< 0.69	< 0.69
Xylene-m,p	**0.48 J**	< 0.69
Total VOCs [2]	**2,864**	**224**

Notes and abbreviations on last page.

Table 3B
Vapor Sample Analytical Results First Quarter 2019,
Tower 102 Treatment System,
Northrop Grumman Systems Corporation,
Operable Unit 2, Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

Notes and Abbreviations:

(1)	Vapor samples collected by Arcadis on the dates shown and submitted to a NYSDOH ELAP certified laboratory for VOC analyses per Modified USEPA Method TO-15.
(2)	Total VOCs represents the sum of individual concentrations of compounds detected rounded to the nearest whole number.
5.5	bold value indicates a detection
< 0.68	Compound is not detected above its laboratory quantification limit.
J	Compound detected below its reporting limit; value is estimated.
µg/m^3	micrograms per cubic meter
ELAP	Environmental Laboratory Approval Program
NYSDOH	New York State Department of Health
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

Table 4A
Summary of AERMOD Air Quality Impact Analysis
Tower 96 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

Constituent	CAS#	T96 Effluent (ug/m^3)	Emission Rate[1]			Scaled Impact - Hourly [2] (ug/m^3)	Scaled Impact - Annual [2] (ug/m^3)	SGC [3] (ug/m^3)	AGC[3] (ug/m^3)	%SGC	% AGC
		2/13/2019	lb/yr	lb/hr	g/s						
1,1,1 - Trichloroethane	00071-55-6	**4.5**	0.72	8.21E-05	1.03E-05	1.53E-03	4.50E-05	9,000	5000.00	0.00%	0.00%
1,1 - Dichloroethane	00075-34-3	**21**	3.36	3.83E-04	4.83E-05	7.15E-03	2.10E-04	--	0.63	--	0.03%
1,2 - Dichloroethane	00107-06-2	**0.73**	0.12	1.33E-05	1.68E-06	2.49E-04	7.29E-06	--	0.04	--	0.02%
1,1 - Dichloroethene	00075-35-4	**65.4**	10.46	1.19E-03	1.50E-04	2.23E-02	6.53E-04	--	200.00	--	0.00%
Tetrachloroethene	00127-18-4	**0.75**	0.12	1.37E-05	1.72E-06	2.55E-04	7.49E-06	300	4.00	0.00%	0.00%
Trichloroethene[4]	00079-01-6	**1,270**	203	2.32E-02	2.92E-03	4.32E-01	1.27E-02	20	0.20	2.16%	6.34%
Vinyl Chloride[4]	00075-01-4	**16**	2.56	2.92E-04	3.68E-05	5.45E-03	1.60E-04	180,000	0.11	0.00%	0.15%
cis 1,2-Dichloroethene	00156-59-2	**105**	16.79	1.92E-03	2.41E-04	3.57E-02	1.05E-03	--	63.00	--	0.00%
trans 1,2-Dichloroethene	00156-60-5	**0.87**	0.14	1.59E-05	2.00E-06	2.96E-04	8.69E-06	--	63.00	--	0.00%
Benzene[4]	00071-43-2	**0.64**	0.10	1.17E-05	1.47E-06	2.18E-04	6.39E-06	1,300	0.13	0.00%	0.00%
Toluene	00108-88-3	**39.6**	6.33	7.23E-04	9.11E-05	1.35E-02	3.96E-04	37,000	5000.00	0.00%	0.00%
Xylenes - m,p	01330-20-7	**0.52**	0.08	9.49E-06	1.20E-06	1.77E-04	5.20E-06	22000	100.00		0.00%
1,2-Dichloropropane	00078-87-5	**2.5**	0.40	4.56E-05	5.75E-06	8.51E-04	2.50E-05	--	4.00	--	0.00%
Chloroethane	00078-93-14	**1.6**	0.26	2.92E-05	3.68E-06	5.45E-04	1.60E-05	--	10000.00	--	0.00%
Chloroform	00078-93-15	**6.8**	1.09	1.24E-04	1.56E-05	2.31E-03	6.79E-05	150	14.70	0.00%	0.00%
Chloromethane	00078-93-16	**1.7**	0.27	3.10E-05	3.91E-06	5.79E-04	1.70E-05	22,000	90.00	0.00%	0.00%
Dichloromethane	00078-93-19	**0.87**	0.14	1.59E-05	2.00E-06	2.96E-04	8.69E-06	14,000	60.00	0.00%	0.00%
Trichlorotrifluoroethane (Freon 113)	00078-93-26	**58**	9.27	1.06E-03	1.33E-04	1.97E-02	5.79E-04	960,000	180000.00	0.00%	0.00%

Notes and Abbreviations on next page

Table 4A
Summary of AERMOD Air Quality Impact Analysis
Tower 96 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

Notes and Abbreviations:

(1) Emission rate calculated based on effluent concentration and a stack air flow rate of 4,839 cfm. The stack air flow rate (in acfm) is taken from the actual stack air flow rate on 2/13/19. Effluent temperature used in the model was 92°F from direct read in-line gauge.
Trichloroethene (lb/hr) = (720 ug/m^3) x (4,839 ft^3/min) x (1 m^3/35 ft^3) x (60 min/hr) x (0.000001 g/1 ug) x (0.0022 lb/g)
lb/yr = lb/hr x 8,760 hrs/yr
g/s = lb/hr x 1 hr/3,600 sec x 453.59 g/1 lb

(2) Ambient impact based on AERMOD modeling using normalized rate of 1 g/s is scaled to the actual emission rate of the pollutant. Modeling was performed using the representative meteorological data from the nearest station (Farmingdale, NY) for the years 2011 through 2015, and a stack which is 55 feet high and 20 inches in diameter. The maximum impact from all the years was used for the calculations.
Scaled hourly impact (ug/m^3) = AERMOD predicted hourly ambient impact at 1 g/s ([ug/m^3]/[g/s]) x Actual emission rate (g/s)
Scaled annual impact (ug/m^3) = AERMOD predicted annual ambient impact at 1 g/s ([ug/m^3]/[g/s]) x Actual emission rate (g/s)

AERMOD Normalized Ambient Impact at 1 g/s	
Hourly ([ug/m^3]/[g/s])	Annual ([ug/m^3]/[g/s])
148.05	4.35

(3) Short-term and annual guideline concentrations for air toxic pollutants specified in the NYSDEC DAR-1 AGC/SGC tables revised August 10, 2016.

(4) Vinyl Chloride and Benzene potential emission rates are less than 0.1 lb/hr and therefore below the trigger emissions for degree of air cleaning requirement (6 CRR-NY 212-2.3). TCE potential emissions are above the trigger limit and require a 12 month rolling average of annual emission to be maintained (see Table 5A) to demonstrate compliance with the 6 CRR-NY 212-2.2 500 lb/year requirement.

AGC	Annual Guideline Concentration	**4.5**	bold value indicates a detection
CAS #	Chemical Abstracts Service Registry Number	acfm	actual cubic feet per minute
CRR-NY	New York Codes, Rules and Regulations	g/s	grams per second
DAR-1	Division of Air Resources-1	µg/m^3	micrograms per cubic meter
--	None Specified	lb/yr	pounds per year
NYSDEC	New York State Department of Environmental Conservation	lb/hr	pounds per hour
SGC	Short-term Guideline Concentration		

Table 4B
Summary of AERMOD Air Quality Impact Analysis
Tower 102 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

Constituent	CAS#	T102 Effluent (ug/m^3)	Emission Rate[1]			Scaled Impact - Hourly [2] (ug/m^3)	Scaled Impact - Annual [2] (ug/m^3)	SGC [3] (ug/m^3)	AGC[3] (ug/m^3)	%SGC	% AGC
		2/13/2019	lb/yr	lb/hr	g/s						
1,1,1 - Trichloroethane	00071-55-6	**0.71**	0.18	2.10E-05	2.65E-06	9.24E-04	6.05E-06	9000	5000.00	0.00%	0.00%
1,1 - Dichloroethane	00075-34-3	**27**	7.00	8.00E-04	1.01E-04	3.51E-02	2.30E-04	--	0.63	--	0.04%
1,1 - Dichloroethene	00075-35-4	**66.6**	17.28	1.97E-03	2.48E-04	8.67E-02	5.68E-04	--	200.00	--	0.00%
Trichloroethene[4]	00079-01-6	**16**	4.15	4.74E-04	5.97E-05	2.08E-02	1.36E-04	20	0.20	0.10%	0.07%
Vinyl Chloride[4]	00075-01-4	**0.21**	0.05	6.22E-06	7.84E-07	2.73E-04	1.79E-06	180,000	0.11	0.00%	0.00%
cis-1,2-Dichloroethene	00156-59-2	**44.8**	11.62	1.33E-03	1.67E-04	5.83E-02	3.82E-04	--	63.00	--	0.00%
trans-1,2-Dichloroethene	00156-60-5	**0.63**	0.16	1.87E-05	2.35E-06	8.20E-04	5.37E-06	--	63.00	--	0.00%
Toluene	00108-88-3	**0.49**	0.13	1.45E-05	1.83E-06	6.38E-04	4.18E-06	37000	5000.00		0.00%
Chloroform	00067-66-3	**4.2**	1.09	1.24E-04	1.57E-05	5.47E-03	3.58E-05	150	14.70	0.00%	0.00%
Chloromethane	00074-87-3	**0.74**	0.19	2.19E-05	2.76E-06	9.63E-04	6.31E-06	22,000	90.00	0.00%	0.00%
Dichloromethane	00075-09-2	**1.6**	0.42	4.74E-05	5.97E-06	2.08E-03	1.36E-05	14,000	60.00	0.00%	0.00%
Trichlorotrifluoroethane (Freon 113)	00076-13-1	**61**	15.82	1.81E-03	2.28E-04	7.94E-02	5.20E-04	960,000	180000.00	0.00%	0.00%

Table 4B
Summary of AERMOD Air Quality Impact Analysis
Tower 102 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

Notes and Abbreviations:

(1) Emission rate calculated based on effluent concentration and a stack air flow rate of 7,852 cfm. The stack air flow rate (in acfm) is taken from the actual stack air flow rate on 2/13/2019. Effluent temperature used in the model was 80°F from direct read in-line gauge.
Trichloroethene (lb/hr) = (21 ug/m^3) x (7,919 ft^3/min) x (1 m^3/35 ft^3) x (60 min/hr) x (0.000001 g/1 ug) x (0.0022 lb/g)
lb/yr = lb/hr x 8,760 hrs/yr
g/s = lb/hr x 1 hr/3,600 sec x 453.59 g/1 lb

(2) Ambient impact based on AERMOD modeling using noramalized rate of 1 g/s is scaled to the actual emission rate of the pollutant. Modeling was performed using the representative meteorological data from the nearest station (Farmingdale, NY) for the years 2011 through 2015, and a stack which is 69.52 feet high and 24 inches in diameter. The maximum impact from all the years was used for the calculations.
Scaled hourly impact (ug/m^3) = AERMOD predicted hourly ambient impact at 1 g/s ([ug/m^3]/[g/s]) x Actual emission rate (g/s)
Scaled annual impact (ug/m^3) = AERMOD predicted annual ambient impact at 1 g/s ([ug/m^3]/[g/s]) x Actual emission rate (g/s)

AERMOD Normalized Ambient Impact at 1 g/s	
Hourly ([ug/m^3]/[g/s])	Annual ([ug/m^3]/[g/s])
348.85	2.29

(3) Short-term and annual guideline concentrations for air toxic pollutants specified in the NYSDEC DAR-1 AGC/SGC tables revised August 10, 2016.
(4) Vinyl Chloride potential emission rate is less than 0.1 lb/hr and therefore below the trigger emissions for degree of air cleaning requirement (6 CRR-NY 212-2.3). TCE potential emissions are above the trigger limit and require a 12 month rolling average of annual emission to be maintained (see Table 5B) to demonstrate compliance with the 6 CRR-NY 212-2.2 500 lb/year requirement.

AGC	Annual Guideline Concentration	**16**	bold value indicates a detection
CAS #	Chemical Abstracts Service Registry Number	acfm	actual cubic feet per minute
CRR-NY	New York Codes, Rules and Regulations	g/s	grams per second
DAR-1	Division of Air Resources-1	µg/m^3	micrograms per cubic meter
--	None Specified	lb/yr	pounds per year
NYSDEC	New York State Department of Environmental Conservation	lb/hr	pounds per hour
SGC	Short-term Guideline Concentration		

Table 5A
Summary of TCE Mass Removal, Tower 96 Treatment System, 2019, Northrop Grumman Systems Corporation, Operable Unit 2, Bethpage, New York[1,2,3]

Date	TCE Concentration (µg/m^3)				TCE Mass Emission[2]	Percent of Allowable TCE Emissions[3]
	T96 INFLUENT	T96 MIDTRAIN	T96 SUP MIDTRAIN	T96 EFFLUENT	(lbs)	12 Month Rolling Average
1/31/2018	NS	3,510	2,710	17	0.4	91.3%
2/28/2018	13,000	2,860	3,930	86.5	1.0	91.4%
4/13/2018 [4]	13,000	NS	NS	232	4.4	52.9%
5/15/2018	17,400	5,430	14	1,590	22	44.5%
9/5/2018 [5]	18,700	3,650	NS	693	34	20.0%
12/7/2018	14,400	3,190	NS	720	29	18.1%
2/13/2019	16,700	4,270	NS	1,270	7.0	25.4%

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) TCE Mass Emission calculated based on the exhaust air flow rate on the day of sampling and the period of time since the preceding day of sampling.

TCE (lb) = TCE Concentration [µg/m^3] x Days x Flow Rate [ft^3/min] x (1 m^3/35 ft^3) x (60 min/hr) x (24 hr/day) x (0.000001 g/1 ug) x (0.0022 lb/g)

(3) Percent of allowable TCE emissions to date is a time-weighted annual rolling average based on the 500 lb/year emission limit specified in the CRR-NY 212-2.2 Table 2. High Toxicity Air Contaminant List, revised April 1, 2017.

(4) Carbon changeout for Tower 96 lead supplemental bed was completed on April 6, 2018.

(5) Regenerative Carbon changeout for Tower 96 was completed on July 28, 2018.

µg/m^3	micrograms per cubic meter
lbs	pounds
CRR-NY	Codes, Rules and Regulations of the State of New York
ELAP	Environmental Laboratory Approval Program
NS	Not Sampled
NYSDOH	New York State Department of Health
SUP	Supplemental
TCE	Trichloroethylene
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

Table 5B
Summary of TCE Mass Removal, Tower 102 Treatment System, 2019, Northrop Grumman Systems Corporation, Operable Unit 2, Bethpage, New York[1,2,3]

ARCADIS Design & Consultancy for natural and built assets

Date	TCE Concentration (µg/m^3)		TCE Mass Emission[2]		Percentage of Allowable TCE Emissions[3]	
	T102 INFLUENT	T102 EFFLUENT	lbs	lbs/day	Period	12 Month Rolling Average
2/28/2018	2,970	4	0.2	0.00	0.2%	0.9%
5/10/2018	1,710	2	0.1	0.00	0.1%	1.2%
9/5/2018 [4]	3,480	1	0.1	0.00	0.1%	0.4%
12/7/2018	2,380	21	1.4	0.01	1.1%	0.4%
2/13/2019	2,230	16	0.8	0.01	0.8%	0.5%

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) TCE Mass Emission calculated based on the exhaust air flow rate on the day of sampling and the period of time since the preceding sampling day.

TCE (lb) = TCE Concentration [µg/m^3] x Days x Flow Rate [ft^3/min] x (1 m^3/35 ft^3) x (60 min/hr) x (24 hr/day) x (0.000001 g/1 ug) x (0.0022 lb/g)

(3) Percent of allowable TCE emissions to date is a time-weighted annual rolling average based on the 500 lb/year emission limit specified in the CRR-NY 212-2.2 Table 2. High Toxicity Air Contaminant List, revised April 1, 2017.

µg/m^3 micrograms per cubic meter
lbs pounds
ELAP Environmental Laboratory Approval Program
NYSDOH New York State Department of Health
T102 Tower 102
TCE trichloroethene
USEPA United States Environmental Protection Agency
VOC volatile organic compound

Table 6
Concentrations of Volatile Organic Compounds and 1,4-Dioxane in Monitoring Wells [1]
BPOW 2-1, BPOW 2-2 and BPOW 2-3, First Quarter 2019,
Operable Unit 2 (Groundwater),
Bethpage, New York

ARCADIS Design & Consultancy for natural and built assets

CONSTITUENT Units (ug/L)	Location ID: Sample ID: Date:	BPOW 2-1 BPOW 2-1 2/18/2019	BPOW 2-2 BPOW 2-2 2/18/2019	BPOW 2-3 BPOW 2-3 2/18/2019
Volatile Organic Compounds (VOCs) [2,3]				
1,1,1-Trichloroethane		< 0.50	< 0.50	< 0.50
1,1,2,2-Tetrachloroethane		< 0.50	< 0.50	< 0.50
1,1,2-trichloro-1,2,2-trifluroethane		< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane		< 0.50	< 0.50	< 0.50
1,1-Dichloroethane		< 0.50	< 0.50	< 0.50
1,1-Dichloroethene		< 0.50	< 0.50	< 0.50
1,2-Dichloroethane		< 0.50	< 0.50	< 0.50
1,2-Dichloropropane		< 0.50	< 0.50	< 0.50
2-Butanone (MEK)		< 5.0	< 5.0	< 5.0
2-Hexanone		< 2.0	< 2.0	< 2.0
4-methyl-2-pentanone (MIK)		< 2.0	< 2.0	< 2.0
Acetone		< 5.0	< 5.0	< 5.0
Benzene		< 0.50	< 0.50	< 0.50
Bromodichloromethane		< 0.50	< 0.50	< 0.50
Bromoform		< 0.50	< 0.50	< 0.50
Bromomethane		< 0.50	< 0.50	< 0.50
Carbon Disulfide		< 0.50	< 0.50	< 0.50
Carbon tetrachloride		< 0.50	< 0.50	< 0.50
Chlorobenzene		< 0.50	< 0.50	< 0.50
Chloroethane		< 0.50	< 0.50	< 0.50
Chloroform		< 0.50	< 0.50	< 0.50
Chloromethane		< 0.50	< 0.50	< 0.50
cis-1,2-dichloroethene		< 0.50	< 0.50	< 0.50
cis-1,3-dichloropropene		< 0.50	< 0.50	< 0.50
Dibromochloromethane		< 0.50	< 0.50	< 0.50
Ethylbenzene		< 0.50	< 0.50	< 0.50
Methylene Chloride		< 0.50	< 0.50	< 0.50
Styrene		< 0.50	< 0.50	< 0.50
Tetrachloroethene		< 0.50	< 0.50	< 0.50
Toluene		< 0.50	< 0.50	< 0.50
trans-1,2-dichloroethene		< 0.50	< 0.50	< 0.50
trans-1,3-dichloropropene		< 0.50	< 0.50	< 0.50
Trichloroethylene		< 0.50	< 0.50	< 0.50
Vinyl Chloride		< 0.50	< 0.50	< 0.50
Xylene-o		< 0.50	< 0.50	< 0.50
Xylenes - m,p		< 0.50	< 0.50	< 0.50
Total VOCs		0	0	0
1,4-Dioxane [2,3]		**0.644**	**0.475**	**3.19**

See last page for Notes and Abbreviations.

Table 6
Concentrations of Volatile Organic Compounds and 1,4-Dioxane in Monitoring Wells [(1)]
BPOW 2-1, BPOW 2-2 and BPOW 2-3, First Quarter 2019,
Operable Unit 2 (Groundwater),
Bethpage, New York

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

0.644	Bold value indicates a detection
VOC	Volatile Organic Compound
µg/L	micrograms per liter
<0.5	Compound not detected above its laboratory quantification limit

FIGURES

CITY:(Reqd) DIV/GROUP:(Reqd) DB:(Reqd) LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
C:\BIM\OneDrive - ARCADIS\BIM 360 Docs\NORTHROP GRUMMAN\OU2 ONCT OM&M PROGRAM\2019\01-DWG\NGC-ONCT-ONSITE-GW-REMEDY.dwg LAYOUT: 1 SAVED: 3/26/2019 5:14 PM ACADVER: 23.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 3/26/2019 5:17 PM BY: SANCHEZ, ADRIAN
XREFS: IMAGES: PROJECTNAME: ----
X-LI-NY_R2&ST
X-1496X01

FORMER RUCO POLYMER SITE

NWIRP SITE (FORMER NAVY SITE)

BETHPAGE COMMUNITY PARK

BETHPAGE HIGH SCHOOL

OU-2 ON-SITE GROUNDWATER REMEDY TREATMENT SYSTEMS

OU2 MAIN FACILITY REMEDIAL SYSTEM (TOWER 96)

OU2 MAIN FACILITY REMEDIAL SYSTEM (TOWER 102)

OU2 OUTFALL 006

OU2 OUTFALL 005

SOUTH BASINS

HWD 10208

HWD 8779

BWD 8768

BWD 8767

BWD 9591

FW-03

HN-24I HN-24S

HN-42S HN-42I

HN-40S HN-40I

GM-13D

GM-16I GM-16SR

MW-3-1

WELL 3R

WELL 3

GM-17SR GM-17I GM-17D

10597

MW-1GF

GM-32S

PLANT 2

WELL 1

GM-39DA GM-39DB

MW-2GF

GM-18S GM-18I GM-18D

GM-73D3 GM-73D2 GM-73D

GM-33D2 10631

WELL-17

10600

GM-78S GM-78I GM-78D GM-78D2

MW-3R

GM-20I GM-20D

GM-21D2 10633

9921

GM-75D2 10624

10627

GM-21S GM-21I GM-21D

10634

GM-19S GM-19I

MW-5 MW-6 MW-4

GM-74I GM-74D GM-74D2 GM-74D3

WELL-18

WELL-19

GM-15SR GM-15I GM-15D GM-15D2

GM-79I GM-79D

10628

GM-71D2

GM-70D2

GM-35D2

GM-36D GM-36D2

N-10821

GM-37D GM-37D2

BWD 6915 6916

BWD 8941 3876

GM-38D GM-38D2

BWD 8004

GM-34D GM-34D2

TOH(LWD) 7076

BPOW 4-2R

BPOW 4-1R

TOH(LWD) 5303

BPOW 3-3 BPOW 3-4

BPOW 3-2 BPOW 3-1

NYAW 9338 NYAW 8480

BPOW 2-2 BPOW 2-3 BPOW 2-1

SFWD 6150

BPOW 1-4 BPOW 1-5 BPOW 1-6 BPOW 1-3 BPOW 1-1 BPOW 1-2

SFWD 7377 SFWD 5148 SFWD 4043

HAYPATH ROAD

FARMERS AVENUE

(PLAINVIEW ROAD)

BROADWAY

GRUMMAN ROAD

LONG ISLAND RAILROAD

CENTRAL AVENUE

BLOOMINGDALE ROAD

NORTH WANTAGH AVE.

HICKSVILLE ROAD

STEWART AVENUE

SEAFORD - OYSTER BAY EXPRESSWAY

BETHPAGE STATE PARKWAY

MALLARD ROAD

(GARDINER'S AVENUE)

LOWLAND ROAD

PIKE

BOUNDARY AVENUE

(107)

PLANT 111, PLANT 116, PLANT 115, PLANT 21, PLANT 37, PLANT 15, PLANT 14, PLANT 26, PLANT 35, PLANT 30, PLANT 3, PLANT 10, PLANT 25, PLANT 5, PLANT 1

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.

0 1000' 2000'

APPROXIMATE SCALE IN FEET

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

LOCATIONS OF OF WELLS AND ON-SITE GROUNDWATER REMEDY

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1

PLANT 25

PLANT 5

TOWER 102
TREATMENT
SYSTEM

WELL 3R

WEST RECHARGE BASINS
(OUTFALL 006)

TOWER 96
TREATMENT
SYSTEM

WELL 3

LONG ISLAND RAILROAD

GRUMMAN ROAD WEST

PLANT 2

PLANT 1

GRUMMAN ROAD EAST

WELL
1

AERATION BASIN

LIRR

WELL
17

SOUTH RECHARGE BASINS
(OUTFALL 005)

WELL 18

WELL
19

SUN–SITE

LEGEND:

- FORMER NORTHROP GRUMMAN PROPERTY LINE
- INFLUENT LINE
- BYPASS
- STORM DRAIN (EFFLUENT)
- NON POTABLE WATER DISTRIBUTION LINE (EFFLUENT)
- RAILROAD TRACKS
- FENCE
- WELL 18 — REMEDIAL WELL
- BASIN
- ONCT — ON–SITE CONTAMINANT

NOTES:

DRAWING IS NOT TO BE USED FOR DESIGN PURPOSES. LAYOUT OF PIPING IS FOR REPRESENTATION ONLY (LOCATIONS ARE APPROXIMATE).

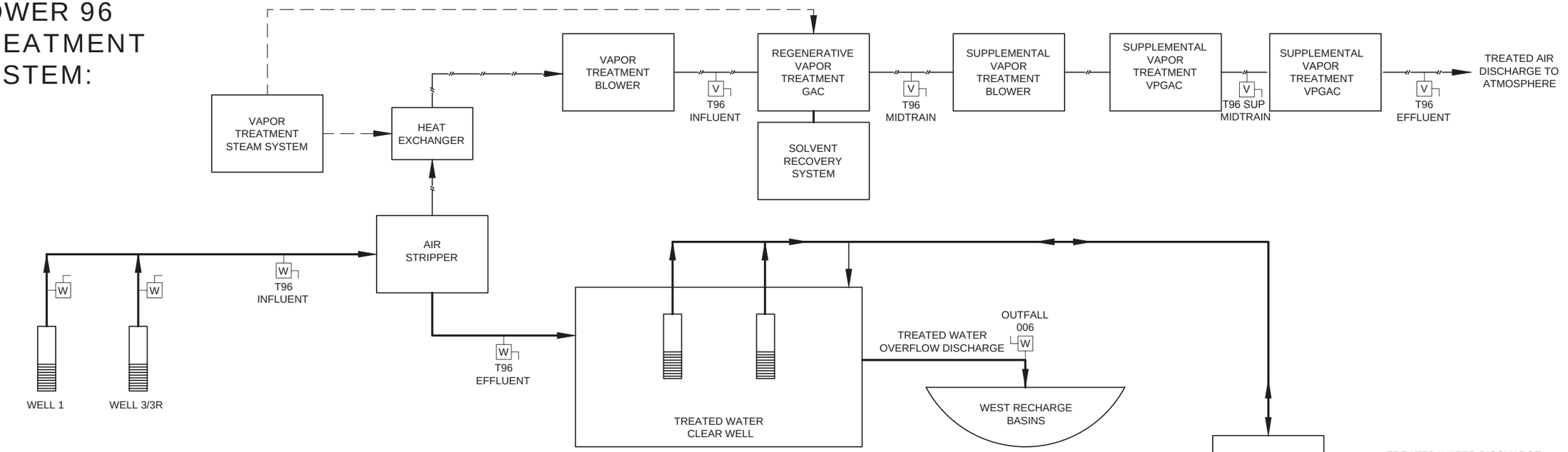
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

ONCT GROUNDWATER EXTRACTION AND TREATMENT SYSTEM SITE PLAN

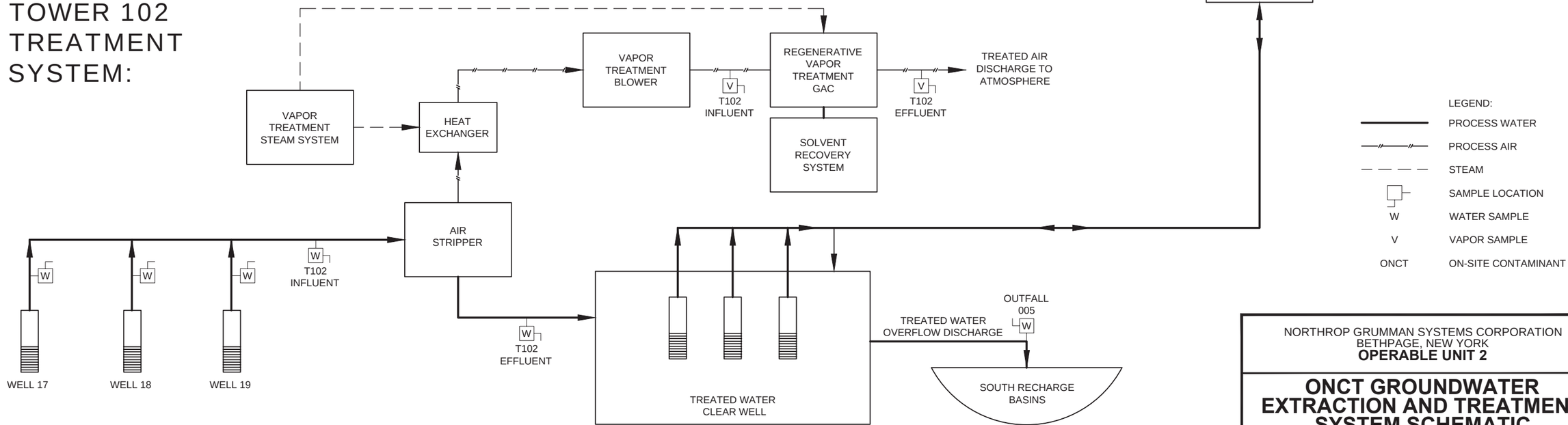
ARCADIS Design & Consultancy for natural and built assets

FIGURE
2

TOWER 96 TREATMENT SYSTEM:



TOWER 102 TREATMENT SYSTEM:



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 3