ARCADIS Design & Consultancy for natural and built assets

Mr. Henry Wilkie
Project Manager
New York State Department of Environmental Conservation
Remedial Bureau A
625 Broadway
Albany, New York 12233-7015

Mr. Steven Scharf, P.E.
Project Manager
New York State Department of Environmental Conservation
Remedial Bureau A
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

Date:
May 31, 2016

Contact:
David E. Stern

Phone:
631.391.5284

Email:
david.stern@arcadis.com

Our ref:
NY001496.315I.GWMI4

Subject:

2016 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)

Dear Henry and Steve:

On behalf of Northrop Grumman Systems Corporation (Northrop Grumman), Arcadis is providing the NYSDEC with the 2016 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 and water balance. Tables 2 and 3 provide the analytical results for remedial system water samples for this period. Tables 3, 4 and 5 provide the analytical results and analysis for vapor samples collected from the system for this period. Figures 1 through 3 show the Well and Treatment System Site Locations, Treatment System Site Plan and the 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
Project Manager

Copies:

Ed Hannon – Northrop Grumman
Fred Weber – Northrop Grumman
Walter Parish – NYSDEC Region 1
Steven Karpinski – New York State Department of Health
Michael Alarcon – Nassau County Department of Health
Joseph DeFranco – Nassau County Department of Health
Lora Fly – NAVFAC Midlant Environmental
David Brayack – TetraTech NUS, Inc.
Roger Smith – Glenn Springs Holdings, Inc.
Kevin Lumpe – Steel Equities
Thomas Taccone – USEPA
Robert Alvey – USEPA
Carol Stein-USEPA
Matthew Russo – Town of Oyster Bay
Stan Carey – Massapequa Water District
Matthew Snyder – New York American Water
Charles Prucha – South Farmingdale Water District
John Reinhardt – Town of Hempstead Water District
Michael Boufis – Bethpage Water District
Lois Lovisolo – Bethpage Public Library (Public Repository)
File

Table 1

Operational Summary for the On-Site Portion of the OU2 Groundwater Remedy, First Quarter 2016 [1]
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	853	104.8	105.1	100%	792	840	738	41,596
Well 3R [11]	700	971	91.7	119.7	131%	529	580	568	87,383
Well 17 [12]	1,000	1,020	131.0	125.7	96%	149	190	195	51,929
Well 18 [12,13]	600	700	78.6	87.1	111%	51	72	51	5,948
Well 19 [12]	700	729	91.7	92.6	101%	148	180	136	7,571
Total [14]	**3,800**	**4,273**	**498**	**530**	**106%**	**--**	**--**	**1,688**	**194,427**
Effluent Groundwater [8]									
Calpine	100 - 400	122	--	15.5	--	--	--	--	--
OXY Biosparge [10]	2 - 42	0	--	0	--	--	--	--	--
West Recharge Basins	1,112 - 1,455	1,045	--	136.9	--	--	2.1	--	--
South Recharge Basins	2,231	2,883	292.4	377.8	129%	--	1.6	--	--
Total [14]	**--**	**4,050**	**--**	**530**	**--**				
Additional Flow to South Recharge Basins									
Storm Water Runoff Contributing to South Recharge Basins Flow Volume [15]	--	--	--	17.4	--	--	--	--	--
Total Flow Volume to South Recharge Basins [14,16]			**292**	**395**	**135%**				

Treatment Efficiencies [9]	
Tower 96 System:	99.6%
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 2016 (1)
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 04, 2016 through April 04, 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 (94%), Well 3R (94%), Well 17 (94%), Well 18 (95%), and Well 19 (97%). "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 March 14, 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 that the OXY Biosparge system required no usage in the 1st Quarter of 2016.
(11) Wells 1 and 3R were shut down on February 10, 2016 for replacement of the Occidental blower belt at Tower 96 and from March 3 through March 7, 2016 for replacement of the heat exchanger steam coil at Tower 96.
(12) Wells 17, 18 and 19 shut down on February 7, 2016 and on March 6, 2016 due to power failures.
(13) Well 18 was shut down on February 3, 2016 for modification of the Variable Frequency Drive.
(14) Total pumpage/recharge rates are accurate to ±15% due to limitations in metering. Flow meter calibration was completed at all required locations except the Tower 102 Weir Overflow (South Recharge Basins), which is scheduled.
(15) 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.
(16) 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, First Quarter 2016, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York

Constituents (units in µg/L)	Location ID: / Sample ID: / Sample Date:	WELL 1 / WELL 1 / 3/14/2016	WELL 3R / WELL 3R / 3/14/2016	96 EFFLUENT / T96 EFFLUENT (GW) / 3/14/2016
Volatile Organic Compounds (VOCs)[1,2]	NYSDEC SCGs (µg/L)[3]			
1,1,1-Trichloroethane	5	**0.40 J**	**0.80 J**	< 1.0
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	**0.82 J**	**1.5**	< 1.0
1,1-Dichloroethene	5	**2.4**	**4.0**	< 1.0
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	**4.2**	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10
2-Hexanone (MBK)	50	< 5.0	< 5.0	< 5.0
4-methyl-2-pentanone (MIK)	50	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0
Carbon tetrachloride	5	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0
Chloroform	7	**0.24 J**	< 1.0	< 1.0
Chloromethane	5	< 1.0	< 1.0	< 1.0
cis-1,2-dichloroethene	5	**4.9**	**5.6**	< 1.0
cis-1,3-dichloropropene	5	< 1.0	< 1.0	< 1.0
Dibromochloromethane	5	< 1.0	< 1.0	< 1.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0
Methylene Chloride	5	< 2.0	< 2.0	< 2.0
Styrene	5	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	**30**	**31**	< 1.0
Toluene	5	< 1.0	< 1.0	< 1.0
trans-1,2-dichloroethene	5	< 1.0	< 1.0	< 1.0
trans-1,3-dichloropropene	5	< 1.0	< 1.0	< 1.0
Trichloroethylene	5	**792 D**	**529 D**	**2.6**
Trichlorotrifluoroethane (Freon 113)	5	**3.3 J**	**3.6 J**	< 5.0
Vinyl Chloride	2	< 1.0	**8.6**	< 1.0
Xylene-o	5	< 1.0	< 1.0	< 1.0
Xylenes - m,p	5	< 1.0	< 1.0	< 1.0
Total VOCs[4]		**840**	**580**	**2.6**
1,4-Dioxane[1,2]	NS	**5.03**	**10.2**	**9.85**

Notes and abbreviations on last page.

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

Constituents (units in µg/L)	Location ID: / Sample ID: / Sample Date:	WELL 17 / WELL 17 / 3/14/2016	WELL 18 / WELL 18 / 3/14/2016	WELL 19 / WELL 19 / 3/14/2016	102 EFFLUENT T102 EFFLUENT (GW) 3/14/2016
Volatile Organic Compounds (VOCs)[1,2]	NYSDEC SCGs (µg/L)[3]				
1,1,1-Trichloroethane	5	**0.45 J**	**0.64 J**	**0.40 J**	< 1.0
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	**1.0**	**1.3**	**0.77 J**	< 1.0
1,1-Dichloroethene	5	**2.1**	< 1.0	**0.79 J**	< 1.0
1,2-Dichloroethane	5	< 1.0	< 1.0	**0.39 J**	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10
2-Hexanone (MBK)	50	< 5.0	< 5.0	< 5.0	< 5.0
4-methyl-2-pentanone (MIK)	50	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0
Carbon tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	**0.38 J**	**0.23 J**	**0.45 J**	< 1.0
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-dichloroethene	5	**3.5**	**2.2**	**18**	< 1.0
cis-1,3-dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Methylene Chloride	5	< 2.0	< 2.0	< 2.0	< 2.0
Styrene	5	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	**29**	**14**	**7.3**	< 1.0
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-dichloroethene	5	< 1.0	< 1.0	**0.90 J**	< 1.0
trans-1,3-dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethylene	5	**149**	**51**	**148**	< 1.0
Trichlorotrifluoroethane (Freon 113)	5	**5.0**	**1.8 J**	**1.2 J**	< 5.0
Vinyl Chloride	2	< 1.0	< 1.0	< 1.0	< 1.0
Xylene-o	5	< 1.0	< 1.0	< 1.0	< 1.0
Xylenes - m,p	5	< 1.0	< 1.0	< 1.0	< 1.0
Total VOCs[4]		**190**	**72**	**180**	0
1,4-Dioxane[1,2]	NS	**4.86**	**3.96**	**4.09[5]**	**5.80**

Notes and abbreviations on last page.

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

ARCADIS Design & Consultancy for natural and built assets

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 2014).
(3) Standards, Criteria, and Guidance (SCG) values based on documents referenced in the Groundwater Feasibility Study Report (ARCADIS Geraghty & Miller, Inc. 2000) that are based on the NYSDEC TOGs (NYSDEC 1998); most stringent values are listed.
(4) Total VOC results rounded to two significant figures.
(5) A blind replicate sample was taken at Well 19 and analyzed for 1,4-Dioxane with a detection of 4.53 ug/L.

	Compound detected in exceedance of NYSDEC SCG Criteria.
2.4	Bold value indicates a detection.
< 5.0	Compound is not detected above its laboratory quantification limit.
µg/L	micrograms per liter
D	Concentration is based on a diluted sample analysis.
J	Constituent value is estimated.
NYSDEC	New York State Department of Conservation
NS	None Specified
REP	blind replicate sample
SCG	standards, criteria and guidance value
SIM	selective ion monitoring
VOC	volatile organic compounds

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

Location ID: Sample ID: Constituents (Units in µg/m^3) Date:	96 INFLUENT T96 INFLUENT (AA) 3/14/2016	96 MID-EFFLUENT T96 MIDTRAIN (AA) 3/14/2016	96 EFFLUENT T96 EFFLUENT (AA) 3/14/2016	102 INFLUENT T102 INFLUENT (AA) 3/14/2016	102 EFFLUENT T102 EFFLUENT (AA) 3/14/2016
Volatile Organic Compounds (VOCs)[1]					
1,1,1-Trichloroethane	**24**	**7.6**	< 0.55	**18**	< 0.55
1,1,2,2-Tetrachloroethane	< 14	< 3.2	< 0.69	< 2.7	< 0.69
1,1,2-Trichloroethane	< 11	< 2.6	< 0.55	< 2.2	< 0.55
1,1-Dichloroethane	**53**	**37**	**4.5**	**54**	**6.1**
1,1-Dichloroethylene	**164**	**124**	**21**	**129**	**28**
1,2-Dichloroethane	< 16	< 3.8	< 0.81	**4.0**	< 0.81
1,2-Dichloropropane	**103**	**13**	< 0.92	< 3.7	< 0.92
Benzene	< 13	< 3.0	< 0.64	< 2.6	< 0.64
Bromodichloromethane	< 13	< 3.1	< 0.67	< 2.7	< 0.67
Bromoform	< 8.3	< 2.0	< 0.41	< 1.7	< 0.41
Bromomethane	< 16	< 3.7	< 0.78	< 3.1	< 0.78
Carbon disulfide	< 12	< 2.9	< 0.62	< 2.5	**0.50 J**
Carbon tetrachloride	< 5.0	< 1.2	< 0.25	**4.8**	< 0.25
Chlorobenzene	< 18	< 4.3	< 0.92	< 3.7	< 0.92
Chloroethane	**9.2 J**	**7.1**	**7.4**	< 2.1	< 0.53
Chloroform	**11 J**	**5.9**	< 0.98	**17**	**1.0**
Chloromethane	< 8.3	**1.3 J**	**2.7**	**1.2 J**	**1.3**
cis-1,3-Dichloropropene	< 18	< 4.3	< 0.91	< 3.6	< 0.91
Dibromochloromethane	< 18	< 4.0	< 0.85	< 3.4	< 0.85
Ethylbenzene	< 17	< 4.1	< 0.87	< 3.5	< 0.87
Methylene chloride	< 14	< 3.3	**2.3**	< 2.8	< 0.69
Styrene	< 17	< 4.0	< 0.85	< 3.4	< 0.85
Tetrachloroethylene	**1,580**	**50**	**1.2**	**674**	**1.8**
Toluene	< 15	**6.0**	< 0.75	**1.8 J**	< 0.75
trans-1,3-Dichloropropene	< 18	< 4.3	< 0.91	< 3.6	< 0.91
Trichloroethylene	**22,500 D**	**3,800 D**	**9.1**	**5,700 D**	**31**
Trichlorotrifluoroethane (Freon 113)	**183**	**91**	< 0.77	**113**	**7.4**
Vinyl chloride	**197**	**168**	**1.4**	< 0.41	**0.54**
Xylene-o	**28**	< 4.1	< 0.87	< 3.5	< 0.87
Xylenes - m,p	**39**	< 4.1	< 0.87	< 3.5	< 0.87
Total VOCs [2]	**24892**	**4311**	**50**	**6717**	**78**

Notes and abbreviations on last page.

Table 3
Vapor Sample Analytical Results for Treatment Systems,
First Quarter 2016, 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.
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

Parameters	Date Sampled:	5/11/2015	9/9/2015	12/15/2015	3/14/2016
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)		4,688	4,581	4,610	4,631
Air Flow Rate (acfm)(2), (3)		4,936	4,840	4,810	4,800
Stack Gas Exit Temperature (K)(2)		310	311	307	305
Ambient Air Temperature (K)(4)		287	293	275	277
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)		195	199	196	198
Annualization Factor(7)		0.08	0.08	0.08	0.08
Average Annual Concentration at Receptor Height ($\mu g/m^3$)(8)		15.6	15.9	15.7	15.8
Distance To Max Concentration (m)(9)		110	109	110	110

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

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 weather.newsday.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 factor.
(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

Compound	SCG[1] ($\mu g/m^3$)	Actual Effluent Concentrations[2] ($\mu g/m^3$)			
		5/11/2015	9/9/2015	12/15/2015	3/14/2016
1,1-Dichloroethane	95,000 [3]	**0.57**	**34**	**5.3**	**4.5**
1,1-Dichloroethene	188,000 [3]	**2.3**	**60.7**	**56.7**	**21**
Chloroethane	619,000 [3]	**12**	**13**	**8.2**	**7.4**
Chloroform	150	0	**2.5**	0	0
Chloromethane	22,000	**3.5**	**1.6**	**2.7**	**2.7**
Methylene Chloride	14,000	**1.7**	**1.7**	**0.87**	**2.3**
Tetrachloroethene	300	**2.7**	**0.37**	**0.61**	**1.2**
Trichloroethene	14,000	**32**	**3.8**	**9.7**	**9.1**
Trichlorotrifluoroethane (Freon 113)	960,000	0	**2.6**	0	0
Vinyl chloride	180,000	**1.0**	**28.4**	**44.5**	**1.4**

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

Compound	AGC[4] (µg/m^3)	Annual MASC[5] (µg/m^3)			
		5/11/2015	9/9/2015	12/15/2015	3/14/2016
1,1-Dichloroethane	0.63	1.73E+04	1.73E+04	1.77E+04	1.76E+04
1,1-Dichloroethene	200	5.50E+06	5.51E+06	5.61E+06	5.59E+06
Chloroethane	10,000	2.75E+08	2.75E+08	2.81E+08	2.79E+08
Chloroform	14.7	4.05E+05	4.05E+05	4.12E+05	4.11E+05
Chloromethane	90	2.48E+06	2.48E+06	2.53E+06	2.51E+06
Methylene Chloride	60	1.65E+06	1.65E+06	1.68E+06	1.68E+06
Tetrachloroethene	4	1.10E+05	1.10E+05	1.12E+05	1.12E+05
Trichloroethene	0.2	5.50E+03	5.51E+03	5.61E+03	5.59E+03
Trichlorotrifluoroethane (Freon 113)	180,000	4.95E+09	4.96E+09	5.05E+09	5.03E+09
Vinyl chloride	0.068	1.87E+03	1.87E+03	1.91E+03	1.90E+03

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

Compound	AGC[4] ($\mu g/m^3$)	Percent of Annual MASC[6]				Cumulative % MASC[7]
		5/11/2015	9/9/2015	12/15/2015	3/14/2016	
1,1-Dichloroethane	0.63	0.0%	0.20%	0.03%	0.03%	0.08%
1,1-Dichloroethene	200	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%
Trichloroethene	0.2	0.58%	0.07%	0.17%	0.16%	0.20%
Trichlorotrifluoroethane (Freon 113)	180,000	0.0%	0.0%	0.0%	0.0%	0.00%
Vinyl chloride	0.068	0.05%	1.52%	2.33%	0.07%	6.45%

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.

µg/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:	5/11/2015	9/9/2015	12/14/2015	3/14/2016
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)		8,068	7,930	7,655	7,873
Air Flow Rate (acfm)(2), (3)		8,220	8,080	7,800	8,000
Stack Gas Exit Temperature (K)(2)		300	300	300	299
Ambient Air Temperature (K)(4)		287	293	275	277
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)		108.7	110.6	114.3	111.3
Annualization Factor(7)		0.08	0.08	0.08	0.08
Average Annual Concentration at Receptor Height ($\mu g/m^3$)(8)		8.7	8.8	9.1	8.9
Distance To Max Concentration (m)(9)		145	144	142	143

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

µg/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

Compound	SCG[1] (µg/m^3)	Actual Effluent Concentrations[2] (µg/m^3)			
		5/11/2015	9/9/2015	12/14/2015	3/14/2016
1,1,1-Trichloroethane	9,000	**0.55**	0	0	0
1,1-Dichloroethane	95,000 [3]	**5.7**	**8.1**	**1.1**	**6.1**
1,1-Dichloroethene	188,000 [3]	**21**	**35**	**4.4**	**28**
Benzene	1,300	0	**0.51**	0	0
Carbon Disulfide	6,200	0	0	0	**0.5**
Chloroform	150	**1.6**	**1.6**	0	**1**
Chloromethane	22,000	**0.99**	**1.3**	**0.74**	**1.3**
Ethylbenzene	20,700[3]	0	**0.69**	0	0
Methylene Chloride	14,000	**1.3**	**1.5**	**3.1**	0
Tetrachloroethene	300	**1.6**	**3.7**	0	**1.8**
Toluene	37,000	0	**21**	0	0
Trichloroethene	14,000	**34**	**12**	**4.9**	**31**
Trichlorotrifluoroethane (Freon 113)	960,000	**7.1**	**7.7**	0	**7.4**
Vinyl Chloride	180,000	0	0	0	**0.54**
Xylene-m,p	22,000	0	**1.9**	0	0
Xylene-o	22,000	0	**0.56**	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

Compound	AGC[4] (µg/m^3)	Annual MASC[5] (µg/m3)			
		5/11/2015	9/9/2015	12/14/2015	3/14/2016
1,1,1-Trichloroethane	5,000	1.48E+08	1.49E+08	1.49E+08	1.49E+08
1,1-Dichloroethane	0.63	1.87E+04	1.88E+04	1.88E+04	1.87E+04
1,1-Dichloroethene	200	5.93E+06	5.96E+06	5.97E+06	5.95E+06
Benzene	0.13	3.85E+03	3.87E+03	3.88E+03	3.87E+03
Carbon Disulfide	700	2.07E+07	2.09E+07	2.09E+07	2.08E+07
Chloroform	14.7	4.36E+05	4.38E+05	4.39E+05	4.37E+05
Chloromethane	90	2.67E+06	2.68E+06	2.69E+06	2.68E+06
Ethylbenzene	1,000	2.96E+07	2.98E+07	2.99E+07	2.98E+07
Methylene Chloride	60	1.78E+06	1.79E+06	1.79E+06	1.79E+06
Tetrachloroethene	4	1.19E+05	1.19E+05	1.19E+05	1.19E+05
Toluene	5,000	1.48E+08	1.49E+08	1.49E+08	1.49E+08
Trichloroethene	0.2	5.93E+03	5.96E+03	5.97E+03	5.95E+03
Trichlorotrifluoroethane (Freon 113)	180,000	5.33E+09	5.36E+09	5.37E+09	5.36E+09
Vinyl Chloride	0.068	2.01E+03	2.03E+03	2.03E+03	2.02E+03
Xylene-m,p	100	2.96E+06	2.98E+06	2.99E+06	2.98E+06
Xylene-o	100	2.96E+06	2.98E+06	2.99E+06	2.98E+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

Compound	AGC[4] (µg/m^3)	Percent of Annual MASC[6]				Cumulative % MASC[7]
		5/11/2015	9/9/2015	12/14/2015	3/14/2016	
1,1,1-Trichloroethane	5,000	0.0%	0.0%	0.0%	0.0%	0.0%
1,1-Dichloroethane	0.63	0.03%	0.04%	0.01%	0.03%	0.03%
1,1-Dichloroethene	200	0.0%	0.0%	0.0%	0.0%	0.0%
Benzene	0.13	0.0%	0.01%	0.0%	0.0%	0.003%
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	0.57%	0.20%	0.1%	0.52%	0.31%
Trichlorotrifluoroethane (Freon 113)	180,000	0.0%	0.0%	0.0%	0.0%	0.0%
Vinyl Chloride	0.068	0.0%	0.0%	0.0%	0.03%	0.008%
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.

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

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.

µg/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

HWD 10208
HWD 8779
FORMER OXY/RUCO POLYMER SITE
(107)
PLANT 111
PLANT 110
PLANT 115
PLANT 21
PLANT 37
PLANT 35
PLANT 15
PLANT 14
PLANT 26
PLANT 30
BETHPAGE COMMUNITY PARK
NWIRP SITE (FORMER NAVY SITE)
PLANT 12
PLANT 12A
PLANT 3
HN-24I
HN-24S
FW-03
PLANT 10
WT
HN-42S
HN-42I
FARMERS AVENUE
BWD 8768
BWD 8767
HAYPATH ROAD
(PLAINVIEW ROAD)
BETHPAGE COMMUNITY PARK
BETHPAGE HIGH SCHOOL
BWD 9591
GM-13D
GM-16I
GM-16SR
HN-40S
HN-40I
BROADWAY
MW-3-1
WELL 3R
WELL 3
10597
GM-17SR
GM-17I
GM-17D
PLANT 5 BASINS
PLANT 5
OU2 MAIN FACILITY REMEDIAL SYSTEM (TOWER 96)
OU2 MAIN FACILITY REMEDIAL SYSTEM (TOWER 102)
EXISTING OU2 TREATMENT SYSTEMS
MW-1GF
GM-32S
PLANT 2
PLANT 1 FUEL DEPOT AREA
GRUMMAN ROAD
PLANT 1
OU-2 ON-SITE GROUNDWATER REMEDY TREATMENT SYSTEMS
WELL 1
GM-18S
GM-18I
GM-18D
MW-2GF
GM-39DA
GM-39DB
GM-19S
GM-19I
MW-5
MW-4
MW-6
GM-15SR
GM-15I
GM-15D
GM-15D2
GM-73D3
GM-73D2
GM-73D
GM-74I
GM-74D
GM-74D2
GM-74D3
WELL 19
GM-33D2
10631
WELL 18
SOUTH BASINS
WELL 17
10600
GM-78S
GM-78I
GM-78D
GM-78D2
GM-20I
GM-20D
GM-21D2
10633
BLOOMINGDALE ROAD
CENTRAL AVENUE
9921
GM-21S
GM-21I
GM-21D
GM-75D2
10624
10627
GM-79I
GM-79D
10628
LONG ISLAND RAILROAD
GM-37D
GM-37D2
10634
GM-71D2
GM-70D2
GM-35D2
GM-36D
GM-36D2
N-10821
BWD 6915
6916
NORTH WANTAGH AVE.
HICKSVILLE ROAD
STEWART AVENUE
BETHPAGE STATE PARKWAY
SEAFORD - OYSTER BAY EXPRESSWAY
MALLARD ROAD
(GARDINER'S AVENUE)
LOWLAND ROAD
GM-34D
GM-34D2
BWD 8941
3876
GM-38D
GM-38D2
BWD 8004
TOH(LWD) 7076
PIKE
BPOW 1-4
BPOW 1-5
BPOW 1-6
BPOW 1-3
BPOW 1-1
BPOW 1-2
SFWD 7377
SFWD 5148
SFWD 4043
BOUNDARY AVENUE
BPOW 4-2R
BPOW 4-1R
TOH(LWD) 5303
BPOW 2-2
BPOW 2-3
BPOW 2-1
SFWD 6150
BPOW 3-3
BPOW 3-4
BPOW 3-2
BPOW 3-1
NYAW 9338
NYAW 8480
HICKSVILLE

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 WELLS AND ON-SITE GROUNDWATER REMEDY

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1

PLANT 25

PLANT 23

PLANT 5

TOWER 102 TREATMENT SYSTEM

WELL 3R

WEST RECHARGE BASINS (OUTFALL 006)

WELL 3

TOWER 96 TREATMENT SYSTEM

PLANT 2

ROUTE 107

WELL 1

HICKSVILLE RD

HICKSVILLE-MASSAPEQUA RD

AERATION BASIN

WELL 17

LIRR

SOUTH RECHARGE BASINS (OUTFALL 005)

WELL 18

WELL 19

GRUMMAN ROAD WEST

LONG ISLAND RAILROAD

PLANT 1

GRUMMAN ROAD EAST

SUN-SITE

CENTRAL AVENUE

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:

VAPOR TREATMENT STEAM SYSTEM

HEAT EXCHANGER

VAPOR TREATMENT BLOWER

V T96 INFLUENT

REGENERATIVE VAPOR TREATMENT GAC

V T96 MIDTRAIN

SUPPLEMENTAL VAPOR TREATMENT BLOWER

SUPPLEMENTAL VAPOR TREATMENT GAC POLISHING BED

SUPPLEMENTAL VAPOR TREATMENT KMnO4

V T96 EFFLUENT

TREATED AIR DISCHARGE TO ATMOSPHERE

SOLVENT RECOVERY SYSTEM

W WELL 1

W WELL 3/3R

W T96 INFLUENT

AIR STRIPPER

W T96 EFFLUENT

TREATED WATER CLEAR WELL

TREATED WATER OVERFLOW DISCHARGE

OUTFALL 006 W

WEST RECHARGE BASINS

TREATED WATER DISTRIBUTION SYSTEM

TREATED WATER DISCHARGE TO CALPINE, OXY BIOSPARGE AND OTHER NORTHROP GRUMMAN NON-CONTACT USE

TOWER 102 TREATMENT SYSTEM:

VAPOR TREATMENT STEAM SYSTEM

HEAT EXCHANGER

VAPOR TREATMENT BLOWER

V T102 INFLUENT

REGENERATIVE VAPOR TREATMENT GAC

V T102 EFFLUENT

TREATED AIR DISCHARGE TO ATMOSPHERE

SOLVENT RECOVERY SYSTEM

W WELL 17

W WELL 18

W WELL 19

W T102 INFLUENT

AIR STRIPPER

W T102 EFFLUENT

TREATED WATER CLEAR WELL

TREATED WATER OVERFLOW DISCHARGE

OUTFALL 005 W

SOUTH RECHARGE BASINS

LEGEND:

- PROCESS WATER
- PROCESS AIR
- STEAM
- SAMPLE LOCATION
- W WATER SAMPLE
- V VAPOR SAMPLE
- ONCT ON-SITE CONTAMINANT

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

CITY:SYRACUSE-NY DIV/GROUP:ENV DB:A.SANCHEZ LD:ALS PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIVITY\00149\01414\GW\MI41496141414F03.dwg LAYOUT: 3 SAVED: 3/15/2016 10:09 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: PDF B PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 3/15/2016 10:30 AM BY: SANCHEZ, ADRIAN
XREFS: PROJECTNAME: ----
IMAGES:
XrBDR-BL