

**Northrop Grumman Systems Corporation**

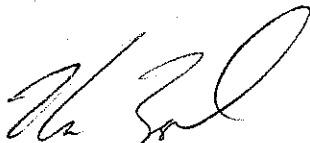
**Operable Unit 3- Interim Operation,  
Maintenance and Monitoring Report**

**November 2008 to December 2008**

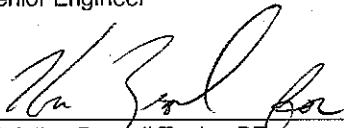
Operable Unit 3 – Soil Gas Interim Remedial Measure  
Former Grumman Settling Ponds  
Bethpage, New York

NYSDEC ID # 1-30-003A

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Operable Unit 3 Soil Gas Interim  
Remedial Measure

Former Grumman Settling Ponds  
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NYSDEC ID# 1-30-003A

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## 1. Introduction

This Operable Unit 3 (OU3) Soil Gas Interim Remedial Measure (soil gas IRM) Interim Operation, Maintenance, and Monitoring Report was prepared by ARCADIS of New York, Inc. (ARCADIS) on behalf of Northrop Grumman Systems Corporation (Northrop Grumman). This report is being submitted pursuant to the Order On Consent (Consent Order or CO) Index # W1-0018-04-01 that was executed by the New York State Department of Environmental Conservation (NYSDEC) and Northrop Grumman, effective July 4, 2005 (NYSDEC 2005). The present day Bethpage Community Park property (Park), which the NYSDEC has termed the "Former Grumman Settling Ponds Area" and designated as OU3, is referred to herein as the Site. A Site location map is provided on Figure 1.

This report summarizes the routine operation, maintenance and monitoring (OM&M) activities for the soil gas IRM performed from November 26, 2008 through December 18, 2008. The soil gas IRM system OM&M was completed in accordance with the Operable Unit 3 Soil Gas Interim Remedial Measure OM&M Manual that was submitted to the NYSDEC on August 26, 2008 (ARCADIS 2008a). System monitoring was completed in accordance with the Sampling and Analysis Plan (SAP), which was provided to the NYSDEC as Appendix C of the Soil Gas Interim Remedial Measure 95% Design Report and Design Drawings dated September 7, 2007 (ARCADIS 2007) and the OM&M Manual. The SAP (ARCADIS 2008b) was approved by the NYSDEC in a letter dated August 1, 2008 (NYSDEC 2008).

A description of the soil gas IRM system OM&M activities completed during the reporting period is provided below.

## 2. Soil Gas Interim Remedial Measure System Description

The OU3 soil gas IRM was constructed in accordance with the Soil Gas Interim Remedial Measure 95% Design Report and Design Drawings, which was approved by the NYSDEC on September 19, 2007. A general site plan that shows the major process equipment, depressurization, and monitoring well locations is provided on Figure 2. A process flow diagram that shows sampling and monitoring locations is provided on Figure 3. A complete set of as-built drawings is provided in the OM&M Manual (ARCADIS 2008a).

In summary, the soil gas IRM consists of the following major components:

- 18 depressurization wells and 47 associated induced vacuum monitoring wells at the locations shown on Figure 2.
- Two (2) "dry-van" type storage containers, which contain the following equipment:
  - Three (3) 52-gallon moisture separators to remove condensate from the influent vapor stream;
  - Two (2) 20-horsepower(hp) and one (1) 30-hp regenerative type depressurization blowers;
  - A programmable logic controller (PLC) based control system;
  - An autodialer;
  - Associated piping, valves, sample ports, gauges, electrical equipment, and other devices necessary to safely control, operate, and monitor the system.
- One (1) heat exchanger to condition the effluent vapor stream prior to treatment; and,
- One (1) 10,000 pound (lb) vapor phase granular activated carbon bed (VPGAC). As referenced in Section 7.2, the removal of the temporary VPGAC unit has been scheduled for late December 2008 per NYSDEC approval.
- One (1) 33-foot tall by 16-inch diameter stack and associated ductwork.

A detailed description of the system is provided in the OM&M Manual (ARCADIS 2008a).

### 3. Operation and Maintenance Activities

The soil gas IRM generally operated continuously during the reporting period with brief system shutdowns for routine maintenance or troubleshooting activities. The routine, monthly OM&M site visit was conducted on December 18, 2008. Routine monthly OM&M activities included inspection of all piping, appurtenances, and mechanical equipment for leaks, defects, or other problems and maintenance of equipment, in accordance with the manufacturers' specifications and as described in the OM&M Manual. In addition to the

OM&M activities referenced above, the influent manifold control valves were adjusted to increase the vacuum and flow at Depressurization Wells DW-1D and DW-2D. The control valve adjustments were completed in an effort to return the overall induced vacuum within respective compliance monitoring wells to obtain values closer to their design criteria. It should be noted that these adjustments were made immediately prior to the recording of system operating parameters. Further discussion on this issue is provided in Section 5 of this report.

Supplemental site visits were completed on a weekly basis to monitor the physical condition of the temporary site controls (i.e., temporary fence).

Discussion of the routine OM&M monitoring program and results is provided in the subsequent sections of this report.

#### **4. Monitoring Activities**

The following sections summarize the methodologies used for routine performance monitoring and routine compliance monitoring during the subject reporting period. The performance monitoring program is completed to ensure that the system components are operating in accordance with the manufacturers specifications, to ensure that the VPGAC unit is operating as designed (if applicable), and to ensure that the general system operating parameters remain consistent with design data and/or historical operating data. The compliance monitoring program consists of the collection of effluent vapor and/or water samples to demonstrate compliance with regulatory discharge criteria and the collection of induced vacuum readings from key monitoring points to demonstrate the soil gas IRM is achieving the design vacuum of -0.1 inches of water (iwc) within the subsurface.

A description of the monitoring activities completed during the reporting period is provided below.

##### **4.1 Routine Performance Monitoring**

Routine performance monitoring was completed on December 18, 2008, in accordance with Table C-1 of the SAP (ARCADIS 2008b). A brief discussion of the routine performance monitoring methodology and/or deviations (if applicable for the subject reporting period) from the methodology described in the SAP is provided below.



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### 4.1.1 System Operating Parameters

System operating parameters that fall under the performance monitoring program include the parameters listed in Attachments C-3.2 and C-3.3 of the SAP (ARCADIS 2008b). There were no significant deviations from the recording of these parameters during the routine monitoring event. However, system operating parameters for Blowers BL-200 and BL-400 were not recorded due to these blowers being offline (i.e., these blowers have been placed in standby mode). In addition, water levels were not collected from monitoring wells due to a malfunctioning water level probe.

### 4.1.2 Vapor Samples

One (1) routine performance monitoring vapor sample was collected for laboratory analysis from the total influent sample location (VSP-601) during the December 18, 2008 monitoring event. The sample was collected and submitted to the laboratory in accordance with the requirements set forth in the SAP (ARCADIS 2008b). The sample was analyzed using USEPA Method TO-15 with the site-specific compound list provided in the SAP (ARCADIS 2008b).

As requested by the NYSDEC, Freon 12 was quantified using USEPA Method TO-15 and the top 20 tentatively identified compounds (TICs) were reported. As referenced in previous correspondence to the NYSDEC, the analytical laboratory does not currently have a calibration standard for the compound Freon 22. Accordingly, Freon 22 is scanned for and reported as a TIC. The analytical laboratory anticipates acquiring the Freon 22 calibration standard prior to the March 2009 monitoring event.

In addition, a screening level vapor sample was collected and monitored from VSP-601 using a photoionization detection (PID) during the routine monitoring event. In accordance with previous recommendations, PID measurements were not collected from individual depressurization wells during the reporting period.

## 4.2 Routine Compliance Monitoring

Routine compliance monitoring was completed on December 18, 2008 in accordance with Table C-1 of the SAP (ARCADIS 2008b). A brief discussion of the routine compliance monitoring methodology and/or deviations (if applicable for the subject reporting period) from the methodology described in the SAP is provided below.

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### 4.2.1 System Operating Parameters

System operating parameters that fall under the compliance monitoring program include the compliance-related induced vacuum measurements listed in Table 2 of the OM&M Manual (ARCADIS 2008a).

In accordance with previous recommendations, induced vacuum measurements were collected from compliance-related induced vacuum monitoring points only during the reporting period.

### 4.2.2 Vapor Samples

One (1) routine, compliance monitoring vapor sample was collected for laboratory analysis from the total effluent sample location (VSP-602) during the December 18, 2008 monitoring event. The sample was collected and submitted for laboratory analysis in accordance with the requirements described in Section 4.1.2.

As requested by the NYSDEC, Freon 12 was quantified using USEPA Method TO-15 and the top 20 tentatively identified compounds (TICs) were reported. As referenced in previous correspondence to the NYSDEC, the analytical laboratory does not currently have a calibration standard for the compound Freon 22. Accordingly, Freon 22 is scanned for and reported as a TIC. The analytical laboratory anticipates acquiring the Freon 22 calibration standard prior to the March 2009 monitoring event.

In addition, a screening level sample was collected and monitored from VSP-602 using a PID during the routine monitoring event.

### 4.2.3 Condensate Samples

Due to the lack of condensate generation, a compliance monitoring condensate sample was not collected for laboratory analysis during the reporting period.

## 5. Monitoring Results and Discussion

The following sections summarize and briefly discuss the results for routine performance monitoring and routine compliance monitoring during the subject reporting period.

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## 5.1 Routine Performance Monitoring

This following section summarizes the results of the routine system performance monitoring event completed on December 18, 2008.

### 5.1.1 System Operating Parameters

A summary of the performance monitoring system operating parameters for the December 18, 2008 monitoring event is provided in Table 1. A summary of induced vacuum measurements is provided in Table 2.

As shown in Table 1, the majority of the system operating parameters (i.e., individual depressurization well flow rate, wellhead vacuums, and general blower operating parameters) recorded in December 2008 remained consistent with operating parameters recorded during November 2008. Several of the individual depressurization well manifold vacuum readings that were elevated during the October 2008 to November 2008 reporting period remained elevated during the November 2008 to December 2008 reporting period. In addition, the flow rate, manifold vacuum, and wellhead vacuum at Depressurization Wells DW-1D and DW-2D increased as a result of the rebalancing activities performed, as described in Section 3 of this report. The wellhead vacuum at Depressurization Well DW-2S continued to increase during the October 2008 to December 2008 period. The wellhead vacuum at Depressurization Well DW-7D, which had increased during the October to November 2008 reporting period, returned to the levels recorded prior to that period.

Key data and observations are as follows:

- The observed manifold vacuum at all depressurization wells with the exception of Depressurization Wells DW-1D and DW-2D, DW-2S and DW-7D remained consistent when comparing November 25, 2008 to December 18, 2008 monitoring data. However, as referenced above the majority of manifolds generally remained elevated when comparing November/December 2008 monitoring data to previous data (i.e., data collected prior to November 2008). While the exact cause of the increase in vacuum is currently unknown, the potential cause could be attributed to condensate or other obstructive material being collecting within the subsurface vapor pipe at turns or "topographic low points" resulting in higher vacuum at the manifold. However, despite the increase in manifold vacuum, the induced vacuum generated at each depressurization well's respective compliance monitoring point is still at or above the respective design criteria. This situation will continue to be monitored and evaluated during future events.

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- As referenced previously, the flow rate, manifold vacuum, and wellhead vacuum increased at Depressurization Wells DW-1D and DW-2D as a result of rebalancing of these two wells. The rebalancing efforts were successful and increased the induced vacuum at each depressurization wells compliance related monitoring point to a value closer to the respective design criteria (i.e., -0.1 iwc).
- Condensate water was not generated during the reporting period.
- The heat exchanger influent temperature (80 deg F) remained lower than the design influent temperature of 150 degrees. Accordingly, the heat exchanger was kept on standby during the reporting period.

### 5.1.2 Vapor Samples

A summary of the December 2008 qualitative vapor sample analytical results is provided in Table 1. A summary of the December 2008 total influent vapor sample laboratory analytical results for detected compounds is provided in Table 3. A summary of all vapor sample analytical results (including detected, non-detect, and TICs) is provided in Appendix A.

Qualitative vapor analyses (i.e., PID readings) were consistent with previous data and were 0.0 parts per million by volume (ppmv) for vapor sample location VSP-601. Total influent (VSP-601) laboratory analytical results for the December 18, 2008 monitoring event were generally consistent with analytical results from November 25, 2008. Specifically, TVOC concentrations were 1,966 ug/m<sup>3</sup> during the December 2008 monitoring event, and the vinyl chloride (VC) concentration was below the limits of detection. Trichloroethylene (TCE) was detected at a concentration of 710 ug/m<sup>3</sup> which is lower when compared to November 2008 data (i.e., 960 ug/m<sup>3</sup>).

Similar to previous operation, Chlorodifluoromethane (Freon 22) and Freon 142 were reported as TICs by the laboratory during the December 2008 monitoring event. In addition, several new TICs were reported by the analytical laboratory. As requested by the NYSDEC, Freon 22 will be added to the quantitative laboratory compound list for the March 2009 monitoring event presuming the calibration standard is received by the laboratory. In addition, ARCADIS has inquired about the availability of a quantitative calibration standard for Freon 142 and is waiting to receive a response from the laboratory. ARCADIS will continue to monitor the TIC data for recurrent detections to determine if additional compounds should be added to the quantitative analyte list.

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## 5.2 Routine Compliance Monitoring

The following section summarizes the results of the routine system compliance monitoring event completed on December 18, 2008.

### 5.2.1 Induced Vacuum Measurements

Induced vacuum measurements collected during the December 18, 2008 monitoring event are summarized in Table 2. As referenced in the 95% Design Report, the soil gas IRM was designed to maintain a negative pressure of -0.1 iwc on a time-weighted rolling average within all monitoring points. Accordingly, the time-weighted rolling average for the compliance related induced vacuum monitoring points has been provided in Table 2. As shown on Table 2, the rolling average for all compliance related monitoring points was greater than or equal to -0.1 iwc as of December 18, 2008. In addition, the average induced vacuum for compliance monitoring wells during the December 18, 2008 monitoring event was -0.15 iwc, which indicates that the soil gas IRM is operating as designed. These data are consistent with data from the November 25, 2008 monitoring event. It should be noted that the instantaneous induced vacuum recorded on December 18, 2008 at compliance well VMWC-16D decreased to -0.063 iwc when compared to November 2008 data. Despite the lower instantaneous vacuum, the monitoring point still meets design criteria by maintaining a time-weighted rolling average negative pressure of -0.1 iwc. Nonetheless, ARCADIS will evaluate this monitoring point during the next scheduled O&M site visit and make system adjustments if necessary.

### 5.2.2 Vapor Samples

A summary of the December 2008 qualitative vapor sample analytical results is provided in Table 1. A summary of the December 2008 total effluent vapor sample laboratory analytical results for detected compounds is provided in Table 3. A summary of all vapor sample analytical results (including detected, non-detect, and TICs) is provided in Appendix A.

Qualitative vapor analyses (i.e., PID readings) were consistent with previous data and were 0.0 parts per million by volume (ppmv) for vapor sample location VSP-602. Total effluent (VSP-602) laboratory analytical results for the December 18, 2008 monitoring event decreased when compared with analytical results from November 25, 2008. Specifically, the TVOC concentration was 931 ug/m<sup>3</sup> during the December 2008 monitoring event.

The concentration of all environmentally "A" rated compounds ([i.e., VC] as defined in DAR 1 AGC/SGC tables revised September 10, 2007) was below the limits of detection. A

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summary of the air emissions model, completed to confirm compliance with applicable air discharge standards, is discussed in Section 6 of this report.

### 5.2.3 Condensate Samples

As discussed previously, a condensate sample was not collected from Storage Tank ST-510 for laboratory analysis during the reporting period due to the lack of condensate water generation. Nonetheless, a table that indicates no samples were collected during the reporting period is provided as Table 4. A similar appendix table has been provided in Appendix B.

## 6. Air Emissions Model

Effluent vapor laboratory analytical results were compared to the NYSDEC Division of Air Resources Air Guide-1 (DAR-1) Short-term Guideline Concentrations (SGCs). In addition, effluent vapor laboratory analytical results were compared to a site-specific modeled annual maximum allowable stack concentration (MASC). The annual MASC was calculated during each monitoring event for individual compounds using the output from a United States Environmental Protection Agency (USEPA) Screen 3 model in conjunction with the NYSDEC DAR-1 Annual Guideline Concentrations (AGCs). Specifically, a scaling factor was calculated using the SCREEN3 model with site-specific physical layout (e.g., building dimension, stack height, terrain, etc.) and operating data (e.g., discharge flow rate, temperature, etc.) inputs for each monitoring event. The scaling factor was then used to adjust (scale) the NYSDEC DAR-1 AGC to a site-specific annual MASC. A summary of the instantaneous percent (e.g., not time-weighted) of the site-specific annual MASC for detected compounds is provided in Table 5. A summary of the cumulative annual percent (i.e., time-weighted) of the site-specific MASC for detected compounds is also provided on Table 5. A summary of the model input, outputs, and backup calculations is provided in Appendix C.

In summary, the soil gas IRM effluent vapor met applicable air discharge criteria based on the following:

- The actual concentrations of individual VOCs in the vapor effluent did not exceed their respective SGCs during all monitoring events (Table 3). It should also be noted that all influent (i.e., prior to treatment) individual VOC concentrations were also below their respective SGCs.

- The actual concentration of individual VOCs in the vapor effluent did not exceed their respective instantaneous MASCs, as calculated using the USEPA SCREEN 3 Model (Table 5). Similarly, the time-weighted rolling average for all detected compounds is currently well below the MASCs.
- The concentration of all environmentally "A" rated compounds ([i.e., VC] as defined in DAR-1 AGC/SGC tables revised September 10, 2007) was below the limits of detection on both the influent and effluent vapor samples.

## 7. Conclusions and Recommendations

The following section summarizes the conclusions and recommendations based on the results of performance and compliance monitoring provided herein.

### 7.1 Conclusions

Based on the information provided herein, ARCADIS makes the following conclusions:

- December 2008 compliance monitoring results indicate that the system continues to operate as designed. Specifically, a time-weight average induced vacuum of greater than -0.1 iwc was achieved in all induced vacuum monitoring points.
- Because the soil gas IRM is currently meeting all design criteria, additional troubleshooting to determine the cause of the increase in manifold vacuums is not warranted at this time.
- VPGAC effluent data indicate that the VPGAC unit is removing TCE from the influent vapor stream as designed. The VPGAC effluent concentration of TCE is below applicable air discharge criteria.
- The actual concentrations of individual VOCs in the vapor effluent did not exceed their respective SGCs during the reporting period.
- The actual concentration of individual VOCs in the vapor effluent did not exceed their respective MASCs as calculated using the USEPA SCREEN 3 model.
- Similarly, the concentration of all environmentally "A" rated compounds ([i.e., VC] as defined in DAR-1 AGC/SGC tables revised September 10, 2007) was below the limits of detection on both the influent and effluent vapor samples.

## 7.2 Recommendations

Based on the information provided herein, ARCADIS makes the following recommendations for the January 2009 to March 2009 operating period:

- Continue operating the soil gas IRM in accordance with system operating parameters recorded during this reporting period.
- Continue to monitor the manifold vacuum of individual depressurization wells in conjunction with system operating parameters and induced vacuum measurements. If induced vacuum measurements decrease to below design criteria, evaluate if additional troubleshooting is warranted to determine the cause of the increase in manifold vacuums.
- Continue to monitor system operating parameters and compliance related induced vacuum measurements for Depressurization Wells DW-1D and DW-2D to determine if the rebalancing activities referenced herein require adjustment.
- A full regulatory evaluation of the current status of influent air emissions was provided to the NYSDEC under separate cover during early December 2008 (ARCADIS 2008). The regulatory evaluation indicates that influent air emissions meet all applicable regulatory standards and recommended the removal of the temporary VPGAC unit from service. The NYSDEC responded with their concurrence to remove the temporary VPGAC unit in a letter dated December 12, 2008 (NYSDEC 2008). Accordingly, the removal of the temporary VPGAC unit has been scheduled for late December 2008.
- Similar to the above, system operating data has continuously indicated a stable trend for all operating parameters and vapor analytical data. Combined, these data have demonstrated that the soil gas IRM meets all design objectives. Based on these observations, a reduction in monitoring frequency from monthly to quarterly has been recommended in previous monitoring reports. The NYSDEC responded with their concurrence to reduce the monitoring frequency in the above-referenced letter dated December 12, 2008. Accordingly, the first routine quarterly monitoring event will be completed in March 2008.



## 8. References

ARCADIS of New York, Inc. 2007. 95% Design Report, Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A September 7, 2007.

ARCADIS of New York, Inc. 2008a. Operable Unit 3 –Operation, Maintenance, and Monitoring Manual, Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A August 26, 2008.

ARCADIS of New York, Inc. 2008b. 95% Design Report, Appendix C, Sampling and Analysis Plan, Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A February 8, 2008.

ARCADIS of New York, Inc. 2008. Air Emission Regulatory Review and Current Status, Related Calculations, and Proposed Modifications to Current System Configuration and Monitoring Procedures, Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A, December 4, 2008.

ARCADIS of New York, Inc. 2009. Operable Unit 3 –Interim Operation, Maintenance, and Monitoring Report, October 2008 to November 2008, Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A, February 6, 2009.

New York State Department of Environmental Conservation (NYSDEC), 2008, Approval Letter regarding Former Grumman Settling Ponds, NYSDEC Nassau County Site No. 1-30-003A OU3 (Bethpage Community Park), August 1, 2008.

New York State Department of Environmental Conservation (NYSDEC), 2005, Order on Consent Index #WI-0018-04-01, Site # 1-30-003A, July 4, 2005.

New York State Department of Environmental Conservation, Division of Air Resources-1 (DAR-1) Guidelines for the Control of Toxic Ambient Air Contaminants dated 1991 and the AGC/SGC Tables dated September 10, 2007.

New York State Department of Environmental Conservation (NYSDEC), 2008, Letter of Approval For Proposed Modifications, December 12, 2008.

Table 1. Summary of General System Operating Parameters, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Date	Extraction Well DW-7S Parameters					Extraction Well DW-7D Parameters					Extraction Well DW-3S Parameters					Extraction Well DW-3D Parameters					Extraction Well DW-5S Parameters					Extraction Well DW-5D Parameters				
	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum
	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)
02/18/08 <sup>(1)</sup>	58	-3.55	55.7	7.2	-2.0	76	-7.2	56.1	29.3	-2.5	80	-7.3	55.7	2.8	-2.5	113	-15.43	53.9	13.3	-4.5	100	-4.6	57.2	0.0	-3.0	52	-16.1	56.8	0.0	-13.5
02/19/08 <sup>(1)</sup>	53	-3.80	NM	9.7	-2.0	78	-7.4	NM	26.7	-2.5	45	-2.5	NM	6.5	-1.75	108	-16.3	NM	16.4	-3.5	57	-2.5	NM	0.0	-2.0	52	-18	NM	0.0	-13.5
02/25/08 <sup>(1)</sup>	55	-5.5	NM	4.2	-2.0	74	-13	NM	5.8	-2.7	37	-2.03	NM	2.1	-1.5	71	-26	NM	6.6	-2.7	20	-1.05	NM	0.4	-1.5	56	-24.1	NM	0.0	-17.5
03/03/08 <sup>(1)</sup>	53	-6	NM	2.8	-2.0	84	-13.0	NM	0.8	-2.7	45	-2.5	NM	1.2	-1.5	88	-16	NM	1.9	-2.7	20	-1.4	NM	0.8	-1.5	66	-27	NM	0.0	-15.2
03/17/08 <sup>(1)</sup>	76	-9	NM	2.6	-2.5	50	-8.00	NM	0.4	-2.0	45	-2.8	NM	1.1	-2.0	83	-16	NM	0.1	-2.7	20	-1.5	NM	0.0	-2.5	70	-32	NM	0.0	-25.0
04/16/08	84.97	-10.46	50.3	2.7	NM	41.10	-2	55.4	2.0	NM	15.48	-0.41	58.6	0.6	NM	28.56	-1.07	57.0	4.6	NM	34.44	-0.77	55.0	0.0	-2.5	32.13	-22.0	57.5	0.6	NM
05/19/08	72.43	-5.0	57.0	5.0	-4.0	19.76	-0.800	62.2	2.1	-1.5	14.98	-0.45	62.2	0.0	-2.0	23.35	-2.0	59.3	3.5	-3.0	77.92	-2.5	59.9	2.5	-2.5	19.73	-14.0	59.0	0.0	-10.5
06/02/08	86.01	-5.8	65.8	0.0	-1.8	23.40	-0.7	72.8	0.0	-0.9	16.09	-0.4	71.0	0.0	-1.1	26.95	-2.0	71.7	0.0	-1.3	86.18	-2.3	65.4	0.0	-2.8	16.56	-14.0	74.3	0.0	-10.0
07/07/08	49.33	-4.4	69.4	4.7	-2.2	18.04	-1.2	76.1	2.6	-1.0	17.56	-0.4	74.1	2.3	-1.2	17.63	-11	77.9	3.1	-2.2	121.21	-2.2	71.0	2.1	-2.7	15.22	-14.2	82.2	2.3	-10
08/06/08 <sup>(5,8)</sup>	78.62	-4.5	76.3	NM	-2.5	19.49	-0.9 <sup>(9)</sup>	80.6	NM	-1.7	9.84	-2.0 <sup>(6)</sup>	76.8	NM	-1.0	12.84	-11.5	80.0	NM	-1.1	82.68	-2.1	75.1	NM	-2.0	4.62	-14.5	81.6	NM	-0.9
09/18/08	95.06	-4.5	69.4	NM	-1.5	23.22	-0.8	68.7	NM	-0.7	13.29	-3.0	69.4	NM	-0.2	23.56	-2.1	68.8	NM	-1.0	84.01	-2.2	69.6	NM	-0.80	6.91	-14.5	69.0	NM	-1.0
10/27/08	84.98	-5.5	62.6	NM	-1.5	22.34	-0.8	62.6	NM	-0.9	13.25	-7.0 <sup>(12)</sup>	62.4	NM	-0.8	23.31	-0.1	62.6	NM	-0.9	88.57	-2.2	62.6	NM	-1.4	18.42	-15.0	62.6	NM	-1.3
11/25/08	NM	-10	53.6	NM	-1.4	20.49	-4.0	54.1	NM	-0.8	12.60	-12.0	58.2	NM	-0.4	30.20	-0.8	54.6	NM	-0.6	116.98	-3.6	55	NM	-1.4	29.89	-22.0	54.3	NM	-3.1
12/18/08	95.89	-9	50.9	NM	-1.4	20.08	-1.0	51.8	NM	-0.56	12.88	-13	57.3	NM	-0.27	26.36	-1.5	51.8	NM	-0.56	89.91	-4.0	52.5	NM	-1.5	67.85	-18.0	51.8	NM	-11.4

Notes and Abbreviations:

- \*F - Degrees Fahrenheit
- DW - Depressurization well
- ft bmp - Feet below measuring point
- iwc - Inches of water column
- NM - Not measured
- scfm - Standard cubic feet per minute
- ppmv - Parts per million by volume
- VMWC - Vapor monitoring well cluster

1. Flow rate at manifold on associated dates quantified using venturi flow meter and associated flow chart. Remaining flow rates measured with a hotwire anemometer and calculated to standard conditions using the formula below.
2. Access point covered by insulation no measurement taken during this round.
3. Blowers BL-200 and BL-400 were taken off-line on April 10th during system rebalancing.
4. Field recording error suspected.
5. Temperature readings are erroneous due to field measurement error. July 7, 2008 temperature readings used for conversion of flow to scfm.
6. Data point is average of readings observed which fluctuated between -0.9 and -3.0 iwc.
7. Original parameter not collected on 8/6/08 or was erroneous, data point reported is second reading taken on 08/07/08.
8. Wellhead vacuum gauges replaced during reporting period with lower range/higher accuracy gauges.
9. Gauge vacuum at 0.0 iwc manometer reading used for table.
10. New gauge range too high to collect measurable reading.
11. Vacuum reading taken using digital manometer during this round of monitoring.
12. Data point is average of readings observed which fluctuated between -4.0 and -10 iwc.

Standard Conditions Calculation:

$$\text{scfm} = \text{Flow rate} \times \text{Area} \times \left(\frac{T_s}{T_m}\right) \times \left(\frac{P_m}{P_s}\right)$$

- Flow rate in feet per minute
- Area in square feet
- Ts - Standard Temperature in Rankine
- Tm - Measured Temperature in Rankine
- Pm - Measured Pressure in pounds per square inch
- Ps - Standard Pressure in pounds per square inch

Table 1. Summary of General System Operating Parameters, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Date	Extraction Well DW-6S Parameters					Extraction Well DW-6D Parameters					Extraction Well DW-1S Parameters					Extraction Well DW-1D Parameters					Extraction Well DW-4S Parameters					Extraction Well DW-4D Parameters				
	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum
	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)
02/18/08 <sup>(1)</sup>	170	-13.1	55.0	0.0	-6.0	44	-16.0	60.2	0.0	-14.0	160	-11.8	54.1	0.0	-5.0	20	-16.8	62.4	0.0	-15.0	170	-12.0	54.6	0.0	-2.0	8	-2.0	60.8	0.0	-3.0
02/19/08 <sup>(1)</sup>	167	-13.6	NM	0.0	-6.0	48	-17.5	NM	0.0	-14.0	235	-19.78	NM	0.0	-8.0	20	-18	NM	0.0	-16.0	155	-13.5	NM	0.0	-5.5	8	-1.95	NM	0.0	-1.5
02/25/08 <sup>(1)</sup>	167	-16.0	NM	0.0	-6.0	94	-23.5	NM	0.0	-20.5	228	-25.4	NM	NM	-7.2	28	-24.25	NM	0.0	-25.0	160	-16.0	NM	0.0	-5.5	8	-1.1	NM	0.0	-2.0
03/03/08 <sup>(1)</sup>	170	-16.0	NM	0.5	-5.5	55	-25.2	NM	0.0	-20	208	-26.79	NM	0.1	-7.0	32	-26.5	NM	0.0	-25.0	160	-16.0	NM	1.1	-5.70	8	-1.0	NM	0.0	-2.0
03/17/08 <sup>(1)</sup>	185	-22	NM	0.0	-6.0	65	-31	NM	1.2	-22	208	-29	NM	0.0	-7.5	32	-32.6	NM	0.0	-30	176	-26	NM	0.0	-6.0	8	-1.25	NM	0.0	-1.75
04/16/08	49.50	-1.44	53.6	0.2	NM	10.55	-1.86	57.5	1.9	NM	89.48	-3.31	52.3	0.0	NM	3.97	-0.79	61.3	0.0	NM	48.16	-1.43	55.5	0.0	NM	9.27	-0.48	60.6	0.0	NM
05/19/08	42.93	-1.2	61.8	2.5	-1.3	11.47	-2.6	60.0	0.0	-2.0	147.62	-10.5	55.5	0.0	-4.5	6.60	-1.8	64.4	0.3	-2.5	32.14	-1.0	61.7	1.7	-2.7	15.01	-1.1	63.3	0.6	-2.2
06/02/08	48.18	-1.2	68.0	0.0	-1.2	14.88	-2.2	72.5	0.0	-2.5	179.95	-10.3	61.3	0.0	-4.2	8.54	-1.8	74.1	0.0	-5.1	30.98	-0.7	66.2	0.0	-2.1	17.44	-1.2	71.6	0.0	-2.7
07/07/08	52.63	-1.5	71.6	1.2	-2.0	14.89	-2.1	75.2	3.3	-2.2	153.47	-6	68.5	2.3	-3.8	8.71	-1.3	77.3	2.2	-4.7	38.23	-0.2	72.8	1.2	-2.1	18.41	-1.1	73	2.5	-1.8
08/06/08 <sup>(5,8)</sup>	41.38	-1.2	75.4	NM	-1.0	11.75	-2.1	79.9	NM	-0.9 <sup>(6)</sup>	137.92	-6.2	75	NM	-3.0	12.86	-1.2	80.7	NM	-1.1	12.93	-0.8	87	NM	-0.6	12.97	-1.0	80.7	NM	0 <sup>(10)</sup>
09/18/08	41.91	-1.1	69.8	NM	-0.9	12.59	-2.1	69.6	NM	-1.5	152.30	-6.2	70.5	NM	-3.0	6.33	-1.5	69.6	NM	-1.5	9.34	-11.5	70.3	NM	-0.5	14.47	-0.5	69.6	NM	-0.38 <sup>(11)</sup>
10/27/08	41.72	-1.2	62.6	NM	-0.9	11.22	-2.0	62.2	NM	-0.2	154.64	-6.7	63.1	NM	-2.8	6.32	-1.5	62.7	NM	-1.8	30.65	-12.9	62.2	NM	-0.5	14.06	-0.6	62.6	NM	-0.4
11/25/07	52.72	-1.6	55.4	NM	-0.9	6.11	-1.0	55.7	NM	-0.788	62.57	-3	55.5	NM	-1.2	1.51	-0.1	61.7	NM	-0.258	54.57	-19	62.2	NM	-0.15	18.39	-0.7	54.6	NM	-0.5
12/18/08	47.97	-1.5	52.5	NM	-0.8	5.17	-1.0	53.7	NM	-0.7	53.68	-2.5	52.5	NM	-1.0	8.24	-1.5	53.2	NM	-1.4	17.91	-16.5	58.1	NM	-0.23	17.08	-0.75	51.8	NM	-0.40

Notes and Abbreviations:

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- iwc - Inches of water column
- NM - Not measured
- scfm - Standard cubic feet per minute
- ppmv - Parts per million by volume
- VMWC - Vapor monitoring well cluster

1. Flow rate at manifold on associated dates quantified using venturi flow meter and associated flow chart. Remaining flow rates measured with a hotwire anemometer and calculated to standard conditions using the formula below.
2. Access point covered by insulation no measurement taken during this round.
3. Blowers BL-200 and BL-400 were taken off-line on April 10th during system rebalancing.
4. Field recording error suspected.
5. Temperature readings are erroneous due to field measurement error. July 7, 2008 temperature readings used for conversion of flow to scfm.
6. Data point is average of readings observed which fluctuated between -0.9 and -3.0 iwc.
7. Original parameter not collected on 8/6/08 or was erroneous, data point reported is second reading taken on 08/07/08.
8. Wellhead vacuum gauges replaced during reporting period with lower range/higher accuracy gauges.
9. Gauge vacuum at 0.0 iwc manometer reading used for table.
10. New gauge range too high to collect measurable reading.
11. Vacuum reading taken using digital manometer during this round of monitoring.
12. Data point is average of readings observed which fluctuated between -4.0 and -10 iwc.

Standard Conditions Calculation:

$$\text{scfm} = \text{flow rate} \times \text{Area} \times \left(\frac{T_s}{T_m}\right) \times \left(\frac{P_m}{P_s}\right)$$

- flow rate in feet per minute
- Area in square feet
- Ts - Standard Temperature in Rankine
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Table 1. Summary of General System Operating Parameters, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Date	Extraction Well DW-8S Parameters					Extraction Well DW-9S Parameters					Extraction Well DW-2S Parameters					Extraction Well DW-2D Parameters					Extraction Well DW-10S Parameters					Extraction Well DW-11S Parameters				
	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum	Flow Rate at Manifold	Vacuum at Manifold	Temperature at Manifold	PID Measured Concentration	Wellhead Vacuum
	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)	(scfm)	(iwc)	(°F)	(ppmv)	(iwc)
02/18/08 <sup>(1)</sup>	135	-9.1	55.0	0.0	-3.0	72	-10.0	57.3	0.0	-4.5	45	-5.1	61.1	0.0	-2.5	80	-11.9	55.2	0.0	-7.0	75	-13.5	57.5	0.0	-5.0	80	-1.5	55.2	0.0	-13.0
02/19/08 <sup>(1)</sup>	140	-12.0	NM	0.0	-3.5	72	-10.4	NM	0.0	-4.5	65	-10	NM	0.0	-3.6	82	-12.7	NM	0.0	-8.0	75	-13.7	NM	0.0	-5.2	70	-16.04	NM	0.0	-10
02/25/08 <sup>(1)</sup>	138	-14.90	NM	0.3	-3.5	72	-12.3	NM	0.4	-4.7	67	-12.2	NM	0.4	-4.0	40	-6.2	NM	0.0	-5.7	75	-16.0	NM	0.4	-5.5	77	-19.5	NM	0.3	-9.0
03/03/08 <sup>(1)</sup>	140	-18.2	NM	0.9	-3.7	76	-13.4	NM	0.1	-5.0	67	-13.85	NM	0.0	-4.5	40	-5.1	NM	0.0	-4.9	78	-17.16	NM	0.2	-5.5	72	-21	NM	0.0	-9.8
03/17/08 <sup>(1)</sup>	140	-18	NM	0.2	-4.0	76	-12.0	NM	0.1	-5.5	65	-15.2	NM	0.0	-4.5	50	-6	NM	0.0	-5.0	77	-17.6	NM	0.1	-5.5	77	-20	NM	0.0	-9.0
04/16/08	35.32	-2.13	55.4	0.2	NM	28.89	-1.47	56.1	0.2	NM	34.18	-2.2	56.8	0.1	NM	19.24	-0.8	58.6	0.0	NM	24.42	-1.64	57.3	0.0	NM	32.38	-3.14	55.2	0.4	NM
05/19/08	65.68	-9.0	59.1	2.2	-3.5	64.77	-6.8	59.0	0.8	-4.2	33.64	-3.5	61.7	0.8	-1.7	46.61	-4.3	59.3	1.2	-4.0	48.22	-7.2	59.0	0.7	-3.5	42.94	-6.0	59.9	1.1	-3.7
06/02/08	72.85	-9.2	62.0	0.0	-3.9	68.01	-6.8	62.4	0.0	-4.5	34.15	-4.1	67.6	0.0	-1.8	50.56	-4.4	66.3	0.0	-4.1	52.84	-9.0	65.8	0.0	-3.8	46.34	-6.0	66.3	0.0	-3.7
07/07/08	102.21	-9	70.5	2.5	-4.1	87.48	-7.0	70.1	0.7	-4.5	41.33	-3.7	71.7	2.0	-1.8	56.29	-4.4	71.0	2.1	-4.0	68.91	-7.9	70.5	2.1	-2.5	56.39	-6.2	71.2	1.9	-3.8
08/06/08 <sup>(5,9)</sup>	94.43	-9.0	80.1	NM	-2.7	68.18	-7.1	80.9	NM	-2.5	30.27	-3.1	81.9	NM	-1.9	50.43	-4.5	83.9	NM	-3.0	61.75	-7.8	80.8	NM	-3.5	47.67	-6.4	82.2	NM	-3.5
09/18/08	100.42	-9.0	70.7	NM	-2.3	75.43	-7.0	70.7	NM	-2.5	34.54	-3.5	70.7	NM	-1.5	50.31	-4.5	70.1	NM	-3.0	56.60	-7.5	70.3	NM	-3.5	50.04	-6.5	70.3	NM	-3.5
10/27/08	92.13	-10.5	62.6	NM	-0.1	79.59	-8.0	62.6	NM	-2.5	32.94	-4.1	62.2	NM	-2.4	51.69	-4.5	62.4	NM	-2.9	54.19	-10	62.0	NM	-3.5	43.20	-8.1	62.2	NM	-2.5
11/25/08	81.50	-15.5	55.4	NM	-2.8	85.93	-11.5	55.5	NM	-3.15	41.96	-7	55.4	NM	-2.13	8.66	-0.5	55.5	NM	-0.5	55.91	-14	54.5	NM	-4.1	45.90	-11.0	54.3	NM	-3.49
12/18/08	70.52	-14.5	52.3	NM	-2.1	71.12	-11	52.5	NM	-2.9	28.13	-10	52.5	NM	-1.3	60.09	-5.25	51.6	NM	-2.9	43.00	-14	51.8	NM	-2.4	35.52	NM	51.4	NM	-2.4

Notes and Abbreviations:

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8. Wellhead vacuum gauges replaced during reporting period with lower range/higher accuracy gauges.
9. Gauge vacuum at 0.0 iwc manometer reading used for table.
10. New gauge range too high to collect measurable reading.
11. Vacuum reading taken using digital manometer during this round of monitoring.
12. Data point is average of readings observed which fluctuated between -4.0 and -10 iwc.

Standard Conditions Calculation:

$$scfm = flow\ rate * Area * (Ts/Tm) * (Pm/Ps)$$

- flow rate in feet per minute
- Area in square feet
- Ts - Standard Temperature in Rankine
- Tm - Measured Temperature in Rankine
- Pm - Measured Pressure in pounds per square inch
- Ps - Standard Pressure in pounds per square inch

Table 1. Summary of General System Operating Parameters, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Date	Knock Out Tank Parameters						Blower Parameters <sup>(2)</sup> BL-200				Blower Parameters <sup>(3)</sup> BL-300				Blower Parameters <sup>(2)</sup> BL-400				Combined Blower Parameters VSP-601						Stack Parameters VSP-602			Water levels in Wells				
	Vacuum			Totalizer			Influent Vacuum	Effluent Pressure	Effluent Flow Rate	Effluent PID	Influent Vacuum	Effluent Pressure	Effluent Flow Rate	Effluent PID	Influent Vacuum	Effluent Pressure	Effluent Flow Rate	Effluent PID	Total Effluent Flow Rate	Total Influent PID	Heat Exchanger Influent Temp.	Total Effluent Pressure	VPGAC Influent Temperature	VPGAC Effluent PID	Discharge Temperature	Effluent Relative Humidity	VMWC-1D	VMWC-5D	B24MMV-3	VMWC-1C	VMWC-5B	
	Influent KO-200	Influent KO-300	Influent KO-400	Effluent KO-200	Effluent KO-300	Effluent KO-400																										(iwc)
02/18/08 <sup>(1)</sup>	-17.9	-37.9	-34.8	33.66	9,996,124	35.99	-19.5	6.2	499.59	6.4	-40	12.0	594.88	0.0	-38	11.5	643.39	0.0	1963.69	0.9	100	9.6	93	0.0	NM	NM	52.13	Dry	53.75	Dry	Dry	
02/19/08 <sup>(1)</sup>	-19.5	-39.5	-36.0	33.66	9,996,124	35.99	-20.5	9.0	432.20	2.7	-40.6	12.0	841.92	1.6	-38.5	10.0	604.74	1.3	1673.81	NM	95	9.8	84	NM	NM	52.17	Dry	53.77	Dry	Dry		
02/25/08 <sup>(1)</sup>	-27.4	-42.0	-39.8	57.34	9,996,124	35.99	-28.3	8.2	433.60	NM	-42.9	10.4	821.99	NM	-42.1	10.2	653.35	NM	1678.65	2.4	94	9.0	94	0.0	NM	NM	52.19	49.12	53.89	38.20	Dry	
03/03/08 <sup>(1)</sup>	-26.5	-44.0	-42.0	128.57	9,996,124	35.99	-28.5	7.6	391.71	NM	-45.2	10.1	752.16	NM	-43.9	10.0	685.41	NM	1792.84	0.5	104	8.6	94	0.0	NM	NM	Dry	Dry	53.90	Dry	Dry	
03/17/08 <sup>(1)</sup>	-33	-43	-41	132.70	9,996,272.5 <sup>(4)</sup>	35.99	-34.3	7.6	411.73	NM	-45.4	10.1	717.83	NM	-43.8	10.0	805.36	NM	1773.50	0.0	102.5	8.0	96	0.0	NM	NM	Dry	Dry	53.62	Dry	Dry	
04/16/08	0	-32	0	132.67	9,996,202.72	35.94	0	0	NM	NM	-35	1	641	1.0	0	0	0	NM	NM	NM <sup>(2)</sup>	1.0	90	0.9	82	0.7	NM	NM	51.55	48.47	53.25	Dry	Dry
05/19/08	0	-18	0	132.67	9,996,202.72	35.94	0	0	NM	NM	-19.5	1.5	666	3.1	0	0	NM	NM	NM <sup>(2)</sup>	4.6	85	1.4	74	1.7	NM	NM	51.53	48.50	53.20	Dry	Dry	
06/02/08	0	-15.5	0	132.67	9,996,202.72	35.94	0	0	NM	NM	-19.5	1.2	746	0.0	0	0	NM	NM	NM <sup>(2)</sup>	0.0	85	1.6	85	0.0	NM	NM	51.71	50.55	53.33	Dry	Dry	
07/07/08	0	-17	0	132.67	9,996,202.72	35.94	0	0	NM	NM	-19.8	1.5	829	0.9	0	0	NM	NM	NM <sup>(2)</sup>	0.7	85	1.5	90	0.0	NM	NM	52.25	Dry	53.9	Dry	Dry	
08/06/08	0	-18	0	132.67	9,996,202.72	35.94	NM	NM	NM	NM	-20.0	1.5	640	NM	NM	NM	NM	NM	NM <sup>(2)</sup>	0.0	98	1.6	95	0.0	NM	NM	52.62 <sup>(7)</sup>	Dry <sup>(7)</sup>	54.2	Dry	Dry	
09/18/08	0	-18	0	132.67	9,996,202.72	35.94	0	0	NM	NM	-20	1.5	633	NM	0	0	NM	NM	583.44	0.4	95	1.6	91	0.1	NM	NM	52.78	Dry	54.36	Dry	Dry	
10/27/08	0	-18	0	132.67	9,996,202.71	35.94	0	0	NM	NM	-20.1	1.5	552	NM	0	0	NM	NM	523.21	0.2	85	1.6	85	0.1	NM	NM	52.95	Dry	54.54	Dry	Dry	
11/25/08	0	-23	0	132.67	9,996,202.71	35.94	NM	NM	NM	NM	-24.0	1	NM	NM	NM	NM	NM	NM	487.30	1.4	95	1.3	70	NM	NM	53.03	Dry	54.70	Dry	Dry		
12/18/08	0	-20	0	132.67	9,996,202.72	35.94	NM	NM	NM	NM	-23.5	1.2	NM	NM	NM	NM	NM	NM	539.73	0.0	80	1.4	74	0.0	NM	NM	NM	NM	NM	NM	NM	

Notes and Abbreviations:

- \*F - Degrees Fahrenheit
- DW - Depressurization well
- ft bmp - Feet below measuring point
- iwc - Inches of water column
- NM -Not measured
- scfm - Standard cubic feet per minute
- ppmv - Parts per million by volume
- VMWC - Vapor monitoring well cluster

1. Flow rate at manifold on associated dates quantified using venturi flow meter and associated flow chart. Remaining flow rates measured with a hotwire anemometer and calculated to standard conditions using the formula below.
2. Access point covered by insulation no measurement taken during this round.
3. Blowers BL-200 and BL-400 were taken off-line on April 10th during system rebalancing.
4. Field recording error suspected.
5. Temperature readings are erroneous due to field measurement error. July 7, 2008 temperature readings used for conversion of flow to scfm.
6. Data point is average of readings observed which fluctuated between -0.9 and -3.0 iwc.
7. Original parameter not collected on 8/6/08 or was erroneous, data point reported is second reading taken on 08/07/08.
8. Wellhead vacuum gauges replaced during reporting period with lower range/higher accuracy gauges.
9. Gauge vacuum at 0.0 iwc manometer reading used for table.
10. New gauge range too high to collect measurable reading.
11. Vacuum reading taken using digital manometer during this round of monitoring.
12. Data point is average of readings observed which fluctuated between -4.0 and -10 iwc.

Standard Conditions Calculation:

$$scfm = \text{flow rate} \cdot \text{Area} \cdot (T_s/T_m) \cdot (P_m/P_s)$$

- flow rate in feet per minute
- Area in square feet
- Ts - Standard Temperature in Rankine
- Tm - Measured Temperature in Rankine
- Pm - Measured Pressure in pounds per square inch
- Ps - Standard Pressure in pounds per square inch

Table 2. Summary of Induced Vacuum Readings, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.<sup>(1)</sup>

Well ID:	DW-7S			DW-7D	DW-3S				DW-3D			DW-5S			DW-5D	DW-1S									
Date	VMWC-14A <sup>(4)</sup>	VMWC-14B <sup>(4)</sup>	VMWC-14D <sup>(4)</sup>	VMWC-9A	VMWC-9B	VMWC-10B	VMWC-11B <sup>(4)</sup>	VMWC-10D	VMWC-11D	VMWC-12D <sup>(4)</sup>	VMWC-15A <sup>(4)</sup>	VMWC-15B <sup>(4)</sup>	VMWC-15D <sup>(4)</sup>	VMWC-1A	VMWC-2A	VMWC-4A	VMWC-3A <sup>(4)</sup>	VMWC-1B	VMWC-4B	VMWC-3B <sup>(4)</sup>	VMWC-1C	VMWC-2C	VMWC-4C	VMWC-3C <sup>(4)</sup>	
02/18/08	-0.05	-0.26	-0.31	-0.51	-0.67	-0.50	-0.41	-0.57	-0.43	-0.34	-0.52	-0.41	-0.35	-0.12	-0.10	-0.07	-0.07	-0.15	-0.08	-0.08	-0.11	-0.11	-0.09	-0.08	
02/19/08	-0.09	-0.27	-0.30	-0.42	-0.53	-0.40	-0.33	-0.48	-0.40	-0.31	-0.30	-0.30	-0.35	-0.74	-0.61	-0.50	-0.42	-0.93	-0.58	-0.42	-0.78	-0.66	-0.61	-0.46	
02/25/08	-0.09	-0.26	-0.31	-0.39	-0.49	-0.39	-0.34	-0.44	-0.36	-0.31	-0.23	-0.23	-0.27	-0.70	-0.58	-0.44	-0.40	-0.88	-0.54	-0.42	-0.74	-0.62	-0.55	-0.44	
03/03/08	-0.11	-0.28	-0.31	-0.38	-0.44	-0.37	-0.31	-0.41	-0.33	-0.27	-0.19	-0.21	-0.25	-0.62	-0.48	-0.40	-0.32	-0.78	-0.46	-0.38	-0.66	-0.54	-0.49	-0.39	
03/17/08	-0.11	-0.28	-0.31	-0.39	-0.50	-0.36	-0.29	-0.39	-0.36	-0.54	-0.25	-0.25	-0.28	-0.70	-0.60	-0.44	-0.38	-0.89	-0.50	-0.40	-0.68	-0.60	-0.52	-0.43	
04/16/08	-0.11	-0.16	-0.18	-0.15	-0.17	-0.14	-0.13	-0.14	-0.13	-0.11	-0.09	-0.09	-0.08	-0.20	-0.16	-0.16	-0.11	-0.24	-0.16	-0.11	-0.19	-0.16	-0.16	-0.11	
05/19/08	-0.099	-0.143	-0.163	-0.170	-0.199	-1.490	-0.154	-0.083	-0.219	-0.143	-0.159	-0.125	-0.159	-0.425	-0.369	-1.377	-0.221	-0.410	-0.299	-0.283	-0.423	-0.372	-0.333	-0.218	
06/02/08	-0.095	-0.146	-0.148	-0.165	-0.171	-0.165	-0.165	-0.142	-0.135	-0.127	-0.150	-0.140	-0.133	-0.437	-0.339	-0.492	-0.200	-0.505	-0.299	-0.213	-0.408	-0.335	-0.313	-0.212	
07/07/08	-0.097	-0.146	-0.149	-0.123	-0.135	-0.129	-0.122	-0.131	-0.129	-0.125	-0.127	-0.126	-0.133	-0.303	-0.258	-0.193	-0.152	-0.409	-0.227	-0.160	-0.331	-0.263	-0.219	-0.164	
08/06/08	-0.10	-0.15	-0.15	-0.10	-0.16	-0.11	-0.146 <sup>(5)</sup>	-0.11	-0.11	-0.11	-0.13	-0.13	-0.11	-0.34	-0.241 <sup>(5)</sup>	-0.26	-1.14	-0.39	-0.30	-0.16	-0.32	-0.290 <sup>(5)</sup>	-0.29	-0.16	
09/18/08	-0.121	-0.186	-0.198	NM	NM	NM	-0.184	NM	NM	-0.255	-0.140	-0.144	-0.138	NM	NM	NM	-0.193	NM	NM	-0.204	NM	NM	NM	-0.207	
10/27/08	-0.097	-0.139	-0.144	NM	NM	NM	-0.135	NM	NM	-0.143	-0.129	-0.127	-0.110	NM	NM	NM	-0.180	NM	NM	-0.180	NM	NM	NM	-0.182	
11/25/08	-0.125	-0.194	-0.201	NM	NM	NM	-0.156	NM	NM	-0.162	-0.165	-0.155	-0.145	NM	NM	NM	-0.106	NM	NM	-0.109	NM	NM	NM	-0.109	
12/18/08	-0.102	-0.171	-0.203	NM	NM	NM	-0.151	NM	NM	-0.165	-0.200	-0.199	-0.199	NM	NM	NM	-0.110	NM	NM	-0.116	NM	NM	NM	-0.089	

Time Weighted<sup>(2)</sup>

Rolling Average:	-0.11	-0.18	-0.19	NA	NA	NA	-0.180	NA	NA	-0.20	-0.16	-0.15	-0.15	NA	NA	NA	-0.34	NA	NA	-0.22	NA	NA	NA	-0.22
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Gross Average Compliance Points

12/18/08	-0.15
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Notes and Abbreviations:

- DW Depressurization Well
- NA Not Applicable
- NM Not Measured
- VMWC Vapor Monitoring Well Cluster

1. All induced vacuum measurements units in inches of water column (iwc).
2. Data point appears to be erroneous based on vacuum readings at further vapor point greater than that recorded at the closer location.
3. Data point is average of readings taken which fluctuated between -0.22 and -0.29 iwc.
4. Compliance vapor monitoring point.
5. Original parameter collected on 8/6/08 was erroneous, data point reported is second reading taken on 08/07/08.
6. Compliance goal is -0.1 iwc induced vacuum at all compliance monitoring points.
7. Non-compliance monitoring point measurements not taken as recommended in the February to June 2008 Operations Maintenance and Monitoring Report and Startup Summary.

Table 2. Summary of Induced Vacuum Readings, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York. <sup>(1)</sup>

Well ID:	DW-1D				DW-4D	DW-8S			DW-2S							DW-2D					DW-11S		
Date	VMWC-1D	VMWC-2D	VMWC-4D	VMWC-3D <sup>(4)</sup>	VMWC-16D <sup>(4)</sup>	VMWC-16A <sup>(4)</sup>	VMWC-16B <sup>(4)</sup>	VMWC-5A	VMWC-6A	VMWC-8A	VMWC-7A <sup>(4)</sup>	VMWC-5B	VMWC-6B	VMWC-8B	VMWC-7B <sup>(4)</sup>	VMWC-5D	VMWC-6D	VMWC-8D	VMWC-7D	VMWC-13D <sup>(4)</sup>	VMWC-17D <sup>(4)</sup>	VMWC-18A <sup>(4)</sup>	VMWC-18B <sup>(4)</sup>
02/18/08	-1.16	-0.99	-0.16	-0.90	-0.51	-0.04	-0.10	-0.07	-0.04	-0.40	-0.08	-0.10	-0.05	-0.02	-0.03	-1.91	-1.47	-0.03 <sup>(2)</sup>	-1.03	-0.17	-0.39	-0.05	-0.07
02/19/08	-1.31	-1.08	-0.86	-0.96	-0.54	-0.26	-0.26	-0.62	-0.37	-0.29	-0.22	-0.74	-1.73	-0.33	-0.23	-2.19	-0.37 <sup>(2)</sup>	-1.88	-1.4	-0.44	-0.53	-0.25	-0.26 <sup>(3)</sup>
02/25/08	-1.56	-1.23	-0.97	-1.07	-0.39	-0.29	-0.30	-0.70	-0.42	-0.31	-0.28	-0.82	-0.46	-0.35	-0.29	-1.21	-1.09	-0.88	-0.89	-0.39	-0.22	-0.24	-0.3
03/03/08	-1.56	-1.20	-0.90	-0.98	-0.27	-0.26	-0.27	-0.68	-0.40	-0.31	-0.27	-0.83	-0.44	-0.35	-0.30	-0.90	-0.72	-0.65	-0.53	-0.24	-0.16	-0.24	-0.27
03/17/08	-1.72	-1.51	-0.96	-1.15	-0.43	-0.31	-0.35	-0.69	-0.41	-0.33	-0.25	-0.78	-0.42	-0.36	-0.28	-1.15	-0.92	-0.82	-0.65	NM	-0.25	-0.29	-0.34
04/16/08	-0.18	-0.15	-0.18	-0.13	-0.09	-0.08	-0.08	-0.26	-0.14	NM	-0.09	-0.22	-0.15	NM	-0.09	-0.23	-0.21	NM	-0.17	NM	-0.08	-0.08	-0.09
05/19/08	-0.424	-0.391	-0.309	-0.310	-0.147	-0.162	-0.170	-0.328	-0.209	-0.180	-0.157	-0.327	-0.213	-0.156	-0.164	-1.097	-0.879	-0.763	-0.694	-0.223	-0.237	-0.139	-0.163
06/02/08	-0.345	-0.283	-0.253	-0.227	-0.195	-0.159	-0.168	-0.310	-0.190	-0.148	-0.142	-0.311	-0.199	-0.169	-0.141	-1.047	-0.838	-0.730	-0.743	-0.180	NM	-0.129	-0.151
07/07/08	-0.366	-0.269	-0.238	-0.311	-0.170	-0.160	-0.171	-0.310	-0.185	-0.156	-0.136	-0.344	-0.201	-0.170	-0.148	-1.047	-0.846	-0.757	-0.501	-0.189	NM	-0.132	-0.160
08/06/08	-0.32	-0.27	-0.30	-0.22	-0.14	-0.14	-0.16	-0.24	-0.19	-0.19	-0.16	-0.34	-0.20	-0.19	-0.15	-0.95	-0.77	-0.75	-0.55	-0.19	-0.17	-0.13	-0.16
09/18/08	NM	NM	NM	-0.342	-0.259	-0.165	-0.181	NM	NM	NM	-0.217	NM	NM	NM	-0.168	NM	NM	NM	NM	-0.388	-0.217	-0.134	-0.161
10/27/08	NM	NM	NM	-0.240	-0.136	-0.148	-0.163	NM	NM	NM	-0.136	NM	NM	NM	-0.144	NM	NM	NM	NM	-0.227	-0.675	-0.127	-0.130
11/25/08	NM	NM	NM	-0.122	-0.120	-0.177	-0.192	NM	NM	NM	-0.187	NM	NM	NM	-0.193	NM	NM	NM	NM	-0.100	-0.166	-0.146	-0.176
12/18/08	NM	NM	NM	-0.111	-0.063	-0.153	-0.174	NM	NM	NM	-0.154	NM	NM	NM	-0.162	NM	NM	NM	NM	-0.136	-0.219	-0.126	-0.162
Time Weighted Rolling Average:	NA	NA	NA	-0.40	-0.21	-0.17	-0.19	NA	NA	NA	-0.17	NA	NA	NA	-0.17	NA	NA	NA	NA	-0.235	-0.225	-0.15	-0.18

Notes and Abbreviations:

- DW Depressurization Well
- NA Not Applicable
- NM Not Measured
- VMWC Vapor Monitoring Well Cluster

1. All induced vacuum measurements units in inches of water column (iwc).
2. Data point appears to be erroneous based on vacuum readings at further vapor point greater than that recorded at the closer location.
3. Data point is average of readings taken which fluctuated between -0.22 and -0.29 iwc.
4. Compliance vapor monitoring point.
5. Original parameter collected on 8/6/08 was erroneous, data point reported is second reading taken on 08/07/08.
6. Compliance goal is -0.1 iwc induced vacuum at all compliance monitoring points.
7. Non-compliance monitoring point measurements not taken as recommended in the February to June 2008 Operations Maintenance and Monitoring Report and Startup Summary.

Table 3. Summary of Total Influent and Effluent Vapor Sample Analytical Results, Northrop Grumman Operable Unit 3  
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.<sup>(2)</sup>

Compound <sup>(2)</sup> (units in ug/m <sup>3</sup> )	Location ID: Sample Date:	VSP-601 2/18/2008	VSP-602 2/18/2008	VSP-601 2/19/2008	VSP-602 2/19/2008	VSP-601 2/25/2008	VSP-602 2/25/2008
	SGC						
1,1,1-Trichloroethane	71-55-6	110	< 0.62	71	< 0.61	35	< 0.63
1,1-Dichloroethane	75-34-3	43	< 0.62	33	< 0.61	45	< 0.63
1,1-Dichloroethene	75-35-4	< 14	< 0.62	< 11	< 0.61	< 25	< 0.63
2-Butanone	78-93-3	16	< 0.62	< 11	< 0.61	< 25	< 0.63
Acetone	67-64-1	< 140	< 6.2	< 110	< 6.1	< 250	< 6.3
Benzene	71-43-2	67	< 0.62	22	< 0.61	< 25	< 0.63
Carbon Tetrachloride	56-23-5	< 14	< 0.62	< 11	< 0.61	< 25	< 0.63
Trichlorofluoromethane (CFC-11)	75-69-4	< 14	< 0.62	< 11	< 0.61	< 25	< 0.63
Chloroform	67-66-3	34	< 0.62	24	< 0.61	< 25	< 0.63
cis-1,2-Dichloroethene	156-59-2	5800	< 0.62	4600	< 0.61	2900	< 0.63
Dichlorodifluoromethane (Freon 12)	75-71-8	< 14	< 0.62	< 11	0.71	< 25	5.7
Tetrachloroethene	127-18-4	340	< 0.62	200	< 0.61	82	< 0.63
Toluene	108-88-3	92	< 0.62	98	< 0.61	34	< 0.63
trans-1,2-Dichloroethene	156-60-5	120	< 0.62	71	< 0.61	< 25	< 0.63
Trichloroethylene	79-01-6	14000	< 0.62	9400	< 0.61	5100	< 0.63
Vinyl Chloride	75-01-4	< 14	< 0.62	< 11	< 0.61	< 25	1.1
<b>TVOC</b>		<b>20,622</b>	<b>0.0</b>	<b>14,519</b>	<b>0.71</b>	<b>8,196</b>	<b>6.8</b>

Notes and Abbreviations:

- Bold** Compound detected above method detection limit
- CAS No. Chemical abstracts service list number
- D Compound detected at a secondary dilution

NS Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.  
SGC Short-term guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.

TVOC Total volatile organic compounds  
ug/m<sup>3</sup> Micrograms per cubic meter

1. An SGC was not provided in the DAR-1 AGC/SGC Tables, dated September 10, 2007. An interim SGC was developed based on in Section IV.A.2.b.1 of guidance provided the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for cis-1,2 dichloroethene, which is not defined as a high-toxicity compound, the interim SGC = (smaller of Time Weighted Average [TWA] = Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 793,000 ug/m<sup>3</sup> / 4.2 = 190,000 ug/m<sup>3</sup>.  
Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Simi Valley, CA or Rochester, NY locations) for VOC analyses using USEPA Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008). Data presented in this table corresponds to the period February - December 2008.
3. Table summarizes detected compounds only.



Table 3. Summary of Total Influent and Effluent Vapor Sample Analytical Results, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.<sup>(2)</sup>

Compound <sup>(3)</sup> (units in ug/m <sup>3</sup> )	CAS No.	Location ID: Sample Date:	VSP-601 3/3/2008	VSP-602 3/3/2008	VSP-601 3/17/2008	VSP-602 3/17/2008	VSP-601 4/16/2008	VSP-602 4/16/2008
		SGC						
1,1,1-Trichloroethane	71-55-6	68,000	26	< 0.63	35	< 14	< 25	< 15
1,1-Dichloroethane	75-34-3	NS	47	< 0.63	59	< 11	31	< 11
1,1-Dichloroethene	75-35-4	--	< 13	< 0.63	< 10	< 10	< 10	< 10
2-Butanone	78-93-3	13,000	< 13	< 0.63	< 16	< 16	< 16	< 16
Acetone	67-64-1	180,000	< 130	< 6.3	< 31	< 31	< 31	< 31
Benzene	71-43-2	1,300	< 13	< 0.63	< 8.4	< 8.4	< 8.4	< 8.4
Carbon Tetrachloride	56-23-5	--	< 13	< 0.63	< 3.3	< 3.3	< 3.3	< 3.3
Trichlorofluoromethane (CFC-11)	75-69-4	68,000	< 13	< 0.63	< 15	< 15	< 15	< 15
Chloroform	67-66-3	150	27	< 0.63	35	< 13	< 22	< 13
cis-1,2-Dichloroethene	156-59-2	190,000 <sup>(1)</sup>	1600	< 0.63	1400 D	< 10	1100	78
Dichlorodifluoromethane (Freon 12)	75-71-8	NS	13	8.3	46	< 26	< 46	< 26
Tetrachloroethene	127-18-4	1,000	45	< 0.63	39	< 3.6	54	< 3.7
Toluene	108-88-3	37,000	61	< 0.63	140	< 10	37	< 10
trans-1,2-Dichloroethene	156-60-5	NS	< 13	< 0.63	10	< 10	< 10	< 10
Trichloroethylene	79-01-6	14,000	2500	< 0.63	1500 D	< 2.8	1300	< 2.9
Vinyl Chloride	75-01-4	180,000	200	40	980 D	920 D	120	710
<b>TVOC</b>			<b>4,519</b>	<b>48.3</b>	<b>4,244</b>	<b>920</b>	<b>2,642</b>	<b>788</b>

Notes and Abbreviations:

- Bold** Compound detected above method detection limit
- CAS No.** Chemical abstracts service list number
- D** Compound detected at a secondary dilution

**NS** Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.  
**SGC** Short-term guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.  
**TVOC** Total volatile organic compounds

ug/m<sup>3</sup> Micrograms per cubic meter

1. An SGC was not provided in the DAR-1 AGC/SGC Tables, dated September 10, 2007. An interim SGC was developed based on in Section IV.A.2.b.1 of guidance provided the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for cis-1,2 dichloroethene, which is not defined as a high-toxicity compound, the interim SGC = (smaller of Time Weighted Average [TWA] = Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 793,000 ug/m<sup>3</sup> / 4.2 = 190,000 ug/m<sup>3</sup>.
2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Simi Valley, CA or Rochester, NY locations) for VOC analyses using USEPA Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008). Data presented in this table corresponds to the period February - December 2008.
3. Table summarizes detected compounds only.

# ARCADIS

Table 3. Summary of Total Influent and Effluent Vapor Sample Analytical Results, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.<sup>(2)</sup>

Compound <sup>(3)</sup> (units in ug/m <sup>3</sup> )	CAS No.	Location ID: Sample Date:	VSP-601 5/19/2008	VSP-602 5/19/2008	VSP-601 6/2/2008	VSP-602 6/2/2008	VSP-601 7/7/2008	VSP-602 7/7/2008
1,1,1-Trichloroethane	71-55-6	SGC	38	< 2.7	44	< 2.5	48	< 6.5
1,1-Dichloroethane	75-34-3	68,000	25	5.8	27	7.6	28	11
1,1-Dichloroethene	75-35-4	NS	< 19	< 1.9	< 18	< 1.8	< 18	< 4.7
2-Butanone	78-93-3	13,000	< 28	< 2.9	28	< 2.7	27	< 7
Acetone	67-64-1	180,000	< 57	< 5.8	< 55	8.4	< 53	< 14
Benzene	71-43-2	1,300	19	< 1.6	< 15	< 1.5	150	< 3.8
Carbon Tetrachloride	56-23-5	68,000	< 6.1	< 0.62	< 5.8	< 0.58	< 5.6	< 1.5
Trichlorofluoromethane (CFC-11)	75-69-4	150	< 27	< 2.8	< 26	< 2.6	< 25	< 6.7
Chloroform	67-66-3	190,000 <sup>(1)</sup>	44	< 2.4	55	3	88	8.4
cis-1,2-Dichloroethene	156-59-2	NS	950	180	930	230 D	1100	350
Dichlorodifluoromethane (Freon 12)	75-71-8	1,000	< 48	< 4.9	< 45	< 4.5	< 44	< 12
Tetrachloroethene	127-18-4	37,000	42	< 0.67	48	2.2	61	< 1.6
Toluene	108-88-3	NS	< 18	< 1.8	< 17	< 1.7	< 17	< 4.5
trans-1,2-Dichloroethene	156-60-5	14,000	< 19	< 1.9	< 18	2.8	< 18	< 4.7
Trichloroethylene	79-01-6	180,000	1000	5.3	1100	6.5	1500	7.7
Vinyl Chloride	75-01-4		< 12	65	< 12	13	< 11	5.9
<b>TVOC</b>			<b>2,118</b>	<b>256.1</b>	<b>2,232</b>	<b>273.5</b>	<b>3,002</b>	<b>383</b>

Notes and Abbreviations:

**Bold** Compound detected above method detection limit  
**CAS No.** Chemical abstracts service list number  
**D** Compound detected at a secondary dilution

**NS** Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.  
**SGC** Short-term guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.  
**TVOC** Total volatile organic compounds

**ug/m<sup>3</sup>** Micrograms per cubic meter

1. An SGC was not provided in the DAR-1 AGC/SGC Tables, dated September 10, 2007. An interim SGC was developed based on in Section IV.A.2.b.1 of guidance provided the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for cis-1,2 dichloroethene, which is not defined as a high-toxicity compound, the interim SGC = (smaller of Time Weighted Average [TWA] = Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 793,000 ug/m<sup>3</sup> / 4.2 = 190,000 ug/m<sup>3</sup>.
2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Simi Valley, CA or Rochester, NY locations) for VOC analyses using USEPA Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008). Data presented in this table corresponds to the period February - December 2008.
3. Table summarizes detected compounds only.

# ARCADIS

Table 3. Summary of Total Influent and Effluent Vapor Sample Analytical Results, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.<sup>(2)</sup>

Compound <sup>(3)</sup> (units in ug/m <sup>3</sup> )	CAS No.	SGC	VSP-601 8/6/2008	VSP-602 8/6/2008	VSP-601 9/24/2008	VSP-602 9/24/2008	VSP-601 10/27/2008	VSP-602 10/27/2008
1,1,1-Trichloroethane	71-55-6	68,000	47	< 4.4	77	9.7	61	< 15
1,1-Dichloroethane	75-34-3	NS	26	9.2	47	26	33	30
1,1-Dichloroethene	75-35-4	--	< 22	< 3.2	< 21	3.5	< 14	< 11
2-Butanone	78-93-3	13,000	< 32	< 4.7	< 31	< 3.2	< 20	< 16
Acetone	67-64-1	180,000	< 65	< 9.6	< 63	< 6.3	< 41	< 32
Benzene	71-43-2	1,300	22	< 2.6	< 17	< 1.7	< 11	< 8.5
Carbon Tetrachloride	56-23-5	--	< 6.8	< 1	< 6.7	< 0.67	< 4.3	< 3.3
Trichlorofluoromethane (CFC-11)	75-69-4	68,000	< 31	5.5	< 30	11	< 19	< 15
Chloroform	67-66-3	150	89	8.2	160	35	95	45
cis-1,2-Dichloroethene	156-59-2	190,000 <sup>(1)</sup>	990	320 D	1500	620 D	1100	830
Dichlorodifluoromethane (Freon 12)	75-71-8	NS	< 54	< 8	< 53	< 5.3	< 34	< 26
Tetrachloroethene	127-18-4	1,000	56	< 1.1	64	0.88	32	< 3.6
Toluene	108-88-3	37,000	< 20	< 3	< 20	< 2	< 13	< 10
trans-1,2-Dichloroethene	156-60-5	NS	< 22	3.6	< 21	8.6	< 14	< 11
Trichloroethylene	79-01-6	14,000	1400	9.2	1500	120	1100	120
Vinyl Chloride	75-01-4	180,000	< 14	4.9	< 14	4.9	< 8.8	< 6.8
<b>TVOC</b>			<b>2,630</b>	<b>361</b>	<b>3,348</b>	<b>829</b>	<b>2,421</b>	<b>1,025</b>

Notes and Abbreviations:

**Bold** Compound detected above method detection limit  
**CAS No.** Chemical abstracts service list number  
**D** Compound detected at a secondary dilution

**NS** Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.  
**SGC** Short-term guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.  
**TVOC** Total volatile organic compounds

ug/m<sup>3</sup> Micrograms per cubic meter

1. An SGC was not provided in the DAR-1 AGC/SGC Tables, dated September 10, 2007. An interim SGC was developed based on in Section IV.A.2.b.1 of guidance provided the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for cis-1,2 dichloroethene, which is not defined as a high-toxicity compound, the interim SGC = (smaller of Time Weighted Average [TWA] = Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 793,000 ug/m<sup>3</sup> / 4.2 = 190,000 ug/m<sup>3</sup>.  
 Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Simi Valley, CA or Rochester, NY locations) for VOC analyses using USEPA Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008). Data presented in this table corresponds to the period February - December 2008.
2. Table summarizes detected compounds only.
3. Table summarizes detected compounds only.

Table 3. Summary of Total Influent and Effluent Vapor Sample Analytical Results, Northrop Grumman Operable Unit 3  
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.<sup>(2)</sup>

Compound <sup>(3)</sup> (units in ug/m <sup>3</sup> )	CAS No.	Location ID: Sample Date:	VSP-601 11/25/2008	VSP-602 11/25/2008	VSP-601 12/18/2008	VSP-602 12/18/2008
		SGC				
1,1,1-Trichloroethane	71-55-6	68,000	68	23	75 J	< 18
1,1-Dichloroethane	75-34-3	NS	38	32	33 J	29
1,1-Dichloroethene	75-35-4	--	< 20	< 13	< 12 J	< 13
2-Butanone	78-93-3	13,000	< 30	< 19	< 18 J	< 19
Acetone	67-64-1	180,000	< 60	< 38	< 36 J	< 39
Benzene	71-43-2	1,300	43	< 10	63 J	< 10
Carbon Tetrachloride	56-23-5	--	8.4	< 4	< 3.8 J	< 4.1
Trichlorofluoromethane (CFC-11)	75-69-4	68,000	< 29	< 18	< 17 J	< 18
Chloroform	67-66-3	150	< 25	53	52 J	42
cis-1,2-Dichloroethene	156-59-2	190,000 <sup>(1)</sup>	1200	770	1000 J	730
Dichlorodifluoromethane (Freon 12)	75-71-8	NS	< 50	69	< 30 J	< 32
Tetrachloroethene	127-18-4	1,000	31	< 4.3	21 J	< 4.4
Toluene	108-88-3	37,000	< 19	< 12	12 J	< 12
trans-1,2-Dichloroethene	156-60-5	NS	< 20	< 13	< 12 J	< 13
Trichloroethylene	79-01-6	14,000	960	310	710 J	130
Vinyl Chloride	75-01-4	180,000	< 13	< 8.2	< 7.8 J	< 8.3
<b>TVOC</b>			<b>2,348</b>	<b>1,257</b>	<b>1,966 J</b>	<b>931</b>

Notes and Abbreviations:

- Bold** Compound detected above method detection limit
- CAS No.** Chemical abstracts service list number
- D** Compound detected at a secondary dilution
- J** Estimated
- NS** Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
- SGC** Short-term guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
- TVOC** Total volatile organic compounds
- ug/m<sup>3</sup>** Micrograms per cubic meter

1. An SGC was not provided in the DAR-1 AGC/SGC Tables, dated September 10, 2007. An interim SGC was developed based on in Section IV.A.2.b.1 of guidance provided the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for cis-1,2 dichloroethene, which is not defined as a high-toxicity compound, the interim SGC = (smaller of Time Weighted Average [TWA] = Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 793,000 ug/m<sup>3</sup> / 4.2 = 190,000 ug/m<sup>3</sup>.
2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Simit Valley, CA or Rochester, NY locations) for VOC analyses using USEPA Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008). Data presented in this table corresponds to the period February - December 2008.
3. Table summarizes detected compounds only.

# ARCADIS

Table 4. Summary of Condensate Sample Analytical Results, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York. <sup>(2)</sup>

Compound <sup>(3)</sup> (units in ug/L)	Location ID: Sample Date:	NA NA
	CAS No.	
1,1-Dichloroethane	75-34-3	
2-Butanone	78-93-3	
Acetone	67-64-1	
cis-1,2-Dichloroethene	156-59-2	No Sampling Performed
Isopropylbenzene	98-82-8	During The Report
Toluene	108-88-3	Period
trans-1,2-Dichloroethene	156-60-5	
Trichloroethylene	79-01-6	
Vinyl Chloride	75-01-4	
<b>TVOC</b> <sup>(1)</sup>		NA

Notes and Abbreviations:

<b>Bold</b>	Compound detected above method detection limit
CAS No.	Chemical abstracts service list number
D	Compound detected at a secondary dilution
TVOC	Total volatile organic compounds
ug/L	Micograms per liter
NA	Not applicable

1. Total volatile organic compounds determined by summing individual detections and rounding to the nearest whole number.
2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Rochester, NY) for VOC analyses using Method 8260 in accordance with the project Sampling and Analysis Plan (ARCADIS 2008). Data presented in this table corresponds to the period November - December 2008.
3. Table summarizes detected compounds only.

Table 5. Air Emissions Model Output Summary, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Compound <sup>(1)</sup>	AGC <sup>(2)</sup> ( $\mu\text{g}/\text{m}^3$ )	Percent of MASC Per Event <sup>(3)</sup>									
		02/18/08	02/19/08	02/25/08	03/03/08	03/17/08	04/16/08	05/19/08	06/02/08		
Vinyl chloride	0.11	0.00%	0.00%	0.04%	1.60%	36.84%	20.63%	1.91%	0.41%		
1,1-Dichloroethane	0.63	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.04%		
Trichloroethylene	0.5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.05%		
Tetrachloroethylene	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%		
cis-1,2-Dichloroethylene	63	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%		
Dichlorodifluoromethane (Freon 12)	12,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
Acetone	28,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
Chloroform	0.043	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.24%		
trans-1,2-Dichloroethene	63	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
Trichlorofluoromethane (Freon 11)	1,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
1,1-Dichloroethene	70	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
1,1,1-Trichloroethane	1,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		

See notes last page.

Table 5. Air Emissions Model Output Summary, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Compound <sup>(1)</sup>	AGC <sup>(2)</sup> (µg/m <sup>3</sup> )	Percent of MASC Per Event <sup>(3)</sup>							Cumulative % MASC <sup>(4)</sup>
		07/07/08	08/06/08	09/24/08	10/27/08	11/25/08	12/18/08		
Vinyl chloride	0.11	0.20%	0.14%	0.14%	0.00%	0.00%	0.00%	0.00%	3.87%
1,1-Dichloroethane	0.63	0.06%	0.05%	0.13%	0.14%	0.14%	0.13%	0.13%	0.06%
Trichloroethylene	0.5	0.06%	0.06%	0.78%	0.71%	1.66%	0.73%	0.73%	0.32%
Tetrachloroethylene	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
cis-1,2-Dichloroethylene	63	0.02%	0.02%	0.03%	0.04%	0.03%	0.03%	0.03%	0.02%
Dichlorodifluoromethane (Freon 12)	12,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acetone	28,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chloroform	0.043	0.68%	0.62%	2.63%	3.07%	3.29%	2.75%	2.75%	1.16%
trans-1,2-Dichloroethene	63	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Trichlorofluoromethane (Freon 11)	1,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1,1-Dichloroethene	70	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1,1,1-Trichloroethane	1,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

See notes last page.

Table 5. Air Emissions Model Output Summary, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

**Notes:**

1. Compounds listed include all compounds detected in the system effluent vapor stream.
2. AGC refers to the compound-specific annual guideline concentration per the NYSDEC DAR-1 AGC/SGC tables, revised September 10, 2007. NYSDEC DAR-1 AGCs were scaled using the results of a site-specific annual USEPA SCREEN 3 model to calculate the annual maximum allowable stack concentration (MASC) per monitoring event.
3. Percent of AGC was calculated by dividing the actual effluent concentration by the site-specific annual MASC. Detailed calculations are included in Appendix C.
4. Cumulative percent of the MASC was calculated using a time-weighted average of the percent MASC per event.

$\mu\text{g}/\text{m}^3$  - Micrograms per cubic meter.

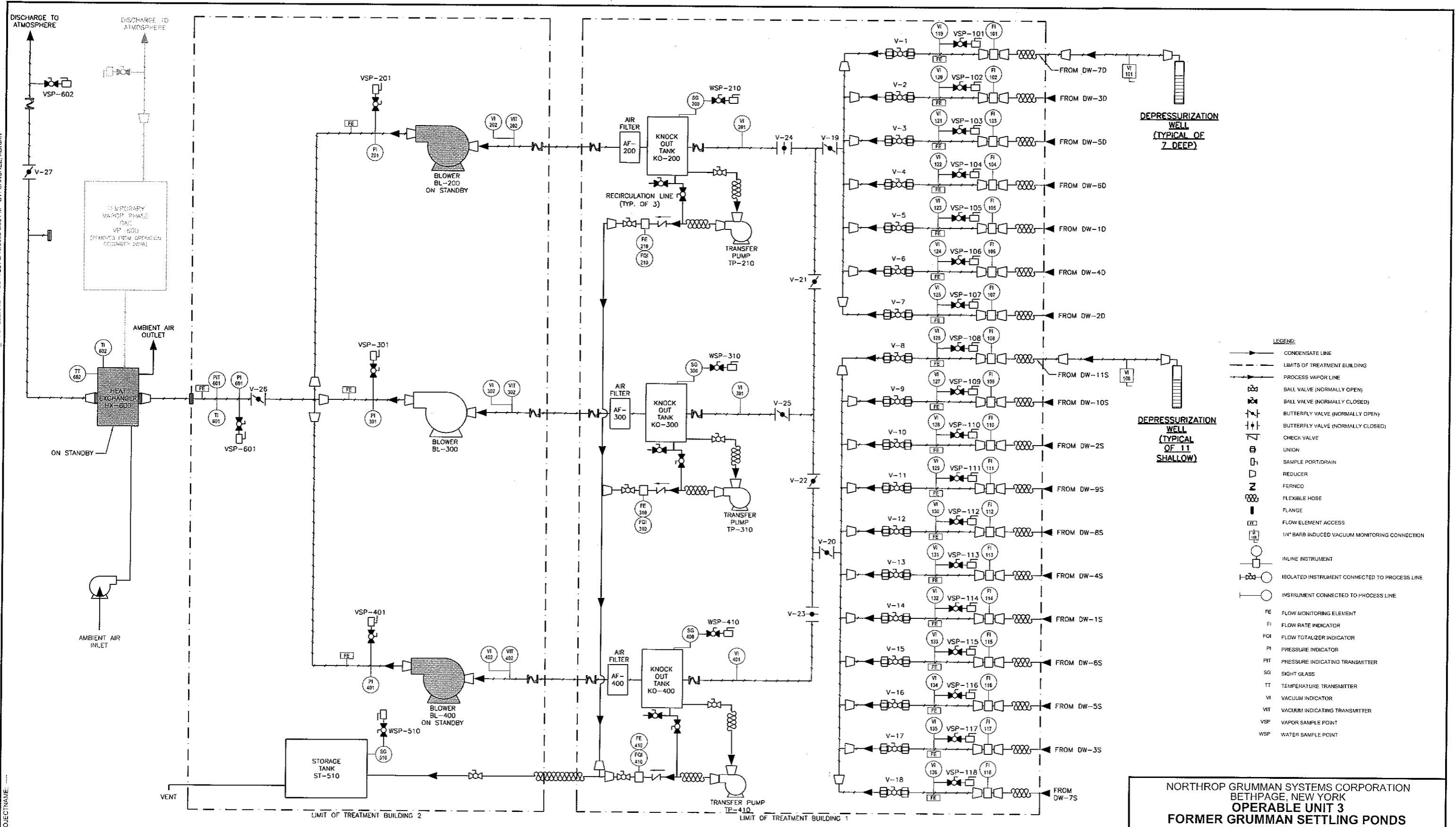
AGC - Annual guideline concentration.







CITY: MELVILLE, NY DIV: GROUP: ENV/604 DB: LD: PIC: PM/CSG TM/KZ LVR/ON\*OFF-REF\*  
 C:\ENV\CAD\DWG\18-NY\NY014814140700008\CH\81403\_P&ID.dwg LAYOUT: 3 SAVED: 26/2/2009 10:43 AM ACD/VER: 17/15 (LMS TECH) PAGES: 11/17 PLOT STYLE TABLE: ARCADIS.MELVILLE.CTB PLOTTED: 2/18/2009 3:00 PM BY: SANCHEZ, ADRIAN  
 XREFS: IMAGES: PROJECTNAME:



- LEGEND:**
- CONDENSATE LINE
  - LIMITS OF TREATMENT BUILDING
  - PROCESS VAPOR LINE
  - BALL VALVE (NORMALLY OPEN)
  - BALL VALVE (NORMALLY CLOSED)
  - BUTTERFLY VALVE (NORMALLY OPEN)
  - BUTTERFLY VALVE (NORMALLY CLOSED)
  - CHECK VALVE
  - UNION
  - SAMPLE PORT/DRAIN
  - REDUCER
  - FERNCO
  - FLEXIBLE HOSE
  - FLANGE
  - FLOW ELEMENT ACCESS
  - 1/4" BARB INDUCED VACUUM MONITORING CONNECTION
  - INLINE INSTRUMENT
  - ISOLATED INSTRUMENT CONNECTED TO PROCESS LINE
  - INSTRUMENT CONNECTED TO PROCESS LINE
- FE FLOW MONITORING ELEMENT  
 FI FLOW RATE INDICATOR  
 FOI FLOW TOTALIZER INDICATOR  
 PI PRESSURE INDICATOR  
 PIT PRESSURE INDICATING TRANSMITTER  
 SG SIGHT GLASS  
 TT TEMPERATURE TRANSMITTER  
 VI VACUUM INDICATOR  
 VIT VACUUM INDICATING TRANSMITTER  
 VSP VAPOR SAMPLE POINT  
 WSP WATER SAMPLE POINT

NORTHROP GRUMMAN SYSTEMS CORPORATION  
 BETHPAGE, NEW YORK  
**OPERABLE UNIT 3**  
**FORMER GRUMMAN SETTLING PONDS**

**PROCESS FLOW DIAGRAM**  
**SOIL GAS INTERIM REMEDIAL MEASURE**

**ARCADIS**

FIGURE  
**3**

**ARCADIS**

**Appendix A**

Summary of Vapor Sample  
Analytical Results Including  
Tentatively Identified Compounds

# ARCADIS

Appendix A-1. Summary of Total Influent and Effluent Vapor Sample Analytical Results, Northrop Grumman Operable Unit 3  
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.<sup>(1)</sup>

Compound (units in ug/m3)	Location ID: Sample Date:	VSP-601 12/18/2008	VSP-602 12/18/2008
	CAS No.		
1,1,1-Trichloroethane	71-55-6	<b>75 J</b>	< 18
1,1,1,2-Tetrachloroethane	79-34-5	< 4.2 J	< 4.5
1,1,2-Trichloroethane	79-00-5	< 17 J	< 18
1,1-Dichloroethane	75-34-3	<b>33 J</b>	<b>29</b>
1,1-Dichloroethene	75-35-4	< 12 J	< 13
1,2-Dichloroethane	107-06-2	< 12 J	< 13
1,2-Dichloropropane	78-87-5	< 14 J	< 15
1,3-Butadiene	106-99-0	< 13 J	< 14
2-Butanone	78-93-3	< 18 J	< 19
2-Hexanone	591-78-6	< 12 J	< 13
4-Methyl-2-Pentanone	108-10-1	< 25 J	< 27
Acetone	67-64-1	< 36 J	< 39
Benzene	71-43-2	<b>63 J</b>	< 10
Bromodichloromethane	75-27-4	< 4.1 J	< 4.4
Bromoform	75-25-2	< 31 J	< 34
Bromomethane	74-83-9	< 12 J	< 13
Carbon Disulfide	75-15-0	< 9.5 J	< 10
Carbon Tetrachloride	56-23-5	< 3.8 J	< 4.1
Trichlorofluoromethane (CFC-11)	75-69-4	< 17 J	< 18
Chlorobenzene	108-90-7	< 14 J	< 15
Chlorodibromomethane	124-48-1	< 5.2 J	< 5.5
Chloroethane	75-00-3	< 16 J	< 17
Chloroform	67-66-3	<b>52 J</b>	<b>42</b>
Chloromethane	74-87-3	< 13 J	< 13
cis-1,2-Dichloroethene	156-59-2	<b>1000 J</b>	<b>730</b>
cis-1,3-Dichloropropene	10061-01-5	< 28 J	< 30
Ethylbenzene	100-41-4	< 26 J	< 28
Trichlorotrifluoroethane (Freon 113)	76-13-1	< 4.7 J	< 5
Dichlorodifluoromethane (Freon 12)	75-71-8	< 30 J	< 32
Methyl Tert-Butyl Ether	1634-04-4	< 22 J	< 23
Methylene Chloride	75-09-2	< 11 J	< 11
Styrene	100-42-5	< 26 J	< 28
Tetrachloroethene	127-18-4	<b>21 J</b>	< 4.4
Toluene	108-88-3	<b>12 J</b>	< 12
trans-1,2-Dichloroethene	156-60-5	< 12 J	< 13
trans-1,3-Dichloropropene	10061-02-6	< 14 J	< 15
Trichloroethylene	79-01-6	<b>710 J</b>	<b>130</b>
Vinyl Chloride	75-01-4	< 7.8 J	< 8.3
Xylene-o	95-47-6	< 26 J	< 28
Xylenes - m,p	NA	< 53 J	< 57
<b>TVOC</b>		<b>1,966</b>	<b>931</b>

Notes and Abbreviations on last page.

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Appendix A-1. Summary of Total Influent and Effluent Vapor Sample Analytical Results, Northrop Grumman Operable Unit 3  
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.<sup>(1)</sup>

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Notes and Abbreviations:

<b>Bold</b>	Compound detected above method detection limit
CAS No.	Chemical abstracts service list number
D	Compound detected at a secondary dilution
J	Estimated Value
TVOC	Total volatile organic compounds
ug/m <sup>3</sup>	Micrograms per cubic meter

1. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Rochester, NY) for VOC analyses using USEPA Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008) . Data presented in this table corresponds to the period November - December 2008.

# ARCADIS

Appendix A-2. Summary of Total Influent and Effluent Vapor Sample Analytical Results, Tentatively Identified Compounds, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.<sup>(2)</sup>

Tentatively Identified Compounds <sup>(3,4,5)</sup> (units in ppbv)	Location ID: Sample Date:	VSP-601 12/18/08	VSP-602 12/18/08
Hexamethylcyclotrisiloxane <sup>(1)</sup>		--	<b>23</b>
Chlorodifluoromethane (Freon 22)		<b>460</b>	<b>260</b>
Methylcyclohexane		<b>10</b>	--
3-Methyl-Hexane		<b>27</b>	--
Heptane		<b>12</b>	--
Unknown aliphatic hydrocarbon		<b>22</b>	--
Ethane, 1-chloro-1,1-difluoro (Freon 142)		<b>130</b>	<b>170</b>
Octamethylcyclotetrasiloxane		--	<b>9</b>
2-Methylpentane		<b>31</b>	--
Hexane		<b>29</b>	--
Unknown hydrocarbon		<b>21</b>	--
Unknown hydrocarbon		<b>18</b>	--
4-Methyl 1-heptene		<b>8</b>	--

Notes and Abbreviations:

- Not Reported during this sampling event.
- Bold** Detected
- ppbv Parts per billion by volume.
- 1. Possible laboratory artifact.
- 2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Rochester, NY) for VOC analyses using USEPA Method TO-15 modified in accordance with the project Sampling and Analysis Plan (ARCADIS 2008) . Data presented in this table corresponds to the period November - December 2008.
- 3. Tentatively Identified Compounds (TICs) are identified based on review of mass spectrometry results via a comprehensive library search of all organic compounds.
- 4. All results are estimated.
- 5. Results from initial analytical run tabulated when multiple dilutions reported by laboratory.

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**Appendix B**

Summary of Condensate Sample  
Analytical Results Including  
Tentatively Identified Compounds



Appendix B-1. Summary of Condensate Sample Analytical Results, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York. <sup>(2)</sup>

Compound (units in ug/L)	Location ID: Sample Date:	NA NA
	CAS No.	
1,1,1-Trichloroethane	71-55-6	
1,1,2,2-Tetrachloroethane	79-34-5	
1,1,2-Trichloroethane	79-00-5	
1,1-Dichloroethane	75-34-3	
1,1-Dichloroethene	75-35-4	
1,2,4-Trichlorobenzene	120-82-1	
1,2-Dibromo-3-Chloropropane (DBCP)	96-12-8	
1,2-Dibromoethane (EDB)	106-93-4	
1,2-Dichlorobenzene	95-50-1	
1,2-Dichloroethane	107-06-2	
1,2-Dichloropropane	78-87-5	
1,4-Dichlorobenzene	106-46-7	
2-Butanone	78-93-3	
2-Hexanone	591-78-6	
4-Methyl-2-Pentanone	108-10-1	
Acetone	67-64-1	
Benzene	71-43-2	
Bromodichloromethane	75-27-4	
Bromoform	75-25-2	
Bromomethane	74-83-9	
Carbon Disulfide	75-15-0	
Carbon Tetrachloride	56-23-5	No Sampling Performed During The Report Period
Trichlorofluoromethane (CFC-11)	75-69-4	
Chlorobenzene	108-90-7	
Chlorodibromomethane	124-48-1	
Chloroethane	75-00-3	
Chloroform	67-66-3	
Chloromethane	74-87-3	
cis-1,2-Dichloroethene	156-59-2	
cis-1,3-Dichloropropene	10061-01-5	
Cyclohexane	110-82-7	
Ethylbenzene	100-41-4	
Trichlorotrifluoroethane (Freon 113)	76-13-1	
Dichlorodifluoromethane (Freon 12)	75-71-8	
Isopropylbenzene	98-82-8	
m-Dichlorobenzene	541-73-1	
Methyl Acetate	79-20-9	
Methyl tert-butyl ether	1634-04-4	
Methylcyclohexane	108-87-2	
Methylene Chloride	75-09-2	
Styrene	100-42-5	
Tetrachloroethene	127-18-4	
Toluene	108-88-3	
trans-1,2-Dichloroethene	156-60-5	
trans-1,3-Dichloropropene	10061-02-6	
Trichloroethylene	79-01-6	
Vinyl Chloride	75-01-4	
Xylene-o	95-47-6	
Xylenes - m,p	179601-23-1	
<b>TVOC</b>		NA

Notes and abbreviations on next page

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Appendix B-1. Summary of Condensate Sample Analytical Results, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York. <sup>(2)</sup>

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Notes and Abbreviations:

<b>Bold</b>	Compound detected above method detection limit
CAS No.	Chemical abstracts service list number
D	Compound detected at a secondary dilution
TVOC	Total volatile organic compounds
ug/L	Micograms per liter
NA	Not applicable

1. Total volatile organic compounds determined by summing individual detections and rounding to the nearest whole number.
2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Rochester, NY) for VOC analyses using Method 8260 in accordance with the project Sampling and Analysis Plan (ARCADIS 2008). Data presented in this table corresponds to the period November - December 2008.

# ARCADIS

## Appendix B-2. Summary of Condensate Sample Analytical Results, Tentatively Identified Compounds (TICs), Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York. <sup>(2)</sup>

Tentatively Identified Compounds <sup>(1,3)</sup> (units in ug/L)	Sample ID:	NA
	Date:	NA
Unknown		
Ethanol		
Furan, tetrahydro-		
Unknown alcohol		
Cyclohexanone		No Sampling Performed
Isopropyl Alcohol		During The Report Period
Butanal		
Heptanal		
1-Hexanol, 2-ethyl-		

### Notes and Abbreviations:

- Not Reported
  - Bold** Detected
  - J Estimated value
  - N Presumptive evidence of this constituent. Calibrations were not run for these constituents; therefore, the results should be used for qualitative purposes only.
  - NA Not applicable
  - ug/L Micograms per liter
1. TICs are identified based on review of mass spectrometry results via a comprehensive library search of all organic compounds.
  2. Samples were collected by O&M personnel on the dates shown and submitted to Columbia Analytical Services Laboratory (Rochester, NY) for VOC analyses using Method 8260 in accordance with the project Sampling and Analysis Plan (ARCADIS 2008). Data presented in this table corresponds to the period November - December 2008.
  3. All results are estimated.

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**Appendix C**

Air Modeling Calculations

Table C-1. Summary of SCREEN3 Model Input and Outputs, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Parameters	Date Sampled:	02/18/08	02/19/08	02/25/08	03/03/08	03/17/08	04/16/08	05/19/08
<b>SCREEN3 Model Input</b>								
Source Type	Point	1	1	1	1	1	1	1
Emission Rate (g/s)	Point	33	33	33	33	33	33	33
Stack Height (ft)	Point	10.1	10.1	10.1	10.1	10.1	10.1	10.1
Stack Inside Diameter (m)	Point	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Air Flow Rate (scfm) <sup>(1)</sup>	Point	1,964	1,674	1,679	1,793	1,774	641	666
Air Flow Rate (acfm @ stack temp) <sup>(2)</sup>	Point	2,048	1,717	1,754	1,873	1,859	655	671
Stack Gas Exit Temperature (K) <sup>(3)</sup>	Point	307	302	308	308	309	301	296
Ambient Air Temperature (K) <sup>(3)</sup>	Point	283	275	274	275	276	281	284
Receptor Height (m) <sup>(4)</sup>	Point	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Urban/Rural	Point	Urban	Urban	Urban	Urban	Urban	Urban	Urban
Building Height (m)	Point	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Min Horizontal Bldg Dim (m)	Point	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Max Horizontal Bldg Dim (m)	Point	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Consider Bldg Downwash?	Point	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Simple/Complex Terrain Above Stack	Point	Simple	Simple	Simple	Simple	Simple	Simple	Simple
Simple/Complex Terrain Above Stack Base	Point	Simple	Simple	Simple	Simple	Simple	Simple	Simple
Meteorology	Point	Full	Full	Full	Full	Full	Full	Full
Automated Distances Array	Point	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Terrain Height Above Stack Base	Point	0	0	0	0	0	0	0
<b>SCREEN3 Model Output</b>								
1-HR Max	Point	596.3	698.3	638.3	622.9	627.6	1,292	1,278
Annualization Factor <sup>(6)</sup>	Point	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Average Annual Concentration at Receptor Height (ug/m <sup>3</sup> ) <sup>(7)</sup>	Point	47.7	55.9	51.1	49.8	50.2	103.4	102.2
Distance To Max Concentration (m) <sup>(8)</sup>	Point	66	61	64	64	64	45	45

See notes last page.

Table C-1. Summary of SCREEN3 Model Input and Outputs, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Parameters	Date Sampled:	06/02/08	07/07/08	08/06/08	09/24/08	10/27/08	11/25/08	12/18/08
<b>SCREEN3 Model Input</b>								
Source Type	Point	1	1	1	1	1	1	1
Emission Rate (g/s)	Point	33	33	33	33	33	33	33
Stack Height (ft)	Point	10.1	10.1	10.1	10.1	10.1	10.1	10.1
Stack Height (m)	Point	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Stack Inside Diameter (m)	Point	746	829	640	638	552	487	540
Air Flow Rate (scfm) <sup>(1)</sup>	Point	766	860	670	668	567	487	543
Air Flow Rate (acfm @ stack temp) <sup>(2)</sup>	Point	303	305	308	308	303	294	296
Stack Gas Exit Temperature (K) <sup>(1)</sup>	Point	294	298	299	289	286	279	275
Ambient Air Temperature (K) <sup>(3)</sup>	Point	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Receptor Height (m) <sup>(4)</sup>	Urban/Rural	Urban	Urban	Urban	Urban	Urban	Urban	Urban
Building Height (m)	Point	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Min Horizontal Bldg Dim (m)	Point	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Max Horizontal Bldg Dim (m)	Point	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Consider Bldg Downwash?	Point	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Simple/Complex Terrain Above Stack	Point	Simple	Simple	Simple	Simple	Simple	Simple	Simple
Simple/Complex Terrain Above Stack Base	Point	Simple	Simple	Simple	Simple	Simple	Simple	Simple
Meteorology	Point	Full	Full	Full	Full	Full	Full	Full
Automated Distances Array	Point	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Terrain Height Above Stack Base	Point	0	0	0	0	0	0	0
<b>SCREEN3 Model Output</b>								
1-HR Max	Point	1,200	1,129	1,279	1,281	1,373	1,454	1,374
Annualization Factor <sup>(6)</sup>	Point	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Average Annual Concentration at Receptor Height (ug/m <sup>3</sup> ) <sup>(7)</sup>	Point	96	90.3	102.3	102.5	109.8	116.3	109.9
Distance To Max Concentration (m) <sup>(8)</sup>	Point	47	48	45	45	43	42	43

See notes last page.

Table C-1. Summary of SCREEN3 Model Input and Outputs, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Notes

1. The stack air flow rate (in scfm) and temperature were measured using a handheld thermo-anemometer. Values were measured immediately prior to where the effluent air stream enters the vapor-phase carbon unit.
2. The stack air flow rate at the stack temperature (in acfm) was calculated by dividing the stack air flow rate in scfm by the ratio of the standard temperature to the actual stack gas exit temperature.
3. The ambient temperature was recorded from the weather.newday.com website for Islip, New York. The mean actual temperature from the website was used in model calculation.
4. The receptor height corresponds to the average inhalation level.
5. SCREEN3 calculated constituent concentration at listed conditions at the specified inhalation level.
6. A USEPA time averaging conversion factor of 1/0.08 was used to convert the 1-hour maximum concentration output to an annual average.
7. Average annual constituent concentration at the receptor height was calculated by multiplying the one hour maximum concentration by the annualization factor.
8. SCREEN3 calculated distance to the 1-hour maximum concentration.

g/s - Grams per second

ft - Feet

m - Meters

scfm - Standard cubic feet per minute

acfm - Actual cubic feet per minute

K - Kelvin

µg/m<sup>3</sup> - Micrograms per cubic meter

Table C-2. Summary of Annual Maximum Allowable Stack Concentration Calculations, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Compound	Actual Effluent Concentrations <sup>(1)</sup> (µg/m <sup>3</sup> )						
	02/18/08	02/19/08	02/25/08	03/03/08	03/17/08	04/16/08	05/19/08
Vinyl chloride	0	0	1.1	40	920	710	65
1,1-Dichloroethane	0	0	0	0	0	0	5.8
Trichloroethylene	0	0	0	0	0	0	5.3
Tetrachloroethylene	0	0	0	0	0	0	0
cis-1,2-Dichloroethylene	0	0	0	0	0	78	180
Dichlorodifluoromethane (Freon 12)	0	0.71	5.7	8.3	0	0	0
Acetone	0	0	0	0	0	0	0
Chloroform	0	0	0	0	0	0	0
trans-1,2-Dichloroethene	0	0	0	0	0	0	0
Trichlorofluoromethane (Freon 11)	0	0	0	0	0	0	0
1,1-Dichloroethene	0	0	0	0	0	0	0
1,1,1-Trichloroethane	0	0	0	0	0	0	0

Compound	AGC <sup>(2)</sup> (µg/m <sup>3</sup> )	Annual Maximum Allowable Stack Concentration (µg/m <sup>3</sup> )						
		02/18/08	02/19/08	02/25/08	03/03/08	03/17/08	04/16/08	05/19/08
Vinyl chloride	0.11	2.39E+03	2.43E+03	2.60E+03	2.50E+03	2.50E+03	3.44E+03	3.40E+03
1,1-Dichloroethane	0.63	1.37E+04	1.39E+04	1.49E+04	1.43E+04	1.43E+04	1.97E+04	1.95E+04
Trichloroethylene	0.5	1.08E+04	1.10E+04	1.18E+04	1.14E+04	1.14E+04	1.56E+04	1.54E+04
Tetrachloroethylene	1	2.17E+04	2.21E+04	2.36E+04	2.27E+04	2.27E+04	3.13E+04	3.09E+04
cis-1,2-Dichloroethylene	63	1.37E+06	1.39E+06	1.49E+06	1.43E+06	1.43E+06	1.97E+06	1.95E+06
Dichlorodifluoromethane (Freon 12)	12,000	2.60E+08	2.65E+08	2.84E+08	2.73E+08	2.72E+08	3.75E+08	3.71E+08
Acetone	28,000	6.07E+08	6.18E+08	6.62E+08	6.36E+08	6.36E+08	8.76E+08	8.65E+08
Chloroform	0.043	9.33E+02	9.49E+02	1.02E+03	9.77E+02	9.76E+02	1.35E+03	1.33E+03
trans-1,2-Dichloroethene	63	1.37E+06	1.39E+06	1.49E+06	1.43E+06	1.43E+06	1.97E+06	1.95E+06
Trichlorofluoromethane (Freon 11)	1,000	2.17E+07	2.21E+07	2.36E+07	2.27E+07	2.27E+07	3.13E+07	3.09E+07
1,1-Dichloroethene	70	1.52E+06	1.55E+06	1.65E+06	1.59E+06	1.59E+06	2.19E+06	2.16E+06
1,1,1-Trichloroethane	1,000	2.17E+07	2.21E+07	2.36E+07	2.27E+07	2.27E+07	3.13E+07	3.09E+07

See notes last page.



Table C-2. Summary of Annual Maximum Allowable Stack Concentration Calculations, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Compound	Actual Effluent Concentrations <sup>(1)</sup> (µg/m <sup>3</sup> )						
	06/02/08	07/07/08	08/06/07	09/24/08	10/27/08	11/25/08	12/18/08
Vinyl chloride	13	6	4.9	4.9	0	0	0
1,1-Dichloroethane	7.6	11	9.2	26	30	32	29
Trichloroethylene	6.5	7.7	9.2	120	120	310	130
Tetrachloroethylene	2.2	0	0	0.88	0	0	0
cis-1,2-Dichloroethylene	230	350	320	620	830	770	730
Dichlorodifluoromethane (Freon 12)	0	0	0	0	0	69	0
Acetone	8.4	0	0	0	0	0	0
Chloroform	3	8	8.2	35	45	53	42
trans-1,2-Dichloroethene	2.8	0	3.6	8.6	0	0	0
Trichlorofluoromethane (Freon 11)	0	0	5.5	11	0	0	0
1,1-Dichloroethene	0	0	0	3.5	0	0	0
1,1,1-Trichloroethane	0	0	0	9.7	0	23	0

Compound	AGC <sup>(2)</sup> (µg/m <sup>3</sup> )	Annual Maximum Allowable Stack Concentration (µg/m <sup>3</sup> )						
		06/02/08	07/07/08	08/06/08	09/24/08	10/27/08	11/25/08	12/18/08
Vinyl chloride	0.11	3.17E+03	3.00E+03	3.40E+03	3.40E+03	3.74E+03	4.12E+03	3.91E+03
1,1-Dichloroethane	0.63	1.82E+04	1.72E+04	1.95E+04	1.95E+04	2.14E+04	2.36E+04	2.24E+04
Trichloroethylene	0.5	1.44E+04	1.36E+04	1.55E+04	1.55E+04	1.70E+04	1.87E+04	1.78E+04
Tetrachloroethylene	1	2.88E+04	2.73E+04	3.09E+04	3.09E+04	3.40E+04	3.74E+04	3.55E+04
cis-1,2-Dichloroethylene	63	1.82E+06	1.72E+06	1.95E+06	1.95E+06	2.14E+06	2.36E+06	2.24E+06
Dichlorodifluoromethane (Freon 12)	12,000	3.46E+08	3.27E+08	3.71E+08	3.71E+08	4.08E+08	4.49E+08	4.26E+08
Acetone	28,000	8.07E+08	7.64E+08	8.66E+08	8.66E+08	9.53E+08	1.05E+09	9.94E+08
Chloroform	0.043	1.24E+03	1.17E+03	1.33E+03	1.33E+03	1.46E+03	1.61E+03	1.53E+03
trans-1,2-Dichloroethene	63	1.82E+06	1.72E+06	1.95E+06	1.95E+06	2.14E+06	2.36E+06	2.24E+06
Trichlorofluoromethane (Freon 11)	1,000	2.88E+07	2.73E+07	3.09E+07	3.09E+07	3.40E+07	3.74E+07	3.55E+07
1,1-Dichloroethene	70	2.02E+06	1.91E+06	2.16E+06	2.17E+06	2.38E+06	2.62E+06	2.49E+06
1,1,1-Trichloroethane	1,000	2.88E+07	2.73E+07	3.09E+07	3.09E+07	3.40E+07	3.74E+07	3.55E+07

See notes last page.

Table C-2. Summary of Annual Maximum Allowable Stack Concentration Calculations, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Compound	Percent of Annual Maximum Allowable Stack Concentration <sup>(4)</sup>							
	02/18/08	02/19/08	02/25/08	03/03/08	03/17/08	04/16/08	05/19/08	
Vinyl chloride	0.00%	0.00%	0.04%	1.60%	36.84%	20.63%	1.91%	
1,1-Dichloroethane	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	
Trichloroethylene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	
Tetrachloroethylene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
cis-1,2-Dichloroethylene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	
Dichlorodifluoromethane (Freon 12)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Acetone	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Chloroform	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
trans-1,2-Dichloroethene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Trichlorofluoromethane (Freon 11)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1,1-Dichloroethene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1,1,1-Trichloroethane	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	

See notes last page.

Table C-2. Summary of Annual Maximum Allowable Stack Concentration Calculations, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Compound	Percent of Annual Maximum Allowable Stack Concentration <sup>(4)</sup>						
	06/02/08	07/07/08	08/06/08	09/24/08	10/27/08	11/25/08	12/18/08
Vinyl chloride	0.41%	0.20%	0.14%	0.14%	0.00%	0.00%	0.00%
1,1-Dichloroethane	0.04%	0.06%	0.05%	0.13%	0.14%	0.14%	0.13%
Trichloroethylene	0.05%	0.06%	0.06%	0.78%	0.71%	1.66%	0.73%
Tetrachloroethylene	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
cis-1,2-Dichloroethylene	0.01%	0.02%	0.02%	0.03%	0.04%	0.03%	0.03%
Dichlorodifluoromethane (Freon 12)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Acetone	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chloroform	0.24%	0.68%	0.62%	2.63%	3.07%	3.29%	2.75%
trans-1,2-Dichloroethene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Trichlorofluoromethane (Freon 11)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1,1-Dichloroethene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1,1,1-Trichloroethane	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

**Notes:**

1. Actual effluent concentrations are analytical results from air samples collected on the dates shown.
2. AGC refers to the compound-specific annual guideline concentration per the NYSDEC DAR-1 AGC/SGC tables, revised September 10, 2007.
3. Annual maximum allowable stack concentrations were calculated by dividing the product of the annual guideline concentration of a compound and the ratio of the SCREEN3 gas emission rate and the SCREEN 3 average annual concentration at receptor height by the air flow rate at the stack temperature and multiplying by the appropriate conversion factors.
4. Percent of MASC was calculated by dividing the actual effluent concentration by the MASC for a given monitoring event.

µg/m<sup>3</sup> - Micrograms per cubic meter  
 AGC - Annual guideline concentration