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ENVIRONMENT

Mr. Steven Scharf, P.E.
New York State Department of Environmental Conservation
Remedial Action, Bureau A
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7015

Subject:
Air Emission Regulatory Review and Current Status, Related Calculations, and Proposed Modifications to Current System Configuration and Monitoring Procedures, Operable Unit 3 (Former Grumman Settling Ponds) Soil Gas Interim Remedial Measure, Bethpage, New York, NYSDEC Site #1-30-003A.

Date:
December 4, 2008

Contact:
Carlo San Giovanni

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Our ref:
NY001464.0908.00004

Dear Steve:

At the request of the New York State Department of Environmental Conservation (NYSDEC) and on behalf of Northrop Grumman Systems Corporation (Northrop Grumman), ARCADIS of New York, Inc. (ARCADIS) is providing the NYSDEC with the attached air emissions regulatory review summary and current regulatory status of the Operable Unit 3 (OU3) soil gas interim remedial measure (SG IRM) system air emissions. The goal of the evaluation presented herein is to determine if the removal of trichloroethylene (TCE) or other site-related compounds in effluent air emissions is required for the SG IRM system to meet applicable regulatory criteria and/or provide protection of human health and the environment. As described below, ARCADIS concludes that the untreated SG IRM system air emissions meet applicable regulatory criteria and that the removal of the temporary vapor phase granular activated carbon (VPGAC) unit is appropriate at this time.

The air emission evaluation conducted as well as of proposed modifications to the SG IRM system configuration and the respective rationale for the proposed modifications is provided below.

*Air Emission Regulatory Framework*

There are several regulations in the New York Codes Rules and Regulations (NYCRR) that govern air emissions, treatment requirements, and related permitting requirements. However, as a result of the complicated organization of these regulations, and the continuous updates of both the NYCRR, and federal regulations, the NYSDEC issued the technical guidance document entitled "DAR-1" to assist facilities in understanding the applicable requirements and review mechanism of the Division of Air Resources (DAR). Accordingly, the DAR-1 technical guidance criteria

were generally followed in evaluating the emissions from the SG IRM. Specifically, the process used to evaluate the SG IRM air emissions included the following:

1. Identify site-related air toxics.

2. Determine the hazard rating, emission rate potential (ERP), and current emission rate (CER) for individual air toxics based on actual site data.

3. Determine the actual annual impact and short-term impact for each air toxic using a site-specific air emissions model. Compare the actual impacts to applicable air standards for individual air toxics.

4. Determine the degree of air cleaning required in Table 3 of 6 NYCRR 212.9 for each air toxic.

5. Determine the permitting requirements for air emissions based on 6 NYCRR Part 201.

As referenced in bullet number 4 above, the primary air emission treatment requirement regulation in the State of New York is 6 NYCRR Part 212 "General Process Emission Sources". The primary citation within 6 NYCRR Part 212 that regulates air emission regulatory status and treatment requirements for the New York Metropolitan Area (which is defined to include Suffolk County) is Table 3 of 6 NYCRR Part 212.9. A copy of Table 3 is provided below.

**Table 3 of 6 NYCRR 212.9 - Degree of Air Cleaning Required for Process Emission Sources Emitting Volatile Organic Compounds in the New York City Metropolitan Area**

| Environmental Rating | *EMISSION RATE POTENTIAL (LB/HR)* | | |
|---|---|---|---|
| | *Less than 1.0* | *1 to 3.5* | *Greater than 3.5* |
| A | * | 99% OR GREATER OR BEST AVAILABLE CONTROL TECHNOLOGY | |
| B or C | * | | REASONABLY AVAILABLE CONTROL TECHNOLOGY |
| D | NO AIR CLEANING REQUIRED | | REASONABLY AVAILABLE CONTROL TECHNOLOGY |

* Degree of air cleaning required will be specified by the commissioner.

As shown in Table 3 of 6 above, treatment requirements for individual air toxics are based on their respective emission rate potential and their environmental rating. "A" rated compounds are considered a significant risk to human health and the environment and require special consideration. Where applicable, the DAR-1 indicates that "A" rated contaminants be treated to the extent practicable at emission rates of less than 1.0 lb/hr. However, the DAR-1 further indicate "if the hourly emission rate of an "A" rated air toxic is less than 0.1 pound per hour and the ambient impact is less than both the Annual Guideline Concentration (AGC) and the Short-term Guideline Concentration (SGC), the no control option may be considered by the RAPCE."

"B and C" rated compounds require reasonably available control technology (RACT) for individual emissions of greater than 3.5 lb/hr. For emission rates of less than 3.5 lb/hr, the DAR-1 infers that RACT only be provided if required to reduce the annual impact or short-term impact to below applicable discharge criteria (i.e., the AGC or SGC). If RACT is required, the removal efficiency of the RACT will correspond the required removal efficiency to treat the respective individual air toxic(s) to below their respective AGC or SGC.

For completeness, ARCADIS has also provided herein, a brief summary of applicable air emission permit regulatory requirements and the current regulatory status of the OU3 SG IRM system with respect to these requirements. Air emission permit regulatory requirements are generally set forth in 6 NYCRR Part 201. As discussed in the NYSDEC-approved 95% Design Report (ARCADIS 2008), the SG IRM is exempt from facility air permitting requirements under 6 NYCRR Part 201-3.3(c)(29) but must meet the substantive requirements set forth in the air emission regulations. 6 NYCRR Part 201.2.1(21)(i) also provides further clarification on the definition of a major stationary source as it pertains to hazardous air pollutants (HAPs). Specifically, "for hazardous air pollutants other than radionuclides, a major source is defined as any stationary emission units or group of stationary emission units located within a contiguous area, under common control, that emits or has the potential to emit, in the aggregate, 10 [tons per year] (tpy) or more of any hazardous air pollutant as defined in Part 200 of this Title (including any fugitive emissions of such pollutant), 25 tpy or more of any combination of such hazardous air pollutants (including any fugitive emissions of such pollutants), or such lesser quantity as the administrator may establish by rule..."

*Current Regulatory Status of Soil Gas Interim Remedial Measure*

ARCADIS has reviewed and evaluated the current regulatory status of influent vapor quality using the general DAR-1 approach described herein. It should be noted that

the influent vapor quality would represent the stack emissions if the vapor treatment is removed as proposed. The evaluation is summarized in the following three tables:

- Table 1 provides a summary of the identified site-related air toxics, their current hazard ratings as identified in the DAR-1 AGC/SGC tables (NYSDEC 2007), and their respective ERP and CER.

- Table 2 provides a summary of the current regulatory status of influent emissions (i.e., calculated based on September 2008 data) related to the discharge criteria set forth in DAR-1 using site-specific SCREEN3 model output. Attachments A-1 and A-2 provide back-up calculations for the SCREEN 3 model data provided in Table 2.

- Table 3 provides a summary of influent vapor quality compared to the SGCs set forth in DAR-1.

- Table 4 provides a summary of the ERP and CER (i.e., September 2008) regulatory status as it pertains to air permitting and the definition of a major stationary source (i.e., 6 NYCRR Part 201).

The following can be concluded from Table 1:

- Two A rated air toxics, nine B or C rated air toxics, and one unrated air toxic (Freon 12) have been identified in the influent vapor quality of the SG IRM.

- The ERP for all A rated compounds is two orders of magnitude lower than the 0.1 pound per (lb/hr), criteria used by DAR-1 to identify sites that qualify for the no control option for A rated compounds.

- The CER for vinyl chloride is 0.0 lb/hr.

- The ERP for all B, C, and unrated compounds is significantly less than 3.5 lbs/hr DAR-1 criteria used to identify sites requiring RACT.

- Similarly, the CER for all B, C, and unrated compounds is significantly less than 3.5 lbs/hr DAR-1 criteria used to identify sites requiring RACT.

The following can be concluded from Table 2 and 3:

- The instantaneous percent (i.e., not time-weighted) of the site-specific annual ambient impact for each of the detected compounds is well below each of

their respective maximum allowable ambient impacts during the last six months of system operation.

- Likewise, the time-weighted site-specific cumulative percent of the annual impacts is well below the calculated discharge criteria. These data indicate that the influent untreated vapor emission is well below all guidance values as set forth in the DAR-1. Furthermore, these data indicate that further treatment is not required for all B and C related compounds to meet applicable air emission guidance criteria set forth in the DAR-1.

- The influent concentration of all air toxics is currently and has historically been below their respective SGCs.

The following can be concluded from Table 4:

- The ERP and CER of individual HAPs (i.e., air toxics) are significantly below their respective major stationary source permitting criteria. This indicates that the facility is not a major stationary source and further corroborates that RACT is not required for "B" and "C" rated compounds.

- The data indicate that this facility is subject to the Minor Facility Registration requirements. As referenced previously, although this facility is exempt from acquiring permits under 6 NYCRR Part 201-3.3(c)(29), a Minor Facility Registration form was filed with and approved by the NYSDEC as part of the 95% Design Report (ARCADIS 2008) submittal.

In summary, both the ERP and CER are below all criteria that define the minimum requirements for providing air treatment for "B and C" rated compounds. In addition, the ERP for "A" rated compounds is two orders of magnitude lower than the criteria established to allow the no control option for "A" rated compounds. The CER for vinyl chloride is 0.0 lb/hr. Finally, the vapor concentrations of all compounds are below their respective SGCs. Based on engineering experience at similar sites, it is expected that influent vapor concentrations will continue to be stable or decline. Accordingly, the analysis herein provides clear evidence that VPGAC and/or other air emission treatment alternatives for the SG IRM are not required.

*Proposed Modifications to the Soil Gas Interim Remedial Measure*

As described below several modification to the SG IRM system Operation, Maintenance and Monitoring (OMM) have been proposed in the monthly monitoring reports previously submitted to the NYSDEC. The primary modifications to the SG

IRM system will be implemented during the Winter 2008; however, certain modifications to performance and compliance monitoring have already been implemented. The specific SG IRM system modifications include the following:

- Removal of the temporary 10,000 lb vapor phase granular activated carbon (VPGAC) unit. Based on the analysis presented herein, Northrop Grumman proposes to remove the VPGAC unit from operation during mid-December 2008.

- Perform SG IRM performance and compliance monitoring on a quarterly basis. Northrop Grumman will continue to collect monthly monitoring data through December 2008 to document that influent air emissions continue to operate at steady-state conditions. Accordingly, the first quarterly monitoring event will be completed in March 2008.

- Collect induced vacuum measurements from compliance-only related monitoring points. This modification was first recommended in the June 2008 Interim Operation, Maintenance, and Monitoring Report and was implemented beginning in September 2008.

Furthermore, per previous correspondence, ARCADIS has recommended a reduction in the frequency of routine performance and compliance monitoring from monthly to quarterly. This recommendation was first made as part of the OU3 Soil Gas IRM Interim Operation, Maintenance, and Monitoring Report for February 2008 to June 2008. Specifically, the recommendation indicated that if data remained stable during the July 2008 and August 2008 monitoring periods, a quarterly routine performance and compliance monitoring schedule was appropriate. Subsequent to this recommendation, four (4) additional monthly monitoring performance and compliance monitoring events have been completed. As a conclusion in each of the respective monitoring reports, system performance and compliance data have remained stable. Accordingly, Northrop Grumman intends to continue routine monthly performance and compliance monitoring through December 2008; with the routine monitoring events to be completed on a quarterly basis thereafter. Note that this does not preclude the implementation of non-routine monitoring events to collect additional data if system troubleshooting is required. Additionally, Northrop Grumman recognizes that maintaining operation of the SG IRM in accordance with the minimum and maximum operating requirements set forth in Table 3 of the OMM Manual (ARCADIS 2008) is a critical component in the operation of the SG IRM. Accordingly, site visits will be completed on a monthly basis to monitor system flow rates and vacuums as well as maintain system equipment.

Finally, per previous correspondence, ARCADIS has recommended the collection of individual vacuum measurements from the list of compliance related induced vacuum monitoring wells only. This recommendation was first rendered in the June Interim OMM Report and was subsequently recommended in the July and August Interim OMM Reports. As referenced in the June Interim OMM Report, the compliance related induced vacuum monitoring wells include all monitoring wells located furthest from their respective depressurization well. Non-compliance related induced vacuum monitoring points will be maintained but monitored for troubleshooting purposes only.

If you have any questions, please do not hesitate to contact us at any time.

Sincerely,

ARCADIS

Carlo San Giovanni
Project Manager

Kenneth Zegel, PE
Senior Engineer

Copies:
Steven Scharf – NYSDEC - 1 Hard copy and 1 Electronic copy
John Cofman, NGC – 1 Hard copy and 1 Electronic copy
Kent Smith, NGC – 1 Electronic copy only
Jay Tolle, NGC – 1 Electronic copy only
Jill Palmer, NGC – Electronic copy
File

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Table 1. Summary of Site Related Air Toxics, Hazard Rating, Emission Rate Potential and Current Emission Rates, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

| Compound | Environmental Hazard Rating | Maximum Observed Influent Concentration [1] | ERP [2] | September 2008 Influent Concentrations | CER |
|---|---|---|---|---|---|
| | | ($\mu g/m^3$) | (lbs/hr) | ($\mu g/m^3$) | (lbs/hr) |
| 1,1,1-Trichloroethane | C | 110 | 8.44E-04 | 77 | 1.93E-04 |
| 1,1-Dichloroethane | C | 59 | 4.11E-04 | 47 | 1.18E-04 |
| 2-Butanone | B | 28 | 8.03E-05 | 0 | 0.00E+00 |
| Benzene | A | 150 | 4.83E-04 | 0 | 0.00E+00 |
| Chloroform | B | 160 | 4.00E-04 | 160 | 4.00E-04 |
| cis-1,2-Dichloroethene | B | 5,800 | 4.45E-02 | 1,500 | 3.75E-03 |
| Freon 12 | NR | 46 | 3.20E-04 | 0 | 0.00E+00 |
| Tetrachloroethene | B | 340 | 2.61E-03 | 64 | 1.60E-04 |
| Toluene | C | 140 | 9.75E-04 | 0 | 0.00E+00 |
| Trans-1,2-Dichloroethene | B | 120 | 9.21E-04 | 0 | 0.00E+00 |
| Trichloroethylene | B | 14,000 | 1.07E-01 | 1,500 | 3.75E-03 |
| Vinyl Chloride | A | 980 | 6.82E-03 | 0 | 0.00E+00 |

**Notes:**

1. Maximum observed influent concentration represents the highest observed concentration for an individual compound between system startup (February 2008) and September 2008.

2. Maximum emission rate potential calculated by multiplying the maximum observed influent concentration by the stack air flow rate on the sample date and the appropriate conversion factors.

AGC/SGC - Annual and short-term guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
$\mu g/m^3$ - Micrograms per cubic meter
acfm - Actual cubic feet per minute
lbs/hr - Pounds per hour
ERP - Emission rate potential
CER - Current emission rate based on September 2008 monitoring data

A - Constituent is considered a "high" toxicity rated compound per the NYSDEC DAR-1 AGC/SGC tables, revised September 10, 2007.
B - Constituent is considered a "medium" toxicity rated compound per the NYSDEC DAR-1 AGC/SGC tables, revised September 10, 2007.
C - Constituent is considered a "low" toxicity rated compound per the NYSDEC DAR-1 AGC/SGC tables, revised September 10, 2007.
NR - Constituent toxicity is not rated in the NYSDEC DAR-1 AGC/SGC tables, revised September 10, 2007.

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Table 2. Influent Vapor Air Emissions Model Output Summary, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

| Compound [1] | AGC [2] | Percent of Maximum Allowable Ambient Impact Per Event (3) | | | | | | | | | | | Cumulative % Maximum Allowable Ambient Impact (4) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ($\mu g/m^3$) | 2/18/2008 | 2/19/2008 | 2/25/2008 | 3/3/2008 | 3/17/2008 | 4/16/2008 | 5/19/2008 | 6/2/2008 | 7/7/2008 | 8/6/2008 | 9/24/2008 | |
| Vinyl chloride | 0.11 | 0.00% | 0.00% | 0.00% | 8.00% | 39.24% | 3.49% | 0.00% | 0.00% | 0.03% | 0.06% | 0.09% | 2.76% |
| 1,1-Dichloroethene | 0.63 | 0.31% | 0.24% | 0.30% | 0.33% | 0.41% | 0.16% | 0.13% | 0.15% | 0.16% | 0.13% | 0.24% | 0.19% |
| Trichloroethylene | 0.5 | 129.09% | 85.16% | 43.15% | 22.01% | 13.21% | 8.31% | 6.47% | 7.64% | 11.00% | 9.06% | 9.69% | 12.13% |
| Tetrachloroethylene | 1 | 1.57% | 0.91% | 0.35% | 0.20% | 0.17% | 0.17% | 0.14% | 0.17% | 0.22% | 0.18% | 0.21% | 0.20% |
| cis-1,2-Dichloroethylene | 63 | 0.42% | 0.33% | 0.19% | 0.11% | 0.10% | 0.06% | 0.05% | 0.05% | 0.06% | 0.05% | 0.08% | 0.07% |
| Dichlorodifluoromethane (Freon 12) | 12,000 | 0.00% | 0.00% | 0.00% | 0.00% | 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% | 0.00% | 0.00% | 0.00% | 0.00% |
| Chloroform | 0.043 | 3.65% | 2.53% | 0.00% | 2.76% | 3.58% | 0.00% | 3.31% | 4.44% | 7.50% | 6.70% | 12.02% | 4.36% |
| trans-1,2-Dichloroethene | 63 | 0.01% | 0.01% | 0.00% | 0.00% | 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% | 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% | 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% | 0.00% | 0.00% | 0.00% | 0.00% |

**Notes**:

1. Compounds listed include all constituents detected in the system influent 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 ambient impact per monitoring event.
3. Percent of AGC was calculated by dividing the actual effluent concentration by the site-specific annual Maximum Allowable Ambient Impact. Detailed calculations are included in Appendix C of the September 2008 Monitoring Report.
4. Cumulative percent of the Maximum Allowable Ambient Impact was calculated using a time-weighted average of the percent Maximum Allowable Ambient Impact per event.

$\mu g/m^3$ - Micrograms per cubic meter.
AGC - Annual guideline concentration.

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Table 3. Summary of Total Influent Vapor Sample Analytical Results Compared to DAR-1 SGCs, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.[2]

| Compound[3] (units in ug/m3) | Location ID: Sample Date: | VSP-601 2/18/2008 | VSP-601 2/19/2008 | VSP-601 2/25/2008 | VSP-601 3/3/2008 | VSP-601 3/17/2008 | VSP-601 4/16/2008 | VSP-601 5/19/2008 | VSP-601 6/2/2008 | VSP-601 7/7/2008 | VSP-601 8/6/2008 | VSP-601 9/24/2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SGC | | | | | | | | | | | |
| 1,1,1-Trichloroethane | 68,000 | **110** | **71** | **35** | **26** | **35** | <25 | **38** | **44** | **48** | **47** | **77** |
| 1,1-Dichloroethane | NS | **43** | **33** | **45** | **47** | **59** | **31** | **25** | **27** | **28** | **26** | **47** |
| 2-Butanone | 13,000 | **16** | < 11 | < 25 | < 13 | < 16 | < 16 | < 28 | **28** | **27** | < 32 | < 31 |
| Benzene | 1,300 | **67** | **22** | < 25 | < 13 | < 8.4 | < 8.4 | **19** | < 15 | **150** | **22** | < 17 |
| Chloroform | 150 | **34** | **24** | < 25 | **27** | **35** | <22 | **44** | **55** | **88** | **89** | **160** |
| cis-1,2-Dichloroethene | 190,000[1] | **5800** | **4600** | **2900** | **1600** | **1400 D** | **1100** | **950** | **930** | **1100** | **990** | **1500** |
| Freon 12 | NS | < 14 | < 11 | < 25 | **13** | **46** | <46 | < 48 | < 45 | < 44 | < 54 | < 53 |
| Tetrachloroethene | 1,000 | **340** | **200** | **82** | **45** | **39** | **54** | **42** | **48** | **61** | **56** | **64** |
| Toluene | 37,000 | **92** | **98** | **34** | **61** | **140** | **37** | < 18 | < 17 | < 17 | < 20 | < 20 |
| trans-1,2-Dichloroethene | NS | **120** | **71** | < 25 | < 13 | **10** | <19 | < 19 | < 18 | < 18 | < 22 | < 21 |
| Trichloroethylene | 14,000 | **14000** | **9400** | **5100** | **2500** | **1500 D** | **1300** | **1000** | **1100** | **1500** | **1400** | **1500** |
| Vinyl Chloride | 180,000 | < 14 | < 11 | < 25 | **200** | **980 D** | **120** | < 12 | < 12 | < 11 | < 14 | < 14 |
| **TVOC** | | **20,622** | **14,519** | **8,196** | **4,519** | **4,244** | **2,642** | **2,118** | **2,232** | **3,002** | **2,630** | **3348** |

Notes and Abbreviations:

**Bold** Compound detected above method detection limit
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
$ug/m^3$ 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/m3 / 4.2 = 190,000 ug/m3.
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 - September 2008.
3. Table summarizes detected compounds only.

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Table 4. Summary of Emission Rate Potential and Current Emission Rates Compared to 6 NYCRR Part 201 Major Stationary Source Defining Criteria, Northrop Grumman Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

| | Analyte/Compound | CER lb/hr (1) | CER tons/yr** (2) | ERP lb/hr (1) | ERP tons/yr (2) | Emissions Standard tons/yr |
|---|---|---|---|---|---|---|
| Nonattainment Area Specific Compounds | | | | | | |
| | Total Volatile Organic Compounds*** | 8.21E-03 | 3.60E-02 | 1.64E-01 | 7.19E-01 | 25 |
| Hazardous Air Pollutants (HAPs) | | | | | | |
| | Vinyl chloride*** | 0.00E+00 | 0.00E+00 | 6.82E-03 | 2.99E-02 | 10 |
| | 1,1-Dichloroethane*** | 1.18E-04 | 5.15E-04 | 4.11E-04 | 1.80E-03 | 10 |
| | Trichloroethylene*** | 3.75E-03 | 1.64E-02 | 1.07E-01 | 4.70E-01 | 10 |
| | Tetrachloroethylene*** | 0.00E+00 | 0.00E+00 | 2.61E-03 | 1.14E-02 | 10 |
| | cis-1,2-Dichloroethylene*** | 3.75E-03 | 1.64E-02 | 4.45E-02 | 1.95E-01 | 10 |
| | Dichlorodifluoromethane (Freon 12)*** | 0.00E+00 | 0.00E+00 | 3.20E-04 | 1.40E-03 | 10 |
| | Acetone*** | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 10 |
| | Chloroform*** | 4.00E-04 | 1.75E-03 | 4.00E-04 | 1.75E-03 | 10 |
| | trans-1,2-Dichloroethene*** | 0.00E+00 | 0.00E+00 | 9.21E-04 | 4.03E-03 | 10 |
| | Trichlorofluoromethane (Freon 11)*** | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 10 |
| | 1,1-Dichloroethene*** | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 10 |
| | 1,1,1-Trichloroethane*** | 1.93E-04 | 8.44E-04 | 8.44E-04 | 3.70E-03 | 10 |
| | | Total HAPs = | 3.60E-02 | Total HAPs = | 7.19E-01 | 25 |

(1) Emission rate calculated by multiplying the actual effluent constituent concentration by the stack air flow (on the September 2008 sample date) in actual cubic feet per minute and the appropriate conversion factors.

(2) Emissions Rate in tons per year (tons/yr) assumes the system is operating 24 hrs per day, 365 days per year.

CER Current emissions rate (September 2008)

ERP Maximum emissions rate potential based on highest observed emissions rate since system startup.

*** Total volatile organic compounds calculated from sum of HAPs with *** adjacent to their respective chemical name.

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Attachment A-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: | 2/18/2008 | 2/19/2008 | 2/25/2008 | 3/3/2008 | 3/17/2008 | 4/16/2008 | 5/19/2008 | 6/2/2008 | 7/7/2008 | 8/6/2008 | 9/24/2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***SCREEN3 Model Input*** | | | | | | | | | | | | |
| Source Type | | Point | Point | Point | Point | Point | Point | Point | Point | Point | Point | Point |
| Emission Rate (g/s) | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Stack Height (ft) | | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 | 33 |
| Stack Height (m) | | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 |
| Stack Inside Diameter (m) | | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 |
| Air Flow Rate (scfm) [1] | | 1,964 | 1,674 | 1,679 | 1,793 | 1,774 | 641 | 666 | 746 | 829 | 640 | 638 |
| Air Flow Rate (acfm @ stack temp) [2] | | 2,048 | 1,717 | 1,754 | 1,873 | 1,859 | 655 | 671 | 766 | 860 | 670 | 668 |
| Stack Gas Exit Temperature (K) [1] | | 307 | 302 | 308 | 308 | 309 | 301 | 296 | 303 | 305 | 308 | 308 |
| Ambient Air Temperature (K) [3] | | 283 | 275 | 274 | 275 | 276 | 281 | 284 | 294 | 298 | 299 | 289 |
| Receptor Height (m) [4] | | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Urban/Rural | | Urban | Urban | Urban | Urban | Urban | Urban | Urban | Urban | Urban | Urban | Urban |
| Building Height (m) | | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 |
| Min Horizontal Bldg Dim (m) | | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| Max Horizontal Bldg Dim (m) | | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Consider Bldg Downwash? | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Simple/Complex Terrain Above Stack | | Simple | Simple | Simple | Simple | Simple | Simple | Simple | Simple | Simple | Simple | Simple |
| Simple/Complex Terrain Above Stack Base | | Simple | Simple | Simple | Simple | Simple | Simple | Simple | Simple | Simple | Simple | Simple |
| Meteorology | | Full | Full | Full | Full | Full | Full | Full | Full | Full | Full | Full |
| Automated Distances Array | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Terrain Height Above Stack Base | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ***SCREEN3 Model Output*** | | | | | | | | | | | | |
| 1-HR Max | | 596.3 | 698.3 | 638.3 | 622.9 | 627.6 | 1,292 | 1,278 | 1,200 | 1,129 | 1,279 | 1,281 |
| Annualization Factor [6] | | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| Average Annual Concentration at Receptor Height (u | | 47.7 | 55.9 | 51.1 | 49.8 | 50.2 | 103.4 | 102.2 | 96 | 90.3 | 102.3 | 102.5 |
| Distance To Max Concentration (m) [8] | | 66 | 61 | 64 | 64 | 64 | 45 | 45 | 47 | 48 | 45 | 45 |

See notes last page.

Attachment A-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. Conservative annualization factor of 0.08 was used in the calculations.
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
$\mu g/m^3$ - Micrograms per cubic meter

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Attachment A-2. Summary of Annual Maximum Allowable Ambient Impact Calculations for Influent Vapor, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

| Constituent | Actual Influent Concentrations [1] (µg/m $^3$) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2/18/2008 | 2/19/2008 | 2/25/2008 | 3/3/2008 | 3/17/2008 | 4/16/2008 | 5/19/2008 | 6/2/2008 | 7/7/2008 | 8/6/2008 | 9/24/2008 |
| Vinyl chloride | 0 | 0 | 0 | 200 | 980 | 120 | 0 | 0 | 1 | 2 | 3 |
| 1,1-Dichloroethane | 43 | 33 | 45 | 47 | 59 | 31 | 25 | 27 | 28 | 26 | 47 |
| Trichloroethylene | 14,000 | 9,400 | 5,100 | 2,500 | 1,500 | 1,300 | 1,000 | 1,100 | 1,500 | 1,400 | 1,500 |
| Tetrachloroethylene | 340 | 200 | 82 | 45 | 39 | 54 | 42 | 48 | 61 | 56 | 64 |
| cis-1,2-Dichloroethylene | 5,800 | 4,600 | 2,900 | 1,600 | 1,400 | 1,100 | 950 | 930 | 1,100 | 990 | 1,500 |
| Dichlorodifluoromethane (Freon 12) | 0 | 0 | 0 | 13 | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acetone | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chloroform | 34 | 24 | 0 | 27 | 35 | 0 | 44 | 55 | 88 | 89 | 160 |
| trans-1,2-Dichloroethene | 120 | 71 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichlorofluoromethane (Freon 11) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1,1-Dichloroethene | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1,1,1-Trichloroethane | 110 | 71 | 35 | 26 | 35 | 0 | 38 | 44 | 48 | 47 | 77 |

| Constituent | AGC [2] (µg/m$^3$) | Annual Maximum Allowable Ambient Impact (µg/m3) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2/18/2008 | 2/19/2008 | 2/25/2008 | 3/3/2008 | 3/17/2008 | 4/16/2008 | 5/19/2008 | 6/2/2008 | 7/7/2008 | 8/6/2008 | 9/24/2008 |
| 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 | 3.17E+03 | 3.00E+03 | 3.40E+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 | 1.82E+04 | 1.72E+04 | 1.95E+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 | 1.44E+04 | 1.36E+04 | 1.55E+04 | 1.55E+04 |
| Tetrachloroethylene | 1 | 2.17E+04 | 2.21E+04 | 2.36E+04 | 2.27E+04 | 2.27E+04 | 3.13E+04 | 3.09E+04 | 2.88E+04 | 2.73E+04 | 3.09E+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 | 1.82E+06 | 1.72E+06 | 1.95E+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 | 3.46E+08 | 3.27E+08 | 3.71E+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 | 8.07E+08 | 7.64E+08 | 8.66E+08 | 8.66E+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 | 1.24E+03 | 1.17E+03 | 1.33E+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 | 1.82E+06 | 1.72E+06 | 1.95E+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 | 2.88E+07 | 2.73E+07 | 3.09E+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 | 2.02E+06 | 1.91E+06 | 2.16E+06 | 2.17E+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 | 2.88E+07 | 2.73E+07 | 3.09E+07 | 3.09E+07 |

See notes last page.

Attachment A-2. Summary of Annual Maximum Allowable Ambient Impact Calculations for Influent Vapor, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

| Constituent | Percent of Annual Maximum Allowable Ambient Impact (4) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2/18/2008 | 2/19/2008 | 2/25/2008 | 3/3/2008 | 3/17/2008 | 4/16/2008 | 5/19/2008 | 6/2/2008 | 7/7/2008 | 8/6/2008 | 9/24/2008 |
| Vinyl chloride | 0.00% | 0.00% | 0.00% | 8.00% | 39.24% | 3.49% | 0.00% | 0.00% | 0.03% | 0.06% | 0.09% |
| 1,1-Dichloroethane | 0.31% | 0.24% | 0.30% | 0.33% | 0.41% | 0.16% | 0.13% | 0.15% | 0.16% | 0.13% | 0.24% |
| Trichloroethylene | 129.09% | 85.16% | 43.15% | 22.01% | 13.21% | 8.31% | 6.47% | 7.64% | 11.00% | 9.06% | 9.69% |
| Tetrachloroethylene | 1.57% | 0.91% | 0.35% | 0.20% | 0.17% | 0.17% | 0.14% | 0.17% | 0.22% | 0.18% | 0.21% |
| cis-1,2-Dichloroethylene | 0.42% | 0.33% | 0.19% | 0.11% | 0.10% | 0.06% | 0.05% | 0.05% | 0.06% | 0.05% | 0.08% |
| Dichlorodifluoromethane (Freon 12) | 0.00% | 0.00% | 0.00% | 0.00% | 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% | 0.00% | 0.00% | 0.00% | 0.00% |
| Chloroform | 3.65% | 2.53% | 0.00% | 2.76% | 3.58% | 0.00% | 3.31% | 4.44% | 7.50% | 6.70% | 12.02% |
| trans-1,2-Dichloroethene | 0.01% | 0.01% | 0.00% | 0.00% | 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% | 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% | 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% | 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 December 22, 2003.
3. Annual Maximum Allowable Ambient Impacts were calculated by dividing the product of the annual guideline concentration of a constituent 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 Maximum Allowable Ambient Impact was calculated by dividing the actual effluent concentration by the Maximum Allowable Ambient Impact for a given monitoring event.

$\mu g/m^3$ - Micrograms per cubic meter

AGC - Annual guideline concentration