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Operation, Maintenance, and Monitoring Report for the Groundwater Interim Remedial Measure

2010 Annual Summary Report

Operable Unit 3 (Former Grumman Settling Ponds)
Bethpage, New York

NYSDEC ID # 1-30-003A

April 7, 2011

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Grumman Settling Ponds)
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1. Introduction

Pursuant to the Administrative Order on Consent (AOC) Index # W1-0018-04-01 (NYSDEC 2005), ARCADIS of New York, Inc. (ARCADIS), on behalf of Northrop Grumman Systems Corporation (Northrop Grumman), has prepared this Operable Unit 3 (OU3) Groundwater Interim Remedial Measure (Groundwater IRM) Operation, Maintenance, and Monitoring (OM&M) 2010 Annual Summary Report for submittal to the New York State Department of Environmental Conservation (NYSDEC). The present day Bethpage Community Park property (Park) and the Former Grumman Plant 24 Access Road, which the NYSDEC has termed the "Former Grumman Settling Ponds Area" and designated as OU3, are referred to herein as the Site Area. The Groundwater IRM has been operational since July 21, 2009. A Site Area location map is provided on Figure 1.

This OM&M report summarizes the Groundwater IRM OM&M activities conducted, data collected, summary of system alarms, conclusions, recommendations, and engineering certification for the groundwater IRM during 2010 (i.e. from January 1 to December 31, 2010).

Additionally, this report summarizes the OM&M activities performed during the 4th Quarter of 2010 (i.e. October 1 through December 31, 2010 [the "reporting period"]). Detailed OM&M summaries for the previous three 2010 operational quarterly periods are available in the following reports (2010 Quarterly Reports):

- Quarterly OM&M Report for the Groundwater IRM, January 1 through March 31 (ARCADIS 2010a)
- Quarterly OM&M Report for the Groundwater IRM, April 1 through June 31 (ARCADIS 2010b)
- Quarterly OM&M Report for the Groundwater IRM, July 1 through September 31 (ARCADIS 2010c)

During 2010, the Groundwater IRM was operated, maintained, and monitored in accordance with the NYSDEC-approved interim OU3 Groundwater IRM System OM&M Manual (OM&M Manual [ARCADIS 2009]).

As discussed in the OU3 Site Area Remedial Investigation Report (ARCADIS 2011), Northrop Grumman does not take responsibility for Freon 12 and Freon 22, which were

present at the Site. Throughout this report, a distinction is made between the "project" and "non-project" Volatile Organic Compounds (VOCs); which are defined as follows:

- "Project VOCs:" are VOCs that may be related to former Grumman historical activities. For this report, Project VOCs are the VOCs listed in the Interim State Pollutant Elimination Discharge System (SPDES) permit equivalency (NYSDEC 2009), plus Toluene, Benzene, and Total Xylenes. A list of "Project VOCs" is provided in various tables throughout this report.

- "Non-project VOCs:" are VOCs, such as Freon 12 and Freon 22 that are not related to former Grumman activities but have been detected at the Site. As noted in the Site Area RI (ARCADIS 2011), a sub-plume of Freon 22 has been identified originating from the area of the Town of Oyster Bay's (Town's) former ice rink. Based on Town information, Freon 22 was used and released to the environment.

2. Groundwater Interim Remedial Measure Objectives

The remedial action objectives (RAOs) for the Groundwater IRM are as follows:

- Mitigate the off-site migration of project-related, dissolved-phase VOCs. Specifically, the Groundwater IRM addresses:

  Ø Groundwater that has total volatile organic compound (TVOC) concentrations greater than 5 micrograms per liter (ug/L) in the upper 20 feet of the surficial aquifer across the 1,200-foot wide lateral extent of the southern Site boundary.

  Ø Groundwater below the upper 20 feet of the surficial aquifer that has TVOC concentrations greater than 50 ug/L.

- Comply with applicable NYSDEC standards, criteria and guidance values (SCGs) for treated water and air emissions.

A secondary benefit of the Groundwater IRM is the creation of a clean-water front atop the downgradient groundwater, which minimizes the potential for vapor intrusion downgradient of the Site.

3. Groundwater Interim Remedial Measure Description

The Groundwater IRM consists of:

- A "pump-and-treat system" where groundwater is:
  - Ø Extracted along the southern portion of the Northrop Grumman Former Plant 24 Access Road via four remedial wells.
  - Ø Conveyed to a treatment plant at McKay Field via four underground pipelines.
  - Ø Treated via air stripping to reduce concentrations of Project and Non-Project VOCs.
  - Ø Filtered to remove oxidized metals.
  - Ø Returned to the aquifer, via a discharge pipeline routed to a recharge basin located on the adjacent former Bethpage Navy Weapons Industrial Reserve Plant (NWIRP) property.
- A vapor phase treatment system that reduces concentrations of Project VOCs in the air stripper off-gas prior to discharge to the atmosphere.
- A Groundwater Monitoring Network that is periodically monitored to assess the environmental effectiveness of the Groundwater IRM.

The major components of the Groundwater IRM are briefly described below; additional information is provided in the OM&M Manual (ARCADIS 2009). The layout of the Groundwater IRM is shown on Figure 2 and a schematic drawing is provided on Figure 3. The groundwater sampling locations in the Groundwater Monitoring Network are shown on Figure 4.

Groundwater Extraction and Conveyance System

The GW IRM is designed to extract groundwater at a rate of approximately 210 gallons per minute (gpm) from four remedial wells (RW-1 through RW-4) located along the downgradient (i.e., southern) boundary of the Site (Figure 2). The individual design pumping rates for RW-1 through RW-4 are 30 gpm, 75gpm, 75 gpm, and 30 gpm, respectively. Each remedial well is equipped with a submersible pump; RW-1 and RW-4 have 3 horsepower (hp) pumps and RW-2 and RW-3 have 7.5 hp pumps. Remedial Well construction details are summarized in Table A-1 (Appendix A).

Extracted groundwater is conveyed to the treatment plant via four, underground influent pipelines, one for each Remedial Well. RW-1 and RW-4 have 2-inch diameter high-density polyethylene (HDPE) pipelines and RW-2 and RW-3 have 3-inch diameter HDPE pipelines.

Groundwater Treatment

VOCs are removed from the extracted groundwater via a low-profile air stripper equipped with a 40 hp blower. Metals, such as iron, which are oxidized during the air stripping process, are removed from the air stripper effluent by bag filters. To eliminate the need to shut down the plant when the spent bag filters need replacement, two filter units are used so that when one unit is “on-line”, the other is in “stand by” mode. Each unit has eight bag filters.

Groundwater Discharge

Treated groundwater is pumped using a 10 hp pump to a stormwater manhole that discharges to a recharge basin on the adjacent NWIRP property, which is now owned by Nassau County. This discharge is permitted by Nassau County.

Air Stripper Off-gas Treatment

Project VOCs are removed from the air stripper off-gas using two 10,000 pound (lb), vapor phase granular activated carbon (VPGAC) emission control units (ECUs) and two 10,000 lb potassium permanganate-impregnated zeolite (PPZ) ECUs.

Groundwater Monitoring Network

The Groundwater Monitoring Network consists of 35 monitoring locations (i.e., 17 groundwater monitoring wells, 4 remedial wells, and 14 piezometers) as shown on Figure 4. Construction details for the monitoring wells and piezometers are provided in Appendix A. In accordance with the Groundwater IRM Environmental Effectiveness Monitoring Program, depth-to-water measurements are collected quarterly and groundwater quality samples are collected annually from the Groundwater Monitoring Network to assess the effectiveness of the Groundwater IRM.

4. Operation and Maintenance Activities

4.1 Fourth Quarter 2010

Groundwater IRM operation and maintenance (O&M) activities conducted during the reporting period are described below and are summarized in Table 1:

- The system operated full-time, 88 out of 92 days (96 percent uptime).
- The system was monitored during the majority of business days, either via a site visit or remotely by wireless computer link-up.
- The Supervisory Control and Data Acquisition (SCADA) system operated as designed, and when conditions warranted (see below), shut the system down automatically and instantaneously, and provided notification of system advisories and alarms to plant operators.
- The system shut down automatically for the alarm condition listed below. The alarm condition was responded to, and the system was restarted, on the following day (see Table 1 for details):
  - Ø Low Flow Alarm: A low-flow (water) alarm condition at Remedial Well RW-3 shut the system down on October 14, 2010. This low-flow condition was caused by a temporary loss of power.
- In addition to the unplanned shutdown noted above, the system was shut down for the activities listed below (see Table 1 for details):
  - Ø On November 1, 2010 to perform scheduled programming maintenance on the SCADA system.
  - Ø On November 15, 2010 to perform routine maintenance on the system holding tank.
  - Ø On December 1, 2010 to replace the VPGAC media in ECU-501 and ECU-502.
  - Ø Between December 17 and 20, 2010 to perform scheduled maintenance activities and routine inspections of Remedial Wells RW-2 and RW-3.

Remedial Well RW-2 was left offline throughout the remainder of the current reporting period to complete rehabilitation/redevelopment activities, and is scheduled to be placed back online during the next reporting period.

4.2 2010 Annual System Performance and Alarm Summary

The 2010 system operation up-time is provided on Table 1 and summarized below. System shut downs that occurred in 2010 are summarized below, and are described in the 2010 Quarterly Reports (ARCADIS 2010a, ARCADIS 2010b, and ARCADIS 2010c).

In 2010,

- The system operated full-time 352, out of 365 days (96 percent uptime).
- There were 24 system shut downs, of which:
  - Ø Four (4) were due to temporary power interruptions,
  - Ø Nine (9) were for system maintenance (e.g. periodic preventative system maintenance, vapor phase media changeouts, or required system repairs/upgrade), and
  - Ø Eleven (10) were due to alarm conditions created during the normal operation of the system.
    - o Five (5) of the alarms were due to iron fouling inside the remedial wells and/or their influent pipelines.
    - o Three (3) pump overload alarms at Remedial Well RW-2 (March 24, April 20, and April 24).
    - o One (1) pump overload alarm at Remedial Well RW-3 (January 9).
    - o One (1) low-pressure alarm at Remedial Well RW-3 (September 8).

    For the most part, the system was able to be restarted without incident the same day or the following day that the alarm occurred. However, after the

April 24 RW-2 overload alarm, the system could not be restarted. Subsequently, the pump was replaced and the well was rehabilitated.

To address the reoccurring problems associated with the accumulation of iron participate inside Remedial Wells RW-2 and RW-3, a preventative maintenance program was developed in 2010. The proposed program, consisting of periodic injections of carbon dioxide into the impacted wells, was pilot-tested on Remedial Well RW-2 in December 2010. Initial monitoring after the pilot-test indicates that this preventative maintenance process was relatively successful compared to conventional chemical cleaning/physical scrubbing rehabilitation. Additional carbon dioxide injections/preventative maintenance events are scheduled for 2011. If the injections improve system performance, then the preventative maintenance program will be formally added to the system maintenance program via the OM&M Manual.

- Three (3) air stripper vacuum/pressure alarms associated with the air striper blower (May 4, May 21, and July 5). For the most part, the system was able to be restarted without incident the same day or the following day.

  To address the air flow/pressure issue, the air stripper demister was replaced and the air stripper trays are cleaned more frequently.

- One (1) high-pressure (water) alarm at the system bag filters (July 11) occurred when the stand-by bag filter influent valve did not open when the bag filtering system tried to switch over. The System was inspected and subsequently restarted.

- One (1) high-level (water) alarm in the building sump (July 17) occurred when the air stripper condensation filled the building sump and created the alarm condition. To help prevent a system shut down due the condensation from process equipment (air stripper, bag filters, piping, etc.); ARCADIS makes additional site visits in the summer time, especially on hot, humid days to pump down the water in the sump.

- One (1) air stripper sump high-level (water) alarm (January 10) occurred but after inspecting the System, there was no apparent reason why the System shut down. The System subsequently restarted without issue.

5. Treatment System Compliance and Performance Monitoring

5.1 Fourth Quarter 2010 System Monitoring Activities

The following compliance and performance monitoring events were performed during the Fourth Quarter of 2010. A summary of the required compliance and performance monitoring program is provided in Table B-1 (Appendix B).

- Three monthly sampling events to collect required monthly water samples and quarterly air samples.

- Thirteen weekly site visits to monitor and record key system operational parameters.

- In addition to the required monitoring, the following additional, non-routine monitoring activities were performed during this reporting period to assess system performance:

  Ø On October 4, 2010, RW-1, RW-2, RW-3, RW-4, treatment system influent and treatment system effluent water samples were analyzed for total and dissolved cadmium (Cd), chromium (Cr), and manganese (Mg); and VPGAC mid-train, VPGAC effluent/PPZ influent (system mid-train) and PPZ mid-train vapor samples were analyzed for VOCs.

  Ø On November 8, 2010, treatment system influent water sample was analyzed for total and dissolved iron (Fe); and the first port of the lead VPGAC bed vapor sample was analyzed for VOCs.

  Ø On December 6, 2010, RW-2, RW-3, and treatment system influent water samples were analyzed for total and dissolved iron (Fe); and PPZ mid-train and system effluent vapor samples were analyzed for VOCs.

Field and analytical data collected during these monitoring events were used to assess performance of the Groundwater IRM and to determine whether the system discharges were compliant with project objectives. System performance and compliance results are discussed in Sections 5.2 and 5.3, respectively, of this report.

5.2 2010 System Monitoring Activities

In addition to the system monitoring discussed above, the system compliance and performance monitoring activities performed during the previous three quarterly periods are described in the 2010 Quarterly Reports (ARCADIS 2010a, ARCADIS 2010b, and ARCADIS 2010c).

5.3 System Monitoring Results

In accordance with the OM&M Manual, the following tables, graphs, and appendices were developed to summarize the system operation and monitoring results:

- An Operational Summary, including monitoring events, system operational days, and noteworthy site activities (Table 1).
- Summary of Influent and Effluent Water Sample Analytical Results (Tables 2 and 3, respectively). Table 3 also provides the Groundwater IRM treatment system removal efficiency. Complete validated Water Sample Analytical Result Summaries, for each sample event, are included in Appendix B.
- Summary of Influent and Effluent Vapor Sample Analytical Results (Tables 4 and 5, respectively). Table 5 also provides the Groundwater IRM treatment system removal efficiency. Complete, validated Vapor Sample Analytical Results, for each sample event, are included in Appendix C.
- System Parameters including flow rates, line pressures, and temperatures (Table 6).
- Summaries of Groundwater Recovered, VOC Mass Removed, and VOC Removal Rates (Table 7). Table 7 provides a breakdown of these parameters by Remedial Well and System and also breaks down the VOC Mass Removed and VOC Removal Rates into Project, Non-Project, and Total VOCs.
- Air Discharge Quality Evaluation and Compliance Table (Appendix D and Table 8, respectively).
- Concentrations of VOCs and Metals in Remedial Well Groundwater Samples (Tables 9 and 10, respectively).

- Cumulative Total, Project, and Non-Project VOC Mass Removed (Figure 5).
- Remedial Well Total, Project, and Non-Project VOC Concentrations (Figures 6A, 6B, and 6C, respectively).
- Influent Total, Project, and Non-Project VOC Concentrations (Figure 7).
- Total, Project, and Non-Project VOC Mass Removal Rates (Figures 8A, 8B, and 8C, respectively).

5.4 Summary of OM&M Results

5.4.1 System Operation and Effectiveness

Groundwater IRM OM&M results are summarized below by operational period:

- Total volume of groundwater recovered and treated (Table 7):
  - Ø 4th Quarter 2010: Approximately 28 million gallons.
  - Ø Annual 2010 Total: Approximately 104 million gallons.
  - Ø Project Total (since July 2009, including groundwater pumped/treated during the system testing/troubleshooting phase): Approximately 149 million gallons.
- Total mass of VOCs recovered and estimated mass removal rates (Table 7 and Figures 5, 8A, 8B, and 8C):
  - Ø 4th Quarter 2010: Approximately 142 pounds (lbs) of VOCs were recovered at an average rate of 1.4 lbs per day.
  - Ø Annual 2010 Total: Approximately 674 lbs of VOCs were recovered at an average rate of 1.8 lbs per day.
  - Ø Project Total (since July 2009, including groundwater pumped/treated during the system testing/troubleshooting phase): Approximately 1,018 lbs of VOCs were recovered.

- Ø As of the 4th Quarter 2010, the amount of Non-Project VOCs mass recovered (approximately 521 lbs) is greater than the amount of Project VOC mass recovered (approximately 493 lbs).

- Total mass of VOCs recovered and estimated mass removal rates for each well in 2010 (Table 7 and Figures 8A, 8B, and 8C):

  - Ø RW-1: During the 4th Quarter 2010, 0.16 lbs were recovered at an average rate of less than 0.01 lbs/day. During 2010, approximately 0.60 lbs of VOCs were recovered, at an average rate of less than 0.01 lbs/day.

  - Ø RW-2: During the 4th Quarter 2010, 28 lbs were recovered at an average rate of 0.28 lbs/day. During 2010, approximately 170 lbs of VOCs were recovered at an average rate of 0.47 lbs/day.

  - Ø RW-3: During the 4th Quarter 2010, 84 lbs were recovered at an average rate of 0.84 lbs/day. During 2010, approximately 410 lbs of VOCs were recovered at an average rate of 1.1 lbs/day.

  - Ø RW-4: During the 4th Quarter 2010, 30 lbs were recovered at an average rate of 0.30 lbs/day. During 2010, approximately 89 lbs of VOCs were recovered at an average rate of 0.24 lbs/day.

  - Ø Approximately 90% of the Project VOC mass has been recovered by RW-2, and an additional 9.3% has been recovered by RW-3. During the 4th quarter 2010 the VOC removal rate for RW-2 for December was lower than for the two previous months. This lower VOC removal rate for RW-2 was caused, in part, by the well being off-line during part of December for rehabilitation (see Section 4.2). The average rate of Project VOC recovery by RW-2 in 2010 (0.46 lbs/day) is significantly lower than in 2009 (1.9 lbs/day).

  - Ø Over 99% of the Non-Project VOC mass is recovered by RW-3 and RW-4. The rate of Non-Project VOCs recovered by RW-3 and RW-4 in 2010 (1.3 lbs/day) is significantly higher than in 2009 (0.31 lbs/day).

- Treatment System Influent concentrations, since Groundwater IRM start up (Table 2 and Figure 7):

- Ø Project VOCs: Influent concentrations peaked at approximately 1,000 ug/L just after system start-up (July and August 2009) and decreased over the next 10 months (September 2009 through June 2010) before leveling out at approximately 130 ug/L over the last six months.

- Ø Non-project VOCs: Influent concentrations started low (less than 30 ug/L in July and August 2009), increased to a peak of 650 ug/L in May 2010, and decreased during the 4th Quarter 2010, averaging 337 ug/L.

  During the 4th Quarter, the average influent concentration of Non-project VOCs was 256% greater than the average influent concentration of Project VOCs.

Iron: Influent total iron concentrations have ranged from 500 to 6,640 ug/L since system startup. Because the influent samples are not filtered, some of the sample results may be artificially high due to the presence of iron particulates. These particulates, which accumulate over time in the influent pipeline, can become introduced into the samples during sampling. Overall, we believe that the influent iron concentration has steadily decreased since October 2009, as indicated by a similar trend in RW-2, which is the remedial well that has the highest iron concentrations (Table 10).

Mercury: Mercury has not been detected in any influent sample since system start-up.

- Remedial Well VOC concentrations, since Groundwater IRM start up (Table 9, Figures 6A, 6B, and 6C):

  - Ø Concentrations of Total VOCs have remained constant in RW-1 (Figure 6A).

  - Ø Concentrations of Project VOCs in RW-2 significantly decreased and remained relatively constant in RW-3. (Figure 6B).

  - Ø Concentrations of Non-Project VOCs increased in RW-3 and RW-4 (Figure 6C).

- Metals Trends in Remedial Wells and Monitoring Wells (Tables 10 and 14):

- Ø Concentrations of metals detected in the Remedial Wells and Monitoring Wells in 2010 were similar to the concentrations detected in the wells in previous sampling events, except for:
  - Chromium in Monitoring Well BCPMW-4-1 approximately doubled.
  - Iron concentrations in RW-2 dropped from a high of 3,500 ug/L (9/10/2009) to 590 ug/L (12/6/2010).
  - Manganese concentrations in RW-1 decreased by approximately 50% but almost tripled in RW-1.
- Ø In 2010, as with previous Remedial Well samples, mercury was not detected in any sample.

- Treatment efficiency of the air stripper, air stripper off-gas treatment system, and bag filter system in 2010:
  - Ø The air stripper VOC removal efficiency was greater than 99.9 percent for Project and Non-Project VOCs (Table 3).
  - Ø The air stripper off-gas emission control system's overall efficiency, calculated using Total VOCs (both Project and Non-Project VOCs) was 27 to 52 percent. The system efficiency improved to 91 to 97 percent when calculated using only Project VOCs (Table 5). Note: the vapor phase treatment system was designed to reduce only Project VOCs.
  - Ø The post-air stripper bag filter system reduced total iron concentration in the system effluent below regulated discharge limits (Table 3).
- Operational Issues/Solutions:
  - Ø Iron in the groundwater captured by Wells RW-2 and RW-3, continues to cause iron fouling. When dissolved-phase iron enters the remedial wells, some of the iron is oxidized and/or metabolized by iron-reducing bacteria, resulting in iron precipitate and biological growth (e.g. slime). The iron precipitate and slime accumulate on the well screens, pumps, motors; conveyance pipelines and the air stripper.

- During 2010, iron fouling was largely responsible for five (5) system shut-downs (see Section 4.2 for more details); damage of two extraction pumps and motors (one each in Remedial Well RW-2 and RW-3); artificially high total iron concentrations in system influent samples; and additional monitoring and maintenance requirements. To address these operational problems, ARCADIS and Northrop Grumman developed and implemented a preventative maintenance program that consists of periodically injecting Carbon Dioxide into RW-2 and RW-3. These injections are designed to control iron fouling and to redevelop/rehabilitate the wells. If the continued implementation of the Carbon Dioxide preventative maintenance improves the system performance, the program will be formally added to the maintenance program in 2011.

  Even though iron fouling has caused operational problems, iron has not been a compliance issue because the bag filters are effectively reducing the concentration of iron in the air stripper effluent prior to discharge.

5.4.2 Regulatory Status of Discharges

5.4.2.1 Air Discharge

To determine the compliance status of air discharge from the Groundwater IRM treatment system during 2010, the system's effluent vapor concentrations were compared to NYSDEC Division of Air Resources Air Guide-1 (DAR-1) Model Short-term Guideline Concentrations (SGCs [NYSDEC 2007]) (Table 5) and the effluent vapor laboratory 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 the USEPA SCREEN3 Model in conjunction with the NYSDEC DAR-1 AGCs. A scaling factor was calculated using the SCREEN3 model with site-specific physical layout information (e.g. building dimensions, stack height, terrain, etc.) and operating data (e.g. air 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 MASC. A summary of the instantaneous percent (i.e., not time- weighted) of the site-specific annual MASC for Project VOCs, Freon 12, and Freon 22 is provided in Table 8. A summary of the cumulative annual percent (i.e. time-weighted) of the site-specific MASC for detected compounds is also provided in Table 8. A summary of the model inputs, outputs, and backup calculations is provided in Appendix D.

The Groundwater IRM air effluent met NYSDEC requirements throughout 2010, as indicated by the following:

- The measured concentrations of individual VOCs in the vapor effluent did not exceed applicable SGCs (Table 5).

- The measured concentration of individual VOCs in the vapor effluent did not exceed their applicable, instantaneous MASCs, as calculated using the USEPA SCREEN 3 Model (Table 8). Similarly, the time-weighted rolling averages for the individual Project VOCS, Freon 12, and Freon 22 are below their respective MASCs.

5.4.2.2 Water Discharge

The Groundwater IRM treated water effluent met NYSDEC regulatory requirements during 2010 (Table 3 and Appendix B).

5.5 Performance and Compliance Monitoring Conclusions

Based on the data collected during 2010, the following conclusions were made about the system operation:

- The system operated within its normal operational parameters during 2010; except for the 11 system alarms that shut the plant down (see Section 4 for details on system alarms).

- The system controls and interlocks functioned correctly during 2010.

- The majority (87 percent) of the VOC mass removed during 2010 came from Remedial Wells RW-2 and RW-3 (i.e. 580 lbs of the 670 total lbs) (Table 7).

- Concentrations of project-related VOCs in the system influent appear to be leveling off at a concentration (~130 ug/L), which is 87% below its detected maximum concentration (Table 2 and Figure 7).

- Concentrations of non-project VOCs (Freon 22) also appear to be leveling off, but continue to remain elevated when compared with concentrations observed during system start-up. The percentage of Non-Project VOCs in the system influent is still 256% greater than the percentage of Project VOCs (Table 2 and Figure7).

- Through December 2010, the mass of Non-Project VOCs removed (approximately 521 lbs) exceeded the amount of Project VOCs removed (approximately 493 lbs) (Table 7).

- Project VOCs were not detected in Wells RW-1 or RW-4 above their respective SCGs during 2010.

- Non-project VOCs (Freon 12 and Freon 22) comprised approximately 93% of the Total VOCs detected in Well RW-3 and over 99% of the Total VOCs detected in Well RW-4 during 2010.

- Mercury was not detected in project water samples.

- A preventive maintenance program to address the problems caused by iron fouling of Wells RW-2 and RW-3, remedial pumps, and conveyance pipelines was implemented during the 4th quarter of 2010. ARCADIS will continue this preventative maintenance program and monitor its results.

- The treated water discharge complied with project requirements.

- The air emissions complied with project requirements.

6. Environmental Effectiveness Monitoring

Groundwater IRM treatment system environmental effectiveness (i.e., groundwater hydraulic and quality monitoring) activities and results for this reporting period are discussed below. Environmental Effectiveness Monitoring was performed in accordance with OM&M Manual requirements and procedures.

6.1 Hydraulic Monitoring

6.1.1 Activities

In accordance with OM&M Manual requirements and methodologies (ARCADIS 2009), a quarterly round of groundwater hydraulic monitoring was performed during this reporting period. The depth-to-water was measured at 35 locations on December 10, 2010. The location of the 35 wells and piezometers are shown on Figure 4.

6.1.2 Results

The piezometer and monitor well network employed at the site was designed to facilitate the assessment of remedial system effectiveness. Specifically, piezometer and monitor well clusters were designed to provide ground water-level observations at numerous locations (both vertically and horizontally distributed) throughout the anticipated capture zone of the GW IRM. This monitoring network enables an assessment to be made of both horizontal and vertical groundwater flow. Figure 4 shows the water-level elevations observed on December 10 (summarized on Table 11) and the inferred horizontal groundwater flow directions.

The potentiometric surface configuration and inferred horizontal groundwater flow directions indicate that the operation of the groundwater containment system has created a capture zone that prevents the off-site migration of shallow groundwater. This conclusion is complimented by an evaluation of vertical groundwater hydraulic gradients. The vertical hydraulic gradient is a measure of the potential for vertical groundwater flow between two vertically separated, closely spaced (e.g., clustered or nested observation wells) observation points. The magnitude of the gradient indicates the steepness of the gradient, and the sign of the gradient indicates the direction of vertical flow (i.e., a positive vertical gradient indicates upward flow, while a negative vertical gradient indicates downward groundwater flow). The gradient does not provide any insight with respect to the rate of groundwater movement, which is affected by the hydraulic conductivity of the aquifer material through which the water is moving.

Table 12 provides a summary of observed vertical groundwater hydraulic gradients at key well pairs located along the site's southern boundary. The vertical gradient directions are shown on Figure 9. The vertical hydraulic gradients indicate that shallow groundwater is moving downward and deeper groundwater is being drawn upward toward the well screens of remedial wells RW-1 through RW-4, thereby documenting an area of vertical hydraulic control.

The hydraulic monitoring results for the other three quarterly periods are provided in the 2010 Quarterly Reports (ARCADIS 2010a, ARCADIS 2010b, and ARCADIS1010c).

6.2 Groundwater Quality Monitoring

6.2.1 Activities

In accordance with the OM&M Manual (ARCADIS 2009), the 2010 Annual Groundwater IRM sampling event occurred during the Fourth Quarter of 2010. Groundwater samples were collected from 13 monitoring wells and analyzed for the Target Compound List (TCL) VOCs, plus Freon 12 and Freon 22, using NYSDEC Analytical Services Protocol (ASP) 2000 Method OLM4.2. Groundwater samples from 10 of the 13 monitoring wells sampled were also analyzed for total and dissolved cadmium and chromium using NYSDEC Method ILM4.0. Both analytical methods are outlined in the Quality Assurance Project Plan (QAPP) (Appendix D-1 of the OM&M Manual; ARCADIS 2009).

6.2.2 Results

Table 13 summarizes the results of laboratory analysis for VOCs in groundwater samples collected from monitoring wells associated with the Groundwater IRM. The table includes the results of samples collected during this and previous reporting periods. In general, when the 4th Quarter 2010 results are compared to the results from previous quarters, monitoring wells located upgradient and side-gradient (BCPMW 4-1, BCPMW 4-2) of the recovery wells show a decrease in Project VOC concentrations. Water quality data from MW-201-1 indicate that the concentration of Project VOCs at this location has increased since the IRM began operating. It is anticipated that groundwater quality at MW-201-1 will improve with continued IRM system operation; although in the short-term project VOC concentrations may continue to rise at this location.

Figure 9 is a cross section along the Site southern boundary showing Project VOC concentrations and contours. Figure 9, in combination with Figure 4, indicates that the remedial wells are intercepting the VOC-impacted groundwater and controlling its off-site migration. As discussed in the previous section, vertical hydraulic gradients indicate that the IRM has established an area of hydraulic control that encompasses that portion of the aquifer having Project VOC concentrations above 5µg/l.

Table 14 summarizes the results of laboratory analysis of metals in groundwater samples collected from monitoring wells associated with the Groundwater IRM. The October 2010 results indicate no detections of cadmium and the detections of chromium are consistent with concentrations seen during previous sampling events. At

all locations the concentrations of total and dissolved cadmium and chromium were reported to be below NYSDEC's SCGs.

When an appropriate amount of data has been collected, trend graphs will be developed for selected wells.

6.3 Environmental Effectiveness Monitoring Conclusions

As shown on Figure 4, an evaluation of the operational hydraulic monitoring data indicates that the groundwater containment system is operating as designed and the associated capture zone has developed.

An evaluation of Figure 9 indicates that the groundwater containment system is preventing the off-site migration of groundwater that has Project VOC concentrations greater than 5 µg/l.

7. Groundwater IRM Recommendations

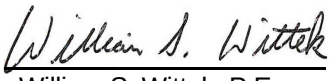
- Remove mercury from the SPDES equivalency monitoring program because mercury has never been detected in any system water sample.

- Continue operating, maintaining, and monitoring the system in accordance with the Groundwater OM&M Manual (ARCADIS 2009) and implementing the preventative maintenance program to address iron fouling in Remedial Wells RW-2 and RW-3.

Certification

Statement of Certification

On behalf of Northrop Grumman Systems Corporation, I hereby certify and attest that the Operable Unit 3 Groundwater Interim Remedial Measure is operated in compliance with the remedial action objectives provided within the NYSDEC approved Groundwater Interim Remedial Measure Work Plan dated December 2007, which was prepared pursuant to NYSDEC Order on Consent Index # W1-0018-04-01 referencing the Former Grumman Settling Ponds Site and dated July 4, 2005.



William S. Wittek, P.E.
Senior Engineer
License # 080827

8. References

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Table 1. Operational Summary, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

MONTH	DAY 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Days Operational (1)
2009 Totals																																160
Jan-10				b				b			#/*	b					b					b				b					b	31
Feb-10		#/**b				b					b					b	C1				b					b						28
Mar-10		b					b			#/*		b						b					b				b					29
Apr-10	b				b					b		#/**	b				b			b	b		b									30
May-10				b						#/**				b,b	b	b		b				b						b				30
Jun-10									####/**	b						b									b							29
Jul-10	b						b				b				b					#/**	b							b				29
Aug-10					b				#/##	*	b	*					b					b					b					29
Sep-10		b					#		b								b				b						b		b			29
Oct-10			b	####/*/**					b					(2)	b				b						b			b			31
Nov-10	(3)		b			b		#/*	b				b		(4)	b							b					b				30
Dec-10	C1,2(5)	b				####/*/b					b				b		(6)											b				27
Q4 2010																																88
2010 Totals																																352
TOTAL																																**512**

Legend:

	Indicates system online for at least the majority of the day.
	Indicates system operated with reduced flow rates.
	Indicates system offline for at least the majority of the day.
#	Indicates water compliance samples were collected.
##	Indicates water performance samples were collected.
**	Indicates vapor compliance samples were collected.
*	Indicates vapor performance samples were collected
b	Indicates filter bag unit changed over.
C1	Indicates VPGAC ECU 501 media changeout.
C2	Indicates VPGAC ECU 502 media changeout.

Notes on last page.

Table 1. Operational Summary, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Notes:

(1) Days in which the system was operational for the majority of the day are counted as one day.

(2) The system shut down at 5:39 PM on October 14, 2010 due to a low water flow rate alarm condition at Remedial Well RW-3. The alarm condition was caused by a temporary power failure. The system was physically inspected for problems and subsequently restarted when none were found. The system was off-line for a total of approximately 17 hours between October 14 and 15, 2010.

(3) The system was intentionally shut down at approximately 3:00 PM on November 1, 2010 to perform scheduled programming maintenance on the SCADA system. The system was off-line for approximately 1 hour.

(4) The system shut down at 2:39 PM on November 15, 2010 due to a high-water level alarm condition in the building sump. The alarm condition was created during routine maintenance on the system holding tank. The system was restarted following completion of the maintenance activities and was off-line for approximately 1.8 hours.

(5) The system was intentionally shut down at 7:47 AM on December 1, 2010 to replace the VPGAC media in ECU-501 and ECU-502. 10,000-pounds of VPGAC media were removed from each ECU and replaced with 10,000-pounds of virgin VPGAC media. The system was off-line for approximately 8.5 hours.

(6) The system was intentionally shut down at 8:23 AM on December 17, 2010 to perform scheduled maintenance activities and routine inspections of Remedial Wells RW-2 and RW-3. The system was restarted on December 20, 2010 at 1:16 PM with Remedial Well RW-2 off-line for rehabilitation/redevelopment. The system was off-line for approximately 77 hours. Remedial Well RW-2 is scheduled to be placed back online during the next reporting period.

Acronyms\Key:

IRM Interim Remedial Measure.

VPGAC Vapor phase granular activated carbon.

ECU Emission control unit.

SCADA Supervisory control and data acquisition.

Table 2. Summary of Influent Water Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1]

Compound [2]	01/11/10 (µg/L)	02/02/10 (µg/L)	03/10/10 (µg/L)	04/12/10 (µg/L)	05/10/10 (µg/L)	06/09/10 (µg/L)	07/20/10 (µg/L)	08/09/10 (µg/L)	09/07/10 (µg/L)	10/04/10 (µg/L)	11/08/10 (µg/L)	12/06/10 (µg/L)
Project VOCs												
1,1,1 - Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 - Dichloroethane	1.7	1	ND	ND	ND	1.1	0.90	ND	ND	0.75	0.80	0.85
1,2 - Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 - Dichloroethene	1	ND	ND	ND	ND	0.93	ND	ND	ND	0.80	0.88	0.88
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	**23**	**18**	**17**	**17**	**10**	**17**	**14**	**14**	**13**	**14**	**15**	**14**
Vinyl Chloride	**35**	**23**	**25**	**20**	ND	**22**	**15**	**14**	**11**	**13**	**12**	**12**
cis 1,2-Dichloroethene	**240**	**180**	**150**	**130**	**33**	**130**	**100**	**99**	**110**	**92**	**91**	**90**
trans 1,2-Dichloroethene	ND	**16**	ND	2.6	ND	0.9	ND	ND	ND	ND	0.98	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	**24**	13	20	15	ND	9.9	9.4	ND	ND	**6.6**	**5.9**	**8.1**
Xylenes	2.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Subtotal Project VOCs	**327**	**251**	**212**	**185**	**43**	**182**	**139**	**127**	**134**	**127**	**127**	**126**
Non-Project VOCs												
Dichlorodifluoromethane (Freon 12)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorodifluoromethane (Freon 22)	**440**	**480**	**590**	**610**	**650**	**450**	**440**	**480**	**430**	**330**	**350**	**330**
Subtotal Non-Project VOCs	**440**	**480**	**590**	**610**	**650**	**450**	**440**	**480**	**430**	**330**	**350**	**330**
Total VOCs [3]	**767**	**731**	**802**	**795**	**693**	**632**	**579**	**607**	**564**	**457**	**477**	**456**
Inorganics												
Total Iron	**500**	**4,050**	**790**	**1,470**	**1,060**	**4,840**	**540**	**540**	**6,640**	**1,180**	**2,000**	**770**
Total Mercury	NA	NA	NA	ND	ND	ND	NA	ND	NA	NA	NA	NA
pH [4]	6.1 [5]	5.8	6.5	6.7	6.8	6.0	5.8	6.4	6.3	6.5	5.7	6.3

See notes on last page.

Table 2. Summary of Influent Water Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1)

Notes:

(1) Water samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses per NYSDEC ASP 2000, Method OLM 4.3, for iron analyses per USEPA Method 6010 and for mercury analyses per USEPA Method 7470. The VOC analyte list is provided in the DRAFT Groundwater IRM OM&M Manual (ARCADIS 2009b). Influent water samples were collected from Water Sampling Port-5 (WSP-5); refer to Figure 3 of this OM&M Report for the schematic location of WSP-5. Data in this tables corresponds to approximately the past year of system operation.

(2) Only VOCs associated with the interim State Pollutant Discharge Elimination System (SPDES) equivalency program, plus Toluene, Benzene, Xylenes, non-project related Freon 12 and Freon 22, Mercury and Iron are included in this table. Complete VOC and inorganic data summary tables, including VOC TICs, are provided in Appendix B. Laboratory data qualifiers are included in the Appendix B tables.

(3) "Total VOCs" represents the sum of individual concentrations of the compounds detected. The values used in calculations referenced in this report have been rounded to the nearest whole number.

(4) pH samples collected and measured in the field by ARCADIS personnel on the dates listed using an Oakton Model 300 pH/conductivity meter. pH units are standard units.

(5) The January 2010 pH value was measured on December 7, 2009.

Acronyms\Key:

700	Bold data indicates that the analyte was detected at or above its reporting limit.
16	Data that is not bold indicates analyte detected but below its reporting limit; the value is estimated.
IRM	Interim remedial measure.
NA	Not analyzed.
ND	Analyte not detected at, or above its laboratory quantification limit.
NYSDEC	New York State Department of Environmental Conservation.
OM&M	Operation, maintenance and monitoring.
TICs	Tentatively identified compounds.
USEPA	United States Environmental Protection Agency.
VOC	Volatile organic compound.
µg/L	Micrograms per liter.

Table 3. Summary of Effluent Water Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1]

Compound [2]	Discharge Limit [3] (µg/L)	01/11/10 (µg/L)	02/02/10 (µg/L)	03/10/10 (µg/L)	04/12/10 (µg/L)	05/10/10 (µg/L)	06/09/10 (µg/L)	07/20/10 (µg/L)	08/09/10 (µg/L)	09/07/10 (µg/L)	10/04/10 (µg/L)	11/08/10 (µg/L)	12/06/10 (µg/L)
Project VOCs													
1,1,1 - Trichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 - Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2 - Dichloroethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 - Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis 1,2-Dichloroethene	5	ND	**0.23**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans 1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Subtotal Project VOCs	**--**	**0.0**	**0.23**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Non-Project VOCs													
Dichlorodifluoromethane (Freon 12)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorodifluoromethane (Freon 22)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Subtotal Non-Project VOCs	**--**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total VOCs [4]	**--**	**0.0**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Treatment Efficiency [5]	--	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%	> 99.9%
Inorganics													
Total Iron	600	**560**	**320**	**540**	**520**	**400**	**490**	**300**	**310**	**380**	**210**	**270**	**200**
Total Mercury	250	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
pH [6]	5.5 - 8.5	6.8 [7]	6.4	6.9	7.0	7.0	6.4	6.2	6.9	6.5	6.4	6.1	6.6

See notes on last page.

Table 3. Summary of Effluent Water Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1)

Notes:

(1) Water samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses per NYSDEC ASP 2000, Method OLM 4.3, for iron analyses per USEPA Method 6010 and for mercury analyses per USEPA Method 7470. The VOC analyte list is provided in the DRAFT Groundwater IRM OM&M Manual (ARCADIS 2009b). Effluent water samples were collected from Water Sampling Port-7 (WSP-7); refer to Figure 3 of this OM&M Report for the location of WSP-7. Data in this tables corresponds to approximately the past year of system operation.

(2) Only VOCs associated with the interim SPDES equivalency program, including Toluene, Benzene, Xylenes, non-project related Freon 12 and Freon 22, Mercury and Iron are included in this table. Complete VOC and inorganic data summary tables, including VOC TICs, are provided in Appendix B. Laboratory data qualifiers are included in the Appendix B tables.

(3) Discharge limits per the interim SPDES equivalency program or Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) Quality Standards and Guidance Values and Groundwater Effluent Limitations, if the compound is not part of the interim SPDES equivalency program.

(4) "Total VOCs" represents the sum of individual concentrations of compounds detected. The values used in calculations referenced in this report have been rounded to the nearest whole number.

(5) Treatment efficiency was calculated by dividing the difference between the influent and effluent total VOC concentrations by the influent total VOC concentration.

(6) pH samples collected and measured in the field by ARCADIS personnel on the dates listed using an Oakton Model 300 pH/conductivity meter. pH units are standard units.

(7) The January 2010 pH value was measured on December 7, 2009.

Acronyms\Key:

700	Bold data indicates that the analyte was detected at or above its reporting limit.
16	Data that is not bold indicates analyte detected but below its reporting limit; the value is estimated.
IRM	Interim remedial measure.
ND	Analyte not detected at, or above its laboratory quantification limit.
NYSDEC	New York State Department of Environmental Conservation.
OM&M	Operation, maintenance, and monitoring.
SPDES	State pollutant discharge elimination system.
TICs	Tentatively identified compounds.
USEPA	United States Environmental Protection Agency.
VOC	Volatile organic compound.
µg/L	Micrograms per liter.
--	Not applicable.
>	Greater than.

Table 4. Summary of Influent Vapor Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1]

Compound [2]	02/02/10 (µg/m^3)	04/12/10 (µg/m^3)	06/09/10 (µg/m^3)	07/20/10 (µg/m^3)	08/10/10 (µg/m^3)	10/04/10 [4] (µg/m^3)
Project VOCs						
1,1,1 - Trichloroethane	ND	ND	**3.6**	ND	**3.6**	ND
1,1 - Dichloroethane	**26**	**20**	**15**	**14**	**17**	**12**
1,2 - Dichloroethane	ND	ND	ND	ND	0.77	ND
1,1 - Dichloroethene	**16**	**14**	**12**	**9.0**	**11**	ND
Tetrachloroethene	**6.1**	ND	**5.5**	ND	**6.4**	ND
Trichloroethene	**370**	**280**	**230**	**190**	**190**	**200**
Vinyl Chloride	**410**	**330**	**220**	**180**	**150**	**170**
cis 1,2-Dichloroethene	**3,100**	**2,400**	**1,900**	**1,700**	**1,500**	**1,800**
trans 1,2-Dichloroethene	**4.6**	ND	**2.5**	ND	**4.6**	ND
Benzene	ND	ND	**2.1**	ND	**1.2**	ND
Toluene	**370**	**340**	**150**	**150**	**150**	**100**
Xylenes	**45**	**34**	**24**	ND	**19**	ND
Subtotal Project VOCs	**4,348**	**3,418**	**2,565**	**2,243**	**2,054**	**2,282**
Non-Project VOCs						
Dichlorodifluoromethane (Freon 12)	ND	ND	**3.5**	ND	**4.6**	ND
Chlorodifluoromethane (Freon 22)	**3,700**	**4,700**	**5,200**	**6,100**	**5,800**	**4,600**
Subtotal Non-Project VOCs	**3,700**	**4,700**	**5,204**	**6,100**	**5,805**	**4,600**
Total VOCs [3]	**8,048**	**8,118**	**7,769**	**8,343**	**7,859**	**6,882**

See notes on last page.

Table 4. Summary of Influent Vapor Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1)

Notes:

(1) Vapor samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses per Modified USEPA Method T0-15. A VOC analyte list is provided in the DRAFT Groundwater IRM OM&M Manual (ARCADIS 2009b). Influent samples were collected at Vapor Sampling Port-1 (VSP-1); refer to Figure 3 of this OM&M Report for the location of VSP-1. Data in this tables corresponds to approximately the past year of system operation.

(2) Only VOCs that are associated with the interim State Pollutant Discharge Elimination System (SPDES) equivalency program, Toluene, Benzene, Xylenes, and non-project related Freon 12 and Freon 22 are included in this table. Complete VOC summary tables, including VOC TICs, are provided in Appendix C. Laboratory data qualifiers are included in the Appendix C tables.

(3) "Total VOCs" represents the sum of individual concentrations of compounds detected. The values used in calculations referenced in this report have been rounded to the nearest whole number.

(4) The influent sample container, when it arrived at the laboratory, had a pressure that exceeded the allowable limits. Therefore, per our laboratory data validation program, all the data for this sample have been qualified to indicate that the values are "estimated". Additional information is provided in Table C-1.

Acronyms\Key:

700	Bold data indicates that the analyte was detected at or above its reporting limit.
16	Data that is not bold indicates analyte detected but below its reporting limit; the value is estimated.
IRM	Interim remedial measure.
ND	Analyte not detected at or above its laboratory reporting limit.
OM&M	Operation, maintenance, and monitoring.
R	The sample results are rejected.
TICs	Tentatively identified compounds.
USEPA	United States Environmental Protection Agency.
VOC	Volatile organic compound.
$\mu g/m^3$	Micrograms per cubic meter.

Table 5. Summary of Effluent Vapor Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1]

Compound [2]	Discharge Limit [3] (µg/m^3)	01/11/10 (µg/m^3)	02/02/10 (µg/m^3)	03/10/10 (µg/m^3)	04/12/10 (µg/m^3)	05/10/10 (µg/m^3)	06/09/10 (µg/m^3)	07/20/10 (µg/m^3)	08/12/10 (µg/m^3)	10/04/10 (µg/m^3)	12/06/10 (µg/m^3)
Project VOCs											
1,1,1 - Trichloroethane	68,000	ND	ND	**1**	ND	ND	**0.97**	ND	ND	ND	ND
1,1 - Dichloroethane	NS	**3**	ND	**6**	ND	**1.2**	**4.4**	ND	**3.3**	**8.1**	**1.3**
1,2 - Dichloroethane	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 - Dichloroethene	380 [4]	ND	ND	**1**	ND	ND	**0.77**	ND	**2.0**	**3.9**	**0.66**
Tetrachloroethene	1,000	ND	ND	**1**	ND	ND	**1.1**	ND	**0.82**	**0.92**	ND
Trichloroethene	14,000	**13**	**13**	**17**	**17**	**5.1**	**12**	**9.9**	**12**	**13**	**9.6**
Vinyl Chloride	180,000	**36**	**12**	**29**	**27**	ND	**5**	**17**	**15**	**14**	**2.4**
cis 1,2-Dichloroethene	190,000 [5]	**52**	**34**	**77**	**65**	**9.2**	**21**	**40**	**49**	**120**	**50**
trans 1,2-Dichloroethene	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1,300	**8**	**17**	**5**	**29**	**7.8**	**13**	**17**	**11**	**11**	**2.6**
Toluene	37,000	**38**	**40**	**96**	**80**	ND	**44**	**31**	**25**	**26**	**11**
Xylenes	37,000	**3.7**	ND	**8.2**	ND	ND	**3.8**	ND	ND	**2.7**	ND
Subtotal Project VOCs	NA	**153**	**116**	**241**	**218**	**23**	**106**	**115**	**118**	**200**	**78**
Non-Project VOCs											
Dichlorodifluoromethane (Freon 12)	NS	**3**	**3**	**4**	ND	**3.5**	**3.5**	ND	**2.8**	**3.5**	ND
Chlorodifluoromethane (Freon 22)	NS	**3,700**	**3,700**	**4,700**	**4,800**	**3,500**	**5,400**	**6,000**	**5,200**	**3,900**	**3,500**
Subtotal Non-Project VOCs	NA	**3,703**	**3,703**	**4,704**	**4,800**	**3,504**	**5,404**	**6,000**	**5,203**	**3,904**	**3,500**
Total VOCs [6]	NA	**3,856**	**3,819**	**4,945**	**5,018**	**3,527**	**5,510**	**6,115**	**5,321**	**4,104**	**3,578**
Treatment Efficiency (Total VOCs) [7]	NA	--	**52.5%**	--	**38.2%**	--	**29.1%**	**26.7%**	**32.3%**	**40.4%**	--
Treatment Efficiency (Project VOCs) [8]	NA	--	**97.3%**	--	**93.6%**	--	**95.9%**	**94.9%**	**94.3%**	**91.2%**	--

See notes on last page.

Table 5. Summary of Effluent Vapor Sample Analytical Results, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1)

Notes:

(1) Vapor samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses per Modified USEPA Method T0-15. A VOC analyte list is provided in the DRAFT Groundwater IRM OM&M Manual (ARCADIS 2009b). Effluent samples were collected at Vapor Sampling Port-5 (VSP-5); refer to Figure 3 of this OM&M Report for the location of VSP-5. Data in this tables corresponds to approximately the past year of system operation.

(2) Only VOCs that are associated with the interim State Pollutant Discharge Elimination System (SPDES) equivalency program, Toluene, Benzene, Xylenes, and non-project related Freon 12 and Freon 22 are included in this table. Complete VOC summary tables, including VOC TICs, are provided in Appendix C. Laboratory data qualifiers are included in the Appendix C tables.

(3) Discharge limit is compound specific short-term guidance concentration (SGC) per the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.

(4) An SGC was not provided in the DAR-1 AGC/SGC Tables, dated September 10, 2007. An interim SGC was developed based on guidance of the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for 1,1- dichloroethene, which is not defined as provided in Section IV.A.2.b.1 a high-toxicity compound, the Interim SGC = (smaller of Time Weighted Average [TWA] - Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2. or 1,600 $\mu g/m^3$ / 4.2 = approximately 380 $\mu g/m^3$. An interim SGC was developed for this compound because it has a moderate toxicity rating, as specified in the DAR-1 AGC/SGC Tables, dated September 10, 2007.

(5) An SGC was not provided in the DAR-1 AGC/SGC Tables, dated September 10, 2007. An interim SGC was developed based on guidance provided in Section IV.A.2.b.1 of 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 790,000 $\mu g/m^3$ / 4.2 = approximately 190,000 $\mu g/m^3$. An interim SGC was developed for this compound because it has a moderate toxicity rating, as specified in the DAR-1 AGC/SGC Tables, dated September 10, 2007.

(6) "Total VOCs" represents the sum of individual concentrations of all compounds detected. The values used in calculations referenced in this report have been rounded to the nearest whole number.

(7) Treatment efficiency was calculated by dividing the difference between the influent and effluent total VOC concentrations by the influent total VOC concentration. Treatment efficiency is only calculated when there is a corresponding influent sample.

(8) Treatment efficiency was calculated by dividing the difference between the influent and effluent total Project VOC concentrations by the influent total Project VOC concentration. Treatment efficiency is only calculated when there is a corresponding influent sample.

Acronyms\Key:

700	Bold data indicates that the analyte was detected at or above its reporting limit.
16	Data that is not bold indicates analyte detected but below its reporting limit; the value is estimated.
AGC	Annual guideline concentration.
IRM	Interim remedial measure.
NA	Not applicable.
ND	Analyte not detected at or above its laboratory reporting limit.
NS	Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007. An interim SGC was not developed for these compounds because they have low toxicity ratings in the NYSDEC DAR-1 AGC/SGC tables revised September 10, 2007.
NYSDEC	New York State Department of Environmental Conservation.
OM&M	Operation, maintenance, and monitoring.
TICs	Tentatively identified compounds.
USEPA	United States Environmental Protection Agency.
VOC	Volatile organic compound.
$\mu g/m^3$	Micrograms per cubic meter.
--	Data not available or value could not be calculated.

Table 6. Summary of System Parameters, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Date [1]	Water Flow Rates [2]						Water Pressures [2]					Air Flow Rate [2]	Air Pressures [2]					Air Temp. [2]
	Remedial Well				Combined Influent	Effluent	Remedial Well Effluent [3]				Effluent	Effluent	ECU Influents				Effluent	Stack Temp.
	RW-1 (gpm)	RW-2 (gpm)	RW-3 (gpm)	RW-4 (gpm)	(gpm)	(gpm)	RW-1 (psi)	RW-2 (psi)	RW-3 (psi)	RW-4 (psi)	(psi)	(scfm)	GAC-501 (inH_2O)	GAC-502 (inH_2O)	PPZ-601 (inH_2O)	PPZ-602 (inH_2O)	(inH_2O)	(^oR)
01/11/10	30.5	75.7	75.7	30.4	219	218	57.5	40.6	65.6	57.0	7.0	2,184	8.7	5.3	3.5	1.1	0.0	531 [4]
02/02/10	30.5	75.6	75.7	30.9	220	216	57.2	42.9	65.1	56.5	8.0	2,135	8.6	5.1	3.4	1.3	0.0	530 [4]
03/10/10	30.8	75.2	75.2	30.6	218	229	57.5	34.3	65.9	56.9	6.5	2,099	6.0 [5]	7.7 [5]	3.4	1.2	0.0	537 [4]
04/12/10	30.1	75.2	75.6	30.5	218	229	59.0	28.2	67.2	58.2	7.5	2,086	5.8	7.5	3.2	1.1	0.0	540
05/10/10	30.3	0.0 [6]	75.6	30.6	139	137	59.3	0.0 [7]	68.8	59.0	6.0	2,076	6.0	7.7	3.3	1.1	0.0	540
06/09/10	30.3	75.4	75.6	30.4	216	218	59.4	58.7	68.0	59.0	8.0	2,003	7.8	9.5	5.2	3.5	0.0	537
07/20/10	30.4	75.8	75.8	30.6	219	216	58.5	54.9	66.2	58.0	7.0	2,114	5.6	6.8	3.9	1.6	0.0	550
08/09/10	30.7	75.4	75.5	30.8	219	218	58.1	54.5	67.8	57.7	7.0	2,097	5.5	6.5	3.5	1.5	0.0	551
09/07/10	30.4	75.4	75.4	30.5	218	212	58.0	52.4	56.4	57.6	6.0 [7]	2,134	5.2	6.5	3.5	1.5	0.0	548
10/04/10	30.1	75.4	75.5	30.2	217	211	58.7	49.9	70.1	57.7	8.3	2,112	5.4	4.3	3.4	1.5	0.0	547
11/08/10	30.1	75.3	75.5	30.5	217	202	58.2	46.2	67.0	58.0	7.5	1,967	7.5	5.5	3.0	2.3	0.5	534
12/06/10	30.1	75.1	75.2	30.1	216	213	58.2	43.9	61.3	57.8	6.0	2,021	8.2	4.6	2.8	1.2	0.0	532

See notes on last page.

Table 6. Summary of System Parameters, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Notes:

(1) Operational data collected by ARCADIS on days noted. Parameters listed were typically recorded during compliance monitoring events. Data in this table corresponds to approximately the past year of system operation.
(2) Instantaneous values from field-mounted instruments, except for the combined influent water-flow rate, which is the sum of individual well flow rates via the Supervisory Control and Data Acquisition (SCADA) System.
(3) Remedial Well effluent pressure readings measured at the influent manifold within the treatment system building.
(4) Total effluent air temperature gauge (TI-601) malfunctioned; the value shown was measured at the mid-train air temperature gauge (TI-501).
(5) The emission control units were reconfigured after the February 17, 2010 VPGAC media replacement event. VPGAC ECU-502 was placed in the lead position and VPGAC ECU-501 was placed in the lag position.
(6) Remedial Well RW-2 was off-line between April 24 and May 14, 2010 for rehabilitation activities and to replace the well pump and motor.
(7) Value is from September 14, 2010, data was not collected during the September 7, 2010 event.

Acronyms\Key:

ECU	Emission control unit.
gpm	Gallons per minute.
inH_2O	Inches of water column.
psi	Pounds per square inch.
^oR	Degrees Rankine.
scfm	Standard cubic feet per minute.
Temp.	Temperature.
VPGAC	Vapor phase granular activated carbon.

Table 7. Summary of Groundwater Recovered, VOC Mass Recovered, and VOC Mass Recovery Rates, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Operating Period [1]	Volume of Groundwater Recovered (x1,000 gal) [2]					VOC Mass Recovered (lbs) [3]															VOC Mass Recovery Rate (lbs/day) [4]													
						Total VOCs [5]					Project VOCs [6]					Non-Project VOCs [7]					Total VOCs [5]					Project VOCs [6]					Non-Project VOCs [7]				
	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total	RW-1	RW-2	RW-3	RW-4	Total
System Pilot Test, Shakedown and Start Up Totals [8]																																		
	137	270	251	150	808	NA	NA	NA	NA	1.1	NA	NA	NA	NA	1.0	NA	NA	NA	NA	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2009 Totals [9]																																		
7/21/09 - 12/30/09	6,592	13,838	16,445	6,574	43,449	0.41	280	54	14	343	0.17	273	19	0.20	293	<0.01	0.60	35	13	49	<0.01	1.9	0.34	0.09	2.2	<0.01	1.9	0.12	0.00	1.9	<0.01	0.00	0.22	0.08	0.31
January 2010 through March 2010 Totals																																		
Subtotal Jan-Mar 10 [10]	3,805	9,389	9,411	3,790	26,395	0.13	65	110	14	188	0.11	64	7.4	0.10	71	<0.01	0.00	102	14	116	<0.01	0.75	1.3	0.16	2.2	<0.01	0.74	0.09	0.00	0.82	<0.01	0.00	1.2	0.16	1.3
April 2010 through June 2010 Totals																																		
Subtotal April-June 10 [11]	4,195	8,324	10,409	4,196	27,124	0.15	48	120	20	189	0.14	48	7.5	0.00	56	<0.01	0.00	113	20	132	<0.01	0.48	1.2	0.20	1.9	<0.01	0.48	0.08	0.00	0.57	<0.01	0.00	1.1	0.20	1.3
July 2010 through September 2010 Totals																																		
Subtotal July-Sept 10 [12]	3,520	8,751	7,880	3,528	23,679	0.16	32	98	25	155	0.16	32	6.0	0.00	38	<0.01	0.00	92	25	117	<0.01	0.39	1.2	0.30	1.9	<0.01	0.39	0.07	0.00	0.46	<0.01	0.00	1.1	0.30	1.4
October 2010 through December 2010 Totals																																		
09/27/10 - 11/08/10	1,828	4,511	4,547	1,821	12,707	0.07	15	37	13	65	0.07	14	3.2	0.00	17	<0.01	0.17	34	13	47	<0.01	0.36	0.88	0.31	1.5	<0.01	0.33	0.08	0.00	0.40	<0.01	0.00	0.81	0.31	1.1
11/08/10 - 12/06/10	1,251	2,992	2,898	1,191	8,332	0.05	9.7	23	8.4	41	0.04	9.6	2.1	0.00	12	<0.01	0.11	21	8.4	30	<0.01	0.35	0.82	0.30	1.5	<0.01	0.34	0.08	0.00	0.43	<0.01	0.00	0.75	0.30	1.1
12/06/10 - 01/05/11	1,127	1,160	3,015	1,163	6,465	0.04	3.7	24	8.2	36	0.04	3.7	0.82	0.00	4.6	<0.01	0.04	22	8.2	30	<0.01	0.12	0.80	0.27	1.2	<0.01	0.12	0.03	0.00	0.15	<0.01	0.00	0.73	0.27	1.0
Subtotal Oct-Dec 10 [13]	4,206	8,663	10,460	4,175	27,504	0.16	28	84	30	142	0.15	27	6.1	0.00	34	<0.01	0.32	77	30	107	<0.01	0.28	0.84	0.30	1.4	<0.01	0.27	0.06	0.00	0.34	<0.01	0.00	0.77	0.30	1.1
Subtotal 2010 [14]	15,726	35,127	38,160	15,689	104,702	0.60	173	412	89	674	0.56	171	27	0.10	199	<0.01	0.32	384	89	472	<0.01	0.47	1.1	0.24	1.8	<0.01	0.46	0.07	0.00	0.54	<0.01	0.00	1.0	0.24	1.3
Total [15]	22,455	49,235	54,856	22,413	148,959	1.0	453	466	103	1,018	0.73	444	46	0.30	493	<0.01	0.92	419	102	521	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

See notes on last page.

Table 7. Summary of Groundwater Recovered, VOC Mass Recovered, and VOC Mass Recovery Rates, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Notes:

(1) Represents operating period between consecutive monitoring events.
(2) Volume of groundwater recovered is based on individual local well totalized flow readings. Listed value is the difference between totalized flow values recorded between consecutive monitoring events. The total groundwater recovered during a given operating period is the sum of the individual well flow totals. Values shown are rounded to the nearest gallon, but should only be considered accurate to two significant figures to account for error associated with field measurements.
(3) Mass recovered per well was calculated by multiplying the TVOC concentration from the most recent sampling event by the number of gallons extracted between sampling events. The total amount recovered during a given operating period is the sum of masses recovered from each of the individual wells. Values less than ten pounds are presented using two significant figures and values greater than ten pounds have been rounded to the nearest whole number; however, these values should only be considered accurate to two significant figures to account for error associated with field measurements and analytical data.
(4) Mass recovery rates were calculated by dividing the total mass recovered for each well and for the system by the number of days in the respective operating period. Values are presented using two significant figures.
(5) "Total VOCs" represents the sum of individual concentrations of the VOCs detected.
(6) "Project VOCs" represents the sum of individual compound concentrations of 1,1,1-Trichloroethane; 1,1-Dichloroethane; 1,2-Dichloroethane; 1,1-Dichloroethene; Tetrachloroethene; Trichloroethene; Vinyl Chloride; cis-1,2-Dichloroethene; trans-1,2-Dichloroethene; Benzene; Toluene; and Xylenes-o,m, and p.
(7) "Non-Project VOCs" represents the difference between Total VOCs and Project VOCs.
(8) Values based on operational data recorded prior to system startup on July 21, 2009.
(9) The volume of groundwater recovered and mass recovered calculations represent the operational period between system start-up on July 21, 2009 and December 30, 2009.
(10) The volume of groundwater recovered and mass recovered calculations represent the operational period between December 30, 2009 and March 31, 2010.
(11) The volume of groundwater recovered and mass recovered calculations represent the operational period between March 31, 2010 and June 30, 2010.
(12) The volume of groundwater recovered and mass recovered calculations represent the operational period between June 30, 2010 and September 30, 2010.
(13) The volume of groundwater recovered and mass recovered calculations represent the operational period between September 30, 2010 and December 31, 2010.
(14) "Subtotal 2010" refers to the amounts removed by the OU3 Groundwater IRM during 2010; mass recovery rates are averages and not totals.
(15) "Total" refers to the amounts removed by the Operable Unit 3 Groundwater Interim Remedial Measure.

Acronyms\Key:

IRM	Interim Remedial Measure.
gal	Gallons.
lbs	Pounds.
lbs/day	Pounds per day.
NA	Not applicable.
TVOC	Total volatile organic compounds.
<	Less than.

Table 8. Summary of Air Emissions Model Output, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Compound [1]	AGC [2] ($\mu g/m^3$)	Percent of MASC Per Event [3]										Percent AGC [4]
		1/11/10	2/2/10	3/10/10	4/12/10	5/10/10	6/9/10	7/20/10	8/12/10	10/4/10	12/6/10	
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%
1,1 - Dichloroethane	0.63	0.07%	0.00%	0.14%	0.00%	0.03%	0.11%	0.00%	0.08%	0.20%	0.03%	0.08%
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%
2-Butanone	5,000	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%
Chloroform	0.043	1.51%	2.83%	2.82%	0.00%	1.25%	2.37%	0.00%	1.72%	3.30%	1.67%	1.87%
Ethylbenzene	1,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Xylenes (o)	100	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Xylenes (m,p)	100	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chloromethane	90	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Methylene Chloride	2.1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%
Tetrachloroethene	1	0.00%	0.00%	0.02%	0.00%	0.00%	0.02%	0.00%	0.01%	0.01%	0.00%	0.01%
Trichloroethene	0.5	0.40%	0.40%	0.52%	0.52%	0.16%	0.36%	0.30%	0.37%	0.40%	0.29%	0.37%
Vinyl Chloride	0.11	5.07%	1.68%	4.05%	3.76%	0.00%	0.69%	2.38%	2.10%	1.97%	0.33%	2.18%
cis 1,2 Dichloroethene	63	0.01%	0.01%	0.02%	0.02%	0.00%	0.01%	0.01%	0.01%	0.03%	0.01%	0.01%
Benzene	0.13	0.93%	2.02%	0.54%	3.42%	0.92%	1.52%	2.01%	1.30%	1.31%	0.31%	1.41%
Toluene	5,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2-Hexanone	48	0.00%	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%
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%
Chlorodifluoromethane (Freon 22)	50,000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

See notes on last page.

Table 8. Summary of Air Emissions Model Output, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Notes:

(1) Only VOCs that were detected in the effluent vapor sample (VSP-5) over the past year of system operation are included in this table.

(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 (or Percent MASC) was calculated by dividing the actual effluent concentration by the site-specific annual MASC. Detailed calculations are included in Appendix D.

(4) Percent AGC is the twelve month average at the end of the reporting period. The Percent AGC was calculated by time-weighting the "Percent MASCs" for the individual sampling events over the past year. For this reporting period, the MASCs for September 2010 were assumed to be the same as for August 2010, and MASCs for November 2010 were assumed to be the same as for October 2010.

Acronyms\Key:

AGC Annual Guideline Concentration.
DAR-1 Division of Air Resources-1.
NYSDEC New York State Department of Environmental Conservation.
SGC Short-term Guideline Concentration.
USEPA United States Environmental Protection Agency.
VOCs Volatile Organic Compounds.
$\mu g/m^3$ Micrograms per cubic meter.

Table 9. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Remedial Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1]

COMPOUND (ug/L)	Sample Location: / Sample Date:	RW-1 7/29/2009	RW-1 8/12/2009	RW-1 9/10/2009	RW-1 11/10/2009	RW-1 12/2/2009	RW-1 2/2/2010
	NYSDEC SCGs						
1,1,1-Trichloroethane	5	< 5	< 5	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	5	< 5	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	1	< 5	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane	5	< 5	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	5	< 5	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethane	0.6	< 5	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane	1	< 5	< 5	< 5	< 5	< 5	< 5
2-Butanone	NE	**6.5 J**	< 50	< 50	< 50	< 50	< 50
2-Hexanone	50	< 50	< 50	< 50	< 50	< 50	< 50
4-methyl-2-pentanone	50	< 50	< 50	< 50	< 50	< 50	< 50
Acetone	NE	**3.5 J**	< 50	**2.9 J**	**1.5 J**	< 50	< 50
Benzene	1	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Bromodichloromethane	50	< 5	< 5	< 5	< 5	< 5	< 5
Bromoform	50	< 5	< 5	< 5	< 5	< 5	< 5
Bromomethane	5	< 5	< 5	< 5	< 5	< 5 R	< 5
Carbon Disulfide	60	< 5	< 5	< 5	< 5	< 5	< 5
Carbon tetrachloride	5	< 5	< 5	< 5	< 5	< 5	< 5
Chlorobenzene	5	< 5	< 5	< 5	< 5	< 5	< 5
Chlorodifluoromethane (Freon 22)	NE	< 5	< 5	< 5	< 5	< 5	< 5
Chloroethane	5	< 5	< 5	< 5	< 5	< 5	< 5
Chloroform	7	**3 J**	**2.4 J**	**1.9 J**	**1.4 J**	**1.3 J**	**0.8 J**
Chloromethane	5	< 5	< 5	< 5	< 5	< 5 R	< 5
cis-1,2-dichloroethene	5	**1.5 J**	**1.5 J**	**1.4 J**	**1.5 J**	**1.7 J**	**1.5 J**
cis-1,3-dichloropropene	0.4	< 5	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane	50	< 5	< 5	< 5	< 5	< 5	< 5
Dichlorodifluoromethane (Freon 12)	5	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	5	< 5	< 5	< 5	< 5	< 5	< 5
Methyl tert-Butyl Ether	5	--	--	--	--	--	< 5
Methylene Chloride	5	< 5	< 5	< 5	< 5	< 5	< 5
Styrene	5	< 5	< 5	< 5	< 5	< 5	< 5
Tetrachloroethene	5	< 5	< 5	< 5	< 5	< 5	< 5
Toluene	5	< 5	< 5	< 5	< 5	< 5	< 5
trans-1,2-dichloroethene	5	< 5	< 5	< 5	< 5	< 5	< 5
trans-1,3-dichloropropene	0.4	< 5	< 5	< 5	< 5	< 5	< 5
Trichloroethylene	5	**1.3 J**	**1.7 J**	**1.5 J**	**1.8 J**	**2 J**	**2 J**
Trichlorotrifluoroethane (Freon 113)	5	< 5	< 5	< 5	< 5	< 5	< 5
Vinyl Chloride	2	< 2	< 2	< 2	< 2	< 2	< 2
Xylene-o	5	< 5	< 5	< 5	< 5	< 5	< 5
Xylenes - m,p	5	< 5	< 5	< 5	< 5	< 5	< 5
Total VOCs [2]		**15.8**	**5.6**	**7.7**	**6.2**	**5.0**	**4.3**
Project VOCs [3]		**2.8**	**3.2**	**2.9**	**3.3**	**3.7**	**3.5**

See notes on last page.

Table 9. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Remedial Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1]

COMPOUND (ug/L)	Sample Location: / Sample Date:	RW-1 4/12/2010	RW-1 7/20/2010	RW-1 10/4/2010	RW-2 7/29/2009	RW-2 8/12/2009	RW-2 9/10/2009
	NYSDEC SCGs						
1,1,1-Trichloroethane	5	< 5	< 5	< 5	< 100	< 100	< 50
1,1,2,2-Tetrachloroethane	5	< 5	< 5	< 5	< 100	< 100	< 50
1,1,2-Trichloroethane	1	< 5	< 5	< 5	< 100	< 100	< 50
1,1-Dichloroethane	5	< 5	< 5	< 5	**9.2 J**	**8.8 J**	**6.4 J**
1,1-Dichloroethene	5	< 5	< 5	< 5	< 100	< 100	< 50
1,2-Dichloroethane	0.6	< 5	< 5	< 5	< 100	< 100	< 50
1,2-Dichloropropane	1	< 5	< 5	< 5	< 100	< 100	< 50
2-Butanone	NE	< 50	< 50	< 50	< 1000	< 1000	< 500
2-Hexanone	50	< 50	< 50	< 50	< 1000	< 1000	< 500
4-methyl-2-pentanone	50	< 50	< 50	< 50	< 1000	< 1000	< 500
Acetone	NE	< 50	< 50	< 50	< 1000	< 1000	< 500
Benzene	1	< 0.7	< 0.7	< 0.7	< 14	< 14	< 7
Bromodichloromethane	50	< 5	< 5	< 5	< 100	< 100	< 50
Bromoform	50	< 5	< 5	< 5	< 100	< 100	< 50
Bromomethane	5	< 5	< 5	< 5	< 100	< 100	< 50
Carbon Disulfide	60	< 5	< 5	< 5	< 100	< 100	< 50
Carbon tetrachloride	5	< 5	< 5	< 5	< 100	< 100	< 50
Chlorobenzene	5	< 5	< 5	< 5	< 100	< 100	< 50
Chlorodifluoromethane (Freon 22)	NE	< 5	< 5	< 5	< 100	< 100	**4 J**
Chloroethane	5	< 5	< 5	< 5	< 100	< 100	< 50
Chloroform	7	**0.42 J**	**0.36 J**	**0.31 J**	< 100	< 100	**3.4 J**
Chloromethane	5	< 5	< 5	< 5	< 100	< 100	< 50
cis-1,2-dichloroethene	5	**1.5 J**	**2 J**	**1.3 J**	**2,600**	**2,300**	**1,300**
cis-1,3-dichloropropene	0.4	< 5	< 5	< 5	< 100	< 100	< 50
Dibromochloromethane	50	< 5	< 5	< 5	< 100	< 100	< 50
Dichlorodifluoromethane (Freon 12)	5	< 5	< 5	< 5	< 100	< 100	< 50
Ethylbenzene	5	< 5	< 5	< 5	**13 J**	**7.2 J**	**4.8 J**
Methyl tert-Butyl Ether	5	< 5	< 5	< 5	--	--	--
Methylene Chloride	5	< 5	< 5	< 5	< 100	< 100	< 50
Styrene	5	< 5	< 5	< 5	< 100	< 100	< 50
Tetrachloroethene	5	< 5	< 5	< 5	< 100	< 100	< 50
Toluene	5	< 5	< 5	< 5	**520**	**170**	**190**
trans-1,2-dichloroethene	5	< 5	< 5	< 5	**12 J**	**21 J**	**32 J**
trans-1,3-dichloropropene	0.4	< 5	< 5	< 5	< 100	< 100	< 50
Trichloroethylene	5	**2.4 J**	**3.4 J**	**3 J**	**46 J**	**30 J**	**52**
Trichlorotrifluoroethane (Freon 113)	5	< 5	< 5	< 5	< 100	< 100	< 50
Vinyl Chloride	2	< 2	< 2	< 2	**630**	**670**	**370**
Xylene-o	5	< 5	< 5	< 5	**14 J**	**9.4 J**	**5.4 J**
Xylenes - m,p	5	< 5	< 5	< 5	**27 J**	**9.2 J**	**7.9 J**
Total VOCs [2]		**4.3**	**5.8**	**4.6**	**3,871**	**3,226**	**1,976**
Project VOCs [3]		**3.9**	**5.4**	**4.3**	**3,849**	**3,210**	**1,957**

See notes on last page.

Table 9. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Remedial Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1]

COMPOUND (ug/L)	Sample Location: / Sample Date:	RW-2 11/10/2009	RW-2 12/2/2009	RW-2 2/2/2010	RW-2 4/12/2010	RW-2 7/20/2010	RW-2 10/4/2010
	NYSDEC SCGs						
1,1,1-Trichloroethane	5	< 25	< 25	< 25	< 13	< 13	< 13
1,1,2,2-Tetrachloroethane	5	< 25	< 25	< 25	< 13	< 13	< 13
1,1,2-Trichloroethane	1	< 25	< 25	< 25	< 13	< 13	< 13
1,1-Dichloroethane	5	**5.2 J**	**5.3 J**	**3.5 J**	**3.2 J**	**2.3 J**	**2.2 J**
1,1-Dichloroethene	5	**2.9 J**	**3.1 J**	< 25	**3 J**	**2.1 J**	**2.2 J**
1,2-Dichloroethane	0.6	< 25	< 25	< 25	< 13	< 13	< 13
1,2-Dichloropropane	1	< 25	< 25	< 25	< 13	< 13	< 13
2-Butanone	NE	< 250	< 250	< 250	< 130	< 130	< 130
2-Hexanone	50	< 250	< 250	< 250	< 130	< 130	< 130
4-methyl-2-pentanone	50	< 250	< 250	< 250	< 130	< 130	< 130
Acetone	NE	< 250	< 250	< 250	< 130	< 130	< 130 B
Benzene	1	< 3.5	< 3.5	< 3.5	< 1.8	< 1.8	< 1.8
Bromodichloromethane	50	< 25	< 25	< 25	< 13	< 13	< 13
Bromoform	50	< 25	< 25	< 25	< 13	< 13	< 13
Bromomethane	5	< 25	< 25 R	< 25	< 13	< 13	< 13
Carbon Disulfide	60	< 25	< 25	< 25	< 13	< 13	< 13
Carbon tetrachloride	5	< 25	< 25	< 25	< 13	< 13	< 13
Chlorobenzene	5	< 25	< 25	< 25	< 13	< 13	< 13
Chlorodifluoromethane (Freon 22)	NE	**3.5 J**	**3.3 J**	< 25	**1.7 J**	**1.1 J**	**1 J**
Chloroethane	5	< 25	< 25	< 25	< 13	< 13	< 13
Chloroform	7	**3 J**	**2.3 J**	**2 J**	**1.5 J**	**1.4 J**	**1.9 J**
Chloromethane	5	< 25	< 25 R	< 25	< 13	< 13	< 13
cis-1,2-dichloroethene	5	**930**	**880**	**590**	**480**	**310**	**270**
cis-1,3-dichloropropene	0.4	< 25	< 25	< 25	< 13	< 13	< 13
Dibromochloromethane	50	< 25	< 25	< 25	< 13	< 13	< 13
Dichlorodifluoromethane (Freon 12)	5	< 25	< 25	< 25	< 13	< 13	< 13
Ethylbenzene	5	**6.4 J**	**5.1 J**	**1.8 J**	**2.2 J**	**1.7 J**	**1.5 J**
Methyl tert-Butyl Ether	5	--	--	< 25	< 13	< 13	< 13
Methylene Chloride	5	< 25	< 25	< 25	< 13	< 13	< 13
Styrene	5	< 25	< 25	< 25	< 13	< 13	< 13
Tetrachloroethene	5	< 25	< 25	< 25	< 13	< 13	< 13
Toluene	5	**200**	**150**	**49**	**71**	**35**	**25**
trans-1,2-dichloroethene	5	**6.2 J**	**2.1 J**	**49**	< 13	**0.95 J**	< 13
trans-1,3-dichloropropene	0.4	< 25	< 25	< 25	< 13	< 13	< 13
Trichloroethylene	5	**59**	**63**	**46**	**43**	**35**	**36**
Trichlorotrifluoroethane (Freon 113)	5	< 25	< 25	< 25	< 13	< 13	< 13
Vinyl Chloride	2	**210**	**210**	**83**	**94**	**54**	**45**
Xylene-o	5	**6 J**	**4.9 J**	< 25	**2.2 J**	**1.3 J**	**0.9 J**
Xylenes - m,p	5	**11 J**	**9 J**	< 25	**3.5 J**	**2.4 J**	**1.9 J**
Total VOCs [2]		**1,443**	**1,338**	**824**	**705**	**447**	**388**
Project VOCs [3]		**1,430**	**1,327**	**821**	**699**	**443**	**383**

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Table 9. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Remedial Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1)

COMPOUND (ug/L)	Sample Location: / Sample Date:	RW-3 7/29/2009	RW-3 8/12/2009	RW-3 9/10/2009	RW-3 11/10/2009	RW-3 12/2/2009	RW-3 2/2/2010
	NYSDEC SCGs						
1,1,1-Trichloroethane	5	< 5	< 5	< 5	< 5	< 13	< 25
1,1,2,2-Tetrachloroethane	5	< 5	< 5	< 5	< 5	< 13	< 25
1,1,2-Trichloroethane	1	< 5	< 5	< 5	< 5	< 13	< 25
1,1-Dichloroethane	5	**2.4 J**	**2.1 J**	**1.9 J**	**1.4 J**	**1.3 J**	< 25
1,1-Dichloroethene	5	< 5	**0.35 J**	**0.41 J**	**0.53 J**	< 13	< 25
1,2-Dichloroethane	0.6	< 5	< 5	< 5	< 5	< 13	< 25
1,2-Dichloropropane	1	< 5	< 5	< 5	< 5	< 13	< 25
2-Butanone	NE	< 50	< 50	< 50	< 50	< 130	< 250
2-Hexanone	50	< 50	< 50	< 50	< 50	< 130	< 250
4-methyl-2-pentanone	50	< 50	< 50	< 50	< 50	< 130	< 250
Acetone	NE	< 50	< 50	**2 J**	**3.1 J**	< 130	< 250
Benzene	1	< 0.7	< 0.7	< 0.7	< 0.7	< 1.8	< 3.5
Bromodichloromethane	50	**0.35 J**	< 5	< 5	< 5	< 13	< 25
Bromoform	50	< 5	< 5	< 5	< 5	< 13	< 25
Bromomethane	5	< 5	< 5	< 5	< 5	< 13	< 25
Carbon Disulfide	60	< 5	< 5	< 5	< 5	< 13	< 25
Carbon tetrachloride	5	< 5	< 5	< 5	< 5	< 13	< 25
Chlorobenzene	5	< 5	< 5	< 5	< 5	< 13	< 25
Chlorodifluoromethane (Freon 22)	NE	**2.1 J**	**8.5**	**93**	**490 D**	**660 D**	**1,300 D**
Chloroethane	5	< 5	< 5	< 5	< 5	< 13	< 25
Chloroform	7	**2.1 J**	**2.3 J**	**2.9 J**	**5.9**	**6 J**	**4.3 J**
Chloromethane	5	< 5	< 5	< 5	< 5	< 13 R	< 25
cis-1,2-dichloroethene	5	**130**	**120**	**130**	**85**	**72**	**68**
cis-1,3-dichloropropene	0.4	< 5	< 5	< 5	< 5	< 13	< 25
Dibromochloromethane	50	< 5	< 5	< 5	< 5	< 13	< 25
Dichlorodifluoromethane (Freon 12)	5	< 5	< 5	< 5	< 5	< 13	< 25
Ethylbenzene	5	< 5	< 5	< 5	< 5	< 13	< 25
Methyl tert-Butyl Ether	5	--	--	--	--	--	< 25
Methylene Chloride	5	< 5	< 5	< 5	< 5	< 13	< 25
Styrene	5	< 5	< 5	< 5	< 5	< 13	< 25
Tetrachloroethene	5	**0.81 J**	**0.56 J**	**0.83 J**	**0.54 J**	< 13	< 25
Toluene	5	< 5	< 5	< 5	< 5	< 13	< 25
trans-1,2-dichloroethene	5	**0.68 J**	**0.54 J**	**0.59 J**	**0.52 J**	< 13	**7.2 J**
trans-1,3-dichloropropene	0.4	< 5	< 5	< 5	< 5	< 13	< 25
Trichloroethylene	5	**37**	**34**	**29**	**24**	**22**	**19 J**
Trichlorotrifluoroethane (Freon 113)	5	< 5	< 5	< 5	< 5	< 13	< 25
Vinyl Chloride	2	< 2	< 2	**0.47 J**	**0.42 J**	< 5	< 10
Xylene-o	5	< 5	< 5	< 5	< 5	< 13	< 25
Xylenes - m,p	5	< 5	< 5	< 5	< 5	< 13	< 25
Total VOCs (2)		**175**	**168**	**261**	**611**	**761**	**1,399**
Project VOCs (3)		**171**	**158**	**163**	**112**	**95**	**94**

See notes on last page.

Table 9. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Remedial Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1]

COMPOUND (ug/L)	Sample Location: / Sample Date:	RW-3 4/12/2010	RW-3 7/20/2010	RW-3 10/4/2010	RW-4 7/29/2009	RW-4 8/12/2009	RW-4 9/10/2009
	NYSDEC SCGs						
1,1,1-Trichloroethane	5	< 25	< 50	< 25	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	5	< 25	< 50	< 25	< 5	< 5	< 5
1,1,2-Trichloroethane	1	< 25	< 50	< 25	< 5	< 5	< 5
1,1-Dichloroethane	5	< 25	< 50	< 25	**0.42 J**	**0.38 J**	**0.47 J**
1,1-Dichloroethene	5	< 25	< 50	< 25	< 5	< 5	< 5
1,2-Dichloroethane	0.6	< 25	< 50	< 25	< 5	< 5	< 5
1,2-Dichloropropane	1	< 25	< 50	< 25	< 5	< 5	< 5
2-Butanone	NE	< 250	< 500	< 250	< 50	< 50	< 50
2-Hexanone	50	< 250	< 500	< 250	< 50	< 50	< 50
4-methyl-2-pentanone	50	< 250	< 500	< 250	< 50	< 50	< 50
Acetone	NE	< 250	< 500	< 250	< 50	< 50	< 50
Benzene	1	< 3.5	< 7	< 3.5	< 0.7	< 0.7	< 0.7
Bromodichloromethane	50	< 25	< 50	< 25	< 5	< 5	< 5
Bromoform	50	< 25	< 50	< 25	< 5	< 5	< 5
Bromomethane	5	< 25	< 50	< 25	< 5	< 5	< 5
Carbon Disulfide	60	< 25	< 50	< 25	< 5	< 5	< 5
Carbon tetrachloride	5	< 25	< 50	< 25	< 5	< 5	< 5
Chlorobenzene	5	< 25	< 50	< 25	< 5	< 5	< 5
Chlorodifluoromethane (Freon 22)	NE	**1,300 D**	**1400**	**880**	**140**	**200**	**330 D**
Chloroethane	5	< 25	< 50	< 25	< 5	< 5	< 5
Chloroform	7	**3.2 J**	< 50	**6.6 J**	**1 J**	**0.88 J**	**0.78 J**
Chloromethane	5	< 25	< 50	< 25	< 5	< 5	< 5
cis-1,2-dichloroethene	5	**70**	**64**	**64**	**1.5 J**	**1.7 J**	**1.9 J**
cis-1,3-dichloropropene	0.4	< 25	< 50	< 25	< 5	< 5	< 5
Dibromochloromethane	50	< 25	< 50	< 25	< 5	< 5	< 5
Dichlorodifluoromethane (Freon 12)	5	< 25	< 50	< 25	< 5	< 5	< 5
Ethylbenzene	5	< 25	< 50	< 25	< 5	< 5	< 5
Methyl tert-Butyl Ether	5	< 25	< 50	< 25	--	--	--
Methylene Chloride	5	< 25	< 50	< 25	< 5	< 5	< 5
Styrene	5	< 25	< 50	< 25	< 5	< 5	< 5
Tetrachloroethene	5	< 25	< 50	< 25	**0.44 J**	**0.44 J**	**0.44 J**
Toluene	5	< 25	< 50	< 25	< 5	< 5	< 5
trans-1,2-dichloroethene	5	< 25	**4.8 J**	**6.7 J**	< 5	< 5	< 5
trans-1,3-dichloropropene	0.4	< 25	< 50	< 25	< 5	< 5	< 5
Trichloroethylene	5	**17 J**	**14 J**	**12 J**	**1.1 J**	**1.2 J**	**1.6 J**
Trichlorotrifluoroethane (Freon 113)	5	< 25	< 50	< 25	< 5	< 5	< 5
Vinyl Chloride	2	< 10	< 20	**2.6 J**	< 2	< 2	< 2
Xylene-o	5	< 25	< 50	< 25	< 5	< 5	< 5
Xylenes - m,p	5	< 25	< 50	< 25	< 5	< 5	< 5
Total VOCs [2]		**1,390**	**1,483**	**972**	**144**	**205**	**335**
Project VOCs [3]		**87**	**83**	**85**	**3.5**	**3.7**	**4.4**

See notes on last page.

Table 9. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Remedial Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1]

COMPOUND (ug/L)	Sample Location: / Sample Date:	RW-4 11/10/2009	RW-4 12/2/2009	RW-4 2/2/2010	RW-4 4/12/2010	RW-4 7/20/2010	RW-4 10/4/2010
	NYSDEC SCGs						
1,1,1-Trichloroethane	5	< 5	< 10	< 10	< 13	< 25	< 25
1,1,2,2-Tetrachloroethane	5	< 5	< 10	< 10	< 13	< 25	< 25
1,1,2-Trichloroethane	1	< 5	< 10	< 10	< 13	< 25	< 25
1,1-Dichloroethane	5	**0.52 J**	< 10	**0.6 J**	< 13	< 25	< 25
1,1-Dichloroethene	5	< 5	< 10	< 10	< 13	< 25	< 25
1,2-Dichloroethane	0.6	< 5	< 10	< 10	< 13	< 25	< 25
1,2-Dichloropropane	1	< 5	< 10	< 10	< 13	< 25	< 25
2-Butanone	NE	< 50	< 100	< 100	< 130	< 250	< 250
2-Hexanone	50	< 50	< 100	< 100	< 130	< 250	< 250
4-methyl-2-pentanone	50	< 50	< 100	< 100	< 130	< 250	< 250
Acetone	NE	**3.5 J**	< 100	< 100	< 130	< 250	< 250
Benzene	1	< 0.7	< 1.4	< 1.4	< 1.8	< 3.5	< 3.5
Bromodichloromethane	50	< 5	< 10	< 10	< 13	< 25	< 25
Bromoform	50	< 5	< 10	< 10	< 13	< 25	< 25
Bromomethane	5	< 5	< 10 R	< 10	< 13	< 25	< 25
Carbon Disulfide	60	< 5	< 10	< 10	< 13	< 25	< 25
Carbon tetrachloride	5	< 5	< 10	< 10	< 13	< 25	< 25
Chlorobenzene	5	< 5	< 10	< 10	< 13	< 25	< 25
Chlorodifluoromethane (Freon 22)	NE	**230 D**	**290**	**440 D**	**560 D**	**840**	**850**
Chloroethane	5	< 5	< 10	< 10	< 13	< 25	< 25
Chloroform	7	**0.95 J**	**0.88 J**	**0.72 J**	**0.8 J**	< 25	< 25
Chloromethane	5	< 5	< 10 R	< 10	< 13	< 25	< 25
cis-1,2-dichloroethene	5	**1.9 J**	**2.2 J**	**1.8 J**	**1.5 J**	< 25	< 25
cis-1,3-dichloropropene	0.4	< 5	< 10	< 10	< 13	< 25	< 25
Dibromochloromethane	50	< 5	< 10	< 10	< 13	< 25	< 25
Dichlorodifluoromethane (Freon 12)	5	< 5	< 10	< 10	< 13	< 25	< 25
Ethylbenzene	5	< 5	< 10	< 10	< 13	< 25	< 25
Methyl tert-Butyl Ether	5	--	--	< 10	< 13	< 25	< 25
Methylene Chloride	5	< 5	< 10	< 10	< 13	< 25	< 25
Styrene	5	< 5	< 10	< 10	< 13	< 25	< 25
Tetrachloroethene	5	**0.48 J**	< 10	**0.64 J**	**0.9 J**	< 25	< 25
Toluene	5	< 5	< 10	< 10	< 13	< 25	< 25
trans-1,2-dichloroethene	5	< 5	< 10	< 10	< 13	< 25	< 25
trans-1,3-dichloropropene	0.4	< 5	< 10	< 10	< 13	< 25	< 25
Trichloroethylene	5	**1.9 J**	**1.8 J**	**1.4 J**	**1.4 J**	< 25	< 25
Trichlorotrifluoroethane (Freon 113)	5	< 5	< 10	< 10	< 13	< 25	< 25
Vinyl Chloride	2	< 2	< 4	< 4	< 5	< 10	< 10
Xylene-o	5	< 5	< 10	< 10	< 13	< 25	< 25
Xylenes - m,p	5	< 5	< 10	< 10	< 13	< 25	< 25
Total VOCs [2]		**239**	**295**	**445**	**565**	**840**	**850**
Project VOCs [3]		**4.8**	**4.0**	**4.4**	**3.8**	**0.0**	**0.0**

See notes on last page.

Table 9. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Monitoring Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1)

Notes:

(1) Water samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analysis using NYSDEC ASP 2000 Method OLM4.2. Results validated following protocols specified in Sampling and Analysis Plan in the December 2009 DRAFT OM&M Manual (ARCADIS 2009).

(2) "Total VOCs" represents the sum of individual concentrations of the VOCs detected.

(3) "Project VOCs" represents the sum of individual compound concentrations of 1,1,1-Trichloroethane; 1,1-Dichloroethane; 1,2-Dichloroethane; 1,1-Dichloroethene; Tetrachloroethene; Trichloroethene; Vinyl Chloride; cis-1,2-Dichloroethene; trans-1,2-Dichloroethene; Benzene; Toluene; and Xylenes-o,m, and p.

Acronyms\Key:

	Indicates an exceedance of an SCG.
700	Bold data indicates that the analyte was detected at or above its reporting limit.
NYSDEC	New York State Department of Environmental Conservation.
VOC	Volatile Organic Compound.
ASP	Analytical services protocol.
SCGs	Standards, criteria, and guidance values.
ug/L	Micrograms per liter.
NE	Not established.
J	Value is estimated.
D	Constituent identified from secondary dilution.
R	Concentration for the constituent was rejected.
B	Compound detected in associated blank sample.
< 5	Compound not detected above its laboratory quantification limit.

Table 10. Concentrations of Metals in Groundwater Samples Collected from Recovery Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1]

COMPOUND (ug/L)	Sample Location: / Sample Date:	RW-1 4/21/2009	RW-1 7/29/2009	RW-1 8/12/2009	RW-1 9/10/2009	RW-1 11/10/2009	RW-1 12/2/2009	RW-1 10/4/2010	RW-2 4/21/2009	RW-2 7/29/2009	RW-2 8/12/2009
	NYSDEC SCGs										
Total Cadmium	5	< 5	--	--	--	--	--	< 5	< 5	--	--
Dissolved Cadmium	5	< 5	--	--	--	--	--	< 5	< 5	--	--
Total Chromium	50	**24.3**	--	--	--	--	--	**27**	< 10	--	--
Dissolved Chromium	50	**20.2**	--	--	--	--	--	**27**	< 10	--	--
Total Iron	300	< 100	< 100	< 100	< 100	< 100	< 100	< 100	**2,330**	**5,950**	**4,870**
Dissolved Iron	300	< 100	--	--	--	--	--	< 100	**781**	--	--
Total Manganese	300	**23.6**	--	--	--	--	--	**12**	**241**	--	--
Dissolved Manganese	300	**22.4**	--	--	--	--	--	**11**	**248**	--	--
Total Mercury	0.7	< 0.2	--	--	--	--	--	--	< 0.2	--	--
Dissolved Mercury	0.7	< 0.2	--	--	--	--	--	--	< 0.2	--	--

See notes on last page.

Table 10. Concentrations of Metals in Groundwater Samples Collected from Recovery Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1]

COMPOUND (ug/L)	Sample Location: / Sample Date:	RW-2 9/10/2009	RW-2 10/9/2009	RW-2 11/10/2009	RW-2 12/2/2009	RW-2 1/11/2010	RW-2 2/2/2010	RW-2 3/10/2010	RW-2 4/12/2010	RW-2 7/20/2010	RW-2 10/4/2010
	NYSDEC SCGs										
Total Cadmium	5	--	--	--	--	--	--	--	--	--	< 5
Dissolved Cadmium	5	--	--	--	--	--	--	--	--	--	< 5
Total Chromium	50	--	--	--	--	--	--	--	--	--	< 10
Dissolved Chromium	50	--	--	--	--	--	--	--	--	--	< 10
Total Iron	300	**3,550**	**3,800**	**2,040**	**1,260**	**1,140**	**1,000**	**2,550**	**880**	**1,180**	**710**
Dissolved Iron	300	--	--	--	--	--	--	--	--	--	**380**
Total Manganese	300	--	--	--	--	--	--	--	--	--	**187**
Dissolved Manganese	300	--	--	--	--	--	--	--	--	--	**192**
Total Mercury	0.7	--	--	--	--	--	--	--	--	--	--
Dissolved Mercury	0.7	--	--	--	--	--	--	--	--	--	--

See notes on last page.

Table 10. Concentrations of Metals in Groundwater Samples Collected from Recovery Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1]

COMPOUND (ug/L)	Sample Location: / Sample Date:	RW-2 12/6/2010	RW-3 4/22/2009	RW-3 7/29/2009	RW-3 9/10/2009	RW-3 11/10/2009	RW-3 12/2/2009	RW-3 3/10/2010	RW-3 4/12/2010	RW-3 7/20/2010	RW-3 10/4/2010	RW-3 12/6/2010
	NYSDEC SCGs											
Total Cadmium	5	--	< 5	--	--	--	--	--	--	--	< 5	--
Dissolved Cadmium	5	--	< 5	--	--	--	--	--	--	--	< 5	--
Total Chromium	50	--	**22.6**	--	--	--	--	--	--	--	< 10	--
Dissolved Chromium	50	--	< 10	--	--	--	--	--	--	--	< 10	--
Total Iron	300	**590**	**246**	< 100	< 100	< 100	< 100	**200**	**470**	**890**	**350**	**340**
Dissolved Iron	300	**270**	< 100	--	--	--	--	--	--	--	< 100	**150**
Total Manganese	300	--	< 10	--	--	--	--	--	--	--	**35**	--
Dissolved Manganese	300	--	< 10	--	--	--	--	--	--	--	**34**	--
Total Mercury	0.7	--	< 0.2	--	--	--	--	--	--	--	--	--
Dissolved Mercury	0.7	--	< 0.2	--	--	--	--	--	--	--	--	--

See notes on last page.

Table 10. Concentrations of Metals in Groundwater Samples Collected from Recovery Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1)

COMPOUND (ug/L)	Sample Location: / Sample Date:	RW-4 4/22/2009	RW-4 7/29/2009	RW-4 8/12/2009	RW-4 9/10/2009	RW-4 11/10/2009	RW-4 12/2/2009	RW-4 10/4/2010
	NYSDEC SCGs							
Total Cadmium	5	< 5	--	--	--	--	--	< 5
Dissolved Cadmium	5	< 5	--	--	--	--	--	< 5
Total Chromium	50	< 10	--	--	--	--	--	< 10
Dissolved Chromium	50	< 10	--	--	--	--	--	< 10
Total Iron	300	< 100	< 100	< 100	< 100	< 100	< 100	< 100
Dissolved Iron	300	< 100	--	--	--	--	--	< 100
Total Manganese	300	**10.4**	--	--	--	--	--	**28**
Dissolved Manganese	300	< 10	--	--	--	--	--	**29**
Total Mercury	0.7	< 0.2	--	--	--	--	--	--
Dissolved Mercury	0.7	< 0.2	--	--	--	--	--	--

Notes:

(1) Water samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for metals analysis using NYSDEC ASP Method 2000 ILM4.0. Results validated following protocols specified in Sampling and Analysis Plan in the December 2009 DRAFT OM&M Manual (ARCADIS 2009).

Acronyms/Key:

	Indicates an exceedance of an SCG.
700	Bold data indicates that the analyte was detected at or above its reporting limit.
NYSDEC	New York State Department of Environmental Conservation.
ASP	Analytical services protocol.
SCGs	Standards, criteria, and guidance values.
ug/L	Micrograms per liter.
--	Not analyzed.
> 5	Compound not detected above its laboratory quantification limit.

Table 11. Summary of Water Level Elevations, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Well Identification	Well Casing Elevation (ft msl)	Event Date	Baseline (1) 5/8/2009 (ft msl)	Week 2 7/27/09 (ft msl)	Week 3 08/05/09 (ft msl)	Week 6 08/27/09 (ft msl)	Week 7 09/01/09 (ft msl)	Week 8 09/11/09 (ft msl)	Week 9 09/17/09 (ft msl)	Week 10 09/23/09 (ft msl)	Week 20 11/30/09 (ft msl)	1Q2010 2/4/2010 (ft msl)	2Q2010 04/23/10 (ft msl)	3Q2010 08/26/10 (ft msl)	4Q2010 12/10/10 (ft msl)
Recovery Wells															
RW-1	125.18		69.75	NM	NM	70.88	69.85	70.21	70.93	70.74	70.32	70.67	74.38	72.52	71.11
RW-2	124.48		72.27	67.57	65.60	63.42	63.16	63.27	61.51	61.30	63.07	61.80	64.88	63.44	61.35
RW-3	122.84		69.40	68.55	68.49	67.89	68.05	68.04	67.88	67.68	67.29	67.64	71.4	69.44*	68.13
RW-4	121.25		69.25	71.21	71.23	70.55	69.40	70.12	70.77	70.37	70.01	70.35	74.02	71.93	70.56
Monitoring Wells															
B24MW-2	126.96		74.31	74.92	75.04	74.48	74.58	74.56	74.69	74.35	73.54	74.13	76.16	75.86	75.65
B24MW-3	127.11		72.63	73.04	73.07	72.37	71.46	69.71	72.33	72.23	71.71	72.16	75.87	74.10	72.89
B30MW-1	128.33		73.55	73.97	73.92	73.27	73.43	73.35	73.29	73.19	72.68	73.00	76.54	74.96	73.86
BCPMW-1	125.73		73.16	73.57	73.56	72.83	73.16	73.00	72.98	72.79	72.43	72.67	76.26	74.66	73.43
BCPMW-2	126.39		72.55	72.69	72.71	72.01	72.26	72.16	72.04	71.93	71.38	71.83	75.52	73.69	72.55
BCPMW-3	124.94		72.46	72.44	72.39	71.74	71.94	71.82	71.75	71.60	71.12	71.59	75.24	73.40	72.27
BCPMW-4-1	128.76		72.30	72.12	72.13	71.51	70.36	71.55	71.51	71.40	70.96	71.33	75.05	73.13	72.02
BCPMW-4-2	129.15		72.58	72.24	72.16	71.53	70.43	71.59	71.55	71.44	70.95	71.36	75.07	73.16	72.08
BCPMW-4-3	129.19		72.32	72.31	72.31	71.67	70.59	71.81	71.65	71.55	71.07	71.46	75.16	73.26	72.14
BCPMW-5-1	129.37		72.79	73.52	73.42	72.22	72.55	72.36	72.24	72.15	71.77	72.14	75.66	73.94	72.72
BCPMW-6-1	126.01		72.12	72.09	72.09	71.47	71.61	71.58	71.43	71.31	70.85	71.26	74.91	72.96	71.91
BCPMW-6-2	125.16		71.74	71.73	71.73	71.11	71.29	70.53	71.11	70.87	70.58	70.96	74.64	72.60	71.59
BCPMW-7-1	124.81		72.00	72.14	72.14	71.55	71.68	71.62	71.50	71.41	70.94	71.33	74.99	72.99	71.97
MW-200-1	123.49		72.16	72.25	72.22	71.58	70.52	71.74	71.66	72.64	70.95	71.37	75.07	73.14	72.08
MW-201-1	121.69		72.04	71.99	71.96	71.38	71.50	71.40	71.37	72.45	70.69	71.10	74.84	72.87	71.79
MW-202-1	119.27		71.90	72.02	72.94	71.35	71.48	71.46	71.40	72.26	70.72	71.13	74.83	72.82	71.77
MW-203-1	118.25		71.83	72.01	71.93	71.32	71.45	71.40	71.40	72.24	70.69	71.10	74.75	72.77	71.75
Piezometers															
PZ-1a	128.82		72.56	71.90	71.90	71.30	71.40	71.50	71.31	71.20	70.75	71.15	74.87	72.94	71.85
PZ-1b	128.92		72.47	71.76	71.78	71.18	71.35	71.37	71.21	71.11	70.67	71.09	74.78	72.88	71.82
PZ-1c	128.96		72.47	72.26	72.34	71.65	71.21	71.75	71.62	71.48	71.11	71.48	75.15	73.23	72.13
PZ-2a	128.36		72.47	71.88	71.87	71.27	71.41	71.38	71.27	71.15	70.73	71.09	74.82	72.87	71.81
PZ-2b	128.37		72.43	71.87	71.86	71.26	71.40	71.37	71.24	71.13	70.70	71.08	74.77	72.86	71.78
PZ-2c	128.55		72.41	72.21	72.21	71.57	71.75	71.66	71.57	71.44	71.02	71.40	75.05	73.15	72.05
PZ-3	124.99		72.52	71.68	71.72	71.10	71.27	71.18	71.10	71.03	70.52	70.94	74.69	72.71	71.65
PZ-4	125.31		72.50	71.77	71.84	71.20	71.38	71.29	71.21	71.11	70.64	71.07	74.81	72.83	71.78
PZ-5a	129.07		72.50	72.75	72.79	72.12	72.33	72.17	72.12	71.99	71.53	71.94	75.61	73.79	72.59
PZ-5b	129.06		72.50	72.66	72.72	72.01	72.24	72.07	71.98	71.90	71.45	71.84	75.53	73.69	72.51
PZ-6a	125.67		72.50	71.85	71.84	71.24	71.35	71.31	71.21	71.09	70.65	71.03	74.73	72.84	71.70
PZ-6b	125.74		72.50	71.76	71.76	71.16	71.29	71.22	71.12	71.00	72.54	70.93	74.7	72.65	71.58
PZ-7a	125.10		72.50	72.16	72.16	71.57	71.69	71.61	71.52	71.41	70.96	71.32	75.02	73.00	72.00
PZ-7b	125.06		72.50	71.46	71.94	71.31	71.49	71.15	71.29	71.18	70.81	71.21	74.85	72.83	71.83

Notes:
(1) Baseline readings were taken prior to system start-up, which occurred on July 21, 2009.

Acronyms/Key:
ft msl: feet relative to mean sea level
NM: not measured
*: RW-3 water level measurement collected on September 9, 2010.

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Table 12. Summary of Calculated Vertical Groundwater Hydraulic Gradients on December 10, 2010, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Observation Well Pairing		Observed Head		Vertical Distance	Vertical Hydraulic
Shallow	Deep	Shallow (ft msl)	Deep (ft msl)	Between Screens (ft)	Gradient (ft/ft)
PZ-01a	PZ-01b	71.85	71.82	20	-0.0015
PZ-01b	PZ-01c	71.82	72.13	50	0.0062
PZ-02a	PZ-02b	71.81	71.78	20	-0.0015
PZ-02b	PZ-02c	71.78	72.05	50	0.0054
PZ-05a	PZ-05b	72.59	72.51	45	-0.0018
PZ-06a	PZ-06b	71.7	71.58	25	-0.0048
PZ-07a	PZ-07b	72	71.83	48	-0.0035
BCPMW-4-1	BCPMW-4-2	72.02	72.08	21	0.0029
BCPMW-4-2	BCPMW-4-3	72.08	72.14	44	0.0014
BCPMW-6-1	BCPMW-6-2	71.91	71.59	44.5	-0.0072

Positive groundwater hydraulic gradient indicates vertically upward gradient.
Negative groundwater hydraulic gradient indicates vertically downward gradient.

Table 13. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Monitoring Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2]

COMPOUND (ug/L)	Sample Location: / Sample Date:	B24MW-2 4/23/2009	B24MW-2 10/4/2010	B24MW-3 4/20/2009	B24MW-3 10/6/2010	B30MW-1 4/23/2009	B30MW-1 10/4/2010
	NYSDEC SCGs						
1,1,1-Trichloroethane	5	< 5	< 5	**0.62 J**	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	5	< 5	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	1	< 5	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane	5	< 5	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	5	< 5	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethane	0.6	< 5	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane	1	< 5	< 5	< 5	< 5	< 5	< 5
2-Butanone	NE	< 50	< 50	< 50	< 50	< 50	< 50
2-Hexanone	50	< 50	< 50	< 50 J	< 50	< 50	< 50
4-methyl-2-pentanone	50	< 50	< 50	< 50 J	< 50	< 50	< 50
Acetone	NE	< 50 B	< 50	< 50	< 50	< 50 B	< 50 B
Benzene	1	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Bromodichloromethane	50	< 5	< 5	< 5	< 5	< 5	< 5
Bromoform	50	< 5	< 5	< 5	< 5	< 5	< 5
Bromomethane	5	< 5	< 5	< 5	< 5	< 5	< 5
Carbon Disulfide	60	< 5	< 5	< 5	< 5	< 5	< 5
Carbon tetrachloride	5	< 5	< 5	< 5	< 5	< 5	< 5
Chlorobenzene	5	< 5	< 5	< 5	< 5	< 5	< 5
Chlorodifluoromethane (Freon 22)	NE	< 5	< 5	< 5	< 5	< 5	< 5
Chloroethane	5	< 5	< 5	< 5	< 5	< 5	< 5
Chloroform	7	< 5	**0.3 J**	< 5	< 5	< 5	< 5
Chloromethane	5	< 5	< 5	< 5	< 5	< 5	< 5
cis-1,2-dichloroethene	5	< 5	< 5	**10**	**1.2 J**	< 5	< 5
cis-1,3-dichloropropene	0.4	< 5	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane	50	< 5	< 5	< 5	< 5	< 5	< 5
Dichlorodifluoromethane (Freon 12)	5	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	5	< 5	< 5	< 5	< 5	< 5	< 5
Methyl tert-Butyl Ether	5	--	< 5	--	< 5	--	< 5
Methylene Chloride	5	< 5	< 5	< 5	< 5	< 5	< 5
Styrene	5	< 5	< 5	< 5	< 5	< 5	< 5
Tetrachloroethene	5	< 5	< 5	**0.51 J**	< 5	< 5	< 5
Toluene	5	< 5	< 5	< 5	< 5	< 5	< 5
trans-1,2-dichloroethene	5	< 5	< 5	< 5	< 5	< 5	< 5
trans-1,3-dichloropropene	0.4	< 5	< 5	< 5	< 5	< 5	< 5
Trichloroethylene	5	**3.7 J**	**4.4 J**	**45**	**5.9**	< 5	< 5
Trichlorotrifluoroethane (Freon 113)	5	< 5	< 5	< 5	< 5	< 5	< 5
Vinyl Chloride	2	< 2	< 2	< 2	< 2	< 2	< 2
Xylene-o	5	< 5	< 5	< 5	< 5	< 5	< 5
Xylenes - m,p	5	< 5	< 5	< 5	< 5	< 5	< 5
Total VOCs [3]		**3.7**	**4.7**	**56**	**7.1**	0	0
Project VOCs [4]		**3.7**	**4.4**	**56**	**7.1**	0	0

See notes on last page.

Table 13. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Monitoring Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2]

COMPOUND (ug/L)	Sample Location: / Sample Date:	BCPMW-1 4/28/2009	BCPMW-2 4/28/2009	BCPMW-3 4/29/2009	BCPMW-4-1 4/17/2009	BCPMW-4-1 12/1/2009	BCPMW-4-1 10/4/2010
	NYSDEC SCGs						
1,1,1-Trichloroethane	5	< 5	< 10	< 25	< 25	**2.4 J**	**14 J**
1,1,2,2-Tetrachloroethane	5	< 5	< 10	< 25	< 25	< 5	< 25
1,1,2-Trichloroethane	1	< 5	< 10	< 25	< 25	**0.38 J**	< 25
1,1-Dichloroethane	5	**0.37 J**	**8 J**	**9.6 J**	**6.5 J**	**46**	**38**
1,1-Dichloroethene	5	< 5	**3.8 J**	**43**	**1.8 J**	**14**	**21 J**
1,2-Dichloroethane	0.6	< 5	**0.68 J**	< 25	< 25	**0.65 J**	< 25
1,2-Dichloropropane	1	< 5	< 10	< 25	< 25	**4.7 J**	**3.8 J**
2-Butanone	NE	< 50	< 100	< 250	< 250	< 50	< 250
2-Hexanone	50	< 50	< 100	< 250	< 250 J	< 50	< 250
4-methyl-2-pentanone	50	< 50	< 100	< 250	< 250 J	< 50	< 250
Acetone	NE	< 50 B	< 100	< 250	< 250 J	< 50	< 250
Benzene	1	< 0.7	< 1.4	< 3.5	< 3.5	**0.44 J**	< 3.5
Bromodichloromethane	50	< 5	< 10	< 25	< 25	< 5	< 25
Bromoform	50	< 5	< 10	< 25	< 25	< 5	< 25
Bromomethane	5	< 5	< 10	< 25	< 25	R	< 25
Carbon Disulfide	60	< 5	< 10	< 25	< 25	< 5	< 25
Carbon tetrachloride	5	< 5	< 10	< 25	< 25	< 5	< 25
Chlorobenzene	5	< 5	< 10	< 25	< 25	< 5	< 25
Chlorodifluoromethane (Freon 22)	NE	< 5	< 10	< 25	**17 J**	**6.2**	**4.3 J**
Chloroethane	5	< 5	< 10	< 25	< 25	**2.4 J**	**4.1 J**
Chloroform	7	**0.88 J**	< 10	< 25	< 25	< 5	< 25
Chloromethane	5	< 5	< 10	< 25	< 25	R	< 25
cis-1,2-dichloroethene	5	**22**	**310**	**900**	**1800 D**	**750 D**	**510**
cis-1,3-dichloropropene	0.4	< 5	< 10	< 25	< 25	< 5	< 25
Dibromochloromethane	50	< 5	< 10	< 25	< 25	< 5	< 25
Dichlorodifluoromethane (Freon 12)	5	< 5	< 10	< 25	< 25	< 5	< 25
Ethylbenzene	5	< 5	< 10	< 25 B	< 25	< 5	< 25
Methyl tert-Butyl Ether	5	--	--	--	--	--	< 25
Methylene Chloride	5	**0.52 J**	< 10	< 25	< 25	< 5	< 25
Styrene	5	< 5	< 10	< 25	< 25	< 5	< 25
Tetrachloroethene	5	< 5	**1.5 J**	< 25	< 25	**0.64 J**	< 25
Toluene	5	**0.33 J**	< 10	< 25 B	< 25	< 5	< 25
trans-1,2-dichloroethene	5	**0.44 J**	**2.4 J**	**8.9 J**	**110**	**2.5 J**	**3.9 J**
trans-1,3-dichloropropene	0.4	< 5	< 10	< 25	< 25	< 5	< 25
Trichloroethylene	5	**190**	**180**	**470**	**22 J**	**170**	**45**
Trichlorotrifluoroethane (Freon 113)	5	< 5	< 10	< 25	< 25	< 5	< 25
Vinyl Chloride	2	< 2	**4.1**	**300**	**180**	**540 D**	**220**
Xylene-o	5	< 5	< 10	< 25 B	< 25	**8**	< 25
Xylenes - m,p	5	< 5	< 10	< 25 B	< 25	< 5	< 25
Total VOCs [3]		**215**	**510**	**1,732**	**2,137**	**1,548**	**864**
Project VOCs [4]		**213**	**511**	**1,732**	**2,120**	**1,535**	**852**

See notes on last page.

Table 13. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Monitoring Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2]

COMPOUND (ug/L)	Sample Location: / Sample Date:	BCPMW-4-2 4/17/2009	BCPMW-4-2 12/4/2009	BCPMW-4-2 10/7/2010	BCPMW-4-3 4/17/2009	BCPMW-4-3 12/1/2009	BCPMW-4-3 10/7/2010
	NYSDEC SCGs						
1,1,1-Trichloroethane	5	< 250	< 10	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	5	< 250	< 10	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	1	< 250	< 10	< 5	< 5	< 5	< 5
1,1-Dichloroethane	5	**57 J**	**8.7 J**	**7.3**	< 5	< 5	< 5
1,1-Dichloroethene	5	**34 J**	**2.7 J**	**1.9 J**	< 5	< 5	< 5
1,2-Dichloroethane	0.6	< 250	< 10	**0.91 J**	< 5	< 5	< 5
1,2-Dichloropropane	1	< 250	< 10	**0.9 J**	< 5	< 5	< 5
2-Butanone	NE	< 2500	< 100	< 50	< 50	< 50	< 50
2-Hexanone	50	< 2500 J	< 100	< 50	< 50 J	< 50	< 50
4-methyl-2-pentanone	50	< 2500 J	< 100	< 50	< 50 J	< 50	< 50
Acetone	NE	< 2500 J	< 100	< 50 B	< 50 J	< 50	< 50
Benzene	1	< 35	< 1.4	< 0.7	< 0.7	< 0.7	< 0.7
Bromodichloromethane	50	< 250	< 10	< 5	< 5	< 5	< 5
Bromoform	50	< 250	< 10	< 5	< 5	< 5	< 5
Bromomethane	5	< 250	< 10	< 5	< 5	< 5	< 5
Carbon Disulfide	60	< 250	< 10	< 5	< 5	< 5	< 5
Carbon tetrachloride	5	< 250	< 10	< 5	< 5	< 5	< 5
Chlorobenzene	5	< 250	< 10	< 5	< 5	< 5	< 5
Chlorodifluoromethane (Freon 22)	NE	< 250	**0.8 J**	< 5	< 5	< 5	< 5
Chloroethane	5	< 250	**1.1 J**	**0.79 J**	< 5	< 5	< 5
Chloroform	7	< 250	< 10	**0.96 J**	**0.53 J**	**0.32 J**	< 5
Chloromethane	5	< 250	R	< 5	< 5	R	< 5
cis-1,2-dichloroethene	5	**18000 D**	**270**	**99**	**0.37 J**	< 5	< 5
cis-1,3-dichloropropene	0.4	< 250	< 10	< 5	< 5	< 5	< 5
Dibromochloromethane	50	< 250	< 10	< 5	< 5	< 5	< 5
Dichlorodifluoromethane (Freon 12)	5	< 250	< 10	< 5	< 5	< 5	< 5
Ethylbenzene	5	**62 J**	**0.78 J**	< 5	< 5	< 5	< 5
Methyl tert-Butyl Ether	5	**--**	**--**	**0.35 J**	--	--	< 5
Methylene Chloride	5	< 250	< 10	< 5	< 5	< 5	< 5
Styrene	5	< 250	< 10	< 5	< 5	< 5	< 5
Tetrachloroethene	5	< 250	**0.82 J**	**0.73 J**	< 5	< 5	< 5
Toluene	5	**2400**	< 10 B	< 5	< 5	< 5	< 5
trans-1,2-dichloroethene	5	< 250	**1.3 J**	**0.65 J**	< 5	< 5	< 5
trans-1,3-dichloropropene	0.4	< 250	< 10	< 5	< 5	< 5	< 5
Trichloroethylene	5	< 250	**310**	**66**	**0.56 J**	**0.51 J**	**0.41 J**
Trichlorotrifluoroethane (Freon 113)	5	< 250	< 10	< 5	< 5	< 5	< 5
Vinyl Chloride	2	**6300**	**58**	**54**	< 2	< 2	< 2
Xylene-o	5	**110 J**	< 10 B	< 5	< 5	< 5	< 5
Xylenes - m,p	5	**190 J**	< 10 B	< 5	< 5	< 5	< 5
Total VOCs [3]		**27,153**	**655**	**233**	**1.5**	**0.83**	**0.41**
Project VOCs [4]		**27,091**	**652**	**231**	**0.9**	**0.51**	**0.41**

See notes on last page.

Table 13. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Monitoring Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2]

COMPOUND (ug/L)	Sample Location: / Sample Date:	BCPMW-5-1 4/23/2009	BCPMW-6-1 4/20/2009	BCPMW-6-1 12/4/2009	BCPMW-6-1 10/6/2010	BCPMW-6-2 5/8/2009	BCPMW-6-2 12/4/2009
	NYSDEC SCGs						
1,1,1-Trichloroethane	5	< 100	< 5	< 5	< 100	< 5	**0.78 J**
1,1,2,2-Tetrachloroethane	5	< 100	< 5	< 5	< 100	< 5	< 5
1,1,2-Trichloroethane	1	< 100	< 5	< 5	< 100	< 5	< 5
1,1-Dichloroethane	5	< 100	**0.3 J**	< 5	< 100	**0.37 J**	**0.65 J**
1,1-Dichloroethene	5	**21 J**	< 5	< 5	< 100	< 5	**0.44 J**
1,2-Dichloroethane	0.6	< 100	< 5	< 5	< 100	< 5	< 5
1,2-Dichloropropane	1	< 100	< 5	< 5	< 100	< 5	< 5
2-Butanone	NE	< 1000	< 50	< 50	< 1000	< 50	< 50
2-Hexanone	50	< 1000	< 50 J	< 50	< 1000	< 50	< 50
4-methyl-2-pentanone	50	< 1000	< 50 J	< 50	< 1000	< 50	< 50
Acetone	NE	< 1000	< 50 J	< 50	< 1000	< 50	< 50
Benzene	1	< 14	< 0.7	< 0.7	< 14	< 0.7	< 0.7
Bromodichloromethane	50	< 100	< 5	< 5	< 100	< 5	< 5
Bromoform	50	< 100	< 5	< 5	< 100	< 5	< 5
Bromomethane	5	< 100	< 5	R	< 100	< 5	R
Carbon Disulfide	60	< 100	< 5	< 5	< 100	< 5	< 5
Carbon tetrachloride	5	< 100	< 5	< 5	< 100	< 5	< 5
Chlorobenzene	5	< 100	< 5	< 5	< 100	< 5	< 5
Chlorodifluoromethane (Freon 22)	NE	< 100	**4500 D**	**1700 EJ**	**10000 D**	< 5	< 5
Chloroethane	5	< 100	< 5	< 5	< 100	< 5	< 5
Chloroform	7	< 100	**1.7 J**	**0.32 J**	< 100	**0.53 J**	< 5
Chloromethane	5	< 100	< 5	R	< 100	< 5	R
cis-1,2-dichloroethene	5	**960**	**21**	**1.7 J**	< 100	< 5	< 5
cis-1,3-dichloropropene	0.4	< 100	< 5	< 5	< 100	< 5	< 5
Dibromochloromethane	50	< 100	< 5	< 5	< 100	< 5	< 5
Dichlorodifluoromethane (Freon 12)	5	< 100	< 5	< 5	< 100	< 5	< 5
Ethylbenzene	5	**48 J**	< 5	< 5	< 100	< 5	< 5
Methyl tert-Butyl Ether	5	**--**	--	--	<100	--	--
Methylene Chloride	5	< 100	< 5	< 5	< 100	< 5	< 5
Styrene	5	< 100	< 5	< 5	< 100	< 5	< 5
Tetrachloroethene	5	< 100	**0.34 J**	< 5	< 100	< 5	**0.79 J**
Toluene	5	**2700**	< 5	< 5	< 100	< 5	< 5
trans-1,2-dichloroethene	5	< 100	< 5	< 5	< 100	< 5	< 5
trans-1,3-dichloropropene	0.4	< 100	< 5	< 5	< 100	< 5	< 5
Trichloroethylene	5	**220**	**4.9 J**	**1.6 J**	< 100	< 5	**0.45 J**
Trichlorotrifluoroethane (Freon 113)	5	< 100	< 5	< 5	< 100	< 5	< 5
Vinyl Chloride	2	**330**	< 2	< 2	< 40	< 2	< 2
Xylene-o	5	**40 J**	< 5	< 5	< 100	< 5	< 5
Xylenes - m,p	5	**110**	< 5	< 5	< 100	< 5	< 5
Total VOCs [3]		**4,429**	**4,528**	**1,704**	**10,000**	**0.9**	**3.1**
Project VOCs [4]		**4,381**	**27**	**2.3**	**0**	**0.4**	**3.1**

See notes on last page.

Table 13. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Monitoring Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2]

COMPOUND (ug/L)	Sample Location: Sample Date:	NYSDEC SCGs	BCPMW-6-2 10/6/2010	BCPMW-7-1 4/20/2009	BCPMW-7-1 12/1/2009	BCPMW-7-1 10/7/2010	MW-200-1 4/29/2009	MW-200-1 12/2/2009
1,1,1-Trichloroethane		5	< 5	< 5	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane		5	< 5	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane		1	< 5	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane		5	**0.47 J**	< 5	< 5	< 5	**0.79 J**	< 5
1,1-Dichloroethene		5	< 5	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethane		0.6	< 5	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane		1	< 5	< 5	< 5	< 5	< 5	< 5
2-Butanone		NE	< 50	< 50	< 50	< 50	< 50	< 50
2-Hexanone		50	< 50	< 50 J	< 50	< 50	< 50	< 50
4-methyl-2-pentanone		50	< 50	< 50 J	< 50	< 50	< 50	< 50
Acetone		NE	< 50	< 50	< 50	< 50	< 50 B	< 50
Benzene		1	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Bromodichloromethane		50	< 5	< 5	< 5	< 5	< 5	< 5
Bromoform		50	< 5	< 5	< 5	< 5	< 5	< 5
Bromomethane		5	< 5	< 5	R	< 5	< 5	R
Carbon Disulfide		60	< 5	< 5	< 5	< 5	< 5	< 5
Carbon tetrachloride		5	< 5	< 5	< 5	< 5	< 5	< 5
Chlorobenzene		5	< 5	< 5	< 5	< 5	< 5	< 5
Chlorodifluoromethane (Freon 22)		NE	< 5	**2.6 J**	**1.5 J**	**5.2**	< 5	< 5
Chloroethane		5	< 5	< 5	< 5	< 5	< 5	< 5
Chloroform		7	**0.41 J**	< 5	< 5	< 5	**2.3 J**	**2.3 J**
Chloromethane		5	< 5	< 5	R	< 5	< 5	R
cis-1,2-dichloroethene		5	< 5	< 5	< 5	< 5	**38**	**5.7**
cis-1,3-dichloropropene		0.4	< 5	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane		50	< 5	< 5	< 5	< 5	< 5	< 5
Dichlorodifluoromethane (Freon 12)		5	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene		5	< 5	< 5	< 5	< 5	< 5	< 5
Methyl tert-Butyl Ether		5	<5	--	--	< 5	--	--
Methylene Chloride		5	< 5	< 5	< 5	< 5	< 5	< 5
Styrene		5	< 5	< 5	< 5	< 5	< 5	< 5
Tetrachloroethene		5	**2.1 J**	< 5	< 5	< 5	**0.54 J**	< 5
Toluene		5	< 5	< 5	< 5	< 5	< 5	< 5
trans-1,2-dichloroethene		5	< 5	< 5	< 5	< 5	**0.3 J**	< 5
trans-1,3-dichloropropene		0.4	< 5	< 5	< 5	< 5	< 5	< 5
Trichloroethylene		5	< 5	< 5	< 5	< 5	**34**	**12**
Trichlorotrifluoroethane (Freon 113)		5	< 5	< 5	< 5	< 5	< 5	< 5
Vinyl Chloride		2	< 2	< 2	< 2	< 2	< 2	< 2
Xylene-o		5	< 5	< 5	< 5	< 5	< 5	< 5
Xylenes - m,p		5	< 5	< 5	< 5	< 5	< 5	< 5
Total VOCs [3]			**3.0**	**2.6**	**1.5**	**5.2**	**76**	**20**
Project VOCs [4]			**2.6**	**0.0**	**0.0**	**0.0**	**74**	**18**

See notes on last page.

Table 13. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Monitoring Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2]

COMPOUND (ug/L)	Sample Location: / Sample Date:	MW-200-1 10/5/2010	MW-201-1 5/1/2009	MW-201-1 12/2/2009	MW-201-1 10/5/2010	MW-202-1 5/1/2009	MW-202-1 12/2/2009
	NYSDEC SCGs						
1,1,1-Trichloroethane	5	< 5	**5.5 J**	**3.3 J**	< 50	< 5	< 5
1,1,2,2-Tetrachloroethane	5	< 5	< 25	< 50	< 50	< 5	< 5
1,1,2-Trichloroethane	1	< 5	< 25	< 50	< 50	< 5	< 5
1,1-Dichloroethane	5	< 5	**10 J**	**9 J**	**14 J**	< 5	< 5
1,1-Dichloroethene	5	< 5	**7.9 J**	**8.1 J**	**6.9 J**	< 5	< 5
1,2-Dichloroethane	0.6	< 5	< 25	< 50	< 50	< 5	< 5
1,2-Dichloropropane	1	< 5	< 25	< 50	< 50	< 5	< 5
2-Butanone	NE	< 50	< 250	< 500	< 500	< 50	< 50
2-Hexanone	50	< 50	< 250	< 500	< 500	< 50	< 50
4-methyl-2-pentanone	50	< 50	< 250	< 500	< 500	< 50	< 50
Acetone	NE	< 50	< 250 B	< 500	< 500	< 50	< 50
Benzene	1	< 0.7	< 3.5	< 7	< 7	< 0.7	< 0.7
Bromodichloromethane	50	< 5	< 25	< 50	< 50	< 5	< 5
Bromoform	50	< 5	< 25	< 50	< 50	< 5	< 5
Bromomethane	5	< 5	< 25	< 50	< 50	< 5	< 5
Carbon Disulfide	60	< 5	< 25	< 50	< 50	< 5	< 5
Carbon tetrachloride	5	< 5	< 25	< 50	< 50	< 5	< 5
Chlorobenzene	5	< 5	< 25	< 50	< 50	< 5	< 5
Chlorodifluoromethane (Freon 22)	NE	< 5	< 25	< 50	< 50	< 5	< 5
Chloroethane	5	< 5	< 25	< 50	< 50	< 5	< 5
Chloroform	7	**0.5 J**	< 25	< 50	**4.2 J**	**6.2**	**6.7**
Chloromethane	5	< 5	< 25	R	< 50	< 5	< 5
cis-1,2-dichloroethene	5	**3.5 J**	**970 D**	**1300**	**3900 D**	**0.64 J**	**0.58 J**
cis-1,3-dichloropropene	0.4	< 5	< 25	< 50	< 50	< 5	< 5
Dibromochloromethane	50	< 5	< 25	< 50	< 50	< 5	< 5
Dichlorodifluoromethane (Freon 12)	5	< 5	< 25	< 50	< 50	< 5	< 5
Ethylbenzene	5	< 5	< 25	< 50	< 50	< 5	< 5
Methyl tert-Butyl Ether	5	< 5	--	--	<50	--	--
Methylene Chloride	5	< 5	< 25	< 50	< 50	< 5	< 5
Styrene	5	< 5	< 25	< 50	< 50	< 5	< 5
Tetrachloroethene	5	< 5	< 25	< 50	< 50	< 5	< 5
Toluene	5	< 5	< 25	< 50	< 50	< 5	< 5
trans-1,2-dichloroethene	5	< 5	**2.7 J**	**3.5 J**	**6.7 J**	< 5	< 5
trans-1,3-dichloropropene	0.4	< 5	< 25	< 50	< 50	< 5	< 5
Trichloroethylene	5	**7**	**160**	**230**	**72**	**7.5**	**9.3**
Trichlorotrifluoroethane (Freon 113)	5	< 5	< 25	< 50	< 50 U	< 5	< 5
Vinyl Chloride	2	< 2	< 10	**38**	**820**	< 2	< 2
Xylene-o	5	< 5	< 25	< 50	**7.2 J**	< 5	< 5
Xylenes - m,p	5	< 5	< 25	< 50	< 50	< 5	< 5
Total VOCs [3]		**11**	**1,156**	**1,592**	**4,831**	**14**	**17**
Project VOCs [4]		**11**	**1,156**	**1,592**	**4,827**	**8.1**	**9.9**

See notes on last page.

Table 13. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Monitoring Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2]

COMPOUND (ug/L)	Sample Location: / Sample Date:	MW-202-1 10/6/2010	MW-203-1 5/1/2009	MW-203-1 12/2/2009	MW-203-1 10/5/2010
	NYSDEC SCGs				
1,1,1-Trichloroethane	5	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	1	< 5	< 5	< 5	< 5
1,1-Dichloroethane	5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	5	< 5	< 5	< 5	< 5
1,2-Dichloroethane	0.6	< 5	< 5	< 5	< 5
1,2-Dichloropropane	1	< 5	< 5	< 5	< 5
2-Butanone	NE	< 50	< 50	< 50	< 50
2-Hexanone	50	< 50	< 50	< 50	< 50
4-methyl-2-pentanone	50	< 50	< 50	< 50	< 50
Acetone	NE	< 50	< 50 B	< 50	< 50 B
Benzene	1	< 0.7	< 0.7	< 0.7	< 0.7
Bromodichloromethane	50	< 5	< 5	< 5	< 5
Bromoform	50	< 5	< 5	< 5	< 5
Bromomethane	5	< 5	< 5	< 5	< 5
Carbon Disulfide	60	< 5	< 5	< 5	< 5
Carbon tetrachloride	5	< 5	< 5	< 5	< 5
Chlorobenzene	5	< 5	< 5	< 5	< 5
Chlorodifluoromethane (Freon 22)	NE	**0.61 J**	**73**	**17**	**29**
Chloroethane	5	< 5	< 5	< 5	< 5
Chloroform	7	**0.93 J**	**7.9**	**2.6 J**	**1.5 J**
Chloromethane	5	< 5	< 5	< 5	< 5
cis-1,2-dichloroethene	5	< 5	**1.6 J**	**0.83 J**	**0.97 J**
cis-1,3-dichloropropene	0.4	< 5	< 5	< 5	< 5
Dibromochloromethane	50	< 5	< 5	< 5	< 5
Dichlorodifluoromethane (Freon 12)	5	< 5	< 5	< 5	< 5
Ethylbenzene	5	< 5	< 5	< 5	< 5
Methyl tert-Butyl Ether	5	< 5	--	--	**0.88 J**
Methylene Chloride	5	< 5	< 5	< 5	< 5
Styrene	5	< 5	< 5	< 5	< 5
Tetrachloroethene	5	**0.48 J**	< 5	< 5	< 5
Toluene	5	< 5	< 5	< 5	< 5
trans-1,2-dichloroethene	5	< 5	< 5	< 5	< 5
trans-1,3-dichloropropene	0.4	< 5	< 5	< 5	< 5
Trichloroethylene	5	**2.4 J**	**1.3 J**	**0.7 J**	**1.6 J**
Trichlorotrifluoroethane (Freon 113)	5	**0.43 J**	< 5	< 5	< 5
Vinyl Chloride	2	< 2	< 2	< 2	< 2
Xylene-o	5	< 5	< 5	< 5	< 5
Xylenes - m,p	5	< 5	< 5	< 5	< 5
Total VOCs [3]		**4.9**	**84**	**21**	**34**
Project VOCs [4]		**2.9**	**2.9**	**1.5**	**2.6**

See notes on last page.

Table 13. Concentrations of Volatile Organic Compounds in Groundwater Samples Collected from Monitoring Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1,2)

Notes:

(1) Results validated following protocols specified in Sampling and Analysis Plan in the December 2009 DRAFT OM&M Manual (ARCADIS 2009).
(2) Samples analyzed for the TCL VOCs using NYSDEC ASP 2000 Method OLM4.2.
(3) "Total VOCs" represents the sum of individual concentrations of the VOCs detected.
(4) "Project VOCs" represents the sum of individual compound concentrations of 1,1,1-Trichloroethane; 1,1-Dichloroethane; 1,2-Dichloroethane; 1,1-Dichloroethene; Tetrachloroethene; Trichloroethene; Vinyl Chloride; cis-1,2-Dichloroethene; trans-1,2-Dichloroethene; Benzene; Toluene; and Xylenes-o,m, and p.

Acronyms\Key:

Indicates an exceedance of an SCG.
Bold value indicates a detection.

RI/FS	Remedial Investigation/Feasibility Study.
NYSDEC	New York State Department of Environmental Conservation.
TCL	Target compound list.
VOC	Volatile Organic Compound.
ASP	Analytical services protocol.
SCGs	Standards, criteria, and guidance values.
ug/L	Micrograms per liter.
NE	Not established.
E	Concentration for the constituent exceeded the calibration range.
J	Value is estimated.
D	Constituent identified from secondary dilution.
R	Concentration for the constituent was rejected.
B	Compound detected in associated blank sample.
< 5	Compound not detected above its laboratory quantification limit.

Table 14. Concentrations of Metals in Groundwater Samples Collected from Monitoring Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1,2)

COMPOUND (ug/L)	Sample Location: / Sample Date:	B24MW-2 4/23/2009	B24MW-3 4/20/2009	BCPMW-1 4/28/2009	BCPMW-2 4/28/2009	BCPMW-3 4/29/2009	BCPMW-4-1 4/17/2009	BCPMW-4-1 10/4/2010	BCPMW-4-2 4/17/2009	BCPMW-4-2 10/7/2010
	NYSDEC SCGs									
Cadmium (total)	5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Cadmium (dissolved)	5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	--
Chromium (total)	50	**40.3**	**28.2**	**20.8**	< 10	< 10	**22.7**	**43**	**10.6**	< 10
Chromium (dissolved)	50	< 10	**10.6**	< 10	< 10	< 10	**12.8**	**41**	< 10	--
Iron (total)	300	--	**597**	--	< 100	**2,080**	**103**	**--**	**4,630**	**--**
Iron (dissolved)	300	--	< 100	--	< 100	**1,760**	< 100	**--**	**4,080**	**--**
Manganese (total)	300	--	**16.9**	--	**12.7**	**51.4**	**11.2**	**--**	**228**	**--**
Manganese (dissolved)	300	--	**13.7**	--	**11.3**	**49.2**	< 10	**--**	**217**	**--**

See notes on last page.

Table 14. Concentrations of Metals in Groundwater Samples Collected from Monitoring Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2]

COMPOUND (ug/L)	Sample Location: / Sample Date:	BCPMW-4-3 4/17/2009	BCPMW-4-3 10/7/2010	BCPMW-5-1 4/23/2009	BCPMW-6-1 4/20/2009	BCPMW-6-1 10/6/2010	BCPMW-6-2 5/8/2009	BCPMW-6-2 10/6/2010	BCPMW-7-1 4/20/2009	BCPMW-7-1 10/7/2010
	NYSDEC SCGs									
Cadmium (total)	5	< 5	< 5	< 5	< 5	<5	< 5	<5	< 5	< 5
Cadmium (dissolved)	5	< 5	< 5	< 5	< 5	<5	< 5	<5	< 5	< 5
Chromium (total)	50	< 10	< 10	< 10	< 10	< 10	**10.3**	<10	< 10	< 10
Chromium (dissolved)	50	< 10	< 10	< 10	< 10	<10	< 10	<10	< 10	< 10
Iron (total)	300	< 100	--	**7,420**	< 100	--	--	--	< 100	--
Iron (dissolved)	300	< 100	--	**6,370**	< 100	--	--	--	< 100	--
Manganese (total)	300	< 10	--	**145**	< 10	--	--	--	**106**	**--**
Manganese (dissolved)	300	< 10	--	**131**	< 10	--	--	--	**94.8**	**--**

See notes on last page.

Table 14. Concentrations of Metals in Groundwater Samples Collected from Monitoring Wells, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1,2)

COMPOUND (ug/L)	Sample Location: / Sample Date:	MW-200-1 4/29/2009	MW-200-1 10/5/2010	MW-201-1 5/1/2009	MW-201-1 10/5/2010	MW-202-1 5/1/2009	MW-202-1 10/6/2010	MW-203-1 5/1/2009	MW-203-1 10/5/2010
	NYSDEC SCGs								
Cadmium (total)	5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Cadmium (dissolved)	5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chromium (total)	50	< 10	**14**	< 10	< 10	**16.5**	**15**	**31.5**	**31**
Chromium (dissolved)	50	< 10	< 10	< 10	< 10	< 10	<10	< 10	< 10
Iron (total)	300	--	--	--	--	--	--	--	--
Iron (dissolved)	300	--	--	--	--	--	--	--	--
Manganese (total)	300	--	--	--	--	--	--	--	--
Manganese (dissolved)	300	--	--	--	--	--	--	--	--

Notes:

(1) Results validated following protocols specified in Sampling and Analysis Plan in the December 2009 DRAFT OM&M Manual (ARCADIS 2009).

(2) Samples analyzed for the metals using NYSDEC ASP Method 2000 ILM4.0.

Acronyms/Key:

Indicates an exceedance of an SCG.

Bold value indicates a detection.

RI/FS Remedial Investigation/Feasibility Study.

NYSDEC New York State Department of Environmental Conservation.

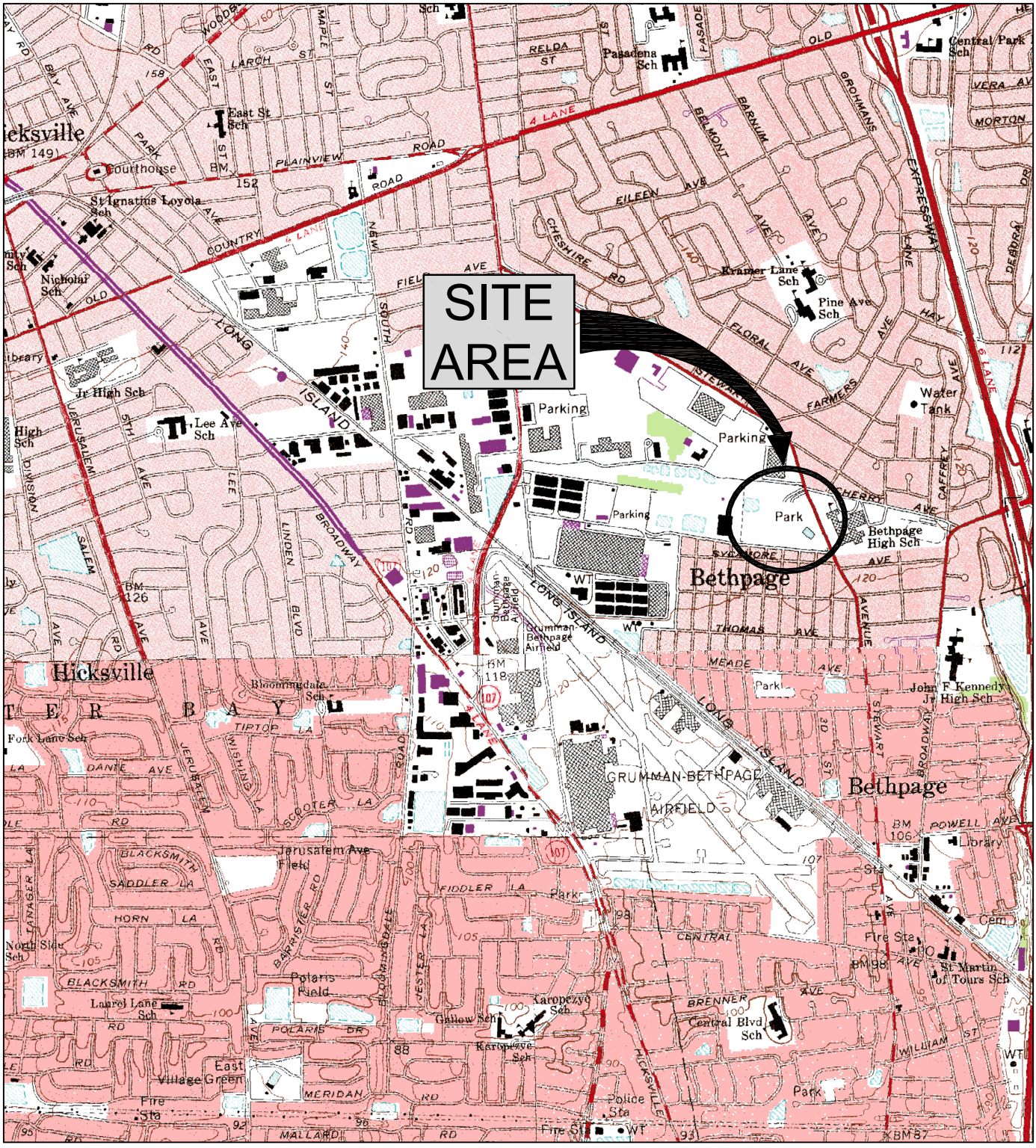
ASP Analytical services protocol.

SCGs Standards, criteria, and guidance values.

ug/L Micrograms per liter.

-- Not analyzed.

< 5 Compound not detected above its laboratory quantification limit.



SOURCE:
USGS 7.5 MIN. AMITYVILLE QUADRANGLE, AMITYVILLE, NY. 1994
USGS 7.5 MIN. FREEPORT QUADRANGLE, FREEPORT, NY., 1994
USGS 7.5 MIN. HICKSVILLE QUADRANGLE, HICKSVILLE, NY., 1967, PHOTOREVISED 1979
USGS 7.5 MIN. HUNTINGTON QUADRANGLE, HUNTINGTON, NY. 1967, PHOTOREVISED 1979

GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
BETHPAGE, NEW YORK

SITE AREA LOCATION

ARCADIS

FIGURE
1

CITY:MELVILLE DIV/GROUP:ENR1 DB:ALS LD: PIC: PM:CSG TM:BW LYR:ON=*;OFF=*REF*
G:\APROJECT\Northrop Grumman\Superfund\2010\OU3\NY001496.0910 OM&M\Task 2 GW IRM\Reports\3rd Quarter 2010\Figures\cadd\01_sitelocation.dwg LAYOUT: 1 SAVED: 11/12/2010 3:24 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ARCADIS_MELVILLE.CTB PLOTTED: 4/1/2011 3:01 PM BY: SANCHEZ, ADRIAN
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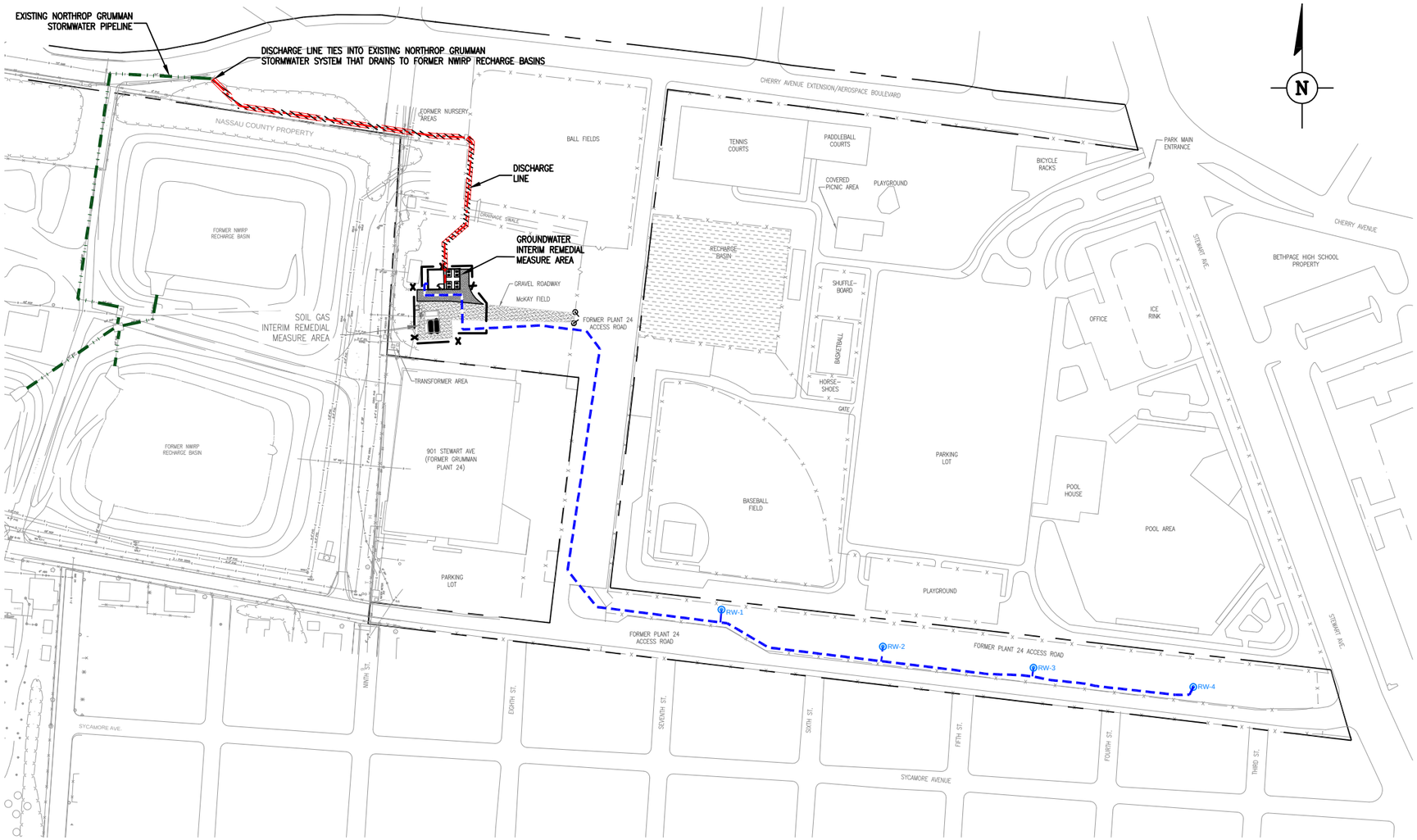

GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
BETHPAGE, NEW YORK

SITE AND GROUNDWATER INTERIM REMEDIAL MEASURE LAYOUT

ARCADIS

FIGURE
2

CITY:MELVILLE DIV/GROUP:ENR1 DB:ALS LD: PIC: PM:CSG TM: LYR:ON=*;OFF=*REF*
G:\APROJECT\Northrop Grumman\Superfund\2010\OU3\NY001496.0910 OM&M\Task 2 GW IRM\Reports\3rd Quarter 2010\Figures\cadd\02_sitesystemlayout.dwg LAYOUT: 2 SAVED: 11/12/2010 2:51 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ARCADIS_MELVILLE.CTB
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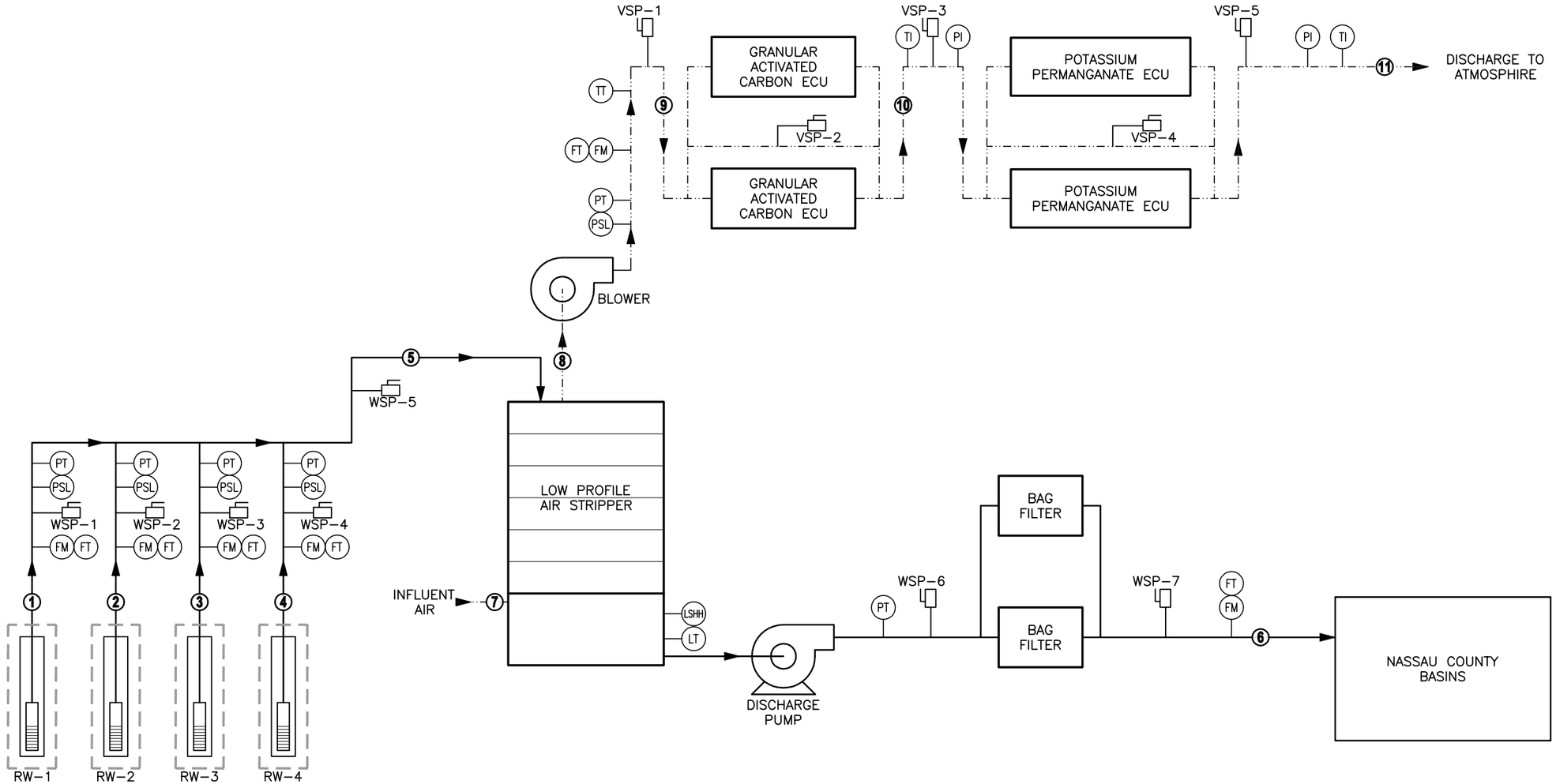
BCP_Aerial.jpg



LEGEND:

- PROCESS WATER
- PROCESS AIR
- FM — INSTRUMENT
- SAMPLE PORT
- FLOW DIRECTION
- FM FLOW METER
- FT FLOW RATE TRANSMITTER
- PSL PRESSURE VACUUM LOW
- PT PRESSURE TRANSMITTER
- PI PRESSURE INDICATOR
- LSHH LEVEL SWITCH HIGH HIGH
- LT LEVEL TRANSMITTER
- TT TEMPERATURE TRANSMITTER
- TI TEMPERATURE INDICATOR
- ⑧ PROCESS DESIGNATION
- WSP WATER SAMPLE PORT
- VSP VAPOR SAMPLE PORT

PROCESS	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪
Mass Loading (lbs/day)											
Trichloroethene	0.009	0.041	0.082	0.008	0.140	<0.008	0.000	0.140	0.140	<0.014	<0.014
cis -1,2 Dichloroethene	0.007	1.877	0.431	0.030	2.346	<0.008	0.000	2.346	2.346	<0.235	<0.235
Vinyl Chloride	0.000	0.443	0.001	0.000	0.444	<0.003	0.000	0.444	0.444	0.444	<0.044
Flow Rate (gpm)	40	85	85	40	250	250	---	---	---	---	---
Flow Rate (CFM)	---	---	---	---	---	---	1,300 - 1,600	1,300	1,535	1,557	1,581
Pressure (feet of water)	10	10	10	10	8	15	---	---	---	---	---
Pressure (inches of water)	---	---	---	---	---	---	0	- 28 to - 38	12	6	0
pH	6.4	6.4	6.4	6.4	6.4	6.2	---	---	---	---	---
Temperature	55	55	55	55	55	55	10	55	97	95	95
Relative Humidity	---	---	---	---	---	---	20 - 80	100	<50	<50	<50

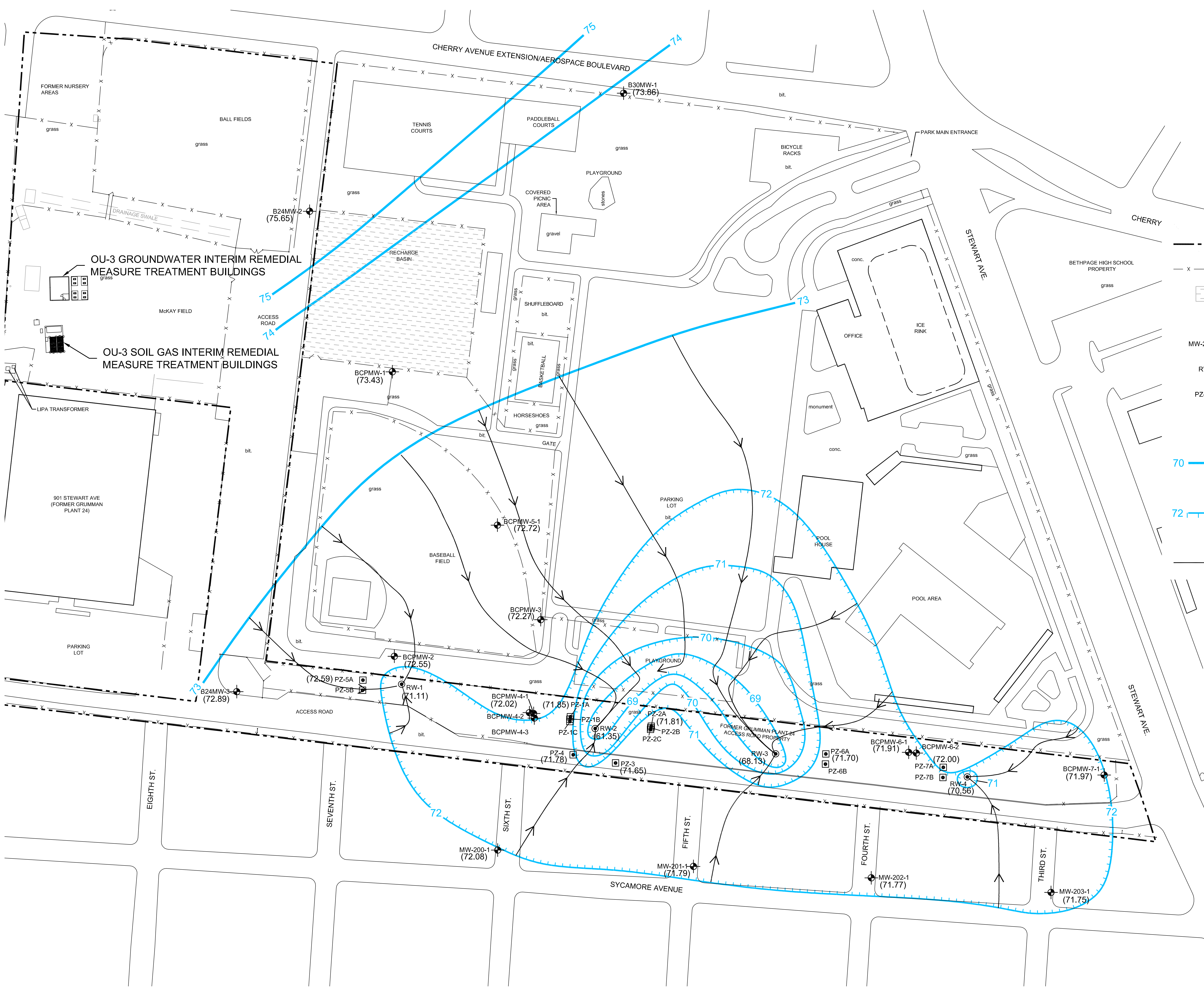
GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
BETHPAGE, NEW YORK

GROUNDWATER TREATMENT SYSTEM PROCESS SCHEMATIC, PROCESS FLOW DIAGRAM, AND MONITORING LOCATIONS

ARCADIS

FIGURE
3

CITY:(Reqd) DIV/GROUP:(Reqd) DB:(Reqd) LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\APROJECT\Northrop Grumman\Superfund\2010\OU3\NY001496.0910 OM&M\Task 2 GW IRM\Reports\3rd Quarter 2010\Figures\cad\03_processflowdiagram.dwg LAYOUT: 3 SAVED: 11/12/2010 2:56 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ARCADIS_MELVILLE.CTB
PLOTTED: 11/12/2010 3:02 PM BY: SANCHEZ, ADRIAN
XREFS: IMAGES: PROJECTNAME: NY001491.0000.00012



EXPLANATION:

— · — · —	NORTHROP GRUMMAN PROPERTY LINE
— x — x —	FENCE
(hatched)	BASIN
bit.	BITUMINOUS PAVEMENT
MW-200-1	MONITORING WELL
RW-2	RECOVERY WELL
PZ-2C	PIEZOMETER
(71.78)	WATER-LEVEL ELEVATION (FEET MEAN SEA LEVEL)
70	GROUNDWATER ELEVATION CONTOUR (RELATIVE TO MEAN SEA LEVEL)
72	CLOSED GROUNDWATER ELEVATION CONTOUR THAT DENOTES A LOWER WATER LEVEL ELEVATION WITHIN THE CONTOUR (RELATIVE TO MEAN SEA LEVEL)
→	HORIZONTAL COMPONENT OF GROUNDWATER FLOW

NOTES:

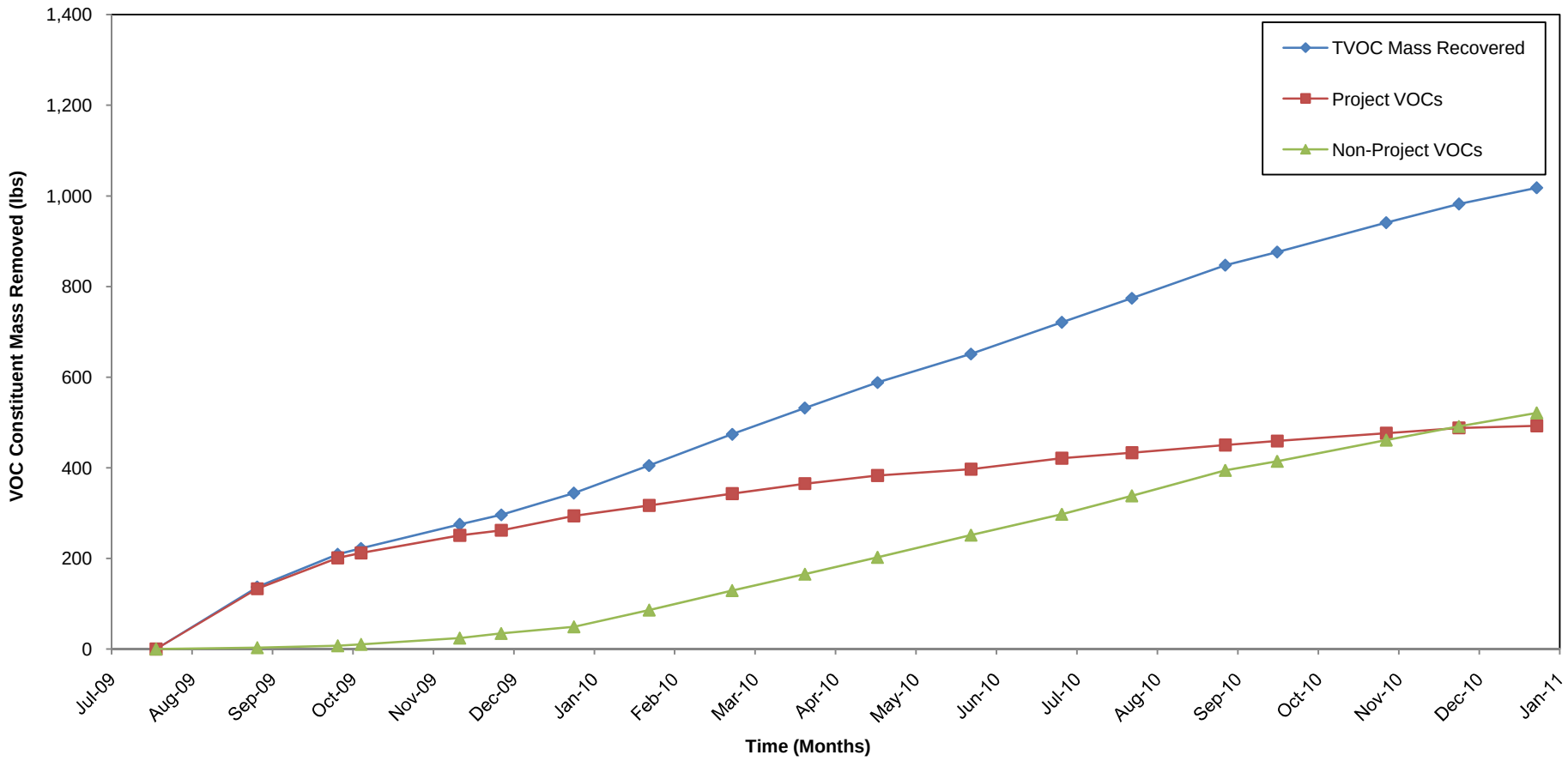
1. MONITORING WELLS, RECOVERY WELLS, AND PIEZOMETERS SURVEYED TO NORTH AMERICAN DATUM (NAD) 83.
2. PARK FEATURES SHOWN WERE PRESENT PRIOR TO TOWN OF OYSTER BAY REDEVELOPMENT IN 2005.

NORTHROP GRUMMAN SYSTEMS CORPORATION
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLINGONDS)
BETHPAGE, NEW YORK

GROUNDWATER MONITORING WELL NETWORK AND CONFIGURATION OF THE SHALLOW POTENTOMETRIC SURFACE AND GROUNDWATER FLOW DIRECTIONS DECEMBER 10, 2010

ARCADIS

FIGURE 4



Notes:

VOC = Volatile organic compound.

lbs = Pounds.

Total VOCs = Sum of VOCs detected.

Project VOCs = Sum of 1,1,1-Trichloroethane; 1,1-Dichloroethane; 1,2-Dichloroethane; 1,1-Dichloroethene; Tetrachloroethene; Trichloroethene; Vinyl Chloride; cis-1,2-Dichloroethene; trans-1,2-Dichloroethene; Benzene; Toluene: and Total Xylenes.

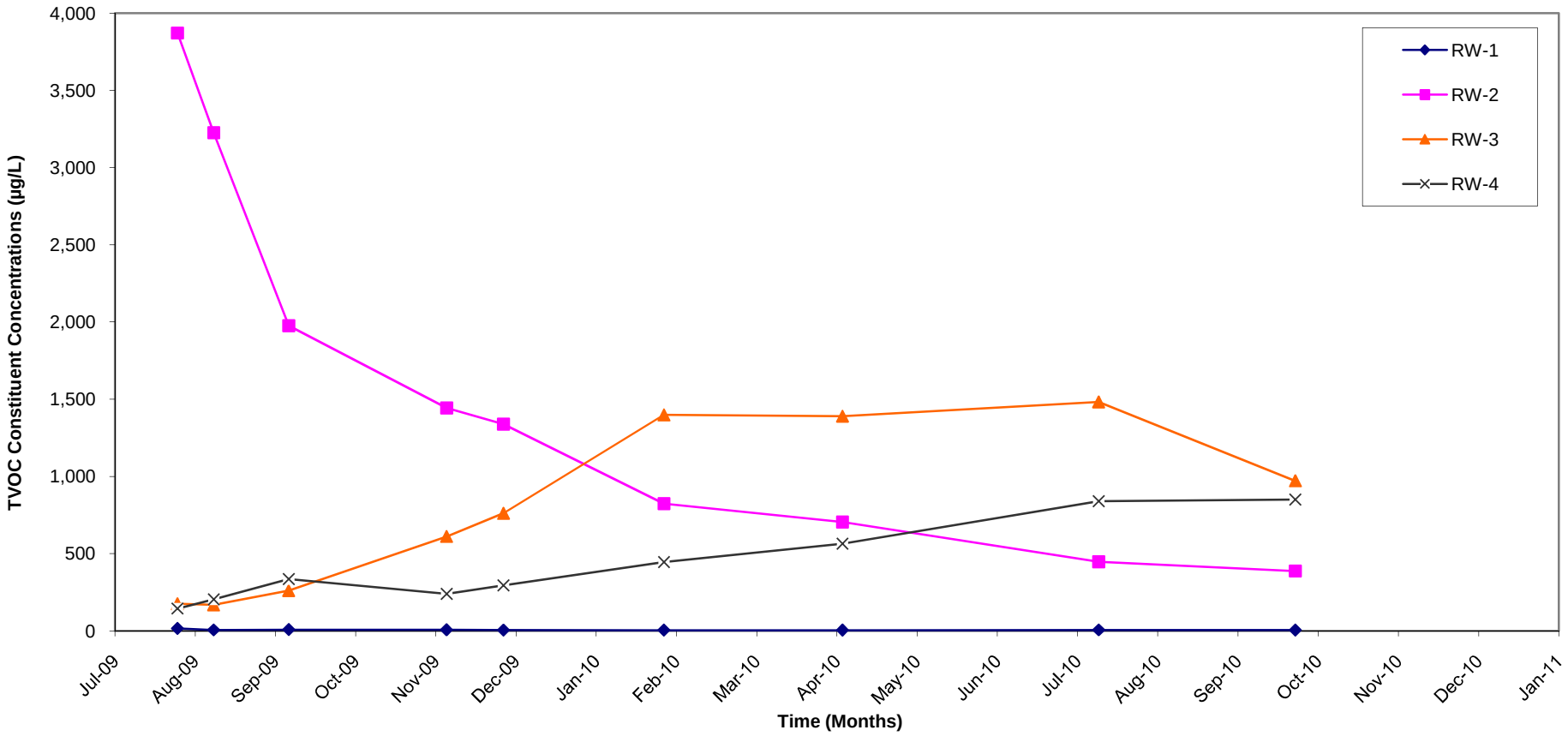
Non-Project VOCs = Sum of Total VOCs that are not Project VOCs.

GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
BETHPAGE, NEW YORK

CUMULATIVE TOTAL, PROJECT, AND NON-PROJECT VOC MASS REMOVED THROUGH DECEMBER 2010

ARCADIS

FIGURE 5



Notes:
VOC = Volatile organic compound.

µg/L = Micrograms per liter.

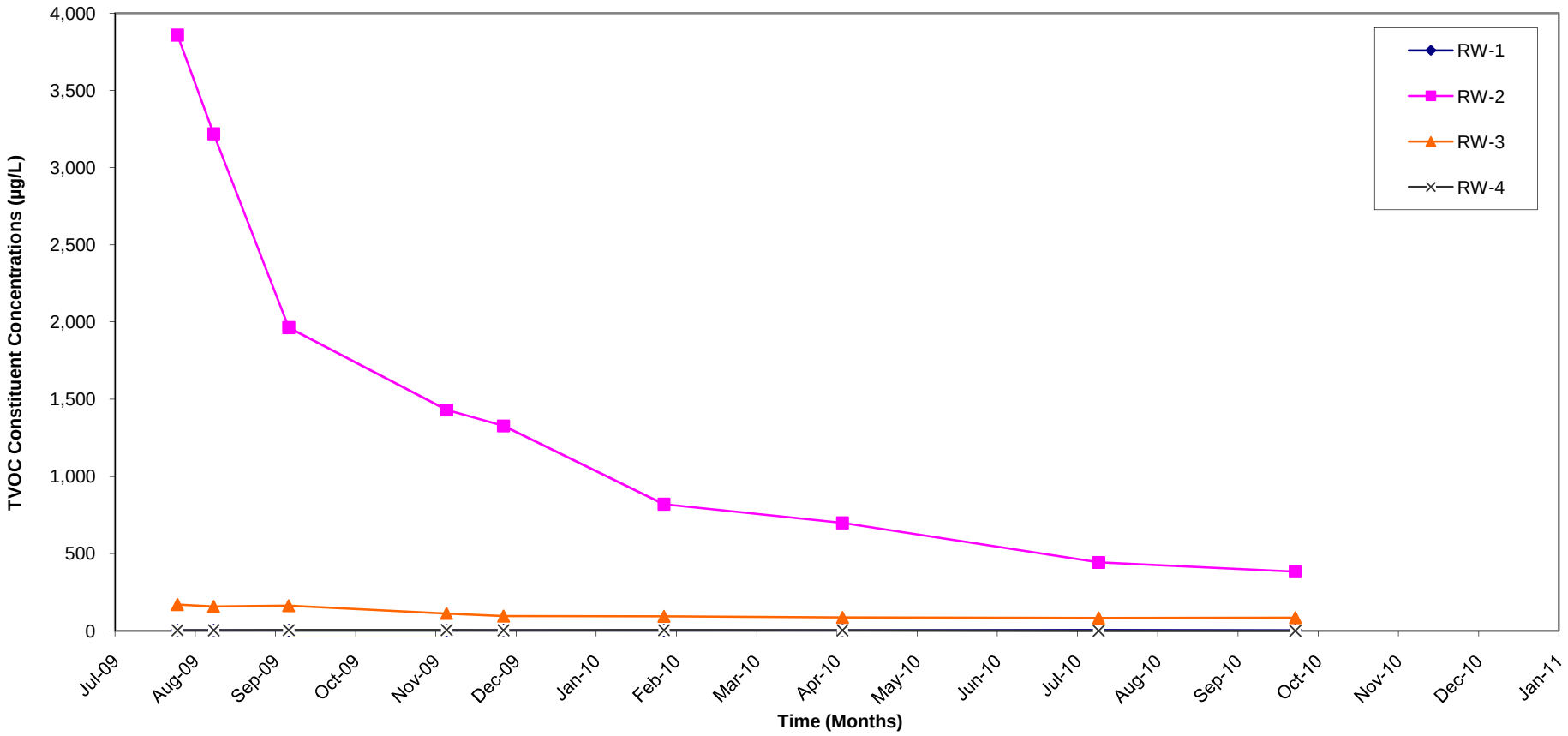
Total VOCs = Sum of VOCs detected.

GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
BETHPAGE, NEW YORK

REMEDIAL WELL TOTAL VOC CONCENTRATIONS THROUGH DECEMBER 2010

ARCADIS

FIGURE
6A



Notes:
VOC = Volatile organic compound.

µg/L = Micrograms per liter.

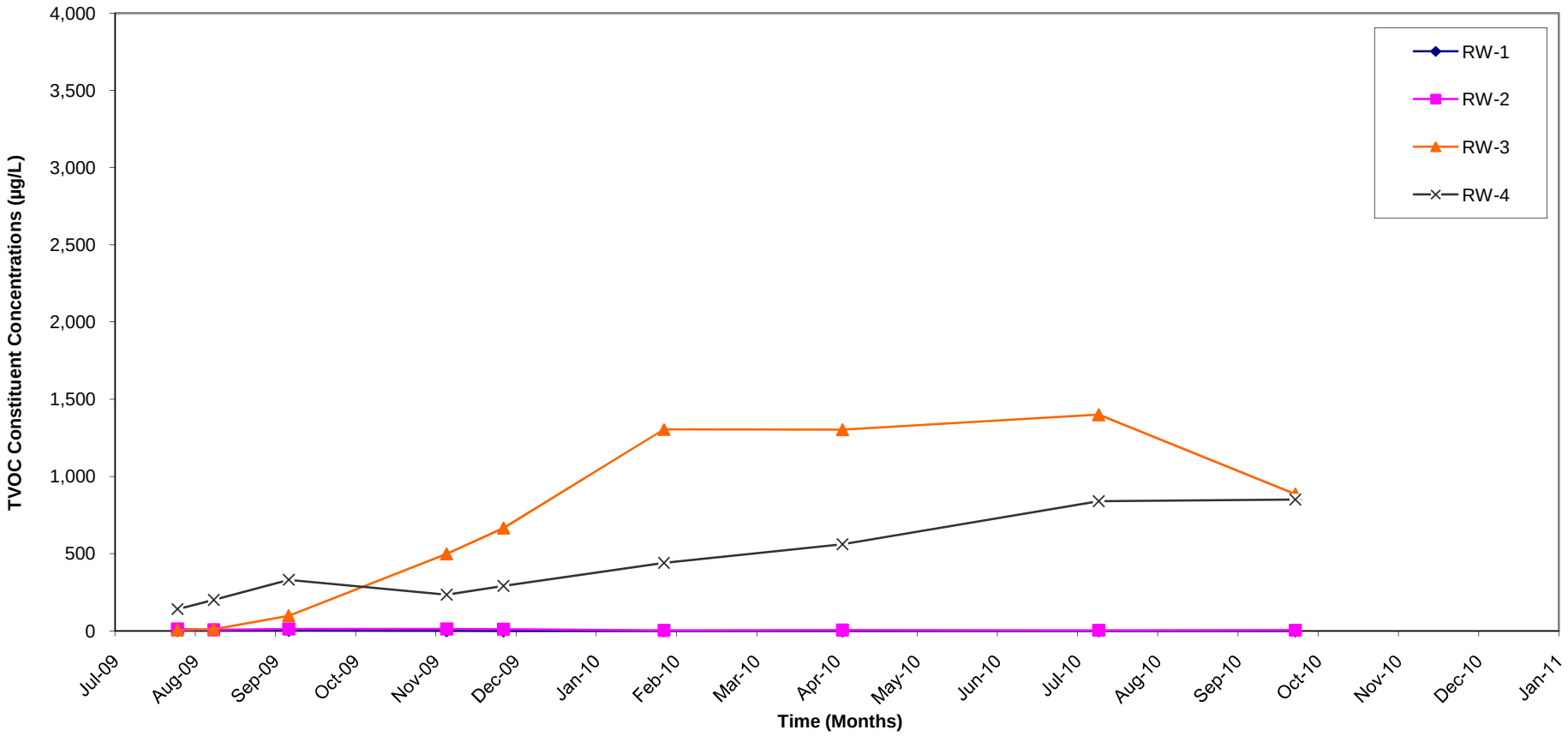
Project VOCs = Sum of 1,1,1-Trichloroethane; 1,1-Dichloroethane; 1,2- Dichloroethane; 1,1-Dichloroethene; Tetrachloroethene; Trichloroethene; Vinyl Chloride; cis-1,2-Dichloroethene; trans-1,2-Dichloroethene; Benzene; Toluene: and Total Xylenes.

GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
BETHPAGE, NEW YORK

REMEDIAL WELL PROJECT VOC CONCENTRATIONS THROUGH DECEMBER 2010

ARCADIS

FIGURE
6B



Notes:
VOC = Volatile organic compound.

µg/L = Micrograms per liter.

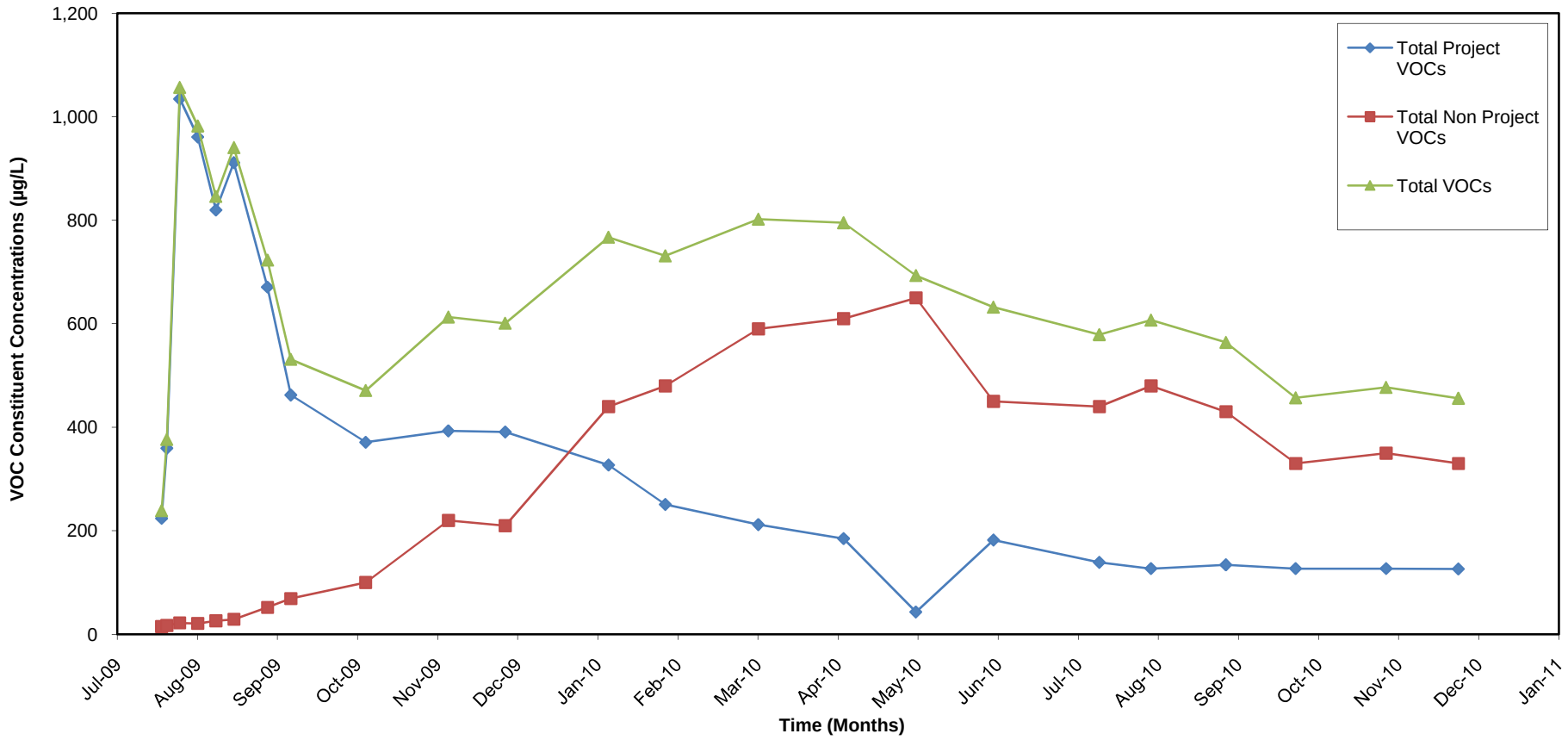
Non-Project VOCs = Sum of Total VOCs that are not Project VOCs.

GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
BETHPAGE, NEW YORK

REMEDIAL WELL NON-PROJECT VOC CONCENTRATIONS THROUGH DECEMBER 2010

ARCADIS

FIGURE
6C



Notes:

VOC = Volatile organic compound.

ug/L = Microgram per liter.

Total VOCs = Sum of VOCs detected.

Project VOCs = Sum of 1,1,1-Trichloroethane; 1,1-Dichloroethane; 1,2-Dichloroethane; 1,1-Dichloroethene; Tetrachloroethene; Trichloroethene; Vinyl Chloride; cis-1,2-Dichloroethene; trans-1,2-Dichloroethene; Benzene; Toluene: and Total Xylenes.

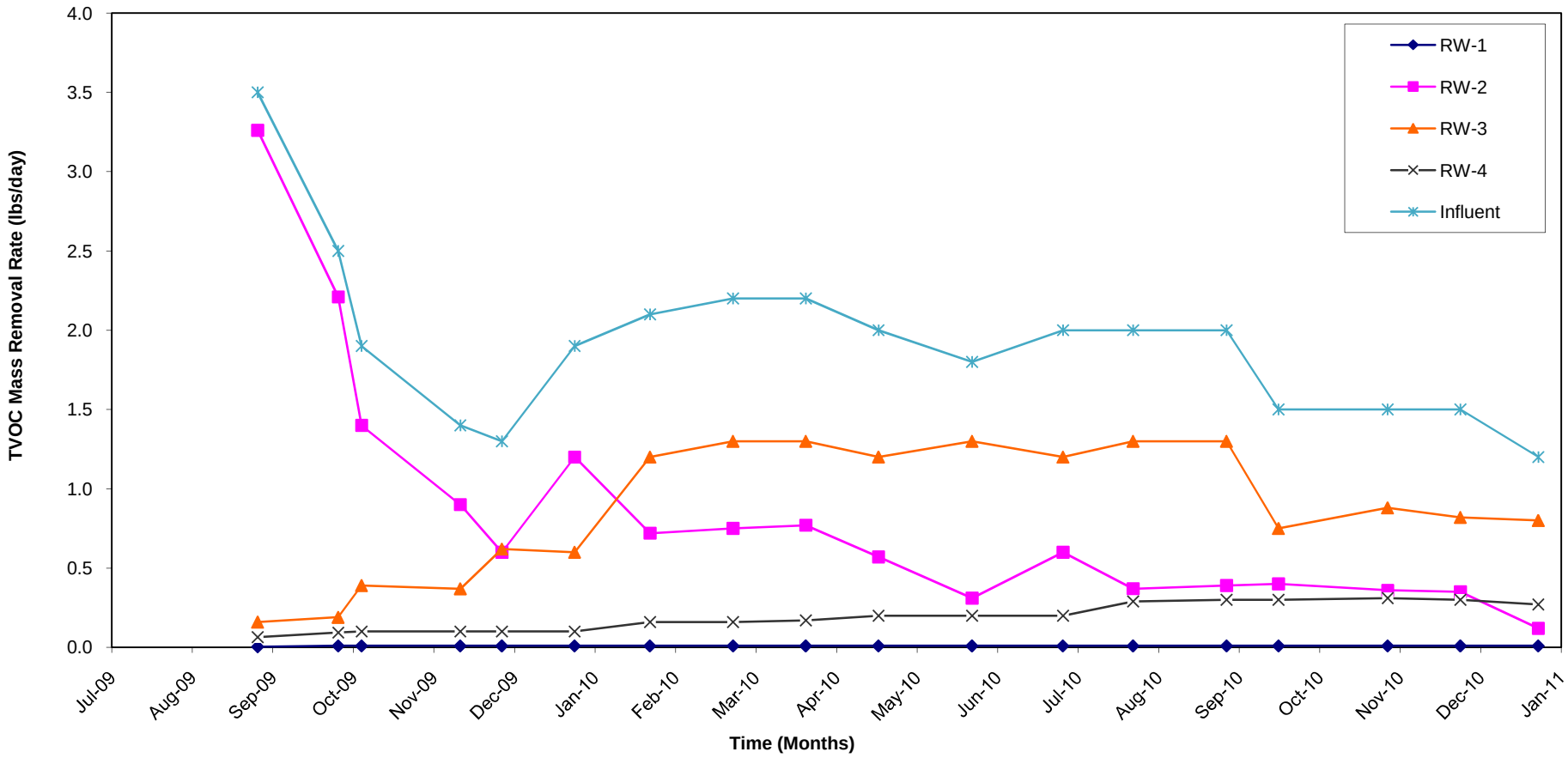
Non-Project VOCs = Sum of Total VOCs that are not Project VOCs.

GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
BETHPAGE, NEW YORK

INFLUENT TOTAL, PROJECT, AND NON-PROJECT VOC CONCENTRATIONS THROUGH DECEMBER 2010

ARCADIS

FIGURE
7



Notes:
VOC = Volatile organic compound.

lbs/day = Pounds per day.

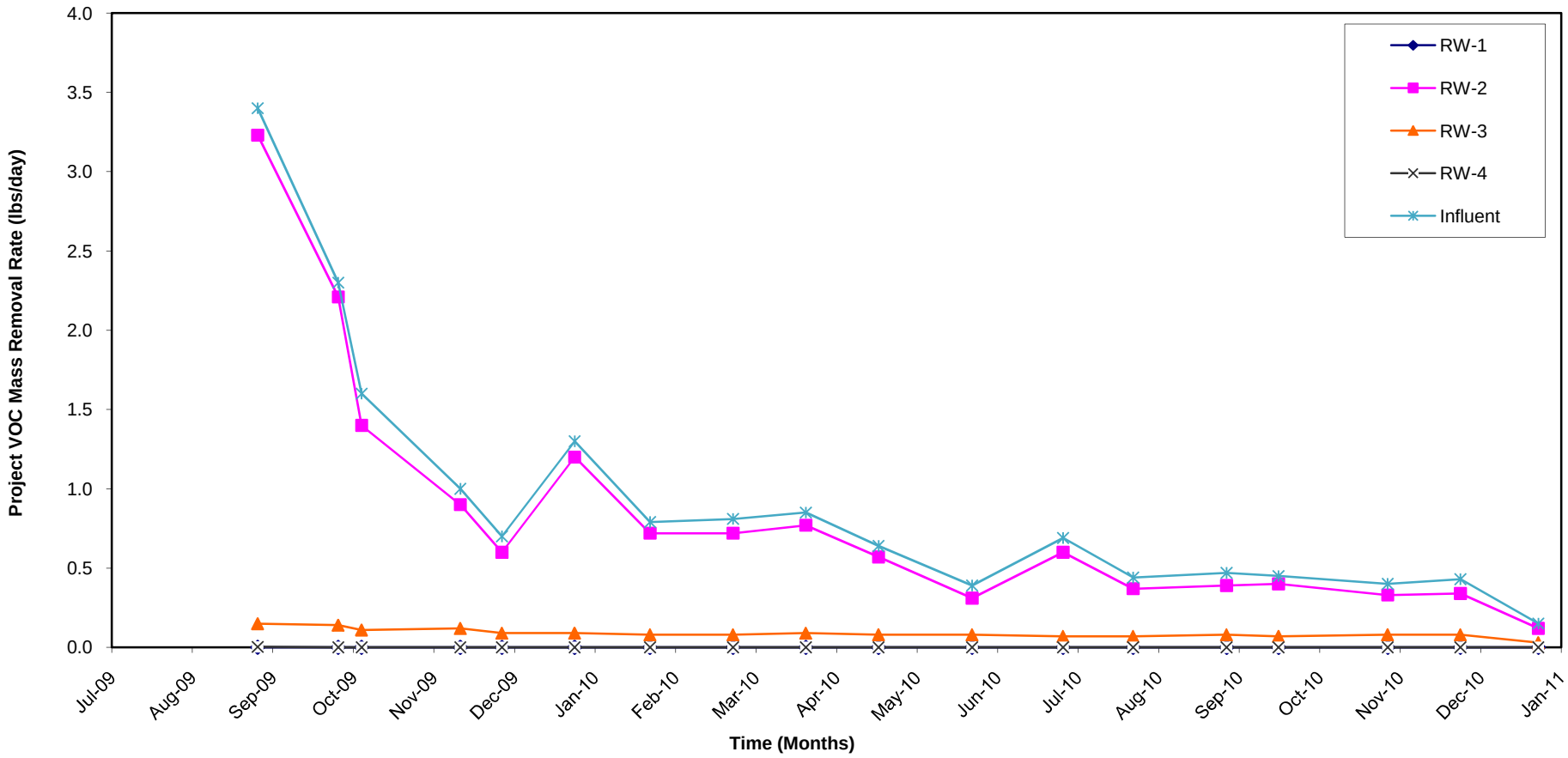
Total VOCs = Sum of VOCs detected.

GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
BETHPAGE, NEW YORK

TOTAL VOC MASS REMOVAL RATES THROUGH DECEMBER 2010

ARCADIS

FIGURE
8A



Notes:
VOC = Volatile organic compound.

lbs/day = Pounds per day.

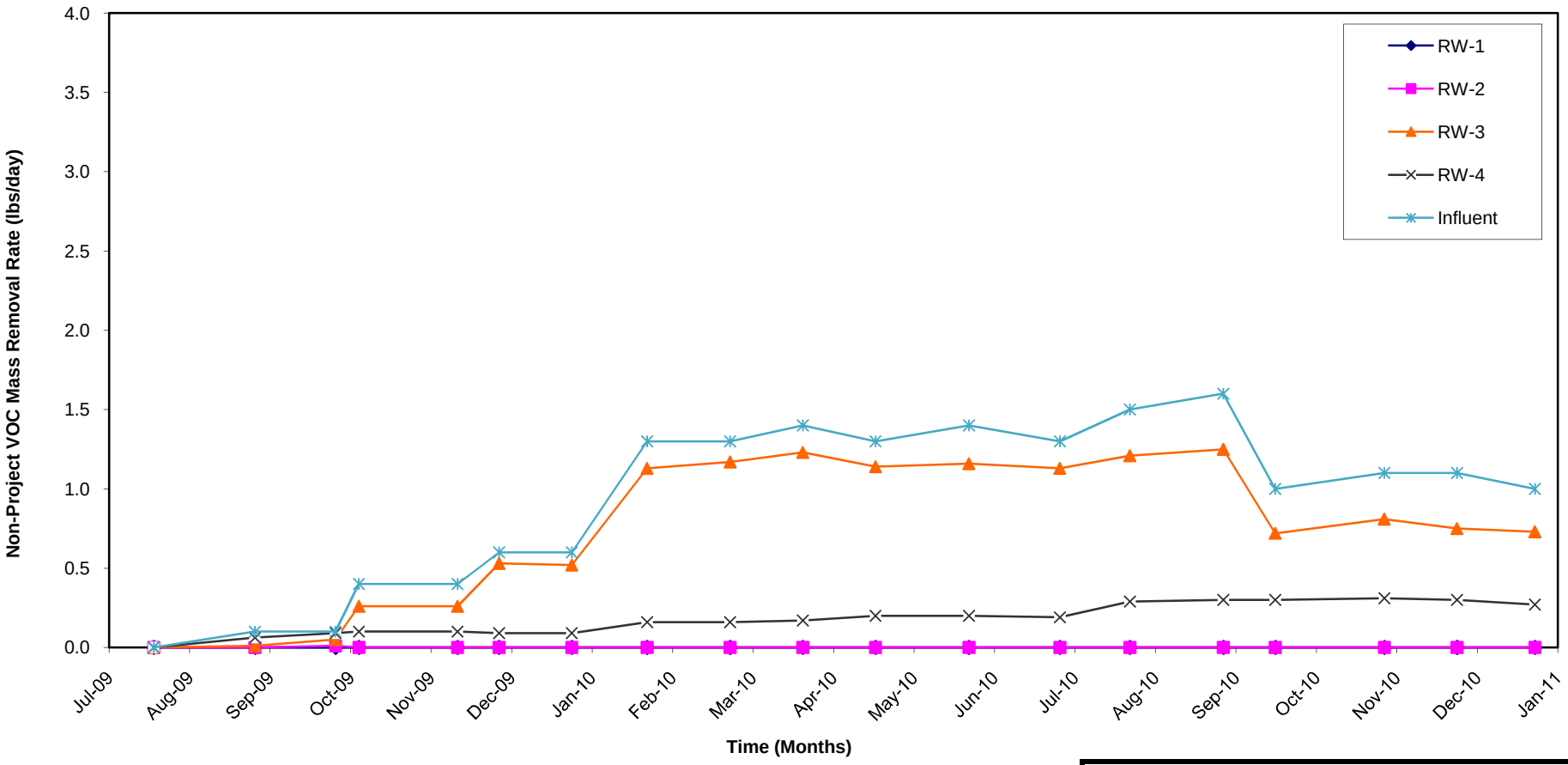
Project VOCs = Sum of 1,1,1-Trichloroethane; 1,1-Dichloroethane; 1,2- Dichloroethane; 1,1-Dichloroethene; Tetrachloroethene; Trichloroethene; Vinyl Chloride; cis-1,2-Dichloroethene; trans-1,2-Dichloroethene; Benzene; Toluene: and Total Xylenes.

GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
BETHPAGE, NEW YORK

PROJECT VOC MASS REMOVAL RATES THROUGH DECEMBER 2010

ARCADIS

FIGURE
8B



Notes:

VOC = Volatile organic compound.

lbs/day = Pounds per day.

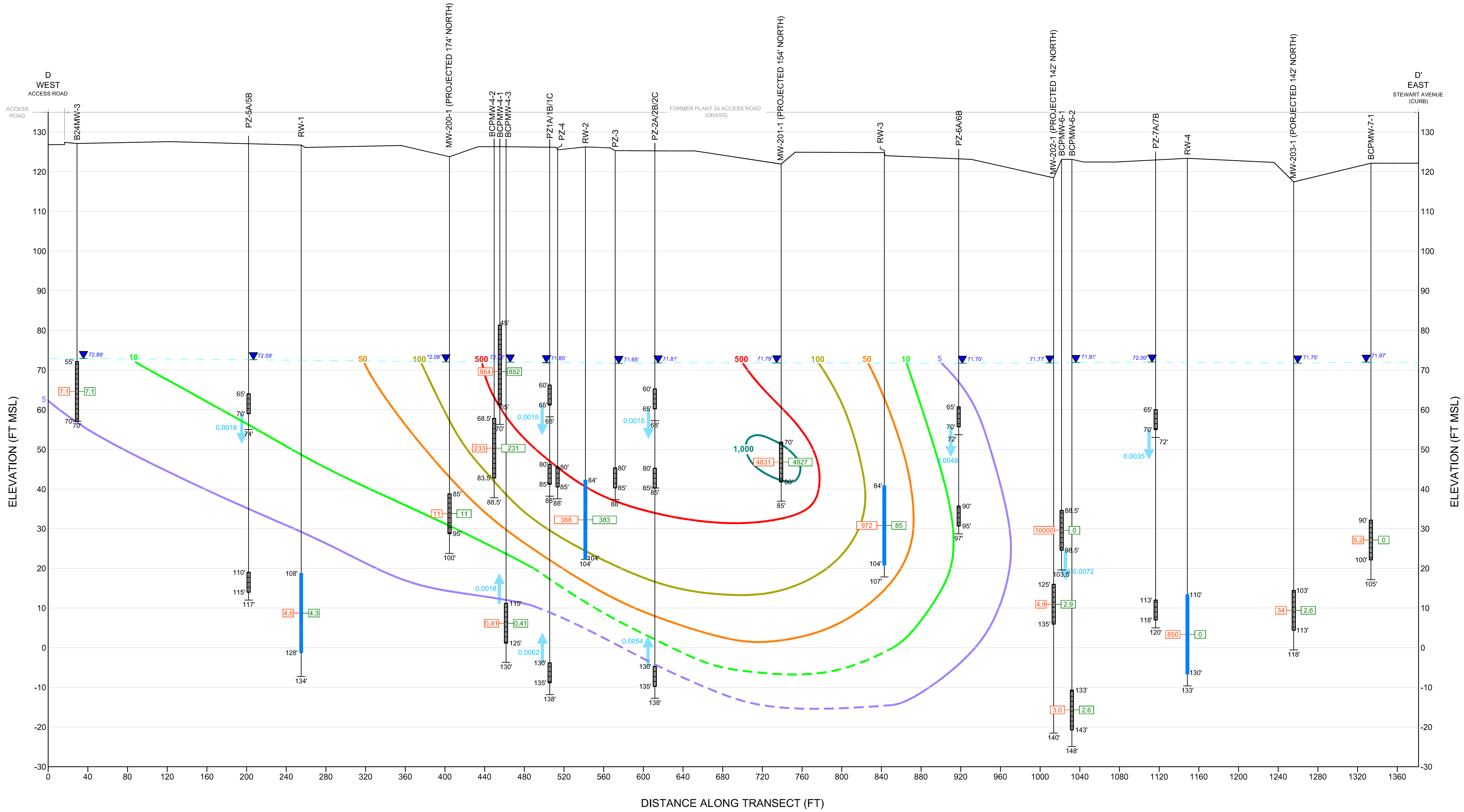
Non-Project VOCs = Sum of Total VOCs that are not Project VOCs.

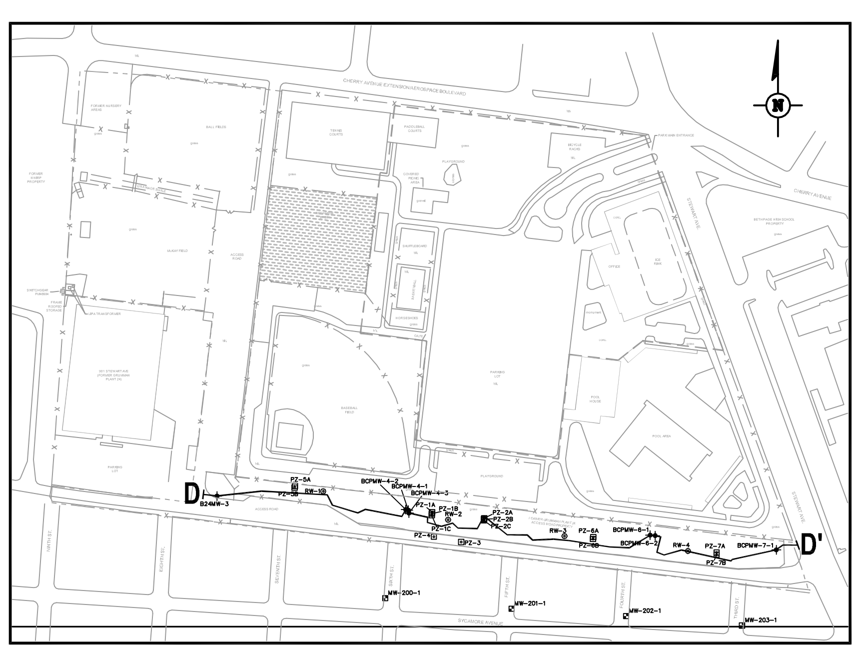
GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
BETHPAGE, NEW YORK

NON-PROJECT VOC MASS REMOVAL RATES THROUGH DECEMBER 2010

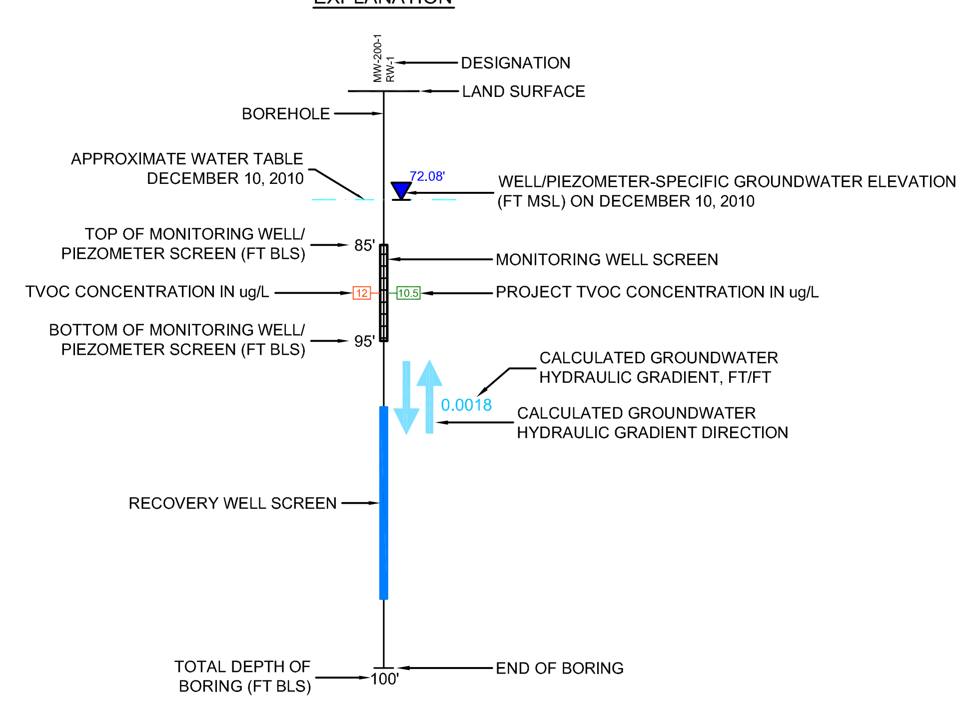
ARCADIS

FIGURE
8C





KEY PLAN
SHOWING CROSS SECTION D-D'



VERTICAL SCALE IN FEET
EXAGGERATION: 4x
HORIZONTAL SCALE IN FEET

DEFINITIONS:

FT - FEET
MSL - MEAN SEA LEVEL
TCE - TRICHLOROETHENE
ug/L - MICROGRAMS PER LITER
TVOC - TOTAL VOLATILE ORGANIC COMPOUND

DEFINITION OF CONTOURS
(DASHED WHERE INFERRED)

- 5 µg/L
- 10 µg/L
- 50 µg/L
- 100 µg/L
- 500 µg/L
- 1,000 µg/L

NOTES:

1. WATER LEVEL ELEVATIONS CALCULATED FROM DATA COLLECTED ON DECEMBER 10, 2010.
2. MONITORING WELL TVOC/PROJECT TVOC DATA FROM THE OCTOBER 2010 SAMPLING ROUND. RESULT REPRESENTATIVE OF ENTIRE WELL SCREEN INTERVAL.
3. CONTOURS ARE BASED ON PROJECT TVOC DATA, SEE TABLE 11.
4. THE GROUNDWATER INTERIM REMEDIAL MEASURE (IRM) HAS BEEN DESIGNED TO ADDRESS GROUNDWATER THAT HAS TVOC CONCENTRATIONS GREATER THAN 5 µG/L IN THE UPPER 20 FEET OF THE SURFICIAL AQUIFER AND GROUNDWATER BELOW THE UPPER 20 FEET OF THE SURFICIAL AQUIFER THAT HAS TVOC CONCENTRATIONS GREATER THAN 50 µG/L.

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

CROSS SECTION D-D' SHOWING TVOCs IN GROUNDWATER AND DIRECTION OF VERTICAL GROUNDWATER HYDRAULIC GRADIENTS

ARCADIS

FIGURE
9

ARCADIS

Appendix A

Well Construction Information and Environmental Effectiveness Monitoring Program

Table A-1. Well Construction Information and Environmental Effectiveness Monitoring Program, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York. [1,2]

Well ID	Well Diameter (inches)	Depth to Screen Top (ft bls)	Depth to Screen Bottom (ft bls)	Screen Length (ft)	Well Depth (ft)	Well Materials	Water Levels [3]	MONITORING ACTIVITY WATER QUALITY [4] VOC	Cd/Cr	Fe/Mn
Monitoring Wells										
BCPMW-1	2	50	65	15	65	Sch. 40 PVC	Quarterly	Baseline	Baseline	--
BCPMW-2	2	60	75	15	75	Sch. 40 PVC	Quarterly	Baseline	Baseline	Baseline
BCPMW-3	2	59	74	15	74	Sch. 40 PVC	Quarterly	Baseline	Baseline	Baseline
BCPMW-4-1	4	45	65	20	70	Sch. 40 PVC	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	Baseline
BCPMW-4-2	4	68.5	83.5	15	88.5	Sch. 40 PVC	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	Baseline
BCPMW-4-3	4	115	125	10	130	Sch. 40 PVC	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	Baseline
BCPMW-5-1	4	50	65	15	70	Sch. 80 PVC/ SS	Quarterly	Baseline	Baseline	Baseline
BCPMW-6-1	4	88.5	98.5	10	103.5	Sch. 40 PVC	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	--
BCPMW-6-2	4	133	143	10	148	Sch. 40 PVC	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	--
BCPMW-7-1	4	90	100	10	105	Sch. 40 PVC	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	--
B24MW-2	2	54	74	20	74	PVC	Quarterly	Baseline/Annual	Baseline	--
B24MW-3	2	55	70	15	70	PVC	Quarterly	Baseline/Annual	Baseline	--
B30MW-1	2	57	72	15	72	PVC	Quarterly	Baseline/Annual	Baseline	--
MW-200-1	4	85	95	10	100	Sch. 40 PVC/ SS	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	--
MW-201-1	4	70	80	10	85	Sch. 40 PVC/ SS	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	--
MW-202-1	4	125	135	10	140	Sch. 40 PVC/ SS	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	--
MW-203-1	4	103	113	10	118	Sch. 40 PVC/ SS	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	--
Remedial Wells [6]										
RW-01	8	108	128	20	134	Sch. 80 PVC/SS	Quarterly	Baseline/Quarterly	Baseline/Quarterly	--
RW-02	6	84	104	20	104	Steel/SS	Quarterly	Baseline/Quarterly	Baseline/Quarterly	--
RW-03	8	84	104	20	107	Sch. 80 PVC/SS	Quarterly	Baseline/Quarterly	Baseline/Quarterly	--
RW-04	8	110	130	20	133	Sch. 80 PVC/SS	Quarterly	Baseline/Quarterly	Baseline/Quarterly	--

See notes on last page.

Table A-1. Well Construction Information and Environmental Effectiveness Monitoring Program, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York. [1,2]

Well ID	Well Diameter (inches)	Depth to Screen Top (ft bls)	Depth to Screen Bottom (ft bls)	Screen Length (ft)	Well Depth (ft)	Well Materials	Water Levels [3]	MONITORING ACTIVITY WATER QUALITY [4] VOC	Cd/Cr	Fe/Mn
Piezometers										
PZ-01a	2	60	65	5	68	Sch. 40 PVC	Quarterly	--	--	--
PZ-01b	1	80	85	5	88	Sch. 40 PVC	Quarterly	--	--	--
PZ-01c	1	130	135	5	138	Sch. 40 PVC	Quarterly	--	--	--
PZ-02a	2	60	65	5	68	Sch. 40 PVC	Quarterly	--	--	--
PZ-02b	1	80	85	5	85	Sch. 40 PVC	Quarterly	--	--	--
PZ-02c	1	130	135	5	138	Sch. 40 PVC	Quarterly	--	--	--
PZ-03	1	80	85	5	88	Sch. 40 PVC	Quarterly	--	--	--
PZ-04	1	80	85	5	88	Sch. 40 PVC	Quarterly	--	--	--
PZ-05a	2	65	70	5	74	Sch. 40 PVC	Quarterly	--	--	--
PZ-05b	1	110	115	5	117	Sch. 40 PVC	Quarterly	--	--	--
PZ-06a	2	65	70	5	72	Sch. 40 PVC	Quarterly	--	--	--
PZ-06b	1	90	95	5	97	Sch. 40 PVC	Quarterly	--	--	--
PZ-07a	2	65	70	5	72	Sch. 40 PVC	Quarterly	--	--	--
PZ-07b	1	113	118	5	120	Sch. 40 PVC	Quarterly	--	--	--

Notes:

(1) Water samples will be collected and analyzed in accordance with the method and procedures described in this Sampling and Analysis Plan (SAP).

(2) Approximate locations of the wells and piezometers in the OU-3 Groundwater Interim Remedial Measure Monitoring Program are shown in Figure 1.

(3) Water levels will be measured in all wells/piezometers during the baseline monitoring event. Water levels will be measured in accordance with the procedures presented in this SAP.

(4) VOC: VOCs, per Table D-3 in the Quality Assurance Project Plan (QAPP), using NYSDEC ASP 2000 Method OLM 4.3.
Cd/Cr: Cadmium and Chromium using USEPA Method 6010.
Fe/Mn: Iron and Manganese using USEPA Method 6010, both total and dissolved.

(5) Semiannual wells will be monitored annually after Year 1.

(6) Some of the analyses listed here are also covered in the Remedial System Sampling Program.

Acronyms\Key:

Sch. 80 PVC	Schedule 80 polyvinyl chloride.
Sch. 40 PVC	schedule 40 polyvinyl chloride.
SS	Stainless steel.
Steel	Low carbon steel.
ft	Feet.
ft ms	Feet relative to mean sea level.
ft bls	Feet below land surface.
--	Not applicable.
VOC	Volatile organic compound.

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Appendix B

Compliance and Performance Program and Water Sample Analytical Results

Table B-1. Compliance and Performance Program Elements, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Sample Location/Instrument [1]	Parameter (Method) [2]	Frequency			
		Short-Term [3] (first month)	Short-Term [3] (five month period following first month)	Long-Term [4]	SCADA Data Acquisition
Water Samples [5]					
Remedial Well 1 (WSP-1)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Remedial Well 2 (WSP-2)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Remedial Well 3 (WSP-3)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Remedial Well 4 (WSP-4)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Air Stripper Influent (WSP-5)	VOCs (NYSDEC 2000 OLM 4.3)	1-hr [6]; Days 1, 3, & Weekly	Monthly	Quarterly	NA
	Iron (USEPA 6010)	1-hr [6]; Days 1, 3, & Weekly	Monthly	Quarterly	NA
Air Stripper Effluent (WSP-6)	Iron (USEPA 6010)	1-hr [6]; As Needed	As Needed	As Needed	NA
Plant Effluent (WSP-7)	**VOCs (NYSDEC 2000 OLM 4.3)**	**1-hr [6]; Days 1, 3, & Weekly**	**Monthly**	**Monthly**	NA
	Iron (USEPA 6010)	**1-hr [6]; Days 1, 3, & Weekly**	**Monthly**	**Monthly**	NA
	Mercury (USEPA 7470) [7]	**1-hr [6]; Days 1, 3, & Weekly**	**Monthly**	**Monthly**	NA
	ph (field)	**1-hr [6]; Days 1, 3, & Weekly**	**Monthly**	**Monthly**	NA
Air Samples [8] [9]					
Air Stripper Effluent/ECU-1 Influent (VSP-1)	VOCs (TO-15 Modified)	Monthly	Monthly	Quarterly	NA
ECU-1 Effluent/ECU-2 Influent (VSP-2)	VOCs (TO-15 Modified)	As Needed	As Needed	As Needed	NA
ECU-2 Effluent/ECU-3 Influent (VSP-3)	VOCs (TO-15 Modified)	As Needed	As Needed	As Needed	NA
ECU-3 Effluent/ECU-4 Influent (VSP-4)	VOCs (TO-15 Modified)	As Needed	As Needed	As Needed	NA
Total Effluent (VSP-5)	**VOCs (TO-15 Modified)**	**Monthly**	**Monthly**	**Quarterly**	NA

See notes on last page.

Table B-1. Compliance and Performance Program Elements, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Sample Location/Instrument [1]	Parameter (Method) [2]	Frequency			
		Short-Term [3] (first month)	Short-Term [3] (five month period following first month)	Long-Term [4]	SCADA Data Acquisition
Water Flow Measurements					
Remedial Well RW-1 (FT - 110)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-2 (FT - 120)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-3 (FT - 130)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-4 (FT - 140)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Combined Influent (FR - 200)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
System Effluent (FT-700)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Air Flow Measurements					
Air Stripper Effluent (FT-500)	Flow rate (SCFM)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Water Pressure Measurements					
Remedial Well RW-1 (PT - 110)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-2 (PT - 120)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-3 (PT - 130)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-4 (PT - 140)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Air Stripper Effluent (PT-700)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Air Temperature & Relatively Humidity Measurements					
Air Stripper Effluent (TT-500)	Temperature	Weekly	Weekly	Weekly	Continuously
ECU Mid-Train (TI-503)	Temperature	Weekly	Weekly	Weekly	NA
Effluent (TI-603)	Temperature	Weekly	Weekly	Weekly	NA

See notes on last page.

Table B-1. Compliance and Performance Program Elements, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Sample Location/Instrument [1]	Parameter (Method) [2]	Frequency			
		Short-Term [3] (first month)	Short-Term [3] (five month period following first month)	Long-Term [4]	SCADA Data Acquisition
Air Pressure Measurements					
Air Stripper Effluent (PT-500)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	Continuously
ECU #1 Influent (PI-501)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
ECU #2 Influent (PI-502)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
ECU #3 Influent (PI-601)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
ECU #4 Influent (PI-602)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
System Effluent (PI-603)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA

See notes on last page.

Table B-1. Compliance and Performance Program Elements, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Notes:

(1) Refer to Figure 3 of this Operation, Maintenance, & Monitoring (OM&M) Report and Appendix E of the Groundwater IRM OM&M Manual (OM&M Manual (ARCADIS 2009c)) for a diagram showing referenced sample locations and measurement points.
(2) Parameters/methods may be modified based on review of short-term and/or long-term testing results. Parameters shown in **Bold** indicate parameters that require NYSDEC notification/approval prior to change in monitoring schedule.
(3) Short-term schedule is tentative. Modification may be required/recommended based on the results of start-up and performance testing.
(4) Long-term schedule is tentative. Modification may be required/recommended based on the results of short-term testing or water quality trends.
(5) Water samples will be collected in accordance with the methods described in the Sampling and Analysis Plan, which is included as Appendix A of the OM&M Manual (ARCADIS 2009c). Samples will be analyzed in accordance with the methods and procedures described in the Sampling and Analysis Plan.
(6) Per NYSDEC request, a 1-hr pilot test was performed during system shake-down. 1-hr pilot test samples were also analyzed for mercury.
(7) Per the interim treated effluent (water) discharge criteria provided in the NYSDEC letter dated March 19, 2009 (NYSDEC 2009a), select samples are being analyzed for Mercury (Hg). However, this analyte is not expected to be a long-term analyte since it is not a site contaminant of concern.
(8) Air samples collected and analyzed in accordance with methods described in the Sampling and Analysis Plan, which is included as Appendix A of the OM&M Manual (ARCADIS 2009c).
(9) Additional air samples will be collected to help calculate media usage rates and to help determine media changeout frequencies.

Acronyms\Key:

NA	Not applicable.
ECU	Emissions control unit.
VOCs	Volatile organic compounds (refer Tables D-3 and D-5 in the Quality Assurance Project Plan (QAPP) (Appendix D of the OM&M Manual (ARCADIS 2009c)) for the analyte lists for aqueous and air samples, respectively).
gal.	Gallons.
gpm	Gallons per minute.
i.w.g.	Inches water gauge.
NYSDEC	New York State Department of Environmental Conservation.
EPA	U.S. Environmental Protection Agency.
SCADA	Supervisory Control And Data Acquisition.
OM&M	Operation, maintenance and monitoring.

Table B-2. Water Sample Analytical Results - October 4, 2010, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2,3]

COMPOUND (ug/L)	Sample ID: / Sample Location: / Sample Date:	WSP-01 RW-1 10/4/2010	WSP-02 RW-2 10/4/2010	WSP-03 RW-3 10/4/2010	WSP-04 RW-4 10/4/2010	WSP-05 Influent 10/4/2010	WSP-05 dup. Influent 10/4/2010	WSP-07 Effluent 10/4/2010
Volatile Organic Compounds								
1,1,1-Trichloroethane		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
1,1,2,2-Tetrachloroethane		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
1,1,2-Trichloroethane		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
1,1-Dichloroethane		< 5 U	**2.2 J**	< 25 U	< 25 U	**0.75 J**	**0.83 J**	< 5 U
1,1-Dichloroethene		< 5 U	**2.2 J**	< 25 U	< 25 U	**0.80 J**	< 13 U	< 5 U
1,2-Dichloroethane		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
1,2-Dichloropropane		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
2-Butanone		< 50 U	< 130 U	< 250 U	< 250 U	< 130 U	< 130 U	< 50 U
2-Hexanone		< 50 U	< 130 U	< 250 U	< 250 U	< 130 U	< 130 U	< 50 U
4-methyl-2-pentanone		< 50 U	< 130 U	< 250 U	< 250 U	< 130 U	< 130 U	< 50 U
Acetone		< 50 U	< 130 UB	< 250 U	< 250 U	< 130 UB	< 130 U	< 50 U
Benzene		< 0.70 U	< 1.8 U	< 3.5 U	< 3.5 U	< 1.8 U	< 1.8 U	< 0.70 U
Bromodichloromethane		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Bromoform		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Bromomethane		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Carbon Disulfide		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Carbon tetrachloride		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Chlorobenzene		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Chlorodifluoromethane (Freon 22)		< 5 U	**1.0 J**	**880**	**850**	**330**	**310**	< 5 U
Chloroethane		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Chloroform		**0.31 J**	**1.9 J**	**6.6 J**	< 25 U	**2.3 J**	**2.0 J**	< 5 U
Chloromethane		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
cis-1,2-dichloroethene		**1.3 J**	**270**	**64**	< 25 U	**92**	**85**	< 5 U
cis-1,3-dichloropropene		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Dibromochloromethane		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Dichlorodifluoromethane (Freon 12)		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Ethylbenzene		< 5 U	**1.5 J**	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Methyl tert-Butyl Ether		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Methylene Chloride		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Styrene		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Tetrachloroethene		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Toluene		< 5 U	**25**	< 25 U	< 25 U	**6.6 J**	**6.2 J**	< 5 U
trans-1,2-dichloroethene		< 5 U	< 13 U	**6.7 J**	< 25 U	< 13 U	< 13 U	< 5 U
trans-1,3-dichloropropene		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Trichloroethylene		**3.0 J**	**36**	**12 J**	< 25 U	**14**	**13**	< 5 U
Trichlorofluoromethane (CFC-11)		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Trichlorotrifluoroethane (Freon 113)		< 5 U	< 13 U	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Vinyl Chloride		< 2 U	**45**	**2.6 J**	< 10 U	**13**	**12**	< 2 U
Xylene-o		< 5 U	**0.90 J**	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Xylenes - m,p		< 5 U	**1.9 J**	< 25 U	< 25 U	< 13 U	< 13 U	< 5 U
Subtotal VOCs [4]		**5**	**388**	**972**	**850**	**459**	**429**	0
Tentatively Identified Compounds		ND	ND	ND	ND	ND	ND	ND
Subtotal TICs [5]		0	0	0	0	0	0	0
Total VOCs [6]		**5**	**388**	**972**	**850**	**459**	**429**	0

See notes on last page.

Table B-2. Water Sample Analytical Results - October 4, 2010, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1,2,3)

COMPOUND (ug/L)	Sample ID: / Sample Location: / Sample Date:	WSP-01 RW-1 10/4/2010	WSP-02 RW-2 10/4/2010	WSP-03 RW-3 10/4/2010	WSP-04 RW-4 10/4/2010	WSP-05 Influent 10/4/2010	WSP-05 dup. Influent 10/4/2010	WSP-07 Effluent 10/4/2010
Metals								
Cadmium (Dissolved)		< 5 U	< 5 U	< 5 U	< 5 U	< 5 U	--	< 5 U
Cadmium (Total)		< 5 U	< 5 U	< 5 U	< 5 U	< 5 U	--	< 5 U
Chromium (Dissolved)		**27**	< 10 U	< 10 U	< 10 U	< 10 U	--	< 10 U
Chromium (Total)		**27**	< 10 U	< 10 U	< 10 U	**13**	--	< 10 U
Iron (Dissolved)		< 100 U	**380**	< 100 U	< 100 U	**100**	--	< 100 U
Iron (Total)		< 100 U	**710**	**350**	< 100 U	**1,180**	--	**210**
Manganese (Dissolved)		**11**	**192**	**34**	**29**	**68**	--	**78**
Manganese (Total)		**12**	**187**	**35**	**28**	**71**	--	**80**
Mercury (Dissolved)		--	--	--	--	--	--	--
Mercury (Total)		--	--	--	--	--	--	< 0.30 U

Notes:

(1) Samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses using New York State Department of Environmental Conservation ASP 2000 Method OLM 4.3 and metals using USEPA Method 6010, except for mercury, which was analyzed using USEPA Method 7470.
(2). Refer to Figure 3 of this OM&M Report for schematic sample locations.
(3). Results validated following protocols specified in the Sampling and Analysis Plan (Appendix A) of the Groundwater OM&M Manual (ARCADIS 2009c).
(4) "Subtotal VOCs" represents the sum of individual concentrations of VOCs detected. Values shown have been rounded to the nearest whole number.
(5) "Subtotal TICs" represents the sum of individual TICs detected. Values shown have been rounded to the nearest whole number.
(6) "Total VOCs" represent the sum of VOCs and TICs detected. Values shown have been rounded to the nearest whole number.

Acronyms\Key:

Bold value indicates a detection.

J	Estimated value.
ND	TIC not detected.
OM&M	Operation, maintenance and monitoring.
TICs	Tentatively identified compounds.
USEPA	United States Environmental Protection Agency.
VOC	Volatile organic compound.
ug/L	Micrograms per liter.
--	Not analyzed.
< 5 U	Compound not detected above its laboratory quantification limit.

Table B-3. Water Sample Analytical Results - November 8, 2010, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2,3]

COMPOUND (ug/L)	Sample ID: / Sample Location: / Sample Date:	WSP-05 Influent 11/8/2010	WSP-07 Effluent 11/8/2010
Volatile Organic Compounds			
1,1,1-Trichloroethane		< 13 U	< 5 U
1,1,2,2-Tetrachloroethane		< 13 U	< 5 U
1,1,2-Trichloroethane		< 13 U	< 5 U
1,1-Dichloroethane		**0.80 J**	< 5 U
1,1-Dichloroethene		**0.88 J**	< 5 U
1,2-Dichloroethane		< 13 U	< 5 U
1,2-Dichloropropane		< 13 U	< 5 U
2-Butanone		< 130 U	< 50 U
2-Hexanone		< 130 U	< 50 U
4-methyl-2-pentanone		< 130 U	< 50 U
Acetone		< 130 U	< 50 U
Benzene		< 1.8 U	< 0.7 U
Bromodichloromethane		< 13 U	< 5 U
Bromoform		< 13 U	< 5 U
Bromomethane		< 13 U	< 5 U
Carbon Disulfide		< 13 U	< 5 U
Carbon tetrachloride		< 13 U	< 5 U
Chlorobenzene		< 13 U	< 5 U
Chlorodifluoromethane (Freon 22)		**350**	< 5 U
Chloroethane		< 13 U	< 5 U
Chloroform		**3.2 J**	< 5 U
Chloromethane		< 13 U	< 5 U
cis-1,2-dichloroethene		**91**	< 5 U
cis-1,3-dichloropropene		< 13 U	< 5 U
Dibromochloromethane		< 13 U	< 5 U
Dichlorodifluoromethane (Freon 12)		< 13 U	< 5 U
Ethylbenzene		< 13 U	< 5 U
Methyl tert-Butyl Ether		< 13 U	< 5 U
Methylene Chloride		< 13 U	< 5 U
Styrene		< 13 U	< 5 U
Tetrachloroethene		< 13 U	< 5 U
Toluene		**5.9 J**	< 5 U
trans-1,2-dichloroethene		**0.98 J**	< 5 U
trans-1,3-dichloropropene		< 13 U	< 5 U
Trichloroethylene		**15**	< 5 U
Trichlorofluoromethane (CFC-11)		< 13 U	< 5 U
Trichlorotrifluoroethane (Freon 113)		< 13 U	< 5 U
Vinyl Chloride		**12**	< 2 U
Xylene-o		< 13 U	< 5 U
Xylenes - m,p		< 13 U	< 5 U
Subtotal VOCs [4]		**480**	0
Tentatively Identified Compounds		ND	ND
Subtotal TICs [5]		0	0
Total VOCs [6]		**480**	0

See notes on last page.

Table B-3. Water Sample Analytical Results - November 8, 2010, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1,2,3)

COMPOUND (ug/L)	Sample ID: / Sample Location: / Sample Date:	WSP-05 Influent 11/8/2010	WSP-07 Effluent 11/8/2010
Metals			
Cadmium (Dissolved)		--	--
Cadmium (Total)		--	--
Chromium (Dissolved)		--	--
Chromium (Total)		--	--
Iron (Dissolved)		**160**	**140**
Iron (Total)		**2,000**	**270**
Manganese (Dissolved)		--	--
Manganese (Total)		--	--
Mercury (Dissolved)		--	--
Mercury (Total)		--	< 0.30 U

Notes:

(1) Samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses using New York State Department of Environmental Conservation ASP 2000 Method OLM 4.3 and metals using USEPA Method 6010, except for mercury, which was analyzed using USEPA Method 7470.
(2). Refer to Figure 3 of this OM&M Report for schematic sample locations.
(3). Results validated following protocols specified in the Sampling and Analysis Plan (Appendix A) of the Groundwater OM&M Manual (ARCADIS 2009c).
(4) "Subtotal VOCs" represents the sum of individual concentrations of VOCs detected. Values shown have been rounded to the nearest whole number.
(5) "Subtotal TICs" represents the sum of individual TICs detected. Values shown have been rounded to the nearest whole number.
(6) "Total VOCs" represent the sum of VOCs and TICs detected. Values shown have been rounded to the nearest whole number.

Acronyms\Key:

Bold value indicates a detection.

J	Estimated value.
ND	TIC not detected.
OM&M	Operation, maintenance and monitoring.
TICs	Tentatively identified compounds.
USEPA	United States Environmental Protection Agency.
VOC	Volatile organic compound.
ug/L	Micrograms per liter.
--	Not analyzed.
< 5 U	Compound not detected above its laboratory quantification limit.

Table B-4. Water Sample Analytical Results - December 6, 2010, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2,3]

COMPOUND (ug/L)	Sample ID: / Sample Location: / Sample Date:	WSP-02 RW-2 12/6/2010	WSP-03 RW-3 12/6/2010	WSP-05 Influent 12/6/2010	WSP-07 Effluent 12/6/2010	WSP-07 dup. Effluent 12/6/2010
Volatile Organic Compounds						
1,1,1-Trichloroethane		--	--	< 13 U	< 5 U	< 5 U
1,1,2,2-Tetrachloroethane		--	--	< 13 U	< 5 U	< 5 U
1,1,2-Trichloroethane		--	--	< 13 U	< 5 U	< 5 U
1,1-Dichloroethane		--	--	**0.85 J**	< 5 U	< 5 U
1,1-Dichloroethene		--	--	**0.88 J**	< 5 U	< 5 U
1,2-Dichloroethane		--	--	< 13 U	< 5 U	< 5 U
1,2-Dichloropropane		--	--	< 13 U	< 5 U	< 5 U
2-Butanone		--	--	< 130 U	< 50 U	< 50 U
2-Hexanone		--	--	< 130 U	< 50 U	< 50 U
4-methyl-2-pentanone		--	--	< 130 U	< 50 U	< 50 U
Acetone		--	--	**2.3 J**	**1.2 J**	**1 J**
Benzene		--	--	< 1.8 U	< 0.7 U	< 0.7 U
Bromodichloromethane		--	--	< 13 U	< 5 U	< 5 U
Bromoform		--	--	< 13 U	< 5 U	< 5 U
Bromomethane		--	--	< 13 U	< 5 U	< 5 U
Carbon Disulfide		--	--	< 13 U	< 5 U	< 5 U
Carbon tetrachloride		--	--	< 13 U	< 5 U	< 5 U
Chlorobenzene		--	--	< 13 U	< 5 U	< 5 U
Chlorodifluoromethane (Freon 22)		--	--	**330**	< 5 U	< 5 U
Chloroethane		--	--	< 13 U	< 5 U	< 5 U
Chloroform		--	--	**2.6 J**	< 5 U	< 5 U
Chloromethane		--	--	< 13 U	< 5 U	< 5 U
cis-1,2-dichloroethene		--	--	**90**	< 5 U	< 5 U
cis-1,3-dichloropropene		--	--	< 13 U	< 5 U	< 5 U
Dibromochloromethane		--	--	< 13 U	< 5 U	< 5 U
Dichlorodifluoromethane (Freon 12)		--	--	< 13 U	< 5 U	< 5 U
Ethylbenzene		--	--	< 13 U	< 5 U	< 5 U
Methyl tert-Butyl Ether		--	--	< 13 U	< 5 U	< 5 U
Methylene Chloride		--	--	< 13 U	< 5 U	< 5 U
Styrene		--	--	< 13 U	< 5 U	< 5 U
Tetrachloroethene		--	--	< 13 U	< 5 U	< 5 U
Toluene		--	--	**8.1 J**	< 5 U	< 5 U
trans-1,2-dichloroethene		--	--	< 13 U	< 5 U	< 5 U
trans-1,3-dichloropropene		--	--	< 13 U	< 5 U	< 5 U
Trichloroethylene		--	--	**14**	< 5 U	< 5 U
Trichlorofluoromethane (CFC-11)		--	--	< 13 U	< 5 U	< 5 U
Trichlorotrifluoroethane (Freon 113)		--	--	< 13 U	< 5 U	< 5 U
Vinyl Chloride		--	--	**12**	< 2 U	< 2 U
Xylene-o		--	--	< 13 U	< 5 U	< 5 U
Xylenes - m,p		--	--	< 13 U	< 5 U	< 5 U
Subtotal VOCs [4]		**--**	**--**	**461**	**1**	**1**
Tentatively Identified Compounds		--	--	ND	ND	ND
Subtotal TICs [5]		--	--	0	0	0
Total VOCs [6]		--	--	**461**	**1**	**1**

See notes on last page.

Table B-4. Water Sample Analytical Results - December 6, 2010, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1,2,3)

COMPOUND (ug/L)	Sample ID: / Sample Location: / Sample Date:	WSP-02 RW-2 12/6/2010	WSP-03 RW-3 12/6/2010	WSP-05 Influent 12/6/2010	WSP-07 Effluent 12/6/2010	WSP-07 dup. Effluent 12/6/2010
Metals						
Cadmium (Dissolved)		--	--	--	--	--
Cadmium (Total)		--	--	--	--	--
Chromium (Dissolved)		--	--	--	--	--
Chromium (Total)		--	--	--	--	--
Iron (Dissolved)		**270**	**150**	**110**	< 100 U	--
Iron (Total)		**590**	**340**	**770**	**200**	--
Manganese (Dissolved)		--	--	--	--	--
Manganese (Total)		--	--	--	--	--
Mercury (Dissolved)		--	--	--	--	--
Mercury (Total)		--	--	--	< 0.3 U	--

Notes:

(1) Samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses using New York State Department of Environmental Conservation ASP 2000 Method OLM 4.3 and metals using USEPA Method 6010, except for mercury, which was analyzed using USEPA Method 7470.
(2). Refer to Figure 3 of this OM&M Report for schematic sample locations.
(3). Results validated following protocols specified in the Sampling and Analysis Plan (Appendix A) of the Groundwater OM&M Manual (ARCADIS 2009c).
(4) "Subtotal VOCs" represents the sum of individual concentrations of VOCs detected. Values shown have been rounded to the nearest whole number.
(5) "Subtotal TICs" represents the sum of individual TICs detected. Values shown have been rounded to the nearest whole number.
(6) "Total VOCs" represent the sum of VOCs and TICs detected. Values shown have been rounded to the nearest whole number.

Acronyms\Key:

Bold value indicates a detection.

J	Estimated value.
ND	TIC not detected.
OM&M	Operation, maintenance and monitoring.
TICs	Tentatively identified compounds.
USEPA	United States Environmental Protection Agency.
VOC	Volatile organic compound.
ug/L	Micrograms per liter.
--	Not analyzed.
< 5 U	Compound not detected above its laboratory quantification limit.

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Appendix C

Vapor Sample Analytical Results

Table C-1. Vapor Sample Analytical Results - October 4, 2010, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2,3]

COMPOUND (ug/m^3)	Location ID: / Sample Location: / Sample Date:	VSP-1 (7) System Influent 10/4/2010	VSP-2 VPGAC Mid-Train 10/4/2010	VSP-3 System Mid-Train 10/4/2010	VSP-4 (8) PPZ Mid-Train 10/4/2010	VSP-5 System Effluent 10/4/2010
Volatile Organic Compounds						
1,1,1-Trichloroethane		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
1,1,2,2-Tetrachloroethane		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
1,1,2-Trichloroethane		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
1,1-Dichloroethane		**12 J**	< 3.5 U	**16**	< 16 UJ	**8.1**
1,1-Dichloroethene		R	< 3.5 U	**24**	< 16 UJ	**3.9**
1,2-Dichloroethane		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
1,2-Dichloropropane		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
1,3-butadiene		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
1-Chloro-1,1-difluoroethane (CFC 142b)		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
2-Butanone		R	< 35 U	< 57 U	< 160 UJ	**16**
2-Hexanone		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
4-methyl-2-pentanone		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
Acetone		R	**200**	**65**	**170 J**	**390**
Benzene		R	< 3.5 U	< 5.7 U	< 16 UJ	**11**
Bromodichloromethane		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
Bromoform		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
Bromomethane		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
Carbon Disulfide		R	< 35 U	< 57 U	< 160 UJ	< 6.8 U
Carbon tetrachloride		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
Chlorobenzene		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
Chlorodifluoromethane (Freon 22)		**4,600 J**	**4,700 D**	**4,700 D**	**3,200 DJ**	**3,900 D**
Chloroethane		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
Chloroform		**37 J**	< 3.5 U	< 5.7 U	< 16 UJ	**9.2**
Chloromethane		R	< 3.5 U	< 5.7 U	< 16 UJ	**2.7**
cis-1,2-dichloroethene		**1,800 J**	< 3.5 U	**1,200**	**420 J**	**120**
cis-1,3-dichloropropene		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
Dibromochloromethane		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
Dichlorodifluoromethane (Freon 12)		R	**4.1**	< 5.7 U	< 16 UJ	**3.5**
Ethylbenzene		R	< 3.5 U	< 5.7 U	< 16 UJ	**0.93**
Methyl tert-Butyl Ether		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
Methylene Chloride		R	< 3.5 U	< 5.7 U	< 16 UJ	**0.91**
Styrene		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
Tetrachloroethene		R	< 3.5 U	< 5.7 U	< 16 UJ	**0.92**
Toluene		**100 J**	< 3.5 U	< 5.7 U	**24 J**	**26**
trans-1,2-dichloroethene		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
trans-1,3-dichloropropene		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
Trichloroethylene		**200 J**	< 3.5 U	< 5.7 U	**24 J**	**13**
Trichlorofluoromethane (CFC-11)		R	< 3.5 U	< 5.7 U	< 16 UJ	**1.6**
Trichlorotrifluoroethane (Freon 113)		R	< 3.5 U	< 5.7 U	< 16 UJ	< 0.68 U
Vinyl Chloride		**170 J**	**180**	**170**	**68 J**	**14**
Xylene-o		R	< 3.5 U	< 5.7 U	< 16 UJ	**0.90**
Xylenes - m,p		R	< 6.9 U	< 11 U	< 32 UJ	**1.8**
Subtotal VOCs [4]		**6,919**	**5,084**	**6,175**	**3,906**	**4,524**

See notes on last page.

Table C-1. Vapor Sample Analytical Results - October 4, 2010, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2,3]

COMPOUND (ug/m^3)	Location ID: / Sample Location: / Sample Date:	VSP-1 System Influent 10/4/2010	VSP-2 VPGAC Mid-Train 10/4/2010	VSP-3 System Mid-Train 10/4/2010	VSP-4 PPZ Mid-Train 10/4/2010	VSP-5 System Effluent 10/4/2010
Tentatively Identified Compounds						
3-Methyl Decane		--	--	--	**410 JN**	**46 JN**
Propylene Glycol		--	**85 JN**	**78 JN**	--	--
2,5-Hexanedione		--	**41 JN**	**34 JN**	--	--
2,6-Dimethylundecane		--	--	--	**1,300 JN**	**88 JN**
2-Butoxyethanol		--	**95 JN**	--	--	--
2-Methyldecalin Isomers + C12H26 Compound WITH HIGHEST CONC.		--	--	--	**1,600 JN**	**200 JN**
2-Phenyl-2-Propanol		--	**610 JN**	**180 JN**	--	--
Acetophenone		--	**65 JN**	**92 JN**	--	--
Alpha-Methylstyrene		--	**230 JN**	**87 JN**	--	--
C12H26 Branched Alkane WITH 2ND HIGHEST CONC		--	--	--	**530 JN**	**48 JN**
C12H26 Branched Alkane WITH HIGHEST CONC.		--	--	--	**1,100 JN**	**130 JN**
Dodecane		--	--	--	**420 JN**	--
Hexamethyl Cyclotrisloxane		--	**130 JN**	**600 JN**	--	--
Pentylcyclohexane		--	--	--	**1,300 JN**	**150 JN**
Trimethylsilanol		--	**20 JN**	**49 JN**	--	--
Uknown Siloxane with the Highest Concentration		--	**45 JN**	**130 JN**	--	--
Undecane		--	--	--	**830 JN**	**43 JN**
UNKNOWN 2-Methyldecalin Isomers WITH 2nd HIGHEST CONC.		--	--	--	**720 JN**	**77 JN**
UNKNOWN 2-Methyldecalin Isomers WITH THE HIGHEST CONC.		--	--	--	**830 JN**	**150 JN**
UNKNOWN C11H22 COMPOUND WITH THE HIGHEST CONC.		--	--	--	**310 JN**	**57 JN**
UNKNOWN C11H24 COMPOUND WITH 2ND HIGHEST CONC.		--	--	--	--	**37 JN**
UNKNOWN C12H24 COMPOUND WITH THE HIGHEST CONC.		--	--	--	**520 JN**	**70 JN**
UNKNOWN C12H22 COMPOUND WITH THE HIGHEST CONC.		--	--	--	**310 JN**	--
UNKNOWN C12H26 COMPOUND WITH 2ND HIGHEST CONC.		--	--	--	**1,600 JN**	**130 JN**
UNKNOWN C12H26 COMPOUND WITH 3RD HIGHEST CONC.		--	--	--	**1,500 JN**	**87 JN**
UNKNOWN C12H26 COMPOUND WITH 4th HIGHEST CONC.		--	--	--	**340 JN**	--
UNKNOWN C12H26 COMPOUND WITH THE HIGHEST CONC.		--	--	--	**1,700 JN**	**140 JN**
UNKNOWN C13H28 COMPOUND WITH THE HIGHEST CONC.		--	--	--	**950 JN**	**120 JN**
UNKNOWN C7H10 COMPOUND WITH THE HIGHEST CONC.		--	**31 JN**	--	--	--
UNKNOWN Decahydronaphthalene Isomer WITH THE HIGHEST CONC		--	--	--	--	**41 JN**
UNKNOWN WITH HIGHEST CONC.		--	--	--	**1,000 JN**	**170 JN**
UNKNOWN WITH 2ND HIGHEST CONC.		--	--	--	**600 JN**	**39 JN**
UNKNOWN WITH 3RD HIGHEST CONC.		--	--	--	--	**34 JN**
Subtotal TICs [5]		0	**1,352**	**1,250**	**17,870**	**1,857**
Total VOCs [6]		**6,919**	**6,436**	**7,425**	**21,776**	**6,381**

See notes on last page.

Table C-1. Vapor Sample Analytical Results - October 4, 2010, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1,2,3)

Notes:

(1) Samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses per Modified USEPA Method TO-15.
(2) Refer to Figure 3 of this OM&M Report for schematic sample locations.
(3) Results validated following protocols specified in the Sampling and Analysis Plan (Appendix A) of the Groundwater OM&M Manual (ARCADIS 2009c).
(4) "Subtotal VOCs" represents the sum of individual concentrations of VOCs detected. Values shown have been rounded to the nearest whole number.
(5) "Subtotal TICs" represents the sum of individual TICs detected. Values shown have been rounded to the nearest whole number.
(6) "Total VOCs" represent the sum of VOCs and TICs detected. Values shown have been rounded to the nearest whole number.
(7) The 10/4/2010 VSP-1 vapor sample container had a positive pressure (+1.6 inches of Mercury) when it arrived at the laboratory. Per our laboratory QA/QC program, the results of any sample with a pressure greater than a negative 0.1 inches of Mercury are required to be denoted as "Rejected" or "Unusable". Specifically, if the compound is not detected in the sample a "R" qualifier is used and if the compound is detected, a "J" qualifier is used to denote that the value is "estimated".
(8) The 10/4/2010 VSP-4 vapor sample container had a pressure of -0.4 inches of Mercury when it arrived at the laboratory. Per our laboratory QA/QC program, the results of any sample with a pressure between -1.0 and -0.1 inches of Mercury are required to be denoted with a "J" qualifier to indicate that the value is "estimated".

Acronyms\Key:

Bold value indicates a detection.

D	Concentration is based on a diluted sample analysis.
J	Estimated value.
JN	Compound tentatively identified, concentration is estimated.
OM&M	Operation, maintenance and monitoring.
R	The sample results are rejected.
TIC	Tentatively identified compound.
USEPA	United States Environmental Protection Agency.
VOC	Volatile organic compound.
ug/m^3	Micrograms per cubic meter.
< 9.2 U	Compound not detected above its laboratory quantification limit.
--	TIC not detected.

Table C-2. Vapor Sample Analytical Results - November 8, 2010, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2,3]

COMPOUND (ug/m^3)	Location ID: / Sample Location: / Sample Date:	Lead P1 / Lead VPGAC Port 1 / 11/8/2010
Volatile Organic Compounds		
1,1,1-Trichloroethane		< 7.4 U
1,1,2,2-Tetrachloroethane		< 7.4 U
1,1,2-Trichloroethane		< 7.4 U
1,1-Dichloroethane		**19**
1,1-Dichloroethene		**15**
1,2-Dichloroethane		< 7.4 U
1,2-Dichloropropane		< 7.4 U
1,3-butadiene		< 7.4 U
1-Chloro-1,1-difluoroethane (CFC 142b)		< 7.4 U
2-Butanone		< 74 U
2-Hexanone		< 7.4 U
4-methyl-2-pentanone		< 7.4 U
Acetone		**81**
Benzene		< 7.4 U
Bromodichloromethane		< 7.4 U
Bromoform		< 7.4 U
Bromomethane		< 7.4 U
Carbon Disulfide		< 74 U
Carbon tetrachloride		< 7.4 U
Chlorobenzene		< 7.4 U
Chlorodifluoromethane (Freon 22)		**4,000 D**
Chloroethane		< 7.4 U
Chloroform		**9.5**
Chloromethane		< 7.4 U
cis-1,2-dichloroethene		**1,900 D**
cis-1,3-dichloropropene		< 7.4 U
Dibromochloromethane		< 7.4 U
Dichlorodifluoromethane (Freon 12)		< 7.4 U
Ethylbenzene		< 7.4 U
Methyl tert-Butyl Ether		< 7.4 U
Methylene Chloride		< 7.4 U
Styrene		< 7.4 U
Tetrachloroethene		< 7.4 U
Toluene		< 7.4 U
trans-1,2-dichloroethene		< 7.4 U
trans-1,3-dichloropropene		< 7.4 U
Trichloroethylene		< 7.4 U
Trichlorofluoromethane (CFC-11)		< 7.4 U
Trichlorotrifluoroethane (Freon 113)		< 7.4 U
Vinyl Chloride		**160**
Xylene-o		< 7.4 U
Xylenes - m,p		< 15 U
Subtotal VOCs [4]		**6,185**

See notes on last page.

Table C-2. Vapor Sample Analytical Results - November 8, 2010, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1,2,3)

COMPOUND (ug/m^3)	Location ID:	Lead P1
	Sample Location:	Lead VPGAC Port 1
	Sample Date:	11/8/2010
Tentatively Identified Compounds		
Acetophenone		**61 JN**
Alpha-Methylstyrene		**59 JN**
Hexamethyl Cyclotrisloxane		**89 JN**
Subtotal TICs (5)		**209**
Total VOCs (6)		**6,394**

Notes:

(1) Samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses per Modified USEPA Method TO-15.
(2) Refer to Figure 3 of this OM&M Report for schematic sample locations.
(3) Results validated following protocols specified in the Sampling and Analysis Plan (Appendix A) of the Groundwater OM&M Manual (ARCADIS 2009c).
(4) "Subtotal VOCs" represents the sum of individual concentrations of VOCs detected. Values shown have been rounded to the nearest whole number.
(5) "Subtotal TICs" represents the sum of individual TICs detected. Values shown have been rounded to the nearest whole number.
(6) "Total VOCs" represent the sum of VOCs and TICs detected. Values shown have been rounded to the nearest whole number.

Acronyms\Key:

Bold value indicates a detection.

D	Concentration is based on a diluted sample analysis.
JN	Compound tentatively identified, concentration is estimated.
OM&M	Operation, maintenance and monitoring.
TIC	Tentatively identified compound.
USEPA	United States Environmental Protection Agency.
VOC	Volatile organic compound.
ug/m^3	Micrograms per cubic meter.
< 9.2 U	Compound not detected above its laboratory quantification limit.

Table C-3. Vapor Sample Analytical Results - December 6, 2010, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. [1,2,3]

COMPOUND (ug/m^3)	Location ID: / Sample Location: / Sample Date:	VSP-4 / PPZ Mid-Train / 12/6/2010	VSP-5 / System Effluent / 12/6/2010
Volatile Organic Compounds			
1,1,1-Trichloroethane		< 7 U	< 0.65 U
1,1,2,2-Tetrachloroethane		< 7 U	< 0.65 U
1,1,2-Trichloroethane		< 7 U	< 0.65 U
1,1-Dichloroethane		< 7 U	**1.3**
1,1-Dichloroethene		< 7 U	**0.66**
1,2-Dichloroethane		< 7 U	< 0.65 U
1,2-Dichloropropane		< 7 U	< 0.65 U
1,3-butadiene		< 7 U	< 0.65 U
1-Chloro-1,1-difluoroethane (CFC 142b)		< 7 U	< 0.65 U
2-Butanone		< 70 U	< 6.5 U
2-Hexanone		< 7 U	< 0.65 U
4-methyl-2-pentanone		< 7 U	< 0.65 U
Acetone		< 70 U	**56**
Benzene		**8.3**	**2.6**
Bromodichloromethane		< 7 U	< 0.65 U
Bromoform		< 7 U	< 0.65 U
Bromomethane		< 7 U	< 0.65 U
Carbon Disulfide		< 70 U	< 6.5 U
Carbon tetrachloride		< 7 U	< 0.65 U
Chlorobenzene		< 7 U	< 0.65 U
Chlorodifluoromethane (Freon 22)		**3,800 D**	**3,500 D**
Chloroethane		< 7 U	< 0.65 U
Chloroform		< 7 U	**4.7**
Chloromethane		< 7 U	< 0.65 U
cis-1,2-dichloroethene		**120**	**50**
cis-1,3-dichloropropene		< 7 U	< 0.65 U
Dibromochloromethane		< 7 U	< 0.65 U
Dichlorodifluoromethane (Freon 12)		< 7 U	< 0.65 U
Ethylbenzene		< 7 U	< 0.65 U
Methyl tert-Butyl Ether		< 7 U	< 0.65 U
Methylene Chloride		< 7 U	< 0.65 U
Styrene		< 7 U	< 0.65 U
Tetrachloroethene		< 7 U	< 0.65 U
Toluene		**11**	**11**
trans-1,2-dichloroethene		< 7 U	< 0.65 U
trans-1,3-dichloropropene		< 7 U	< 0.65 U
Trichloroethylene		**16**	**9.6**
Trichlorofluoromethane (CFC-11)		< 7 U	< 0.65 U
Trichlorotrifluoroethane (Freon 113)		< 7 U	< 0.65 U
Vinyl Chloride		**9.0**	**2.4**
Xylene-o		< 7 U	< 0.65 U
Xylenes - m,p		< 14 U	< 1.3 U
Subtotal VOCs [4]		**3,964**	**3,638**

See notes on last page.

Table C-3. Vapor Sample Analytical Results - December 6, 2010, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York. (1,2,3)

COMPOUND (ug/m^3)	Location ID: / Sample Location: / Sample Date:	VSP-4 / PPZ Mid-Train / 12/6/2010	VSP-5 / System Effluent / 12/6/2010
Tentatively Identified Compounds			
3-Methyldecane		**460 JN**	--
3-Methyldecane + alpha-Cumylalcohol		--	**46 JN**
Acetophenone		--	**27 JN**
C10H18 Compound		--	**23 JN**
C10H20 Compound		**580 JN**	**28 JN**
C11H20 Compound		--	**45 JN**
C11H20 Compound		**1,000 JN**	**90 JN**
C11H20 Compound		**890 JN**	**68 JN**
C12H26 Branched Alkane WITH 2ND HIGHEST CONC		**1,500 JN**	**62 JN**
C12H26 Branched Alkane WITH 3RD HIGHEST CONC.		**1,400 JN**	**60 JN**
C12H26 Branched Alkane WITH 4RD HIGHEST CONC.		**1,400 JN**	**55 JN**
C12H26 Branched Alkane WITH 5TH HIGHEST CONC.		**1,300 JN**	**53 JN**
C12H26 Branched Alkane WITH 6TH HIGHEST CONC.		**920 JN**	**25 JN**
C12H26 Branched Alkane WITH 7TH HIGHEST CONC.		**750 JN**	--
C12H26 Branched Alkane WITH 8TH HIGHEST CONC.		**440 JN**	--
C12H26 Branched Alkane WITH HIGHEST CONC.		**1,700 JN**	**77 JN**
C13H28 Branched Alkane		**1,600 JN**	**69 JN**
Hexamethyl Cyclotrisloxane		--	**48 JN**
Pentylcyclohexane		**1,300 JN**	**56 JN**
Undecane		**960 JN**	--
UNKNOWN C11H22 COMPOUND WITH THE HIGHEST CO		**490 JN**	--
UNKNOWN WITH HIGHEST CONC.		**1,600 JN**	**87 JN**
UNKNOWN WITH 2ND HIGHEST CONC.		**800 JN**	**37 JN**
UNKNOWN WITH 3RD HIGHEST CONC.		**710 JN**	**30 JN**
UNKNOWN WITH 4TH HIGHEST CONC.		**660 JN**	**25 JN**
Subtotal TICs (5)		**20,460**	**1,011**
Total VOCs (6)		**24,424**	**4,649**

Notes:

(1) Samples collected by ARCADIS on the dates shown and submitted to Columbia Analytical Services, Inc. for VOC analyses per Modified USEPA Method TO-15.
(2) Refer to Figure 3 of this OM&M Report for schematic sample locations.
(3) Results validated following protocols specified in the Sampling and Analysis Plan (Appendix A) of the Groundwater OM&M Manual (ARCADIS 2009c).
(4) "Subtotal VOCs" represents the sum of individual concentrations of VOCs detected. Values shown have been rounded to the nearest whole number.
(5) "Subtotal TICs" represents the sum of individual TICs detected. Values shown have been rounded to the nearest whole number.
(6) "Total VOCs" represent the sum of VOCs and TICs detected. Values shown have been rounded to the nearest whole number.

Acronyms\Key:

Bold value indicates a detection.

D	Concentration is based on a diluted sample analysis.
JN	Compound tentatively identified, concentration is estimated.
OM&M	Operation, maintenance and monitoring.
TIC	Tentatively identified compound.
USEPA	United States Environmental Protection Agency.
VOC	Volatile organic compound.
ug/m^3	Micrograms per cubic meter.
< 9.2 U	Compound not detected above its laboratory quantification limit.
--	TIC not detected.

ARCADIS

Appendix D

Air Discharge Quality Evaluation

Table D-1. Annual Summary of SCREEN3 Model Input and Outputs, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Parameters	Date Sampled:	01/11/10	02/02/10	03/10/10	04/12/10	05/10/10	06/09/10	07/20/10	08/12/10	10/04/10	12/06/10
SCREEN3 Model Input											
Source Type		Point	Point	Point	Point	Point	Point	Point	Point	Point	Point
Emission Rate (g/s)		1	1	1	1	1	1	1	1	1	1
Stack Height (ft)		13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
Stack Height (m)		4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Stack Inside Diameter (m)		0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Air Flow Rate (scfm)[(1)]		2,184	2,135	2,099	2,086	2,076	2,003	2,114	2,097	2,112	2,021
Air Flow Rate (acfm @ stack temp)[(2)]		2,188	2,135	2,127	2,125	2,115	2,029	2,194	2,180	2,180	2,029
Stack Gas Exit Temperature (K)[(1)]		295	294	298	300	300	298	306	306	304	296
Ambient Air Temperature (K)[(3)]		269	269	280	285	283	288	299	296	285	280
Receptor Height (m)[(4)]		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
Building Height (m)		2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Min Horizontal Bldg Dim (m)		7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
Max Horizontal Bldg Dim (m)		9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
Consider Bldg Downwash?		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/Complex Terrain Above Stack Base		Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple	Simple
Meteorology		Full	Full	Full	Full	Full	Full	Full	Full	Full	Full
Automated Distances Array		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
SCREEN3 Model Output											
1-HR Max Concentration at Receptor Height ($\mu g/m^3$) [(5)]		1,876	1,912	1,912	1,911	1,919	1,985	1,857	1,869	1,876	1,993
Annualization Factor[(6)]		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 ($\mu g/m^3$)[(7)]		150.1	153	153	152.9	153.5	158.8	148.6	149.5	150.1	159.4
Distance To Max Concentration (m)[(8)]		8	8	8	8	8	8	8	8	8	8

See notes on last page.

Table D-1. Annual Summary of SCREEN3 Model Input and Outputs, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Notes:

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

(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.

Acronyms\Key:

$\mu g/m^3$	Micrograms per cubic meter.
acfm	Actual cubic feet per minute.
ft	Feet.
g/s	Grams per second.
K	Kelvin.
m	Meters.
scfm	Standard cubic feet per minute.
USEPA	United States Environmental Protection Agency.

Table D-2. Annual Summary of Maximum Allowable Stack Concentration Calculations, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Compound	Actual Effluent Concentrations[1] (µg/m^3)									
	1/11/10	2/2/10	3/10/10	4/12/10	5/10/10	6/9/10	7/20/10	8/12/10	10/4/10	12/6/10
1,1,1 - Trichloroethane	0	0	0.91	0	0	0.97	0	0	0	0
1,1 - Dichloroethane	2.8	0	5.9	0	1.2	4.4	0	3.3	8.1	1.3
1,1 - Dichloroethene	0	0	0.97	0	0	0.77	0	2	3.9	0.66
2-Butanone	16	42	17	0	9.2	9.1	0	8.1	16	0
Acetone	61	550	98	200	95	170	930	230	390	56
Chloroform	4.2	7.9	7.9	0	3.5	6.7	0	4.8	9.2	4.7
Ethylbenzene	1.1	0	1.8	0	0	0.79	0	0	0.93	0
Xylenes (o)	1.4	0	3.1	0	0	1.4	0	0	0.90	0
Xylenes (m,p)	2.3	0	5.1	0	0	2.4	0	0	1.8	0
Chloromethane	0	8.8	0.82	0	0.97	2.8	0	0	2.7	0
Methylene Chloride	0	0	0	0	0	0	0	0	0.91	0
Tetrachloroethene	0	0	1.2	0	0	1.1	0	0.82	0.92	0
Trichloroethene	13	13	17	17	5.1	12	9.9	12	13	9.6
Vinyl Chloride	36	12	29	27	0	5.0	17	15	14	2.4
cis 1,2 Dichloroethene	52	34	77	65	9.2	21	40	49	120	50
Benzene	7.8	17	4.6	29	7.8	13	17	11	11	2.6
Toluene	38	40	96	80	0	44	31	25	26	11
2-Hexanone	0	0	0.81	0	0	0	0	0	0	0
Trichlorofluoromethane (Freon 11)	0	0	0	0	0	0	0	1.2	1.6	0
Dichlorodifluoromethane (Freon 12)	2.9	3.3	3.8	0	3.5	3.5	0	2.8	3.5	0
Chlorodifluoromethane (Freon 22)	3,700	3,700	4,700	4,800	3,500	5,400	6,000	5,200	3,900	3,500

See notes on last page.

Table D-2. Annual Summary of Maximum Allowable Stack Concentration Calculations, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Compound	AGC[2]	Maximum Allowable Stack Concentration[3] (µg/m^3)									
	(µg/m^3)	1/11/10	2/2/10	3/10/10	4/12/10	5/10/10	6/9/10	7/20/10	8/12/10	10/4/10	12/6/10
1,1,1 - Trichloroethane	1,000	6.45E+06	6.49E+06	6.51E+06	6.52E+06	6.53E+06	6.58E+06	6.50E+06	6.50E+06	6.48E+06	6.55E+06
1,1 - Dichloroethane	0.63	4.06E+03	4.09E+03	4.10E+03	4.11E+03	4.11E+03	4.14E+03	4.09E+03	4.10E+03	4.08E+03	4.13E+03
1,1 - Dichloroethene	70	4.52E+05	4.54E+05	4.56E+05	4.56E+05	4.57E+05	4.60E+05	4.55E+05	4.55E+05	4.53E+05	4.59E+05
2-Butanone	5,000	3.23E+07	3.24E+07	3.26E+07	3.26E+07	3.26E+07	3.29E+07	3.25E+07	3.25E+07	3.24E+07	3.28E+07
Acetone	28,000	1.81E+08	1.82E+08	1.82E+08	1.83E+08	1.83E+08	1.84E+08	1.82E+08	1.82E+08	1.81E+08	1.83E+08
Chloroform	0.043	2.77E+02	2.79E+02	2.80E+02	2.80E+02	2.81E+02	2.83E+02	2.79E+02	2.80E+02	2.78E+02	2.82E+02
Ethylbenzene	1,000	6.45E+06	6.49E+06	6.51E+06	6.52E+06	6.53E+06	6.58E+06	6.50E+06	6.50E+06	6.48E+06	6.55E+06
Xylenes (o)	100	6.45E+05	6.49E+05	6.51E+05	6.52E+05	6.53E+05	6.58E+05	6.50E+05	6.50E+05	6.48E+05	6.55E+05
Xylenes (m,p)	100	6.45E+05	6.49E+05	6.51E+05	6.52E+05	6.53E+05	6.58E+05	6.50E+05	6.50E+05	6.48E+05	6.55E+05
Chloromethane	90	5.81E+05	5.84E+05	5.86E+05	5.87E+05	5.87E+05	5.92E+05	5.85E+05	5.85E+05	5.83E+05	5.90E+05
Methylene Chloride	2.1	1.35E+04	1.36E+04	1.37E+04	1.37E+04	1.37E+04	1.38E+04	1.36E+04	1.37E+04	1.36E+04	1.38E+04
Tetrachloroethene	1	6.45E+03	6.49E+03	6.51E+03	6.52E+03	6.53E+03	6.58E+03	6.50E+03	6.50E+03	6.48E+03	6.55E+03
Trichloroethene	0.5	3.23E+03	3.24E+03	3.26E+03	3.26E+03	3.26E+03	3.29E+03	3.25E+03	3.25E+03	3.24E+03	3.28E+03
Vinyl Chloride	0.11	7.10E+02	7.14E+02	7.16E+02	7.17E+02	7.18E+02	7.23E+02	7.15E+02	7.15E+02	7.12E+02	7.21E+02
cis 1,2 Dichloroethene	63	4.06E+05	4.09E+05	4.10E+05	4.11E+05	4.11E+05	4.14E+05	4.09E+05	4.10E+05	4.08E+05	4.13E+05
Benzene	0.13	8.39E+02	8.43E+02	8.46E+02	8.48E+02	8.48E+02	8.55E+02	8.45E+02	8.45E+02	8.42E+02	8.52E+02
Toluene	5,000	3.23E+07	3.24E+07	3.26E+07	3.26E+07	3.26E+07	3.29E+07	3.25E+07	3.25E+07	3.24E+07	3.28E+07
2-Hexanone	48	3.10E+05	3.11E+05	3.13E+05	3.13E+05	3.13E+05	3.16E+05	3.12E+05	3.12E+05	3.11E+05	3.14E+05
Trichlorofluoromethane (Freon 11)	1,000	6.45E+06	6.49E+06	6.51E+06	6.52E+06	6.53E+06	6.58E+06	6.50E+06	6.50E+06	6.48E+06	6.55E+06
Dichlorodifluoromethane (Freon 12)	12,000	7.74E+07	7.78E+07	7.81E+07	7.83E+07	7.83E+07	7.89E+07	7.80E+07	7.80E+07	7.77E+07	7.86E+07
Chlorodifluoromethane (Freon 22)	50,000	3.23E+08	3.24E+08	3.26E+08	3.26E+08	3.26E+08	3.29E+08	3.25E+08	3.25E+08	3.24E+08	3.28E+08

See notes on last page.

Table D-2. Annual Summary of Maximum Allowable Stack Concentration Calculations, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Compound	Percent of Maximum Allowable Stack Concentration[4]									
	1/11/10	2/2/10	3/10/10	4/12/10	5/10/10	6/9/10	7/20/10	8/12/10	10/4/10	12/6/10
1,1,1 - Trichloroethane	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1,1 - Dichloroethane	0.07%	0.00%	0.14%	0.00%	0.03%	0.11%	0.00%	0.08%	0.20%	0.03%
1,1 - Dichloroethene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2-Butanone	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%
Chloroform	1.51%	2.83%	2.82%	0.00%	1.25%	2.37%	0.00%	1.72%	3.30%	1.67%
Ethylbenzene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Xylenes (o)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Xylenes (m,p)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chloromethane	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Methylene Chloride	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%
Tetrachloroethene	0.00%	0.00%	0.02%	0.00%	0.00%	0.02%	0.00%	0.01%	0.01%	0.00%
Trichloroethene	0.40%	0.40%	0.52%	0.52%	0.16%	0.36%	0.30%	0.37%	0.40%	0.29%
Vinyl Chloride	5.07%	1.68%	4.05%	3.76%	0.00%	0.69%	2.38%	2.10%	1.97%	0.33%
cis 1,2 Dichloroethene	0.01%	0.01%	0.02%	0.02%	0.00%	0.01%	0.01%	0.01%	0.03%	0.01%
Benzene	0.93%	2.02%	0.54%	3.42%	0.92%	1.52%	2.01%	1.30%	1.31%	0.31%
Toluene	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2-Hexanone	0.00%	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%
Dichlorodifluoromethane (Freon 12)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chlorodifluoromethane (Freon 22)	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. Data in this table corresponds to approximately the past year of system operation.

(2) AGC refers to the compound-specific annual guideline concentration per the NYSDEC DAR-1 AGC/SGC tables, revised September 10, 2007.

(3) 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 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.

Acronyms\Key:

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

AGC Annual guideline concentration.

MASC Maximum allowable stack concentration.