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2013 Periodic Review Report

On-Site Groundwater Remedy
Operable Unit 2

Northrop Grumman Systems Corporation
Bethpage, New York
NYSDEC Site # 1-30-003A

Naval Weapons Industrial Reserve Plant
Bethpage, New York
NYSDEC Site # 1-30-003B

October 2014

ARCADIS

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ARCADIS

1. Certification

For each institutional or engineering control identified for the Operable Unit 2 (OU2) On-Site Groundwater Remedy, I certify that all of the following statements are true:

(a) The engineering control employed for the OU2 On-Site Groundwater Remedy is unchanged from the date the control was put in place, or last approved by Division of Environmental Remediation (DER).
(b) Nothing has occurred that would impair the ability of such control to protect public health and the environment.
(c) Nothing has occurred that would constitute a violation or failure to comply with any operation, maintenance, and monitoring plan for this control.
(d) Access to the OU2 On-Site Groundwater Remedy will continue to be provided to DER to evaluate the remedy, including access to evaluate the continued maintenance of this control.

Christopher Engler, P.E.
Engineer of Record
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2. Executive Summary

This Periodic Review Report (PRR) summarizes and certifies the operation, maintenance, and monitoring (OM&M) activities conducted by Northrop Grumman for the Operable Unit 2 (OU2) On-Site Containment (ONCT) system that contains impacted groundwater beneath both the Northrop Grumman Systems Corporation (Northrop Grumman), Bethpage, New York facility (Site No. 1-30-003A) and the former Naval Weapons Industrial Reserve Plant (NWIRP), Bethpage, New York (Site No. 1-30-003B) (hereinafter referred to as the "Site") during 2013 (i.e., from January 1 to December 31, 2013 [the "reporting period"]). This PRR also satisfies the requirement for the OU2 2013 Annual Groundwater Monitoring Report, including reporting of data collected during the fourth quarter of 2013.

2.1 Site Overview

The former Grumman Aerospace Corporation (now the Northrop Grumman Systems Corporation) (New York State Department of Environmental Conservation [NYSDEC] Site # 1-30-003A) occupied approximately 500 acres in east-central Nassau County, in the Hamlet of Bethpage, Town of Oyster Bay, New York. The original Site was bounded by Stewart Avenue to the north, Central Avenue to the south, Route 107 to the southwest, South Oyster Bay Road to the west, and various residential and commercial areas to the east. Currently, Northrop Grumman occupies and/or owns the parcels identified on Figure 1. The former Bethpage Naval Weapons Industrial Reserve Plant (NWIRP; NYSDEC Site # 1-30-003B) and the former Occidental Chemical Corporation (OXY)/RUCO Polymer Corporation (NYSDEC Site # 1-30-0004) sites are located adjacent to the Site.

The primary groundwater constituents of concern (COCs), based on concentration and frequency of detection, for the former Northrop Grumman and NWIRP sites are chlorinated volatile organic compounds (VOCs), mainly: trichloroethene (TCE); tetrachloroethene (PCE); 1,1,1-trichloroethane (1,1,1-TCA); 1,2-dichloroethene (1,2-DCE); 1,1-dichloroethene (1,1-DCE); and 1,1-dichloroethane (1,1-DCA). The former OXY/RUCO Polymer Site exhibits these COCs as well, with the addition of vinyl chloride monomer (VCM; also referred to as vinyl chloride). Additionally, metals were identified as COCs in the area near former Northrop Grumman Plant 2 (cadmium and chromium) and in the area near former Northrop Grumman Plant 1 (chromium). The 1994 Remedial Investigation (RI) Report (Geraghty & Miller 1994) describes and depicts the overall extent of groundwater impacts prior to remediation, which included

on-site and off-site VOC-impacted groundwater above NYSDEC Standard, Criteria, and Guidance (SCGs).

As stated in the OU2 Record of Decision (ROD), the overall remedial goal is to meet all SCGs and be protective of human health and the environment. The key remedial objective for achieving the overall remedial goal is to eliminate, to the extent practicable, off-site migration of impacted groundwater.

The OU2 ONCT groundwater extraction and treatment system, which was intended to actively remediate the on-site portion of the VOC-impacted groundwater, consists of:

- Five Remedial Wells (1, 3/3R, 17, 18, and 19)
- Two treatment systems (Tower 96 and Tower 102), each consisting of a packed tower air stripper to remove VOCs from the extracted groundwater and a regenerable vapor-phase granular activated carbon (RVPGAC) system
- Supplemental air treatment at Tower 96, provided by OXY, which consists of vapor-phase granular activated carbon (VPGAC) and potassium permanganate-impregnated zeolite (PPZ)
- Two sets of recharge basins (the Southern Recharge Basins [primary] and the Western Recharge Basins [secondary]) to accept the treated water discharge

As a component of the OU2 ROD, the ONCT System was evaluated to confirm that its performance was consistent with the key remedial objective of eliminating, to the extent practicable, the off-site migration of impacted groundwater. Additionally, Northrop Grumman collected data in 2011/2012 and 2013 under the "ONCT Hydraulic Effectiveness Program" to supplement a 2003 effort and ongoing routine monitoring of the ONCT System. These data also support the conclusion that the ONCT System is meeting the key remedial objective.

2.2 Effectiveness of the OU2 On-Site Groundwater Remedy

The following conclusions are provided about the performance and ability of the OU2 On-Site Groundwater Remedy, in whole or in part, to achieve the Remedial Action Objectives (RAOs) for the Site:

- The OU2 ONCT system generally operated as designed and extracted on-site impacted groundwater to prevent it from migrating off-site.
  - The OU2 ONCT system operated continuously during the fourth quarter reporting period with the exception of brief shutdown periods for routine maintenance and alarm conditions. In general, system operation in 2013 is consistent with operation in previous years.
  - Approximately 7,517 lbs of VOC mass were removed from the aquifer and treated by the OU2 ONCT system during this reporting.
  - Since full-time startup in November 1998, approximately 181,000 lbs of VOCs have been removed from the aquifer and treated by the ONCT system.
- Routine hydraulic monitoring indicates hydraulic containment is being achieved; confirming that the combination of shallow recharge at the South Recharge Basins coupled with pumpage of the remedial wells in the Deep2 zone forms a hydraulic barrier to groundwater flow that is preventing the off-site migration of VOC-impacted groundwater.
- Routine VOC groundwater quality monitoring indicates shallow and intermediate wells on-site and off-site exhibit few SCG exceedances and have demonstrated downward trends over time, which support the conclusion that the operation of the OU2 ONCT system has formed an effective hydraulic barrier that prevents the off-site migration of VOC-impacted groundwater in the shallower portions of the aquifer.
- Routine VOC groundwater quality monitoring indicates bifurcation of the VOC-impacted groundwater is occurring in the Deep and Deep2 zones immediately south of the hydraulic barrier, with demonstrated downward VOC trends occurring over time.
- Supplemental data collected during recently completed Phases 1 and 2 of the ONCT Hydraulic Effectiveness Program further confirm that the ONCT System provides effective vertical and horizontal control of VOC-impacted groundwater and is preventing its off-site migration.
- On-Site cadmium and chromium impacts to groundwater from Plant 2 remain limited to on-site areas. On-site chromium concentrations near Plant 1 generally have been stable since 2009.

- The operation of the ONCT system complied with applicable NYSDEC SCGs for various OU2 ONCT system emissions (i.e., treated water and air emissions).
  - The OU2 ONCT system's effluent met NYSDEC regulatory requirements during the reporting period.
  - The effluent vapor met applicable air discharge criteria during the reporting period.

2.3 Compliance with OM&M Manual and Associated Plans

Requirements of the OU2 ONCT OM&M Manual were met during the reporting period in terms of operation and maintenance with several exceptions noted in Section 5 related to record keeping and performance of routine, scheduled maintenance of the OU2 ONCT system equipment and components. Several recommendations are provided to address areas requiring modification or improvement.

Requirements of the OU2 ONCT OM&M Manual were met during the reporting period in terms of remedial system monitoring (performance and compliance). Modifications are not necessary at this time.

Overall, requirements of the associated Groundwater Monitoring Plan were met. However, areas of modification are identified with respect to hydraulic and groundwater quality monitoring, specifically the addition of select monitoring wells that were supplemental in 2013 as well as the outpost monitoring wells.

In the future, for periodic review reporting purposes, ARCADIS proposes to return to the Annual Groundwater Monitoring Report format per requirements of the OU2 ONCT OM&M Manual and associated Groundwater Monitoring Plan.

3. Introduction

ARCADIS of New York, Inc. (ARCADIS) has been retained by Northrop Grumman Systems Corporation (Northrop Grumman) to prepare this Periodic Review Report (PRR), at the request of the New York State Department of Environmental Conservation (NYSDEC), to document the operation, maintenance, and monitoring (OM&M) activities for the Operable Unit 2 (OU2) On-Site Groundwater Remedy (also referred to as the OU2 On-Site Containment [ONCT] system) located at the Site. These activities were conducted by Northrop Grumman, in accordance with the NYSDEC-approved Operation, Maintenance, and Monitoring Manual (ARCADIS 2014a) and associated Groundwater Monitoring Plan (ARCADIS 2014b) to meet the

remedial action objectives set forth in the March 2001 OU2 Record of Decision (ROD) (NYSDEC 2001).

This PRR summarizes and certifies the operation and maintenance (O&M) activities conducted by Northrop Grumman for the OU2 ONCT system and the monitoring of associated media and remedial technologies used at the Site during 2013 (i.e., from January 1 to December 31, 2013 [the "reporting period"]). This PRR also satisfies the requirement for the OU2 2013 Annual Groundwater Monitoring Report, including reporting of data collected during the fourth quarter of 2013. This PRR does not summarize or certify the OM&M activities conducted by the Navy at the former NWIRP property nor the ROD-required off-site components of the groundwater remedial program, which includes monitoring of the GM-38 hotspot, OM&M of the GM-38 groundwater extraction and treatment system, off-site groundwater investigation and components of the public water supply protection program.

4. Site Overview

This section provides a brief description of the Site, relevant history as it relates to the OU2 On-Site Groundwater Remedy, main features/components of the OU2 On-Site Groundwater Remedy, and describes the remedial action objectives (RAOs) specified in the OU2 ROD.

4.1 Description of Site

The former Grumman Aerospace Corporation (now the Northrop Grumman Systems Corporation) (NYSDEC Site # 1-30-003A) occupied approximately 500 acres in east-central Nassau County, in the Hamlet of Bethpage, Town of Oyster Bay, New York. The original Site was bounded by Stewart Avenue to the north, Central Avenue to the south, Route 107 to the southwest, South Oyster Bay Road to the west, and various residential and commercial areas to the east. Currently, Northrop Grumman occupies and/or owns the parcels identified on Figure 1. The former Bethpage Naval Weapons Industrial Reserve Plant (NWIRP) (NYSDEC Site # 1-30-003B) and the former Occidental Chemical Corporation (OXY)/RUCO Polymer Corporation (NYSDEC Site # 1-30-0004) sites are located adjacent to the Site.

4.2 Nature and Extent of Impacted Groundwater

This section provides an overview of the nature and extent of impacted groundwater detected beneath and in the vicinity of the former Northrop Grumman, NWIRP, and

OXY/RUCO Polymer sites. Groundwater sampling conducted as part of the Remedial Investigations (RIs) for the above three sites indicates that past chemical storage and/or waste disposal practices at each of these sites has resulted in impacts to groundwater (i.e., the upper glacial aquifer and Magothy aquifer). The primary groundwater constituents of concern (COCs), based on concentration and frequency of detection, for the former Northrop Grumman and NWIRP sites are chlorinated volatile organic compounds (VOCs), mainly: trichloroethene (TCE); tetrachloroethene (PCE); 1,1,1-trichloroethane (1,1,1-TCA); 1,2-dichloroethene (1,2-DCE); 1,1-dichloroethene (1,1-DCE); and 1,1-dichloroethane (1,1-DCA). The former OXY/RUCO Polymer Site exhibits these COCs as well, with the addition of vinyl chloride monomer (VCM; also referred to as vinyl chloride). Additionally, metals were identified as COCs in the area near former Northrop Grumman Plant 2 (cadmium and chromium) and in the area near former Northrop Grumman Plant 1 (chromium). The 1994 RI Report (Geraghty & Miller 1994) describes and depicts the overall extent of groundwater impacts prior to remediation, which included on-site and off-site VOC-impacted groundwater above Standards, Criteria, and Guidance (SCGs).

4.3 Remedial Action Objectives

As stated in the OU2 ROD, the overall remedial goal is to meet all SCGs and be protective of human health and the environment.

Consistent with the remedial goals selected for the Site as stated in the OU2 ROD, the RAOs for the OU2 On-Site Groundwater Remedy, either in whole or in part, are to:

- Eliminate, to the extent practicable, site-related constituents from the affected public water supplies and prevent, to the extent practicable, the future impacts to public water supplies.
- Eliminate, to the extent practicable, exposures to impacted groundwater.
- Eliminate, to the extent practicable, off-site migration of impacted groundwater and, where practicable, restore the groundwater to pre-disposal conditions.
- Eliminate, to the extent practicable, the off-site migration of soils impacts entering the groundwater.
- Eliminate, to the extent practicable, exceedances of applicable environmental quality standards related to releases of constituents to the waters of the state.

- Comply with applicable NYSDEC SCGs for various OU2 ONCT system emissions (i.e., treated water and air emissions). The discharge requirements for water and air emissions are provided in the OM&M Manual (ARCADIS 2014a).

4.4 Main Features/Components of the Remedy

Per the OU2 ROD, the following are the main features/components of OU2 On-Site Groundwater Remedy, which was intended to actively remediate the on-site portion of the VOC-impacted groundwater:

- The operation, maintenance and monitoring of the OU2 ONCT groundwater extraction and treatment system to address the on-site impacted groundwater. The OU2 ONCT groundwater extraction and treatment system consists of:
  - Five Remedial Wells (1, 3/3R, 17, 18, and 19) with design pumping rates of 800 gallons per minute (gpm), 700 gpm, 1,000 gpm, 600 gpm and 700 gpm, respectively
  - Two treatment systems (Tower 96 and Tower 102), each consisting of a packed tower air stripper to remove VOCs from the extracted groundwater and a regenerable vapor-phase granular activated carbon (RVPGAC) system, with on-site steam regeneration via on-site boilers, to remove VOCs from the air stripper off gas
  - Supplemental air treatment at Tower 96, provided by OXY, which consists of vapor-phase granular activated carbon (VPGAC) and potassium permanganate-impregnated zeolite (PPZ)
  - Two sets of recharge basins (the Southern Recharge Basins [primary] and the Western Recharge Basins [secondary]) to accept the clearwell treated water gravity overflow discharge
  - A pressurized, Site-wide discharge main to accept the treated water discharge for non-potable reuse
- A groundwater monitoring program to assess the overall OU2 On-Site Groundwater Remedy environmental effectiveness and a performance and compliance monitoring program at the treatment plants. The groundwater monitoring program also includes outpost monitoring upgradient of potentially affected public water supply wells in accordance with the Public Water Supply

Contingency Plan (PWSCP) (ARCADIS G&M, Inc., 2003a). The groundwater monitoring well network and additional wells in the Site vicinity are shown on Figure 1.

As a component of the OU2 ROD, the ONCT System was evaluated to confirm that its performance was consistent with the RAO of eliminating, to the extent practicable, the off-site migration of impacted groundwater. The "Operable Unit 2 Groundwater Remedial System Hydraulic Effectiveness Evaluation" (ARCADIS G&M Inc., 2003b) carried out jointly by Navy and Northrop Grumman, pursuant to the OU2 ROD, provided additional data that supported the conclusion that the ONCT System is meeting the above RAO. Additionally, Northrop Grumman collected data in 2011/2012 and 2013 under the "ONCT Hydraulic Effectiveness Program" to supplement the 2003 report and ongoing routine monitoring of the ONCT System. These data also support the conclusion that the ONCT System is meeting this RAO.

Additional information is provided in the OU2 ONCT OM&M Manual (ARCADIS 2014a) and the associated Groundwater Monitoring Plan (ARCADIS 2014b). A site plan of the OU2 ONCT groundwater extraction and treatment system is provided on Figure 2, and a schematic drawing of the Tower 96 and Tower 102 treatment systems is provided on Figure 3.

Since the selection of the remedy in the OU2 ROD, several significant changes have been made to the OU2 On-Site Groundwater Remedy, as approved by the NYSDEC. The following is a summary of the significant changes:

- 2001: OXY installed the supplemental vapor-phase treatment system, as noted above, at the Tower 96 treatment system due to the increasing concentration of VCM within the influent groundwater.

- 2004: Remedial Well 3 (former Grumman Production Well 3 [GP-3]) was formally recognized by the NYSDEC as a component of the OU2 On-Site Groundwater Remedy.

- 2004: The recharge rate to the Southern Recharge Basins was reevaluated, and it was determined that the rate could be reduced to 2,300 gpm so that treated water could be provided to Calpine (as required under contract) while maintaining the hydraulic capture of the on-site VOC-impacted groundwater.

- 2006: The design pumping rates for Remedial Wells 1 and 3 were modified to 800 gpm and 700 gpm, respectively, to prevent migration of VCM beyond Remedial Well 3.

- 2013: Remedial Well 3R was brought online to replace Remedial Well 3 due to the decreasing specific capacity of Remedial Well 3.

Additional historical information is provided in the OU2 ONCT OM&M Manual (ARCADIS 2014a). Historical information related to significant modifications to the groundwater monitoring program are provided in the Groundwater Monitoring Plan (ARCADIS 2014b), which incorporates the most recent modifications (May 2012) to the monitoring well network and/or frequency of monitoring, subsequently approved by the NYSDEC in August 2012 and implemented in 2013.

5. Operation and Maintenance

The following subsections provides a summary of the routine and non-routine operation and maintenance activities completed during the reporting period to meet requirements outlined in the OM&M Manual (ARCADIS 2014a), as well as a performance evaluation of the remedial treatment systems. Finally, overall conclusions and recommendations regarding O&M for the Site are included in this section.

5.1 Summary of O&M Completed

In general, the O&M of the OU2 ONCT system was conducted in accordance with the OU2 ONCT OM&M Manual (ARCADIS 2014a). This consisted of the following:

- Daily site checks were performed by the system operator during business days to visually check the system for proper operation and to check for leaks or other potential emergency situations. Both systems were also continuously monitored by the Supervisory Control and Data Acquisition (SCADA) system. As per the recently updated and approved OU2 ONCT OM&M Manual (ARCADIS 2014), a daily site visit checklist will be used starting in 2014 to improve the record keeping and tracking of OM&M problems and issues.

- Weekly site checks were performed to monitor and record key process parameters to confirm proper system operation, to assess whether a process parameter is changing, and to provide information that may be helpful later in case there is an

operational problem. A summary of the weekly monitoring data collected for Tower 96 and Tower 102 is provided in Tables 1A and 1B, respectively.

- Routine maintenance of equipment generally was performed in accordance with the manufacturers' specifications as needed. As per the recently updated and approved OU2 ONCT OM&M Manual (ARCADIS 2014a), a routine maintenance schedule and checklist will be implemented starting in 2014 to further improve the treatment system uptime and ensure the RAOs continue to be met.

- Non-routine maintenance of equipment and system components was performed in response to alarm conditions, physical damage or systems parameters operating outside of their normal operating ranges. A summary of the non-routine maintenance activities completed for Tower 96 and Tower 102 is provided in Table 2.

- Solvent (also referred to as free product) recovered by the RVPGAC system was handled, stored, and disposed off-site. The solvent is characterized as a hazardous waste (D040/F001) and is drummed, temporarily staged in a hazardous waste storage area, and properly transported and disposed of off-site by Northrop Grumman in accordance with applicable regulations and permit requirements. Copies of the completed hazardous waste manifests are included in Appendix A.

5.2 Performance Evaluation

The OU2 ONCT system operated continuously during the fourth quarter reporting period with the exception of brief shutdown periods for routine maintenance and alarm conditions. In general, system operation in 2013 is consistent with operation in previous years. An operational summary of the remedial wells, discharges, and treatment system efficiencies for 2013 (reporting period) and the period of record (since initial startup in 1998) is provided in Table 3. Consistent with reporting during previous Annual Groundwater Monitoring Reports, the operational summary associated with the fourth quarter of 2013 is provided in Appendix C for completeness. In summary during the reporting period:

- The remedial wells operated above their respective design rates, with the exception of Remedial Wells 3 and 19.

    - Remedial Well 3 operated at a reduced average flow rate due to a decline of the specific capacity within the first quarter, and the well was pumped at a

reduced flow rate to ensure adequate water above the top of the pump. The Remedial Well 3 submersible pump was lowered approximately 100 feet in August 2013 to maintain the design flow rate. A new replacement remedial well (Remedial Well 3R) was brought online in December 2013 and operated at approximately 800 gpm throughout the remainder of the year.

- Remedial Well 19 operated at a reduced average flow rate due to failure of its vertical turbine pump and redevelopment activities completed from August through October 2013. Throughout the performance of the redevelopment activities, the flow rate of Remedial Well 18 was increased to an average of approximately 820 gpm to compensate for the lost pumping capacity. A temporary pump was installed at the completion of the Remedial Well 19 redevelopment activities and it operated at a reduced average flow rate (600 gpm) throughout the remainder of the year. Work to convert Remedial Well 19 from a vertical turbine pump with a pressure modulating valve, to a submersible pump with a variable frequency drive (VFD), was completed during the first quarter of 2014. Remedial Well 19 has operated above 700 gpm since completion of the work.

- The remedial wells extracted a combined total of 1,913 million gallons (MG) of groundwater during the reporting period, which represented approximately 96 percent of the design volume.

- The remedial wells operated for the following percentage of the reporting period: Remedial Well 1 (98 percent), Remedial Well 3/3R (93 percent), Remedial Well 17 (95 percent), Remedial Well 18 (96 percent), and Remedial Well 19 (83 percent).

- The water treatment components of the OU2 ONCT system (air stripper/clear well) performed within acceptable operating ranges for this reporting period, as indicated by the following:

  - The air stripper VOC removal efficiencies were greater than 99 percent.

  - The air stripper effluent water discharges complied with applicable SCGs (Table 4). Additional details regarding system water monitoring are discussed in Section 6.

- The air treatment components of the OU2 ONCT system (RVPGAC/solvent recovery) did not perform within acceptable operating ranges during portions of this

reporting period. The RVPGAC stack discharges complied with applicable SCGs and discharge limits (Tables 5A, 5B, 6A, and 6B); however, various operational and maintenance issues were noted with the solvent recovery system throughout the reporting period. This was evidenced by periodic solvent odors and elevated photoionization detector (PID) readings within the treatment system buildings, and system parameters not within typical operating ranges. To correct these issues, additional troubleshooting and maintenance was completed during the reporting period and continuing through October 2014. This included the replacement of various faulty valves and gauges, replacement of steam pressure relief valves, replacement of the influent/effluent RVPGAC damper seals, repairs to the solvent recovery storage tank cover gasket at Tower 96, replacement of the condenser cooling water pump with a new direct feed from the effluent force main at Tower 102, repairs to the process blower duct boots at Tower 96 and Tower 102, and repair of the condenser cooling water flow meter at Tower 96. Additional details regarding the non-routine maintenance completed to address the solvent recovery system are provided in Table 2.

- Additional maintenance and assessment of the OU2 ONCT system's critical alarms and SCADA system set points was completed during the reporting period, and continuing through May 2014. This effort was conducted to ensure that the alarms were functioning properly, would shut down the treatment systems in the event of an alarm condition, and that the set points were properly established in relation to the design criteria and current treatment system operating conditions.

5.3 Conclusions and Recommendations for O&M

Generally, the majority of O&M activities conducted during 2013 met the overall O&M requirements. Additionally, areas of modification and improvement were identified and are summarized in Section 8 along with plans and a schedule to address.

6. Monitoring

The following subsections provide a summary of the monitoring completed during this reporting period to meet requirements outlined in the OM&M Manual (ARCADIS 2014a) and the associated Groundwater Monitoring Plan (ARCADIS 2014b). The following subsections also provide summaries of 2013 monitoring data, comparisons of the results with applicable SCGs, and additional data evaluations describing the performance and effectiveness of the OU2 ONCT system. Additionally, a subsection is included that provides a summary of the recently completed Phase 1 and Phase 2

work associated with the ONCT Hydraulic Effectiveness Program and resulting interpretation. Finally, overall conclusions and recommendations regarding monitoring for the Site are included.

6.1 Summary of Monitoring Completed

In general, the monitoring of the OU2 ONCT system was completed in accordance with the OU2 ONCT OM&M Manual (ARCADIS 2014a) and associated Groundwater Monitoring Plan (ARCADIS 2014b). A summary of the monitoring completed during this reporting period is provided below:

- Quarterly remedial system performance monitoring:
    - Remedial well water quality monitoring was completed to monitor the performance of groundwater capture and assess VOC mass removal. A summary of the results is provided in Table 4.
    - Remedial treatment systems water quality monitoring was completed to monitor the performance of the water treatment components of the OU2 ONCT system. A summary of the results is provided in Table 4.
    - Remedial treatment systems air quality monitoring was completed to monitor the performance of the air treatment components of the OU2 ONCT system. A summary of the results is provided in Tables 5A and 5B.
- Remedial system compliance monitoring:
    - Monthly State Pollutant Discharge Elimination System (SPDES) monitoring was completed to determine the compliance status of water discharged to the Western Recharge Basins (i.e., Outfall 005) and Southern Recharge Basins (i.e., Outfall 006). Monitoring was in accordance with the terms and conditions of Northrop Grumman's SPDES Permit No. NY0096792. A summary of the results is provided in Table 7. SPDES discharge monitoring data are documented monthly by Northrop Grumman in Discharge Monitoring Reports (DMRs) that are transmitted to the NYSDEC under separate cover. Copies of the completed DMRs are provided in Appendix B.

- Quarterly air monitoring was completed to determine the compliance status of the air discharge from the OU2 ONCT system. A summary of the results is provided in Tables 5A, 5B, 6A, and 6B.

- Semiannual groundwater hydraulic monitoring:

  - Groundwater hydraulic (water-level) monitoring was completed to determine, monitor, and document local and regional groundwater flow patterns resulting from the operation of the OU2 On-Site Groundwater Remedy, including the vertical and horizontal extent of the cumulative capture zone created by the operation of the OU2 ONCT system (Figures 4 and 5).

  - During the reporting period, routine hydraulic monitoring was performed semiannually as indicated in Tables 8 and 9, specifically on July 15, 2013 (associated with second quarter 2013 monitoring activities) and on November 19, 2013 (fourth quarter 2013), respectively. Tables 8 and 9 provide these second and fourth quarter 2013 water-level measurement data, respectively. Water levels were also collected from the following additional monitoring wells: MW 3-1 (associated with the replacement of Well 3 with Well 3R) and GM-21D2, GM-78D, GM-78D2, GM-73D3, and GM-74D3 (associated with Phase 1 and Phase 2 of the ONCT Hydraulic Effectiveness Program). Tables 8 and 9 include these supplemental water-level data, as applicable.

- Groundwater quality monitoring:

  - Groundwater quality monitoring was completed to demonstrate the effectiveness of the OU2 On-Site Groundwater Remedy in removing/treating impacted groundwater and preventing its off-site migration, as well as discharging treated groundwater. As on-site hydraulic containment continues and the off-site migration of VOCs is prevented, on- and off-site groundwater quality is expected to improve over time. In the area immediately south of the hydraulic barrier, a clean water front is expected to develop, which will cause the eventual bifurcation of the VOC impacts (i.e., development and growth of a zone of groundwater with trace or no detectable VOCs downgradient of the Site southern boundary). Further south, in the more distal portions of the off-site VOC impacts, improving groundwater quality would also be expected over time as a result of continued on-site hydraulic containment, as well as the natural processes of dispersion, adsorption, and biodegradation. However, the VOC impacts exceeding SCGs in these further downgradient areas are

expected to continue in the short-term due to the off-site migration of VOC-impacted groundwater from the Site prior to the startup of the OU2 ONCT system.

- During this reporting period, groundwater quality monitoring was performed quarterly for VOCs at outpost monitoring wells (first, second, third, and fourth quarters of 2013), semiannually for VOCs and cadmium/chromium at select on-site and off-site wells (second and fourth quarters of 2013), and annually for VOCs at remaining on-site and off-site wells in the groundwater monitoring network (second quarter of 2013). Groundwater quality results associated with the first, second, and third quarters of 2013 have been previously submitted to NYSDEC in quarterly reports. Similar data summaries associated with the fourth quarter of 2013 are provided in Appendix C. Consistent with reporting during previous Annual Groundwater Monitoring Reports, copies of the completed Groundwater Sampling Logs and Chains of Custody are provided in Appendix D.

- Groundwater quality monitoring results for second quarter 2013 (annual round monitoring) for VOCs are summarized by hydrogeologic zone in Tables 11 through 15.

6.2 Summary of Monitoring Results

6.2.1 Remedial System Performance Monitoring

Remedial system performance monitoring results are summarized below:

- Treatment system influent concentrations, mass recovered and mass removal rates (Tables 3, 4, and 11 through 15; Figures 6, 7, 8, 9, and 10):

  - Total volatile organic compound (TVOC) influent concentrations from the remedial wells ranged from 73 micrograms per liter (µg/L; Remedial Well 18) to 1,900 µg/L (Remedial Well 3) during this reporting period (Table 4). TCE and PCE were the contaminants detected at the highest concentrations. With the exception of Remedial Well 19, the remedial wells exhibit overall stable to decreasing trends since mid-2006 (Figures 9 and 10).

  - VCM was detected in Remedial Wells 1 and 3 during this reporting period, but was not detected in the other remedial wells (or monitoring wells) sampled this

period (Tables 4 and 11 through 15). Remediation of groundwater (i.e., biosparge system) to address VCM upgradient (northwest) of Remedial Well 3/3R is currently underway by OXY under United States Environmental Protection Agency (USEPA) oversight.

- Approximately 7,517 lbs of VOC mass were removed from the aquifer and treated by the OU2 ONCT system during this reporting period (Table 3 and Figures 6, 7, and 8). The majority of VOC mass was recovered by Remedial Well 3 (57 percent), Remedial Well 1 (20 percent) and Remedial Well 17 (14 percent). Overall, the VOC mass removed has declined by 12% compared to Year 2012. The decline in mass removal can be attributed to the overall decline in remedial well concentrations and the downtime for maintenance of Remedial Wells 3 and 19.

- Since full-time startup of the ONCT system in November 1998, approximately 181,000 lbs of VOCs have been removed from the aquifer and treated by the ONCT system (Table 3).

6.2.2 Remedial System Compliance Monitoring

6.2.2.1 Water Discharge

The OU2 ONCT system's effluent met NYSDEC regulatory requirements during the reporting period (Table 7 and Appendix B), as indicated by the following:

- The measured concentration of individual VOCs in the treated water effluent were below applicable discharge limits, per the SPDES permit.

- The measured concentration of nitrogen and pH in the treated water effluent were below applicable discharge limits or ranges, per the SPDES permit.

6.2.2.2 Air Discharge

Effluent vapor laboratory results were compared to the NYSDEC DAR-1 Short-Term Guidance Concentrations (SGCs; Tables 5A and 5B). In addition, effluent vapor laboratory analytical results were compared to a site-specific modeled annual maximum allowable stack concentration (MASC). The annual MASC was calculated during each monitoring event for individual compounds using the output from a USEPA SCREEN3 model in conjunction with the NYSDEC DAR-1 Annual Guidance

Concentrations (AGCs). A scaling factor was calculated using the SCREEN3 model with site-specific physical layout (e.g., building dimension, stack height, terrain, and other features) and operating data (e.g., discharge flow rate, temperature, and other parameters) inputs for each monitoring event. The scaling factor was then used to adjust (scale) the NYSDEC DAR-1 AGC to a site-specific annual MASC. A summary of the instantaneous percent (i.e., not time-weighted) of the site-specific annual MASC for detected compounds and a summary of the cumulative annual percent (i.e., time-weighted) of the site-specific MASC for detected compounds is provided in Tables 6A and 6B. A summary of the model input, outputs, and backup calculations is provided in Appendix E.

The effluent vapor met applicable air discharge criteria during the reporting period based on the following:

- The measured concentrations of individual VOCs in the effluent did not exceed applicable SGCs (Tables 5A and 5B).

- The measured concentration of individual VOCs in the effluent did not exceed applicable instantaneous MASCs, as calculated using the USEPA SCREEN 3 Model (Tables 6A and 6B). Similarly, the time-weighted rolling average for all detected compounds is below the MASCs.

6.2.3 Groundwater Flow

In general, “mounding”, as a result of the discharge of treated water to on-site recharge basins, is expected to be evident in the Shallow/Intermediate zones of the aquifer, and “cones of depression”, in response to remedial well pumpage, are expected to be most clearly evident in the Deep2 zone where the remedial wells are screened. Under these conditions, groundwater flow in the vicinity of the OU2 ONCT system is generally expected to be vertically downward from the shallower portions of the aquifer to the deeper portions of the aquifer toward the remedial wells.

Figures 4 and 5 depict groundwater elevations and horizontal flow directions in the Shallow/Intermediate and Deep2 zones, respectively during operation of the OU2 ONCT system. Table 10 summarizes vertical hydraulic gradients for key monitoring well pairs, which were calculated using the July 2013 water-level measurements, and compares these gradients to model-predicted gradients (both direction and magnitude).

Hydraulic monitoring results obtained during this reporting period are consistent with prior years and indicate that the OU2 ONCT system is providing hydraulic containment of VOCs in groundwater on the Site. Figure 4 shows that mounding of the water table exists in the Shallow/Intermediate zones, extending beneath the South Recharge Basins and across the Site southern boundary. Additionally, data (Table 10) indicate vertical hydraulic gradients in Shallow/Shallow, Shallow/Intermediate, Shallow/Deep, Deep/Deep2, and Deep2/Deep2 wells pairs are oriented downward (with the exception of the GM-21S/GM-21I and GM-15D/GM-15D2 well pairs), consistent with expectations and model-predicted directions (i.e., updated version of the groundwater model used to support the design of the OU2 ONCT system). The mounding and downward vertical gradients described above force shallower groundwater vertically downward into the Deep2 zone, where it is extracted by the ONCT remedial wells. Figure 5 shows that the ONCT remedial wells have developed a collective zone of capture in the Deep2 zone that extends approximately 500 feet downgradient of the Site (see groundwater divide depicted on Figure 5). In summary, 2013 hydraulic monitoring data indicate that collectively, the mounding, downward vertical gradients, and the Deep2 capture zone resulting from the operation of the OU2 ONCT system prevents the off-site migration of impacted groundwater in accordance with the RAOs. Additional confirmation of this hydraulic capture of impacted groundwater is provided in Section 6.3.

6.2.4 Groundwater Quality

This section describes and evaluates the analytical results of groundwater quality monitoring completed during the second quarter 2013.

6.2.4.1 Volatile Organic Compounds

The evaluation of VOC monitoring results is presented by hydrogeologic zone and considers the following factors: (1) proximity to the hydraulic barrier formed by the OU2 ONCT system (i.e., upgradient/on-site, along the Site southern boundary, and downgradient of the hydraulic barrier) and (2) NYSDEC SCGs.

As mentioned above, results of the routine annual monitoring round (second quarter of 2013) are used to evaluate VOC groundwater quality for the reporting period. Tables 11 through 15 summarize detected VOCs during the annual groundwater monitoring round by hydrogeologic zone compared to applicable NYSDEC SCGs. Additionally, time-concentration graphs depicting the long-term VOC concentration trends in key wells grouped by proximity to the hydraulic barrier created by operation of the OU2

ONCT system are shown on Figures 9 through 15. Data trend graphs include key wells with detectable concentrations of VOCs that were sampled in 2013.

- Shallow/Intermediate Zones: As shown in Tables 11 and 12, shallow and intermediate monitoring wells located near or immediately downgradient of the Site southern boundary (GM-20I, GM-21S, GM-21I, GM-74I, GM-78S, GM-78I, and N-10631) exhibited no exceedances of VOCs in 2013. Generally, the majority of shallow and intermediate monitoring wells located on-site and upgradient of the Site southern boundary (GM-15SR, GM-15I, GM-17I, GM-18I, HN-40S, HN-42S, and HN-42I) exhibited no VOC exceedances in 2013. A few of the upgradient wells (FW-03, HN-40I, and HN-24I) exhibited exceedances of VOCs, including PCE and/or TCE. These three wells are located within the capture zone of the ONCT system; therefore, groundwater in this area is hydraulically contained and, over time, will be extracted and treated. Additionally, upgradient well HN-24I shows an overall decreasing concentration trend since startup of the OU2 ONCT system (Figure 11).

  In summary, shallow and intermediate well groundwater quality data supports the conclusion that the operation of the OU2 ONCT system has formed an effective hydraulic barrier that prevents the off-site migration of VOC-impacted groundwater in the shallower portions of the aquifer.

- Deep and Deep2 Zones: 2013 groundwater quality data indicate SCG exceedances exists on-site and in wells located further downgradient of the hydraulic barrier in the off-site portion of the groundwater VOC impacts not actively remediated. However, an overall downward trend in VOC concentrations over time exists in Deep/Deep2 zone wells upgradient of the OU2 ONCT system and in off-site areas, further downgradient of the Site. Data summarized in Tables 13 and 14, as well as VOC trend graphs depicted on Figures 9 through 15 support these findings as follows:

  - Well GM-13D is located on-site and upgradient of the OU2 ONCT system in the Deep zone (Figure 1). This well exhibits an overall downward trend in TVOC concentrations (Figure 11), with current concentrations representing a reduction in VOC concentrations of greater than 85 percent since 2002.

  - Deep zone monitoring wells located on-site along or upgradient of the Site southern boundary (e.g., GM-15D, GM-17D, GM-18D, GM-74D, and GM-39DA) and Deep zone monitoring wells located immediately downgradient of

the Site southern boundary (e.g., Wells N-10627, GM-20D, and GM-21D) exhibited no SCG exceedances for VOCs during 2013. Monitoring Well GM-79D, also located immediately downgradient and southeast of the Site in the Deep zone, exhibited SCG exceedances of TCE; however, the trend in VOC concentrations remains downward over time in this well (Figure 12).

- Figure 9 depicts TVOC concentration trends for Deep2 zone wells along the southern and southwestern boundary of the Site. While exceedances of SCGs during 2013 are noted for monitoring wells GM-33D2 and GM-73D2 (Table 14), the overall long-term trends are downward with stable trends since approximately 2009. Current concentrations in Wells GM-33D2 and GM-73D2 represent an approximate reduction in VOC concentrations of greater than 99% since 1999, and 96% since 2002, respectively.

- Figure 10 depicts TVOC concentration trends for Deep and Deep2 zone wells along the southern and southeastern Site boundaries. While exceedances of SCGs during 2013 are noted for some of these Deep2 zone monitoring wells (Table 14), continued long-term trends are relatively stable for most of these wells. Following an initial decreasing trend through 2005, Well GM-73D also exhibits a current stable trend.

- Figures 13 and 14 depict TVOC concentrations trends for Deep and Deep2 zone wells further downgradient of the Site to the southeast and to the south, respectively, in off-site areas of VOCs in groundwater that are not actively remediated. While exceedances of SCGs during 2013 are noted for some of these Deep and Deep2 zone monitoring wells (Tables 13 and 14), these wells continue to exhibit stable to decreasing TVOC concentration trends (e.g., GM-34D, GM-35D2, GM-70D2, and GM-75D2).

- Figure 15 depicts TVOC trends for Deep and Deep2 zone wells in the GM38 Area, located further downgradient and southeast of the Site. OM&M reports for the GM-38 Area Remedy are submitted to NYSDEC by the Navy under separate cover. The TVOC concentrations in the off-site wells GM-38D and GM-38D2 have decreased since mid-2006 and 2002, respectively. Concentrations have continued to decrease since the startup of the GM-38 Area remedial system in September 2009, with the current TVOC concentrations representing the lowest levels observed through the period of record for these wells.

In summary, the groundwater quality data from the Deep and Deep2 zone wells continues to support the interpretation of the hydraulic data and confirm that the operation of the OU2 ONCT system has formed an effective hydraulic barrier that prevents the off-site migration of VOC-impacted groundwater in the Deep and Deep2 zone and that groundwater quality off-site in the deeper portions of the aquifer is improving over time. Groundwater quality data from the Deep and Deep2 zones indicate that bifurcation of the VOC impacts has occurred, as expected, as shown in Appendix F - Figures 4 and 5. Furthermore, on-site/upgradient wells are located within the capture zone of the remedial wells (which are screened in the Deep2 zone) and, therefore, VOC-impacted groundwater exceeding SCGs in this area is hydraulically contained and over time will be extracted and treated by the OU2 ONCT system.

- Deep3 Zone: Groundwater monitoring data from the Deep3 zone are summarized in Table 15 and include detected VOCs for recently installed monitoring well TT-101D2, which was recently incorporated into the program for downgradient monitoring of the distal portion (off-site) of the VOC impacts (Figure 1). Table 15 also includes supplemental results for wells recently installed on-site along the Site southern boundary as part of the ONCT Hydraulic Effectiveness Program (GM-73D3 and GM-74D3). Based on results for the Deep3 zone wells, findings are as follows:

    - TT-101D2 exhibits exceedances of SCGs for VOCs (TCE and Freon 113) similar to other wells installed in this well cluster above the Deep2 zone (e.g., TT-101D and TT-101D1). Generally, the results are consistent with concentrations expected in the off-site portion of the VOC impacts not actively remediated.

    - Wells GM-73D3 and GM-74D3 exhibited no SCG exceedances for VOCs. The lack of VOCs exceeding applicable SCGs in this deepest portion of the aquifer in the vicinity of the remedial wells confirms that the OU2 ONCT system is providing effective hydraulic containment vertically to the base of the regional aquifer.

6.2.4.2 Outpost Well Monitoring

Consistent with reporting during previous Annual Groundwater Monitoring Reports, the results of the fourth quarter 2013 outpost well monitoring round are provided in Appendix C and are summarized below. The complete description of the procedures

to collect groundwater samples from the outpost wells and to evaluate and document the results is provided in the PWSCP (ARCADIS G&M, Inc. 2003a). Originally, there were a total of nine outpost wells (BPOW1-1, BPOW1-2, BPOW1-3, BPOW2-1, BPOW2-2, BPOW3-1, BPOW3-2, BPOW4-1, and BPOW4-2) with trigger values established for seven of the wells in accordance with the PWSCP. Established trigger values for some of the nine original outpost wells have been exceeded (as summarized in previous Annual Groundwater Monitoring Reports and noted in Table C4 provided in Appendix C). Currently there are a total of 15 outpost wells, and six outpost monitoring wells (BPOW1-4, BPOW1-5, BPOW1-6, BPOW2-3, BPOW3-3, and BPOW3-4) did not have trigger levels established. As such, results for the fourth quarter of 2013 are compared to applicable SCGs as follows:

- VOCs were not detected in outpost wells BPOW1-2, BPOW1-3, BPOW 1-4, BPOW 1-5, BPOW 1-6, BPOW2-1, BPOW2-2, BPOW2-3, BPOW3-1, BPOW3-2, and BPOW 3-3 during the reporting period.

- VOCs were detected in outpost wells BPOW1-1 and BPOW4-2 below their respective SCGs, but above the TVOC outpost trigger values, where established. Additionally, VOCs were detected in outpost well BPOW4-1 with TCE exceeding its SCG and site-related VOCs detected above the established TVOC outpost trigger value. As indicated above (and noted in Table C4 provided in Appendix C), notification and reporting of the initial trigger value exceedances for these wells, as outlined in the PWSCP (ARCADIS G&M, Inc. 2003a), was performed prior to 2013.

- Well BPOW3-4 also had yielded detections of site-related VOCs with only TCE exceeding its SCG. No trigger value was established for this well.

Based on the consistency of trigger value exceedances and additional evaluation of the VOC impacts by the Navy through the installation of additional Vertical Profile Borings (VPBs) and wells, the original nine outpost wells (BPOW1-1, BPOW1-2, BPOW1-3, BPOW2-1, BPOW2-2, BPOW3-1, BPOW3-2, BPOW4-1, and BPOW4-2) have met the goal of the PWSCP. Therefore, they will be re-purposed, upon NYSDEC's approval of the associated recommendation outlined in Section 8, which is to serve as monitoring wells positioned proximal to public water supply wells.

6.2.4.3 Cadmium and Chromium

Consistent with reporting during previous Annual Groundwater Monitoring Reports, cadmium and chromium analytical results for the fourth quarter of 2013 are provided in

Appendix C (Table C3). Trends in cadmium concentrations are shown on Figure 16. Trends in total chromium concentrations for former Northrop Grumman Plants 2 and 1 are shown on Figures 17 and 18, respectively.

- Exceedances of cadmium were not detected in Monitoring Wells GM-78S, GM-78I, and N-10631 in 2013 (Figure 16).

- Chromium did not exceed the SCG near the former Northrop Grumman Plant 2 in 2013 (Figure 17). Well MW-02GF exhibited decreasing trends in total chromium, with concentrations decreasing from above the SCG in 2012 to below the SCG in 2013.

- Monitoring Wells GM-78S, GM-78I, and N-10631 (located downgradient of Plant 2) continued to exhibit consistent decreasing or stable trends with total chromium concentrations below the SCG (Figure 17).

- Since late 2010, the chromium concentration trends in the wells near the former Northrop Grumman Plant 1 have been stable to decreasing over time in Monitoring Wells GM-15S, PLT1MW-05, and PLT1MW-06 (Figure 18). Since late 2008, wells PLT1MW-05 and GM-15S have exhibited a higher degree of variability in chromium concentrations over time. There have been no detections of chromium in Well PLT1MW-04 since mid-2005 (Figure 18).

6.2.4.4 Tentatively Identified Compounds

Consistent with reporting during previous Annual Groundwater Monitoring Reports, this section summarizes Tentatively Identified Compounds (TICs). One unknown TIC was detected in outpost monitoring well BPOW 1-4 in the second quarter of 2013. TICs were not detected in any other monitoring wells during 2013.

6.3 ONCT Hydraulic Effectiveness Program

As mentioned previously, consistent with the OU2 ROD, Northrop Grumman conducted work in 2012 (Phase 1) and 2013 (Phase 2) under the "ONCT Hydraulic Effectiveness Program" to provide supplemental data to further evaluate and confirm that the ONCT system is performing effectively. The technical memorandum associated with Northrop Grumman's On-Site Hydraulic Effectiveness Program is provided in Appendix F. This memorandum includes a summary of the work performed, summary of the additional data (geologic, hydrogeologic, and groundwater

quality) collected, and an interpretation regarding the effectiveness of the OU2 ONCT system in meeting its remedial objective (i.e., on-site containment of VOC-impacted groundwater).

Additional interpretive figures were developed and included in the technical memorandum to support data evaluation. Profile-view figures (Figures 2 and 3 of the technical memorandum) provide interpretations of TVOCs in groundwater, groundwater flow, and superimposed geologic framework in the vertical plane along the Site southern boundary. Plan-view figures (Figures 4 and 5 of the technical memorandum) provide interpretations of TVOCs in the Deep and Deep2 zones.

Key findings and conclusions from the technical memorandum are summarized as follows:

- Based on the profile-view figures, groundwater quality in the deepest portion of the aquifer (basal Magothy) did not exhibit VOC concentrations in excess of applicable SCGs. Groundwater containing TVOCs at concentrations greater than 5 µg/L was not found below the base of the Magothy aquifer (i.e., the top of the Raritan Confining Unit [RCU]), nor did VOCs exceed SCGs below the top of the RCU.

- Profile-view figures collectively indicate that groundwater containing TVOCs at concentrations at or greater than 5 µg/L is within the capture zone of the ONCT system, and groundwater impacted with VOCs is being drawn toward the well screens of Remedial Wells 17, 18, and 19 and removed from the aquifer by pumping these wells.

- Plan-view figures collectively suggest that, as pumping continues over time, bifurcation of TVOC-impacted groundwater, and the associated “clean water” front will continue to develop downgradient of the ONCT system as on-site containment is maintained and VOC-impacted groundwater continues to be removed from the aquifer by pumping the remedial wells

In summary, evaluation of the data collected during Phases 1 and 2 of the ONCT System Hydraulic Effectiveness Program further confirms that the ONCT system provides effective vertical and horizontal hydraulic control of groundwater containing TVOC concentrations of 5 µg/L or greater and is preventing its off-site migration. Therefore, the ONCT system is satisfying its remedial objective.

6.4 Conclusions and Recommendations for Monitoring

Overall, monitoring activities conducted during 2013 met the monitoring requirements outlined in the OU2 ONCT OM&M Manual (ARCADIS 2014a) and associated Groundwater Monitoring Plan (ARCADIS 2014b). However, areas of modification are identified with respect to hydraulic and groundwater quality monitoring; specifically, the addition of select monitoring wells that were supplemental in 2013. Additional details are summarized in Section 8 along with plans and a schedule to implement.

7. Evaluation of Performance, Effectiveness and Protectiveness

The OU2 On-Site Groundwater Remedy was effective at achieving the RAOs during the reporting period. Table 16 provides a summary of how each RAO was achieved in whole or in part through operation of the OU2 On-Site Groundwater Remedy. Supporting data in the form of tables and graphs are also referenced in the previous sections of this Periodic Review Report.

8. Conclusions and Recommendations

This section provides overall conclusions and recommendations based on the periodic review for the 2013 reporting period.

8.1 Compliance with OM&M Manual and Associated Groundwater Monitoring Plan

Requirements of the OU2 ONCT OM&M Manual were met during the reporting period in terms of operation and maintenance with several exceptions noted in Section 5 related to record keeping and performance of routine, scheduled maintenance of the OU2 ONCT system equipment and components. The following recommendations are provided to address areas requiring modification or improvement:

- As per the ONCT OM&M Manual, implement daily record keeping of monitoring for critical components, routine and non-routine maintenance, and alarm response and troubleshooting, to expand the maintenance program with a predictive maintenance element and to detail OM&M issues and causality.

- As per the ONCT OM&M Manual, generate and implement a routine maintenance schedule and checklist to further improve the treatment system uptime, help ensure that the treatment system equipment and components operate as designed, and ensure the RAOs continue to be met.

- Investigate developing a remedial well inspection and redevelopment program to minimize future downtime. This may consist of the currently completed monthly water-level and specific capacity monitoring, supplemented with an annual pump inspection and periodic down-hole video logging of the remedial well casing and screen. Alternative redevelopment methods, instead of the traditional chemical redevelopment, will be considered and evaluated.

- Requirements of the OU2 ONCT OM&M Manual were met during the reporting period in terms of remedial system monitoring (performance and compliance). Modifications are not necessary at this time.

Overall, monitoring activities conducted during 2013 met the requirements outlined in the associated Groundwater Monitoring Plan (ARCADIS 2014b). However, areas of modification are identified with respect to hydraulic and groundwater quality monitoring; specifically the addition of select monitoring wells that were supplemental in 2013. The following recommendations are provided to address areas requiring modification:

- Supplement the OU2 groundwater monitoring program by adding six monitoring wells (Monitoring Wells MW 3-1, GM-21D2, GM-78D, GM-78D2, GM73D3, and GM-74D3) to the semiannual hydraulic and groundwater quality monitoring rounds.

- Outpost Monitoring Wells:

    - Based on the consistency of analytical results in the original nine outpost wells over time and additional evaluation of the off-site groundwater by the Navy, it is concluded that the wells have met the goals of the PWSCP in identifying the potential for detections in the associated public supply wells. Because the original nine outpost wells have met the PWSCP goals, it is concluded that these wells plus the six new outpost wells are best used to monitor long-term water quality trends.

    - Accordingly, the following is recommended:
        - Reduce the sampling the frequency of the 15 outpost wells to semi-annual, evaluate overall trends in water quality, and compare analytical results to SCGs.
        - Modify the analytical method to NYSDEC ASP OLM4.3, which is consistent with other VOC impact monitoring wells.

8.2 Performance and Effectiveness of the OU2 On-Site Groundwater Remedy

The following conclusions are provided about the performance and ability of the OU-2 On-Site Groundwater Remedy, in whole or in part, to achieve the RAOs for the Site:

- The ONCT groundwater extraction and treatment system generally operated as designed and extracted on-site contaminated groundwater to prevent it from migrating off-site.

- Routine hydraulic monitoring indicates that hydraulic containment is being achieved; confirming that the combination of shallow recharge at the South Recharge Basins (coupled with pumpage of the remedial wells in the Deep2 zone) forms a hydraulic barrier to groundwater flow that is preventing the off-site migration of VOC-impacted groundwater.

- Routine VOC groundwater quality monitoring indicates that shallow and intermediate wells on-site and off-site exhibit few SCG exceedances and have demonstrated downward trends over time.

- Routine VOC groundwater quality monitoring indicates that bifurcation of the VOC impacts is occurring in the Deep and Deep2 zones immediately south of the hydraulic barrier, with demonstrated downward VOC trends occurring over time. Further downgradient of the hydraulic barrier, wells exhibiting VOC impacts above SCGs prior to startup of the OU2 ONCT system show generally stable to slightly decreasing trends in the Deep and Deep 2 zones.

- Supplemental data collected during recently completed Phases 1 and 2 of the ONCT Hydraulic Effectiveness Program further confirm that the ONCT system provides effective vertical and horizontal control of VOC-impacted groundwater and is preventing its off-site migration.

- On-Site cadmium and chromium impacts to groundwater from Plant 2 remain limited to on-site areas. On-site chromium concentrations near Plant 1 generally have been stable since 2009.

- The operation of the ONCT system complied with applicable NYSDEC SCGs for various OU2 ONCT system emissions (i.e., treated water and air emissions).

- The OU2 ONCT system's effluent water met NYSDEC regulatory requirements during the reporting period.
- The effluent vapor met applicable air discharge criteria during the reporting period.

8.3 Future Periodic Review Submittals

In the future, for periodic review reporting purposes, ARCADIS proposes to return to the Annual Groundwater Monitoring Report format per requirements of the OU 2 ONCT OM&M Manual (ARCADIS 2014a) and associated Groundwater Monitoring Plan (ARCADIS 2014b).

9. References

ARCADIS of New York, Inc. (ARCADIS). 2014a. Operation, Maintenance, and Monitoring Manual, On-Site Groundwater Containment System, Operable Unit 2 – Northrop Grumman and NWIRP Sites, Bethpage, New York, NYSDEC Site #s 1-30-003A and B, May 2014.

ARCADIS. 2014b. Groundwater Monitoring Plan, Operable Unit 2 – Northrop Grumman and NWIRP Sites, Bethpage, New York, NYSDEC Site #s 1-30-003A and B, May 2014.

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New York State Department of Environmental Conservation (NYSDEC). 2001. Record of Decision, Operable Unit 2 Groundwater, Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites, Nassau County, Site Numbers 1-30-003A & B, March 29, 2001.

NYSDEC. 2010. DAR-1 AGC/SGC Tables, Revised October 18, 2010.

ARCADIS

Tables

Table 1A. Summary of Weekly Monitoring Data, Tower 96 Treatment System, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Date	WELL 1							WELL 3 / WELL 3R [3]								AIR STRIPPER				
	Extracted Groundwater				VFD			Extracted Groundwater					VFD			Influent Water Flow				
	Flow Rate (gpm)	Totalizer (x1000) (gal)	Actual Gallons Pumped [4] (gal)	Pressure (psig)	Frequency (Hz)	Amperage (Amps)	Bus VDC	Flow Rate (gpm)	Totalizer (x1000) (gal)	Actual Gallons Pumped [4] (gal)	Pressure Before Check Valve (psig)	Pressure After Check Valve (psig)	Frequency (Hz)	Amperage (Amps)	Bus VDC	Flow Recorder Rate (gpm)	Flow Meter Rate (gpm)	Totalizer (x100) (gal)	Actual Gallons Pumped [4] (gal)	Ambient Influent Air Temperature (°F)
01/02/13	806	845,946	8,708,000	42	47.69	97.2	621.8	711	913,330	7,122,000	36	32	57.20	109.8	623.3	1,629	1,627	4,347,780	16,132,300	28
01/07/13	812	851,021	5,075,000	44	47.66	96.6	617.1	716	918,322	4,992,000	36	32	56.91	109.8	621.4	1,627	1,640	4,459,846	11,206,600	44
01/14/13	814	859,048	8,027,000	44	47.84	96.6	613.5	713	925,411	7,089,000	36	32	57.17	109.6	615.9	1,639	1,630	4,620,431	16,058,500	52
01/21/13	816	867,258	8,210,000	43	47.84	97.2	614.4	713	932,635	7,224,000	36	32	57.05	108.7	617.9	1,637	1,625	4,783,461	16,303,000	30
01/28/13	805	875,386	8,128,000	44	47.74	96.3	615.8	716	939,825	7,190,000	37	33	57.30	109.5	618.2	1,635	1,630	4,944,607	16,114,600	32
02/04/13	804	883,456	8,070,000	44	47.82	97.0	616.9	710	946,788	6,963,000	38	32	56.96	108.7	621.4	1,637	1,627	5,103,534	15,892,700	27
02/11/13	814	891,635	8,179,000	44	47.84	96.7	606.4	712	954,008	7,220,000	38	32	57.37	110.0	616.8	1,627	1,626	5,265,543	16,200,900	43
02/18/13	808	899,787	8,152,000	43	47.72	96.7	615.7	714	961,229	7,221,000	36	32	57.23	109.7	618.6	1,620	1,611	5,426,535	16,099,200	28
02/25/13	807	906,619	6,832,000	42	47.76	96.8	619.5	712	967,232	6,003,000	35	32	56.77	107.8	623.2	1,616	1,608	5,561,248	13,471,300	34
03/04/13	807	913,688	7,069,000	43	47.70	96.7	615.4	714	973,464	6,232,000	36	32	56.68	107.6	619.0	1,623	1,617	5,699,597	13,834,900	40
03/11/13	811	921,757	8,069,000	44	47.95	96.9	618.8	713	980,589	7,125,000	36	32	56.82	107.8	619.0	1,602	1,602	5,859,631	16,003,400	50
03/18/13	817	928,614	6,857,000	43	47.78	96.6	609.3	711	986,612	6,023,000	38	32	56.56	107.2	613.0	1,625	1,600	5,994,757	13,512,600	36
03/25/13	811	936,329	7,715,000	44	47.87	96.7	609.7	710	993,711	7,099,000	36	32	57.01	107.9	613.4	1,587	1,628	6,146,546	15,178,900	37
04/01/13	807	944,415	8,086,000	44	47.84	96.6	608.7	711	1,000,823	7,112,000	36	32	57.00	108.4	612.3	1,625	1,586	6,313,605	16,705,900	54
04/08/13	818	952,674	8,259,000	44	47.78	97.0	613.9	718	1,008,072	7,249,000	36	32	57.31	109.7	618.3	1,622	1,606	6,468,029	15,442,400	57
04/15/13	811	960,615	7,941,000	44	47.63	96.6	621.5	709	1,015,130	7,058,000	36	32	57.52	109.6	625.6	1,614	1,619	6,624,900	15,687,100	44
04/22/13	801	968,844	8,229,000	44	47.90	97.1	622.8	709	1,022,349	7,219,000	38	32	57.69	109.5	628.0	1,616	1,605	6,787,466	16,256,600	50
04/29/13	805	976,962	8,118,000	42	47.89	97.1	620.4	710	1,029,498	7,149,000	38	32	57.75	109.6	624.2	1,589	1,566	6,945,947	15,848,100	54
05/06/13	804	985,155	8,193,000	43	47.65	96.4	616.8	555	1,035,359	5,861,000	35	30	51.18	89.6	625.5	1,436	1,433	7,089,796	14,384,900	61
05/13/13	810	993,299	8,144,000	42	47.65	96.4	622.4	554	1,040,944	5,585,000	35	29	51.56	90.6	631.4	1,422	1,416	7,232,444	14,264,800	55
05/20/13	810	1,001,554	8,255,000	42	47.61	96.0	610.4	556	1,046,188	5,244,000	36	29	51.41	90.1	618.2	1,426	1,405	7,368,325	13,588,100	70
05/28/13	833	1,010,454	8,900,000	42	47.73	96.4	609.5	558	1,052,352	6,164,000	35	30	51.56	90.9	619.2	1,425	1,432	7,525,314	15,698,900	65
06/03/13	810	1,017,430	6,976,000	42	47.64	96.3	616.3	557	1,057,119	4,767,000	30	29	51.98	91.9	624.4	1,438	1,430	7,646,904	12,159,000	67
06/10/13	809	1,025,626	8,196,000	43	47.65	96.0	617.2	557	1,062,766	5,647,000	35	30	52.13	92.4	623.7	1,374	1,361	7,790,620	14,371,600	64
06/17/13	810	1,033,798	8,172,000	42	47.53	95.7	610.9	557	1,068,044	5,278,000	35	30	51.64	90.9	622.2	1,378	1,373	7,920,089	12,946,900	80
06/24/13	807	1,041,635	7,837,000	42	47.66	96.0	604.6	555	1,073,440	5,396,000	35	30	51.84	92.7	611.7	1,408	1,403	8,054,039	13,395,000	80
07/01/13	811	1,049,924	8,289,000	42	47.60	96.4	609.9	557	1,079,163	5,723,000	35	29	52.16	93.7	616.4	1,388	1,383	8,195,224	14,118,500	74
07/08/13	828	1,057,968	8,044,000	45	48.02	96.7	603.4	MM	1,082,943	3,780,000	35	30	60.00	117.8	605.0	1,534	1,580	8,336,695	14,147,100	88
07/15/13	810	1,066,097	8,129,000	42	47.48	96.2	610.4	457	1,087,050	4,107,000	35	28	47.31	80.0	619.2	1,310	1,307	8,459,567	12,287,200	94
07/22/13	809	1,074,155	8,058,000	42	47.49	96.2	609.5	457	1,091,615	4,565,000	35	28	47.55	80.7	619.0	1,306	1,295	8,586,311	12,674,400	81
07/29/13	806	1,082,302	8,147,000	42	47.58	96.4	613.9	457	1,095,595	3,980,000	44	ER	47.20	80.0	626.1	1,301	1,310	8,717,229	13,091,800	83
08/05/13	801	1,090,451	8,149,000	39	47.07	95.3	613.0	--	--	--	--	--	--	--	--	807	821	8,845,213	12,798,400	81
08/12/13	800	1,098,662	8,211,000	39	47.05	94.8	602.9	--	--	--	--	--	--	--	--	821	810	8,926,723	8,151,000	73
08/19/13	812	1,106,832	8,170,000	44	48.02	97.1	605.2	808	MM	NC	30	ER	59.99	117.5	605.2	1,620	1,591	9,073,462	14,673,900	80
08/26/13	807	1,114,900	8,068,000	43	47.92	97.4	596.3	820	MM	NC	30	ER	60.00	117.1	598.0	1,627	1,617	9,232,900	15,943,800	79
09/03/13	809	1,124,282	9,382,000	33	47.90	97.1	604.5	812	MM	NC	30	ER	60.00	117.4	606.0	1,621	1,607	9,416,998	18,409,800	79
09/09/13	809	1,131,160	6,878,000	33	48.03	97.3	611.8	805	MM	NC	30	ER	59.70	115.1	612.8	1,614	1,608	9,551,449	13,445,100	68
09/16/13	810	1,139,350	8,190,000	43	47.94	97.1	611.0	708	5,270	NC	29	ER	57.64	115.1	108.0	1,574	1,580	9,708,055	15,660,600	63
09/23/13	812	1,147,471	8,121,000	43	47.99	97.5	609.5	708	12,382	7,112,000	28	ER	57.77	108.6	612.6	1,572	1,555	9,862,264	15,420,900	61
09/30/13	801	1,154,560	7,089,000	44	47.89	97.1	607.1	705	19,353	6,971,000	29	ER	57.82	108.8	609.9	1,556	1,590	10,014,330	15,206,600	67
10/07/13	815	1,163,655	9,095,000	43	47.94	97.6	599.5	704	26,548	7,195,000	29	ER	57.98	109.4	600.3	1,551	1,535	10,174,050	15,972,000	76
10/14/13	803	1,171,736	8,081,000	44	47.97	97.0	607.6	704	33,587	7,039,000	28	ER	58.08	109.1	612.0	1,545	1,548	10,322,560	14,851,000	61
10/21/13	811	1,179,912	8,176,000	43	48.08	97.6	613.7	704	40,747	7,160,000	30	ER	58.05	109.5	616.7	1,534	1,499	10,477,220	15,466,000	67
10/28/13	808	1,188,031	8,119,000	43	47.88	97.3	608.7	705	47,841	7,094,000	30	ER	58.22	110.8	612.3	1,522	1,522	10,625,820	14,860,000	60
11/04/13	825	1,196,047	8,016,000	44	48.18	97.9	611.5	706	55,002	7,161,000	30	ER	58.38	110.6	615.7	1,529	1,525	10,775,350	14,953,000	44
11/11/13	808	1,204,179	8,132,000	44	48.21	97.8	611.3	706	62,119	7,117,000	30	ER	58.68	111.6	613.9	1,452	1,453	10,950,410	17,506,000	50
11/18/13	806	1,212,110	7,931,000	43	48.14	97.2	603.2	701	69,073	6,954,000	30	ER	58.61	111.6	605.0	1,500	1,498	11,073,580	12,317,000	65
11/25/13	814	1,219,528	7,418,000	44	49.02	100.0	620.7	707	76,059	6,986,000	30	ER	58.59	110.9	622.3	1,547	1,539	11,213,970	14,039,000	33
12/02/13	825	1,227,561	8,033,000	41	48.60	98.1	617.0	--	82,935	6,876,000	--	--	--	--	--	830	818	11,365,640	15,167,000	47
12/09/13	816	1,235,677	8,116,000	42	48.39	98.1	614.8	--	--	--	--	--	--	--	--	839	825	11,448,060	8,242,000	40
12/16/13	827	1,243,944	8,267,000	46	50.42	102.1	618.3	796	86,518	3,583,000	32	ER	44.57	74.6	632.4	1,678	1,700	11,568,460	12,040,000	27
12/23/13	828	1,251,998	8,054,000	47	50.31	101.8	608.8	816	94,576	8,058,000	32	ER	45.34	76.3	622.6	1,701	1,685	11,737,870	16,941,000	54
12/30/13	821	1,260,193	8,195,000	48	51.19	100.6	615.2	807	102,794	8,218,000	32	ER	45.12	75.8	628.1	1,728	1,726	11,908,120	17,025,000	34

See notes on last page.

Table 1A. Summary of Treatment System Parameters, Tower 96 Treatment System, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Date	HEAT EXCHANGER			PROCESS BLOWER				REGENERATIVE VAPOR PHASE TREATMENT UNITS											CONDENSER		
								Adsorb				Desorb							Condenser Cooling Water		
	Air Inlet Pressure (iwc)	Air Inlet Temperature (°F)	Steam Inlet Pressure (psig)	Air Inlet Pressure (iwc)	Air Effluent Temperature (°F)	Air Effluent Pressure (iwc)	Blower Static Pressure (iwc)	Flow (cfm)	Pressure (iwc)	Temperature (°F)	Flow (scfm)	Desorb Bed (A/B)	Time into cycle (min)	Influent Steam Temperature (°F)	Influent Steam Pressure (psig)	Effluent Steam Temperature (°F)	Effluent Pressure (at bed) (iwc)	Effluent Temperature (°F)	Influent Temperature (°F)	Effluent Temperature (°F)	Temperature Differential (°F)
01/02/13	-3.5	58	12	-4.2	86	3.5	7.7	4,770	0.5	88	4,619	A	28	239	11	146	1.0	88	56	69	13
01/07/13	-3.8	63	13	-4.5	87	3.0	7.5	4,790	1.0	90	4,627	B	27	236	--	161	0.5	90	56	62	6
01/14/13	-3.8	62	12	-4.5	88	3.5	8.0	4,740	1.0	90	4,579	B	25	236	--	165	0.5	90	56	60	4
01/21/13	-3.8	60	12	-4.5	86	3.0	7.5	4,770	1.0	88	4,625	B	23	240	12	168	0.6	88	56	76	20
01/28/13	-4.0	58	13	-4.8	86	3.0	7.8	4,790	1.3	88	4,647	B	40	239	12	170	0.5	89	57	79	22
02/04/13	-3.7	60	12	-4.5	86	3.0	7.5	4,790	1.0	90	4,627	B	30	238	12	160	0.5	88	56	65	9
02/11/13	-3.5	60	12	-4.5	86	3.0	7.5	4,790	1.0	88	4,644	B	25	237	12	165	--	90	56	78	22
02/18/13	-3.8	60	12	-4.5	86	3.0	7.5	4,790	1.0	90	4,627	B	63	241	12	167	0.5	90	56	80	24
02/25/13	-3.6	60	8	-4.6	86	3.0	7.6	4,750	1.0	86	4,622	B	81	210	2	156	1.0	80	56	70	14
03/04/13	-3.6	62	12	-4.5	88	3.0	7.5	4,750	1.0	86	4,622	B	76	225	0	172	1.0	80	58	70	12
03/11/13	-3.8	64	12	-4.6	88	3.0	7.6	4,740	1.0	88	4,596	B	75	232	10	161	1.0	88	56	80	24
03/18/13	-3.5	58	12	-4.2	88	3.2	7.4	4,700	1.0	84	4,590	B	75	232	10	161	1.0	88	56	70	14
03/25/13	-3.5	60	12	-4.2	87	3.2	7.4	4,670	1.0	88	4,528	A	21	235	11	158	1.0	82	--	--	--
04/01/13	-3.8	62	12	-4.6	86	3.0	7.6	4,770	1.5	90	4,613	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	56	78	22
04/08/13	-3.5	65	12	-4.4	92	3.2	7.6	4,747	0.7	92	4,566	A	26	218	0	170	1.0	90	56	75	19
04/15/13	-3.8	62	12	-4.6	87	3.0	7.6	4,800	1.0	88	4,654	B	54	231	10	190	0.5	88	56	75	19
04/22/13	-3.5	64	12	-4.2	90	3.2	7.4	4,710	0.5	90	4,544	A	73	247	11	172	0.5	90	56	75	19
04/29/13	-3.5	64	12	-4.2	88	3.0	7.2	4,720	0.5	88	4,571	A	28	235	12	194	0.5	88	56	75	19
05/06/13	-3.6	65	12	-4.6	92	3.6	8.2	4,720	0.5	90	4,554	A	62	236	12	167	0.6	90	56	75	19
05/13/13	-3.8	62	12	-5.0	89	3.5	8.5	4,690	0.5	89	4,533	A	53	228	12	162	0.5	90	56	75	19
05/20/13	-3.8	67	12	-4.5	92	3.0	7.5	4,650	0.5	92	4,470	A	76	233	12	194	0.5	92	56	78	22
05/28/13	-5.3	64	12	-6.0	90	2.0	8.0	4,720	0.0	90	4,548	B	64	235	12	184	0.0	90	56	80	24
06/03/13	-3.8	64	12	-4.6	92	3.0	7.6	4,830	0.8	90	4,664	B	63	232	12	184	0.5	90	56	90	34
06/10/13	-4.2	66	12	-5.2	88	2.0	7.2	4,860	2.2	90	4,709	B	72	238	12	197	1.0	92	57	80	23
06/17/13	-3.7	66	12	-4.5	94	3.0	7.5	4,870	1.0	94	4,670	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	57	80	23
06/24/13	-3.5	70	12	-4.6	95	3.0	7.6	4,700	0.5	92	4,518	A	66	232	12	181	1.0	94	56	82	26
07/01/13	-3.5	66	12	-4.4	92	3.0	7.4	4,750	0.5	92	4,566	A	25	234	12	176	1.0	92	57	80	23
07/08/13	-3.8	70	12	-4.5	94	3.0	7.5	4,750	0.5	98	4,517	A	39	234	12	187	1.0	96	58	85	27
07/15/13	-3.5	70	12	-4.4	96	3.0	7.4	4,760	0.5	96	4,543	A	38	234	12	190	1.0	98	57	--	--
07/22/13	-3.5	68	12	-4.2	94	3.0	7.2	4,790	0.5	94	4,588	A	44	234	12	190	1.0	94	57	82	25
07/29/13	-3.4	66	12	-4.2	94	3.0	7.2	4,780	0.5	92	4,595	A	32	235	12	184	1.0	94	57	82	25
08/05/13	-3.0	65	12	-3.8	93	3.2	7.0	4,810	0.7	92	4,626	A	36	233	12	180	1.0	92	58	85	27
08/12/13	-3.0	66.5	12	-3.8	93	3.2	7.0	4,790	0.5	92	4,605	A	46	236	12	185	1.0	94	59	83	24
08/19/13	-3.8	64	12	-4.6	94	3.0	7.6	4,800	0.5	92	4,614	A	34	234	12	180	0.5	92	56	80	24
08/26/13	-3.8	66	12	-4.5	94	3.0	7.5	4,760	1.0	92	4,582	A	56	234	12	188	0.5	94	56	80	24
09/03/13	-3.8	67	12	-4.5	94	3.0	7.5	4,760	0.5	92	4,576	A	25	234	12	171	1.0	94	56	80	24
09/09/13	-3.8	62	12	-4.6	92	3.0	7.6	4,720	0.5	91	4,546	A	50	236	12	187	0.5	92	56	80	24
09/16/13	-3.8	63	12	-4.6	90	3.0	7.6	4,730	0.5	90	4,564	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	56	80	24
09/23/13	-3.8	64	12	-4.6	90	3.0	7.6	4,710	0.5	90	4,544	A	42	236.5	12	185	0.5	91	56	80	24
09/30/13	-3.8	66	12	-4.8	92	3.0	7.8	4,760	0.5	92	4,576	B	44	235	12	189	0.5	92	56	80	24
10/07/13	-3.8	68	12	-4.5	90	3.0	7.5	4,700	0.5	92	4,518	A	24	234	12	195	0.5	92	56	80	24
10/14/13	-3.8	68	12	-4.5	90	3.0	7.5	4,690	0.5	90	4,525	A	48	218	12	180	0.5	85	56	75	19
10/21/13	-3.8	68	12	-4.6	90	2.4	7.0	4,680	0.5	90	4,515	A	26	223	8	196	0.5	90	56	75	19
10/28/13	-4.0	66	12	-4.8	89	2.8	7.6	4,770	0.5	88	4,619	B	53	237	12	191	0.5	89	56	77	21
11/04/13	-4.2	62	12	-5.0	87	2.5	7.5	4,810	1.0	86	4,681	B	86	226	10	191	0.5	88	57	75	18
11/11/13	-3.8	58	12	-4.6	86	3.0	7.6	4,720	0.5	88	4,571	B	47	234	12	194	0.5	88	56	75	19
11/18/13	-4.0	67	12	-4.8	90	2.5	7.3	4,760	1.0	90	4,598	A	65	234	12	184	0.5	90	56	80	24
11/25/13	-4.0	57	12	-4.8	86	3.0	7.8	4,660	0.5	84	4,546	A	20	237	12	135	0.5	--	56	75	19
12/02/13	-3.0	62	12	-3.8	87	3.0	6.8	4,740	1.0	86	4,612	A	24	233	23	160	1.5	88	57	78	21
12/09/13	-3.0	58	12	-3.8	86	3.0	6.8	4,730	1.0	85	4,611	A	40	235	12	175	1.5	86	58	80	22
12/16/13	-3.8	56	12	-4.6	85	3.0	7.6	4,690	0.5	84	4,575	A	56	236	12	183	1.0	84	55	76	21
12/23/13	-4.0	62	12	-4.8	88	2.8	7.6	4,710	0.5	88	4,561	A	225	234	12	190	0.5	88	56	75	19
12/30/13	-4.0	58	12	-4.8	84	3.0	7.8	4,640	0.5	84	4,526	A	41	222	6	167	0.5	82	56	72	16

See notes on last page.

Table 1A. Summary of Treatment System Parameters, Tower 96 Treatment System, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Date	SEPARATOR				AIR COMPRESSOR	SUPPLEMENTAL AIR TREATMENT SYSTEM (OXY)		WEST RECHARGE BASINS			
	Condensed Steam Water					Influent Blower	Total System Effluent	North		South	
	Separator Temperature	Separator Vent Temperature	Observed Flow Rate	Totalizer	Delivery Pressure	Pressure	Pressure	Basin Water Height	Status	Basin Water Height	Status
	(°F)	(°F)	(gpm)	(gal)	(psig)	(iwc)	(iwc)	(ft)	(On/Off)	(ft)	(On/Off)
01/02/13	--	--	MM	MM	115	-2.0	4.8	3	On	0.5	Off
01/07/13	70	96	MM	15,518	100	-1.3	4.9	6	On	0	Off
01/14/13	80	100	4.6	17,378	112	-1.0	5.0	4	On	0	Off
01/21/13	69	92	MM	19,435	110	-1.3	5.0	5	On	0	Off
01/28/13	68	90	MM	21,545	117	-1.4	5.0	4-5	On	0.5	Off
02/04/13	70	97	MM	21,590	112	-1.0	5.0	4	On	0	Off
02/11/13	68	92	MM	2,176	116	-1.3	5.0	6	On	0	Off
02/18/13	68	95	MM	4,373	114	-1.3	5.0	7	On	0	Off
02/25/13	64	90	MM	5,412	112	-1.3	5.0	6	On	0	Off
03/04/13	58	82	MM	597	112	-1.5	5.0	6	On	0	Off
03/11/13	70	95	4.9	1,622	110	-1.3	5.0	7	On	0	Off
03/18/13	60	83	MM	2,613	112	-2.0	5.0	7	On	0	Off
03/25/13	66	100	MM	3,506	112	-2.0	5.0	6	On	0	Off
04/01/13	64	90	MM	1,882	112	-1.3	5.0	6	On	0	Off
04/08/13	68	92	MM	3,457	112	-2.0	4.8	6	On	0	Off
04/15/13	64	85	MM	4,800	112	-1.3	4.8	7	On	0	Off
04/22/13	72	95	MM	6,387	112	-2.0	4.8	7	On	0	Off
04/29/13	70	98	MM	7,138	112	-2.0	4.8	7	On	0	Off
05/06/13	71	95	MM	1,138	117	-2.2	5.0	4	On	0	Off
05/13/13	70	92	MM	8,805	110	-2.2	5.0	4	On	0	Off
05/20/13	73	100	MM	10,556	112	-2.3	4.8	7	On	0	Off
05/28/13	75	100	4.6	12,157	112	-2.3	4.8	8	On	0	Off
06/03/13	75	101	MM	13,534	112	-2.3	4.8	8	On	0	Off
06/10/13	76	100	MM	15,067	112	-0.5	5.0	7	On	0	Off
06/17/13	75	100	MM	16,535	112	-1.3	5.0	7	On	0	Off
06/24/13	76	102	MM	18,154	112	-2.3	5.0	8	On	0	Off
07/01/13	74	98	MM	19,753	112	-2.3	5.0	8	On	0	Off
07/08/13	76	105	MM	21,397	114	-2.3	4.9	8	On	0	Off
07/15/13	76	105	MM	23,024	112	-2.0	4.8	8	On	0	Off
07/22/13	76	100	MM	24,657	112	-2.0	5.0	7	On	0	Off
07/29/13	75	100	4.7	26,266	112	-2.3	5.0	8	On	0	Off
08/05/13	75	100	MM	27,902	112	-2.0	5.0	8	On	0	Off
08/12/13	78	102	MM	29,502	112	-2.0	5.0	8	On	0	Off
08/19/13	75	102	MM	31,279	114	-2.5	4.8	8	On	0	Off
08/26/13	75	102	MM	31,279	110	-2.3	4.8	8	On	0	Off
09/03/13	74	100	MM	34,590	112	-2.3	5.0	9	On	0	Off
09/09/13	74	100	MM	MM	112	-2.3	4.8	8	On	0	Off
09/16/13	73	102	MM	MM	112	-2.5	4.8	9	On	0	Off
09/23/13	75	100	MM	MM	112	-2.3	5.0	8	On	0	Off
09/30/13	74	100	MM	MM	112	-1.3	4.8	9	On	0	Off
10/07/13	74	100	MM	MM	112	-2.0	5.0	9	On	0	Off
10/14/13	70	92	MM	MM	115	-2.0	4.8	10	On	0	Off
10/21/13	63	93	MM	MM	112	-2.3	4.8	9	On	0	Off
10/28/13	71	98	MM	MM	112	-1.8	4.8	9	On	0	Off
11/04/13	66	92	MM	MM	112	-1.5	5.0	8	On	0	Off
11/11/13	70	95	MM	MM	112	-2.0	4.8	9	On	0	Off
11/18/13	72	100	MM	MM	112	-1.5	4.8	9	On	0	Off
11/25/13	63	90	MM	MM	112	-2.3	5.0	9	On	0	Off
12/02/13	68	92	MM	MM	112	-2.0	5.0	8	On	0	Off
12/09/13	70	95	MM	MM	112	-2.0	4.8	3	On	0	Off
12/16/13	68	95	MM	MM	112	-2.3	4.8	10	On	0	Off
12/23/13	72	100	MM	MM	100	-2.0	4.8	9	On	0	Off
12/30/13	62	88	MM	MM	114	-2.3	4.8	10	On	0	Off

See notes on last page.

Table 1A. Summary of Treatment System Parameters, Tower 96 Treatment System, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Notes and Abbreviations:

(1) Operational data collected by ARCADIS on days noted.
(2) Instantaneous values from field-mounted instruments.
(3) Well 3 flow rate was lowered to approximately 560 gpm from May 1 through August 4, 2013 due to a decreasing specific capacity and an increased drawdown. It was off-line due to lowering the submersible pump from August 5 through August 13, 2013. Well 3 was operating at approximately 700 gpm until December 2, 2013, when it was shut down due to construction and replacement by Well 3R. Upon completion of the construction on December 13, 2013, Well 3R was started and its pumping rate increased to approximately 800 gpm to compensate for the previous downtime.
(4) Value represents the difference between totalizer numbers recorded between successive weekly site visits.
(5) Desorb readings not collected due to timing of cycle in relation to the timing of the weekly site visit.

--	Parameter not collected/recorded
Amps	amperes
cfm	cubic feet per minute
°F	degrees Fahrenheit
ft	feet
gal	gallons
gpm	gallons per minute
Hz	hertz
iwc	inches of water column
min	minutes
scfm	standard cubic feet per minute
T96	Tower 96
tot. gal	total gallons
VFD	variable frequency drive
VDC	voltage direct current
ER	Equipment removed without replacement; no parameter collected
MM	Equipment malfunction
NC	Value not calculated due to missing records

Table 1B. Summary of Weekly Monitoring Data, Tower 102 Treatment System, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Date	WELL 17						WELL 18									WELL 19 [3]					
	Extracted Groundwater						Extracted Groundwater						VFD			Extracted Groundwater					
	Flow Recorder Rate (gpm)	Flow Meter Rate (gpm)	Totalizer (x1000) (gal)	Actual Gallons Pumped (gal)	Pressure Before Cla-Val (psig)	Pressure After Cla-Val (psig)	Flow Recorder Rate (gpm)	Flow Meter Rate (gpm)	Totalizer (x1000) (gal)	Actual Gallons Pumped (gal)	Pressure Before Check Valve (psig)	Pressure After Check Valve (psig)	Frequency (Hz)	Amperage (Amps)	Bus VDC	Flow Recorder Rate (gpm)	Flow Meter Rate (gpm)	Totalizer (x1000) (gal)	Actual Gallons Pumped (gal)	Pressure Before Cla-Val (psig)	Pressure After Cla-Val (psig)
01/02/13	1,165	1,190	7,195,481	8,702,000	63	82	629	636	4,740,051	5,010,000	64	64	45.99	82.7	661.7	709	713	3,483,762	5,545,000	72	64
01/07/13	1,016	1,014	7,198,877	3,396,000	80	80	630	639	4,744,571	4,520,000	60	62	45.24	81.0	660.6	715	723	3,488,820	5,058,000	70	60
01/14/13	1,022	1,018	7,208,779	9,902,000	81	80	630	634	4,750,873	6,302,000	62	62	45.13	80.4	658.3	731	743	3,495,897	7,077,000	70	61
01/21/13	997	1,001	7,218,999	10,220,000	82	80	629	640	4,757,310	6,437,000	62	62	45.22	81.4	659.4	710	710	3,503,146	7,249,000	70	60
01/28/13	996	1,003	7,229,009	10,010,000	82	80	637	639	4,763,667	6,357,000	62	62	45.15	81.3	660.4	738	741	3,510,259	7,113,000	60	60
02/04/13	967	974	7,238,810	9,801,000	84	80	632	632	4,769,974	6,307,000	60	60	45.11	80.9	660.1	740	745	3,517,547	7,288,000	70	60
02/11/13	--	--	--	--	--	--	633	629	4,776,370	6,396,000	60	62	45.34	81.3	658.7	728	732	3,524,866	7,319,000	70	60
02/18/13	1,071	1,084	7,258,832	20,022,000	75	80	632	638	4,782,747	6,377,000	62	62	45.40	81.6	656.5	717	724	3,531,964	7,098,000	70	61
02/25/13	994	1,003	7,268,347	9,515,000	82	80	627	636	4,788,923	6,176,000	60	60	45.05	80.6	657.7	735	742	3,539,208	7,244,000	70	60
03/04/13	1,051	1,054	7,278,271	9,924,000	76	80	627	632	4,795,448	6,525,000	60	62	45.42	81.0	656.4	720	731	3,546,806	7,598,000	70	62
03/11/13	965	970	7,286,771	8,500,000	85	78	626	628	4,800,872	5,424,000	60	61	44.99	80.3	662.0	731	740	3,553,025	6,219,000	70	60
03/18/13	967	966	7,296,619	9,848,000	84	78	630	636	4,807,249	6,377,000	60	61	44.90	80.0	662.0	731	740	3,560,376	7,351,000	70	60
03/25/13	919	927	7,305,888	9,269,000	89	78	630	634	4,813,437	6,188,000	60	60	44.75	79.8	662.0	733	741	3,567,650	7,274,000	68	59
04/01/13	1,047	1,060	7,316,246	10,358,000	76	80	628	630	4,819,849	6,412,000	62	62	45.22	80.8	658.1	720	728	3,575,007	7,357,000	70	60
04/08/13	1,040	1,039	7,326,846	10,600,000	76	80	628	632	4,826,275	6,426,000	62	62	45.20	80.7	656.0	713	719	3,582,740	7,733,000	70	60
04/15/13	1,101	1,096	7,331,711	4,865,000	68	80	637	635	4,830,949	4,674,000	62	62	45.51	81.7	659.2	704	715	3,586,073	3,333,000	70	62
04/22/13	1,117	1,111	7,341,889	10,178,000	66	80	622	624	4,836,809	5,860,000	62	64	45.61	81.7	658.3	700	707	3,593,229	7,156,000	70	62
04/29/13	1,111	1,118	--	--	64	80	625	625	4,843,151	6,342,000	64	63	45.48	81.0	657.4	700	707	3,600,231	7,002,000	70	62
05/06/13	1,151	1,153	7,364,153	22,264,000	60	61	632	634	4,849,353	6,202,000	63	64	45.74	81.7	656.9	684	692	3,607,407	7,176,000	71	62
05/13/13	1,149	1,157	7,375,758	11,605,000	60	82	630	636	4,855,715	6,362,000	63	64	45.63	81.7	652.5	692	694	3,614,171	6,764,000	71	62
05/20/13	1,152	1,156	7,387,068	11,310,000	60	80	636	633	4,861,969	6,254,000	62	64	45.81	82.7	654.4	686	693	3,620,843	6,672,000	70	62
05/28/13	1,151	1,154	7,400,134	13,066,000	60	80	641	641	4,869,126	7,157,000	62	64	45.82	82.3	654.1	686	685	3,628,633	7,790,000	70	62
06/03/13	1,149	1,155	7,410,061	9,927,000	60	70	627	633	4,874,581	5,455,000	63	63	45.64	81.0	662.0	686	692	3,634,561	5,928,000	70	61
06/10/13	1,145	1,154	7,421,736	11,675,000	60	80	626	626	4,880,992	6,411,000	64	63	45.49	81.4	659.6	681	687	3,641,497	6,936,000	70	62
06/18/13	1,152	1,159	7,434,680	12,944,000	60	80	637	641	4,888,103	7,111,000	62	63	45.59	81.8	660.0	686	688	3,649,179	7,682,000	70	62
06/24/13	1,149	1,152	7,444,371	9,691,000	60	80	630	626	4,893,423	5,320,000	62	64	45.61	81.9	653.7	690	686	3,654,978	5,799,000	70	62
07/01/13	1,154	1,155	7,454,999	10,628,000	60	80	640	636	4,899,340	5,917,000	62	63	45.46	81.7	656.5	641	627	3,661,221	6,243,000	70	62
07/08/13	1,144	1,151	7,462,796	7,797,000	60	80	631	634	4,903,631	4,291,000	62	63	45.52	81.8	657.6	680	683	3,668,592	7,371,000	70	61
07/15/13	1,145	1,148	7,474,319	11,523,000	60	80	631	633	4,909,988	6,357,000	64	63	45.51	81.7	655.5	692	697	3,675,349	6,757,000	70	62
07/22/13	1,139	1,145	7,483,284	8,965,000	60	80	632	636	4,915,131	5,143,000	62	64	45.52	81.4	653.8	664	673	3,681,189	5,840,000	70	63
07/29/13	1,140	1,147	7,494,821	11,537,000	60	80	627	635	4,921,505	6,374,000	62	64	45.44	81.0	656.1	660	674	3,687,938	6,749,000	70	72
08/05/13	1,148	1,146	7,506,357	11,536,000	60	80	637	633	4,927,880	6,375,000	62	63	45.55	81.9	657.6	657	665	3,694,609	6,671,000	70	62
08/12/13	1,183	1,226	7,518,251	11,894,000	50	70	626	643	4,934,294	6,414,000	52	52	42.62	76.0	664.6	--	--	--	--	--	--
08/19/13	1,177	1,223	7,530,066	11,815,000	48	60	MM	MM	4,942,922	8,628,000	42	42	--	--	--	--	--	--	--	--	--
08/26/13	1,131	1,139	7,541,381	11,315,000	60	75	1,010	1,014	4,951,942	9,020,000	60	59	52.25	103.2	655.0	--	--	--	--	--	--
09/03/13	1,102	1,102	7,553,360	11,979,000	62	75	1,007	1,010	4,962,892	10,950,000	58	59	52.24	103.1	651.9	--	--	--	--	--	--
09/09/13	1,107	1,107	7,562,753	9,393,000	62	75	1,010	1,013	4,971,493	8,601,000	58	59	52.22	102.7	655.7	--	--	--	--	--	--
09/16/13	1,102	1,111	7,573,917	11,164,000	62	77	1,012	1,016	4,981,730	10,237,000	58	59	52.15	102.5	656.1	--	--	--	--	--	--
09/23/13	1,164	1,170	7,581,836	7,919,000	54	78	1,010	1,011	4,989,100	7,370,000	60	60	52.39	103.7	653.8	--	--	--	--	--	--
09/30/13	1,106	1,112	7,593,377	11,541,000	60	76	1,010	1,013	4,999,234	10,134,000	58	59	52.30	103.7	658.0	--	--	3696455	--	--	--
10/07/13	1,074	1,079	7,604,440	11,063,000	64	80	634	631	5,007,271	8,037,000	60	60	45.00	80.4	657.3	604	610	3700208	3,753,000	120	>100
10/14/13	1,075	1,082	7,615,146	10,706,000	64	78	629	633	5,013,561	6,290,000	59	60	45.01	80.3	648.2	593	601	3706166	5,958,000	118	>100
10/21/13	1,080	1,082	7,626,066	10,920,000	64	78	639	639	MM	MM	60	60	44.92	80.9	660.2	590	593	3712195	6,029,000	118	>100
10/28/13	1,067	1,074	7,636,712	10,646,000	64	80	632	365	5,026,282	12,721,000	60	61	45.07	80.8	663.4	637	642	3718358	6,163,000	114	>100
11/04/13	--	--	7,647,442	10,730,000	--	--	619	633	5,032,635	6,353,000	45	45	40.82	72.8	661.9	738	747	3724676	6,318,000	105	95
11/11/13	1,117	1,128	7,655,791	8,349,000	58	80	624	627	5,038,961	6,326,000	60	62	45.17	80.8	657.3	623	631	3731234	6,558,000	115	>100
11/18/13	1,118	1,122	7,666,266	10,475,000	58	80	633	636	5,045,097	6,136,000	60	62	45.25	81.0	656.8	638	639	3737185	5,951,000	112	>100
11/25/13	1,121	1,123	7,677,627	11,361,000	58	80	625	631	5,051,535	6,438,000	60	61	45.19	80.6	662.8	619	629	3743632	6,447,000	115	>100
12/02/13	1,118	1,118	7,688,726	11,099,000	57	80	629	633	5,057,820	6,285,000	60	60	45.15	80.5	622.8	623	631	3749849	6,217,000	114	>100
12/09/13	1,115	1,120	7,699,919	11,193,000	57	80	630	631	5,064,159	6,339,000	60	61	45.11	80.4	658.4	614	625	3756080	6,231,000	115	>100
12/16/13	1,111	1,111	7,710,896	10,977,000	58	80	635	638	5,070,422	6,263,000	60	61	45.15	80.7	660.5	625	630	3762155	6,075,000	112	>100
12/23/13	1,108	1,111	7,721,947	11,051,000	58	80	626	632	5,076,716	6,294,000	60	60	45.22	80.8	660.0	619	626	3768363	6,208,000	112	>100
12/30/13	1,112	1,113	7,733,080	11,133,000	58	80	635	635	5,083,058	6,342,000	60	60	44.93	80.5	654.7	560	565	3774109	5,746,000	110	>100

See notes in last page.

Table 1B. Summary of Treatment System Parameters, Tower 102 Treatment System, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Date	AIR STRIPPER							HEAT EXCHANGER				PROCESS BLOWER TO RVPGAC TREATMENT UNITS						
	Influent Water Flow						Ambient Influent Air Temperature					Air Influent Pressure			VIV Position	Air Effluent Pressure			Blower Static Pressure
	Flow Recorder Rate	Flow Meter Rate	Totalizer (x1000)	Actual Gallons Pumped	Influent Water Temperature	Influent Water Pressure		Air Inlet Temperature	Steam Inlet Pressure	Outlet Temperature	Temperature Differential	U-Tube Reading #1	U-Tube Reading #2	Calculated Pressure		U-Tube Reading #1	U-Tube Reading #2	Calculated Pressure	
	(gpm)	(gpm)	(gal)	(gal)	(°F)	(psig)	(°F)	(°F)	(psig)	(°F)	(°F)	(iwc)	(iwc)	(iwc)	(% open)	(iwc)	(iwc)	(iwc)	(iwc)
01/02/13	2,564	2,557	16,988,999	20,071,000	58	32	32	60	16	125	65	-3.3	3.1	-6.4	40%	7.2	-7.5	14.7	21.1
01/07/13	2,385	2,379	17,001,751	12,752,000	58	31	44	68	16	67	-1	-3.3	2.9	-6.2	40%	7.3	-7.9	15.2	21.4
01/14/13	2,465	2,464	17,025,743	23,992,000	58	32	52	59	12	70	11	-3.3	3.3	-6.6	40%	7.1	-7.5	14.6	21.2
01/21/13	2,404	2,398	17,050,388	24,645,000	58	31	30	58	16	68	10	-3.2	2.9	-6.1	40%	7.0	-8.0	15.0	21.1
01/28/13	2,405	2,405	17,074,970	24,582,000	59	31	34	58	17.5	66	8	-3.6	2.8	-6.4	45%	-6.8	8.4	15.2	21.6
02/04/13	2,402	2,390	17,098,444	23,474,000	58	30	24	58	17.5	100	42	-3.6	2.5	-6.1	40%	6.5	-8.5	15.0	21.1
02/11/13	2,438	2,438	17,122,147	23,703,000	58	31	43	58	17.5	97	39	-3.2	3.3	-6.5	40%	8.5	-6.6	15.1	21.6
02/18/13	2,462	2,448	17,146,385	24,238,000	58	32	25	58	17	--	--	-3.3	3.0	-6.3	40%	8.3	-6.9	15.2	21.5
02/25/13	2,378	2,371	17,169,683	23,298,000	58	30	32	58	16.5	67	9	-4.2	3.4	-7.6	60%	9.5	9.0	18.5	26.1
03/04/13	2,431	2,441	17,194,786	25,103,000	58	32	38	58	11.5	65	7	-4.5	3.0	-7.5	50%	9.0	-9.2	18.2	25.7
03/11/13	2,376	2,364	17,214,552	19,766,000	58	31	50	58	13.5	70	12	-4.6	2.8	-7.4	60%	8.9	-9.8	18.7	26.1
03/18/13	2,362	2,355	17,238,840	24,288,000	58	30	36	58	17.7	67	9	-3.7	3.7	-7.4	60%	11.9	-7.1	19.0	26.4
03/25/13	2,331	2,321	17,261,633	22,793,000	58	30	37	60	17	100	40	-4.2	3.3	-7.5	60%	11.5	-7.4	18.9	26.4
04/01/13	2,431	2,429	17,286,186	24,553,000	58	32	54	60	17.5	70	10	-4.3	3.8	-8.1	60%	9.4	-9.2	18.6	26.7
04/08/13	2,434	2,427	17,310,855	24,669,000	58	32	--	60	16.5	70	10	-4.2	3.6	-7.8	60%	9.3	-9.8	19.1	26.9
04/15/13	2,483	2,477	17,323,800	12,945,000	60	31	44	58	16	--	--	-4.0	3.3	-7.3	60%	9.0	-10.0	19.0	26.3
04/22/13	2,486	2,478	17,347,724	23,924,000	59	32	50	58	16	80	22	-4.3	3.3	-7.6	60%	8.5	-10.2	18.7	26.3
04/29/13	2,494	2,490	17,372,813	25,089,000	58	32	54	58	16	80	22	-4.4	2.8	-7.2	60%	8.3	-10.7	19.0	26.2
05/06/13	2,519	2,518	17,396,934	24,121,000	59	33	59	60	18.5	67	7	-4.7	2.8	-7.5	50%	8.2	-11.2	19.4	26.9
05/13/13	2,509	2,503	17,422,786	25,852,000	59	32	55	60	17	67	7	-5.0	2.8	-7.8	50%	-7.4	11.2	18.6	26.4
05/20/13	2,511	2,499	17,447,280	24,494,000	58	31	70	60	16.5	70	10	-4.1	3.9	-8.0	60%	9.0	-9.5	18.5	26.5
05/28/13	2,501	2,496	17,475,775	28,495,000	58	31	62	60	16	70	10	-3.9	3.7	-7.6	60%	9.1	-10.1	19.2	26.8
06/03/13	2,510	2,502	17,497,488	21,713,000	60	31	65	60	17	68	8	-4.5	3.7	-8.2	60%	8.6	-10.1	18.7	26.9
06/10/13	2,521	2,515	17,523,051	25,563,000	59	31	65	60	17	63	3	-4.4	3.4	-7.8	60%	8.5	-10.5	19.0	26.8
06/18/13	2,517	2,513	17,551,263	28,212,000	60	31	84	60	16.5	70	10	-4.0	3.6	-7.6	60%	9.4	-9.6	19.0	26.6
06/24/13	2,508	2,508	17,572,583	21,320,000	60	31	80	60	17	70	10	-4.2	3.5	-7.7	60%	9.2	-10.0	19.2	26.9
07/01/13	2,508	2,509	17,596,238	23,655,000	58	31	74	60	17	81	21	-4.2	3.3	-7.5	60%	8.7	-10.0	18.7	26.2
07/08/13	2,495	2,498	17,615,936	19,698,000	59	31	88	60	16	85	25	-4.1	3.0	-7.1	60%	8.7	-10.4	19.1	26.2
07/15/13	2,498	2,504	17,641,059	25,123,000	59	31	92	60	16	85	25	-4.3	2.8	-7.1	60%	8.5	-10.9	19.4	26.5
07/22/13	2,490	2,490	17,660,806	19,747,000	60	31	81	62	16	85	23	-4.6	2.8	-7.4	60%	7.9	-11.0	18.9	26.3
07/29/13	2,494	2,487	17,685,995	25,189,000	59	30	83	60	16	85	25	-4.5	2.5	-7.0	60%	8.0	-11.5	19.5	26.5
08/05/13	2,496	2,489	17,711,408	25,413,000	60	31	81	60	16	83	23	-5.3	2.5	-7.8	60%	7.5	-11.5	19.0	26.8
08/12/13	1,916	1,905	17,732,567	21,159,000	60	28	76	60	16	85	25	-4.5	2.0	-6.5	60%	7.7	-12.2	19.9	26.4
08/19/13	2,190	2,177	17,755,047	22,480,000	60	29	80	60	16	82	22	-4.7	2.0	-6.7	60%	7.4	-12.4	19.8	26.5
08/26/13	2,189	2,177	17,774,122	19,075,000	59	29	79	60	16	80	20	-4.6	2.0	-6.6	60%	7.0	-12.2	19.2	25.8
09/03/13	2,169	2,151	17,797,474	23,352,000	60	29	79	60	16	80	20	-4.9	1.8	-6.7	60%	6.7	-12.5	19.2	25.9
09/09/13	2,156	2,142	17,815,754	18,280,000	59	29	68	60	16	88	28	-5.0	1.8	-6.8	60%	6.8	12.6	19.4	26.2
09/16/13	2,145	2,154	17,837,531	21,777,000	59	29	63	60	16	80	20	-5.2	0.3	-5.5	60%	6.7	-13.0	19.7	25.2
09/23/13	2,202	2,197	17,853,788	16,257,000	60	28	61	60	16	85	25	-5.2	0.0	-5.2	60%	6.4	-13.3	19.7	24.9
09/30/13	2,150	2,152	17,875,590	21,802,000	60	29	67	60	16	85	25	-5.4	-0.2	-5.6	60%	5.9	-13.4	19.3	24.9
10/07/13	2,364	2,356	17,898,732	23,142,000	59	30	68	60	16	84	24	-5.6	-0.3	-5.9	60%	5.7	-13.7	19.4	25.3
10/14/13	2,370	2,356	17,922,338	23,606,000	59	30	73	60	13	84	24	-5.9	1.3	-7.2	60%	5.4	-13.9	19.3	26.5
10/21/13	2,353	2,348	17,946,681	24,343,000	58	30	67	60	15.5	85	25	-6.0	-1.0	-7.0	60%	5.3	-14.2	19.5	26.5
10/28/13	2,377	2,378	17,969,973	23,292,000	58	30	60	60	16	70	10	-6.3	-1.0	-7.3	60%	6.7	-14.5	21.2	28.5
11/04/13	1,367	1,362	17,994,098	24,125,000	58	27	47	58	16	70	12	-6.1	0.5	-6.6	60%	6.7	-14.0	20.7	27.3
11/11/13	2,426	2,435	18,015,727	21,629,000	58	30	48	59	16	70	11	-6.7	0.9	-7.6	60%	5.9	-13.6	19.5	27.1
11/18/13	2,426	2,420	18,039,192	23,465,000	58	30	65	60	20.5	70	10	-6.8	0.6	-7.4	60%	5.7	-13.7	19.4	26.8
11/25/13	2,419	2,414	18,063,245	24,053,000	58	30	33	59	16	65	6	-7.0	0.5	-7.5	60%	5.8	-14.3	20.1	27.6
12/02/13	2,421	2,416	18,087,241	23,996,000	58	30	47	60	18	63	3	-7.0	0.3	-7.3	60%	5.6	-14.4	20.0	27.3
12/09/13	2,407	2,403	18,111,611	24,370,000	58	30	40	60	16	68	8	-7.5	0.5	-8.0	60%	5.0	-14.3	19.3	27.3
12/16/13	2,411	2,417	18,135,106	23,495,000	58	30	27	58	16	67	9	-7.4	0.0	-7.4	60%	-5.0	-14.8	19.8	27.2
12/23/13	2,401	2,406	18,159,305	24,199,000	58	30	53	59	16.5	67	8	-7.5	-0.1	-7.6	60%	5.0	-15.0	20.0	27.6
12/30/13	2,327	2,331	18,183,495	24,190,000	58	30	34	59	16	82	23	-7.4	-0.7	-8.1	60%	4.7	-15.3	20.0	28.1

See notes in last page.

Table 1B. Summary of Treatment System Parameters, Tower 102 Treatment System, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Date	REGENERATIVE VAPOR PHASE TREATMENT UNITS							CONDENSER				AIR COMPRESSOR	T102 VAPOR DISCHARGE			T102 WEIR		FORCE MAIN
	Desorb							Cooling Water			Condensed Steam Water		Effluent Treated Vapor			Effluent Treated Groundwater [4]		
	Desorbed Bed	Time Into Cycle	Influent Steam Mass Flow	Influent Steam Pressure	Influent Steam Temperature	Desorb Bed Temperature	Effluent Steam Temperature	Influent Temperature	Effluent Temperature	Temperature Increase	Decanter Vent Temperature	Delivery Pressure	Flow	Velocity Pressure	Temperature	Flow Meter Rate	Totalizer (x1000)	Distribution System Pressure
	(A/B)	(min)	(lb/hr)	(psig)	(°F)	(°F)	(°F)	(°F)	(°F)		(°F)	(psig)	(cfm)	(iwc)	(°F)	(gpm)	(gal)	(psig)
01/02/13	B	114	378	4.0	221	--	175	58	105	47	85	100	7,780	0.40	87	--	--	60.3
01/07/13	B	24	597	4.0	224	--	150	60	105	45	80	105	7,710	0.45	83	2,593	1,653,590	58.4
01/14/13	A	26	524	--	226	--	160	59.5	105	45.5	80	107	7,700	0.40	90	2,646	1,680,262	57.9
01/21/13	B	20	405	3.0	221	--	145	58	95	37	80	105	7,570	0.50	90	2,610	1,706,571	54.1
01/28/13	B	45	344-607	4.0	224	--	166	57.5	109	51.5	86	105	7,780	0.40	96	2,681	1,733,595	47.9
02/04/13	A	39	293	4.0	225	--	165	59	100	41	80	105	7,760	0.40	96	2,575	1,759,551	48.7
02/11/13	B	49	449	--	220	--	160	56	123	67	92	105	7,670	0.45	87	2,681	1,786,576	48.4
02/18/13	A	27	770	5.0	225	--	155	58.5	105	46.5	83	105	7,670	0.40	97	2,859	1,815,394	60.8
02/25/13	A	41	332	5.0	229	--	163	60	105	45	80	105	8,610	0.40	90	2,681	1,842,419	53.0
03/04/13	B	86	760	4.5	223	--	175	57	110	53	83	107	8,470	0.50	80	2,888	1,871,530	59.3
03/11/13	A	23	562	5.1	227	--	150	60	105	45	80	105	8,470	0.50	90	3,036	1,902,133	59.9
03/18/13	A	27	555	--	227	--	150	59	105	46	80	105	8,400	0.55	95	--	--	58.6
03/25/13	B	23	775	4.0	221	--	140	59	105	46	82	105	8,520	0.51	85	2,823	1,959,044	58.3
04/01/13	A	28	750	5.0	225	--	150	59	105	46	80	105	8,270	0.50	90	2,577	863,908	58.5
04/08/13	B	24	582	4.0	223	--	145	60	110	50	80	107	8,330	0.52	80	2,700	889,964	59.0
04/15/13	B	24	451	3.0	218	--	107	60	112	52	85	105	8,270	0.52	90	2,773	904,746	59.0
04/22/13	A	21	195	5.5	227	--	105	60	110	50	80	105	8,290	0.50	90	2,660	930,502	58.8
04/29/13	B	59	889	4.8	228	--	130	62	120	58	85	105	8,310	0.50	100	2,628	957,018	58.9
05/06/13	B	24	574	3.0	218	--	122	60	110	50	80	105	8,370	0.55	85	2,648	982,207	59.1
05/13/13	B	75	376	3.5	218	--	138	63	112	49	87	108	8,330	0.50	90	2,702	9,077	59.2
05/20/13	A	23	286	5.0	224	--	95	59.5	110	50.5	80	105	8,300	0.45	92	2,525	33,829	58.8
05/28/13	B	24	415	3.0	219	--	100	60	110	50	80	105	8,330	0.50	85	2,556	62,278	58.6
06/03/13	B	51	836	3.2	217	--	120	61	110	49	86	105	8,340	0.55	85	2,652	84,432	59.1
06/10/13	A	22	MM	6.5	255	--	90	59	110	51	75	105	8,520	0.45	90	2,963	111,365	58.7
06/18/13	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	--	-- [5]	--	--	--	--	105	8,240	0.45	95	2,820	143,475	59.1
06/24/13	A	25	MM	6.0	260	--	110	60	110	50	87	105	8,230	0.50	100	2,710	166,203	59.1
07/01/13	A	27	MM	6.0	248	--	105	58	110	52	85	102	8,140	0.45	95	2,403	190,695	58
07/08/13	A	53	MM	5.0	230	--	135	59	112	53	97	107	8,180	0.40	100	2,383	209,213	57.1
07/15/13	B	33	MM	4.0	242	165	130	64	115	51	97	110	8,200	0.50	100	2,361	233,173	57.4
07/22/13	A	42	MM	5.0	248	212	125	62	112	50	90	105	8,170	0.45	100	2,385	251,762	58.3
07/29/13	B	24	MM	4.0	233	155	115	62	115	53	90	105	8,200	0.50	91	2,546	277,340	59.2
08/05/13	A	20	MM	5.8	239	170	100	60	110	50	83	105	8,270	0.40	95	2,396	302,657	60.22
08/12/13	A	119	MM	6.0	225	190	135	60	110	50	83	104	8,360	0.50	90	1,439	321,088	59.2
08/19/13	B	44	578	3.5	219	160	125	64	120	56	90	105	8,270	0.50	90	1,788	339,051	60.3
08/26/13	A	51	MM	5.5	239	190	--	60	--	--	--	95	8,260	0.45	100	1,823	358,268	59.8
09/03/13	A	23	489	4.5	224	175	105	63	110	47	82	110	8,230	0.45	98	2,102	378,507	57.7
09/09/13	A	29	994	5.4	224	178	--	63	110	47	82	107	8,190	0.40	92	2,132	396,398	57.2
09/16/13	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	--	--	--	--	98	8,250	0.50	80	2,252	418,566	59.0
09/23/13	B	36	896	3.2	220	150	117	60	112	52	85	105	8,300	0.50	90	2,260	434,272	59.0
09/30/13	A	22	423	6.0	224	170	100	62	110	48	80	95	8,180	1.10	97	1,852	455,902	59.7
10/07/13	B	31	79	3.0	220	150	112	62	112	50	87	103	8,160	1.10	90	1,810	473,043	61.5
10/14/13	B	98	446	3.0	216	177	142	63	112	49	86	92	8,160	1.15	98	1,973	496,729	60.9
10/21/13	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	--	--	--	--	--	8,170	1.30	92	2,312	520,462	57.6
10/28/13	B	22	558	3.2	221	140	102	60.5	110	49.5	80	105	8,170	1.30	83	2,068	543,866	61.0
11/04/13	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	--	--	--	--	115	8,280	1.30	85	1,448	567,129	--
11/11/13	A	24	529	5.5	226	--	--	59	108	49	75	105	8,110	1.20	88	2,331	585,870	59.2
11/18/13	B	57	596	3.0	216	150	125	61	112	51	85	110	8,140	1.10	92	2,457	608,256	59.3
11/25/13	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	--	--	--	--	112	8,020	1.30	80	2,795	634,061	58.6
12/02/13	B	23	634	2.5	217	130	100	58	110	52	80	95	8,100	1.25	82	2,743	661,504	58.5
12/09/13	A	53	440	4.5	225	175	120	58	108	50	80	105	7,990	1.10	87	1,743	687,396	58.5
12/16/13	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	-- [5]	--	--	--	--	100	8,020	1.10	95	2,380	710,219	55.0
12/23/13	A	117	475	5.5	223	170	120	58	105	47	75	100	8,000	1.20	82	2,333	733,683	55.3
12/30/13	B	37	382	2.0	218	140	107	58	107	49	80	110	7,980	1.00	88	2,330	757,320	53.0

See notes in last page.

Table 1B. Summary of Treatment System Parameters, Tower 102 Treatment System, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Notes and Abbreviations:

(1) Operational data collected by ARCADIS on days noted.
(2) Instantaneous values from field-mounted instruments.
(3) Well 19 was shut down from August 12 through October 3, 2013 due to pump malfunction, field investigation, well redevelopment, and temporary submersible pump installation. On October 3, 2013, Well 19 was restarted and operated at decreased pumping rate of approximately 600 gpm to minimize vibration issues and potential damage. New permanent submersible pump and motor installation was bid and will be performed during first quarter of 2014.
(4) The discharge flow rate and flow volume to the South Recharge Basins (T102 weir overflow) were estimated through April 1, 2013 due to the need for re-calibration of the ultrasonic level indicator associated with the water level over the weir. Estimated values were calculated using historical data associated with the total clear well water elevation and weir overflow rates.
(5) Desorb readings not collected due to timing of cycle in relation to the timing of the weekly site visit.

--	Paramerter not collected/recorded
Amps	amperes
cfm	cubic feet per minute
°F	degrees Fahrenheit
ft	feet
gal	gallons
gpm	gallons per minute
Hz	hertz
iwc	inches of water column
min	minutes
lb/hr	pounds per hour
psig	pounds per square inch, gauge
RVPGAC	regenerative vapor phase granullar activated carbon
scfm	standard cubic feet per minute
T102	Tower 102
tot. gal	total gallons
VFD	variable frequency drive
VIV	variable influent vane
VDC	voltage direct current
MM	Equipment malfunction

Table 2. Summary of Non-Routine Maintenance, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Date Completed	Maintenance Item	Description/Comments
01/02/13	T96 condenser cooling water flow meter malfunction	The T96 condenser cooling water flow meter display stopped worked. A new model flow meter was purchased and installed.
02/20/13	T96 MCP power supply	A new power supply was installed for the T96 MCP computer, since it was starting to fail.
03/05/13	Repair of T102 process air piping leaks	Some air leaks were noted coming from the process air ducts at T102. New ducts were installed and the flanges were welded.
03/11/13	Well 17 pilot valve issues	The pilot valve at Well 17 was noted to be leaking, and was repaired.
03/13/13	T96 solenoid valve	It was noted that one of the solenoid valves for the steam system at T96 wasn't properly working. A new replacement solenoid valve was purchased and installed.
04/03/13	T96 steam supply pressure	A drop in the influent steam pressure was noted. Issue was corrected by cleaning the boilers.
04/04/13	Calibration/adjustment of T102 weir overflow meter	Discrepancies were noted between the totalized values of the T102 weir overflow meter and the sum of the total influent volume. Meter was recalibrated and checked.
04/12/13	Replacement of T102 condenser	Some performance issues were noted with the T102 condenser. New supports were welded and a new, replacement condenser was installed.
05/15/13	T102 heat exchanger exhaust temperature	Heat exchanger exhaust temperature was noted as lower than design. Based on an assessment of the steam system, it was determined that the main pressure control valve was faulty. New parts were ordered and installed.
06/01/13	T102 RVPGAC hatch leaks	Steam was noted to be leaking from the hatches at the top of both beds. Both hatches were retightened. Bolts were replaced as necessary.
06/03/13	T102 boiler inspection	One boiler at T102 was taken off-line for an annual inspection. Work was completed and the boiler was put back on-line.
06/25/13	T102 duct welds	Some air leaks were noted coming from the process air ducts at T102. Ducts were welded to correct the issue.
07/11/13	Well pressure gauges and transmitters	Several pressure gauges are inconsistent with transmitter values. Northrop Grumman currently reviewing calibration of transmitters and if gaugues should be replaced.
07/11/13	T102 RVPGAC bed steam leaks	Steam was noted to be leaking from a crack in top of Bed B. Insulation was temporary removed from both beds to weld noted leaks, as well as other potential leaks. Insulation was reinstalled and leaks stopped after the welding was completed.

Table 2. Summary of Non-Routine Maintenance, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Date Completed	Maintenance Item	Description/Comments
08/01/13	Well 19 pilot valve issues	The pilot valve at Well 19 was noted to be malfunctioning. A new pilot valve was purchased and installed.
08/13/13	Well 3 drop pipe/pump modification	Well 3 water levels were dropping lower than recommended. A scope of work/bid was prepared to lower the remedial well pump/motor approxmately 100 feet. The hired subcontractor, Unitech, completed the work and the remedial well pump was restarted at its design flow rate.
08/15/13	Well 19 replacement pump	The remedial well pump in Well 19 was determined to be damaged and needed to be replaced. A new submersible remedial well pump and motor, with check valve and VFD, was installed to replace the damaged components.
09/30/13	Well 18 pump control panel/VFD	Well 18 pump control panel does not fully close. The control panel was fixed so the door could be fully closed.
09/30/13	T96 condensate flow meter display	Condensate flow meter needs new batteries. Batteries were replaced.
09/30/13	T102 influent steam flow meter error	Influent steam flow meter was reading "Error 1." Meter was checked and reset. Information was also confirmed to be transmitted to a secondary readout in the T102 control room.
10/03/13	Well 19 rehabilitation	Due to the declining performance and specific capacity of Well 19, the pump was pulled and the well was video logged. Based on the video, rehabilitation was needed. Work was bid and awarded to Delta Well and Pump. The rehabilitation was completed with acid and chlorine treatment. A temporary pump was installed after completion of the work, due to the deteriated condition of the turbine pump.
10/11/13	Monitoring well maintenance	Various monitoring well maintenance (new covers, manhole replacement, bolt replacement, etc.) was completed as necessary. Work was bid and awarded to Zebra Environmental. All repairs were successfully completed.
10/24/13	T102 Condensate return pipe leak	The steam condensate return line from T102 to the boiler building, is leaking and needs to be repaired and/or replaced. The work was bid and awarded to Saracino Construction. The line was repaired.
11/07/13	T102 boiler building light	A new light is needed for the the T102 boiler building. A work order has been placed and the work is waiting to be scheduled.
11/21/13	T102 boiler blow down tank	The boiler blow down tank and pump at T102 need replacement. Work was bid and awarded to Saracino Construction to install a new replacement tank and pump.
12/09/13	T102 air stripper effluent sample tap leak	A leak was noted at the air stripper effluent sample tap. Portion of the piping and the sample tap were replaced.

Table 2. Summary of Non-Routine Maintenance, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Date Completed	Maintenance Item	Description/Comments
12/19/13	Well 3R Installation	Due to the decline performance and specific capacity of Well 3, a design for a new remedial well (3R) was completed. The contract was bid and awarded to Unitech and involved the installation of the existing Well 3 pump/motor at Well 3R, installation of HDPE piping from Well 3R to the Well 3 pump house, reconfiguration of the Well 3 pump house equipment, and installation of new electrical equipment with VFD.
12/27/13	Correction of T102 steam supply issues	Some steam supply pressure/flow issue were noted due to a failing regulator. A new pressure regulator was ordered and installed.
12/31/13	Western recharge basin scraping	The southern of the Western Recharge Basins needs to be scraped and vegetation needs to be cut back. Work was bid and awarded to Bancker Construction. Material removed was sampled and characterized as non-hazardous. All work was successfully completed.
01/15/14	Well 1 replacement flow meter	The flow meter for Well 1 was malfunctioning and not properly displaying the flow rate. A new, calibrated flow meter was installed. The old meter was sent to manufacturer for calibration, so it could be use as a spare.
03/20/14	T96 steam pneumatic control valve repair	The pneumatic control valve associated with the steam effluent pipe for Carbon Bed A had failed open and was therefore positively pressurizing the recovered solvent storage vessel. A new valve was purchase and installed.
03/20/14	T96 solvent storage tank gasket	The gasket on the lid of the recovered solvent storage vessel had failed. A new gasket was installed to replace the faulty gasket.
03/30/14	T102 RVPGAC influent bed dampers	New damper seals were installed to prevent failure of the dampers and potential steam leaks.
04/15/14	T102 RVPGAC effluent bed dampers	Steam was noted in the RVPGAC damper site glass during the desorb cycle. Specially fabricated damper seals were needed, since the original manufacturer was no longer in business. The new damper seals were installed and stopped the steam leaks.
05/13/14	T102 Condenser cooling water piping	Temperature of cooling water after condenser has been higher than design. It was ultimately determined that the flow rate to the condenser was less than design. A new connection directly to the effluent force main was installed to the existing pump piping.
06/02/14	T96 condenser water flow meter replacement	The condenser feed water flowmeter does not appear to be properly calibrated as it is indicating a flow rate of less than 1 gpm while the plate condenser requires a minimum flow rate of 43 gpm. The meter was replaced with a new meter and flow was confirmed.
06/23/14	T96 solvent level transducer gaskets and hoses repair	The gasket at the level transducer needs to be replaced as a slight leak was noted during preliminary evaluations. Additionally, the solvent tank vent tubing has deteriorated and should be replaced.
06/25/14	T96 RVPGAC influent/effluent bed dampers	New damper seals were installed to prevent failure of the dampers and potential steam leaks during desorb.

Table 2. Summary of Non-Routine Maintenance, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Date Completed	Maintenance Item	Description/Comments
09/22/14	T96 system process blower duct boot repair	The system process blower duct boot within the treatment building was noted to be leaking and in disrepair. A new duct boot was purchased and installed.
09/23/14	OXY blower duct boot repair	The blower effluent duct boot associated with the OXY blower was noted to be significantly deteriorated and in disrepair. A new duct boot was purchased and installed. On-going maintenance activities have identified minor leakage; additional maintenance/repair activities to address are ongoing and are expected to be completed before the end of October 2014.
09/23/14	T102 system process blower duct boot repair	The blower effluent duct boot associated with the T102 blower was noted to be leaking and in disrepair. A new duct boot was purchased and installed. On-going maintenance activities have identified minor leakage; additional maintenance/repair activities to address are ongoing and are expected to be completed before the end of October 2014.

Notes and Abbreviations:

(1) Maintenance items were completed, as necessary, based on observations of the treatment system during the routine daily and weekly site visits.

(2) This table includes maintenance items completed during the 2013 reporting period, as well as maintenance items that carried over into 2014, that were considered critical to repair as part of the Periodic Review Report certification.

T96	Tower 96 treatment system
T102	Tower 102 treatment system
MCP	motor control panel
OXY	Occidental Chemical Corporation
VFD	variable frequency drive
HDPE	high density polyethylene
RVPGAC	regenerative vapor phase granular activated carbon
gpm	gallons per minute

Table 3. Operational Summary for the OU2 On-Site Groundwater Remedy, Year 2013 and Period of Record, Northrop Grumman Systems Corporation, Bethpage, New York. [1]

Identification	Flow Rates (gpm)		Uptime [5]	Annual Flow Volumes (MG)			VOC Mass Removed (lbs) [6]	
	Design [2]	Average [3,4]	Actual	Design [2]	Actual [3,4]	% of Design	Annual	Cumulative[12]
Influent Groundwater								
Well 1	800	812	98%	419.3	417.0	99%	1,472	36,313
Well 3 [10]	700	675	93%	366.9	329.3	90%	4,265	83,203
Well 17	1,000	1,085	95%	524.2	540.3	103%	1,050	49,898
Well 18	600	672	96%	314.5	338.3	108%	216	5,520
Well 19 [11]	700	661	83%	366.9	287.7	78%	514	6,325
Total	3,800	3,905	--	1,992	1,913	96%	7,517	181,259
Effluent Groundwater [7]								
Calpine	100 - 400	160	--	--	84	--	--	--
OXY Biosparge [8]	2 - 42	4	--	--	2	--	--	--
West Recharge Basins	1,112 - 1,455	1,011	--	--	529	--	--	--
South Recharge Basins	2,231	2,483	--	1,169	1,298	111%	--	--
Total	--	3,658	--	--	1,913	--	--	--

Treatment Efficiencies [9]

Tower 96 System Efficiency:	99.83%
Tower 102 System Efficiency:	99.90%

Notes:

(1) Annual reporting period: January 7, 2013 through January 6, 2014.

(2) "Design" flow rates were determined for the five remedial wells and for the South Recharge Basins based on computer modeling (ARCADIS G&M, Inc. 2003c, modified in April 2005). Flow rates for Calpine, OXY Biosparge, and West Recharge Basins are typical flow rates and are provided for reader information. "Design" flow volumes represent the volume of water that should be pumped/discharged during the reporting period and is calculated by multiplying the design rate by the reporting period duration.

(3) "Average" flow rates for the remedial wells represent the average actual pumping rates when the pumps are operational and do not take into account the time that a well is not operational. "Actual" volumes are determined via totalizing flow meters.

(4) "Average" flow rates for the system discharges represent the average flow rate during the entire reporting period and are determined by dividing the total flow during the reporting period by the reporting period duration. The Calpine and South Recharge Basins flow volumes are determined via totalizing flow meters. The West Recharge Basin flow is calculated by subtracting the cumulative flow to the other discharges from the total influent flow. Actual flow to the recharge basins is greater than shown because stormwater combines with the plant effluents prior to discharge to the recharge basins.

(5) Uptime was calculated for the remedial wells as the difference between the downtime and the entire reporting period. Downtime for the reporting period was determined by systematic recording and tabularizing of weekly flow charts and downtimes.

(6) VOC mass removed for the reporting period is calculated by multiplying the VOC concentration from the quarterly sampling event by the quantity of water pumped during the reporting period.

(7) There are five discharges for the effluent groundwater: South Recharge Basins, West Recharge Basins, Calpine, OXY Biosparge system, and minor losses (pipe loss, irrigation use). Treated water is continuously discharged to the South and West Recharge Basins, and is available on-demand to both the Calpine Power Plant (Calpine) for use as make-up water, and the biosparge remediation system operated by Occidental Chemical (OXY Biosparge).

(8) The flow rate and volume for Occidental Chemical (OXY Biosparge) were estimated based on the average pumping rate calculated from data from April 2007 through March 2012.

(9) Treatment System Efficiencies are calculated by dividing the difference between the influent and effluent TVOC concentrations by the influent concentration.

(10) Well 3 flow rate was lowered to approximately 560 gpm from May 1 through August 4, 2013 due to a decreasing specific capacity and an increased drawdown. It was off-line due to lowering the submersible pump from August 5 through August 13, 2013. Since then, Well 3 operated at approximately 700 gpm until December 2, 2013, when it was shut down due to construction and replacement by Well 3R. Upon completion of the construction on December 13, 2013, Well 3R was started and pumping rate increased to approximately 800 gpm through the end of the reporting period, to compensate for the previous downtime.

(11) Well 19 was shut down from August 12 through October 3, 2013 due to pump malfunction, field investigation, well redevelopment, and temporary submersible pump installation. On October 3, 2013, Well 19 was restarted and operated at a decreased pumping rate of approximately 600 gpm to minimize vibration issues and potential damage. A new permanent submersible pump and motor installation was bid and installed during the first and second quarters of 2014.

(12) Since beginning of ONCT System Operation in 1998.

Acronyms\Key:

-- Not Available or Not Applicable

VOC Volatile Organic Compounds

gpm gallons per minute

MG Million Gallons

Table 4. Concentrations of Volatile Organic Compounds Detected in Remedial Wells and Treatment System Influent/Effluent, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards Criteria [1] and Guidance Value in µg/L	Well: Sample ID: Date:	WELL 1 WELL 1 2/18/2013	WELL 1 WELL 1 6/6/2013	WELL 1 WELL 1 8/21/2013	WELL 1 REP082113 8/21/2013	WELL 1 WELL 1 11/18/2013	WELL 1 REP111813 11/18/2013
1,1,1-Trichloroethane	5		< 13 U	< 13 U	< 13 U	**0.53 J**	< 13 U	< 13 U
1,1,2,2-Tetrachloroethane	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
1,1,2-Trichloroethane	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
1,1-Dichloroethane	5		**0.55 J**	**0.68 J**	**0.70 J**	**0.65 J**	**0.50 J**	**0.53 J**
1,1-Dichloroethene	5		**2.0 J**	**2.2 J**	**2.2 J**	**2.1 J**	**1.9 J**	**1.7 J**
1,2-Dichloroethane	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
1,2-Dichloropropane	5		**5.5 J**	**5.9 J**	**6.8 J**	**6.4 J**	< 13 U	**5.6 J**
2-Butanone (MEK)	50		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
2-Hexanone (MBK)	50		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
4-methyl-2-pentanone (MIK)	50		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Acetone	50		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	**3.9 J**
Benzene	1		< 1.8	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8	< 1.8
Bromodichloromethane	50		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Bromoform	50		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Bromomethane	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Carbon Disulfide	50		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Carbon tetrachloride	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Chlorobenzene	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Chloroethane	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Chloroform	7		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Chloromethane	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
cis-1,2-dichloroethene	5		**4.6 J**	**3.9 J**	**4.4 J**	**3.9 J**	**2.4 J**	**3.9 J**
cis-1,3-dichloropropene	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Dibromochloromethane	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Ethylbenzene	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Methylene Chloride	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 UB	< 13 U
Styrene	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Tetrachloroethene	5		**49**	**48**	**48**	**44**	**14 J**	**40 J**
Toluene	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
trans-1,2-dichloroethene	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
trans-1,3-dichloropropene	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Trichloroethylene	5		**360**	**380**	**400**	**390**	**330**	**350**
Trichlorotrifluoroethane (Freon 113)	5		**2.8 J**	**3.1 J**	**2.8 J**	**2.8 J**	**2.0 J**	**2.6 J**
Vinyl Chloride	2		< 5 U	< 5 U	< 5 U	< 5 U	**12**	< 5 U
Xylene-o	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
Xylenes - m,p	5		< 13 U	< 13 U	< 13 U	< 13 U	< 13 U	< 13 U
		TVOC [3]	**420**	**440**	**460**	**450**	**360**	**410**

Notes and Abbreviations:

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(2) Refer to Figure 3 of this report for schematic sample locations.

(3) TVOC represents the sum of individual concentrations of VOCs detected. Values have been rounded to two significant figures.

Bold value indicates a detection.

VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
µg/L	Micrograms per liter
J	Constituent value is estimated
REP	Replicate Sample
ND	Not detected
NYSDEC	New York State Department of Environmental Conservation
< 5 U	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria

Table 4. Concentrations of Volatile Organic Compounds Detected in Remedial Wells and Treatment System Influent/Effluent, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards Criteria [1] and Guidance Value in µg/L	Well: Sample ID: Date:	WELL 3 WELL 3 2/18/2013	WELL 3 WELL 3 6/6/2013	WELL 3 WELL 3 8/21/2013	WELL 3 WELL 3 11/18/2013
1,1,1-Trichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1,2,2-Tetrachloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1,2-Trichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1-Dichloroethane	5		< 5 U	< 5 U	< 5 U	**3.0 J**
1,1-Dichloroethene	5		**8.6 J**	**8.7 J**	**8.9 J**	**9.9 J**
1,2-Dichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,2-Dichloropropane	5		< 5 U	< 5 U	< 5 U	**27 J**
2-Butanone (MEK)	50		< 5 U	< 5 U	< 5 U	< 5 U
2-Hexanone (MBK)	50		< 5 U	< 5 U	< 5 U	< 5 U
4-methyl-2-pentanone (MIK)	50		< 5 U	< 5 U	< 5 U	< 5 U
Acetone	50		< 5 U	< 5 U	< 5 U	< 5 U
Benzene	1		< 7	< 7.0 U	< 7.0 U	< 7.0
Bromodichloromethane	50		< 5 U	< 5 U	< 5 U	< 5 U
Bromoform	50		< 5 U	< 5 U	< 5 U	< 5 U
Bromomethane	5		< 5 U	< 5 U	< 5 U	< 5 U
Carbon Disulfide	50		< 5 U	< 5 U	< 5 U	< 5 U
Carbon tetrachloride	5		< 5 U	< 5 U	< 5 U	< 5 U
Chlorobenzene	5		< 5 U	< 5 U	< 5 U	< 5 U
Chloroethane	5		< 5 U	**4.0 J**	**2.8 J**	< 5 U
Chloroform	7		< 5 U	< 5 U	< 5 U	< 5 U
Chloromethane	5		< 5 U	< 5 U	< 5 U	< 5 U
cis-1,2-dichloroethene	5		**9.7 J**	**8.3 J**	**8.5 J**	**18 J**
cis-1,3-dichloropropene	5		< 5 U	< 5 U	< 5 U	< 5 U
Dibromochloromethane	5		< 5 U	< 5 U	< 5 U	< 5 U
Ethylbenzene	5		< 5 U	< 5 U	< 5 U	< 5 U
Methylene Chloride	5		< 5 U	< 5 U	< 5 U	< 5 UB
Styrene	5		< 5 U	< 5 U	< 5 U	< 5 U
Tetrachloroethene	5		**53**	**54**	**57**	**190**
Toluene	5		< 5 U	< 5 U	< 5 U	< 5 U
trans-1,2-dichloroethene	5		< 5 U	< 5 U	< 5 U	< 5 U
trans-1,3-dichloropropene	5		< 5 U	< 5 U	< 5 U	< 5 U
Trichloroethylene	5		**1,400**	**1,400**	**1,200**	**1,600**
Trichlorotrifluoroethane (Freon 113)	5		**6.8 J**	**6.3 J**	**7.8 J**	**12 J**
Vinyl Chloride	2		**72**	**60**	**58**	< 20
Xylene-o	5		< 5 U	< 5 U	< 5 U	< 5 U
Xylenes - m,p	5		< 5 U	< 5 U	< 5 U	< 5 U
		TVOC [3]	**1,600**	**1,500**	**1,300**	**1,900**

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(3) TVOC represents the sum of individual concentrations of VOCs detected. Values have been rounded to two significant figures.

Bold value indicates a detection.

VOCs Volatile Organic Compounds
TVOCs Total Volatile Organic Compounds
µg/L Micrograms per liter
J Constituent value is estimated
REP Replicate Sample
ND Not detected
NYSDEC New York State Department of Environmental Conservation
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Table 4. Concentrations of Volatile Organic Compounds Detected in Remedial Wells and Treatment System Influent/Effluent, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards Criteria [1] and Guidance Value in µg/L	Well: Sample ID: Date:	96 INFLUENT 96 INFLUENT 2/18/2013	96 INFLUENT 96 INFLUENT 6/6/2013	96 INFLUENT 96 INFLUENT 8/21/2013	96 INFLUENT 96 INFLUENT 11/18/2013
1,1,1-Trichloroethane	5		< 25 U	**0.68 J**	**1.3 J**	< 25 U
1,1,2,2-Tetrachloroethane	5		< 25 U	< 5 U	< 25 U	< 25 U
1,1,2-Trichloroethane	5		< 25 U	< 5 U	< 25 U	< 25 U
1,1-Dichloroethane	5		**1.3 J**	**1.1 J**	**1.4 J**	**1.3 J**
1,1-Dichloroethene	5		**4.8 J**	**4.2 J**	**4.6 J**	**5.0 J**
1,2-Dichloroethane	5		< 25 U	< 5 U	< 25 U	< 25 U
1,2-Dichloropropane	5		**3.8 J**	**4.3 J**	**3.4 J**	**3.7 J**
2-Butanone (MEK)	50		< 250 U	< 5 U	< 250 U	< 250 U
2-Hexanone (MBK)	50		< 250 U	< 5 U	< 250 U	< 250 U
4-methyl-2-pentanone (MIK)	50		< 250 U	< 5 U	< 250 U	< 250 U
Acetone	50		< 250 U	< 5 U	< 250 U	< 250 U
Benzene	1		< 3.5 U	< 0.7 U	< 3.5 U	< 3.5 U
Bromodichloromethane	50		< 25 U	< 5 U	< 25 U	< 25 U
Bromoform	50		< 25 U	< 5 U	< 25 U	< 25 U
Bromomethane	5		< 25 U	< 5 U	< 25 U	< 25 U
Carbon Disulfide	50		< 25 U	< 5 U	< 25 U	< 25 U
Carbon tetrachloride	5		< 25 U	< 5 U	< 25 U	< 25 U
Chlorobenzene	5		< 25 U	< 5 U	< 25 U	< 25 U
Chloroethane	5		< 25 U	**1.1 J**	< 25 U	**1.4 J**
Chloroform	7		< 25 U	**0.25 J**	< 25 U	< 25 U
Chloromethane	5		< 25 U	< 5 U	< 25 U	< 25 U
cis-1,2-dichloroethene	5		**6.2 J**	**6.4**	**6.2 J**	**6.1 J**
cis-1,3-dichloropropene	5		< 25 U	< 5 U	< 25 U	< 25 U
Dibromochloromethane	5		< 25 U	< 5 U	< 25 U	< 25 U
Ethylbenzene	5		< 25 U	< 5 U	< 25 U	< 25 U
Methylene Chloride	5		< 25 U	< 5 U	< 25 U	< 25 UB
Styrene	5		< 25 U	< 5 U	< 25 U	< 25 U
Tetrachloroethene	5		**46**	**46**	**45**	**47**
Toluene	5		< 25 U	< 5 U	< 25 U	< 25 U
trans-1,2-dichloroethene	5		< 25 U	< 5 U	< 25 U	< 25 U
trans-1,3-dichloropropene	5		< 25 U	< 5 U	< 25 U	< 25 U
Trichloroethylene	5		**800**	**700 D**	**780**	**800**
Trichlorotrifluoroethane (Freon 113)	5		**3.4 J**	**3.1 J**	**3.8 J**	**4.4 J**
Vinyl Chloride	2		**30**	**22**	**25**	**22**
Xylene-o	5		< 25 U	< 5 U	< 25 U	< 25 U
Xylenes - m,p	5		< 25 U	< 5 U	< 25 U	< 25 U
		TVOC [3]	**900**	**790**	**870**	**890**

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(3) TVOC represents the sum of individual concentrations of VOCs detected. Values have been rounded to two significant figures.

Bold value indicates a detection.

VOCs Volatile Organic Compounds
TVOCs Total Volatile Organic Compounds
µg/L Micrograms per liter
J Constituent value is estimated
REP Replicate Sample
ND Not detected
NYSDEC New York State Department of Environmental Conservation
< 5 U Compound not detected above its laboratory quantification limit.
Compound detected in exceedance of NYSDEC SCG Criteria

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Constituent in µg/L	NYSDEC Standards Criteria [1] and Guidance Value in µg/L	Well: Sample ID: Date:	96 EFFLUENT 96 EFFLUENT 2/18/2013	96 EFFLUENT 96 EFFLUENT 6/6/2013	96 EFFLUENT 96 EFFLUENT 8/21/2013	96 EFFLUENT 96 EFFLUENT 11/18/2013
1,1,1-Trichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1,2,2-Tetrachloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1,2-Trichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1-Dichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1-Dichloroethene	5		< 5 U	< 5 U	< 5 U	< 5 U
1,2-Dichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,2-Dichloropropane	5		< 5 U	< 5 U	< 5 U	< 5 U
2-Butanone (MEK)	50		< 5 U	< 5 U	< 5 U	< 5 U
2-Hexanone (MBK)	50		< 5 U	< 5 U	< 5 U	< 5 U
4-methyl-2-pentanone (MIK)	50		< 5 U	< 5 U	< 5 U	< 5 U
Acetone	50		< 5 U	< 5 U	< 5 U	< 5 U
Benzene	1		< 0.7 U	< 0.7 U	< 0.7 U	< 0.7 U
Bromodichloromethane	50		< 5 U	< 5 U	< 5 U	< 5 U
Bromoform	50		< 5 U	< 5 U	< 5 U	< 5 U
Bromomethane	5		< 5 U	< 5 U	< 5 U	< 5 U
Carbon Disulfide	50		< 5 U	< 5 U	< 5 U	< 5 U
Carbon tetrachloride	5		< 5 U	< 5 U	< 5 U	< 5 U
Chlorobenzene	5		< 5 U	< 5 U	< 5 U	< 5 U
Chloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
Chloroform	7		< 5 U	< 5 U	< 5 U	< 5 U
Chloromethane	5		< 5 U	< 5 U	< 5 U	< 5 U
cis-1,2-dichloroethene	5		< 5 U	< 5 U	< 5 U	< 5 U
cis-1,3-dichloropropene	5		< 5 U	< 5 U	< 5 U	< 5 U
Dibromochloromethane	5		< 5 U	< 5 U	< 5 U	< 5 U
Ethylbenzene	5		< 5 U	< 5 U	< 5 U	< 5 U
Methylene Chloride	5		< 5 U	< 5 U	< 5 U	< 5 U
Styrene	5		< 5 U	< 5 U	< 5 U	< 5 U
Tetrachloroethene	5		< 5 U	< 5 U	< 5 U	< 5 U
Toluene	5		< 5 U	< 5 U	< 5 U	< 5 U
trans-1,2-dichloroethene	5		< 5 U	< 5 U	< 5 U	< 5 U
trans-1,3-dichloropropene	5		< 5 U	< 5 U	< 5 U	< 5 U
Trichloroethylene	5		**1.2 J**	**0.33 J**	**3.0 J**	**1.5 J**
Trichlorotrifluoroethane (Freon 113)	5		< 5 U	< 5 U	< 5 U	< 5 U
Vinyl Chloride	2		< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Xylene-o	5		< 5 U	< 5 U	< 5 U	< 5 U
Xylenes - m,p	5		< 5 U	< 5 U	< 5 U	< 5 U
		TVOC [3]	**1.2**	**0.33**	**3.0**	**1.5**

Notes and Abbreviations:

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(2) Refer to Figure 3 of this report for schematic sample locations.

(3) TVOC represents the sum of individual concentrations of VOCs detected. Values have been rounded to two significant figures.

Bold value indicates a detection.

VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
µg/L	Micrograms per liter
J	Constituent value is estimated
REP	Replicate Sample
ND	Not detected
NYSDEC	New York State Department of Environmental Conservation
< 5 U	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria

Table 4. Concentrations of Volatile Organic Compounds Detected in Remedial Wells and Treatment System Influent/Effluent, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards Criteria [1] and Guidance Value in µg/L	Well: Sample ID: Date:	WELL 17 WELL 17 2/18/2013	WELL 17 WELL 17 06/06/13	WELL 17 WELL 17 08/21/13	WELL 17 WELL 17 11/18/2013
1,1,1-Trichloroethane	5		**0.60 J**	**0.52 J**	**0.53 J**	**0.50 J**
1,1,2,2-Tetrachloroethane	5		< 10 U	< 10 U	< 5 U	< 10 U
1,1,2-Trichloroethane	5		< 10 U	< 10 U	< 5 U	< 10 U
1,1-Dichloroethane	5		**1.2 J**	**1.3 J**	**1.1 J**	**1.0 J**
1,1-Dichloroethene	5		**2.4 J**	**2.3 J**	**2.4 J**	**2.0 J**
1,2-Dichloroethane	5		< 10 U	< 10 U	< 5 U	< 10 U
1,2-Dichloropropane	5		< 10 U	< 10 U	< 5 U	< 10 U
2-Butanone (MEK)	50		< 10 U	< 10 U	< 5 U	< 10 U
2-Hexanone (MBK)	50		< 10 U	< 10 U	< 5 U	< 10 U
4-methyl-2-pentanone (MIK)	50		< 10 U	< 10 U	< 5 U	< 10 U
Acetone	50		< 10 U	< 10 U	< 5 U	< 10 U
Benzene	1		< 1.4	< 1.4 U	< 0.7 U	< 1.4
Bromodichloromethane	50		< 10 U	< 10 U	< 5 U	< 10 U
Bromoform	50		< 10 U	< 10 U	< 5 U	< 10 U
Bromomethane	5		< 10 U	< 10 U	< 5 U	< 10 U
Carbon Disulfide	50		< 10 U	< 10 U	< 5 U	< 10 U
Carbon tetrachloride	5		< 10 U	< 10 U	0.20 J	< 10 U
Chlorobenzene	5		< 10 U	< 10 U	< 5 U	< 10 U
Chloroethane	5		< 10 U	< 10 U	< 5 U	< 10 U
Chloroform	7		< 10 U	**0.48 J**	**0.28 J**	< 10 U
Chloromethane	5		< 10 U	< 10 U	< 5 U	< 10 U
cis-1,2-dichloroethene	5		**4.5 J**	**4.5 J**	**4.1 J**	**4.1 J**
cis-1,3-dichloropropene	5		< 10 U	< 10 U	< 5 U	< 10 U
Dibromochloromethane	5		< 10 U	< 10 U	< 5 U	< 10 U
Ethylbenzene	5		< 10 U	< 10 U	< 5 U	< 10 U
Methylene Chloride	5		< 10 U	< 10 U	< 5 U	< 10 U
Styrene	5		< 10 U	< 10 U	< 5 U	< 10 U
Tetrachloroethene	5		**31**	**30**	**32**	**30**
Toluene	5		< 10 U	< 10 U	< 5 U	< 10 U
trans-1,2-dichloroethene	5		< 10 U	< 10 U	< 5 U	< 10 U
trans-1,3-dichloropropene	5		< 10 U	< 10 U	< 5 U	< 10 U
Trichloroethylene	5		**210**	**190**	**190 D**	**190**
Trichlorotrifluoroethane (Freon 113)	5		**4.2 J**	**4.0 J**	**4.3 J**	**4.1 J**
Vinyl Chloride	2		< 4.0 U	< 4.0 U	< 2.0 U	< 4.0 U
Xylene-o	5		< 10 U	< 10 U	< 5 U	< 10 U
Xylenes - m,p	5		< 10 U	< 10 U	< 5 U	< 10 U
		TVOC [3]	**220**	**230**	**240**	**230**

Notes and Abbreviations:

(1) Samples collected by ARCADIS on the dates shown and submitted to ALS Environmental for VOC analyses using New York State Department of Environmental Conservation ASP 2005 Method OLM 4.3.

(2) Refer to Figure 3 of this report for schematic sample locations.

(3) TVOC represents the sum of individual concentrations of VOCs detected. Values have been rounded to two significant figures.

Bold value indicates a detection.

VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
µg/L	Micrograms per liter
J	Constituent value is estimated
REP	Replicate Sample
ND	Not detected
NYSDEC	New York State Department of Environmental Conservation
< 5 U	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria

Table 4. Concentrations of Volatile Organic Compounds Detected in Remedial Wells and Treatment System Influent/Effluent, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards Criteria [1] and Guidance Value in µg/L	Well: Sample ID: Date:	WELL 18 WELL 18 2/18/2013	WELL 18 WELL 18 06/06/13	WELL 18 WELL 18 08/21/13	WELL 18 WELL 18 11/18/2013
1,1,1-Trichloroethane	5		**0.91 J**	**0.76 J**	**0.69 J**	**0.74 J**
1,1,2,2-Tetrachloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1,2-Trichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1-Dichloroethane	5		**0.97 J**	**1.1 J**	**1.0 J**	**1.0 J**
1,1-Dichloroethene	5		**3 J**	**3.0 J**	**1.3 J**	**3.6 J**
1,2-Dichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,2-Dichloropropane	5		< 5 U	< 5 U	< 5 U	< 5 U
2-Butanone (MEK)	50		< 5 U	< 5 U	< 5 U	< 5 U
2-Hexanone (MBK)	50		< 5 U	< 5 U	< 5 U	< 5 U
4-methyl-2-pentanone (MIK)	50		< 5 U	< 5 U	< 5 U	< 5 U
Acetone	50		< 5 U	< 5 U	< 5 U	< 5 U
Benzene	1		< 0.7 U	< 0.7 U	< 0.7 U	< 0.7 U
Bromodichloromethane	50		< 5 U	< 5 U	< 5 U	< 5 U
Bromoform	50		< 5 U	< 5 U	< 5 U	< 5 U
Bromomethane	5		< 5 U	< 5 U	< 5 U	< 5 U
Carbon Disulfide	50		< 5 U	< 5 U	< 5 U	< 5 U
Carbon tetrachloride	5		< 5 U	< 5 U	< 5 U	< 5 U
Chlorobenzene	5		< 5 U	< 5 U	< 5 U	< 5 U
Chloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
Chloroform	7		**0.21 J**	**0.26 J**	**0.29 J**	**0.24 J**
Chloromethane	5		< 5 U	< 5 U	< 5 U	< 5 U
cis-1,2-dichloroethene	5		**2.1 J**	**1.7 J**	**1.7 J**	**1.9 J**
cis-1,3-dichloropropene	5		< 5 U	< 5 U	< 5 U	< 5 U
Dibromochloromethane	5		< 5 U	< 5 U	< 5 U	< 5 U
Ethylbenzene	5		< 5 U	< 5 U	< 5 U	< 5 U
Methylene Chloride	5		< 5 U	< 5 U	< 5 U	< 5 U
Styrene	5		< 5 U	< 5 U	< 5 U	< 5 U
Tetrachloroethene	5		**13**	**12**	**12**	**13**
Toluene	5		< 5 U	< 5 U	< 5 U	< 5 U
trans-1,2-dichloroethene	5		< 5 U	< 5 U	< 5 U	< 5 U
trans-1,3-dichloropropene	5		< 5 U	< 5 U	< 5 U	< 5 U
Trichloroethylene	5		**60**	**60**	**55**	**55**
Trichlorotrifluoroethane (Freon 113)	5		**1.3 J**	**1.5 J**	**1.2 J**	**1.3 J**
Vinyl Chloride	2		< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Xylene-o	5		< 5 U	< 5 U	< 5 U	< 5 U
Xylenes - m,p	5		< 5 U	< 5 U	< 5 U	< 5 U
		TVOC [3]	**81**	**80**	**73**	**77**

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(3) TVOC represents the sum of individual concentrations of VOCs detected. Values have been rounded to two significant figures.

Bold value indicates a detection.

VOCs Volatile Organic Compounds
TVOCs Total Volatile Organic Compounds
µg/L Micrograms per liter
J Constituent value is estimated
REP Replicate Sample
ND Not detected
NYSDEC New York State Department of Environmental Conservation
< 5 U Compound not detected above its laboratory quantification limit.
Compound detected in exceedance of NYSDEC SCG Criteria

Table 4. Concentrations of Volatile Organic Compounds Detected in Remedial Wells and Treatment System Influent/Effluent, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards Criteria [1] and Guidance Value in µg/L	Well: Sample ID: Date:	WELL 19 WELL 19 2/18/2013	WELL 19 [4] WELL 19 06/06/13	WELL 19 WELL 19 11/18/2013
1,1,1-Trichloroethane	5		**0.52 J**	**0.45 J**	**0.57 J**
1,1,2,2-Tetrachloroethane	5		< 5 U	< 5 U	< 5 U
1,1,2-Trichloroethane	5		< 5 U	**0.21 J**	**0.22 J**
1,1-Dichloroethane	5		**0.98 J**	**0.84 J**	**0.95 J**
1,1-Dichloroethene	5		**1.7 J**	**1.6 J**	**1.3 J**
1,2-Dichloroethane	5		**0.56 J**	**0.47 J**	**0.46 J**
1,2-Dichloropropane	5		< 5 U	< 5 U	< 5 U
2-Butanone (MEK)	50		< 5 U	< 5 U	< 5 U
2-Hexanone (MBK)	50		< 5 U	< 5 U	< 5 U
4-methyl-2-pentanone (MIK)	50		< 5 U	< 5 U	< 5 U
Acetone	50		< 5 U	< 5 U	< 5 U
Benzene	1		< 0.7 U	< 0.7 U	< 0.7 U
Bromodichloromethane	50		< 5 U	< 5 U	< 5 U
Bromoform	50		< 5 U	< 5 U	< 5 U
Bromomethane	5		< 5 U	< 5 U	< 5 U
Carbon Disulfide	50		< 5 U	< 5 U	< 5 U
Carbon tetrachloride	5		< 5 U	< 5 U	< 5 U
Chlorobenzene	5		< 5 U	< 5 U	< 5 U
Chloroethane	5		< 5 U	< 5 U	< 5 U
Chloroform	7		**0.52 J**	**0.51 J**	**0.64 J**
Chloromethane	5		< 5 U	< 5 U	< 5 U
cis-1,2-dichloroethene	5		**24**	**24**	**21**
cis-1,3-dichloropropene	5		< 5 U	< 5 U	< 5 U
Dibromochloromethane	5		< 5 U	< 5 U	< 5 U
Ethylbenzene	5		< 5 U	< 5 U	< 5 U
Methylene Chloride	5		< 5 U	< 5 U	< 5 U
Styrene	5		< 5 U	< 5 U	< 5 U
Tetrachloroethene	5		**6.2**	**6.5**	**7.0**
Toluene	5		< 5 U	< 5 U	< 5 U
trans-1,2-dichloroethene	5		< 5 U	< 5 U	**0.46 J**
trans-1,3-dichloropropene	5		< 5 U	< 5 U	< 5 U
Trichloroethylene	5		**190**	**180**	**180**
Trichlorotrifluoroethane (Freon 113)	5		**0.85 J**	**0.96 J**	**1.0 J**
Vinyl Chloride	2		< 2.0 U	< 2.0 U	< 2.0 U
Xylene-o	5		< 5 U	< 5 U	< 5 U
Xylenes - m,p	5		< 5 U	< 5 U	< 5 U
		TVOC [3]	**230**	**220**	**210**

Notes and Abbreviations:

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(3) TVOC represents the sum of individual concentrations of VOCs detected. Values have been rounded to two significant figures.

Bold value indicates a detection.

VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
µg/L	Micrograms per liter
J	Constituent value is estimated
REP	Replicate Sample
ND	Not detected
NYSDEC	New York State Department of Environmental Conservation
< 5 U	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria

Table 4. Concentrations of Volatile Organic Compounds Detected in Remedial Wells and Treatment System Influent/Effluent, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards Criteria [1] and Guidance Value in µg/L	Well: Sample ID: Date:	102 INFLUENT 102 INFLUENT 2/18/2013	102 INFLUENT 102 INFLUENT 06/06/13	102 INFLUENT 102 INFLUENT 8/21/2013	102 INFLUENT 102 INFLUENT 11/18/2013
1,1,1-Trichloroethane	5		**0.67 J**	**0.61 J**	**0.57 J**	**0.61 J**
1,1,2,2-Tetrachloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1,2-Trichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1-Dichloroethane	5		**1.0 J**	**1.1 J**	**1.3 J**	**1.2 J**
1,1-Dichloroethene	5		**2.2 J**	**2.3 J**	**3.0 J**	**2.5 J**
1,2-Dichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,2-Dichloropropane	5		< 5 U	< 5 U	< 5 U	< 5 U
2-Butanone (MEK)	50		< 5 U	< 5 U	< 5 U	< 5 U
2-Hexanone (MBK)	50		< 5 U	< 5 U	< 5 U	< 5 U
4-methyl-2-pentanone (MIK)	50		< 5 U	< 5 U	< 5 U	< 5 U
Acetone	50		< 5 U	< 5 U	< 5 U	< 5 U
Benzene	1		< 0.7 U	< 0.7 U	< 0.7 U	< 0.7 U
Bromodichloromethane	50		< 5 U	< 5 U	< 5 U	< 5 U
Bromoform	50		< 5 U	< 5 U	< 5 U	< 5 U
Bromomethane	5		< 5 U	< 5 U	< 5 U	< 5 U
Carbon Disulfide	50		< 5 U	< 5 U	< 5 U	< 5 U
Carbon tetrachloride	5		< 5 U	< 5 U	< 5 U	< 5 U
Chlorobenzene	5		< 5 U	< 5 U	< 5 U	< 5 U
Chloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
Chloroform	7		**0.31 J**	**0.37 J**	**0.32 J**	**0.42 J**
Chloromethane	5		< 5 U	< 5 U	< 5 U	< 5 U
cis-1,2-dichloroethene	5		**8.5**	**9.0**	**3.3 J**	**8.2**
cis-1,3-dichloropropene	5		< 5 U	< 5 U	< 5 U	< 5 U
Dibromochloromethane	5		< 5 U	< 5 U	< 5 U	< 5 U
Ethylbenzene	5		< 5 U	< 5 U	< 5 U	< 5 U
Methylene Chloride	5		< 5 U	< 5 U	< 5 U	< 5 U
Styrene	5		< 5 U	< 5 U	< 5 U	< 5 U
Tetrachloroethene	5		**20**	**22**	**24**	**22**
Toluene	5		< 5 U	< 5 U	< 5 U	< 5 U
trans-1,2-dichloroethene	5		< 5 U	< 5 U	< 5 U	< 5 U
trans-1,3-dichloropropene	5		< 5 U	< 5 U	< 5 U	< 5 U
Trichloroethylene	5		**180**	**170**	**140**	**160**
Trichlorotrifluoroethane (Freon 113)	5		**2.6 J**	**3.1 J**	**3.0 J**	**3.0 J**
Vinyl Chloride	2		< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Xylene-o	5		< 5 U	< 5 U	< 5 U	< 5 U
Xylenes - m,p	5		< 5 U	< 5 U	< 5 U	< 5 U
		TVOC [3]	**220**	**210**	**180**	**200**

Notes and Abbreviations:

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(2) Refer to Figure 3 of this report for schematic sample locations.

(3) TVOC represents the sum of individual concentrations of VOCs detected. Values have been rounded to two significant figures.

Bold value indicates a detection.

VOCs Volatile Organic Compounds
TVOCs Total Volatile Organic Compounds
µg/L Micrograms per liter
J Constituent value is estimated
REP Replicate Sample
ND Not detected
NYSDEC New York State Department of Environmental Conservation
< 5 U Compound not detected above its laboratory quantification limit.
Compound detected in exceedance of NYSDEC SCG Criteria

Table 4. Concentrations of Volatile Organic Compounds Detected in Remedial Wells and Treatment System Influent/Effluent, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards Criteria [1] and Guidance Value in µg/L	Well:	102 EFFLUENT	102 EFFLUENT	102 EFFLUENT	102 EFFLUENT
		Sample ID:	102 EFFLUENT	102 EFFLUENT	102 EFFLUENT	102 EFFLUENT
		Date:	2/18/2013	06/06/13	08/21/13	11/18/2013
1,1,1-Trichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1,2,2-Tetrachloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1,2-Trichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1-Dichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,1-Dichloroethene	5		< 5 U	< 5 U	< 5 U	< 5 UJ
1,2-Dichloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
1,2-Dichloropropane	5		< 5 U	< 5 U	< 5 U	< 5 U
2-Butanone (MEK)	50		< 5 U	< 5 U	< 5 U	< 5 U
2-Hexanone (MBK)	50		< 5 U	< 5 U	< 5 U	< 5 U
4-methyl-2-pentanone (MIK)	50		< 5 U	< 5 U	< 5 U	< 5 U
Acetone	50		< 5 U	< 5 U	< 5 U	< 5 U
Benzene	1		< 0.7 U	< 0.7 U	< 0.7 U	< 0.7 UJ
Bromodichloromethane	50		< 5 U	< 5 U	< 5 U	< 5 U
Bromoform	50		< 5 U	< 5 U	< 5 U	< 5 U
Bromomethane	5		< 5 U	< 5 U	< 5 U	< 5 U
Carbon Disulfide	50		< 5 U	< 5 U	< 5 U	< 5 U
Carbon tetrachloride	5		< 5 U	< 5 U	< 5 U	< 5 U
Chlorobenzene	5		< 5 U	< 5 U	< 5 U	< 5 UJ
Chloroethane	5		< 5 U	< 5 U	< 5 U	< 5 U
Chloroform	7		< 5 U	< 5 U	< 5 U	< 5 U
Chloromethane	5		< 5 U	< 5 U	< 5 U	< 5 U
cis-1,2-dichloroethene	5		< 5 U	< 5 U	< 5 U	< 5 U
cis-1,3-dichloropropene	5		< 5 U	< 5 U	< 5 U	< 5 U
Dibromochloromethane	5		< 5 U	< 5 U	< 5 U	< 5 U
Ethylbenzene	5		< 5 U	< 5 U	< 5 U	< 5 U
Methylene Chloride	5		< 5 U	< 5 U	< 5 U	< 5 U
Styrene	5		< 5 U	< 5 U	< 5 U	< 5 U
Tetrachloroethene	5		< 5 U	< 5 U	< 5 U	< 5 U
Toluene	5		< 5 U	< 5 U	< 5 U	< 5 U
trans-1,2-dichloroethene	5		< 5 U	< 5 U	< 5 U	< 5 U
trans-1,3-dichloropropene	5		< 5 U	< 5 U	< 5 U	< 5 U
Trichloroethylene	5		**0.78 J**	< 5 U	< 5 U	< 5 U
Trichlorotrifluoroethane (Freon 113)	5		< 5 U	< 5 U	< 5 U	< 5 U
Vinyl Chloride	2		< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U
Xylene-o	5		< 5 U	< 5 U	< 5 U	< 5 U
Xylenes - m,p	5		< 5 U	< 5 U	< 5 U	< 5 U
		TVOC [3]	**0.78**	ND	ND	ND

Notes and Abbreviations:

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VOCs Volatile Organic Compounds
TVOCs Total Volatile Organic Compounds
µg/L Micrograms per liter
J Constituent value is estimated
REP Replicate Sample
ND Not detected
NYSDEC New York State Department of Environmental Conservation
< 5 U Compound not detected above its laboratory quantification limit.
Compound detected in exceedance of NYSDEC SCG Criteria

Table 5A. Summary of Effluent Air Emissions, Tower 96 Treatment System, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Compound ($\mu g/m^3$)	Sample Location: / Sample Date:	T96 EFF 2/18/2013	T96 EFF 6/6/2013	T96 EFF 8/21/2013	T96 EFF 11/18/2013
	SGC (1)				
1,1,1-Trichloroethane	9,000	< 23 U	**1.6**	< 1.8 U	**1.0 J**
1,1-Dichloroethane	95,000 (3), (4)	**0.77 J**	**29**	**0.23 J**	**11**
1,1-Dichloroethene	188,000 (3), (5)	**21**	**50**	**27**	**120**
1,2-Dichloroethane	NS	< 17 U	**0.33 J**	< 1.3 U	< 10 U
1,2-Dichloropropane	NS	< 19 U	**0.41 J**	**0.23 J**	< 12 U
2-Butanone (MEK)	13,000	**1.3 J**	< 1.3 UB	**0.52 J**	**1.4 J**
Acetone	180,000	**8.2 J**	**12**	**24**	**10 J**
Benzene	1,300	< 13 U	**0.021 J**	**0.15 J**	**0.44 J**
Carbon Tetrachloride	1,900	< 2.6 U	**0.073 J**	< 0.21 U	< 1.6 U
Chloroethane	619,000 (3), (6)	34	29	35	35
Chloroform	150	< 20 U	**4**	**0.063 J**	**1.4 J**
Chloromethane	22,000	**1.8 J**	**0.96**	**1.5**	**2.6 J**
cis-1,2-Dichloroethylene	190,000 (3), (7)	**3.1 J**	**2.4**	**0.39 J**	**19**
Dichlorodifluoromethane (Freon 12)	1,179,000 (3), (8)	**4.2 J**	**5.1**	**5.5**	**6.7 J**
Dichloromethane	14,000	< 14 U	**0.82**	**0.71 J**	**1.1 J**
Tetrachloroethylene	1,000	**6.6**	**0.16**	**3.7**	< 1.9 U
Toluene	37,000	< 15 U	**0.065 J**	**0.11 J**	< 9.5 U
Trichloroethylene	14,000	**9.4**	**15**	**37**	**96**
Trichlorofluoromethane (Freon 11)	9,000	**6.2 J**	**26**	**16**	**33**
Trichlorotrifluoroethane (Freon 113)	960,000	< 6.4 U	**36**	**0.33 J**	**14**
Vinyl chloride	180,000	**570**	**6.4**	**120 D**	**470**
Xylenes	4,300	< 72 U	**0.038 J**	**0.13 J**	< 44 U

Notes:

(1) Refers to the compound-specific SGC per the NYSDEC DAR-1 AGC/SGC tables revised October 18, 2010.

(2) Only VOCs that were detected in the effluent vapor sample (T96 EFF) over the past year of system operation are included in this table.

(3) An SGC was not provided in the DAR-1 AGC/SGC Tables, dated October 18, 2010.

(4) An interim SGC was developed based on guidelines provided in Section IV.A.2.b.1 of the NYSDEC DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for 1,1- dichloroethane, 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 400,000 $\mu g/m^3$/4.2 = approximately 95,000 $\mu g/m^3$.

(5) An interim SGC was developed based on guidelines provided in Section IV.A.2.b.1 of the NYSDEC DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for 1,1- 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 188,000 $\mu g/m^3$.

(6) An interim SGC was developed based on guidelines provided in Section IV.A.2.b.1 of the NYSDEC DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for chloroethane, 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 2,600,000 $\mu g/m^3$/4.2 = approximately 619,000 $\mu g/m^3$.

(7) An interim SGC was developed based on guidelines 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 and trans-1,2-dichloroethene, which are not defined as a high-toxicity constituent, the interim SGC = (smaller of Time Weighted Average [TWA] -Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 793,000 $\mu g/m^3$/4.2 = approximately 190,000 $\mu g/m^3$.

(8) An interim SGC was developed based on guidelines 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 dichlorodifluoromethane, which is not defined as a high-toxicity constituent, the interim SGC = (smaller of Time Weighted Average [TWA] - Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 4,950,000 $\mu g/m^3$/4.2 = approximately 1,179,000 $\mu g/m^3$.

Table 5A. Summary of Effluent Air Emissions, Tower 96 Treatment System, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Abbreviations:

Bold value indicates a detection.

µg/m^3	Micrograms per cubic meter
AGC	Annual guideline concentration
SGC	Short-term guideline concentration
DAR-1	Division of Air Resources-1
NS	Guideline concentrations not specified in the NYSDEC DAR-1 AGC/SGC tables revised October 18, 2010.
NYSDEC	New York State Department of Environmental Conservation
J	Constituent value is estimated
VOC	Volatile Organic Compounds
< 5 U	Compound not detected above its laboratory quantification limit

Table 5B. Summary of Effluent Air Emissions, Tower 102 Treatment System, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Compound ($\mu g/m^3$)	Sample Location: / Sample Date:	T102 EFF 2/18/2013	T102 EFF 6/6/2013	T102 EFF 8/21/2013	T102 EFF 11/18/2013
	SGC (1)				
1,1,1-Trichloroethane (Methyl Chloroform)	9,000	**0.21 J**	**0.71 J**	**0.16 J**	**1.3 J**
1,1-Dichloroethane	95,000 (3), (4)	**1.9**	**4.6**	**0.55 J**	**2.8**
1,1-Dichloroethene (Vinylidene Chloride)	188,000 (3), (5)	**6.6**	**17**	**2.3**	**5.6**
1,2-Dichloroethane	NL	**0.047 J**	**0.14 J**	**0.082 J**	**0.22 J**
1,2-Dichloropropane	NL	< 0.82 U	**0.16 J**	**0.12 J**	**0.31 J**
2-Butanone	13,000	**0.77 J**	< 1.2 UB	**0.45 J**	**2.2 J**
2-Hexanone	4000	**0.17 J**	**0.061 J**	**0.080 J**	< 2.6 U
4-Methyl-2-Pentanone	31000	< 1.4 U	**0.16 J**	**0.25 J**	< 5.3 U
Acetone	180,000	**4.6 J**	< 9.1 UB	**64**	**14 J**
Benzene	1,300	**0.036 J**	**0.17 J**	**0.055 J**	**0.64 J**
Carbon Disulfide	6,200	**0.035 J**	< 0.62 UB	< 1.0 U	< 2.0 U
Carbon Tetrachloride	1,900	< 0.11 U	**0.10 J**	< 0.22 U	**0.6**
Chloroform	150	**0.51 J**	**1.1**	**0.34 J**	**1.2 J**
Chloromethane	22,000	**0.81**	**0.78 J**	**0.73 J**	**1.6 J**
cis-1,2-Dichloroethene	190,000 (3), (6)	**16**	**21**	**15**	**15**
Dichlorodifluoromethane (Freon 12)	1,179,000 (3), (8)	**4**	**4.3**	**4.2**	**3.7 J**
Dichloromethane	14,000	**1.1**	**2.7**	**0.55 J**	**0.62 J**
Ethylbenzene	54,000	< 1.5 U	**0.36 J**	**1.2 J**	**0.18 J**
Styrene	380	< 1.5 U	**0.27 J**	< 2.9 U	< 5.5 U
Tetrachloroethene	1,000	**1.3**	**2.2**	**2.1**	**70**
Toluene	37,000	**0.031 J**	**8.3**	**0.085 J**	**1.1 J**
trans-1,2-Dichloroethene	190000 (3), (9)	**0.16 J**	**0.98**	**0.14 J**	**0.19 J**
Trichloroethene	14,000	**35**	**50**	**37**	**410 D**
Trichloromonofluoromethane (Freon 11)	9,000	**1.4**	**5.6**	**0.56 J**	**2.1 J**
Trichlorotrifluoroethane (Freon 113)	960,000	**3.1**	**9.5**	**0.26 J**	**4.8**
Vinyl Chloride	180,000	**0.65**	**0.51**	**0.41**	**0.23 J**
Xylenes	4,300	**0.041 J**	**1.01 J**	**6.9 J**	**0.7 J**

Notes:

(1) Refers to the compound-specific SGC per the NYSDEC DAR-1 AGC/SGC tables revised October 18, 2010.

(2) Only VOCs that were detected in the effluent vapor sample (T102 EFF) over the past year of system operation are included in this table.

(3) An SGC was not provided in the DAR-1 AGC/SGC Tables, dated October 18, 2010.

(4) An interim SGC was developed based on guidelines provided in Section IV.A.2.b.1 of the NYSDEC DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for 1,1- dichloroethane, 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 400,000 $\mu g/m^3$/4.2 = approximately 95,000 $\mu g/m^3$.

(5) An interim SGC was developed based on guidelines provided in Section IV.A.2.b.1 of the NYSDEC DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for 1,1- 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 188,000 $\mu g/m^3$.

(6) An interim SGC was developed based on guidelines 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 and trans-1,2-dichloroethene, which are not defined as a high-toxicity constituent, the interim SGC = (smaller of Time Weighted Average [TWA] -Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 793,000 $\mu g/m^3$/4.2 = approximately 190,000 $\mu g/m^3$.

(7) An SGC was not provided in the DAR-1 AGC/SGC tables, revised October 18, 2010. An interim SGC was developed based on guidelines 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 cyclohexane, which is not defined as a high-toxicity constituent, the interim SGC = (smaller of Time Weighted Average [TWA] -Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 1,050,000 $\mu g/m^3$/4.2 = approximately 250,000 $\mu g/m^3$.

Table 5B. Summary of Effluent Air Emissions, Tower 102 Treatment System, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Notes: (cont.)

(8) An interim SGC was developed based on guidelines 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 dichlorodifluoromethane, which is not defined as a high-toxicity constituent, the interim SGC = (smaller of Time Weighted Average [TWA] -Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 4,950,000 µg/m^3/4.2 = approximately 1,179,000 µg/m^3.

(9) An SGC was not provided in the DAR-1 AGC/SGC tables, revised October 18, 2010. An interim SGC was developed based on guidelines 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 and trans-1,2-dichloroethene, which are not defined as a high-toxicity constituent, the interim SGC = (smaller of Time Weighted Average [TWA] -Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 793,000 µg/m^3/4.2 = approximately 190,000 µg/m^3.

Abbreviations:

Bold value indicates a detection.

AGC	Annual guideline concentration.
NL	Compound concentration not listed
µg/m^3	Micrograms per cubic meter.
NYSDEC	New York State Department of Environmental Conservation
D	Constituent value is based on a diluted sample analysis.
J	Constituent value is estimated
UB	Compound considered non-detect at the listed value due to associated blank contamination.
VOC	Volatile Organic Compounds
< 5 U	Compound not detected above its laboratory quantification limit.

Table 6A. Summary of of Air Emissions Model Output, Tower 96 Treatment System, OU2 On-Site Groundwater Remedy
Northrop Grumman Systems Corporation, Bethpage, New York.

Compound	AGC[2] (µg/m^3)	Percent of MASC Per Event [3] 2/18/2013	6/6/2013	8/21/2013	11/18/2013	Percent AGC [4]
1,1,1-Trichloroethane	5,000	0.00%	0.00%	0.00%	0.00%	0.00%
1,1-Dichloroethane	0.63	0.00%	0.17%	0.0%	0.060%	0.069%
1,1-Dichloroethene	70	0.00%	0.00%	0.00%	0.010%	0.00%
1,3-Butadiene	0.033	0.00%	0.0%	0.15%	0.00%	0.033%
2-Butanone (MEK)	5,000	0.00%	0.00%	0.00%	0.00%	0.00%
Acetone	30,000	0.00%	0.00%	0.00%	0.00%	0.00%
Carbon disulfide	700	0.00%	0.00%	0.00%	0.00%	0.00%
Chloroethane	10,000	0.00%	0.00%	0.00%	0.00%	0.00%
Chloroform	0.043	0.00%	0.33%	0.010%	0.11%	0.14%
Chloromethane	90	0.00%	0.00%	0.00%	0.00%	0.00%
cis-1,2-Dichloroethylene	63	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%
Dichloromethane	2.1	0.00%	0.00%	0.00%	0.00%	0.00%
Tetrachloroethylene	1.0	0.020%	0.00%	0.010%	0.00%	0.0063%
Toluene	5,000	0.00%	0.00%	0.00%	0.00%	0.00%
Trichloroethylene	0.5	0.070%	0.11%	0.27%	0.66%	0.28%
Trichlorofluoromethane (Freon 11)	5,000	0.00%	0.00%	0.00%	0.00%	0.00%
Trichlorotrifluoroethane (Freon 113)	180,000	0.00%	0.00%	0.00%	0.00%	0.00%
Vinyl chloride	0.11	19%	0.21%	3.9%	15%	8.5%
Xylenes	100	0.00%	0.00%	0.00%	0.00%	0.00%

Notes and Abbreviations:

(1) Only VOCs that were detected in the effluent vapor sample (T96 EFF) 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 October 18, 2010. NYSDEC DAR-1 AGCs were scaled using the results of a site-specific annual USEPA SCREEN 3 model to calculate the annual MASC per monitoring event.

(3) Percent of MASC was calculated by dividing the actual effluent concentration by the MASC for a given monitoring event.

(4) Percent AGC is the 12 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. MASCs are typically calculated once per quarter; thus, the MASCs for each month within a quarter are assumed to be the same.

µg/m^3 Micrograms per cubic meter.
AGC Annual guideline concentration.
DAR-1 Division of Air Resources-1
MASC Maximum allowable stack concentration.
NYSDEC New York State Department of Environmental Conservation
VOC Volatile Organic Compounds
SGC Short-term Guideline Concentration
USEPA United Stated Environmental Protection Agency

Table 6B. Summary of of Air Emissions Model Output, Tower 102 Treatment System, OU2 On-Site Groundwater Remedy
Northrop Grumman Systems Corporation, Bethpage, New York. (1)

Compound	AGC(2)	Percent of MASC (4)				
	(µg/m^3)	2/18/2013	6/6/2013	08/19/13	11/18/13	Percent AGC (5)
1,1,1-Trichloroethane (Mythyl Chloroform	5,000	0.00%	0.00%	0.00%	0.00%	0.00%
1,1-Dichloroethane	0.63	0.010%	0.020%	0.00%	0.010%	0.014%
1,1-Dichloroethene (Vinylidene Chloride)	70	0.00%	0.00%	0.00%	0.00%	0.00%
1,2-Dichloroethane	0.038	0.00%	0.010%	0.010%	0.020%	0.013%
1,2-Dichloropropane	4	0.00%	0.00%	0.00%	0.00%	0.00%
2-Butanone	5,000	0.00%	0.00%	0.00%	0.00%	0.00%
2-Hexanone	30	0.00%	0.00%	0.00%	0.00%	0.00%
4-Methyl-2-Pentanone	3,000	0.00%	0.00%	0.00%	0.00%	0.00%
Acetone	30,000	0.00%	0.00%	0.00%	0.00%	0.00%
Benzene	0.13	0.00%	0.00%	0.00%	0.020%	0.0067%
Carbon Disulfide	700	0.00%	0.00%	0.00%	0.00%	0.00%
Carbon Tetrachloride	0.17	0.00%	0.00%	0.00%	0.00%	0.00%
Chlorobenzene	110	0.00%	0.00%	0.00%	0.00%	0.00%
Chloroform	0.043	0.040%	0.080%	0.030%	0.090%	0.081%
Chloromethane	90	0.00%	0.00%	0.00%	0.00%	0.00%
cis-1,2-Dichloroethene	63	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%
Ethylbenzene	1,000	0.00%	0.00%	0.00%	0.00%	0.00%
Dichloromethane	2.1	0.00%	0.00%	0.00%	0.00%	0.00%
Styrene	1000	0.00%	0.00%	0.00%	0.00%	0.00%
Tetrachloroethene	1	0.00%	0.010%	0.010%	0.23%	0.083%
Toluene	5,000	0.00%	0.00%	0.00%	0.00%	0.00%
trans-1,2-Dichloroethene	63	0.00%	0.00%	0.00%	0.00%	0.00%
Trichloroethene	0.5	0.24%	0.33%	0.24%	2.7%	1.2%
Trichloromonofluoromethane (Freon 11)	5,000	0.00%	0.00%	0.00%	0.00%	0.00%
Trichlorotrifluoroethane (Freon 113)	180,000	0.00%	0.00%	0.00%	0.00%	0.00%
Vinyl Chloride	0.11	0.020%	0.020%	0.010%	0.010%	0.019%
Xylenes	100	0.00%	0.00%	0.00%	0.00%	0.00%

Notes:

(1) Only VOCs that were detected in the effluent vapor sample (T102 EFF) 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 October 18, 2010. NYSDEC DAR-1 AGCs were scaled using the results of a site-specific annual USEPA SCREEN 3 model to calculate the annual MASC per monitoring event.

(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 SCREEN3 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.

(5) Percent AGC is the twelve-month, rolling average at the end of the reporting period. The Percent AGC was calculated by timeweighting the "Percent MASCs" for the individual sampling events over the past year. MASCs are typically calculated once per quarter, thus the Annual Percent AGC is an average of the last four quarters.

Acronyms\Key:

AGC	Annual guideline concentration.
NL	Compound concentration not listed
DAR-1	Division of Air Resources-1
MASC	Maximum allowable stack concentration.
µg/m^3	Micrograms per cubic meter.
NYSDEC	New York State Department of Environmental Conservation
VOC	Volatile Organic Compounds
SGC	Short-term Guideline Concentration
USEPA	United Stated Environmental Protection Agency

Table 7. Summary of SPDES Effluent Water Sample Analytical Results, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

PARAMETER	UNITS	Discharge Limit	Sample ID: Outfall 006 Date: 1/15/2013	Outfall 006 2/19/2013	Outfall 006 3/12/2013	Outfall 006 4/9/2013	Outfall 006 5/14/2013	Outfall 006 6/11/2013	Outfall 006 7/11/2013
VOCs									
1,1,1-Trichloroethane (TCA)	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
1,1,2-Trichlorotrifluoroethane (Freon 113)	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
1,1-Dichloroethene (1,1-DCE)	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
Methylene Chloride	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
Tetrachloroethene (PCE)	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
Trichloroethene (TCE)	µg/L	5	**0.93**	**0.96**	< 0.50 U	**1.2**	< 0.50 U	< 0.50 UJ	< 0.50 U
Vinyl Chloride	µg/L	2	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
cis-1,2-dichloroethene	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
trans-1,2-dichloroethene	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
TVOCs (1)			**0.93**	**0.96**	ND	**1.2**	ND	ND	ND
Anions									
Nitrogen, Total as Nitrogen	mg/L	10	**5.06**	**5.71**	**2.74**	**5.18**	**5.23**	**5.23 J**	**5.52**
pH - Intake (Tower 96) (2)	S.U.	--	**5.42**	**4.98**	**4.73**	**4.81**	**5.19**	**4.98**	**5.09**
pH - Effluent (2)	S.U.	6.5 - 8.5 (2)	**6.14**	**6.58**	**6.25**	**6.21**	**5.55**	**5.81**	**6.18**

See notes and abbreviations on last page.

Table 7. Summary of SPDES Effluent Water Sample Analytical Results, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

PARAMETER	UNITS	Discharge Limit	Sample ID: Outfall 006 Date: 8/21/2013	Outfall 006 9/10/2013	Outfall 006 10/15/2013	Outfall 006 11/12/2013	Outfall 006 12/10/2013
VOCs							
1,1,1-Trichloroethane (TCA)	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
1,1,2-Trichlorotrifluoroethane (Freon 113)	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
1,1-Dichloroethene (1,1-DCE)	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Methylene Chloride	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Tetrachloroethene (PCE)	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Trichloroethene (TCE)	µg/L	5	**2.1**	**2.0**	**1.3**	**2.0**	< 0.50 U
Vinyl Chloride	µg/L	2	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
cis-1,2-dichloroethene	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
trans-1,2-dichloroethene	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
TVOCs (1)			**2.1**	**2.0**	**1.3**	**2.0**	ND
Anions							
Nitrogen, Total as Nitrogen	mg/L	10	**5.64**	**5.51**	**5.08**	**5.25**	**4.44**
pH - Intake (Tower 96) (2)	S.U.	--	**5.59**	**4.98**	**5.26**	**6.02**	**5.17**
pH - Effluent (2)	S.U.	6.5 - 8.5 (2)	**5.65**	**6.07**	**5.83**	**6.21**	**6.43**

See notes and abbreviations on last page.

Table 7. Summary of SPDES Effluent Water Sample Analytical Results, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

PARAMETER	UNITS	Discharge Limit	Sample ID: Outfall 005 Date: 1/15/2013	Outfall 005 2/19/2013	Outfall 005 3/12/2013	Outfall 005 4/9/2013	Outfall 005 5/14/2013	Outfall 005 6/11/2013	Outfall 005 7/11/2013
VOCs									
1,1,1-Trichloroethane (TCA)	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
1,1,2-Trichlorotrifluoroethane (Freon 113)	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
1,1-Dichloroethene (1,1-DCE)	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
Methylene Chloride	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
Tetrachloroethene (PCE)	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
Trichloroethene (TCE)	µg/L	5	**0.73**	**0.78**	**0.69**	**0.68**	**0.54**	**0.64**	**0.8**
Vinyl Chloride	µg/L	2	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
cis-1,2-dichloroethene	µg/L	5	**0.63**	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
trans-1,2-dichloroethene	µg/L	5	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 UJ	< 0.50 U
TVOCs [(1)]			**1.4**	**0.78**	**0.69**	**0.68**	**0.54**	**0.64**	**0.80**
Anions									
Nitrogen, Total as Nitrogen	mg/L	10	**4.48**	**4.82**	**3.74**	**4.6**	**4.68**	**4.73 J**	**4.55**
pH - Intake (Tower 102) [(2)]	S.U.	--	**5.38**	**4.65**	**4.89**	**4.9**	**4.41**	**4.94**	**5.18**
pH - Effluent [(2)]	S.U.	6.5 - 8.5 [(2)]	**6.08**	**5.75**	**5.99**	**5.76**	**5.02**	**5.69**	**5.84**

See notes and abbreviations on last page.

Table 7. Summary of SPDES Effluent Water Sample Analytical Results, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

PARAMETER	UNITS	Discharge Limit	Sample ID: / Date:	Outfall 005 8/21/2013	Outfall 005 (D) 8/21/2013	Outfall 005 9/10/2013	Outfall 005 10/15/2013	Outfall 005 11/12/2013	Outfall 005 12/10/2013
VOCs									
1,1,1-Trichloroethane (TCA)	µg/L	5		< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
1,1,2-Trichlorotrifluoroethane (Freon 113)	µg/L	5		< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
1,1-Dichloroethene (1,1-DCE)	µg/L	5		< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Methylene Chloride	µg/L	5		< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Tetrachloroethene (PCE)	µg/L	5		< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Trichloroethene (TCE)	µg/L	5		< 0.50 U	< 0.50 U	**0.63**	**0.83**	**0.95**	**0.91**
Vinyl Chloride	µg/L	2		< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
cis-1,2-dichloroethene	µg/L	5		< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
trans-1,2-dichloroethene	µg/L	5		< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
TVOCs [1]				ND	ND	**0.63**	**0.83**	**0.95**	**0.91**
Anions									
Nitrogen, Total as Nitrogen	mg/L	10		**4.73**	NA	**4.95**	**4.59**	**4.52**	**4.3**
pH - Intake (Tower 102) [2]	S.U.	--		**4.95**	NA	**4.77**	**5.10**	**5.07**	**5.00**
pH - Effluent [2]	S.U.	6.5 - 8.5 [2]		**5.81**	NA	**5.70**	**5.30**	**5.74**	**5.76**

See notes and abbreviations on last page.

Table 7. Summary of SPDES Effluent Water Sample Analytical Results, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Notes and Abbreviations:

(1) TVOC represents the sum of individual concentrations of VOCs detected. Results rounded to two significant figures.

(2) As per the SPDES permit, when natural groundwaters have a pH outside the range indicated, the natural pH may be one extremity of the allowable range. In such cases the supply well and outfall pH must be sampled and reported monthly on the Discharge Monitoring Reports (DMRs).

Bold value indicates a detection.

TVOCs	Total Volatile Organic Compounds
VOCs	Volatile Organic Compounds
µg/L	Micrograms per liter
mg/L	Milligrams per liter
UJ	The compound was not detected above the reported sample quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.
J	Constituent value is estimated
< 0.50 U	Compound not detected above its laboratory quantification limit.
(D)	Field Duplicate sample
NA	Not Analyzed
ND	Non-detect
S.U.	Standard Units
SPDES	State Pollution Discharge Elimination System
--	Not applicable

Table 8. Water-Level Measurement Data and Remedial Well Specific Capacities, July 15 and 16, 2013, OU2 On-Site Groundwater Remedy
Northrop Grumman Systems Corporation, Bethpage, New York.

Well Identification	Measuring Point Elevation (ft msl)	Depth to Water (ft bmp)	Water-Level Elevation (ft msl)
Shallow Wells[(1)]			
FW-03	124.30	52.26	72.04
N-9921	94.23	--	--
N-10597	109.85	--	--
N-10600	102.41	--	--
N-10631	103.47	35.59	67.88
N-10633	103.80	--	--
N-10634	101.20	--	--
N-10821	91.58	--	--
GM-15S	109.44	41.82	67.62
GM-15I	109.29	41.68	67.61
GM-16SR	115.86	--	--
GM-17I	115.83	43.97	71.86
GM-17SR	115.79	--	--
GM-18S	107.60	--	--
GM-18I	109.03	41.74	67.29
GM-19S	109.86	--	--
GM-20I	103.88	33.91	69.97
GM-21S	105.81	33.62	72.19
GM-74I	107.42	38.31	69.11
GM-78S	104.94	38.30	66.64
GM-78I	105.06	38.56	66.50
GM-79S (N-10628)	100.88	--	--
HN-24S	122.73	48.41	74.32
HN-40S	116.35	46.18	70.17
HN-40I	115.91	45.55	70.36
HN-42S	120.32	47.88	72.44
HN-42I	119.61	47.25	72.36
MW-3R	101.45	49.71	51.74
Intermediate Wells[(1)]			
GM-16I	115.81	--	--
GM-19I	109.86	--	--
GM-21I	105.72	31.58	74.14
HN-24I	125.80	48.89	76.91

See notes on last page

Table 8. Water-Level Measurement Data and Remedial Well Specific Capacities, July 15 and 16, 2013, OU2 On-Site Groundwater Remedy
Northrop Grumman Systems Corporation, Bethpage, New York.

Well Identification	Measuring Point Elevation (ft msl)	Depth to Water (ft bmp)	Water-Level Elevation (ft msl)
Deep Wells[1]			
N-10624	93.61	29.38	64.23
N-10627	93.70	29.90	63.80
GM-13D	113.97	42.83	71.14
GM-15D	109.84	44.31	65.53
GM-17D	115.68	46.50	69.18
GM-18D	108.88	42.87	66.01
GM-20D	103.92	35.91	68.01
GM-21D	105.66	40.49	65.17
GM-36D	91.63	--	--
GM-37D	97.26	36.33	60.93
GM-38D	91.75	36.91	54.84
$GM\text{-}39D_A$[2]	102.23	36.75	65.48
GM-70D2	99.58	39.09	60.49
GM-74D	107.43	42.57	64.86
GM-79I	101.09	37.52	63.57
GM-79D	101.25	39.02	62.23
BPOW1-1	72.00	28.42	43.58
BPOW1-2	71.82	32.63	39.19
Deep2 Wells[1]			
GM-15D2	109.78	46.98	62.80
GM-33D2	106.85	47.08	59.77
GM-34D	71.19	12.52	58.67
GM-34D2	71.19	15.08	56.11
GM-35D2	96.28	38.91	57.37
GM-36D2	91.60	--	--
GM-37D2	97.17	37.19	59.98
GM-38D2	91.56	40.02	51.54
$GM\text{-}39D_B$[2]	102.08	39.42	62.66
GM-71D2	98.45	39.18	59.27
GM-73D	104.87	41.78	63.09
GM-73D2	104.62	44.32	60.30
GM-74D2	107.36	50.70	56.66
GM-75D2	93.63	33.40	60.23
GM-78D	105.04	--	--
GM-78D2	105.05	--	--
GM-21D2	105.88	--	--

See Notes on last page

Table 8. Water-Level Measurement Data and Remedial Well Specific Capacities, July 15 and 16, 2013, OU2 On-Site Groundwater Remedy
Northrop Grumman Systems Corporation, Bethpage, New York.

Well Identification	Measuring Point Elevation (ft msl)	Depth to Water (ft bmp)	Water-Level Elevation (ft msl)
Deep 2 Wells[1]			
MW 3-1	104 [6]	49.98	54.02
TT-101D	80.89	31.19	49.70
TT-101D1	80.92	33.80	47.12
Well 1	116.78	83.22	33.56
Well 3	117.78	183.70	-65.92
Well 17	104.10	65.22	38.88
Well 18	110.00	62.63	47.37
Well 19	108.70	62.18	46.52
BPOW1-3	71.92	32.97	38.95
BPOW1-4	56.68	12.81	43.87
BPOW2-1	58.64	19.56	39.08
BPOW2-2	58.50	20.11	38.39
BPOW2-3	57.98	19.61	39.39
BPOW3-1	61.43	26.85	34.58
BPOW3-2	61.82	28.61	33.21
BPOW3-3	60.64	23.82	36.82
Deep 3 Wells[1]			
GM-73D3	104.64	44.89	59.75
GM-74D3	107.58	47.92	59.66
BPOW1-5	56.75	13.22	43.53
BPOW1-6	57.06	13.42	43.64
BPOW3-4	62.44	25.68	36.76
BPOW4-1	67.34	28.02	39.32
BPOW4-2	67.18	26.43	40.75
TT-101D2	80.89	34.61	46.28

Remedial Well Specific Capacities [3]

Well ID	Pumping Depth to Water (ft bls)	Static Depth to Water (ft bls) [4]	Drawdown (s) (ft)	Third Quarter 2010 Pumping Rate (Q)(gpm) [5]	Specific Capacity (Q/s)(gpm/ft)
Well 1	83.22	51.50	31.72	806	25.41
Well 3	183.70	50.19	133.51	455	3.41
Well 17	65.22	44.12	21.10	1148	54.41
Well 18	62.63	50.15	12.48	635	50.88
Well 19	62.18	49.13	13.05	693	53.10

Notes

(1) Well identification (e.g., TT-101D2) does not necessarily designate the actual hydrogeologic zone.
Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

(2) Monitoring wells were voluntarily monitored in order to enhance coverage in the Deep and Deep2 zones.

(3) Specific capacity values are qualitative in nature, due to fluctuations in static water levels. Sharp declines in specific capacity could indicate the need for well redevelopment.

(4) For Wells 17, 18, and 19, baseline static depth to water measurements were collected in 1997 prior to OU2 system start-up; baseline pumping depth to water and rate measurements (not shown) used with baseline static depth to water measurements to calculate baseline specific capacities, were collected in 1999 during OU2 system operation.
For Well 1, baseline static depth to water was collected in 2012, during pump maintenance.
For Well 3, baseline static depth to water measurement was collected in 2011, during re-development activities.

(5) Pumping rate determined at time of pumping depth to water measurement.

(6) Surveyed elevation not available, elevation is estimated from topographic maps of the area.

ft msl feet relative to mean sea level
ft bmp feet below measuring point
-- Not measured.
OU2 Operablue Unit 2
ft bls feet below land surface
gpm gallons per minute

Table 9. Water-Level Measurement Data and Remedial Well Specific Capacities, November 19 and 20, 2013, OU2 On-Site Groundwater R
Northrop Grumman Systems Corporation, Bethpage, New York.

Well Identification	Measuring Point Elevation (ft msl)	Depth to Water (ft bmp)	Water-Level Elevation (ft msl)
Shallow Wells[1]			
FW-03	124.30	55.28	69.02
N-9921	94.23	--	--
N-10597	109.85	--	--
N-10600	102.41	--	--
N-10631	103.47	37.25	66.22
N-10633	103.80	40.13	63.67
N-10634	101.20	--	--
N-10821	91.58	--	--
GM-15S	109.44	45.02	64.42
GM-15I	109.29	44.88	64.41
GM-16SR	115.86	--	--
GM-17I	115.83	44.84	70.99
GM-17SR	115.79	43.93	71.86
GM-18S	107.60	--	--
GM-18I	109.03	42.33	66.70
GM-19S	109.86	42.69	67.17
GM-20I	103.88	36.80	67.08
GM-21S	105.81	37.55	68.26
GM-74I	107.42	41.05	66.37
GM-78S	104.94	41.04	63.90
GM-78I	105.06	41.33	63.73
GM-79S (N-10628)	100.88	40.29	60.59
HN-24S	122.73	51.14	71.59
HN-40S	116.35	48.81	67.54
HN-40I	115.91	48.61	67.30
HN-42S	120.32	50.97	69.35
HN-42I	119.61	50.28	69.33
MW-3R	101.45	34.95	66.50
Intermediate Wells[1]			
GM-16I	115.81	--	--
GM-19I	109.86	43.79	66.07
GM-21I	105.72	38.99	66.73
HN-24I	125.80	51.55	74.25

See notes on last page

Table 9. Water-Level Measurement Data and Remedial Well Specific Capacities, November 19 and 20, 2013, OU2 On-Site Groundwater R
Northrop Grumman Systems Corporation, Bethpage, New York.

Well Identification	Measuring Point Elevation (ft msl)	Depth to Water (ft bmp)	Water-Level Elevation (ft msl)
Deep Wells[1]			
N-10624	93.61	32.09	61.52
N-10627	93.70	36.56	57.14
GM-13D	113.97	45.48	68.49
GM-15D	109.84	47.03	62.81
GM-17D	115.68	48.63	67.05
GM-18D	108.88	45.15	63.73
GM-20D	103.92	38.80	65.12
GM-21D	105.66	43.09	62.57
GM-36D	91.63	35.67	55.96
GM-37D	97.26	39.23	58.03
GM-38D	91.75	38.27	53.48
$GM\text{-}39D_A$[2]	102.23	38.86	63.37
GM-70D2	99.58	41.79	57.79
GM-74D	107.43	45.29	62.14
GM-79I	101.09	40.63	60.46
GM-79D	101.25	41.77	59.48
BPOW1-1	72.00	30.87	41.13
BPOW1-2	71.82	31.34	40.48
Deep2 Wells[1]			
GM-15D2	109.78	49.30	60.48
GM-33D2	106.85	49.32	57.53
GM-34D	71.19	14.95	56.24
GM-34D2	71.19	16.42	54.77
GM-35D2	96.28	40.06	56.22
GM-36D2	91.60	37.58	54.02
GM-37D2	97.17	39.74	57.43
GM-38D2	91.56	39.66	51.90
$GM\text{-}39D_B$[2]	102.08	41.70	60.38
GM-71D2	98.45	41.64	56.81
GM-73D	104.87	43.95	60.92
GM-73D2	104.62	45.94	58.68
GM-74D2	107.36	51.19	56.17
GM-75D2	93.63	35.34	58.29
GM-78D	105.04	43.67	61.37
GM-78D2	105.05	45.70	59.35
GM-21D2	105.88	47.72	58.16
MW 3-1	104[6]	52.79	51.21
TT-101D	80.89	33.53	47.36
TT-101D1	80.92	34.61	46.31
Well 1	116.78	84.33	32.45
Well 3	117.78	266.82	-149.04
Well 17	104.10	66.82	37.28
Well 18	110.00	64.73	45.27
Well 19	108.70	62.88	45.82
BPOW1-3	71.92	31.39	40.53
BPOW1-4	56.68	13.17	43.51
BPOW2-1	58.64	22.07	36.57
BPOW2-2	58.50	24.49	34.01
BPOW2-3	57.98	24.42	33.56
BPOW3-1	61.43	25.73	35.70
BPOW3-2	61.82	26.26	35.56
BPOW3-3	60.64	23.8	36.84

See notes on last page

Table 9. Water-Level Measurement Data and Remedial Well Specific Capacities, November 19 and 20, 2013, OU2 On-Site Groundwater R
Northrop Grumman Systems Corporation, Bethpage, New York.

Well Identification	Measuring Point Elevation (ft msl)	Depth to Water (ft bmp)	Water-Level Elevation (ft msl)
Deep3 Wells[1]			
GM-73D3	104.64	45.98	58.66
GM-74D3	107.58	49.40	58.18
BPOW1-5	56.75	13.75	43.00
BPOW1-6	57.06	14.06	43.00
BPOW3-4	62.44	25.59	36.85
BPOW4-1	67.34	25.92	41.42
BPOW4-2	67.18	25.59	41.59
TT-101D2	80.89	35.03	45.86

Remedial Well Specific Capacities [3]

Well ID	Pumping Depth to Water (ft bls)	Static Depth to Water (ft bls) [4]	Drawdown (s) (ft)	Third Quarter 2010 Pumping Rate (Q)(gpm) [5]	Specific Capacity (Q/s)(gpm/ft)
Well 1	84.33	51.50	32.83	848	25.83
Well 3	266.82	50.19	216.63	732	3.38
Well 17	66.82	44.12	22.70	1168	51.45
Well 18	64.73	50.15	14.58	637	43.69
Well 19	62.88	49.13	13.75	675	49.09

Notes

(1) Well identification (e.g., TT-101D2) does not necessarily designate the actual hydrogeologic zone.
Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

(2) Monitoring wells were voluntarily monitored in order to enhance coverage in the Deep and Deep2 zones.

(3) Specific capacity values are qualitative in nature, due to fluctuations in static water levels. Sharp declines in specific capacity could indicate the need for well redevelopment.

(4) For Wells 17, 18, and 19 baseline static depth to water measurements were collected in 1997 prior to OU2 system start-up; baseline pumping depth to water and rate measurements (not shown) used with baseline static depth to water measurements to calculate baseline specific capacities, were collected in 1999 during OU2 system operation.
For Well 1, baseline static depth to water was collected in 2012, during pump maintenance.
For Well 3, baseline static depth to water measurement was collected in 2011, during re-development activities.

(5) Pumping rate determined at time of pumping depth to water measurement.

(6) Surveyed elevation not available, elevation is estimated from topographic maps of the area.

ft msl feet relative to mean sea level
ft bmp feet below measuring point
-- Not measured.
OU2 Operable Unit 2
gpm gallons per minute
ft bls feet below land surface

Table 10. Comparison of July 2013 Vertical Hydraulic Gradients in the Vicinity of OU2 ONCT Systems to Model-Predicted Gradients, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Well Pair ID	Well Screen Midpoint Elevation (ft msl)	Water-Level Elevation (ft msl)	Vertical Gradient [1] (ft/ft) x 10^{-3}	Model-Predicted, OU2 Steady-State Vertical Gradient [2] (ft/ft) x 10^{-3}	Increase Compared to Model-Predicted, Steady-State Vertical Gradient
Shallow-Shallow Wells [3]					
GM-15S [4]	34.53	64.42			
GM-15I [4]	9.29	64.37	1.98	51.51	-49.53
GM-17SR [4]	50.79	71.86			
GM-17I [4]	5.83	70.99	19.35	2.67	16.68
GM-78S	39.94	66.64			
GM-78I	5.56	66.50	4.07	1.75	2.32
Shallow-Intermediate Wells [3]					
GM-19S [4]	59.36	67.17			
GM-19I [4]	-25.14	66.07	13.02	0.47	12.55
GM-21S	40.81	72.19			
GM-21I	-29.28	74.14	-27.82	5.99	-33.81
Shallow-Deep Wells [3]					
GM-17I	5.83	71.86			
GM-17D	-172.32	69.18	15.04	20.43	-5.39
GM-18I	9.03	67.29			
GM-18D	-186.12	66.01	6.56	19.16	-12.60
GM-20I	3.88	69.97			
GM-20D	-117.08	68.01	16.20	26.70	-10.50
GM-21I	-29.28	74.14			
GM-21D	-177.34	65.17	60.58	42.55	18.03
GM-74I	8.42	69.11			
GM-74D	-192.57	64.86	21.15	35.13	-13.98

See notes on last page

Table 10. Comparison of July 2013 Vertical Hydraulic Gradients in the Vicinity of OU2 ONCT Systems to Model-Predicted Gradients, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Well Pair ID	Well Screen Midpoint Elevation (ft msl)	Water-Level Elevation (ft msl)	Vertical Gradient [1] (ft/ft) x 10^{-3}	Model-Predicted, OU2 Steady-State Vertical Gradient [2] (ft/ft) x 10^{-3}	Increase Compared to Model-Predicted, Steady-State Vertical Gradient
Deep-Deep 2 Wells [3]					
GM-15D	-227.34	65.53			
GM-15D2		62.80	-12.01	-16.32	4.31
GM-18D	-186.12	66.01			
GM-33D2	-403.15	59.77	28.75	49.49	-20.74
GM-39D_A	-169.77	65.48			
GM-39D_B	-312.92	62.66	19.70	25.92	-6.22
GM-74D	-192.57	64.86			
GM-74D2	-444.64	56.66	32.53	37.81	-5.28
Deep2-Deep 2 Wells [3]					
GM-73D	-301.13	63.09			
GM-73D2	-437.38	60.30	20.48	23.85	-3.37
Deep2-Deep 3 Wells [3]					
GM-74D2	-444.64	56.66			
GM-74D3	-527.42	59.66	-36.24	-37.49	1.25
GM-73D	-301.13	63.09			
GM-73D3	-537.86	59.75	14.11	10.12	3.99

Notes

(1) Vertical hydraulic gradients are calculated as follows:

$$\frac{(\text{Water-Level Elevation}_1 - \text{Water-Level Elevation}_2)}{(\text{Screen Midpoint Elevation}_1 - \text{Screen Midpoint Elevation}_2)}$$

$_1$ - Shallower well of pairing

$_2$ - Deeper well of pairing

A positive "+" gradient value indicates a downward hydraulic gradient.
A negative "-" gradient value indicates an upward hydraulic gradient.

(2) The 2003 expanded model with subsequent 2004/2005 modifications to the ONCT System was used to calculate the Steady State Vertical Gradient.

(3) Well identification (e.g., GM-73D) does not necessarily designate the actual hydrogeologic zone. Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

(4) Water Level data from November 2013 semi-annual round was used.

ft msl feet relative to mean sea level
OU2 Operable Unit 2
ONCT On-Site Containment

Table 11. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples Collected from Wells in the Shallow Zone[(1)], Second Quarter Sampling Round 2013, OU2 On-Site Groundwater Remedy Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in ug/L	NYSDEC Standards, Criteria, and Guidance Values in ug/L	Well ID: / Sample ID: / Sample Date:	FW-03 / FW-03 / 6/10/2013	GM-15S / GM-15S / 5/24/2013	GM-15I / GM-15I (REP) / 5/24/2013	GM-15I / GM-15I / 5/24/2013	GM-17I / GM-17I / 6/11/2013	GM-18I / GM-18I / 6/12/2013
1,1,1-Trichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloropropane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromomethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chlorodifluoromethane (Freon 22)	NE		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroform	7		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
cis-1,2-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Methyl-Tert-Butylether	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Tetrachloroethene	5		**50**	< 5.0	**0.34 J**	**0.31 J**	< 5.0	< 5.0
Toluene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
trans-1,2-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichloroethene	5		**3.5 J**	**1.9 J**	< 5.0	< 5.0	**0.86 J**	< 5.0
Trichlorotrifluoroethane (Freon 113)	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Vinyl Chloride	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
o-Xylene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
m,p-Xylene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
TVOCs			**54**	**1.9**	**0.34**	**0.31**	**0.86**	0

Notes and Abbreviations:

Results validated following protocols specified in OU2 Groundwater Monitoring Plan (ARCADIS 2001; 2006).
Samples analyzed for the TCL VOCs using NYSDEC ASP 2005 Method OLM 4.3.
Only detected constituents are summarized.
TVOCs are rounded to two significant figures.

Bold value indicates a detection.

NYSDEC	New York State Department of Environmental Conservation
VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
ug/L	micrograms per Liter
NE	Not Established
J	Value is estimated concentration.
B	Compound detected in associated blank sample
SCG	Standards, Criteria and Guidance
TCL	Target Compound List
< 5.0	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria
(1)	Well identification (e.g., GM-15I) does not necessarily designate the actual hydrogeologic zone. Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

Table 11. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples Collected from Wells in the Shallow Zone[(1)], Second Quarter Sampling Round 2013, OU2 On-Site Groundwater Remedy Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in ug/L	NYSDEC Standards, Criteria, and Guidance Values in ug/L	Well ID: Sample ID: Sample Date:	GM-20I GM-20I 6/12/2013	GM-21S GM-21S 5/29/2013	GM-74I GM-74I 5/23/2013	GM-78S GM-78S 5/29/2013	GM-78I GM-78I 5/29/2013
1,1,1-Trichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloropropane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromomethane	5		< 5.0	< 5.0	**0.35 BJ**	< 5.0	< 5.0
Chlorodifluoromethane (Freon 22)	NE		< 5.0	< 5.0	< 5.0 J	< 5.0	< 5.0
Chloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroform	7		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
cis-1,2-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Methyl-Tert-Butylether	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Tetrachloroethene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
trans-1,2-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichloroethene	5		**0.34 J**	**0.34 J**	**0.35 J**	< 5.0	**0.31 J**
Trichlorotrifluoroethane (Freon 113)	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Vinyl Chloride	2		< 2.0	< 2.0	< 5.0	< 2.0	< 2.0
o-Xylene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
m,p-Xylene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
TVOCs			**0.34**	**0.34**	**0.7**	0	**0.31**

Notes and Abbreviations:

Results validated following protocols specified in OU2 Groundwater Monitoring Plan (ARCADIS 2001; 2006).
Samples analyzed for the TCL VOCs using NYSDEC ASP 2005 Method OLM 4.3.
Only detected constituents are summarized.
TVOCs are rounded to two significant figures.

Bold value indicates a detection.

NYSDEC	New York State Department of Environmental Conservation
VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
ug/L	micrograms per Liter
NE	Not Established
J	Value is estimated concentration.
B	Compound detected in associated blank sample
SCG	Standards, Criteria and Guidance
TCL	Target Compound List
< 5.0	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria
(1)	Well identification (e.g., GM-15I) does not necessarily designate the actual hydrogeologic zone. Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

Table 11. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples Collected from Wells in the Shallow Zone[(1)], Second Quarter Sampling Round 2013, OU2 On-Site Groundwater Remedy Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in ug/L	NYSDEC Standards, Criteria, and Guidance Values in ug/L	Well ID:	HN-24S	HN-40S	HN-40I	HN-42S	HN-42I	N-10631
		Sample ID:	HN-24S	HN-40S	HN-40I	HN-42S	HN-42I	N-10631
		Sample Date:	6/10/2013	5/28/2013	5/28/2013	5/28/2013	5/28/2013	6/21/2013
1,1,1-Trichloroethane	5		< 5.0	< 5.0	**1.9 J**	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethane	5		< 5.0	< 5.0	**0.23 J**	< 5.0	< 5.0	< 5.0
1,1-Dichloroethene	5		< 5.0	< 5.0	**0.24 J**	< 5.0	< 5.0	< 5.0
1,2-Dichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloropropane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromomethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chlorodifluoromethane (Freon 22)	NE		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroform	7		< 5.0	**0.21 J**	**0.26 J**	< 5.0	< 5.0	< 5.0
cis-1,2-Dichloroethene	5		< 5.0	< 5.0	**0.76 J**	< 5.0	**1.1 J**	< 5.0
Ethylbenzene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Methyl-Tert-Butylether	5		< 5.0	< 5.0	< 5.0	< 5.0	**0.38 J**	< 5.0
Tetrachloroethene	5		**1.3 J**	< 5.0	**2.1 J**	< 5.0	< 5.0	< 5.0
Toluene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
trans-1,2-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichloroethene	5		**0.58 J**	< 5.0	**22**	< 5.0	**3.0 J**	**0.78 J**
Trichlorotrifluoroethane (Freon 113)	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Vinyl Chloride	2		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
o-Xylene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
m,p-Xylene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
TVOCs			**1.9**	**0.21**	**27**	0	**4.5**	**0.78**

Notes and Abbreviations:

Results validated following protocols specified in OU2 Groundwater Monitoring Plan (ARCADIS 2001; 2006).
Samples analyzed for the TCL VOCs using NYSDEC ASP 2005 Method OLM 4.3.
Only detected constituents are summarized.
TVOCs are rounded to two significant figures.

Bold value indicates a detection.

NYSDEC	New York State Department of Environmental Conservation
VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
ug/L	micrograms per Liter
NE	Not Established
J	Value is estimated concentration.
B	Compound detected in associated blank sample
SCG	Standards, Criteria and Guidance
TCL	Target Compound List
< 5.0	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria
(1)	Well identification (e.g., GM-15I) does not necessarily designate the actual hydrogeologic zone. Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

Table 12. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples Collected from Wells in the Intermediate Zone[1], Second Quarter Sampling Round 2013, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New Yor

Constituent in ug/L	NYSDEC Standards, Criteria, and Guidance Values (µg/L)	Well ID:	GM-21I	HN-24I
		Sample ID:	GM-21I	HN-24I
		Sample Date:	5/29/2013	6/10/2013
1,1,1-Trichloroethane	5		< 5.0	**1.6 J**
1,1-Dichloroethane	5		< 5.0	**2.8 J**
1,1-Dichloroethene	5		< 5.0	**9.6**
Carbon Tetrachloride	5		< 5.0	**0.37 J**
Chlorodifluoromethane (Freon 22)	NE		< 5.0	< 5.0
Chloroform	7		< 5.0	**1.5 J**
cis-1,2-Dichloroethene	5		< 5.0	**1.1 J**
CFC-12	5		< 5.0	**0.85 J**
Methyl-Tert-Butylether	5		< 5.0	**1.2 J**
Tetrachloroethene	5		< 5.0	**33**
trans-1,2-Dichloroethene	5		< 5.0	< 5.0
Trichloroethene	5		**0.31 J**	**16**
CFC-11	5		< 5.0	**13**
Trichlorotrifluoroethane (Freon 113)	5		< 5.0	**0.86 J**
Vinyl Chloride	2		< 2.0	< 2.0
TVOCs			**0.31**	**82**

Notes and Abbreviations:

Results validated following protocols specified in OU2 Groundwater Monitoring Plan (ARCADIS 2001; 2006).
Samples analyzed for the TCL VOCs using NYSDEC ASP 2005 Method OLM 4.3.
Only detected constituents are summarized.
TVOCs are rounded to two significant figures.

Bold value indicates a detection.

NYSDEC	New York State Department of Environmental Conservation
VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
µg/L	micrograms per liter
NE	Not Established
J	Value is estimated concentration.
SCG	Standards, Criteria and Guidance
TCL	Target Compound List
< 5.0	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria
[1]	Well identification (e.g., GM-21I) does not necessarily designate the actual hydrogeologic zone. Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

Table 13. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples Collected from Wells in the Deep Zone[1], Second Quarter Sampling Round 2013, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards, Criteria, and Guidance Values in µg/L	Well ID: / Sample ID: / Sample Date:	GM-13D / GM-13D / 6/17/2013	GM-15D / GM-15D / 5/24/2013	GM-17D / GM-17D / 6/11/2013	GM-18D / GM-18D / 6/10/2013	GM-20D / GM-20D / 6/12/2013
1,1,1-Trichloroethane	5		**2.5 J**	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethane	5		**6.5**	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethene	5		**10**	< 5.0	< 5.0	< 5.0	< 5.0 J
1,2-Dichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromomethane	5		< 5.0	< 5.0 J	< 5.0	< 5.0	< 5.0
Chlorodifluoromethane (Freon 22)	NE		**1.3 J**	< 5.0	< 5.0	< 5.0	< 5.0
Chloroform	7		**0.35 J**	**0.28 J**	< 5.0	< 5.0	< 5.0
cis-1,2-Dichloroethene	5		**22**	< 5.0	< 5.0	< 5.0	< 5.0
CFC-12	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Methyl-Tert-Butylether	5		< 5.0	**1.5 J**	< 5.0	< 5.0	< 5.0
Tetrachloroethene	5		**180**	**0.30 J**	< 5.0	< 5.0	< 5.0
Toluene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0 J
trans-1,2-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichloroethene	5		**72**	**0.36 J**	**0.34 J**	**0.92 J**	**0.32 J**
CFC-11	5		**0.86 J**	< 5.0	< 5.0	< 5.0	< 5.0
Trichlorotrifluoroethane (Freon 113)	5		**2.9 J**	< 5.0	< 5.0	< 5.0	< 5.0
TVOCs			**300**	**2.4**	**0.34**	**0.92**	**0.32**

Notes and Abbreviations:

Results validated following protocols specified in OU2 Groundwater Monitoring Plan (ARCADIS 2001; 2006).
Samples analyzed for the TCL VOCs using NYSDEC ASP 2005 Method OLM4.3.
Only detected constituents are summarized.
TVOCs are rounded to two significant figures.

Bold value indicates a detection.

NYSDEC	New York State Department of Environmental Conservation
VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
µg/L	micrograms per liter
NE	Not Established
J	Value is estimated concentration.
B	Compound detected in associated blank sample
SCG	Standards, Criteria and Guidance
TCL	Target Compound List
< 5.0	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria
[1]	Well identification (e.g., GM-70D2) does not necessarily designate the actual hydrogeologic zone. Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

Table 13. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples Collected from Wells in the Deep Zone[1], Second Quarter Sampling Round 2013, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards, Criteria, and Guidance Values in µg/L	Well ID: / Sample ID: / Sample Date:	GM-21D / GM-21D / 5/29/2013	GM-36D / GM-36D / 8/12/2013	GM-37D / GM-37D / 6/10/2013	GM-38D / GM-38D / 6/13/2013	GM-39D$_A$ / GM-39D$_A$ / 6/14/2013	GM-70D2 / GM-70D2 / 6/13/2013
1,1,1-Trichloroethane	5		< 5.0	< 5.0	< 5.0	**1.0 J**	< 5.0	< 5.0
1,1-Dichloroethane	5		< 5.0	< 5.0	**0.39 J**	**1.5 J**	< 5.0	< 5.0
1,1-Dichloroethene	5		< 5.0	< 5.0	< 5.0	**2.5 J**	< 5.0	< 5.0
1,2-Dichloroethane	5		< 5.0	< 5.0	< 5.0	**2.3 J**	< 5.0	< 5.0
Bromomethane	5		< 5.0	< 5.0	< 5.0	< 13	< 5.0	< 5.0
Chlorodifluoromethane (Freon 22)	NE		< 5.0	< 5.0	< 5.0	< 13	< 5.0	< 5.0
Chloroform	7		< 5.0	< 5.0	< 5.0	**0.93 J**	< 5.0	< 5.0
cis-1,2-Dichloroethene	5		< 5.0	< 5.0	< 5.0	**1.7 J**	< 5.0	< 5.0
CFC-12	5		< 5.0	< 5.0	< 5.0	< 13	< 5.0	< 5.0
Methyl-Tert-Butylether	5		< 5.0	**0.27 J**	**0.72 J**	< 13	< 5.0	< 5.0
Tetrachloroethene	5		< 5.0	< 5.0	**0.28 J**	**11 J**	< 5.0	**3.1 J**
Toluene	5		< 5.0	< 5.0	< 5.0	< 13	< 5.0	< 5.0
trans-1,2-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 13	< 5.0	< 5.0
Trichloroethene	5		**1.8 J**	< 5.0	< 5.0	**410**	**2.8 J**	**12**
CFC-11	5		< 5.0	< 5.0	< 5.0	< 13	< 5.0	< 5.0
Trichlorotrifluoroethane (Freon 113)	5		< 5.0	< 5.0	< 5.0	**2.5 J**	< 5.0	**0.29 J**
TVOCs			**1.8**	**0.27**	**1.4**	**430**	**2.8**	**15**

Notes and Abbreviations:

Results validated following protocols specified in OU2 Groundwater Monitoring Plan (ARCADIS 2001; 2006).
Samples analyzed for the TCL VOCs using NYSDEC ASP 2005 Method OLM4.3.
Only detected constituents are summarized.
TVOCs are rounded to two significant figures.

Bold value indicates a detection.

NYSDEC	New York State Department of Environmental Conservation
VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
µg/L	micrograms per liter
NE	Not Established
J	Value is estimated concentration.
B	Compound detected in associated blank sample
SCG	Standards, Criteria and Guidance
TCL	Target Compound List
< 5.0	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria
[1]	Well identification (e.g., GM-70D2) does not necessarily designate the actual hydrogeologic zone. Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

Table 13. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples Collected from Wells in the Deep Zone[1], Second Quarter Sampling Round 2013, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards, Criteria, and Guidance Values in µg/L	Well ID: / Sample ID: / Sample Date:	GM-74D / GM-74D / 5/23/2013	GM-79I / GM-79I / 5/28/2013	GM-79D / GM-79D / 5/28/2013	N-10624 / N-10624 / 6/12/2013	N-10627 / N-10627 / 6/21/2013
1,1,1-Trichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromomethane	5		**0.29 BJ**	< 5.0	< 5.0	< 5.0	< 5.0
Chlorodifluoromethane (Freon 22)	NE		< 5.0 J	< 5.0 J	< 5.0 J	< 5.0	< 5.0
Chloroform	7		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
cis-1,2-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
CFC-12	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Methyl-Tert-Butylether	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Tetrachloroethene	5		< 5.0	< 5.0	**0.46 J**	< 5.0	< 5.0
Toluene	5		< 5.0	< 5.0	**0.33 J**	< 5.0	< 5.0 B
trans-1,2-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichloroethene	5		**1.6 J**	**0.23 J**	**19**	< 5.0	0.61 J
CFC-11	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichlorotrifluoroethane (Freon 113)	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
TVOCs			**1.9**	**0.23**	**20**	0	**0.61**

Notes and Abbreviations:

Results validated following protocols specified in OU2 Groundwater Monitoring Plan (ARCADIS 2001; 2006).
Samples analyzed for the TCL VOCs using NYSDEC ASP 2005 Method OLM4.3.
Only detected constituents are summarized.
TVOCs are rounded to two significant figures.

Bold value indicates a detection.

NYSDEC	New York State Department of Environmental Conservation
VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
µg/L	micrograms per liter
NE	Not Established
J	Value is estimated concentration.
B	Compound detected in associated blank sample
SCG	Standards, Criteria and Guidance
TCL	Target Compound List
< 5.0	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria
[1]	Well identification (e.g., GM-70D2) does not necessarily designate the actual hydrogeologic zone. Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

Table 14. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples Collected from Wells in the Deep 2 Zone[(1)], Second Quarter Sampling Round 2013, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards, Criteria, and Guidance Values in µg/L	Well ID: / Sample ID: / Sample Date:	GM-15D2 / GM-15D2 / 5/24/2013	GM-21D2 / GM-21D2 / 3/11/2013	GM-33D2 / GM-33D2 / 6/18/2013	GM-34D / GM-34D / 6/17/2013	GM-34D2 / GM-34D2 / 6/17/2013
1,1,1-Trichloroethane	5		< 5.0	< 5.0	< 5.0	< 10	< 5.0
1,1,2-Trichloroethane	5		< 5.0	< 5.0	< 5.0	< 10	**0.21 J**
1,1-Dichloroethane	5		**0.24 J**	**0.21 J**	< 5.0	**0.88 J**	**0.34 J**
1,1-Dichloroethene	5		**1.1 J**	**0.3 J**	< 5.0	**4.0 J**	**1.4 J**
1,2-Dichloroethane	5		< 5.0	< 5.0	< 5.0	< 10	< 5.0
1,2-Dichloropropane	5		< 5.0	< 5.0	< 5.0	< 10	< 5.0
Benzene	1		< 0.70	< 0.70	< 0.70	< 1.4	< 0.70
Bromomethane	5		< 5.0	< 5.0	< 5.0	< 10	< 5.0
Carbon Tetrachloride	5		< 5.0	< 5.0	< 5.0	< 10	< 5.0
Chlorobenzene	5		< 5.0	< 5.0	< 5.0	< 10	< 5.0
Chlorodifluoromethane (Freon 22)	NE		**0.64 J**	< 5.0	< 5.0	< 10	**0.26 J**
Chloroethane	5		< 5.0	< 5.0	< 5.0	< 10	< 5.0
Chloroform	7		**0.31 J**	< 5.0	< 5.0	**0.44 J**	**0.22 J**
cis-1,2-Dichloroethene	5		**0.28 J**	**0.27 J**	**0.30 J**	**8.4 J**	**3.6 J**
CFC-12	5		< 5.0	< 5.0	< 5.0	< 10	**0.24 J**
Methyl-Tert-Butylether	5		< 5.0	< 5.0	< 5.0	< 10	< 5.0
Tetrachloroethene	5		**7.3**	**0.77 J**	**4.7 J**	**5.4 J**	**9.3**
Toluene	5		< 5.0	< 5.0	< 5.0	< 10	< 5.0
trans-1,2-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 10	**0.38 J**
Trichloroethene	5		**11**	**18**	**27**	**330**	**180 D**
CFC-11	5		**0.59 J**	< 5.0	< 5.0	< 10	< 5.0
Trichlorotrifluoroethane (Freon 113	5		**1.1 J**	< 5.0	**5.6**	**6.8 J**	**1.5 J**
Vinyl Chloride	2		< 2.0	< 5.0	< 2.0	< 4.0	< 2.0
o-Xylene	5		< 5.0	< 5.0	< 5.0	< 10	< 5.0
m,p-Xylene	5		< 5.0	< 5.0	< 5.0	< 10	< 5.0
TVOCs			**23**	**20**	**38**	**360**	**200**

Notes and Abbreviations:

Results validated following protocols specified in OU2 Groundwater Monitoring Plan (ARCADIS 2001; 2006).

Samples analyzed for the TCL VOCs using NYSDEC ASP 2005 Method OLM4.3.

Only detected constituents are summarized.

TVOCs are rounded to two significant figures.

Bold value indicates a detection.

NYSDEC	New York State Department of Environmental Conservation
VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
µg/L	micrograms per liter
NE	Not Established
J	Value is estimated concentration.
D	Secondary dilution
B	Compound detected in associated blank sample
OU2	Operable Unit 2
TCL	Target Compound List
SCG	Standards, Criteria and Guidance
< 5.0	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria
(1)	Well identification (e.g., GM-73D) does not necessarily designate the actual hydrogeologic zone. Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

Table 14. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples Collected from Wells in the Deep 2 Zone[(1)], Second Quarter Sampling Round 2013, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards, Criteria, and Guidance Values in µg/L	Well ID: / Sample ID: / Sample Date:	GM-35D2 / GM-35D2 / 5/23/2013	GM-36D2 / GM-36D2 / 8/13/2013	GM-37D2 / GM-37D2 / 6/5/2013	GM-38D2 / GM-38D2 / 6/13/2013	GM-39D$_B$ / GM-39D$_B$ / 6/14/2013	GM-71D2 / GM-71D2 / 6/5/2013
1,1,1-Trichloroethane	5		< 5.0	**0.35J**	**0.71J**	**0.78 J**	< 5.0	**1.7 J**
1,1,2-Trichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethane	5		< 5.0	**0.69J**	**2.0 J**	**4.2 J**	< 5.0	**6.2**
1,1-Dichloroethene	5		< 5.0	**0.59 J**	**0.83J**	**1.1 J**	< 5.0	**2.9 J**
1,2-Dichloroethane	5		< 5.0	< 5.0	< 5.0	**0.65 J**	< 5.0	< 5.0
1,2-Dichloropropane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	1		< 5.0	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70
Bromomethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Carbon Tetrachloride	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	**0.26 J**
Chlorobenzene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chlorodifluoromethane (Freon 22)	NE		< 5.0 J	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroform	7		< 5.0	**0.24 J**	**0.29 J**	**1.9 J**	< 5.0	**0.63 J**
cis-1,2-Dichloroethene	5		**0.48 J**	< 5.0	**0.23 J**	**2.0 J**	**0.43 J**	**0.67 J**
CFC-12	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Methyl-Tert-Butylether	5		< 5.0	< 5.0	**0.22 J**	< 5.0	< 5.0	< 5.0
Tetrachloroethene	5		**7.7**	< 5.0	**0.45J**	< 5.0	**0.49 J**	< 5.0
Toluene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
trans-1,2-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichloroethene	5		**100**	**1.7 J**	**1.6 J**	**29**	**80**	**8**
CFC-11	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichlorotrifluoroethane (Freon 113	5		**1.5 J**	< 5.0	< 5.0	**0.38 J**	< 5.0	< 5.0
Vinyl Chloride	2		< 5.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
o-Xylene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
m,p-Xylene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
TVOCs			**110**	**3.6**	**6.3**	**40**	**81**	**20**

Notes and Abbreviations:

Results validated following protocols specified in OU2 Groundwater Monitoring Plan (ARCADIS 2001; 2006).

Samples analyzed for the TCL VOCs using NYSDEC ASP 2005 Method OLM4.3.

Only detected constituents are summarized.

TVOCs are rounded to two significant figures.

Bold value indicates a detection.

NYSDEC	New York State Department of Environmental Conservation
VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
µg/L	micrograms per liter
NE	Not Established
J	Value is estimated concentration.
D	Secondary dilution
B	Compound detected in associated blank sample
OU2	Operable Unit 2
TCL	Target Compound List
SCG	Standards, Criteria and Guidance
< 5.0	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria
(1)	Well identification (e.g., GM-73D) does not necessarily designate the actual hydrogeologic zone. Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

Table 14. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples Collected from Wells in the Deep 2 Zone[(1)], Second Quarter Sampling Round 2013, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards, Criteria, and Guidance Values in µg/L	Well ID:	GM-73D	GM-73D2	GM-74D2	GM-75D2	GM-75D2
		Sample ID:	GM-73D	GM-73D2	GM-74D2	GM-75D2 (REP)	GM-75D2
		Sample Date:	5/23/2013	5/23/2013	5/23/2013	6/12/2013	6/12/2013
1,1,1-Trichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethane	5		< 5.0	**0.62 J**	**0.52 J**	< 5.0	< 5.0
1,1-Dichloroethene	5		< 5.0	**0.86 J**	**0.88 J**	**0.39 J**	**0.46 J**
1,2-Dichloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloropropane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	1		< 5.0	< 5.0	< 5.0	< 0.70	< 0.70
Bromomethane	5		< 5.0	< 5.0	**0.29 BJ**	< 5.0	< 5.0
Carbon Tetrachloride	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chlorobenzene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chlorodifluoromethane (Freon 22)	NE		< 5.0 J	< 5.0 J	**0.50 J**	< 5.0	< 5.0
Chloroethane	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroform	7		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
cis-1,2-Dichloroethene	5		< 5.0	**0.42 J**	< 5.0	< 5.0	< 5.0
CFC-12	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Methyl-Tert-Butylether	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Tetrachloroethene	5		< 5.0	**1.4 J**	**5.3**	**2.1 J**	**2.1 J**
Toluene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
trans-1,2-Dichloroethene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichloroethene	5		**23**	**44**	**8.2**	**38**	**39**
CFC-11	5		< 5.0	< 5.0	**0.27 J**	< 5.0	< 5.0
Trichlorotrifluoroethane (Freon 113	5		< 5.0	< 5.0	**0.73 J**	**0.64 J**	**0.82 J**
Vinyl Chloride	2		< 5.0	< 5.0	< 5.0	< 2.0	< 2.0
o-Xylene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
m,p-Xylene	5		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
TVOCs			**23**	**47**	**17**	**41**	**42**

Notes and Abbreviations:

Results validated following protocols specified in OU2 Groundwater Monitoring Plan (ARCADIS 2001; 2006).

Samples analyzed for the TCL VOCs using NYSDEC ASP 2005 Method OLM4.3.

Only detected constituents are summarized.

TVOCs are rounded to two significant figures.

Bold value indicates a detection.

NYSDEC	New York State Department of Environmental Conservation
VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
µg/L	micrograms per liter
NE	Not Established
J	Value is estimated concentration.
D	Secondary dilution
B	Compound detected in associated blank sample
OU2	Operable Unit 2
TCL	Target Compound List
SCG	Standards, Criteria and Guidance
< 5.0	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria
(1)	Well identification (e.g., GM-73D) does not necessarily designate the actual hydrogeologic zone. Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

Table 14. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples Collected from Wells in the Deep 2 Zone[(1)], Second Quarter Sampling Round 2013, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards, Criteria, and Guidance Values in µg/L	Well ID:	TT-101D	TT-101D	TT 101D1
		Sample ID:	TT-101D (REP)	TT-101D	TT 101D1
		Sample Date:	6/26/2013	6/26/2013	6/27/2013
1,1,1-Trichloroethane	5		**0.35 J**	**0.40 J**	**0.65J**
1,1,2-Trichloroethane	5		**0.21 J**	**0.23 J**	**0.45J**
1,1-Dichloroethane	5		**0.77 J**	**0.80 J**	**0.58J**
1,1-Dichloroethene	5		**3.0 J**	**2.9 J**	**3.1J**
1,2-Dichloroethane	5		**0.23 J**	< 5.0	< 5.0
1,2-Dichloropropane	5		< 5.0	< 5.0	< 5.0
Benzene	1		< 0.70	< 0.70	< 0.70
Bromomethane	5		< 5.0 J	< 5.0 J	< 5.0 J
Carbon Tetrachloride	5		< 5.0	< 5.0	**1.7J**
Chlorobenzene	5		< 5.0	< 5.0	< 5.0
Chlorodifluoromethane (Freon 22)	NE		**0.63 J**	**0.67 J**	**0.84J**
Chloroethane	5		< 5.0	< 5.0	< 5.0
Chloroform	7		**0.51 J**	**0.43 J**	**0.91J**
cis-1,2-Dichloroethene	5		**2.7 J**	**2.7 J**	**1.7J**
CFC-12	5		**1.6 J**	**1.7 J**	**2.2J**
Methyl-Tert-Butylether	5		< 5.0	< 5.0	< 5.0
Tetrachloroethene	5		**0.68 J**	**0.64 J**	**0.45J**
Toluene	5		< 5.0	< 5.0	< 5.0
trans-1,2-Dichloroethene	5		< 5.0	< 5.0	< 5.0
Trichloroethene	5		**70**	**73**	**160**
CFC-11	5		< 5.0	< 5.0	< 5.0
Trichlorotrifluoroethane (Freon 113	5		**11**	**12**	**12**
Vinyl Chloride	2		< 2.0	< 2.0	< 2.0
o-Xylene	5		< 5.0	< 5.0	< 5.0
m,p-Xylene	5		< 5.0	< 5.0	< 5.0
TVOCs			**92**	**95**	**190**

Notes and Abbreviations:

Results validated following protocols specified in OU2 Groundwater Monitoring Plan (ARCADIS 2001; 2006).

Samples analyzed for the TCL VOCs using NYSDEC ASP 2005 Method OLM4.3.

Only detected constituents are summarized.

TVOCs are rounded to two significant figures.

Bold value indicates a detection.

NYSDEC	New York State Department of Environmental Conservation
VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
µg/L	micrograms per liter
NE	Not Established
J	Value is estimated concentration.
D	Secondary dilution
B	Compound detected in associated blank sample
OU2	Operable Unit 2
TCL	Target Compound List
SCG	Standards, Criteria and Guidance
< 5.0	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria
(1)	Well identification (e.g., GM-73D) does not necessarily designate the actual hydrogeologic zone. Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

Table 14. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples Collected from Wells in the Deep 2 Zone[(1)], Second Quarter Sampling Round 2013, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards, Criteria, and Guidance Values in µg/L	Well ID: Sample ID: Sample Date:	Well 1 Well 1 6/6/2013	Well 3 Well 3 6/6/2013	Well 17 Well 17 6/6/2013	Well 18 Well 18 6/6/2013	Well 19 Well 19 (REP) 6/6/2013	Well 19 Well 19 6/6/2013
1,1,1-Trichloroethane	5		< 13	< 50	**0.52 J**	**0.76 J**	**0.50 J**	**0.45 J**
1,1,2-Trichloroethane	5		< 13	< 50	< 10	< 5.0	< 5.0	**0.21 J**
1,1-Dichloroethane	5		**0.68 J**	< 50	**1.3 J**	**1.1 J**	**0.87 J**	**0.84 J**
1,1-Dichloroethene	5		**2.2 J**	**8.7 J**	**2.3 J**	**3.0 J**	**1.6 J**	**1.6 J**
1,2-Dichloroethane	5		< 13	< 50	< 10	< 5.0	**0.47 J**	**0.47 J**
1,2-Dichloropropane	5		**5.9 J**	< 50	< 10	< 5.0	< 5.0	< 5.0
Benzene	1		< 1.8	< 7.0	< 1.4	< 0.70	< 0.70	< 0.70
Bromomethane	5		< 13	< 50	< 10	< 5.0	< 5.0	< 5.0
Carbon Tetrachloride	5		< 13	< 50	< 10	< 5.0	< 5.0	< 5.0
Chlorobenzene	5		< 13	< 50	< 10	< 5.0	< 5.0	< 5.0
Chlorodifluoromethane (Freon 22)	NE		< 13	< 50	< 10	**0.33 J**	**0.41 J**	**0.36 J**
Chloroethane	5		< 13	**4.0 J**	< 10	< 5.0	< 5.0	< 5.0
Chloroform	7		< 13	< 50	**0.48 J**	**0.26 J**	**0.50 J**	**0.51 J**
cis-1,2-Dichloroethene	5		**3.9 J**	**8.3 J**	**4.5 J**	**1.7 J**	**23**	**24**
CFC-12	5		< 13	< 50	< 10	< 5.0	< 5.0	< 5.0
Methyl-Tert-Butylether	5		< 13	< 50	< 10	< 5.0	< 5.0	< 5.0
Tetrachloroethene	5		**48**	**54**	**30**	**12**	**6.9**	**6.5**
Toluene	5		< 13	< 50	< 10	< 5.0	< 5.0	< 5.0
trans-1,2-Dichloroethene	5		< 13	< 50	< 10	< 5.0	< 5.0	< 5.0
Trichloroethene	5		**380**	**1400**	**190**	**60**	**190**	**180**
CFC-11	5		< 13	< 50	< 10	**0.22 J**	**0.25 J**	**0.24 J**
Trichlorotrifluoroethane (Freon 113	5		**3.1 J**	**6.3 J**	**4.0 J**	**1.5 J**	**0.90 J**	**0.96 J**
Vinyl Chloride	2		< 5.0	**60**	< 4.0	< 2.0	< 2.0	< 2.0
o-Xylene	5		< 13	< 50	< 10	< 5.0	< 5.0	< 5.0
m,p-Xylene	5		< 13	< 50	< 10	< 5.0	< 5.0	< 5.0
TVOCs			**440**	**1500**	**230**	**80**	**220**	**220**

Notes and Abbreviations:

Results validated following protocols specified in OU2 Groundwater Monitoring Plan (ARCADIS 2001; 2006).

Samples analyzed for the TCL VOCs using NYSDEC ASP 2005 Method OLM4.3.

Only detected constituents are summarized.

TVOCs are rounded to two significant figures.

Bold value indicates a detection.

NYSDEC	New York State Department of Environmental Conservation
VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
µg/L	micrograms per liter
NE	Not Established
J	Value is estimated concentration.
D	Secondary dilution
B	Compound detected in associated blank sample
OU2	Operable Unit 2
TCL	Target Compound List
SCG	Standards, Criteria and Guidance
< 5.0	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria
(1)	Well identification (e.g., GM-73D) does not necessarily designate the actual hydrogeologic zone. Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

Table 15. Concentrations of Volatile Organic Compounds Detected in Groundwater Samples Collected from Wells in the Deep 3 Zone[(1)], Second Quarter Sampling Round 2013, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Constituent in µg/L	NYSDEC Standards, Criteria, and Guidance Values in µg/L	Well ID: Sample ID: Sample Date:	GM-73D3 GM-73D3 6/24/2013	GM-74D3 GM-74D3 6/26/2013	TT-101D2 TT-101D2 6/26/2013
1,1,1-Trichloroethane	5		< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	5		< 5.0	< 5.0	< 5.0
1,1-Dichloroethane	5		< 5.0	< 5.0	< 10
1,1-Dichloroethene	5		< 5.0	**0.31 J**	**2.1 J**
Carbon Tetrachloride	5		< 5.0	< 5.0	**1.1 J**
Chlorodifluoromethane (Freon 22)	NE		< 5.0	< 5.0	< 5.0
Chloroform	7		< 5.0	< 5.0	**0.56 J**
cis-1,2-Dichloroethene	5		< 5.0	**0.30 J**	**1.6 J**
CFC-12	5		< 5.0	< 5.0	< 5.0
Methyl-Tert-Butylether	5		< 5.0	< 5.0	< 5.0
Tetrachloroethene	5		**0.49 J**	**1.4 J**	**0.80 J**
Toluene	5		**0.23 J**	**0.29 J**	< 10
Trichloroethene	5		**1.1 J**	**3.0 J**	**460 D**
Trichlorotrifluoroethane (Freon 113)	5		< 5.0	**0.44 J**	**11**
TVOCs			**1.8**	**5.7**	**480**

Notes and Abbreviations:

Results validated following protocols specified in OU2 Groundwater Monitoring Plan (ARCADIS 2001; 2006).

Samples analyzed for the TCL VOCs using NYSDEC ASP 2005 Method OLM4.3.

Only detected constituents are summarized.

TVOCs are rounded to two significant figures.

Bold value indicates a detection.

NYSDEC	New York State Department of Environmental Conservation
VOCs	Volatile Organic Compounds
TVOCs	Total Volatile Organic Compounds
µg/L	micrograms per liter
NE	Not Established
J	Value is estimated concentration.
D	Secondary dilution
OU2	Operable Unit 2
TCL	Target Compound List
SCG	Standards, Criteria and Guidance
< 5.0	Compound not detected above its laboratory quantification limit.
	Compound detected in exceedance of NYSDEC SCG Criteria

(1) Well identification (e.g., TT-101D2) does not necessarily designate the actual hydrogeologic zone. Determination of the hydrogeologic zones is based on the well screen interval and the regional model layering.

Table 16. Remedy Performance, Effectiveness and Protectiveness Summary for the Periodic Review Period of 2013, OU2 On-Site Groundwater Remedy, Northrop Grumman Systems Corporation, Bethpage, New York.

Remedial Action Objective [1]	RAO Achieved during Reporting Period?	Rationale
Eliminate, to the extent practicable, off-site migration of contaminated groundwater and, where practicable, to restore the groundwater to pre-disposal conditions. Eliminate, to the extent practicable, the off-site migration of soils contamination entering the groundwater.	Yes	- The ONCT groundwater extraction and treatment system operated as designed and extracted and treated approximately 1,913 million gallons of VOC-impacted groundwater, which removed approximately 7,517 lbs of VOC mass from the aquifer and prevented it from migrating off-site. Supporting information is provided in Section 5 and Section 6. - Routine hydraulic monitoring indicates hydraulic containment is being achieved, confirming that the combination of shallow recharge at the South Recharge Basins coupled with pumpage of the remedial wells in the Deep2 zone forms a hydraulic barrier to groundwater flow that is preventing the off-site migration of VOC-impacted groundwater. Supporting information is provided in Section 6. - Routine VOC groundwater quality monitoring indicates shallow and intermediate wells on-site and off-site near the southern boundary of the former Northrop Grumman site exhibit few SCG exceedances, indicating a general lack of VOC impacts on-site. Additionally, the off-site water quality data from wells immediately downgradient of the hydraulic barrier have demonstrated discernable downward trends over time and continue to show no or trace VOC concentrations or decreasing VOC concentration trends. Supporting information is provided in Section 6. - Routine VOC groundwater quality monitoring indicates that bifurcation of the VOC impacts is occuring in the Deep and Deep2 zones immediately south of the hydraulic barrier, with demonstrated discernable downward trends in VOCs over time. - Routine VOC groundwater quality monitoring further downgradient (distal portions of the VOC impacts) indicate generally stable to slightly decreasing trends of VOCs in the Deep and Deep2 wells. - Supplemental data collected during recently completed Phases 1 and 2 of the ONCT Hydraulic Effectiveness Program further confirm that the ONCT System provides effective vertical and horizontal control of VOC-impacted groundwater and is preventing its off-site migration. Supporting information is provided in Section 6 and Appendix F. - On-Site cadmium and chromium impacts to groundwater from Plant 2 remain limited to on-site areas. On-site chromium concentrations near Plant 1 generally have been stable since 2009.
Eliminate, to the extent practicable, site-related contaminants from the affected public water supplies and to prevent, to the extent practicable, the future contamination of public water supplies through the implementation of the off-site groundwater remediation.	Yes	- The ONCT system supports achieving this remedial objective by virtue of it being a part of the overall OU2 Groundwater Remedy and eliminating, to the extent practicable, off-site migration of contaminated groundwater.
Eliminate, to the extent practicable, exposures to contaminated groundwater.	Yes	- The ONCT system supports achieving this remedial objective by virtue of it being a part of the overall OU2 Groundwater Remedy, and eliminating, to the extent practicable, off-site migration of contaminated groundwater and achieving compliance with applicable SCGs for various OU2 ONCT system emissions/discharges.
Eliminate, to the extent practicable, exceedances of applicable environmental quality standards related to releases of contaminants to the waters of the state.	Yes	- The ONCT system supports achieving this remedial objective by virtue of it being a part of the overall OU2 Groundwater Remedy and eliminating, to the extent practicable, off-site migration of contaminated groundwater.
Comply with applicable NYSDEC Standards, Criteria, and Guidance (SCGs) for various OU2 ONCT system emissions (i.e., treated water and air emissions).	Yes	- The measured concentration of individual VOC and nitrogen in the OU2 ONCT groundwater extraction and treatment systems' treated water effluent were below applicable discharge limits, per the SPDES permit (Table 7). - The measured pH in the OU2 ONCT groundwater extraction and treatment systems' treated water effluent was within applicable discharge limits, per the SPDES permit (Table 7). - The measured concentrations of individual VOCs in the OU2 ONCT groundwater extraction and treatment systems' treated air effluent were below applicable SGCs (Table 5). - The measured concentration of individual VOCs in the OU2 ONCT groundwater extraction and treatment systems' treated air effluent were below applicable instantaneous MASCs, as calculated using the USEPA SCREEN 3 Model (Tables 6A and 6B) and the time-weighted rolling average for all detected compounds is below the MASCs.

Notes and Abbreviations

(1) Remedial action objectives set forth in the March 2001 OU2 Record of Decision (ROD)

RAO - Remedial action objective
NYSDEC - New York State Department of Environmental Conservation
ONCT - On-site containment
VOC - Volatile organic compoud
SPDES - State Pollution Discharge Elimination System
SGC - Short-term guideline concentration
MASC - Maximum allowable stack concentration
USEPA - United States Environmental Protection Agency

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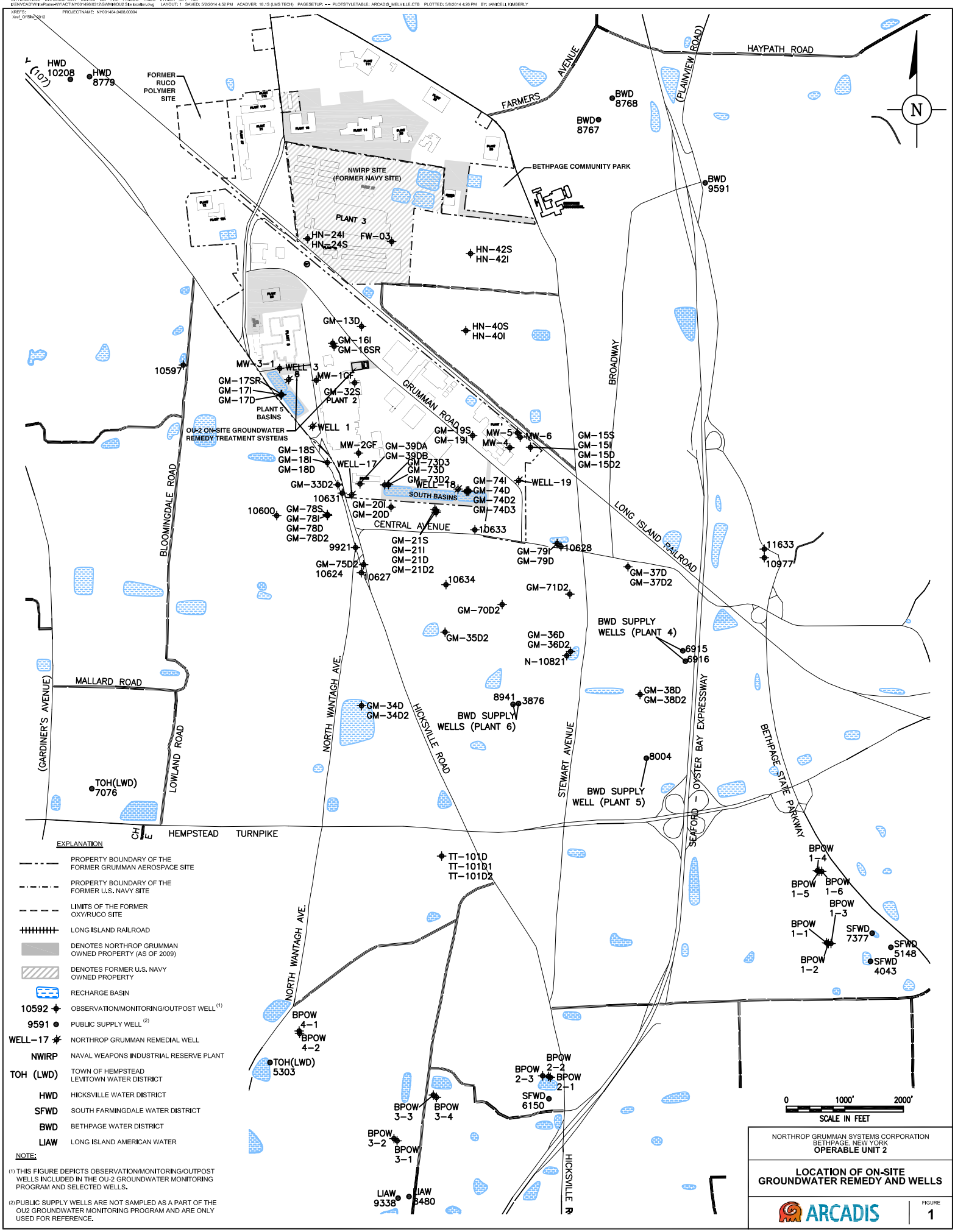
Figures



EXPLANATION

- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- PROPERTY BOUNDARY OF THE FORMER U.S. NAVY SITE
- LIMITS OF THE FORMER OXY/RUCO SITE
- LONG ISLAND RAILROAD
- DENOTES NORTHROP GRUMMAN OWNED PROPERTY (AS OF 2009)
- DENOTES FORMER U.S. NAVY OWNED PROPERTY
- RECHARGE BASIN
- 10592 OBSERVATION/MONITORING/OUTPOST WELL (1)
- 9591 PUBLIC SUPPLY WELL (2)
- WELL-17 NORTHROP GRUMMAN REMEDIAL WELL
- NWIRP NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
- TOH (LWD) TOWN OF HEMPSTEAD LEVITOWN WATER DISTRICT
- HWD HICKSVILLE WATER DISTRICT
- SFWD SOUTH FARMINGDALE WATER DISTRICT
- BWD BETHPAGE WATER DISTRICT
- LIAW LONG ISLAND AMERICAN WATER

NOTE:

(1) THIS FIGURE DEPICTS OBSERVATION/MONITORING/OUTPOST WELLS INCLUDED IN THE OU-2 GROUNDWATER MONITORING PROGRAM AND SELECTED WELLS.

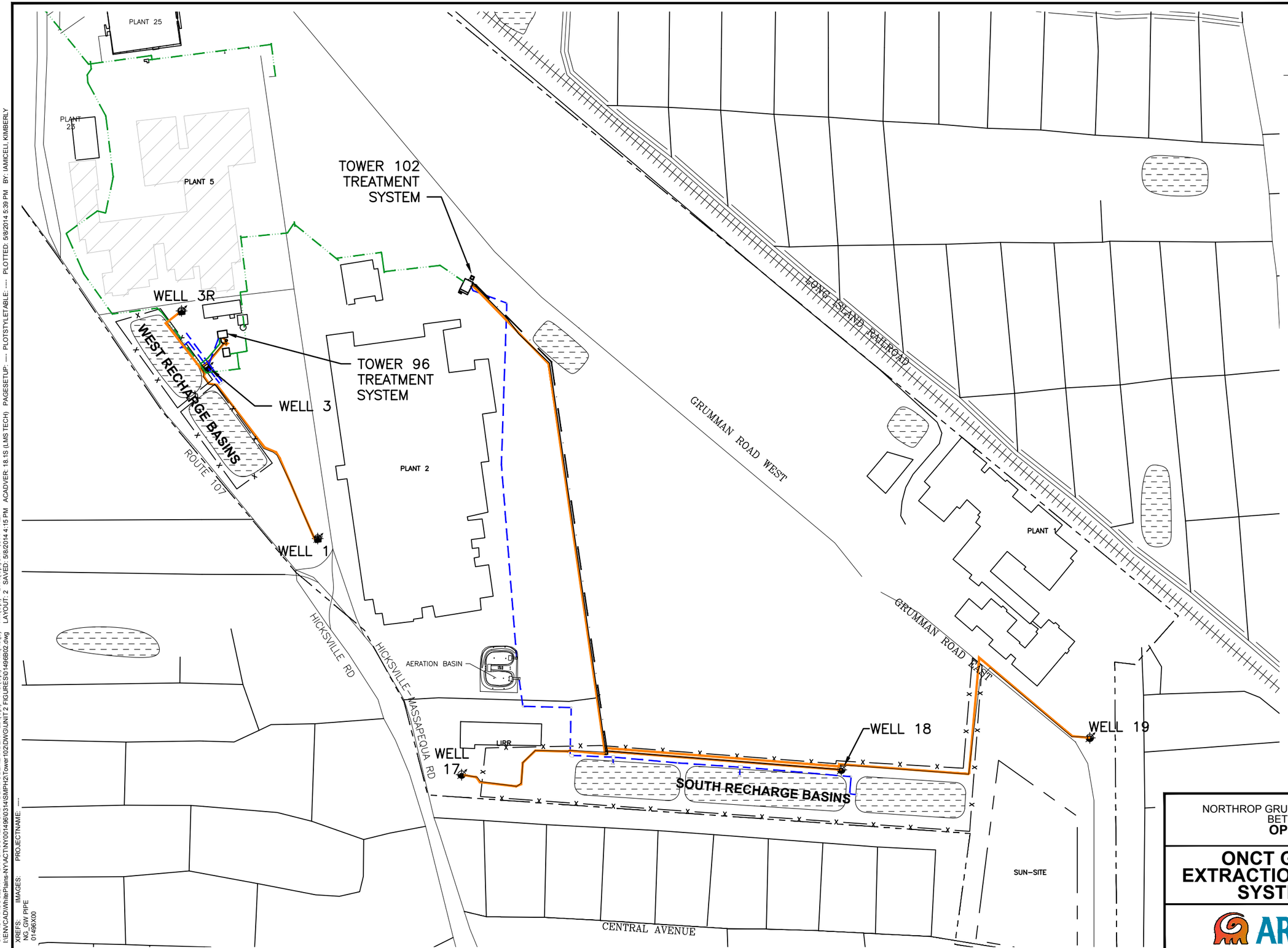
(2) PUBLIC SUPPLY WELLS ARE NOT SAMPLED AS A PART OF THE OU2 GROUNDWATER MONITORING PROGRAM AND ARE ONLY USED FOR REFERENCE.

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

LOCATION OF ON-SITE GROUNDWATER REMEDY AND WELLS

ARCADIS

FIGURE 1



NOTES:

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

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

ONCT GROUNDWATER EXTRACTION AND TREATMENT SYSTEM SITE PLAN

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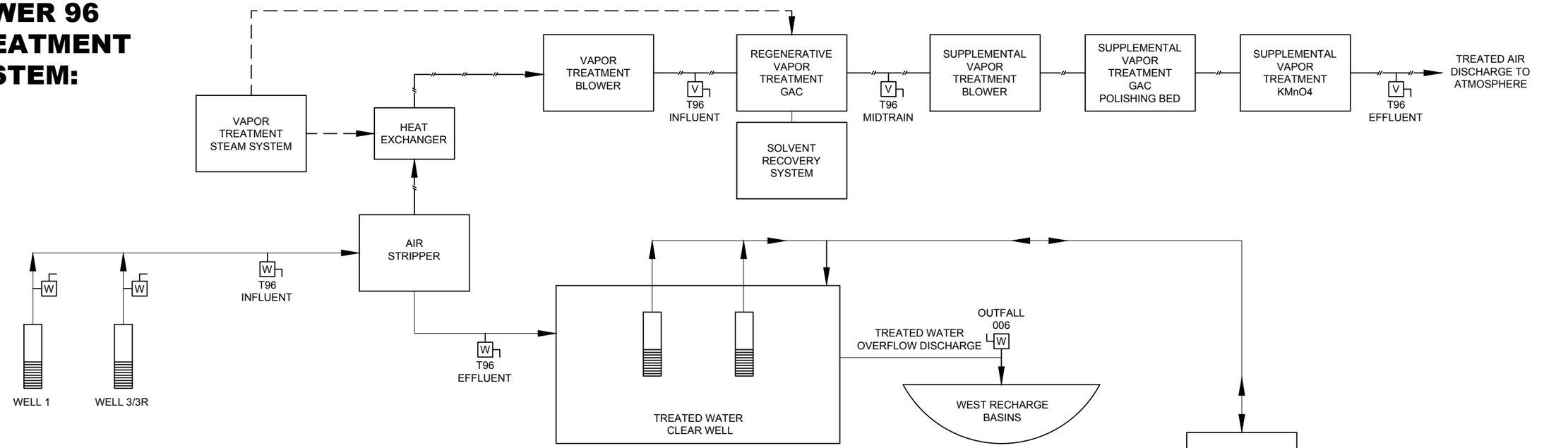
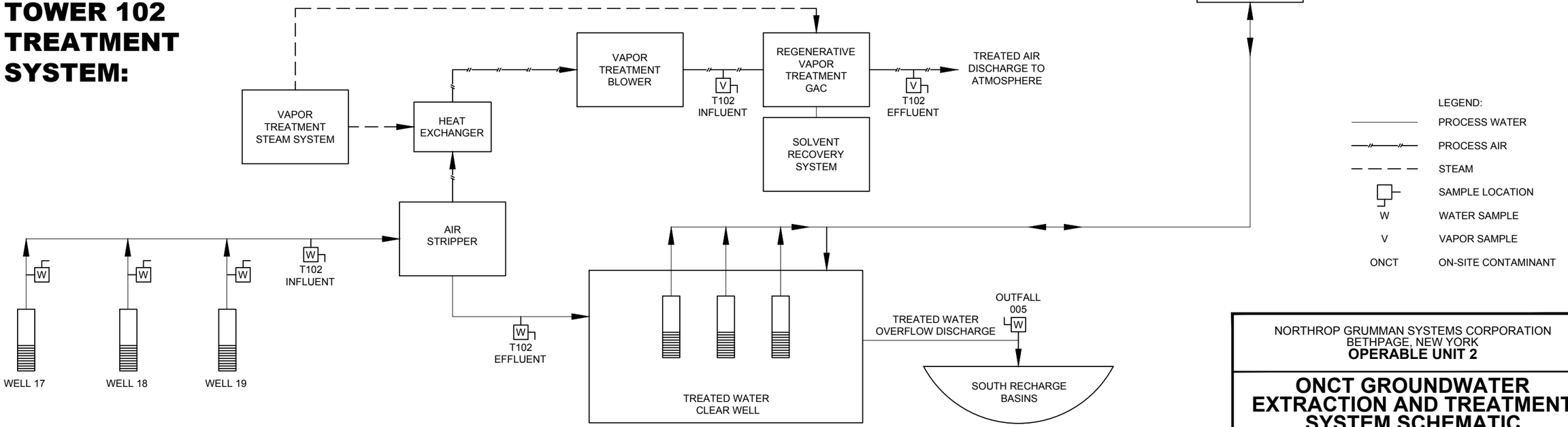
FIGURE
2

TOWER 96 TREATMENT SYSTEM:



TOWER 102 TREATMENT SYSTEM:



NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

ONCT GROUNDWATER EXTRACTION AND TREATMENT SYSTEM SCHEMATIC

ARCADIS

FIGURE 3

0 600' 1200'
SCALE IN FEET

EXPLANATION:

- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- PROPERTY BOUNDARY OF THE FORMER U.S. NAVY SITE
- LONG ISLAND RAILROAD
- DENOTES NORTHROP GRUMMAN OWNED PROPERTY (AS OF 2009)
- DENOTES FORMER U.S. NAVY OWNED PROPERTY
- RECHARGE BASIN
- OBSERVATION/MONITORING WELL
- INDUSTRIAL WELL
- PUBLIC SUPPLY WELL
- IRRIGATION WELL
- NORTHROP GRUMMAN OR NAVY PRODUCTION WELL
- ABANDONED WELL
- COMPLETED OU-2 VERTICAL PROFILE BORING
- COMPLETED OU-3 VERTICAL PROFILE BORING
- 66 — LINE OF EQUAL WATER-LEVEL ELEVATION IN FEET RELATIVE TO MEAN SEA LEVEL (DASHED WHERE LESS CERTAIN)
- (74.14) WATER-LEVEL ELEVATION IN FEET RELATIVE TO MEAN SEA LEVEL
- DIRECTION OF HORIZONTAL COMPONENT OF GROUNDWATER FLOW
- OU-2 OPERABLE UNIT 2
- OU-3 OPERABLE UNIT 3

NOTES:

1. NORTHROP GRUMMAN REMEDIAL WELLS 1, 3, 17, 18 AND 19 SCREENED IN DEEP 2 ZONE.
2. BETHPAGE WATER DISTRICT WELL 3876 SCREENED IN DEEP ZONE.
3. BETHPAGE WATER DISTRICT WELLS 6915 AND 6916 SCREENED IN DEEP 2 ZONE.

ALL COORDINATES REFERENCED TO NORTH AMERICAN DATUM 1983

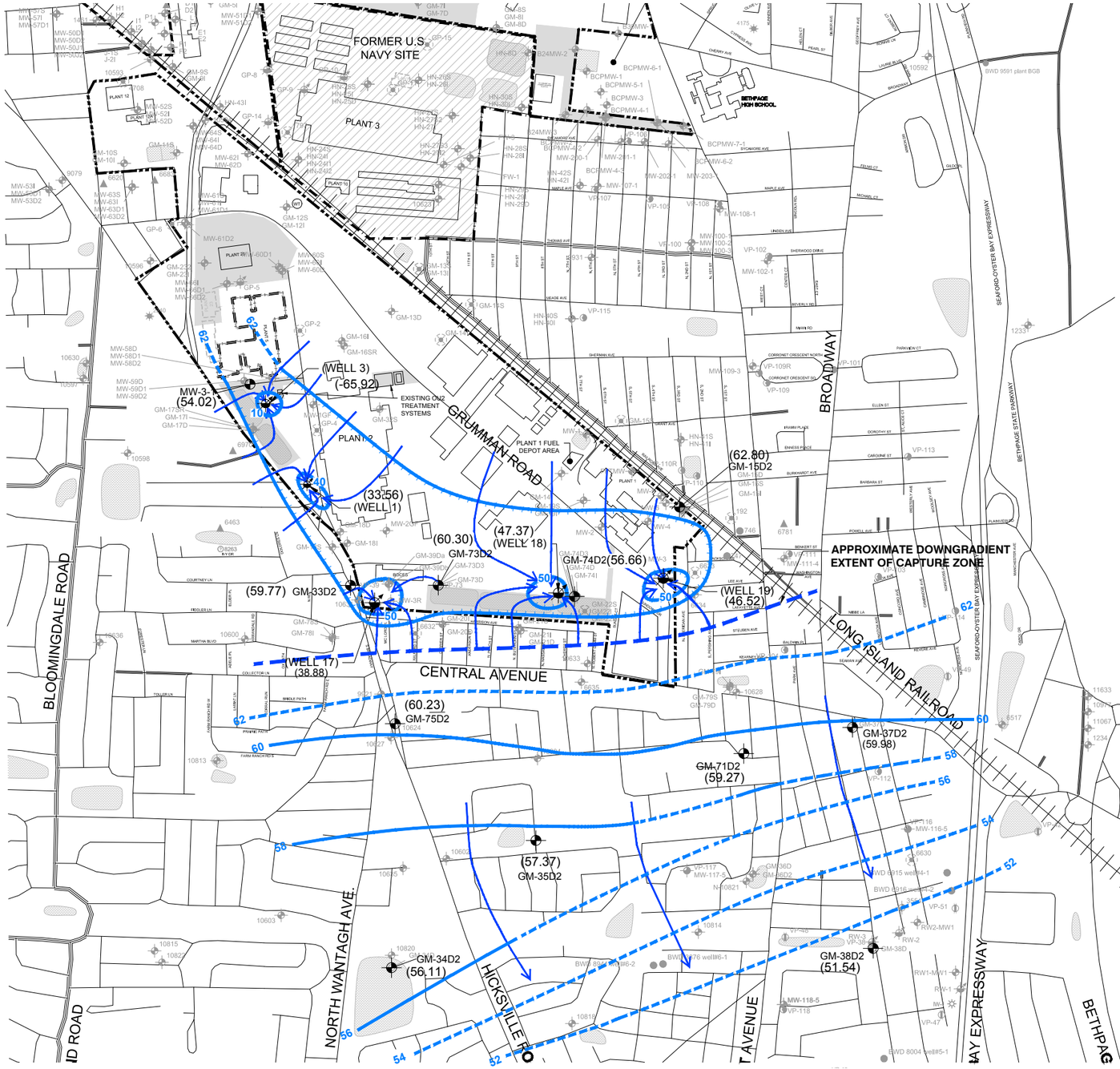
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

WATER-TABLE CONFIGURATION AND HORIZONTAL GROUNDWATER FLOW DIRECTION IN THE SHALLOW/INTERMEDIATE ZONE, JULY 2013

ARCADIS

FIGURE 4

CITY:(Reqd) DIV/GROUP:(Reqd) DB:(Reqd) LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
I:\ENVCAD\WhitePlains-NY\ACTIVE\NY001496\03140\gwm4\401496F02.dwg LAYOUT: 4 SAVED: 5/8/2014 3:42 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTHALF.CTB PLOTTED: 5/8/2014 4:34 PM BY: IANICELI, KIMBERLY
XREFS: IMAGES:
Xref_OffSite SNY01P1014041416270_Page_2.tiff



EXPLANATION:

- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- PROPERTY BOUNDARY OF THE FORMER U.S. NAVY SITE
- LONG ISLAND RAILROAD
- DENOTES NORTHROP GRUMMAN OWNED PROPERTY (AS OF 2009)
- DENOTES FORMER U.S. NAVY OWNED PROPERTY
- RECHARGE BASIN
- OBSERVATION/MONITORING WELL
- INDUSTRIAL WELL
- PUBLIC SUPPLY WELL
- IRRIGATION WELL
- NORTHROP GRUMMAN OR NAVY PRODUCTION WELL
- ABANDONED WELL
- COMPLETED OU-2 VERTICAL PROFILE BORING
- COMPLETED OU-3 VERTICAL PROFILE BORING
- 62 — HACHURES DENOTE LOWER WATER-LEVEL ELEVATION WITHIN POTENTIOMETRIC CONTOUR
- 58 — LINE OF EQUAL WATER-LEVEL ELEVATION IN FEET RELATIVE TO MEAN SEA LEVEL (DASHED WHERE LESS CERTAIN)
- GROUNDWATER DIVIDE
- (62,80) WATER-LEVEL ELEVATION IN FEET RELATIVE TO MEAN SEA LEVEL
- DIRECTION OF the HORIZONTAL COMPONENT OF GROUNDWATER FLOW
- OU-2 OPERABLE UNIT 2
- OU-3 OPERABLE UNIT 3

NOTES:

1. NORTHROP GRUMMAN REMEDIAL WELLS 1, 3, 17, 18 AND 19 SCREENED IN DEEP 2 ZONE.
2. BETHPAGE WATER DISTRICT WELL 3876 SCREENED IN DEEP ZONE.
3. BETHPAGE WATER DISTRICT WELLS 6915 AND 6916 SCREENED IN DEEP 2 ZONE.
4. BETHPAGE WATER DISTRICT WELL 8941 SCREENED IN THE DEEP 3 ZONE.

0 600' 1200'
SCALE IN FEET

ALL COORDINATES REFERENCED TO NORTH AMERICAN DATUM 1983

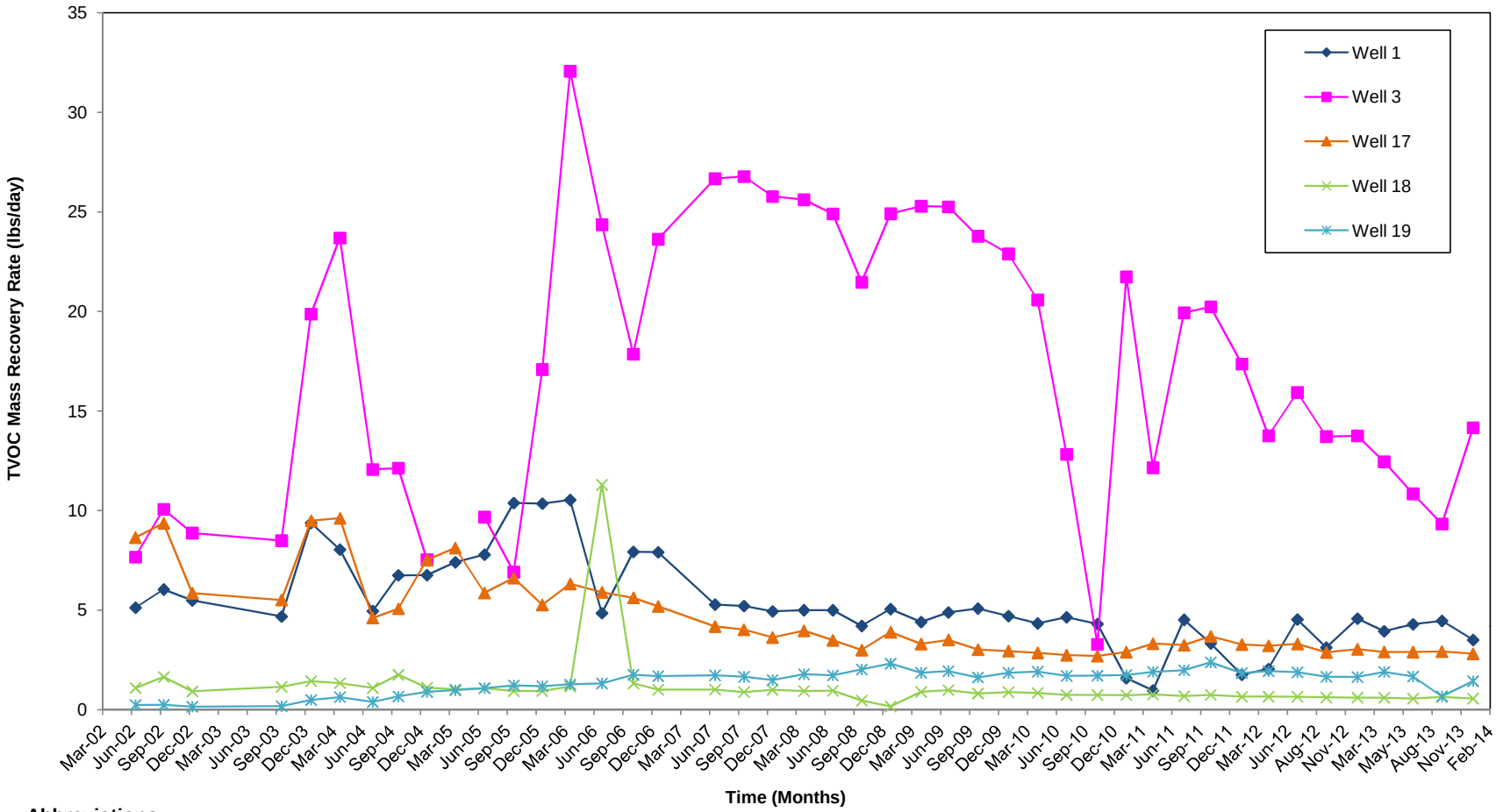
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

POTENTIOMETRIC SURFACE ELEVATION AND HORIZONTAL GROUNDWATER FLOW DIRECTION IN THE DEEP 2 ZONE JULY 2013

ARCADIS

FIGURE 5

CITY:(Reqd) DIV/GROUP:(Reqd) DB:(Reqd) LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
I:\ENVCAD\WhitePlains-NY\ACTIVITY\01496\0314gwm4\NY1496_312_GWM4 F04.dwg LAYOUT: 5 SAVED: 4/30/2014 10:14 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 5/8/2014 3:44 PM BY: IAMICELI, KIMBERLY
XREFS: IMAGES:
Xref_OffSite SNY01P10140414I6270_Page_1.tiff



Abbreviations:

VOC = Volatile organic compound.

lbs/day = Pounds per day.

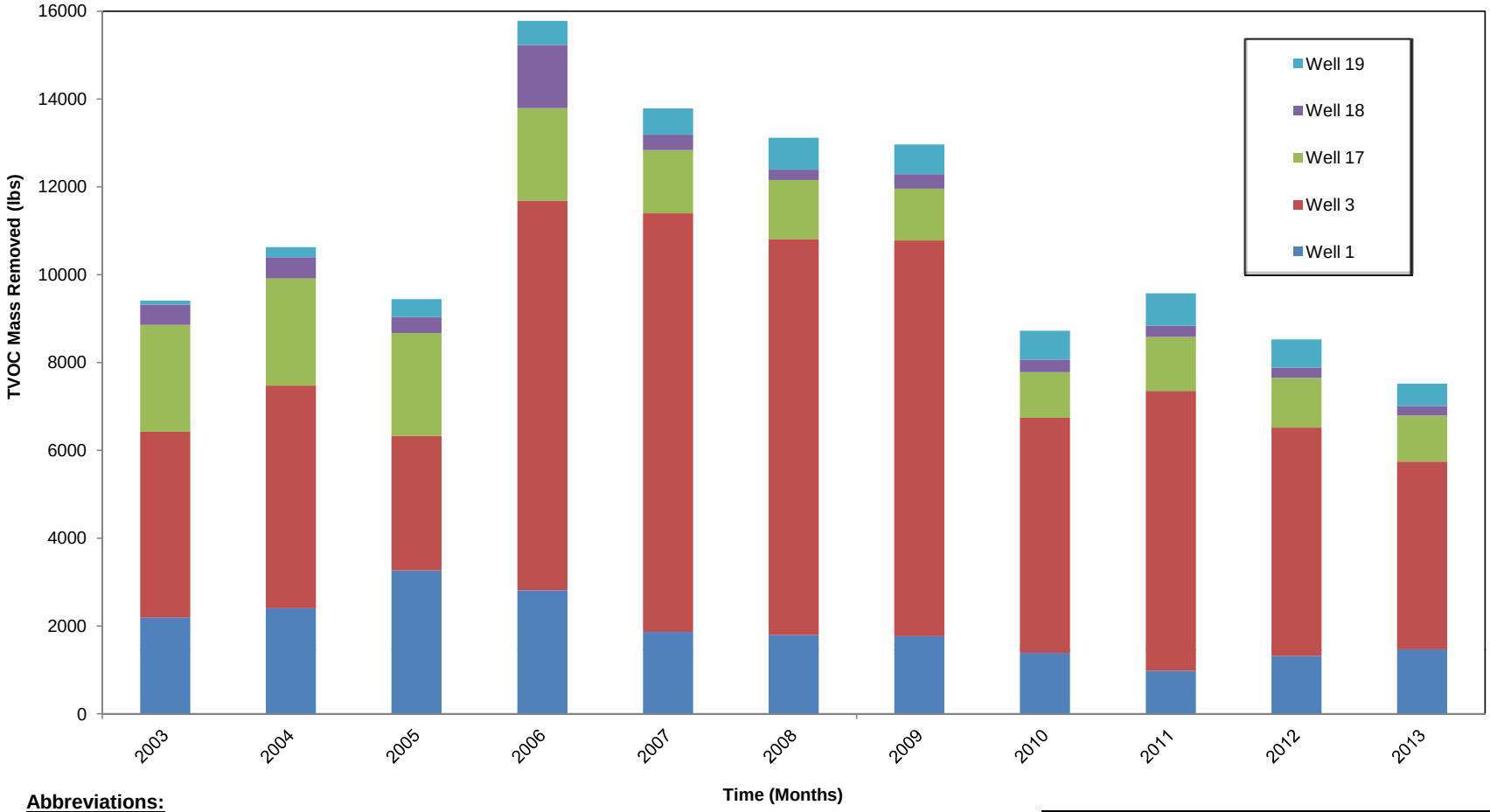
TVOCs = Sum of VOCs detected

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OU2 ON-SITE GROUNDWATER REMEDY

REMEDIAL WELLS TOTAL VOC MASS RECOVERY RATES THROUGH DECEMBER 2013

ARCADIS

FIGURE 6



Abbreviations:

VOC = Volatile organic compound

lbs = Pounds

TVOCs = Sum of VOCs detected

NORTHROP GRUMMAN SYSTEMS CORPORATION

BETHPAGE, NEW YORK

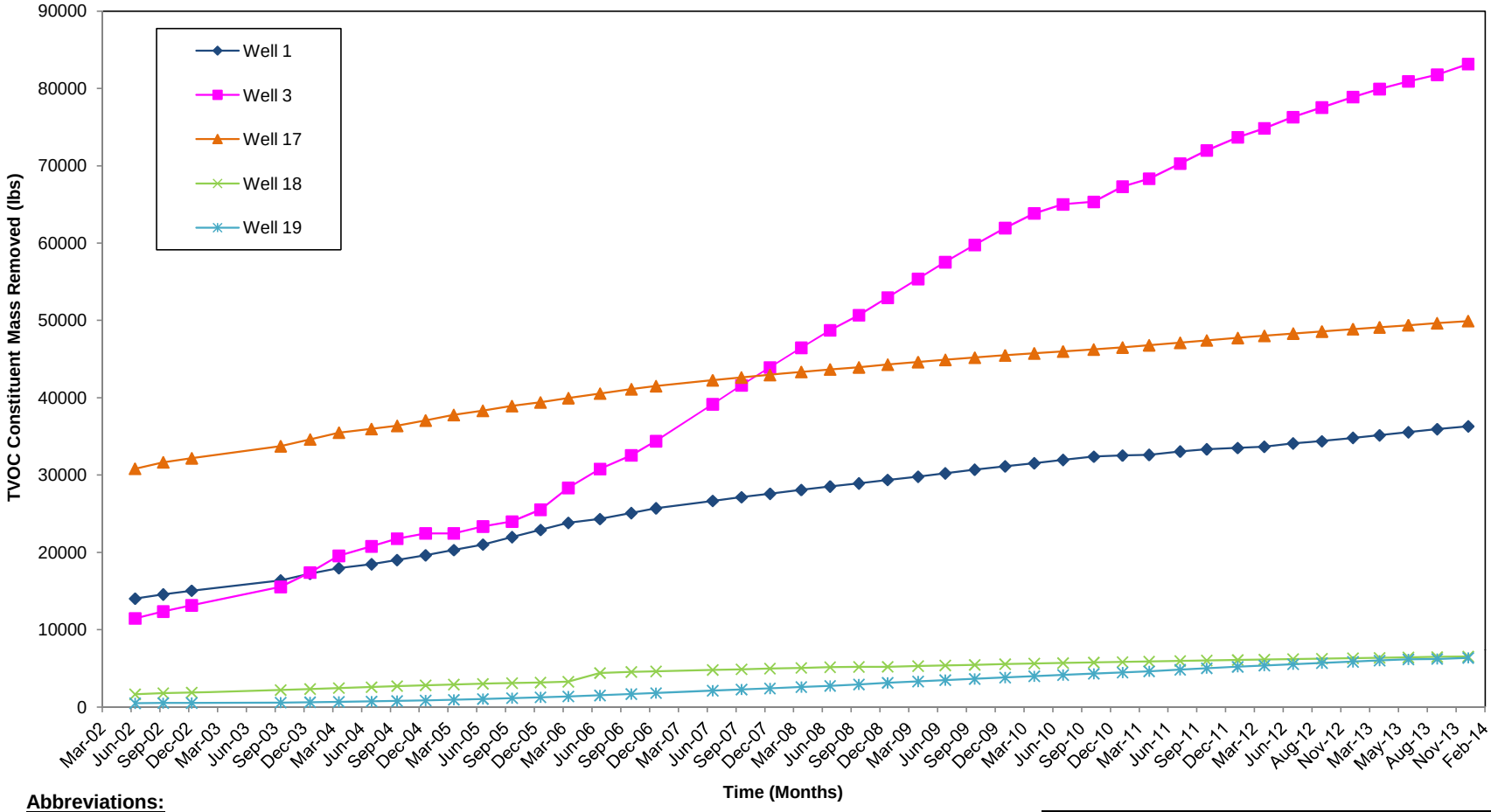
OU2 ON-SITE GROUNDWATER REMEDY

REMEDIAL WELLS YEARLY TOTAL VOC MASS REMOVED THROUGH DECEMBER 2013

ARCADIS

FIGURE

7



Abbreviations:

VOC = Volatile organic compound

lbs = Pounds

TVOCs = Sum of VOCs detected

ONCT = On-Site Containment

Notes:

1. Cumulative Total VOC Mass Removed includes mass removed since startup of the ONCT system in September 1998.

NORTHROP GRUMMAN SYSTEMS CORPORATION

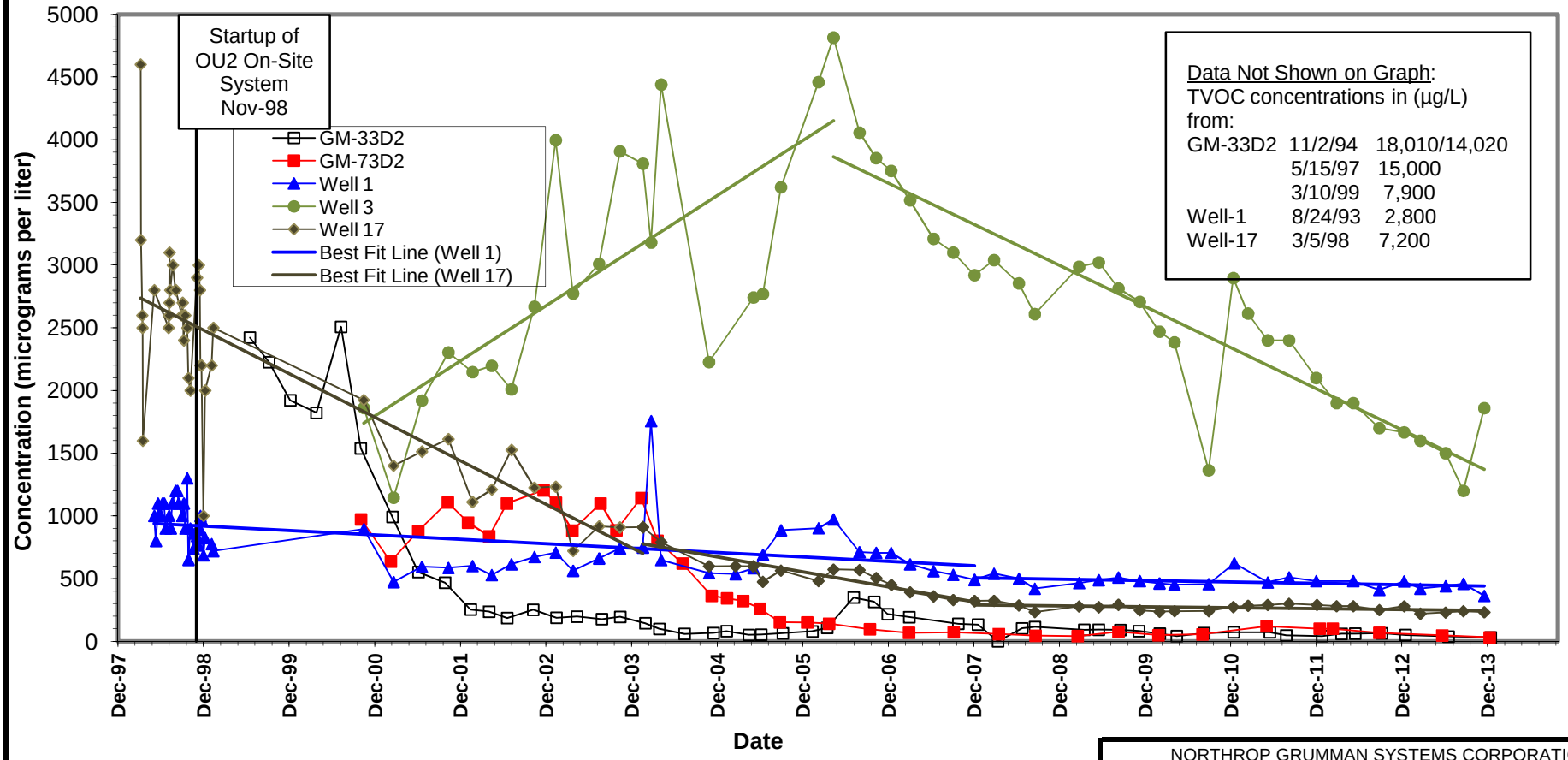
BETHPAGE, NEW YORK

OU2 ON-SITE GROUNDWATER REMEDY

REMEDIAL WELLS CUMULATIVE TOTAL VOC MASS REMOVED THROUGH DECEMBER 2013

ARCADIS

FIGURE 8



Abbreviation:

VOC = Volatile organic compound

Total VOCs = Sum of VOCs detected

µg/L = micrograms per liter

NORTHROP GRUMMAN SYSTEMS CORPORATION

BETHPAGE, NEW YORK

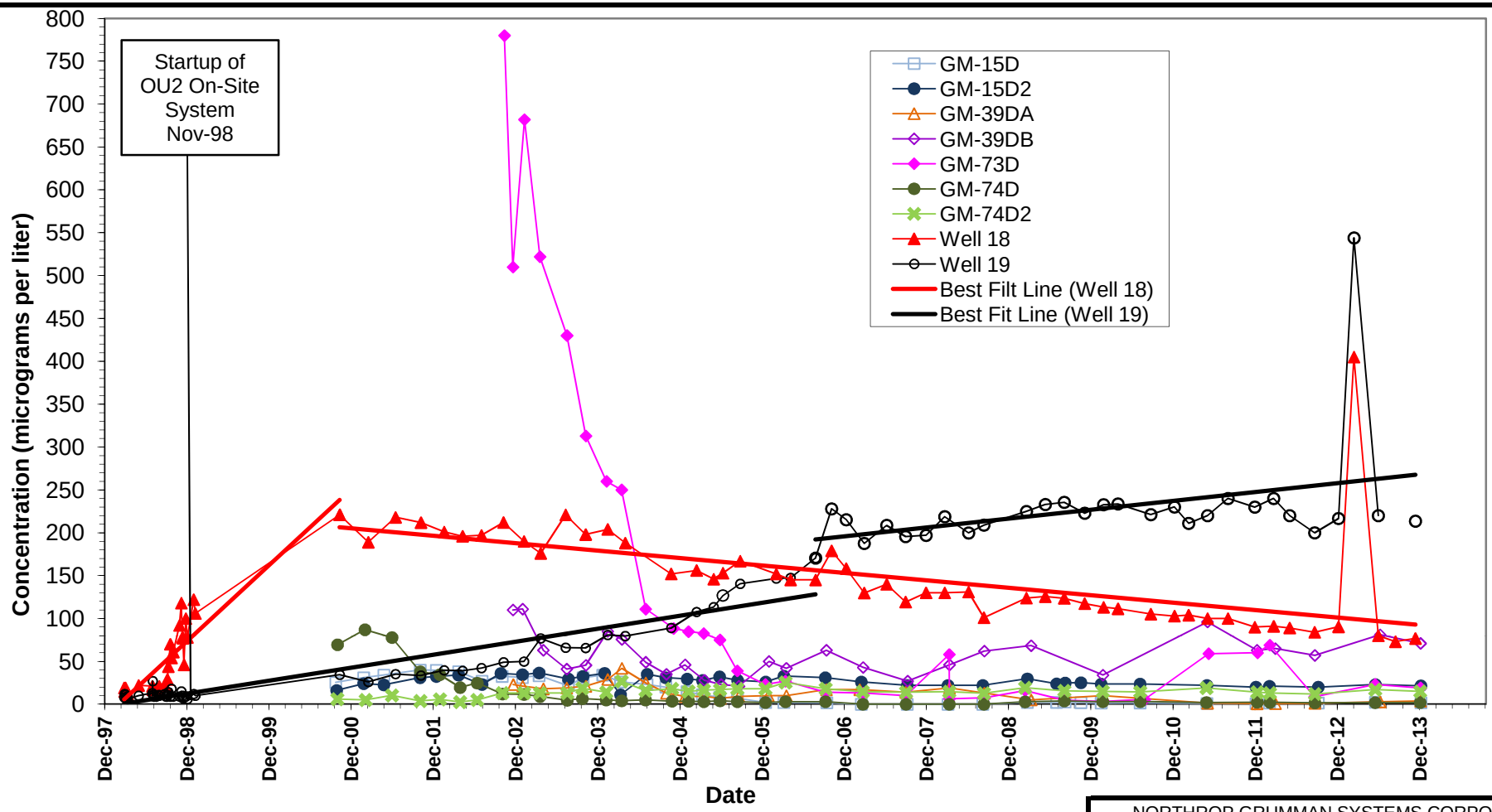
OU2 ON-SITE GROUNDWATER REMEDY

Total Volatile Organic Compounds Concentration (Southern and Southwestern Site Boundary) in Deep 2 Wells, OU2 Remedial Wells, and Monitoring Wells GM-33D2 and GM-73D2

ARCADIS

FIGURE

9

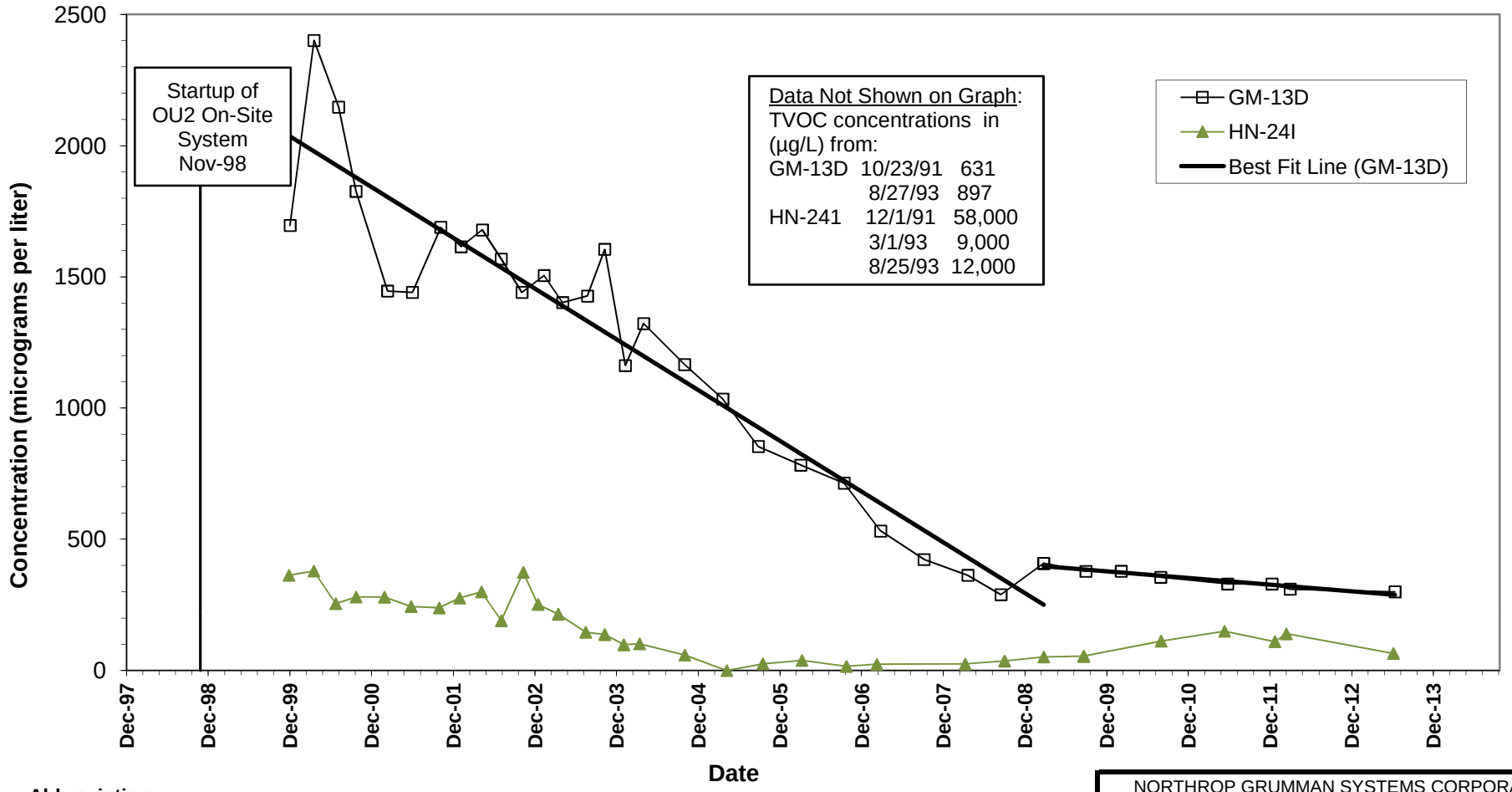


NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OU2 ON-SITE GROUNDWATER REMEDY

Total Volatile Organic Compounds Concentrations (Southern and Southeastern Site Boundary) in On-site Deep and Deep 2 Monitoring Wells and OU2 Remedial Wells 18 and 19

ARCADIS

FIGURE 10



Abbreviation:

VOC = Volatile organic compound

TVOCs = Sum of VOCs detected

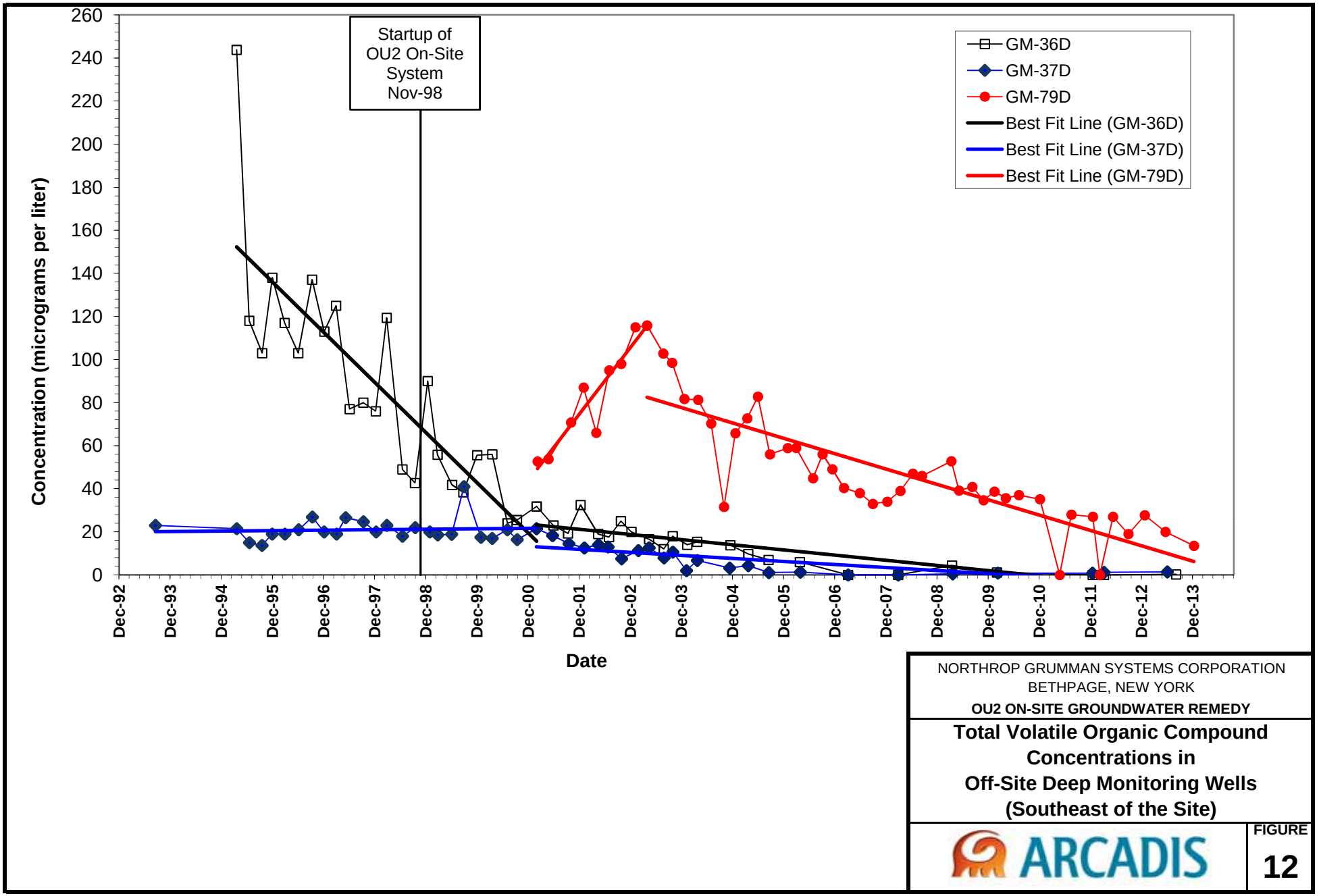
µg/L = micrograms per liter

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OU2 ON-SITE GROUNDWATER REMEDY

Total Volatile Organic Compound Concentrations in On-Site Intermediate and Deep Monitoring Wells

ARCADIS

FIGURE 11



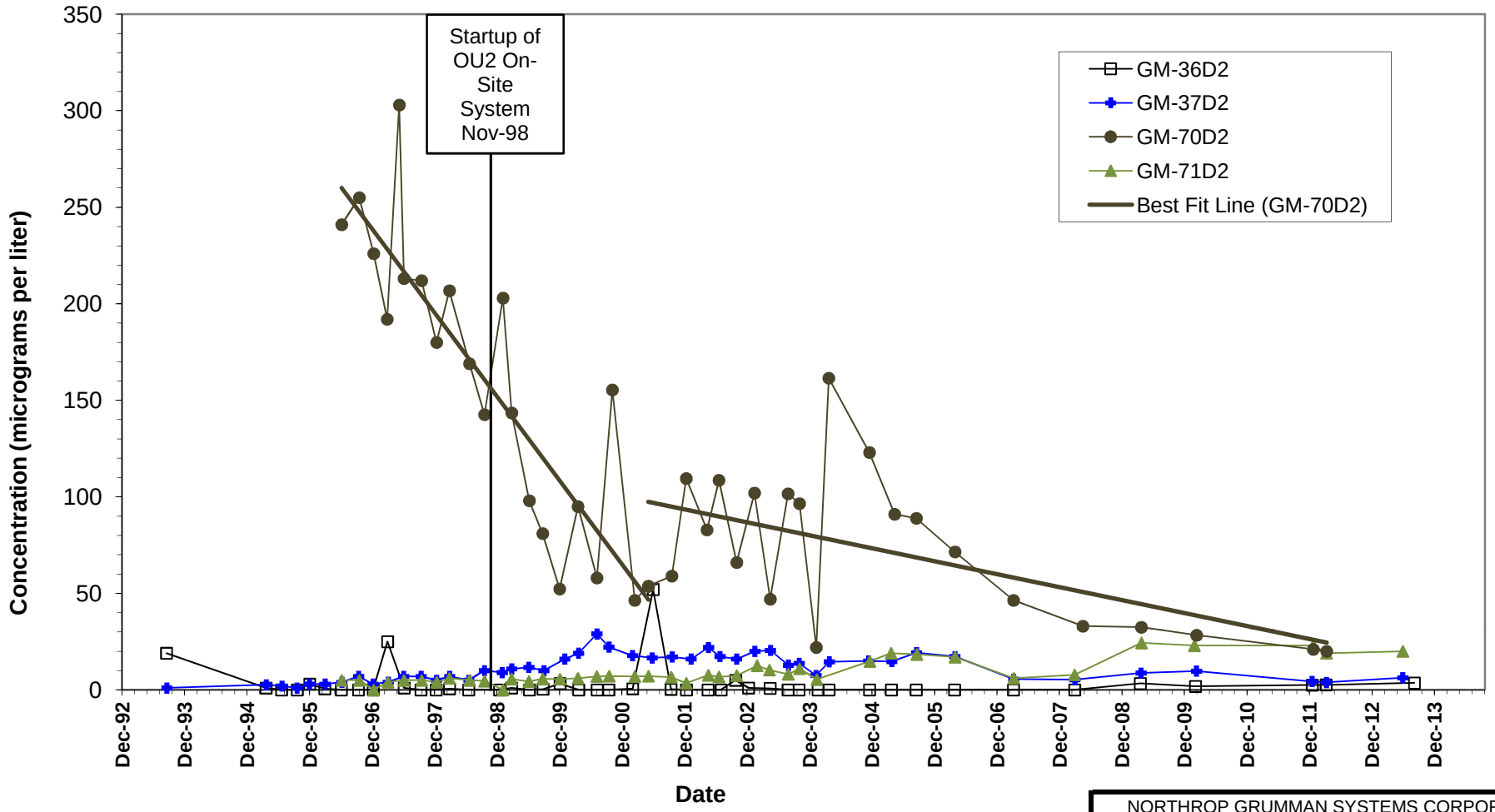
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

OU2 ON-SITE GROUNDWATER REMEDY

Total Volatile Organic Compound Concentrations in Off-Site Deep Monitoring Wells (Southeast of the Site)

ARCADIS

FIGURE 12

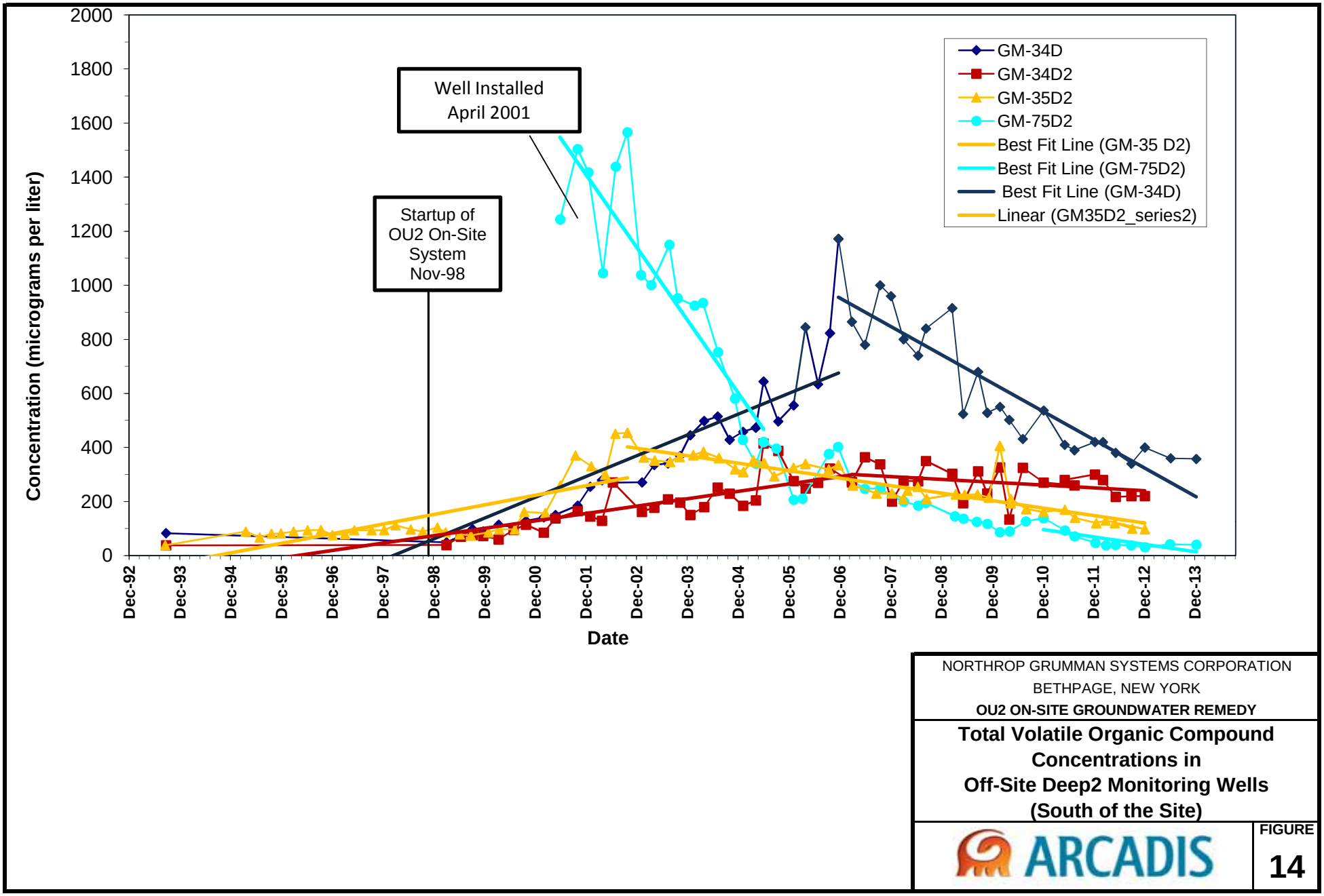


NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OU2 ON-SITE GROUNDWATER REMEDY

Total Volatile Organic Compound Concentrations in Off-Site Deep-Deep2 Monitoring Wells (Southeast of the Site)

ARCADIS

FIGURE 13

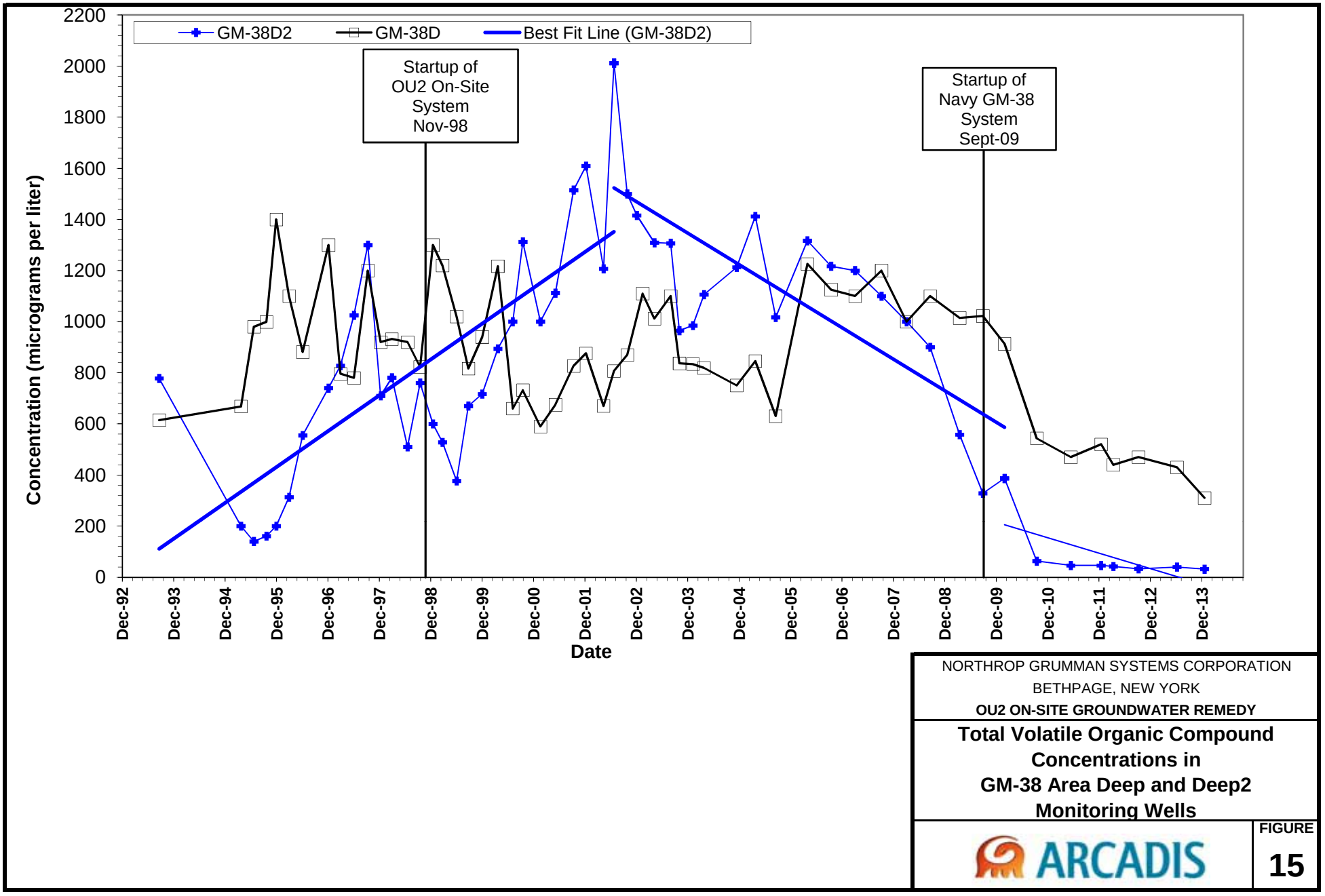


NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OU2 ON-SITE GROUNDWATER REMEDY

Total Volatile Organic Compound Concentrations in Off-Site Deep2 Monitoring Wells (South of the Site)

ARCADIS

FIGURE 14

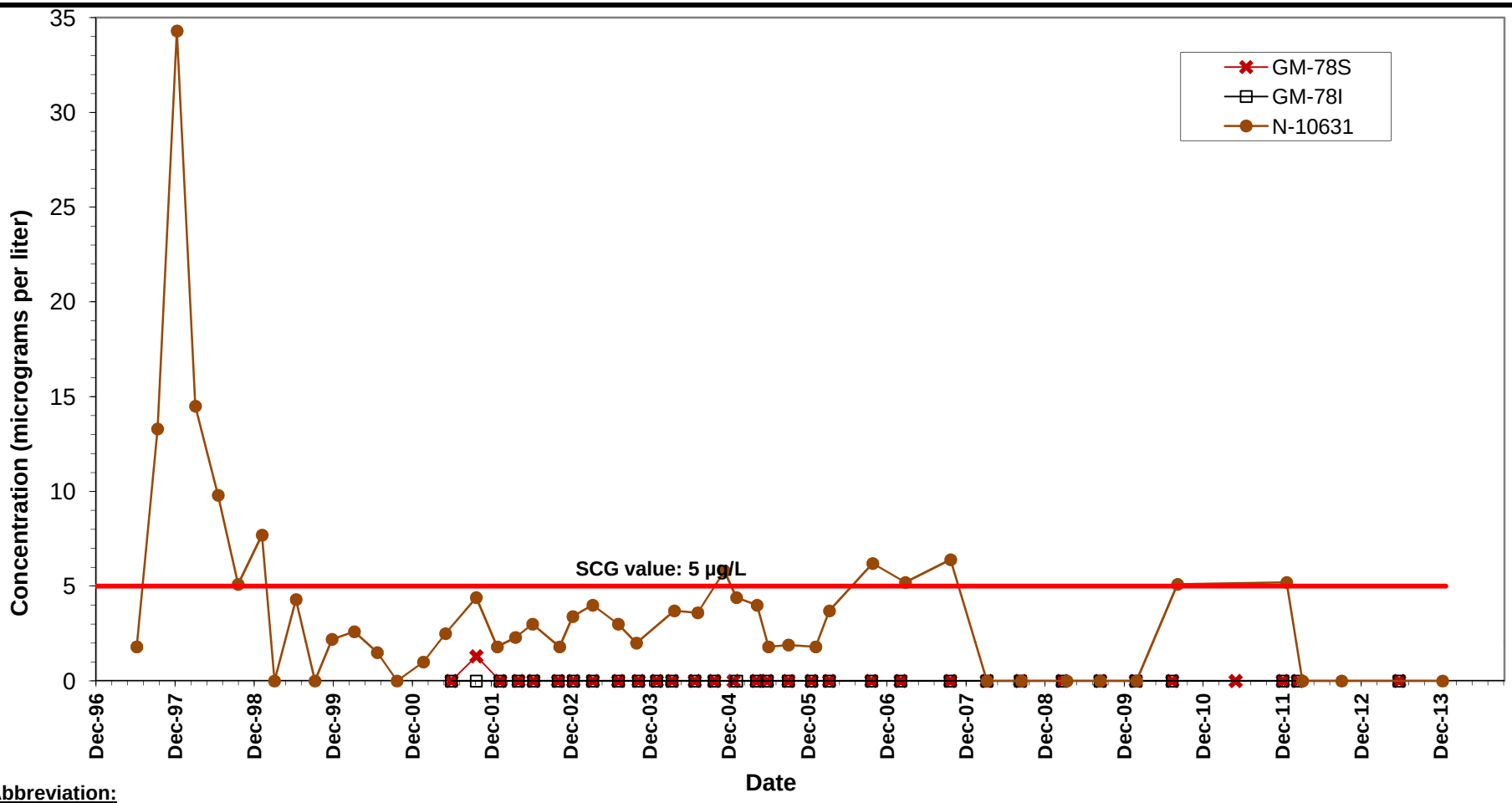


NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OU2 ON-SITE GROUNDWATER REMEDY

Total Volatile Organic Compound Concentrations in GM-38 Area Deep and Deep2 Monitoring Wells

ARCADIS

FIGURE 15



Abbreviation:

SCG= Standards, Criteria and Guidance Values

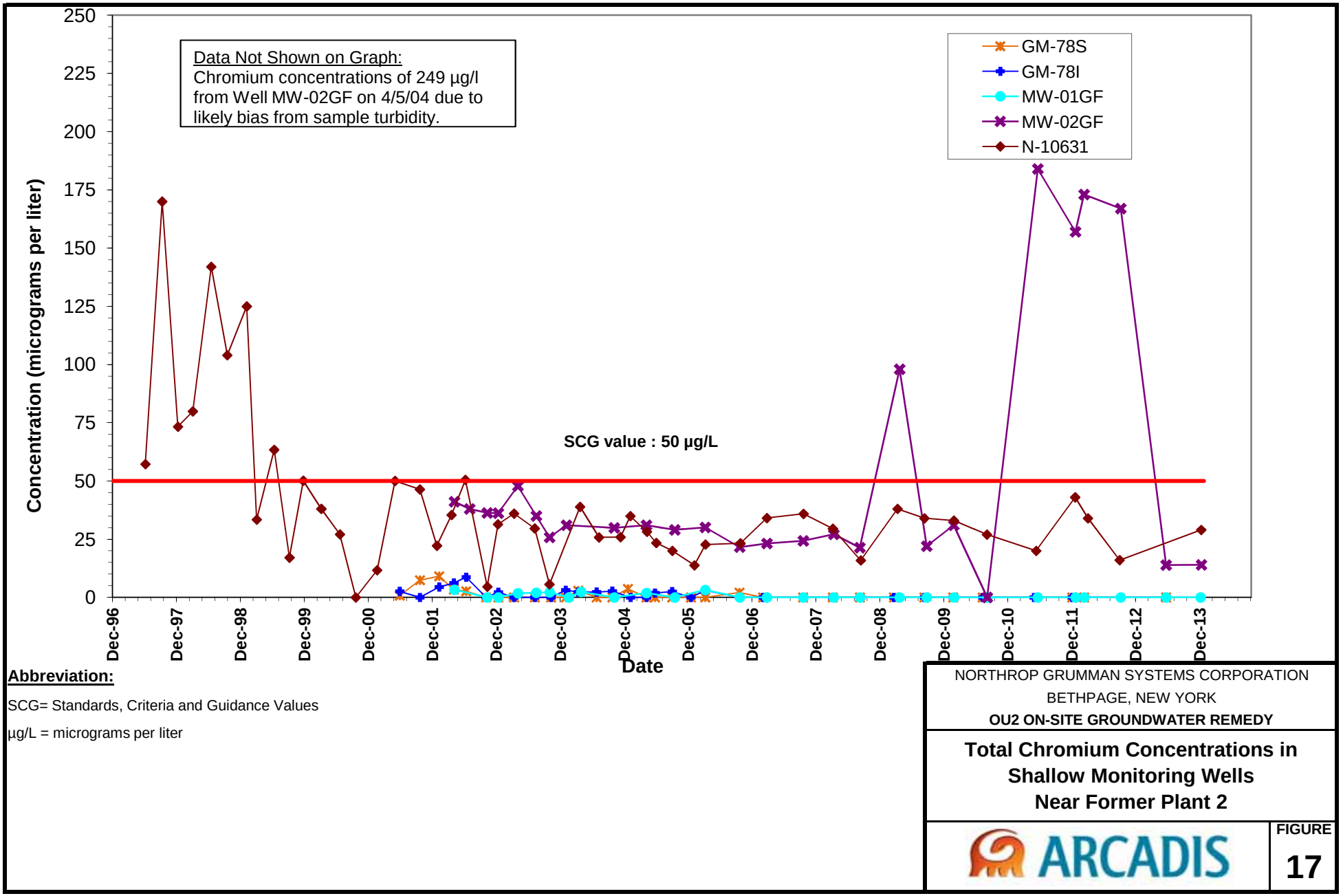
µg/L = micrograms per liter

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OU2 ON-SITE GROUNDWATER REMEDY

Total Cadmium Concentrations in Shallow Monitoring Wells Near Former Plant 2

ARCADIS

FIGURE 16



Abbreviation:

SCG= Standards, Criteria and Guidance Values

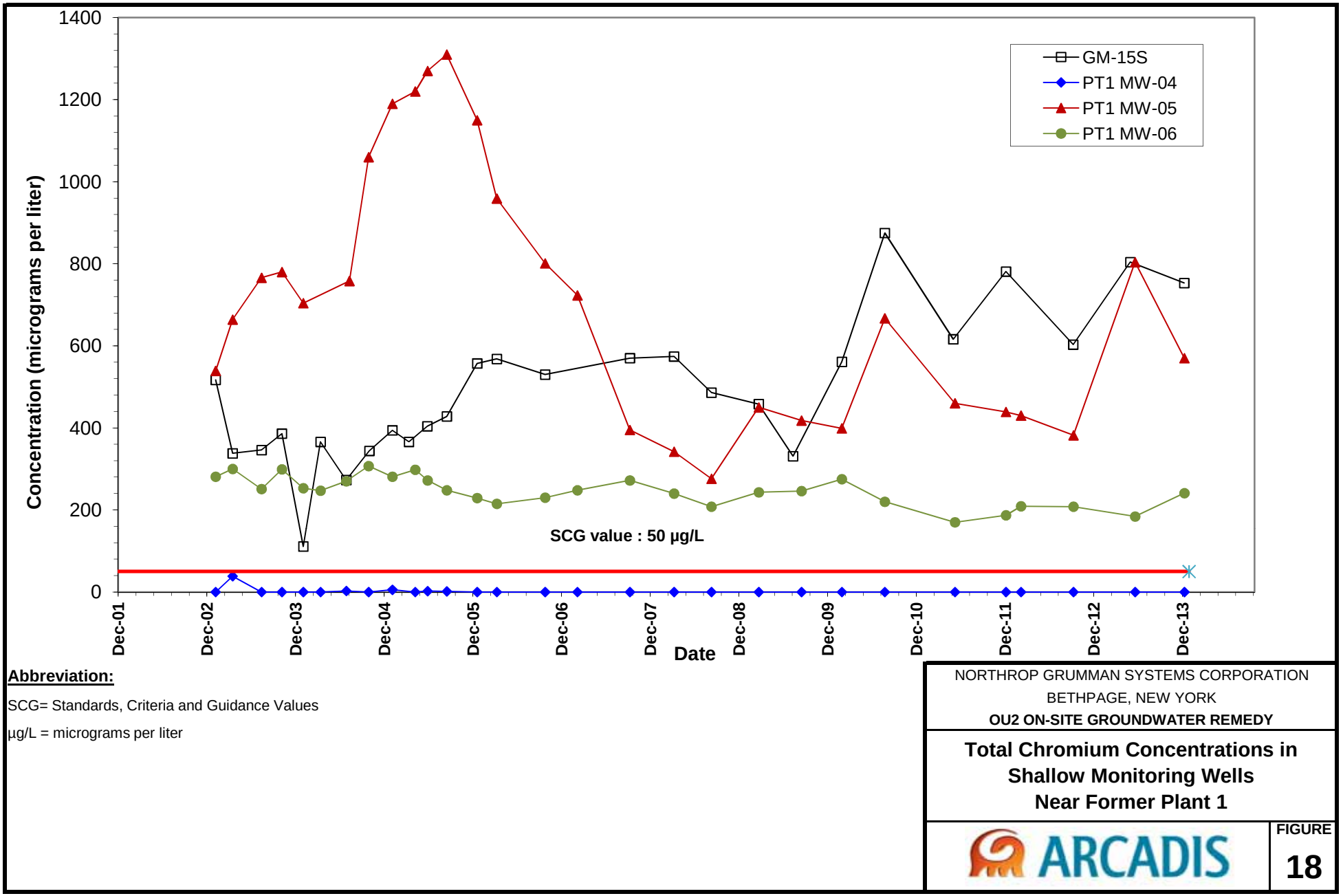
µg/L = micrograms per liter

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OU2 ON-SITE GROUNDWATER REMEDY

Total Chromium Concentrations in Shallow Monitoring Wells Near Former Plant 2

ARCADIS

FIGURE 17



Abbreviation:

SCG= Standards, Criteria and Guidance Values

µg/L = micrograms per liter

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OU2 ON-SITE GROUNDWATER REMEDY

Total Chromium Concentrations in Shallow Monitoring Wells Near Former Plant 1

ARCADIS

FIGURE 18