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NWIRP CALVERTON
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FINAL RECORD OF DECISION AT OPERABLE UNIT 3 (OU 3) SITE 6A GROUNDWATER
NWIRP CALVERTON NY
5/1/2012
NAVFAC MIDLANT



Record of Decision
Operable Unit 3
Site 6a-Southern Area Groundwater
Naval Weapons Industrial Reserve Plant Calverton,
Calverton, New York
May 2012

1 DECLARATION

Site Name and Location

This Record of Decision (ROD) document presents the Selected Remedy for Operable Unit 3 (OU3) (Site 6A- Southern Area Groundwater) at Naval Weapons Industrial Reserve Plant (NWIRP) Calverton, located in Suffolk County New York. This remedy was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the requirements of the New York State Resource Conservation and Recovery Act (RCRA) Hazardous Waste Permit for the facility (NYSDEC 1-4730-00013/00001-0) dated March 25, 1992, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on information contained in the Administrative Record file for Site 6A-Southern Area. Information not specifically summarized in this ROD or its references, but contained in the Administrative Record has been considered and is relevant to the selection of the remedy at Site 6A-Southern Area. Thus, the ROD is based upon and relies upon the entire Administrative Record file in making the decision. The Department of the Navy's (DON) Environmental Restoration Program (ERP) is responsible for ensuring that appropriate CERCLA response alternatives are developed and implemented as necessary to protect public health, welfare, and the environment. No enforcement activities have been recorded at Site 6A-Southern Area.

Statement of Purpose and Basis

The Navy is the federal lead agency in accordance with federal law and the NCP and provides funding for site cleanups at NWIRP Calverton. This document presents the selected remedy for Site 6A-Southern Area Groundwater. The Navy, in consultation with the New York State Department of Environmental Conservation (NYSDEC), Suffolk County Department of Health Services (SCDHS), and New York State Department of Health (NYSDOH), is implementing this remedial decision document which incorporates applicable or relevant and appropriate State requirements. The site is not listed on the National Priorities List (NPL); however, a copy of this document will be sent to the United States Environmental Protection Agency (USEPA) Region II offices for informational purposes.

This decision is based on the Administrative Record for the site and upon public input to the Proposed Plan presented by the Navy. NYSDEC, the lead state regulatory agency, actively participated throughout the investigation, has reviewed this ROD and the materials on which it is based, and concurs with the selected remedy (Appendix A).

Scope and Role of Response Action

NWIRP Calverton is not a Federal National Priorities List (NPL) Site, but is subject to requirements of the New York State CERCLA and RCRA programs to the extent provided for by federal law. To comply with

RCRA program requirements, the State will be concurrently issuing a RCRA Permit Modification addressing the actions for the Site 6A-Southern Area Groundwater. This ROD documents the final remedial action for Site 6A-Southern Area and does not include or affect any other sites at the facility.

This ROD presents the Navy's Selected Remedy for addressing volatile organic compound (VOC)-contaminated groundwater for Site 6A-Southern Area Groundwater. The source areas for this contaminated groundwater consisted of contaminated soils from Site 6A-Fuel Calibration Area (FCA) and Site 10B-Engine Test House (ETH), which were remediated in 2009 and 2010. VOCs remain in the groundwater down gradient of the source areas at concentrations that exceed federal and **NYSDOH drinking water standards** (maximum contaminant levels [MCLs]). Potable water use of this groundwater would represent a threat to human health. The VOCs are also present in groundwater at concentrations that could represent a potential threat to human health through a soil vapor intrusion pathway. Because most of the Site 6A-Southern Area is government-owned (Navy, New York State, and Suffolk County) state-protected Pine Barrens and wetlands, potential future residential development in the area would be restricted. A portion of the Site 6A-Southern Area Groundwater is located under a privately owned club. A soil vapor intrusion investigation was conducted for the club structures and did not identify risk to human health. VOC-contaminated groundwater flows southeast into the Peconic River. Current surface water analytical results in the Peconic River are less than ecological screening levels and surface water quality criteria indicating that adverse effects are not anticipated at this time. However, higher concentrations of VOCs are present in the northwest portion of the Site 6A-Southern Area Groundwater and are migrating toward the Peconic River. If this higher-concentration VOC-contaminated groundwater migrates without attenuation, short-term, localized impacts to ecological receptors in the Peconic River may occur.

This ROD also identifies potential groundwater treatment at Sites 6A and/or 10B source areas and two contingency remedies to be implemented if higher concentration VOC-contaminated groundwater are not adequately addressed by the Fence Line Treatment System and attenuation. The contingency remedies address ecological receptors in the Peconic River that could be affected. The Navy intends the selected remedy in this ROD to be the final response action for Site 6A - Southern Area Groundwater.

1.1 Selected Remedy

Assessment of the Site

The response action selected in this ROD is necessary to protect the public health, welfare and/or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants. Investigations have identified the presence of the chemicals of concern (COCs), which consist of the following non-chlorinated VOCs: benzene, ethylbenzene, isopropyl benzene, naphthalene, and xylene; and chlorinated VOCs: chloroethane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,1-dichloroethane (DCA), 1,1-dichloroethene (DCE), 1,2,4-trichlorobenzene, 1,1,1-trichloroethane (TCA), and vinyl chloride. These VOCs are present in groundwater at concentrations that pose a potential threat to human health under a future residential land use scenario (potable use of groundwater and soil vapor intrusion pathways) and a potential threat to ecological receptors. The selected remedy for the Site 6A - Southern Area addresses the VOC contamination in groundwater originating from Sites 6A and 10B source areas.

The selected remedy consists of Land Use Controls (LUCs) to prevent human exposure to VOC-contaminated groundwater and soil vapor; extraction, treatment, and discharge of groundwater at the Fence Line Area to reduce or eliminate off property migration of contaminants and to reduce potential impacts to downgradient ecological receptors; and groundwater monitoring. The LUCs would identify and limit the use of VOC-impacted groundwater and establish construction requirements of occupied structures (e.g. testing or subslab depressurization units). Treatment of Fence Line Area groundwater would consist of air stripping of extracted groundwater prior to recharge. The groundwater monitoring would be conducted to evaluate the effectiveness of the remedy; to determine whether optional treatment of groundwater at Sites 6A and/or 10B source areas would be implemented; and to determine whether implementation of contingency remedies are required to protect ecological receptors in the Peconic River.

The decision to implement additional treatment at Sites 6A and/or 10B source areas would be based on evidence of a continuing source of groundwater contamination at these sites that would significantly extend the operation of the Fence Line Area System. Sites 6A and 10B source area contaminated soil was removed in 2009 and 2010. The boundaries of the excavations achieved the cleanup levels, but the depth of the excavation was limited by contact with groundwater. Therefore, residual soil contamination may remain below the water table at these sites. Groundwater monitoring of Sites 6A and 10B source areas is continuing, but it is too soon to determine the overall effectiveness of that cleanup. If required, optional treatment at Sites 6A and/or 10B source areas would consist of air sparging to promote volatilization and biodegradation of residual contamination below the water table.

The decision to implement contingency remedies in off property areas would be based on evidence that the VOC-contaminated groundwater would have a significant impact to ecological receptors. Monitoring would be used to evaluate the effectiveness of the Fence Line Area System and attenuation in reducing the concentration of VOCs in the off property groundwater and potential impacts to ecological receptors. The decision to implement contingency remedies would also consider actual impacts to ecological receptors from construction activities needed to implement the contingency remedies. The contingency remedies consist of Enhanced Insitu Biodegradation (EISB) in the High Concentration Area (greater than 500 micrograms per liter [$\mu\text{g/L}$]) and/or Air Sparging in the Peconic River Area.

Statutory Determinations

The Selected Remedy meets the statutory requirements of CERCLA and is protective of human health and the environment, complies with Federal and State regulations that are applicable or relevant and appropriate to the remedial action, is cost-effective, utilizes permanent solutions to the maximum extent practicable, and satisfies the preference for treatment as a principal element of the remedy. Because this remedy will result in hazardous substances, pollutants, or contaminants remaining in groundwater above levels that allow for unlimited use and unrestricted exposure, a statutory review pursuant to *CERCLA* §121(c), 42 U.S.C. §9621(c), will be conducted within 5 years after the initiation of the remedial action to ensure that the remedy remains protective of human health and the environment.

1.2 Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record¹ file for NWIRP Calverton Southern Area.

- COCs and their respective concentrations (Section 2.3 and associated tables)
- Baseline risk represented by the COCs (Section 2.5)
- Cleanup levels established for COCs and the basis for these levels (Section 2.7)
- How source materials constituting principal threats will be addressed (Section 2.6)
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD (Section 2.4)
- Potential land and groundwater use that will be available at the site as a result of the Selected Remedy (Section 2.9.3 and Table 8)
- Estimated capital, annual operation and maintenance (O&M), and total present value costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 2.9)
- Key factor(s) that led to selecting the remedy (i.e., describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision) (Section 2.9.1)

¹ **Blue text** identifies detailed site information available in the Administrative Record and listed in the References Table.

1.3 Authorizing Signatures

This OU3 ROD represents the selected remedy for Site 6A-Southern Area Groundwater at NWIRP Calverton located in Suffolk County, New York.



Mr. William Cords, NAVAIR

5/16/2012

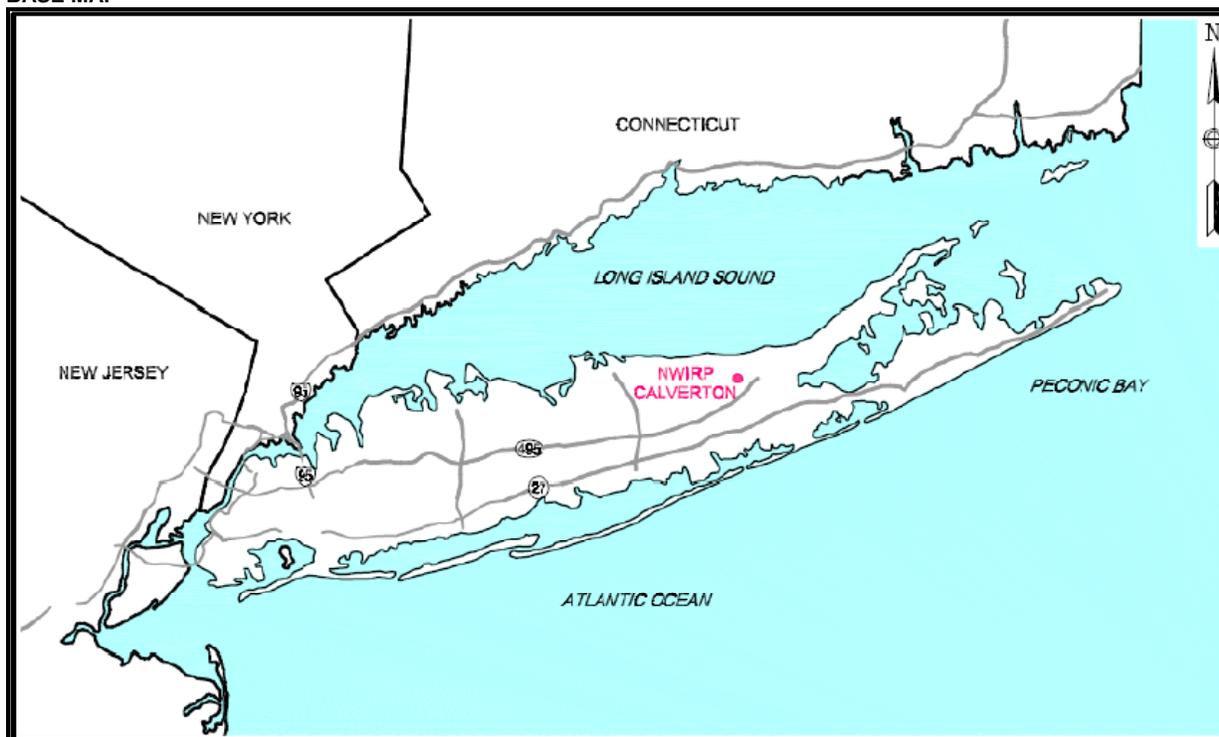
Date

2 Decision Summary

2.1 Site Description and History

The Navy's Calverton facility is located in Suffolk County on Long Island, approximately 70 miles east of New York City (Figure 1). From 1954 to 1996, the facility was operated by Northrop Grumman Corporation (NGC) and its predecessor, who manufactured aircraft parts and subassemblies. NGC phased out its manufacturing process operations and vacated the property in February 1996. Since that time, most of the property contained within the perimeter fence has been conveyed to the Town of Riverhead. The Navy has retained three non-contiguous parcels of land (Parcels A, B, and Site 7 of Parcel C) totaling approximately 209 acres to continue ERP activities, as shown on Figure 2. There are currently no operational activities being conducted on the Navy's retained property.

FIGURE 1
BASE MAP

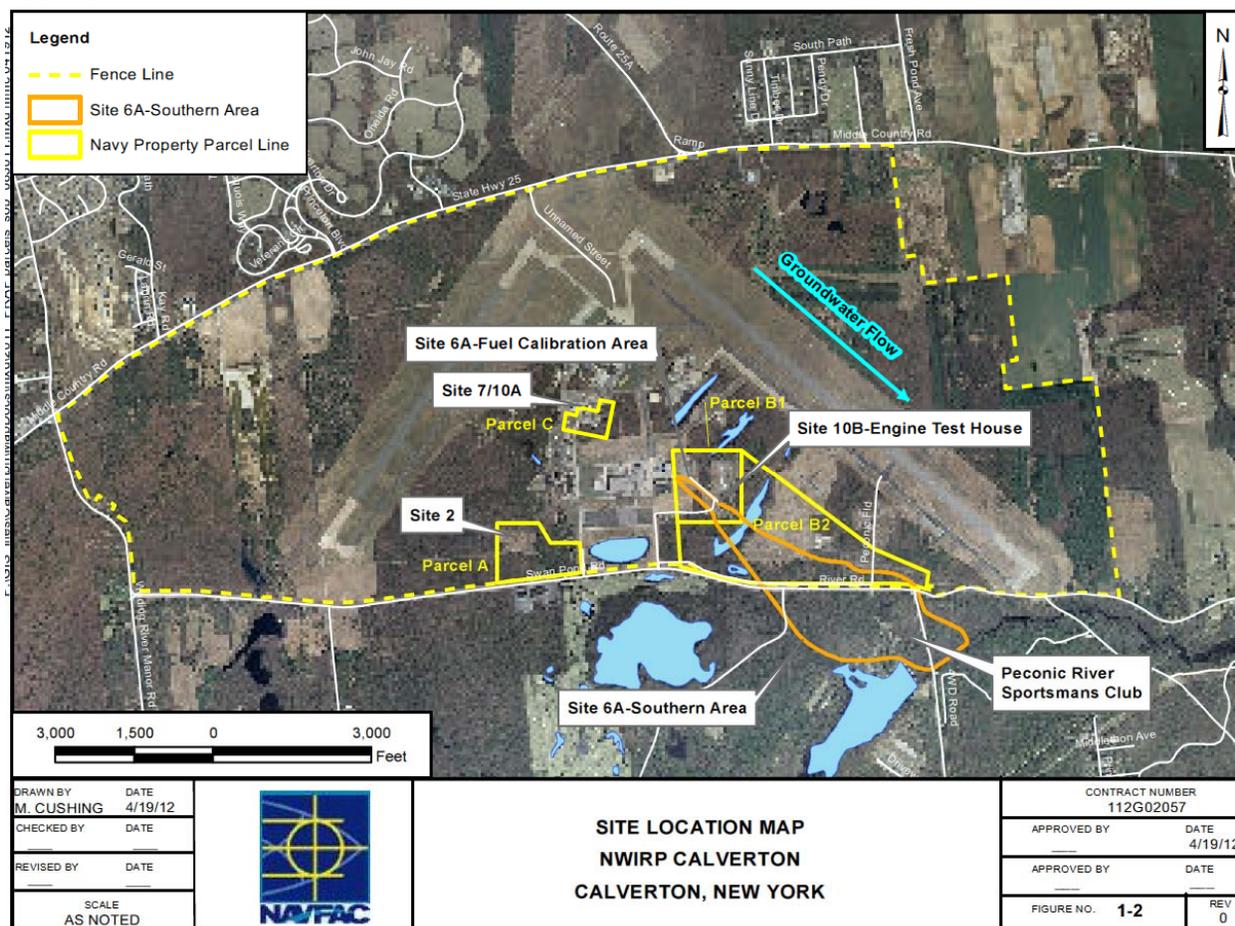


In support of the NWIRP Calverton mission, Sites 6A-FCA and 10B-ETH were **used in the testing of aircraft fuel and engine systems from the late 1950's to 1996**. Activities at Site 6A-FCA and related facilities may have resulted in frequent, small fuel spills onto the area's pavement. Minor maintenance and repairs to the fuel and engine systems were also conducted at the site. Solvents were used during these activities and were likely spilled during their use. A **drainage swale** and culvert from Site 6A-FCA runs adjacent to and hydraulically upgradient of Site 10B-ETH. From the late 1980s to the early 1990s, **groundwater from Site 6A was discharged into this drainage swale and culvert**. During most of these operations, there was no secondary containment in place, and spills of fuels and waste oils to the ground surface likely occurred. Given that the groundwater table is shallow and the soil is permeable sand, releases to the ground surface would leach to and affect the groundwater. Between 2009 and 2010, during the **remediation of site soils**, structures located at these sites were demolished and the area is currently a relatively flat grassy field.

The Site 6A - Southern Area Groundwater originates at Site 6A-FCA in Parcel B1, continues under Site 10B-ETH, an additional source of VOCs in the Southern Area Groundwater, and extends off property to the southeast (Figure 2). The Site 6A-Southern Area Groundwater is approximately 118 acres, consisting

of 25 acres on NWIRP Calverton property and 93 acres off property. This area was investigated because **chlorinated solvents were detected in Navy and Suffolk County monitoring wells** downgradient of the facility. Other than Sites 6A-FCA and 10B-ETH soils, there are no other known or suspected sources of contaminants within the Site 6A-Southern Area. The groundwater flow direction through this area is southeast toward the Peconic River.

FIGURE 2
LOCATION MAP

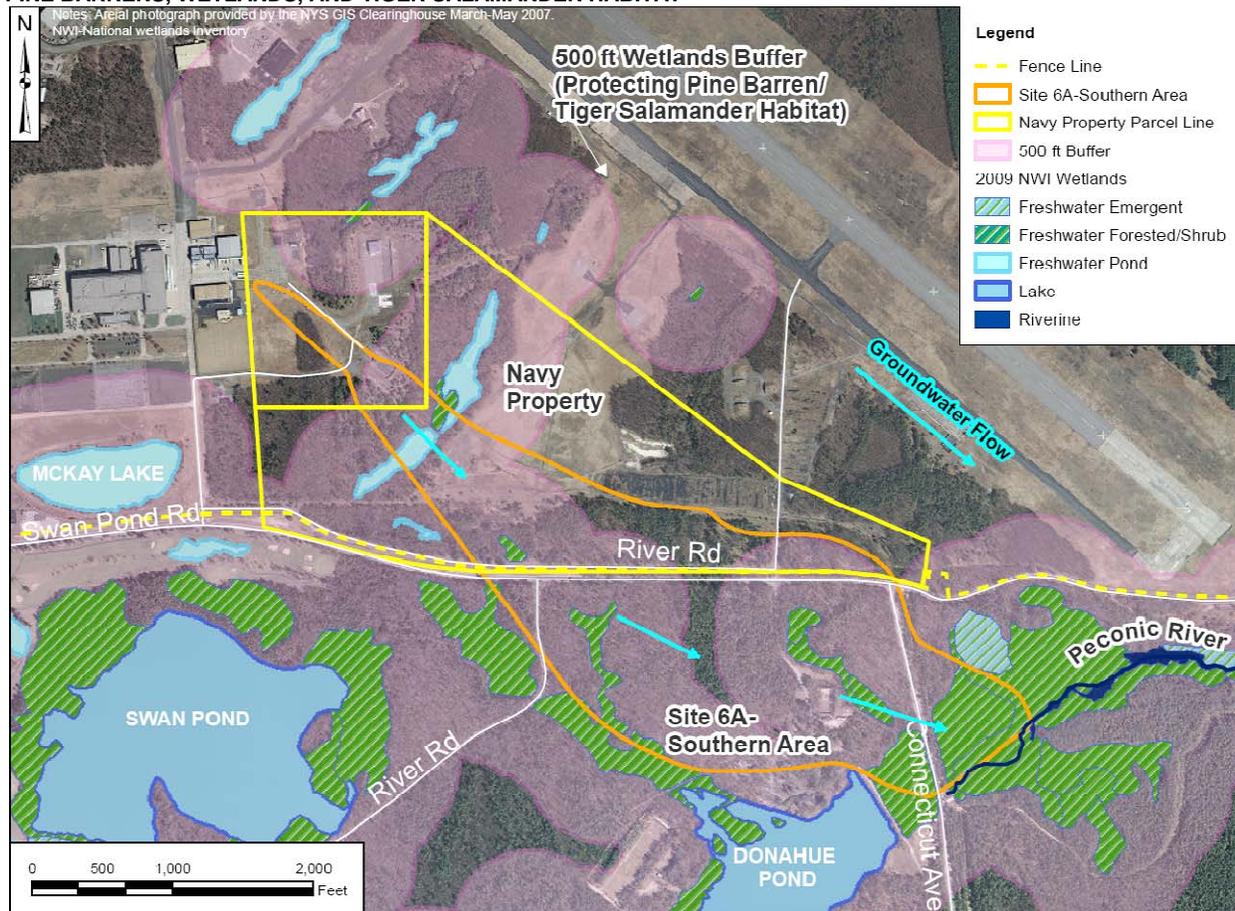


2.2 Site Characteristics

Site 6A-Southern Area Groundwater is defined as the VOC-contaminated groundwater resulting from activities that took place at Sites 6A-FCA and 10B-ETH, and the current areal extent represent the boundary of the Site 6A-Southern Area. Except for an area near the Peconic River where the plume rises, the plume is generally 30 to 100 feet below ground surface. Site 6A-Southern Area is mostly wooded, and includes two shallow ponds near the northern edge. The ponds receive runoff through a drainage swale and culvert from Site 6A-FCA.

As a result of relatively flat topography, sandy soils, and/or proximity to the Peconic River; Pine Barrens and wetlands are common throughout the Southern Area (Figure 3). Other notable features in this area are the Tiger Salamander habitat (a state-endangered species) and the Peconic River that is classified as a New York Wild, Scenic, and Recreational River. The general topography of the Southern Area is mostly flat, with a gentle slope towards the Peconic River. There are freshwater forested/shrub wetlands throughout the area mostly off property and next to the Peconic River.

FIGURE 3
PINE BARRENS, WETLANDS, AND TIGER SALAMANDER HABITAT



The geology at NWIRP Calverton consists of a mixture of sandy and clayey deposits. There is fine to medium-grained sand down to approximately 50 feet below ground surface (bgs) where a silty clay unit (aquitard) is encountered. This aquitard is about 25 feet thick at Site 6A-FCA and thins to the southeast, eventually pinching out off property approximately 1,000 feet to the northwest of the Peconic River. Beneath this silty clay unit is a fine to medium-grained sand that extends down to a deeper, basal silty clay unit at 130 feet bgs, which is interpreted to be continuous across the study area. Boring and **gamma logs from the southeastern portion of Site 6A-Southern Area** show that there is 100 feet of fine to medium-grained sand overlying a 10-foot thick silty clay layer.

The geologic units encountered within the study area appear to be generally flat-lying, consistent with what would be expected for the glacial deposits on Long Island. The upper contact of the Magothy Formation, being an erosional surface, is expected to be flat lying to undulating, reflecting the former topography, even though the formation itself is known to dip to the south.

During the **Phase 2 Remedial Investigation (RI)**, a focused groundwater investigation was performed in the Site 6A-Southern Area to determine whether the Peconic River was the discharge point for shallow groundwater migrating from the facility, or conversely whether some groundwater bypassed the river and migrated to areas further south. Potentiometric surface interpretations based on water level data from the well clusters indicated that the river is the ultimate discharge point for groundwater to a depth of up to 80 feet bgs in this area. A subsequent investigation confirmed that groundwater to a depth of 120 feet bgs also flowed upward to the river. Groundwater in the Site 6A-Southern Area was found to be migrating east-southeast towards the river.

Across the Site 6A-Southern Area to the Peconic River, the water table has generally been encountered at 5 to 20 feet bgs. Near the Peconic River, the depth to groundwater decreased to less than 5 feet bgs. In 1997, the Long Island Chapter of the Nature Conservancy prepared several water table contour maps for the general Calverton area. These maps indicate groundwater flow within the Site 6A-Southern Area is generally to the east-southeast, towards the Peconic River. An overall groundwater flow gradient across the study area of approximately 0.0012 foot/foot was calculated based on the water table contour maps. Considering the **water level data collected during 2010**, the representative average hydraulic gradient across the Southern Area is 0.002 foot/foot. The hydraulic gradient near the River is approximately 0.003 to 0.004 foot/foot. The hydraulic characteristics of the Upper Glacial aquifer at the facility were evaluated during **two pumping tests conducted in 2010**. Based on testing, the average horizontal conductivity of the aquifer near and on NWIRP Calverton is 221 feet per day and the average horizontal conductivity of the aquifer formation near the Peconic River is 42 feet per day. The effective porosity of the aquifer was assumed to be 0.25 (fine to medium sand). Considering the hydraulic gradient of 0.002 to 0.003 foot/foot and assuming the porosity is 25 percent, the groundwater seepage velocities through the Southern Area near the facility and near the Peconic River are estimated to be 640 feet per year and 180 feet per year, respectively.

2.3 Previous Investigations

Site 6A-Southern Area was characterized under several investigations and studies between 1996 and the present. Based on the investigation findings, the Chemicals of Potential Concern (COPCs) within the Site 6A-Southern Area Groundwater are TCA and associated degradation products (e.g., DCA, DCE and chloroethane) and fuel constituents (e.g., benzene, ethylbenzene, and xylene) in groundwater. Table 1 provides a chronological list and brief summary of previous investigations conducted at the Site 6A-Southern Area and summarizes the sampling strategy employed during each investigation. The respective investigations are a part of the Administrative Record and can be referenced for further details for specific sampling strategies, media investigations, and when and where the sampling was performed.

TABLE 1
PREVIOUS INVESTIGATIONS SUMMARY

Previous Study/Investigation ⁽¹⁾	Date	NIRIS Document Number ⁽²⁾	Investigation Activities
RCRA Facility Investigation (RFI) for Sites 1, 2, 6A, and 7 (HNUS, 1995)	1995	N96095-000191	This report was prepared to aid in the development of the RFI Work Plan for the facility. It identified potential corrective measures technologies, and the corresponding field data to be collected during the Facility Investigation. Technologies that were considered included on property or off property containment, treatment, remediation, and/or disposal of contamination. The data collected was to be used to support the evaluation and selection of these technologies.
RCRA Facility Assessment (RFA) - Sampling Visit Addendum (C.F. Braun, 1997)	1996	N96095-000229	This addendum concluded that additional testing was necessary to confirm the presence or absence of contamination at several sites, including Site 10B-ETH and the Site 6A-Southern Area. The nature and extent of petroleum contamination at Site 10B-ETH was better defined. No action was recommended for the Site 6A-Southern Area based on limited contamination findings.
Phase 2 RFI for Sites 6A, 10A, 10B, and Southern Area (C.F. Braun, 1998)	1998	N96095-000306	This RFI served as a supplemental report to the RFI and RFI Addendum, addressing Sites 6A-FCA, 10B-ETH, and the Site 6A-Southern Area. A small area of fuel-type contaminated groundwater was present at Site 6A-FCA. The free product at Site 6A-FCA was still being addressed by NGC. The Navy would proceed with an interim removal action to re-initiate free product recovery at Site 6A-FCA and 10B-ETH. Due to a large area of low-level detections in the Southern Area, the remediation process proceeded to the Corrective Measures Study (CMS) step.
Phase 2 Remedial Investigation (RI) for Sites 6A, 10B, and Southern Area (Tetra Tech, 2001)	2001	N96095-000456	The purpose of the Phase 2 RI was to install additional on- and off property groundwater monitoring wells to fill remaining gaps in data used to delineate the plume. Results of the investigation were that the nature and extent of groundwater contamination had been defined, and no data gaps remained. The Phase 2 RI recommended proceeding to a Feasibility Study (FS). Chlorinated volatile organic compounds (VOCs) were the primary site contaminants. Additional data would be collected during the FS and remedial action (RA) stages as necessary.

Previous Study/Investigation ⁽¹⁾	Date	NIRIS Document Number ⁽²⁾	Investigation Activities
Final Evaluation Report - Review of RI for Sites 6A, 10B, and Off-Site Southern Area (SCA Associates, 2003)	2003	N96095-000552	SCA Associates were asked to review the Navy's investigation of groundwater contamination associated with former jet engine testing operations at the plant. The purpose of the review was to help the Restoration Advisory Board (RAB) community members understand the results of the investigation and conclusions about the nature and extent of contamination. Additional groundwater sampling was recommended to collect additional information on contaminant transport through deep strata.
Groundwater and surface water sampling. Data Summary Report for Site 6A and the Southern Area (Tetra Tech, 2005)	2004-2005	N96095-000616	Groundwater and surface water samples were collected at Site 6A-FCA and Site 6A-Southern Area from September 2004 through March 2005. The summary report concluded the following: <ul style="list-style-type: none"> • VOC- and petroleum-contaminated groundwater was delineated at Site 6A-FCA. The contamination did not extend to the nearest downgradient monitoring wells at the site. The contamination was limited vertically to approximately 60 feet (ft) below ground surface (bgs), where an silty clay aquitard unit is present, preventing downward migration. Concentrations had decreased significantly since 1994. Limited quantities of free product were also present. • The off property contamination was not fully delineated, and further sampling was recommended. The horizontal extent was found to be limited by the Peconic River (receiving water body). Sampling in the river found no impact from site-related contaminants. • The nature and extent of contamination was defined enough to proceed to a CMS. This CMS addressed contaminated soil and groundwater at Sites 6A-FCA and 10B-ETH and the on property portion of Site 6A-Southern Area. The recommended corrective action / remedial alternative for soil at Sites 6A-FCA and 10B-ETH was excavation and off property treatment and disposal. The recommendation for the on property groundwater was LUCs and monitored natural attenuation (MNA).
FS/CMS for Site 6A, Site 10B, and On-Site Southern Area Plume (Tetra Tech, 2006)	2006	N96095-000639	This CMS addressed the off property portion of the Site 6A-Southern Area. Several corrective measure alternatives were evaluated, including LUCs, groundwater extraction and treatment, in situ biological treatment, MNA and LUCs. No alternative was recommended, deferring to future discussion with and decision by NYSDEC.
Draft FS/CMS for Off-Site Southern Area Plume (Tetra Tech, 2006)	2006	N96095-000629	The October 2006 investigation was performed to define the extent of the Site 6A-Southern Area Groundwater, determine whether site-related contamination enters the Peconic River, and determine potential adverse effects on ecological receptors in the river. Trichloroethane (TCA) and associated daughter products (e.g., dichloroethane [DCA] and chloroethane) were detected throughout the groundwater plume. DCA was detected in one surface water sample but at concentrations less than the surface water quality standard. No site-related contaminants were detected in sediment samples.
Groundwater, surface water, and sediment sampling. Results of October 2006 Groundwater, Surface Water, and Sediment Testing - Southern Area (Tetra Tech, 2007)	2006	N96095-000715	This Statement of Basis documented the proposed corrective measures for Sites 6A-FCA and 10B-ETH. The on property portion of the Site 6A-Southern Area was included. The recommended remedial action for soil at Sites 6A-FCA and 10B-ETH was excavation and off property transportation and disposal. The recommended remedial action for groundwater at these sites was MNA and LUCs.
Statement of Basis for Site 6A, 10B, and the On-Site Southern Area Plume (Tetra Tech, 2007)	2007	N96095-000658	The primary objectives of this January through February 2008 investigation were to develop a better understanding of the current site characteristics, presence of contamination, and to identify potential exposure pathways and receptors. Additional monitoring wells were installed in the Site 6A-Southern Area. Groundwater samples were collected at Sites 6A-FCA, 10B-ETH, and Site 6A-Southern Area, and surface water samples were collected from the Peconic River. 1,1-DCA was found at Site 6A-FCA and Site 6A-Southern Area with exceedances of NYSDOH MCLs in several wells. This distribution linked Site 6A-FCA, through the Site 6A-Southern Area and the Peconic River Sportsmans Club (PRSC), to a monitoring well adjacent to the Peconic River. The report recommended the installation of additional monitoring wells and recurring groundwater monitoring to establish temporal contaminant data.
Groundwater and Surface water sampling. Data Summary Report for Pre-Design Groundwater Investigation at Site 6A, Site 10B and the Southern Area (Tetra Tech, 2008)	2008	N96095-000681	The August 2008 groundwater, surface water, and sediment sampling activities were summarized and the data were evaluated in this report. The report recommended locations for additional temporary and permanent monitoring wells, as well as continued groundwater sampling.
Groundwater, surface water, and sediment sampling. Data Summary Report for Groundwater Investigation at Site 6A, Site 10B, and Southern Area (Tetra Tech, 2008)	2008	N96095-000690	These letter reports included the sample results for water testing conducted at the PRSC in December 2008 and March, June, September, and November 2009. Several VOCs were detected above NYSDOH drinking water standards in pre-treatment samples. Quarterly reports were submitted for sampling efforts conducted in December 2008 and March, June, September, and November 2009.
Groundwater sampling. Quarterly Sampling Reports for PRSC Water Supply (Tetra Tech, 2008-2010)	2008-2010	N96095-000054, 000113,000693,0 00326,000766,00 0763,000770,000 721,000738	
EE/CA for Site 6A-Southern Area Off-Site Water Supply (Tetra Tech, 2009)	2009	N96095-000844	This Engineering Evaluation/Cost Analysis (EE/CA) developed and evaluated removal action alternatives for an off property potable water supply for the PRSC and vicinity. Alternatives evaluated included an extension of municipal water line and water well treatment. The EE/CA concluded that extending a municipal water line would be a permanent remedy that eliminates exposure with no long-term annual costs. This alternative provides the best balance of trade-offs based on evaluation criteria. The water line extension is expected to occur in 2011.

Previous Study/Investigation ⁽¹⁾	Date	NIRIS Document Number ⁽²⁾	Investigation Activities
Groundwater Sampling. Data Summary Report for 2009 Groundwater Investigation Activities Site 2, 6A, 10B, and Southern Area (Tetra Tech, 2010)	2009-2010	N96095-000745	This document details the 2009 groundwater investigation activities conducted at Site 6A-Southern Area to address data gaps, supplement the groundwater monitoring network, and develop an understanding of the current site characteristics, including the presence of contamination. Comparable concentrations and/or general decreasing contaminant concentrations were observed in Southern Area monitoring wells. The November 2009 microcosm/biodegradation study showed that conditions in most of the study area are suitable for anaerobic biodegradation of VOCs. Recommendations included continuing annual groundwater monitoring, installing additional temporary monitoring wells to further delineate contamination, conduct pumping tests to support an FS/CMS, and conduct an enhanced reductive dechlorination pilot study in the Site 6A-Southern Area to support an FS/CMS.
Action Memorandum, Water Supply Line for the Off-Site Southern Area (Navy, 2010)	2010	N96095-000755	This Action Memorandum documents the decision by the Navy to extend a municipal water line (potable water supply) to the PRSC. This non-time-critical removal action would eliminate human health risks associated with exposure to VOCs in groundwater. The action is expected to take place in 2011.
Aquifer Pump Tests. Technical Memorandum: Aquifer Test Analysis for Site 6A - Southern Area (Tetra Tech, 2011) Appendix A of Corrective Measures Study/Feasibility Study (CMS/FS)	2010	N96095-000805	This technical memorandum presents the analysis of the aquifer testing performed in July 2010 at two locations at Site 6A-Southern Area. The testing was performed to estimate aquifer hydraulic parameters to evaluate the feasibility of groundwater extraction for VOC-contaminated groundwater in the Site 6A-Southern Area Groundwater and to evaluate potential impacts to wetlands from groundwater extraction. Based on aquifer testing, pumping rates of 120 gallons per minute (gpm) for the near-facility area and 100 gpm for the Connecticut Avenue area would likely be sustainable. Draw downs observed within the wetlands at the water table/wetland surface indicate that long-term pumping in the area would impact water levels in nearby wetlands.
Data Summary Report for 2010 Groundwater Investigation Activities at Site 2, Site 6A, Site 10B, and Southern Area (Tetra Tech, 2011)	2011	N96095-000785	This document details the 2010 groundwater investigation activities conducted at several sites, including Sites 6A-FCA, 10B-ETH, and the Site 6A-Southern Area to address data gaps, supplement the groundwater monitoring network, and further develop the conceptual site model (CSM) for the Site 6A-Southern Area Groundwater. Based on collected data, the Site 6A-Southern Area Groundwater is adequately defined. Concentrations of VOCs decrease with distance from River Road. This data is the principle information used in the 2011 CMS/FS .
Corrective Measures Study/Feasibility Study (CMS/FS) Southern Area Groundwater Plume (Tetra Tech, 2011)	2011	N96095-000805	This CMS addressed the entire Site 6A-Southern Area Groundwater; several Corrective Measures Alternatives were evaluated, including, air sparging, groundwater extraction, treatment and injection, anaerobic enhanced in situ biological treatment, MNA and LUCs. No alternative was recommended, deferring to future discussion with and decision by NYSDEC.
Data Summary Report Soil Vapor Intrusion Investigation Peconic River Sportsman's Club (Tetra Tech, 2011)	2011	N96095-000797	This investigation included indoor air, outdoor air, crawl space, and sub-slab vapor sampling conducted at the PRSC in February 2011. Air samples were analyzed for VOCs via USEPA TO-15 method. Based on the sampling results none of the VOC detections in indoor air exceeded the NYSDOH Air Guideline Values. Based on the NYSDOH matrices, no further action is warranted at the PRSC.
Corrective Measures Study (CMS) Addendum Southern Area Groundwater Plume (Tetra Tech, 2011)	2011	N96095-000818	This report is an addendum to the 2011 CMS/FS for Site 6A-Southern Area Groundwater. The addendum includes the recommended remedy which includes, LUCs, monitoring, and the installation and operation of a groundwater extraction, treatment, and discharge system at the NWIRP southern property line (Fence Line Treatment System). Also, based on monitoring data, the preferred alternative includes the potential installation and operation of an air sparging system at Site 6A-FCA (Source Area), In-situ Biodegradation in the off property Site 6A-Southern Area (High Concentration Area [VOCs greater than 500 µg/L]), and Air Sparging at the Peconic River Area. The preferred alternative is based on a combination of CMS/FS alternatives 3, 4, and 7.

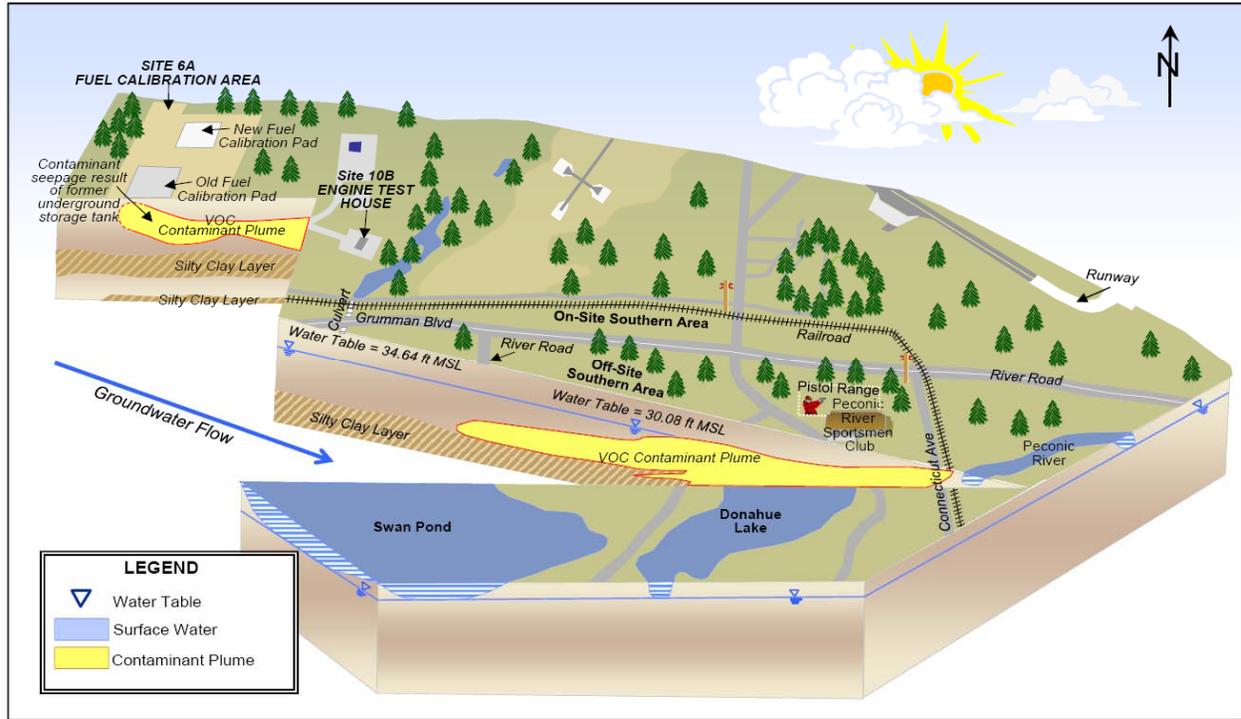
Notes:

- (1) The documents listed are available in the Administrative Record and provide detailed information used to support remedy selection for the Site 6A-Southern Area Groundwater.
- (2) (NIRIS) Naval Installation Restoration Information System-NIRIS record numbers are synonymous with Administrative Record numbers

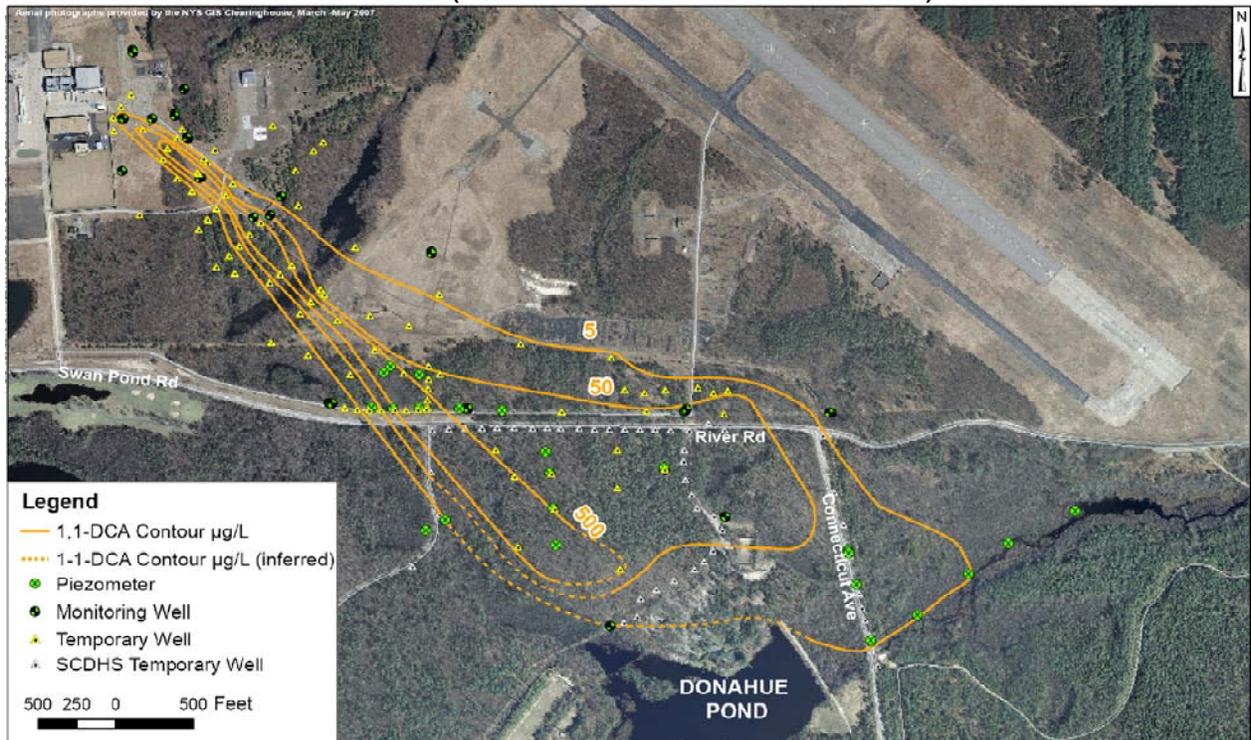
Site 6A-Southern Area **CSM** (Figure 4) depicts the site characteristics, nature and extent of contamination, and transport pathways for the Site 6A-Southern Area Groundwater. Site 6A-Southern Area is a general region of VOC-impacted groundwater located within and downgradient of Sites 6A-FCA and 10B-ETH. The primary VOC is DCA and its presence defines the boundary of Site 6A-Southern Area. Other chlorinated and non-chlorinated VOCs are present at lower concentrations and are contained within the plume boundary defined by DCA. The **VOC-impacted groundwater** is believed to have resulted from one or more releases of chlorinated solvents from a waste solvent tank at Site 6A-FCA (Source Area), intermittent smaller releases at Sites 6A-FCA and 10B-ETH, and/or from potential overland migration through a series of ditches and ponds in the area and groundwater migration. In addition, a free product recovery system discharged **VOC-impacted groundwater** into an unlined ditch and culvert

that ultimately discharged to a pond located between Site 6A-FCA and the facility property line. The Site 6A-Southern Area Groundwater VOC plume extends southeasterly from Sites 6A-FCA and 10B-ETH with the downgradient edge limited by the Peconic River (Figure 5).

**FIGURE 4
CONCEPTUAL SITE MODEL**



**FIGURE 5
DCA ISOCONCENTRATION CONTOUR MAP (SITE 6A – SOUTHERN AREA GROUNDWATER)**



In addition to investigations conducted by the Navy, SCDHS conducted groundwater investigations in the off property portion of Site 6A-Southern Area in 2008 and 2009. These data are summarized in the [Data Summary Report for 2010 Groundwater Investigation Activities](#). The isoconcentration contours presented in Figure 5 generally include the SCDHS data. However, SCDHS also reported DCA in 2 of approximately 30 samples, collected just south of River Road 800 feet west of the intersection of Connecticut Avenue at concentrations greater than 500 µg/L (644 µg/L and 545 µg/L). Because of the infrequent exceedances, a separate 500 µg/L isoconcentration contour was not developed in that area.

Groundwater: The COPCs and maximum groundwater VOC concentrations are provided in Table 2. [NYSDOH MCLs](#) (Human Health), [USEPA MCLs](#) (Human Health), [National Ambient Water Quality Criteria \(NAWQC\)](#) (Human Health), [NYSDEC Class C Surface Water Quality Standards \(SWQS\)](#) (Human Health and Ecological Receptors), [Oakridge National Laboratories \(ORNL\) Surface Water Bench Marks \(SWBMs\)](#) (Ecological Receptors), and [USEPA Regional Screening Levels \(RSLs\) for Tap Water \(Human Health\)](#) are included in the table for comparison purposes. Groundwater COPCs in the Site 6A-Southern Area Groundwater consists mainly of TCA and associated breakdown products: DCA; DCE, and chloroethane. Other VOCs are present, but at lower concentrations and are detected less frequently. These VOCs were detected in groundwater at the former source area (Site 6A-FCA) at higher concentrations in the mid-1990s.

All the VOCs identified in Table 2 were identified as chemicals of concern because the maximum detected concentration was in excess of [NYSDOH MCLs](#). The highest detections of VOCs (greater than 500 µg/L) were present in samples collected at Site 6A-Southern Area along a southeasterly line (SA-TW-348, SA-TW-349, SA-TW-343, SA-TW-331, SA-TW-335, SA-PZ-138I, and SA-PZ-143) (Figure 6).

The VOC-contaminated groundwater flows into the Peconic River. Ecological receptors in the Peconic River could be affected at point of discharge and human health could be affected through ingestion of impacted aquatic life (fish). Surface water and sediment sampling results for the Peconic River have not exceeded federal or state surface water quality criteria. If the Site 6A-Southern Area Groundwater is migrating without sufficient attenuation, and higher VOC concentrations could result in the pore water and sediment under the Peconic River. Dichlorobenzenes, DCA, DCE, trichlorobenzene, TCA, and vinyl chloride concentrations in groundwater exceed [NYSDEC SWQS](#) or [ORNL SWBMs](#). Compliance with [NYSDOH MCLs](#) in groundwater would achieve actual or potential standards for surface water and associated sediment.

Soil Vapor: There are no current structures located above the Site 6A Southern Area VOC-impacted groundwater, and as a result, this pathway is not complete. Site 6A-Southern Area is mostly under federal, State, or County control and designated as Pine Barrens or wetlands that restrict construction of occupied structures. There are two occupied structures located on PRSC property that are near the VOC-impacted groundwater. In 2011, a soil vapor intrusion investigation was conducted for these structures and based on the results, adverse effects are not anticipated. Compliance with [NYSDOH MCLs](#) in groundwater would be expected to be protective of human health through soil vapor intrusion.

Figures 6 (plan view map) and 7 (cross section map) show the estimated horizontal extent of DCA in the Site 6A-Southern Area Groundwater, which is considered representative of the extent of all VOC-impacted groundwater (i.e., the DCA isoconcentration contour encompasses the entire plume). The [plume area measures](#) approximately 118 acres, with approximately 25 acres on property (north of the fence line) and 93 acres off property (south of the fence line). The width, thickness, and depth of the VOC-impacted groundwater varies based on location. The width ranges from approximately 150 to 2,000 feet, the thickness ranges from approximately 9 to 50 feet, and the depth ranges from approximately 2 to 90 feet bgs.

TABLE 2
SITE 6A – SOUTHERN AREAS GROUNDWATER COPCs

Groundwater Chemical of Concern	Maximum Concentration (µg/L)	NYSDOH MCL ⁽¹⁾ (µg/L)	NAWQC ⁽²⁾ (µg/L)	NYSDEC Class C SWQS ⁽³⁾ (µg/L)	ORNL SWBM ⁽⁵⁾ (µg/L)	USEPA MCL ⁽⁶⁾ (µg/L)	USEPA RSL Tap Water ⁽⁷⁾ (µg/L)
Receptor		HH	HH	HH/Eco	Eco	HH	HH
Benzene	17	5	2.2	10 ^{*(3)}	130	5	0.39
Chloroethane	970	5	--	--	--	--	--
Dichlorobenzene, 1,2- (ortho)	6.4	5	420	5 ^{** (4)}	14	600	280
Dichlorobenzene, 1,3- (meta)	3	5	320	5 ^{** (4)}	71	--	--
Dichlorobenzene, 1,4- (para)	13	5	63	5 ^{** (4)}	15	75	0.42
Dichloroethane, 1,1-	2,100	5	--	--	47	--	2.4
Dichloroethene, 1,1-	110	5	330	--	25	7	260
Ethylbenzene	120	5	530	--	--	700	1.3
Isopropyl Benzene	35	5	--	--	--	--	390
Naphthalene	190	50	--	--	--	--	0.14
Trichlorobenzene, 1,2,4-	7.1 J	5	35	5 ^{** (4)}	110	70	0.99
Trichloroethane, 1,1,1-	1,200	5	--	--	11	200	7500
Vinyl Chloride	8.1 J	2	0.025	--	--	2	0.015
Xylene	120	5	--	--	--	10,000	190

Notes:

µg/L - micrograms per liter J - Estimated Value -- Not applicable HH-Human Health Eco-Ecological Receptor

1. NYSDOH MCL. 10 NYCRR, Part 5, Subpart 5-1 Public Water Systems, Tables 1 through 3. http://www.health.ny.gov/regulations/nyccr/title_10/part_5/subpart_5-1_tables.htm#table1.
2. National Ambient Water Quality Criteria (NAWQC), associated with human health. <http://water.epa.gov/scitech/swguidance/waterquality/standards/current/upload/nrwqc-2009.pdf>.
3. NYSDEC Surface Water Quality Standards (SWQS) (6 NYCRR Part 703, Section 703.5[f], Table 1). <http://www.dec.ny.gov/regs/4590.html>.
* Criteria associated with human health via fish consumption.
** Criteria associated with aquatic (chronic).
4. Applies to the sum of 1,2-; 1,3-; and 1,4-dichlorobenzene; or applies to the sum of 1,2,3-; 1,2,4-; and 1,3,5-trichlorobenzene.
5. Oak Ridge National Laboratories (ORNL) Surface Water Bench Marks (SWBM) - Table 3 (secondary chronic values), Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1997 Revision (Hull, Jones, and Suter II, 1997). <http://www.esd.ornl.gov/programs/ecorisk/documents/tm95r4.pdf>.
6. USEPA Drinking Water Contaminants <http://water.epa.gov/drink/contaminants/index.cfm>
7. RSL (Regional Screening Levels) for Tap water <http://www.epa.gov/reg3hwmd/risk/human/rb-concentration-table/Generic-Tables/index.htm>

FIGURE 6
SITE 6A-SOUTHERN AREA GROUNDWATER CROSS SECTION A - A' LOCATION MAP

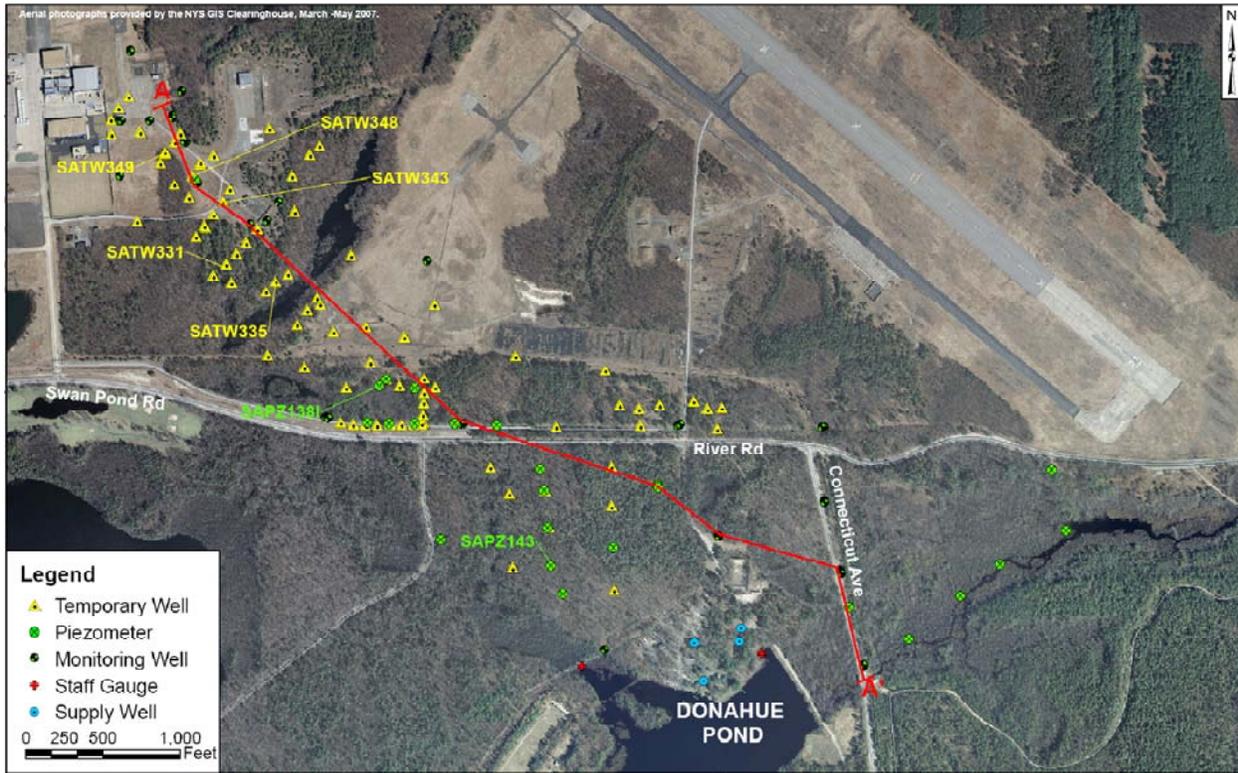
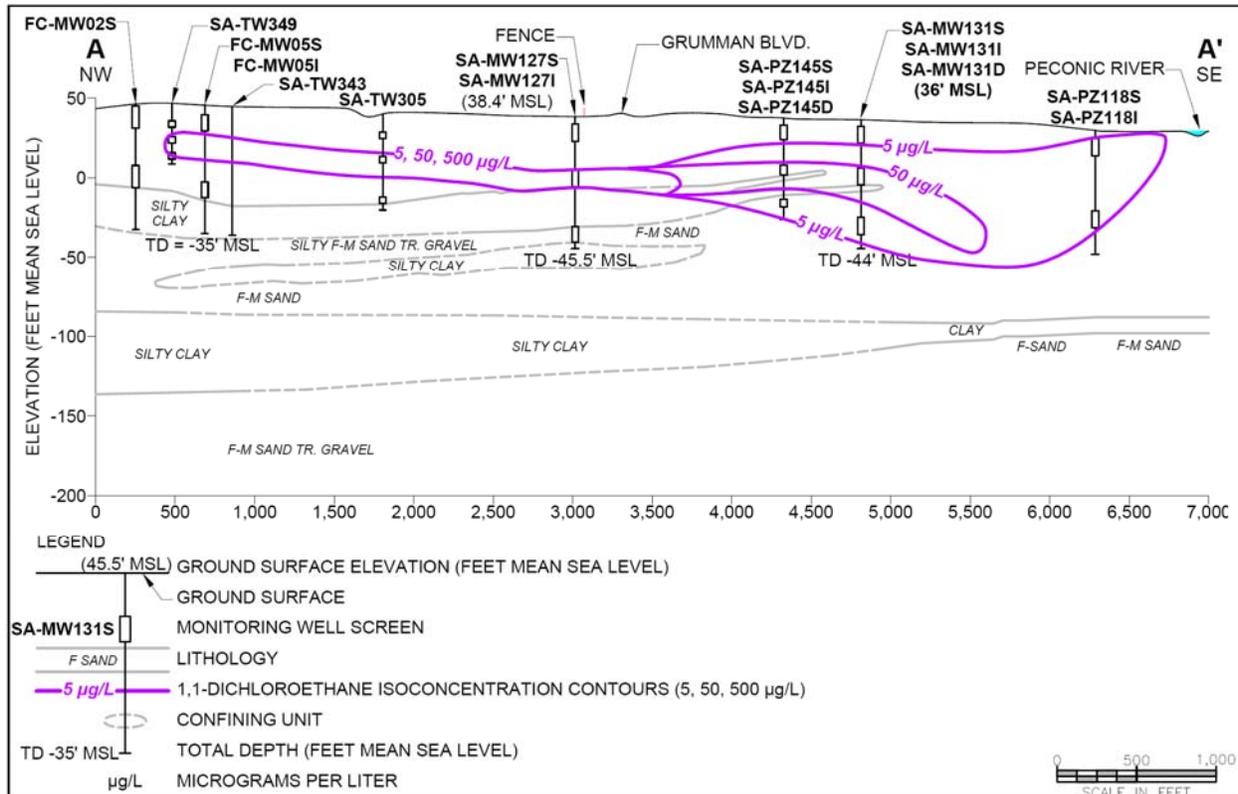


FIGURE 7
SITE 6A-SOUTHERN AREA GROUNDWATER CROSS SECTION MAP A TO A'



From Site 6A-FCA to the southeast, and along approximately 75 percent of the plume length, there is a silty clay unit at a depth of approximately 50 to 60 feet bgs. Where present, most of the VOC-impacted groundwater is found above this unit and the thickness of the VOC-impacted groundwater is approximately 5 to 15 feet. For the remaining length of the plume to the Peconic River, the shallow silty clay unit ends and initially the VOC-impacted groundwater migrates downward. The downward migration appears to result from a hydraulic balancing of groundwater above and below the shallow silty clay unit. VOC-impacted groundwater in this downgradient area is approximately 40 to 50 feet thick and present at a depth of 40 to 90 feet bgs. Another silty clay unit is present at a depth of approximately 130 feet bgs in this area and VOC-impacted groundwater has not been detected at this depth or below the lower silty clay unit. Near the Peconic River, groundwater flows upward and the VOC-impacted groundwater is generally found near the water table.

From Site 6A-FCA to the fence line, the width of the groundwater plume is approximately 150 to 200 feet. Within this area, the concentration of VOCs is relatively constant (i.e., DCA concentrations of 2,100 µg/L near Site 6A-FCA and 1,100 µg/L near the fence line). However, south of the fence line, the width of the plume expands to approximately 2,000 feet. Groundwater mounding effects from Donahue Pond are suspected to interact with groundwater flow south of the fence line. Based on potentiometric surface maps developed using quarterly water level measurements, groundwater flow near Donahue Pond varies from southeasterly under high precipitation rates to easterly, and even northeasterly under lower precipitation rates. These effects from the groundwater mounding may also occur as far north as River Road. This variation in groundwater flow directions may account for the apparent widening of the plume in the off property area.

Using the estimated thickness of VOC-impacted groundwater throughout the Site 6A-Southern Area Groundwater, the area of the plume (118 acres), and the estimated porosity (0.25), the volume of VOC-impacted groundwater is estimated to be 340 million gallons. The total mass of chlorinated VOCs in the Site 6A-Southern Area Groundwater is estimated to be 375 pounds (see Appendix E of the [CMS/FS](#)). For the mass of chlorinated VOCs, approximately 25 percent (93 pounds) is located on property (north of the fence line) and 75 percent (282 pounds) is located off property (south of the fence line).

2.4 Current and Potential Future Land and Water Uses

Site 6A-Southern Area is located on- and off property of NWIRP Calverton. NWIRP Calverton is no longer an active facility; the Navy has transferred most of its NWIRP Calverton property to the Town of Riverhead for economic redevelopment. The on property portion of Site 6A-Southern Area is currently owned by the Navy. Once the property meets environmental conditions it will be transferred to the Town of Riverhead for economic redevelopment, with LUCs. The off property Site 6A-Southern Area also consists of several parcels that are owned by New York State, Suffolk County, and PRSC. Future land use is anticipated to be consistent with current land use, which is primarily environmental conservation and recreational use. The affected groundwater is part of the Suffolk County sole source aquifer with the potential for future use as a drinking water use. Currently, the Navy is unaware of any plans to install additional potable water supply wells in the vicinity of Site 6A-Southern Area. VOC-impacted groundwater flows into the Peconic River, where ecological receptors may be adversely impacted. Detailed results of the human health risk assessment (HHRA) are presented in the [RFI Report](#). An ecological risk assessment is provided in the [CMS/FS](#).

Groundwater serves as the source of drinking water for the population residing within a 4-mile radius of the facility. Private wells, wells on two government-owned facilities (Town of Riverhead and Brookhaven National Laboratory), and two municipal water systems (Riverhead Water District and Suffolk County Water Authority) supply the drinking water needs of the study area. The nearest public water supply well is located approximately 1.5 miles northwest of Site 6A-FCA. Two of five active [supply wells at the PRSC have been impacted](#) by the Southern Area plume. One well was shut down because of VOC detections, and groundwater from another well is treated with liquid-phase granular activated carbon prior to use. A [municipal water line](#) is being constructed by the Navy in 2012 to extend potable city water to the PRSC.

2.5 Summary of Site Risks

Potential human health risks within the Site 6A-Southern Area Groundwater have been compared to the [Human Health Risk Assessment performed for Site 6A in the 1995 RFI](#). Ecological risks were discussed in the [CMS/FS](#). The [RFI](#), [CMS/FS](#), following subsections, and Table 3 briefly summarizes the findings.

TABLE 3
SUMMARY OF HUMAN HEALTH AND ECOLOGICAL RISKS BY MEDIA

Media	Human Health Risk	Ecological Risk
Surface Soil	Acceptable	Not Applicable
Subsurface Soil	Acceptable	Not Applicable
Groundwater	Unacceptable	Potential Future Risk through Pore Water
Sediment	Acceptable	Potential Future Risk through Pore Water
Surface Water	Potential Future Risk	Potential Future Risk
Soil Vapor Intrusion	Potential Future Risk	Not Applicable

2.5.1 Human Health Risk Summary

As part of the 1995 RFI, the Navy conducted a [baseline risk assessment](#) for the former source area (Site 6A-FCA) that evaluated exposure to contaminated soil and groundwater. The VOCs detected in the Site 6A-Southern Area Groundwater are similar to those found in the groundwater at Site 6A-FCA, but concentrations are generally a factor of 5 to 10 times less than used during the baseline risk assessment. The risks from exposure to the groundwater at Site 6A-Southern Area would be comparable to, but likely lower than, the risks from exposure to groundwater at Site 6A-FCA calculated during the 1995 baseline risk assessment.

From the baseline risk assessment for Site 6A-FCA, the following conclusions were developed: (1) there is no unacceptable risk to current site workers. Under future potential residential use of the site, (2) there is no unacceptable risks from exposure to soils, but (3) there are unacceptable carcinogenic and non-carcinogenic risk associated with residential exposure to groundwater, due to both ingestion and inhalation of VOCs. Potential risks to current and potential future receptors in the Site 6A-Southern Area were not specifically considered in the baseline risk assessment. Under current and potential future use of Site 6A-Southern Area, there are no occupied structures; and therefore, the soil vapor intrusion exposure pathway is not complete. Testing conducted at structures near Site 6A-Southern Area did not identify adverse risk to residents via soil vapor intrusion.

The calculated [incremental life-time cancer risk \(ILCR\)](#) for a future resident at Site 6A-FCA is 2.5×10^{-3} and the hazard indices for the future adult resident and future child resident are 8.9 and 23.6, respectively. Ingestion and inhalation of vapors associated with VOC-impacted groundwater were the primary contributors to risk. An ILCR greater than 10^{-4} or a [hazard index \(HI\)](#) greater than 1 is considered under CERCLA to be unacceptable.

TABLE 4
SUMMARY OF POTENTIAL HUMAN HEALTH RISKS

Receptor	Media	Pathway	Chemical of Concern	EPC (µg/L)	RME Cancer Risk	RME Non-Cancer Hazard (HI)	Cancer Toxicity Factor (CSF) mg/kg-day-1	Non-Cancer Toxicity Factor (RfD) mg/kg-day-1
Future Resident (Household Use)	Ground-water	Ingestion	Chloroethane	340	1.16E-05	2.33E-02	2.90E-03	4.00E-01
			Dichlorobenzene, 1,2-	8.5	0	2.59E-03	NA	9.00E-02
			Dichloroethane, 1,1-	5,200	0	1.42E+00	NA	1.00E-01
			Dichloroethene, 1,1-	290	2.04E-03	8.83E-01	6.00E-01	9.00E-03
			Ethylbenzene	33	0	9.04E-03	NA	1.00E-01
			Naphthalene	120	0	8.22E-02	NA	4.00E-02
			Trichloroethane, 1,1,1-	14,000	0	4.28E+00	NA	9.00E-02
			Xylenes	405	0	5.55E-03	NA	2.00E+00
		Dermal Contact	Chloroethane	340	2.25E-07	4.52E-04	2.90E-03	4.00E-01
			Dichlorobenzene, 1,2-	8.5	0	3.76E-04	NA	9.00E-02
			Dichloroethane, 1,1-	5,200	0	3.07E-02	NA	1.00E-01
			Dichloroethene, 1,1-	290	7.93E-05	3.43E-02	6.00E-01	9.00E-03
			Ethylbenzene	33	0	2.03E-03	NA	8.00E-02
			Naphthalene	120	0	2.75E-02	NA	2.00E-02
			Trichloroethane, 1,1,1-	14,000	0	3.51E-01	NA	4.50E-02
			Xylenes	405	0	1.08E-03	NA	2.00E+00
		Inhalation of Volatiles	Chloroethane	340	0	1.70E-03	NA	2.90E+00
			Dichlorobenzene, 1,2-	8.5	0	0.00E+00	NA	5.71E-02
			Dichloroethane, 1,1-	5,200	0	4.46E-01	NA	1.43E-01
			Dichloroethene, 1,1-	290	2.62E-04	0.00E+00	1.80E-01	NA
			Ethylbenzene	33	0	1.35E-03	NA	2.90E-01
			Naphthalene	120	0	0	NA	NA
			Trichloroethane, 1,1,1-	14,000	0	5.19E-01	NA	2.90E-01
			Xylenes	405	0	5.35E-02	NA	9.00E-02
Future Adult Resident	Ground-water	Incidental Ingestion	VOCs ⁽¹⁾	NA	2.10E-03	7.3	NA	NA
		Dermal Contact		NA	8.00E-05	0.49	NA	NA
		Inhalation of Volatiles		NA	2.80E-04	1.1	NA	NA
Future Child Resident	Ground-water	Incidental Ingestion	VOCs ⁽¹⁾	NA	NA	17	NA	NA
		Dermal Contact		NA	NA	0.85	NA	NA
		Inhalation of Volatiles		NA	NA	4.9	NA	NA
Total					4.85E-03	3.98E+01		

Toxicity factors in this table are from the 1995 RCRA Facility Investigation and the 2011 CMS/FS
 EPC= Exposure Point Concentration RME= Reasonable Maximum Exposure
 RfD= Reference dose (non cancer toxicity factor); CSF=Cancer Slope Factor (cancer toxicity factor)
 NA= Exposure route not applicable for receptor, as noted.
 HI= Hazard Index
 µg/L= microgram per liter mg/kg= milligram per kilogram
⁽¹⁾ See Future Resident (Household Use) for individual COCs, EPC, CSF, and RfD

2.5.2 Ecological Risk Summary

Under current conditions, the Site 6A-Southern Area Groundwater was not identified as resulting in adverse risks to ecological receptors. In particular, surface water and sediment sample results in the Peconic River are less than NYSDEC SWQS, Guidance Values or Risk Thresholds. The community noted the absence of applicable NYSDEC values for DCA, the primary Site VOC. At the request of the RAB, NYSDEC calculated values for TCA (690 µg/L), DCA (3,000 µg/L), and DCE (210 µg/L) using the

procedures described in NYCRR Part 706.1 (for surface water) or Technical Guidance for Screening Contaminated Sediments, January 1999 (for sediment). These values were presented to community at the August 2009 RAB meeting. Current VOC concentrations in the Peconic River are below these values. One potential concern for ecological receptors could occur if the higher concentrations of VOCs identified in the upgradient portion of the Site 6A-Southern Area Groundwater migrates without attenuation and enters the Peconic River. Since the site related VOCs do not bioaccumulate or biomagnify, adverse impacts to upper food chain receptors would not be anticipated. Because of dilution and volatilization, this discharge would not adversely affect the surface water quality, but short term, localized adverse impacts to the benthic community may result if groundwater concentrations greater than ecological screening levels discharge to the Peconic River without attenuation or dilution.

2.5.3 Basis for Response Action

It is the current judgment of the Navy, in consultation with the NYSDEC that the selected remedy identified in this ROD, is necessary to protect public health, welfare, and the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment.

Based on exceedances of **NYSDOH MCLs** and the HHRA and future potential exceedances of **NYSDEC Class "C" SWQS** for the Site 6A-Southern Area, the groundwater in the Site 6A-Southern Area poses an unacceptable risk to human health and potential unacceptable risk to the environment because of the presence of VOCs (Table 2). The affected groundwater is classified as a sole source drinking water aquifer with potential future use for public water supplies. The presence of VOCs in the groundwater would limit the use of this groundwater. Ecological receptors in the Peconic River may be adversely impacted if groundwater concentrations greater than **NYSDEC Class "C" SWQS** discharge to the Peconic River without attenuation or dilution. TCA and associated degradation products and fuels have been identified in the Site 6A-Southern Area Groundwater above **NYSDOH MCLs** (Table 2).

2.6 Principal Threat Wastes

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.

The principal threat wastes consisted of polychlorinated biphenyl (PCB)-, petroleum- and/or solvent-contaminated soil at Sites 6A-FCA and 10B-ETH and were removed during excavation activities that took place in 2009 and 2010. This action is believed to have removed all the wastes that caused the Site 6A-Southern Area Groundwater. Groundwater monitoring is being conducted to evaluate and confirm the effectiveness of the Source Area remedies. In the event a continuing source of contamination remains at Sites 6A-FCA or 10B-ETH, the Selected Remedy includes an option for implementing an air sparging system to optimize the operation of the downgradient Fence Line Groundwater Treatment System.

There are no principal threat wastes currently in the Site 6A-Southern Area.

2.7 Remedial Action Objectives

The Remedial Action Objectives (RAOs) are statements that define the extent to which sites require cleanup to protect human health and the environment and comply with **Applicable or Relevant and Appropriate Requirements (ARARs)**. The objectives reflect the COCs, exposure routes and receptors, and acceptable chemical concentrations (or range of acceptable chemical concentrations) for groundwater at Site 6A-Southern Area. The RAOs for the Site 6A-Southern Area Groundwater are based upon the potential of future residential receptors using groundwater as a potable water supply and potential threat to ecological receptors. Compliance with **NYSDOH MCL**-based Cleanup Levels presented in Table 5 would be expected to be protective of ecological receptors in surface water and sediment and human receptors from soil vapor intrusion. The RAOs for Site 6A-Southern Area Groundwater are as follows:

Groundwater

- Prevent human exposure to groundwater containing COCs above cleanup levels (**NYSDOH MCLs**).
- Reduce concentrations of COCs in groundwater to levels that allow for unlimited use/unlimited exposure within a reasonable timeframe.
- Prevent migration or discharge of COCs in groundwater to sediment and surface water at levels that would cause unacceptable risks to human or ecological receptors.

To address these risks, cleanup levels were developed based on **USEPA MCLs** and **NYSDOH MCLs** in groundwater, see Table 5.

**TABLE 5
CLEANUP LEVELS FOR SITE 6A-SOUTHERN AREA GROUNDWATER**

Groundwater Chemical of Concern	NYSDOH MCL ⁽¹⁾ (µg/L)	USEPA MCL ⁽²⁾ (µg/L)	CLEANUP LEVEL ⁽³⁾ (µg/L)
Benzene	5	5	5
Chloroethane	5	--	5
Dichlorobenzene, 1,2- (ortho)	5	600	5
Dichlorobenzene, 1,3- (meta)	5	--	5
Dichlorobenzene, 1,4- (para)	5	75	5
Dichloroethane, 1,1-	5	--	5
Dichloroethene, 1,1-	5	7	5
Ethylbenzene	5	700	5
Isopropyl Benzene	5	--	5
Naphthalene	50	--	50
Trichlorobenzene, 1,2,4-	5	70	5
Trichloroethane, 1,1,1-	5	200	5
Vinyl Chloride	2	2	2
Xylene	5	10,000	5

Notes:

µg/L - micrograms per liter

1. NYSDOH Maximum MCL. 10 NYCRR, Part 5, Subpart 5-1 Public Water Systems Tables 1 through 3, http://www.health.ny.gov/regulations/nycrr/title_10/part_5/subpart_5-1_tables.htm#table1

2. United States Environmental Protection Agency (USEPA, 2007) Drinking Water Contaminants National Primary Drinking Water Regulations, from the USEPA website at

<http://www.epa.gov/safewater/contaminants/index.html#primary>

3. The Cleanup Level is selected based on most conservative criteria.

2.8 Description and Comparative Analysis of Remedial Alternatives

2.8.1 Description of Remedial Alternatives

Remedial alternatives to address groundwater impacts at Site 6A-Southern Area were developed and are detailed in the 2011 **CMS/FS** and the 2011 **CMS Addendum**. Based on screening technologies eight remedial alternatives were retained for detailed comparative analysis. A description is provided in Table 6.

The No Action alternative does not protect human health and the environment, but is presented as a baseline for comparison purposes. In addition, Alternative 2 – Land Use Controls was developed as a stand-alone alternative. Since Alternative 2 does not comply with ARARs and an ARAR waiver cannot be

justified, it will not be further addressed in this ROD. The use of LUCs are incorporated into the other alternatives as appropriate to provide short-term protection. With the exception of the No Action alternative, the common elements of the remedial alternatives are groundwater monitoring and reporting until all COCs have achieved their cleanup levels for four consecutive sampling events, and LUCs until COC concentrations in groundwater are reduced to cleanup levels that allow unlimited use and unrestricted exposure.

**TABLE 6
DESCRIPTION OF REMEDIAL ALTERNATIVES**

Alternative	Components	Details	Cost	
1-No Action	None	Allow the COCs to breakdown naturally over time.	Capital Cost	\$0
			Annual O&M	\$0
			Total Present Value	\$0
			Timeframe	None
3-Monitored Natural Attenuation (MNA) and LUCs	MNA	Monitor groundwater migration and VOC attenuation.	Capital Cost	\$314,000
			Annual O&M	\$106,000 per event, 21 events over 20 years \$14,000 every five years (Five-Year Review) \$7,000 annual (LUC)
	LUCs	Targets areas that require notifications and inspections during implementation of this alternative, until clean up levels are achieved.	Total Present Value	\$2,400,000 (20 years)
			Timeframe	20 years (10 to 40 years)
4-Air Sparge/ MNA/LUCs	Air Sparge	An air sparge treatment system would be installed to volatilize and photodegrade the VOCs in the former source area (Site 6A-FCA) and near the Peconic River area and would consist of one to four treatment lines.	Capital Cost	\$3,400,000
			Annual O&M	\$230,000 (Year 5 to 16) to \$430,000 per year (Year 1 to 4)(Power and operator) \$106,000 per event, 20 events over 16 years (Monitoring) \$14,000 every five years (Five-Year Review)
	MNA	Targets areas between treatment zones and portions of the Site 6A-Southern Area Groundwater with lower VOC concentrations and/or where treatment cannot be effectively implemented because of Site 6A-Southern Area features.	Total Present Value	\$7,000 per year (LUC) \$9,600,000 (16 years)
			Timeframe	16 years (8 to 32 years)
5-Anerobic Enhanced Insitu EISB/MNA/LUCs	EISB	Promote the natural degradation of VOCs by indigenous anaerobic microorganisms in the aquifer through the addition of carbon sources (electron donor substrates).	Capital Cost	\$3,700,000
			Annual O&M	\$1,100,000 (Year 5 injections) \$119,000 per event, 16 events over 10 years (Monitoring) \$14,000 every five years (Five-Year Review) \$7,000 per year (LUC)
	MNA	Targets areas between treatment zones and portions of the Site 6A-Southern Area Groundwater with lower VOC concentrations and/or where treatment cannot be effectively implemented because of Site 6A-Southern Area features.	Total Present Value	\$6,700,000 (16 years)
			Timeframe	16 years (8 to 32 years)
LUCs	Targets areas that require notifications and inspections during implementation of this alternative, until cleanup levels are achieved.	Timeframe	16 years (8 to 32 years)	

Alternative	Components	Details	Cost	
6-Anerobic EISB/Air Sparge/MNA/LUCs	Air Sparge	An air sparge treatment system would be installed to volatalize and photodegrade the VOCs in the former source area (Site 6A-FCA) and near the Peconic River area and would consist of one to four treatment lines.	Capital Cost	\$5,600,000
	EISB	Promote the natural degradation of VOCs by indigenous anaerobic microorganisms in the aquifer through the addition of carbon sources (electron donor substrates).	Annual O&M	\$1,100,000 (Year 5 injections) \$230,000 (Year 1 to 10) (Power and operator) \$119,000 per event, 16 events over 10 years (Monitoring) \$14,000 every five years (Five-Year Review) \$7,000 per year (LUC)
	MNA	Targets areas between treatment zones and portions of the Site 6A-Southern Area Groundwater with lower VOC concentrations and/or where treatment cannot be effectively implemented because of Site 6A-Southern Area features.	Total Present Value	\$11,700,000 (10 years)
	LUCs	Targets areas that require notifications and inspections during implementation of this alternative, until cleanup levels are achieved.	Timeframe	10 years (5 to 20 years)
7-Groundwater Extraction, Treatment, and Injection/MNA/LUCs	Groundwater Extraction Treatment and Injection	The groundwater extraction, treatment, and discharge would be used to manage migration of contaminated groundwater.	Capital Cost	\$4,700,000
	MNA	Targets areas between treatment zones and portions of the Site 6A-Southern Area Groundwater with lower VOC concentrations and/or where treatment cannot be effectively implemented because of Site 6A-Southern Area features.	Annual O&M	\$ 999,000 per year (16)(Power and operator) \$81,000 per event, 20 events over 16 years (Monitoring) \$14,000 every five years (Five-Year Review) \$7,000 per year (LUC)
	LUCs	Targets areas that require notifications and inspections during implementation of this alternative, until cleanup levels are achieved.	Total Present Value	\$20,000,000 (16 years)
			Timeframe	16 years (8 to 25 years)
8-Fenceline Groundwater Extraction, Treatment, and Discharge, LUCs and Monitoring	Fenceline Groundwater Extraction, Treatment, and Discharge	Reduces or eliminates off property migration of contaminants. Excludes option and contingency remedies.	Capital Cost	\$1,680,000
	MNA	Targets areas between treatment zones and portions of the Site 6A-Southern Area Groundwater with lower VOC concentrations and/or where treatment cannot be effectively implemented because of Site 6A-Southern Area features.	Annual O&M	\$243,000 per year (4)(Power and operator) \$81,000 per event, 20 events over 16 years (Monitoring) \$14,000 every five years (Five-Year Review) \$7,000 per year (LUC)
	LUCs	Targets areas that require notifications and inspections during implementation of this alternative, until cleanup levels are achieved	Total Present Value	\$ 4,660,000
			Timeframe	16 years (8 to 25 years)
8A-Source Area Air Sparging Option	Air Sparging System	If present, reduces or eliminates continuing source of groundwater contamination. Alternative 8A is also a component of Alternative 4.	Capital Cost	\$909,000 (incremental)
			Total Present Value	\$1,779,000 (incremental)
			Timeframe	8 years

Alternative	Components	Details	Cost	
8B-High Concentration Area (>500 µg/L) Contingency	EISB	If required, reduces or eliminates high concentration VOCs (>500 µg/L) that are off property. Alternative 8B is also a component of Alternatives 5 and 6.	Capital Cost	\$1,503,000 (incremental)
			Total Present Value	\$1,705,000 (incremental)
			Timeframe	8 years
8C-Peconic River Area Contingency	Air Sparging System	If required, reduces or eliminates migration of VOCs into Peconic River. Alternative 8C is also a component of Alternatives 4 and 6.	Capital Cost	\$1,835,000 (incremental)
			Total Present Value	\$5,439,000 (incremental)
			Timeframe	24 years

2.8.2 Comparative Analysis of Alternatives

A comparative analysis of alternatives with respect to the **nine evaluation criteria** was completed and is provided below. Table 7 depicts a relative ranking of the alternatives. Alternative 1 (No Action) does not achieve RAOs and is not considered further in this ROD. Alternative 2 (LUCs) does not comply with ARARs and is therefore not considered a viable option and will not be discussed further in this ROD. Alternatives 8A, 8B, and 8C are only considered as incremental remedies to Alternative 8.

Threshold Criteria

Overall Protection of Human Health and the Environment. Under current conditions, chlorinated solvents and fuels in groundwater present a risk to potential future residents. Alternatives 3, 4, 5, 6, 7, 8, 8A, 8B, and 8C would be protective of human health and the environment under current- and future-use scenarios by prohibiting groundwater use and residential development while VOC-contaminated groundwater poses unacceptable risk under unrestricted use conditions, and monitoring contaminant concentrations and migration over time to identify when all cleanup levels (**NYSDOH MCLs**) are achieved. Except for potential short-term localized impacts, VOCs are not expected to pose a current or future risk to ecological receptors in the Peconic River. Alternatives 4, 6, 7, and 8C include treatment near the Peconic River to address potential short-term localized impacts. Because of the need to construct extraction or injection wells under Alternatives 4, 6, 7, and 8C, treatment near the Peconic River is expected to result in some short-term localized impacts to wetlands and associated ecological receptors.

Compliance with ARARs. The ARARs include any Federal or State standards, requirement, criteria, or limitations that are determined to be legally applicable or relevant and appropriate to a CERCLA site or action. To be considered (TBC) criteria are non-promulgated advisories or guidance issued by Federal or State government and do not have the status of potential ARARs but are evaluated along with ARARs. The ARARs for the Site 6A-Southern Area Groundwater are provided in Appendix B. Chemical- and Location-specific ARARs are the same for each alternative and Action-specific ARARs may vary to some extent with the different remedial alternatives. Alternatives 3, 4, 5, 6, 7, 8, 8A, 8B, and 8C would comply with **ARARs**.

Primary Balancing Criteria

Long-term Effectiveness and Permanence. Alternatives 3, 4, 5, 6, 7, 8, 8A, 8B, and 8C would result in the permanent reduction of chlorinated solvents and fuels to concentrations less than cleanup levels listed in Table 5. LUCs would be implemented until cleanup levels are achieved. These controls would be effective on Navy-owned property and property transferred to the Town once the remedy is in place. The Navy will work with the off property landowners (New York State, Suffolk County, and PRSC) to enact and enforce the LUCs.

Although no treatment would occur under Alternative 3, threats to human health would be prevented through LUCs. LUCs will be in effect for all alternatives until cleanup levels are met. Alternative 4, 5, 6, 7, and 8 would be effective and permanent and would address contamination faster than Alternative 3.

Reduction of Toxicity, Mobility, or Volume through Treatment. Alternative 3 would not use treatment as a component of the remedy, and therefore, Alternative 3 does not satisfy this criterion.

Alternatives 4, 6, 8A, and 8C would use insitu air sparging and Alternatives 7 and 8 would use groundwater extraction and air stripping to remove VOCs from contaminated groundwater. The VOCs would then be permanently destroyed through photochemical oxidation in the atmosphere. Alternatives 5, 6, and 8B use insitu biodegradation to permanently destroy VOCs in contaminated groundwater.

Alternatives 4, 6, and 7 would treat an estimated 375 pounds of VOCs from Site 6A-Southern Area Groundwater, while Alternative 5 would treat an estimated 150 pounds of VOCs. Alternative 8 would treat an estimated 93 pounds of VOCs and if implemented, the contingency remedies (Alternatives 8B and 8C) would treat up to approximately 280 pounds of VOCs.

Short-term Effectiveness. Under each of the Alternatives, LUCs would be used to protect human health in the short term through prohibitions on potable use of contaminated groundwater and restrictions on the construction of structures over the contaminated groundwater that could result in soil vapor intrusion. The groundwater monitoring components under each of the alternatives would have some minor short term effects on wetlands during sampling activities. Under each of the Alternatives, most of the construction activities would be conducted outside of sensitive ecological habitats (i.e., Pine Barrens and wetlands) and would be effective in the short term. However, for some of the alternatives there would be construction activities conducted within the sensitive ecological areas (wetlands and/or Pine Barrens) (Alternatives 4, 5, 6, 7, 8B, and 8C) and there would be short-term localized impacts to the environment, including the need to remove mature vegetation and temporarily fill wetlands. In addition, Alternative 7 that involves extraction of groundwater in wetlands would result in localized dewatering of wetlands. At the completion each of the Alternatives, the impacted areas would be restored.

Implementability. Alternatives 3, 4, 5, 6, 7, and 8 are implementable; use standard and proven technologies; and require services and materials that are readily available, and have been performed successfully at similar sites. Activities that are conducted in on property areas are relatively simple to implement. Actions conducted in off property areas are more difficult and require cooperation of the property owners. Cooperation with off property owners is anticipated to be dependent on the complexity and duration of the activity conducted. Alternative 3 that involves the installation of wells and groundwater monitoring would be the least difficult to obtain. Other Alternatives that involve short term access (one year or less) and limited impacted in upland Pine Barrens (i.e., EISB under Alternatives 5, 6, and 8B) would be more difficult to implement. Alternatives that involve cutting of mature vegetation and temporary filling of wetlands (Alternatives 4, 6, and 8C) and temporary dewatering of wetlands (Alternative 7) would be progressively more difficult to implement.

Cost. Each alternative was assessed based on capital costs (initial cost to implement) and annual O&M costs. The total cost is based on the net present value of the capital and O&M costs. Alternative 3 is estimated to cost \$2,400,000, Alternative 4 is estimated to cost \$9,600,000, Alternative 5 is estimated to cost \$6,700,000, Alternative 6 is estimated to cost \$9,600,000, Alternative 7 is estimated to cost \$20,000,000, and Alternative 8 is estimated to cost \$4,660,000. The estimated incremental costs for implementing Alternatives 8A, 8B, and 8C are \$1,779,000, \$1,705,000, and 5,439,000, respectively. See Table 6 for additional detail on the cost estimates.

Modifying Criteria

State Acceptance. State involvement has been solicited throughout the CERCLA process. NYSDEC concurs with the Selected Remedy.

Community Acceptance. A public meeting was held on November 3, 2011 to present the Proposed Plan and answer community questions regarding the proposed remedial action for the Site 6A-Southern Area Groundwater. A second public meeting was held on December 13, 2011 to provide the community with an additional opportunity to provide comments and answer questions. The questions and concerns raised at the meetings were general inquiries for informational purposes only. No comments requiring amendment to the Proposed Plan were received from the public during the meeting and public comment

period. Several comments were received from individuals and organizations supporting the Fence Line Treatment component of the remedy, but questioned the timing needed to evaluate and implement potential off property remedies. The comments and Navy response are stated in the Responsiveness Summary in Section 3 of this document.

TABLE 7
SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

Criterion	Alt. 1	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 8A	Alt. 8B	Alt. 8C
Overall Protection of Human Health and the Environment	○	●	●	●	●	●	●	●	●	●
Compliance with ARARs	○	●	●	●	●	●	●	●	●	●
Reduction of Toxicity, Mobility, or Volume through Treatment	○	○	●	●	●	●	●	●	●	●
Long-Term Effectiveness	○	○	●	●	●	●	●	●	●	●
Short-Term Effectiveness	○	○	●	●	●	●	●	●	●	●
Implementability	○	●	○	○	○	○	●	●	○	○
Time to Reach RAOs (Years)	Unknown	20	16	10	10	16	16	8	8	24
Cost								(incremental)	(incremental)	(incremental)
Capital		\$314k	\$3,400k	\$3,700k	\$5,600k	\$4,700k	\$1,680k	\$909k	\$1,503k	\$1,835k
O&M	None	\$127 to 219k/Yr	\$357k to 861k/Yr	\$140k to 1,359k/Yr	\$370k to 1,463k/Yr	\$1,087k to \$1,330k/Yr	\$21k to \$526k	\$202k/Yr	\$100k/Yr	\$231k/Yr
Present Value		\$2,400k	\$9,600k	\$6,700k	\$9,600k	\$20,000k	\$4,660k	\$1,779k	\$1,705k	\$5,439k

Ranking: ● High ○ Moderate ○ Low

2.9 Selected Remedy

The Navy’s selected remedy for Site 6A-Southern Area Groundwater is presented in this Section. Figure 8 provides a summary of the Area-specific remedies.

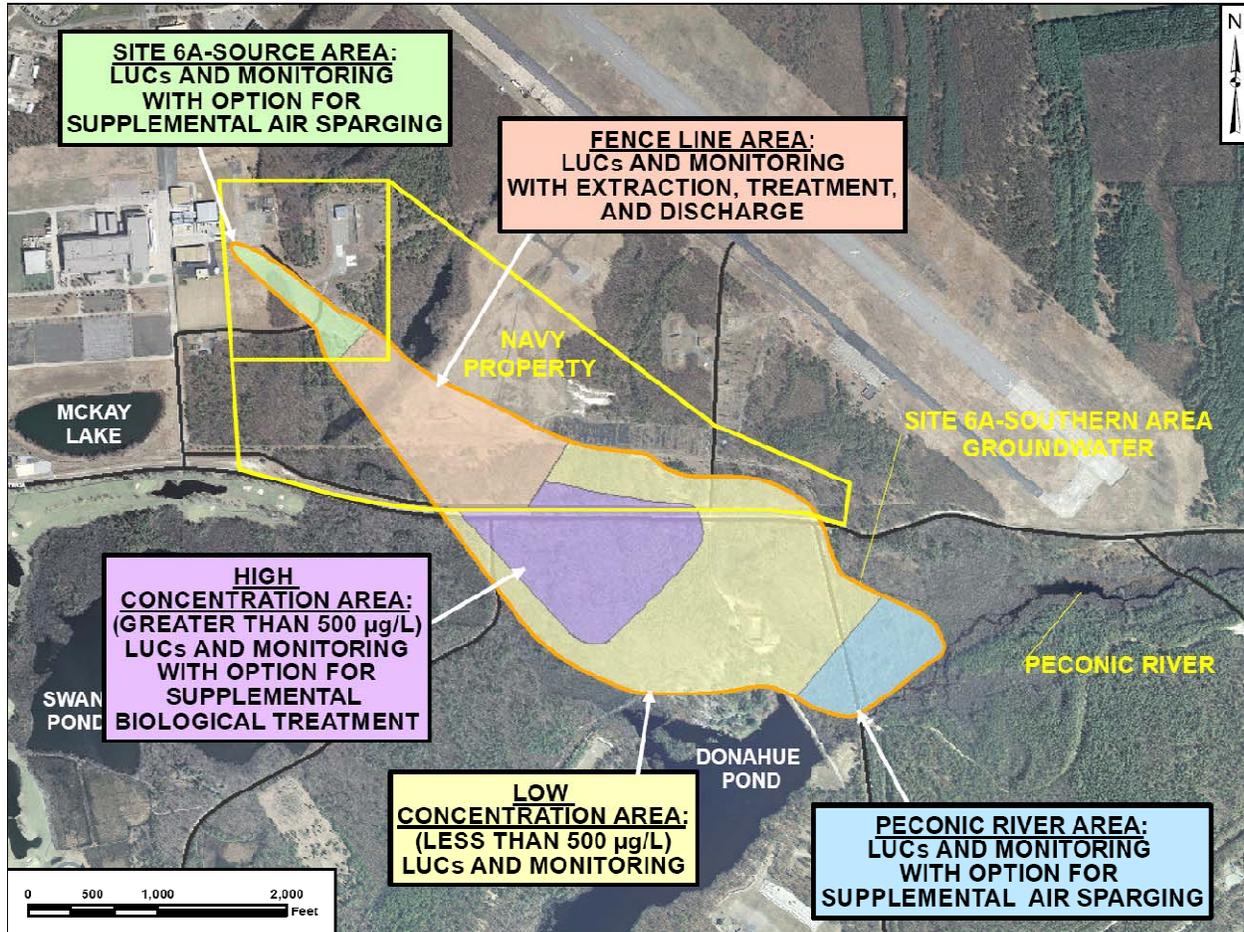
The selected remedy is Alternative 8 and consists of LUCs to prevent human exposure to VOC-contaminated groundwater until cleanup levels are achieved; extraction, treatment, and discharge of groundwater at the Fence Line Area to reduce or eliminate off property migration of contaminants; and monitoring to determine if additional action is required to optimize the Fence Line Area Groundwater Treatment System (shorten operation duration) (Alternative 8A) and/or implement contingency remedies to protect ecological receptors (Alternatives 8B and 8C).

Alternative 8, with the option and contingencies is as summarized as follows.

- Site 6A-Source Area: LUCs and Monitoring. Based on contaminant trend analysis for Site 6A-Southern Area Groundwater, an option to implement Alternative 8A – Air Sparging to treat residual contamination at the source area, if present.
- Fence Line Area: Extraction, Treatment, and Discharge, LUCs, and Monitoring.
- High Concentration Area (VOCs greater than 500 µg/L): LUCs and Monitoring. Based on contaminant trend analysis in the High and Low Concentration Area groundwater, a contingency to implement Alternative 8B - Anaerobic Biodegradation to treat groundwater that may migrate without sufficient attenuation and adversely impact ecological receptors in the Peconic River.
- Low Concentration Area (VOCs less than 500 µg/L): LUCs and Monitoring.

- Peconic River Area: LUCs and Monitoring. Based on contaminant trend analysis in the Low Concentration Area groundwater, a contingency to implement Alternative 8C - Air Sparging to treat groundwater that may mitigate without attenuation and adversely impact ecological receptors in the Peconic River.

FIGURE 8
SELECTED REMEDY-AREA SPECIFIC REMEDIES



2.9.1 Rationale for the Selected Remedy

Alternative 8 was selected over Alternative 3 (the least costly alternative) based on reducing the time required to achieve the cleanup levels. Alternative 8 was selected over Alternatives 4, 5, 6, and 7 since it targets the highest VOC concentrations near the property line (Fence Line Area) and therefore can be implemented relatively quickly, avoid impacts to Pine Barrens, wetlands, and ecological receptors; and implementation would be at the next lowest cost. The selected remedy incorporates contingency remedies (Alternatives 8B and/or 8C) that can be implemented if adverse ecological impacts are anticipated to occur within the Peconic River. Finally, the Selected Remedy meets the statutory preference for active treatment with lower or similar costs to comparable alternatives.

2.9.2 Description of the Selected Remedy

The selected remedy consists of LUCs, groundwater monitoring, and the installation and operation of a groundwater extraction, treatment, and discharge system at the NWIRP southern property line (Fence Line Area Groundwater Treatment System). Also, based on monitoring data and contaminant trend analysis, the selected remedy includes an option for the installation and operation of an air sparging system at Site 6A-Source Area, and contingency remedies of In-situ Biodegradation (EISB) in the High Concentration Area (VOCs greater than 500 µg/L), and Air Sparging at the Peconic River Area.

The LUCs would be implemented in each area to protect human health until cleanup levels are achieved. The LUCs would consist of restrictions on the use of VOC-impacted groundwater, annual inspections, and provisions for addressing soil vapor intrusion for new building construction in areas with VOC-contaminated groundwater (e.g., monitoring or subslab depressurization units). As VOC concentrations in groundwater decrease, LUC boundaries may be modified. Monitoring would be conducted in each area to evaluate the presence and migration of VOC-contaminated groundwater. The monitoring would be used in combination with trigger values to be established in the Remedial Design to remove areas from further consideration, modify the operation of the existing treatment system, and if needed, implement additional groundwater treatment.

The selected remedy complements the two source area (Sites 6A-FCA and 10B-ETH) remedial actions that were completed in 2010. These actions have eliminated or minimized the continuing impact to groundwater. The selected remedy includes monitoring the former source area for VOC-contaminated groundwater for approximately two years, with an optional remedy for implementing an air sparging system to shorten the operation of the Fence Line Groundwater Treatment System. In addition, a water line extension to the PRSC, which is scheduled for June 2012, will eliminate human potential exposure to VOC-contaminated groundwater.

The Fence Line Treatment System will use air stripping to remove an estimated total of 93 pounds of VOCs from 210 million gallons of groundwater over a 4-year period. Based on groundwater monitoring, the Fence Line Treatment System may operate more than 4 years, especially if there is a continuing source of VOC contamination at Site 6A-FCA. These VOCs will be permanently destroyed via photochemical oxidation in the atmosphere. The treated water will be recharged into the local aquifer to maintain natural groundwater flow in the area and to the Peconic River.

A Remedial Design Work Plan will be prepared to establish surface water quality standards for protection of ecological receptors in the Peconic River and associated groundwater trigger values in the High Concentration and Low Concentration Areas. The decision to implement Alternatives 8B and/or 8C will consider anticipated benefits from operation of the Fence Line Area Groundwater Treatment System on downgradient groundwater quality, attenuation, property access, and short term effects on the environment associated with implementation of these contingency remedies.

The estimated capital and present value cost of the selected remedy is \$1,680,000 and \$4,660,000, respectively. Annual costs vary significantly based on the activity being conducted each year and range from early-year operation, monitoring, and maintenance costs for the Fence Line Groundwater Treatment System of \$526,000 per year to out-year inspection costs of approximately \$21,000 per year.

The estimated incremental capital and present value cost for the optional Source Area remedy is at \$909,000 and \$1,779,000, respectively; the High Concentration Area (VOCs greater than 500 µg/L) at \$1,530,000 and \$1,705,000, respectively; and the Peconic River Area at \$1,835,000 and \$5,439,000, respectively. Appendix C contains a detailed cost estimate of the Selected Remedy.

This remedy was selected based on a careful evaluation of the nine criteria. Potential exposure to human health is limited and would be further controlled via LUCs and monitoring. Treatment would be used for groundwater contamination that can be effectively captured at the Fence Line Area. Monitoring would continue to be conducted in this area. Additional treatment would be considered in the down gradient areas, but only if monitoring data in combination with trigger values demonstrates that ecological receptors will be adversely impacted.

Based on information currently available, the lead agency believes the Selected Remedy meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Navy expects the Selected Remedy to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element.

2.9.3 Expected Outcomes of the Selected Remedy

Future land use is anticipated to be consistent with current land use, which is primarily environmental conservation and recreational use. Since this area is classified as a sole source aquifer, in the future there is a potential that groundwater may be used as a drinking water source. Cleanup levels for the Selected Remedy are based on unlimited use and unrestricted exposure of site groundwater. Exposure will be controlled through LUCs until COCs in groundwater are reduced to the cleanup levels. The groundwater extraction treatment and discharge system will be operated for an estimated four years until the groundwater treatment system achieves cleanup levels. System effectiveness will be evaluated annually by comparison of current concentrations of COCs in treatment area monitoring wells to pretreatment concentrations and the cleanup levels.

In accordance with LUC objectives, groundwater use will be restricted to monitoring or remedial purposes. Monitoring will be conducted until each COC in groundwater is at or below its respective cleanup level for four consecutive monitoring events. The Navy in partnership with NYSDEC, will evaluate the discontinuation of monitoring of individual COCs that have met the cleanup levels after four rounds based on site conditions. The results of monitoring will be documented in an annual monitoring report.

When all COCs have achieved their cleanup levels for four consecutive sampling events, site closure will be initiated. Once RAOs for this groundwater action have been achieved, Site 6A-Southern Area Groundwater is expected to be suitable for unlimited use and unrestricted exposure for groundwater. Therefore, the Navy and NYSDEC will evaluate the groundwater LUC component of the Selected Remedy for termination at site closeout.

2.9.4 Statutory Determinations

Protection of Human Health and the Environment- Because there is unacceptable risk to human health due to the contaminated groundwater at Site 6A-Southern Area, a remedial action is required to restore the groundwater to meet drinking water standards (i.e., [NYSDOH MCLs](#)). The Selected Remedy will protect human health and the environment by reducing site risks through groundwater treatment and the implementation of LUCs to eliminate the threat of exposure to the COCs via ingestion of impacted groundwater and soil vapor intrusion.

Compliance with ARARs and TBC Criteria- Section 121(d) of CERCLA, as amended, specifies, in part, that remedial actions for cleanup of hazardous substances must comply with requirements and standards under federal or more stringent state environmental laws and regulations that are applicable or relevant and appropriate (i.e., ARARs) to the hazardous substances or particular circumstances at a site or obtain a waiver. See also 40 Code of Federal Regulations (C.F.R) § 300.430(f)(1)(ii)(B). ARARs include only federal and state environmental or facility citing laws/regulations and do not include occupational safety or worker protection requirements. While Occupational Safety and Health Administration (OSHA) and state worker health and safety standards are not applied to cleanup levels, CERCLA §104(f), 42 U.S.C. §9604(f), requires Federal and state government contracts with consultants who perform response actions to contain requirements for contractor compliance with OSHA and state worker health and safety laws. In addition to ARARs, the lead and support agencies may, as appropriate, identify other advisories, criteria, or guidance to be considered for a particular release. The TBC category consists of advisories, criteria, or guidance that were developed by USEPA, other federal agencies, or states that may be useful in developing CERCLA remedies [see 40 CFR § 300.400(g)(3)]. In accordance with 40 C.F.R.

§300.400(g), the Navy identified the ARARs and TBCs for the selected remedy. Appendix B lists the Chemical-, Location- and Action-Specific ARARs and TBCs.

**TABLE 8
EXPECTED OUTCOMES OF THE SELECTED AREA SPECIFIC REMEDIES**

Risk	Remedial Action Objective	Remedy Component	Metric	Expected Outcomes
Ingestion of VOCs from Groundwater and Inhalation of VOCs through soil vapor intrusion	Prevent human exposure to groundwater containing COCs above cleanup levels.	Site 6A-Source Area - LUCs Fence Line Area -LUCs High Concentration Area (VOCs greater than 500 µg/L) -LUCs Low Concentration Area (VOCs less than 500 µg/L) -LUCs Peconic River Area - LUCs	Implement until groundwater COCs in all areas is at or below cleanup levels, from 4 to 36 years. LUC boundaries to be modified as groundwater achieves cleanup levels.	Achieve unlimited use and unrestricted exposure
Ingestion of VOCs from Groundwater and Inhalation of VOCs through soil vapor intrusion	Allow for unlimited use of groundwater (cleanup levels) within a reasonable timeframe.	Site 6A-Source Area - Monitoring, with Option for air sparging system Fence Line Area - Groundwater extraction treatment and discharge system High Concentration Area (VOCs greater than 500 µg/L) - Monitoring Low Concentration Area (VOCs less than 500 µg/L) - Monitoring Peconic River Area - Monitoring	Implement until groundwater COCs in all areas is at or below cleanup levels, from 4 to 36 years. Monitoring requirements to be modified as groundwater achieves cleanup levels. Source Area Option - If groundwater monitoring contaminant trends do not decrease by 30% or more per year for two years then an Air Sparging system will be installed in order to reduce VOCs by 90%, with an estimated timeframe of 2 to 8 years.	Achieve unlimited use and unrestricted exposure
Ecological exposure to VOCs in surface water	Prevent migration or discharge of COCs in groundwater to sediment and surface water at levels that would cause unacceptable risks to human (through fish ingestion) or ecological receptors.	Site 6A-Source Area - No action Fence Line Area - Groundwater extraction treatment and discharge system High Concentration Area (VOCs greater than 500 µg/L) - Monitoring, with contingency for EISB Low Concentration Area (VOCs less than 500 µg/L) - Monitoring Peconic River Area - Monitoring, monitoring with contingency for air sparging	Source Area - No Action Fence Line Area - A Groundwater Extraction treatment and discharge system will be implemented within 1 year and operate for 2 to 8 years until migration of VOCs have been minimized or eliminated. High Concentration Area (VOCs greater than 500 µg/L) - Trigger values to be established in Remedial Design Work Plan. Groundwater monitoring for 2 to 4 years then a decision will be made to implement the contingency remedy. Contingency remedy would be monitored to evaluate effectiveness and if necessary, enhance. Low Concentration Area (VOCs less than 500 µg/L) - Trigger values to be established in Remedial Design Work Plan. If groundwater monitoring concentrations exceed trigger values established in the Remedial Design after monitoring between 4 to 8 years then monitoring will be conducted to determine the need for EISB in the High Concentration Area (VOCs greater than 500 µg/L) area. Monitoring is estimated to occur for 6 to 14 years and will discontinue when cleanup levels are achieved. Peconic River Area - Trigger values to be established in Remedial Design Work Plan. If groundwater monitoring concentrations exceed trigger values established in the Remedial Design after monitoring between 6 to 14 years then monitoring will be conducted to determine the need for air sparging in the Peconic River Area which would run for 12 to 36 years or until cleanup levels are achieved.	Groundwater concentrations to achieve surface water quality.

Cost-Effectiveness-The Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. The following definition was used to determine cost effectiveness, “A remedy shall be cost-effective if its costs are proportional to its overall effectiveness (NCP §300.430(f)(1)(ii)(D)”. This analysis was accomplished by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria. The costs are proportional to overall effectiveness by achieving long-term effectiveness and permanence within a reasonable timeframe.

Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable-The Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a practicable manner at Site 6A-Southern Area. Because long-term effectiveness and permanence along with reduced toxicity and volume are achieved in the shortest timeframe with the Selected Remedy, the Navy and NYSDEC determined that the Selected Remedy provides the best balance of tradeoffs in terms of the balancing criteria, while also considering the statutory preference for treatment as a principal element and considering State and community acceptance.

Preference for Treatment as a Principal Element-The Selected Remedy uses treatment as a principal element, and therefore satisfies the statutory preference for treatment.

Five-Year Review Requirements-This remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure; therefore in accordance with CERCLA Section 121(c) and the NCP at 40 CFR300.430 (f)(4)(ii) a statutory review will be conducted by the Navy within 5 years after initiation of remedial action to ensure that the

remedy is, or will be, protective of human health and the environment. If the remedy is determined not to be protective of human health and the environment because, for example, LUCs have failed or treatment is unsuccessful, then additional remedial actions would be evaluated by Navy and the Navy may be required to undertake additional remedial action.

2.10 Community Participation

The Navy and NYSDEC provide information regarding the cleanup of NWIRP Calverton to the public through the community relations program which include RAB meetings, public meetings, the Administrative Record for the site, and announcements published in local newspapers. RAB meetings continue to be held to provide an information exchange among community members, the Navy, NYSDOH, NYSDEC and SCDHS. These meetings are open to the public and are held two to three times a year. The most current RAB meeting discussing the Proposed Plan was held on November 3, 2011 at the Calverton Community Center.

In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period from October 27 to December 12, 2011 for the Proposed Plan for Site 6A-Southern Area Groundwater. A public meeting to present the Statement of Basis for Remedy Selection and the Proposed Plan was held on November 3, 2011 at the George Young Community Center, 446 S Jamesport Ave., Riverhead, New York, immediately preceding the RAB meeting. Public notice of the meetings and availability of documents was placed in the Riverhead News Review Newspaper on October 27, 2011. The Proposed Plan for the Southern Area was released for public comment on October 27, 2011. The Proposed Plan identified Alternative 8: Fenceline Groundwater Extraction, Treatment, and Discharge, LUCs and Monitoring with the options and contingencies as the selected remedy for groundwater remediation.

In accordance with RCRA Part 373 Permit for the former NWIRP Calverton, the NYSDEC provided a public comment period for the Statement of Basis for the Remedy Selection for Site 6A-Southern Area Groundwater from December 1, 2011 to January 17, 2012. A public availability session to present the Statement of Basis for Remedy Selection was held on December 13, 2011 at the Calverton Community Center, Calverton Industrial Park, Calverton, New York. Public notice of the meeting and availability of documents was placed in Riverhead News Review Newspaper on December 1, 2011. In addition, a radio announcement was made on WLNG and WRIV in relation to the Calverton NYSDEC permit application for the proposed Corrective Measures for Site 6A-Southern Area Groundwater on December 1, 2011 during the morning and evening rush hours. The Statement of Basis for the Remedy Selection for Site 6A-Southern Area Groundwater was released for public comment on December 1, 2011. The Statement of Basis for the Remedy Selection identified Alternative 8: Fenceline Groundwater Extraction, Treatment, and Discharge, LUCs and Monitoring, as the preferred alternative for groundwater remediation.

The Administrative Record, Community Relations Plan, ERP fact sheets, and final technical reports concerning Site 6A-Southern Area can be obtained from the Administrative Record web site:

<http://go.usa.gov/2XV>

Internet access is available to the public at the following location:

Riverhead Free Library
330 Court Street
Riverhead, New York 11901-2885
(631) 727-3228

2.11 Documentation of Significant Changes

The Proposed Plan for Site 6A-Southern Area Groundwater was released for public comment on October 27, 2011. Several comments and suggestions were received during the public meeting or comment period. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan were necessary or appropriate.

3 Responsiveness Summary

The participants in the Public Meeting held on November 3, 2011, included representatives of the Navy, SCDHS, and NYSDEC. Twenty two community members attended the meeting. Questions received during the public meeting were general inquiries and are described in the public meeting minutes in the Administrative Record. There were several comments and suggestions received during the public comment period. No comments received require amendment to the Proposed Plan. The comments and suggestions are listed below as well as the Navy's response.

1. **Comment:** In general the community expressed concurrence with implementation of the planned monitoring and treatment components of the remedy. However, several comments were received that expressed an interest in accelerating implementation of the off property contingency remedies.

Response: The timing for the off property remedy was based on establishing an approach to allow defensible development of trigger values for implementing contingency remedies in the off property, ecologically sensitive areas with monitoring and evaluation of the effectiveness of upgradient activities (Sites 6A-FCA and 10B-ETH source area remedies implemented in 2009 and 2010 and the planned Fence Line Treatment System). Implementation of off property actions is expected to have negative ecological impacts. The more aggressive the action, the more extensive the impact. The selected remedy provides a balance between mitigating potential localized impacts to ecological receptors in the river, with adverse impacts to other ecological receptors. Once selected, contingency remedies in the ROD would allow relatively quick implementation of the off property remedies as needed.

2. **Comment:** One comment indicated that the contingency remedies should not be limited to only those identified in the Proposed Plan.

Response: The CMS and Proposed Plan developed potentially viable alternatives for treatment of the off property groundwater. No other viable options were identified at this time. Any remedy that is significantly different than those currently identified would require a ROD Amendment.

APPENDIX A
CONCURRENCE LETTER

New York State Department of Environmental Conservation

Division of Environmental Remediation

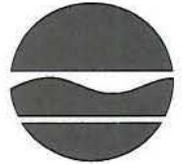
Office of the Director, 12th Floor

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Website: www.dec.ny.gov

MAY 11 2012



Joe Martens
Commissioner

Ms. Lora Fly (lora.fly@navy.mil)
Remedial Project Manager (Code OPNEEV)
Facilities Engineering Command, Mid-Atlantic Naval Facilities
Engineering Command Building Z-144
9742 Maryland Avenue
Norfolk, VA 23511-3095

RE: Calverton NWIRP, OU-3 - Site 6A Southern Area
Site No. 152136
Draft-Final Record of Decision
Dated April 2012

Dear Ms. Fly:

The New York State Department of Environmental Conservation (Department) and the New York State Department of Health (NYSDOH) have reviewed the April 2012 Draft-Final Record of Decision for Site 6A – Southern Area Groundwater at NWIRP Calverton, Suffolk County, NY. The Department concurs with the Navy's preferred alternative for the Southern Area Groundwater Plume. The preferred alternative (Alternative 8) consists of land use conditions, monitoring, and the installation and operation of a groundwater extraction, treatment, and discharge system at the NWIRP southern property line (Fence Line Treatment System). Also, based on monitoring data and trend analysis, the preferred alternative includes contingencies to install additional treatment options at the Source Area, in the Offsite Southern Area (VOCs greater than 500 µg/L), and at the Peconic River Area.

Based on a review by the Department, the selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

If you have any questions, please contact Mr. Henry Wilkie at (518) 402-9625.

Sincerely,

Robert W. Schick, P.E.

Acting Director

Division of Environmental Remediation

ec: Charlotte Bethoney, NYSDOH
Steve Karpinski, NYSDOH
Andrew Rapiejko, SCDHS (andrew.rapiejko@suffolkcountyny.gov)
Jim Harrington
Walter Parish
Daniel Evans
Henry Wilkie

APPENDIX B
ARARs

CHEMICAL-SPECIFIC ARARs AND TBCS					
Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be taken to Attain Requirement
<i>NYSDEC Surface Water and Groundwater Effluent Standards</i>					
State Regulatory Requirement	Groundwater	Water classifications provide for the protection of public water supplies.6 NYCRR 701.15.	Applicable	Standards are used to protect the public health or welfare and enhance water quality. Groundwater in this area is classified as Class GA. 6 NYCRR 701.15, "The best usage of Class GA waters is as a source of potable water supply."	The selected remedy will comply with these regulations through monitored natural attenuation and groundwater extraction, treatment, and discharge.
State Regulatory Requirement	Surface Water	Water classifications provide for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the water, and take into account the use and value of propagation of fish, shellfish and wildlife, recreation in and on the water, and agricultural, industrial and other purposes, including navigation.6 NYCRR 701.8.	Relevant and Appropriate	Standards are used to protect the public health or welfare and enhance water quality. Peconic River in this area is classified as Class C. Per 6 NYCRR 701.8, "the best usage of Class C waters is fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes." Therefore the NYS Class C surface water quality standards apply.	The selected remedy will comply with these regulations through monitored natural attenuation, groundwater extraction, treatment, and discharge, and contingency remedies of insitu biodegradation and air sparging
<i>NYSDEC Public Water Supply Regulations</i>					
State Regulatory Requirement	Groundwater and Surface Water Resources	Maximum Contaminant Levels (MCLs) and monitoring requirements for public water supplies, water supply well construction requirements, water quality treatment districts, and bottled and bulk water standards.10 NYCRR 5, Subpart 5-1.51 to 5-1.52.	Relevant and Appropriate	Potential site contamination impact on public water supply to be addressed by, or potentially caused by, environmental action. The aquifer, which is a potential drinking water source, is impacted by site contamination. NYSDOH MCLs were considered in the development of the remediation goals. Federal MCLs were considered, but are equal to or less stringent than NYSDOH MCLs.	The selected remedy will comply with these regulations through monitored natural attenuation and groundwater extraction, treatment, and discharge.
<i>NYSDOH Soil Vapor Intrusion Guidance</i>					
State Guidance	Indoor Air, Soil Vapor, Ambient Air	Investigation and/or environmental action for contaminated soil/soil vapor and/or indoor air. NYSDOH, 2006. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York. Center for Environmental Health, Bureau of Environmental Exposure Investigation. October.	To be considered	The TBC guidance specifies risk-based benchmark values for subslab vapor and indoor air.	In the short term, LUCs will be implemented to restrict the construction of occupied structures over the Site 6A-Southern Area Groundwater. The groundwater remedy will decrease COC concentrations to allow for potable use and comply with NYS MCLs.

LOCATION-SPECIFIC ARARs AND TBCs					
Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be taken to Attain Requirement
Clean Water Act (CWA)					
Federal Regulatory Requirement	Wetlands	Avoid adverse effects, minimize potential harm, and preserve and enhance wetlands, to the extent possible. Executive Order 11990; Section 7(b).	To Be Considered	Action involving construction of facilities or management of property in wetlands. Wetlands are defined by Executive Order 11990 Section 7 (protection of Wetlands). Wetlands are present throughout the Southern Area. This affects the implementability of all of the active-technology design and implementation. Effects on wetlands must be considered during design and implementation. However, there will not be any "draining, dredging, channelizing, filling, diking, impounding, and related activities and any structures or facilities" in the wetlands (EO 11990 Section 7[b]).	The selected remedy will comply with this requirement by avoiding activities conducted within wetlands to the maximum extent feasible. In particular, treatment buildings will not be located in wetland areas, monitoring wells will be installed and sampled with minimal impacts to sensitive areas, and if needed, air conveyance piping and site access for construction will be designed to minimize short-term impacts on wetlands, and impacted areas will be restored.
NYSDEC Freshwater Wetlands Act					
State Regulatory Requirement	Wetlands	Protect the freshwater wetlands that are present throughout the Southern Area. Activities within or adjacent to state-regulated wetlands requires a permit or letter of approval. NY ECL Article 24; NY ECL 71 Title 23 (enforcement of Article 24). 6 NYCRR 662 - 664.	Applicable	Preserve, protect, and conserve freshwater wetlands (and the benefits derived therefrom) to prevent the despoliation and destruction of freshwater wetlands, and to regulate use and development of such wetlands to secure the natural benefits of freshwater wetlands, consistent with the general welfare and beneficial economic, social, and agricultural development. Wetlands are present throughout the Southern Area.	The selected remedy will comply with this requirement by avoiding activities conducted within wetlands to the maximum extent feasible. In particular, treatment buildings will not be located in wetland areas, monitoring wells will be installed with minimal impacts to sensitive areas, and if needed, air conveyance piping and site access for construction will be designed to minimize short-term impacts on wetlands, and impacted areas will be restored.
NYSDEC Endangered and Threatened Species of Fish and Wildlife; Species of Special Concern					
State Regulatory Requirement	Critical habitat of/or presence of an endangered or threatened species	Protection of NYS endangered and threatened animal species that exist within the Southern Area. 6 NYCRR 182.5.	Relevant and Appropriate	Identify activities that may affect listed species. Actions must not threaten the continued existence of a listed species. Actions must not destroy critical habitat. Information provided by NYSDEC and the NY Natural Heritage program indicates several NYS endangered and threatened animal species exist within the Southern Area. The most notable, tiger salamander (<i>Ambystoma tigrinum</i>), may occur onsite in the ponds adjacent to Site 6A and elsewhere within the Southern Area. Other species include the northern cricket frog (<i>Acris crepitans</i>) and the least tern (<i>Sterna antillarum</i>). Additional endangered and threatened plant species occur within the facility boundary and may be present in the Southern Area.	The selected remedy will comply with this requirement by avoiding activities conducted within sensitive habitats to the maximum extent feasible. In particular, treatment buildings will use existing cleared areas to the extent practical, monitoring wells will be installed with minimal impacts to sensitive areas, and if needed, air and/or water/ conveyance piping and site access for construction will be designed to minimize short-term impacts on sensitive habitats, and impacted areas will be restored.
LOCATION-SPECIFIC ARARs AND TBCs					

LOCATION-SPECIFIC ARARs AND TBCs					
Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be taken to Attain Requirement
<i>NYSDEC Wild, Scenic, and Recreational Rivers System Act</i>					
State Regulatory Requirement	Rivers	NYS designated the upper 10.5-mile reach of the Peconic River as a scenic river and the lower 5.5-mile reach as a recreational river. Design and implementation of the Protection of river 6 NYCRR 666.6.	Relevant and Appropriate	Preservation of New York Rivers in free-flowing conditions and protection for the benefit and enjoyment of present and future generations. Activities within or adjacent to a state-regulated river requires a permit or letter of approval. NYS designated the upper 10.5-mile reach of the Peconic River as a scenic river and the lower 5.5-mile reach as a recreational river. Design and implementation of the selected remedy will not affect the river. However, activities (e.g., remedial construction and O&M) within a certain distance (e.g., 1/2 mile buffer zone [6 NYCRR 666.6]) may require a permit or variance request. Design and implementation should not impact the "natural, cultural, scenic, and recreational qualities" of the river.	The selected remedy will comply with these regulations through land use controls, monitored natural attenuation, and air sparging.

ACTION-SPECIFIC ARARs AND TBCS					
Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be taken to Attain Requirement
<i>Safe Drinking Water Act (SDWA)</i>					
Federal Regulatory Requirement	Underground injection	Protection of groundwater during injection and extraction and discharge 40 CFR 144.81 and 0.82.	Applicable	Regulates the subsurface emplacement of liquids through the Underground Injection Control program, which governs the design and operation of five classes of injection wells in order to prevent contamination of underground sources of drinking water. The Underground Injection Control program regulates well construction, well operation, and monitoring.	Design and implementation of the selected remedy does not include injection of wastes. Selected remedy Alternative 8 includes the injection of treated groundwater via infiltration gallery. Selected contingency remedy Alternative 8B includes the injection of emulsified vegetable oil or similar organic.
<i>Safe Drinking Water Act (SDWA)</i>					
New York State Regulatory Requirement	Air discharge	Protection of ambient air from vapor discharge from air stripping tower. 6 NYCRR Part 212.4.	Relevant and appropriate	Regulates the discharge of VOCs from new emission sources and establishes treatment requirements from point source discharges.	The need for off gas treatment from the air stripping tower will be evaluated and if necessary, vapor phase treatment equipment will be installed.

APPENDIX C
COST ESTIMATES

ALTERNATIVE 8 BASELINE - NO OPTIONS OR CONTINGENCIES

Area Alternative	1. Source Area LUCs & Monitoring 4 years (geo mean of 2-8yr range)		2. Fenceline Extraction, Treatment, Disposal, LUCs, & Monitoring 8 years (prescribed timeframe/steps)		3. VOCs > 500 ug/L LUCs & Monitoring 7 years (geo mean of 4-10yr timeframe)		4. VOCs < 500 ug/L LUCs & Monitoring 10 years (geo mean of 6-14yr timeframe)		5. Peconic River Area LUCs & Monitoring 17 years (geo mean of 8-36yr timeframe)		Subtotals
	Duration	Value	Value	Value	Value	Value	Value	Value	Value		
TOTAL Present Value		\$245,414	\$3,055,650	\$168,868	\$801,754	\$385,534				\$4,657,220	
Implementation		\$91,272	\$1,444,692	\$23,879	\$91,286	\$33,645				\$1,684,774	
Future Total PV		\$154,142	\$1,610,959	\$144,989	\$710,469	\$351,889				\$372,394	
1	\$26,377	\$1,650 LUC Inspection \$24,727 9-month LTM	\$244,813 \$1,650 LUC Inspection \$243,163 Extraction System O&M	\$17,674 \$825 LUC Inspection \$16,849 9-month LTM event	\$62,295 \$825 LUC Inspection \$61,470 9-month LTM event	\$21,235 \$1,650 LUC Inspection \$19,585 9-month LTM event				\$372,394	
2	\$26,377	\$1,650 LUC Inspection \$24,727 18-month LTM	\$275,948 \$1,650 LUC Inspection \$243,163 Extraction System O&M \$31,135 Annual LTM	\$17,674 \$825 LUC Inspection \$16,849 18-month LTM event	\$62,295 \$825 LUC Inspection \$61,470 18-month LTM event	\$21,235 \$1,650 LUC Inspection \$19,585 18-month LTM event				\$403,529	
3	\$51,104	\$1,650 LUC Inspection \$49,454 27- & 36-month LTM	\$275,948 \$1,650 LUC Inspection \$243,163 Extraction System O&M \$31,135 Annual LTM	\$34,523 \$825 LUC Inspection \$33,698 27- & 36-month LTM events	\$123,764 \$825 LUC Inspection \$122,939 27- & 36-month LTM events	\$40,820 \$1,650 LUC Inspection \$39,170 27- & 36-month LTM events				\$526,159	
4	\$51,354	\$1,650 LUC Inspection \$24,977 Well Abandonment \$24,727 Annual LTM	\$275,948 \$1,650 LUC Inspection \$243,163 Extraction System O&M \$31,135 Annual LTM	\$17,674 \$825 LUC Inspection \$16,849 Annual LTM	\$62,295 \$825 LUC Inspection \$61,470 Annual LTM	\$21,235 \$1,650 LUC Inspection \$19,585 Annual LTM				\$428,506	
5			\$285,136 \$1,650 LUC Inspection \$3,450 5YR \$5,738 Well Maintenance \$243,163 Extraction System O&M (Shut down end Year \$31,135 Annual LTM	\$22,268 \$825 LUC Inspection \$1,725 5YR \$2,869 Well Maintenance \$16,849 Annual LTM	\$67,995 \$825 LUC Inspection \$3,450 5YR \$2,250 Well Maintenance \$61,470 Annual LTM	\$30,423 \$1,650 LUC Inspection \$3,450 5YR \$5,738 Well Maintenance \$19,585 Annual LTM				\$405,822	
6			\$32,785 \$1,650 LUC Inspection \$31,135 Annual LTM	\$17,674 \$825 LUC Inspection \$16,849 Annual LTM	\$62,295 \$825 LUC Inspection \$61,470 Annual LTM	\$21,235 \$1,650 LUC Inspection \$19,585 Annual LTM				\$133,989	
7			\$32,785 \$1,650 LUC Inspection \$31,135 Annual LTM	\$22,191 \$825 LUC Inspection \$4,517 Well Abandonment \$16,849 Annual LTM	\$62,295 \$825 LUC Inspection \$61,470 Annual LTM	\$21,235 \$1,650 LUC Inspection \$19,585 Annual LTM				\$138,506	
8			\$123,266 \$1,650 LUC Inspection \$27,731 Well Abandonment \$62,750 Demo/Abandon Extraction System \$31,135 Annual LTM		\$62,295 \$825 LUC Inspection \$61,470 Annual LTM	\$21,235 \$1,650 LUC Inspection \$19,585 Annual LTM				\$206,796	
9					\$62,295 \$825 LUC Inspection \$61,470 Annual LTM	\$21,235 \$1,650 LUC Inspection \$19,585 Annual LTM				\$83,530	
10					\$90,890 \$825 LUC Inspection \$3,450 5YR \$2,250 Well Maintenance \$22,895 Well Abandonment \$61,470 Annual LTM	\$30,423 \$1,650 LUC Inspection \$3,450 5YR \$5,738 Well Maintenance \$19,585 Annual LTM				\$121,313	
11						\$21,235 \$1,650 LUC Inspection \$19,585 Annual LTM				\$21,235	
12						\$21,235 \$1,650 LUC Inspection \$19,585 Annual LTM				\$21,235	
13						\$21,235 \$1,650 LUC Inspection \$19,585 Annual LTM				\$21,235	
14						\$21,235 \$1,650 LUC Inspection \$19,585 Annual LTM				\$21,235	
15						\$30,423 \$1,650 LUC Inspection \$3,450 5YR \$5,738 Well Maintenance \$19,585 Annual LTM				\$30,423	
16						\$21,235 \$1,650 LUC Inspection \$19,585 Annual LTM				\$21,235	
17						\$25,752 \$1,650 LUC Inspection \$4,517 Well abandonment \$19,585 Annual LTM				\$25,752	

Area	Site 6A - Source Area, Option Plus Baseline	
	Air Sparge, LUCs, & Monitoring	
Duration	8 years	
TOTAL Present Value	\$2,023,774	
Implementation	\$132,606	LUC Implementation UFP-SAP Baseline Sampling & New LTM Wells
Future Total PV	\$1,891,169	
Year		
1	\$1,650	LUC Inspection
	\$129,396	Quarterly LTM (total)
2	\$1,650	LUC Inspection
	\$32,349	Annual LTM
3	\$1,650	LUC Inspection
	\$50,552	New performance well install & sample
	\$909,407	Air Sparge Install & Startup
	\$202,623	Air Sparge O&M
	\$156,179	Quarterly LTM (total)
4	\$1,650	LUC Inspection
	\$202,623	Air Sparge O&M
	\$30,322	Annual LTM
5	\$1,650	LUC Inspection
	\$3,450	5YR
	\$5,738	Well Maintenance
	\$30,322	Annual LTM
6	\$1,650	LUC Inspection
	\$30,322	Annual LTM
7	\$1,650	LUC Inspection
	\$30,322	Annual LTM
8	\$1,650	LUC Inspection
	\$64,306	Well Abandonment
	\$34,463	Demo/Abandon Air Sparge system
	\$30,322	Annual LTM

Area	Fence Line Area Baseline, No Option or Contingency	
Alternative	Groundwater Extraction, Treatment, Disposal, LUCs, & Monitoring	
Duration	8 years	
TOTAL Present Value	\$3,055,650	
Implementation	\$1,444,692	LUC Implementation UFP-SAP Baseline Sampling & New LTM Wells Install & Startup Extraction System
Future Total PV	\$1,610,959	
Year		
1	\$1,650 \$243,163 \$118,004	LUC Inspection Extraction System O&M Quarterly LTM (total)
2	\$1,650 \$243,163 \$31,135	LUC Inspection Extraction System O&M Annual LTM
3	\$1,650 \$243,163 \$31,135	LUC Inspection Extraction System O&M Annual LTM
4	\$1,650 \$243,163 \$31,135	LUC Inspection Extraction System O&M Annual LTM
5	\$1,650 \$3,450 \$5,738 \$243,163 \$31,135	LUC Inspection 5YR Well Maintenance Extraction System O&M (Shut down end Year 5) Annual LTM
6	\$1,650 \$31,135	LUC Inspection Annual LTM
7	\$1,650 \$31,135	LUC Inspection Annual LTM
8	\$1,650 \$27,731 \$62,750	LUC Inspection Well Abandonment Demo/Abandon Extraction System

Area	VOCs > 500 ug/L, Contingency Plus Baseline	
Alternative	Biodegradation, LUCs, & Monitoring	
Duration	8 years	
TOTAL Present Value	\$1,873,587	
Implementation	\$60,879	LUC Implementation UFP-SAP Baseline Sampling existing wells
Future Total PV	\$1,812,708	
Year		
1	\$825	LUC Inspection
	\$82,350	Quarterly LTM (total)
2	\$825	LUC Inspection
	\$20,587	Annual LTM
3	\$825	LUC Inspection
	\$20,587	Annual LTM
4	\$825	LUC Inspection
	\$20,587	Annual LTM
5	\$825	LUC Inspection
	\$1,725	5YR
	\$2,869	Well Maintenance
	\$104,857	Injection Performance Well Install & Sample
	\$1,401,971	Injection Well Installation and Injection
	\$99,918	Quarterly LTM (total)
6	\$825	LUC Inspection
	\$25,363	Annual LTM
7	\$825	LUC Inspection
	\$25,363	Annual LTM
8	\$825	LUC Inspection
	\$62,974	Well Abandonment
	\$25,363	Annual LTM

Area	VOCs < 500 ug/L Baseline, No Option or Contingency	
Alternative	2 - LUCs & Monitoring	
Duration	10 years	
TOTAL Present Value	\$801,754	
Implementation	\$91,286	LUC Implementation UFP-SAP Baseline Sampling & Install New wells
Future Total PV	\$710,469	
Year		
1	\$825 \$61,470	LUC Inspection 9-month LTM event
2	\$825 \$61,470	LUC Inspection 18-month LTM event
3	\$825 \$122,939	LUC Inspection 27- & 36-month LTM events
4	\$825 \$61,470	LUC Inspection Annual LTM
5	\$825 \$3,450 \$2,250 \$61,470	LUC Inspection 5YR Well Maintenance Annual LTM
6	\$825 \$61,470	LUC Inspection Annual LTM
7	\$825 \$61,470	LUC Inspection Annual LTM
8	\$825 \$61,470	LUC Inspection Annual LTM
9	\$825 \$61,470	LUC Inspection Annual LTM
10	\$825 \$3,450 \$2,250 \$22,895 \$61,470	LUC Inspection 5YR Well Maintenance Well Abandonment Annual LTM

Area	Peconic River Area, Contingency Plus Baseline	
Alternative	Air Sparge, LUCs, & Monitoring	
Duration	24 years	
TOTAL Present Value	\$5,825,303	
Implementation	\$33,645	LUC Implementation UFP-SAP Baseline Sampling existing wells
Future Total PV	\$5,791,658	
Year		
1	\$1,650 \$90,801	LUC Inspection Quarterly LTM (total)
2	\$1,650 \$22,700	LUC Inspection Annual LTM
3	\$1,650 \$22,700	LUC Inspection Annual LTM
4	\$1,650 \$22,700	LUC Inspection Annual LTM
5	\$1,650 \$3,450 \$5,738 \$71,696 \$1,988,522 \$231,479 \$137,423	LUC Inspection 5YR Well Maintenance New Performance Well Install & Sample Air Sparge System Install & Startup Air Sparge O&M Quarterly LTM (total)
6	\$1,650 \$231,479 \$27,502	LUC Inspection Air Sparge O&M Annual LTM
7	\$1,650 \$231,479 \$27,502	LUC Inspection Air Sparge O&M Annual LTM
8	\$1,650 \$231,479 \$27,502	LUC Inspection Air Sparge O&M Annual LTM
9	\$1,650 \$231,479 \$27,502	LUC Inspection Air Sparge O&M Annual LTM
10	\$1,650 \$3,450 \$5,738 \$231,479 \$27,502	LUC Inspection 5YR Well Maintenance Air Sparge O&M Annual LTM
11	\$1,650 \$231,479 \$27,502	LUC Inspection Air Sparge O&M Annual LTM
12	\$1,650 \$231,479 \$27,502	LUC Inspection Air Sparge O&M Annual LTM
13	\$1,650 \$231,479 \$27,502	LUC Inspection Air Sparge O&M Annual LTM
14	\$1,650 \$231,479 \$27,502	LUC Inspection Air Sparge O&M Annual LTM
15	\$1,650 \$3,450 \$5,738 \$231,479 \$27,502	LUC Inspection 5YR Well Maintenance Air Sparge O&M Annual LTM
16	\$1,650 \$231,479 \$27,502	LUC Inspection Air Sparge O&M Annual LTM
17	\$1,650 \$231,479 \$27,502	LUC Inspection Air Sparge O&M Annual LTM
18	\$1,650 \$231,479 \$27,502	LUC Inspection Air Sparge O&M Annual LTM
19	\$1,650 \$231,479 \$27,502	LUC Inspection Air Sparge O&M Annual LTM
20	\$1,650 \$3,450 \$5,738 \$231,479 \$27,502	LUC Inspection 5YR Well Maintenance Air Sparge O&M (shut down Air Sparge) Annual LTM
21	\$1,650 \$27,502	LUC Inspection Annual LTM
22	\$1,650 \$27,502	LUC Inspection Annual LTM
23	\$1,650 \$27,502	LUC Inspection Annual LTM
24	\$1,650 \$74,518 \$67,397 \$27,502	LUC Inspection Well Abandonment Demo/Abandon Air Sparge System Annual LTM

Item/Activity	Qty	Unit	Unit Cost	Cost
IMPLEMENTATION COST				
LUCs				
LUC Remedial Design and implementation into Navy's <i>LUC Tracker</i> .	1	each	\$2,000	\$2,000
UFP-SAP & Remedial Action Work Plan				
Work Plan for additional sampling, well installation, injection, and groundwater performance monitoring (in Navy's UFP-SAP format).	1	each	\$32,500	\$32,500
Baseline Sampling (13 existing Wells)				
Labor, ODCs, travel	0.5	week	\$9,525	\$4,953
Equipment & Expendables	0.5	week	\$1,000	\$520
Lab & Data Validation	1	each	\$6,736	\$6,736
Report	1	each	\$6,250	\$6,250
New LTM & Extraction Performance Well Installation (4 new wells)				
Mobilization & Site Setup	1	each	\$1,250	\$1,250
Labor, ODCs, travel	0.7	week	\$9,525	\$6,604
Equipment & Expendables	0.7	week	\$200	\$139
Drilling Subcontractor / well installation				
Well installation - HSA drilling & 2-inch PVC install	200	feet	\$36	\$7,200
Well Completion with bollards	4	each	\$325	\$1,300
Travel	0.7	week	\$3,000	\$2,080
Loader/Backhoe for IDW management	0.7	week	1,375	\$953
Water usage (hydrant permit fee)	4	day	\$50	\$200
Survey	1	each	\$500	\$500
Water IDW Transport & Disposal	600	gallon	\$2	\$1,200
Soil IDW Transport & Disposal	0.13	each	\$2,000	\$259
Baseline Sample New Wells (4 wells)				
Labor, ODCs, travel	0.2	week	\$9,525	\$1,524
Equipment & Expendables	0.2	week	\$1,000	\$160
Lab & Data Validation	1	each	\$3,592	\$3,592
Report	1	each	\$6,250	\$6,250
Extraction, Treatment, & Discharge/Injection System Installation & Startup				
Drilling/Well Installation Equipment and Subcontractor				
Mobilization and Site Setup	1	each	\$5,000	\$5,000
Labor, ODCs, travel	3.0	week	\$7,500	\$22,500
Equipment & Expendables	3.0	week	\$200	\$600
Drilling Subcontractor / well installation				
12-inch Mud Rotary drilling	245	feet	\$48	\$11,760
8-inch carbon steel riser installed	145	feet	\$48	\$6,960
8-inch stainless steel 10-ft screen	10	each	\$1,650	\$16,500
Well Completion pads with bollards	5	each	\$575	\$2,875
Travel	3.0	week	\$3,000	\$9,000
Loader/Backhoe for IDW management	3.0	week	1,375	\$4,125
Water usage (hydrant permit fee)	15.0	day	\$50	\$750
Water IDW Transport & Disposal	5,000	gallon	\$2	\$10,000
Water characterization - TCLP VOCs	1	each	\$116	\$116
Soil IDW Transport & Disposal	1	each	\$2,000	\$2,000
Soil characterization - TCLP VOCs	1	each	\$132	\$132
Submersible Centrifugal Pump & Installation	1	ea	\$5,000	\$5,000
Equipment Delivery	1	each	\$500	\$500
Extraction System Equipment & Setup				
Mobilization and Site Setup	1	each	\$30,000	\$30,000
System Storage/Operations Building	1,200	sq ft	\$200	\$240,000
Electricity Conveyance & Hookup	1	each	\$75,000	\$75,000
Conveyance Piping				
Feneline Extraction Well - 4-inch HDPE	1,300	feet	\$3.50	\$4,550
Discharge/Injection Wells - 4-inch HDPE	5,200	feet	\$3.50	\$18,200

Item/Activity	Qty	Unit	Unit Cost	Cost
Trenching & Installation	6.5	week	\$10,025	\$65,163
Misc Piping, Fittings, Materials	1	each	\$15,000	\$15,000
Treatment Plant				
Horizontal-Centrifugal Pump, 100 gpm, 3 hp, 50 ft head	2	each	\$3,602.75	\$7,206
Bag filter, multi-bag (242 sq ft total)	2	each	\$12,410.00	\$24,820
Air Stripper, 750 cfm blower & control panel (100 gpm)	1	each	\$42,000.00	\$42,000
Polyphosphate Feed System	1	each	\$15,000.00	\$15,000
Air Feed Feed System	1	each	\$15,000.00	\$15,000
Switchgear	1	each	\$2,600.00	\$2,600
Heat Tracing	200	feet	\$17.00	\$3,400
Plumb/electrical systems	1	each	\$19,056.00	\$19,056
Post-Construction Site Survey	1	LS	\$6,000	\$6,000
System Startup & Testing				
Labor, ODCs, travel	4	week	\$9,525	\$38,100
Construction Report	1	each	\$30,000	\$30,000
				<i>Subtotal</i>
				\$835,082
<i>Contingency</i>	25%			\$208,770
<i>Project Management</i>	10%			\$83,508
<i>Construction Oversight</i>	10%			\$83,508
<i>Remedial Design</i>	10%			\$83,508
<i>G&A</i>	10%			\$83,508
<i>Fee</i>	8%			\$66,807
			Total Implementation Cost	\$1,444,692
FUTURE COSTS (8 years)				
LUCs (Years 1-8)				
Annual Inspections and reporting (1 per year)	8	year	\$1,500	\$12,000
				<i>Subtotal</i>
			\$1,500	\$12,000
<i>Project Management</i>	10%		\$150	\$1,200
				<i>Subtotal</i>
			\$1,650	\$13,200
			LUCs Future Annual Cost	\$1,650
			LUCs Total Future Cost	\$13,200
			<i>Present Value</i> (0.97%) <i>of Future Cost of LUCs</i>	
	8	year	0.97%	\$12,642
5-Year Reviews (Year 5 only)				
5-Year Review	1	each	\$2,500	\$2,500
				<i>Subtotal</i>
			\$2,500	\$2,500
<i>Contingency</i>	10%		\$250	\$250
<i>Project Management</i>	10%		\$250	\$250
<i>G&A</i>	10%		\$250	\$250
<i>Fee</i>	8%		\$200	\$200
				<i>Subtotal</i>
			\$3,450	\$3,450
			5YR Total Annual Cost at Year 5	\$3,450
			5YR Total Future Cost	\$3,450
			<i>Present Value</i> (0.97%) <i>of Future Cost of 5YRs</i>	
	5	year	0.97%	\$3,287
Well Maintenance (Year 5 only)				
Repair flushmounts & vaults, potential well replacements, etc.	1	event	\$3,750	\$3,750
				<i>Subtotal</i>
			\$3,750	\$3,750
<i>Contingency</i>	25%		\$938	\$938
<i>Project Management</i>	10%		\$375	\$375
<i>G&A</i>	10%		\$375	\$375
<i>Fee</i>	8%		\$300	\$300

Item/Activity	Qty	Unit	Unit Cost	Cost
<i>Subtotal</i>			\$5,738	\$5,738
Well Maintenance Future Annual Cost at Year 5			\$5,738	
Well Maintenance Total Future Cost				\$5,738
<i>Present Value</i> <small>(0.97%)</small> <i>of Future Cost of Well Maintenance</i>	5	year	0.97%	\$5,467
Well Abandonment (Year 8)				
Abandon wells when RAOs are achieved. Driller sub.	22	well	\$300	\$6,600
Labor, ODCs, and Travel	1.0	week	\$9,525	\$9,525
IDW Disposal	1	each	\$2,000	\$2,000
<i>Subtotal</i>				\$18,125
<i>Contingency</i>	25%			\$4,531
<i>Project Management</i>	10%			\$1,813
<i>G&A</i>	10%			\$1,813
<i>Fee</i>	8%			\$1,450
<i>Subtotal</i>				\$27,731
Well Abandonment Future Annual Cost at Year 8				\$27,731
<i>Present Value</i> <small>(0.97%)</small> <i>of Future Cost of Well Abandonment</i>	8	year	0.97%	\$25,670
Extraction System O&M (Years 1-5)				
Electrical usage	456,834	kW-hr	\$0.21	\$95,935
Maintenance	5	each	\$37,446	\$187,228
Polyphosphate	10	drum	\$1,000	\$10,000
Influent & Effluent Sampling				
Labor, ODCs, & Travel	63	day	\$800	\$50,400
Equipment & Expendables	63	day	\$100	\$6,300
VOC Samples (1 extraction wells and 1 effluent)	199	sample	\$112	\$22,288
Sludge Handling				
Disposal	10	ton	\$200	\$2,000
Labor, ODCs, & Travel	260	week	\$925	\$240,500
O&M Report	60	each	\$3,000	\$180,000
<i>Subtotal</i>				\$794,651
<i>Contingency</i>	25%			\$198,663
<i>Project Management</i>	10%			\$79,465
<i>G&A</i>	10%			\$79,465
<i>Fee</i>	8%			\$63,572
<i>Extraction System O&M Year 1-5 Subtotal</i>				\$1,215,816
<i>O&M per year</i>			\$243,163	
<i>Present Value</i> <small>(0.97%)</small> <i>of Future Cost of Extraction&Treatment O&M Years 1-5</i>	5	year	0.97%	\$1,181,221
Demo/Abandonment of Extraction System (Year 8)				
Abandon Extraction system when RAOs are achieved. Demo sub.	1	each	\$25,000	\$25,000
Labor, ODCs, and Travel	2.0	week	\$9,525	\$19,050
IDW disposal	1	each	\$10,000	\$10,000
<i>Subtotal</i>				\$54,050
<i>Contingency</i>	20%			\$3,625
<i>Project Management</i>	10%			\$1,813
<i>G&A</i>	10%			\$1,813
<i>Fee</i>	8%			\$1,450
<i>Subtotal</i>				\$62,750

Item/Activity	Qty	Unit	Unit Cost	Cost
<i>Present Value</i> <small>(0.97%)</small> <i>of Future Cost of Well Abandonment</i>	8	year	0.97%	\$58,086
Performance Groundwater Monitoring (15 wells)				
Year 1 (Quarterly events)				
Labor, ODCs, travel	2.4	week	\$9,525	\$22,860
Equipment & Expendables	2.4	week	\$1,000	\$2,400
Lab & Data Validation	4	each	\$7,368	\$29,473
Report	4	each	\$6,250	\$25,000
<i>Subtotal</i>				\$79,733
<i>Contingency</i>	20%			\$15,947
<i>Project Management</i>	10%			\$7,973
<i>G&A</i>	10%			\$7,973
<i>Fee</i>	8%			\$6,379
<i>Total Future Groundwater Sampling Cost Year 1</i>				\$118,004
<i>Total per quarterly event</i>			\$29,501	
<i>Present Value</i> <small>(0.97%)</small> <i>of Future Cost of Groundwater Sampling Year 1</i>	1	year	0.97%	\$116,871
Years 2-8 (annual) (15 wells)				
Labor, ODCs, travel	4.2	week	\$9,525	\$40,005
Equipment & Expendables	4.2	week	\$1,000	\$4,200
Lab & Data Validation	7	each	\$8,472	\$59,304
Report	7	each	\$6,250	\$43,750
<i>Subtotal</i>				\$147,259
<i>Contingency</i>	20%			\$29,452
<i>Project Management</i>	10%			\$14,726
<i>G&A</i>	10%			\$14,726
<i>Fee</i>	8%			\$11,781
<i>Total Future Groundwater Sampling Cost Years 2-8</i>				\$217,944
<i>Total per year</i>			\$31,135	
<i>Present Value</i> <small>(0.97%)</small> <i>of Future Cost of Groundwater Sampling Years 2-8</i>	8	year	0.97%	\$207,713
Total Present Value of All Future Costs				\$1,610,959
TOTAL PV Cost of Alternative 8(a) - Extraction, Treatment, Discharge, LUCs, and Monitoring			-30%	+50%
			\$3,055,650	\$2,138,955
				\$4,583,476

Notes:

• The "Real" Discount Rates used to calculate the Present Value costs are provided in the Office of Management and Budget (OMB) *Circular A-94, Appendix C, Revised December 2010, "Discount Rates for Cost Effectiveness, Lease Purchase, and Related Analysis" for Calendar Year 2011.*
[http://www.whitehouse.gov/omb/circulars_a094_a94_appx-cl.](http://www.whitehouse.gov/omb/circulars_a094_a94_appx-c/)

- EPA. 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*. OSWER Directive 9355.3-01. EPA/540/G-89/004.
- EPA. 2000. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*. With the U.S. Army Corps of Engineers. OSWER 9355.0-
- The information in this cost estimate is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during Baseline Sampling and the Remedial Design phase. This is an order-of-magnitude engineering cost estimate that is expected to be within -30 to +50 percent of the actual project cost (per EPA, 1988 and 2000).

APPENDIX D
ACRONYMS AND ABBREVIATIONS

ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant appropriate requirement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	code of federal regulations
CSF	cancer slope factor
CMS/FS	Corrective Measures Study/Feasibility Study
COC	chemical of concern
COPC	chemical of potential concern
CSM	conceptual site model
CVOC	chlorinated volatile organic compound
DCA	1,1-dichloroethane
DCE	1,1-dichloroethene
DON	Department of the Navy
ECO	ecological
EE/CA	Engineering Evaluation/Cost Analysis
EISB	Enhanced Insitu Biodegradation
ETH	Engine Test House
EPC	exposure point concentration
ERP	Environmental Restoration Program
FCA	Fuel Calibration Area
gpm	gallon per minute
HH	human health
HHRA	Human Health Risk Assessment
HI	hazard index
ILCR	incremental life-time cancer risk
LUC	Land Use Control
MCL	maximum contaminant level
mg/kg	milligram per kilogram
MNA	monitored natural attenuation
NAWQC	National Ambient Water Quality Criteria
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NGC	Northrop Grumman Corporation
NIRIS	Naval Installation Restoration information Solution
NPL	National Priorities List
NWIRP	Naval Weapons Industrial Reserve Plant

APPENDIX D-ACRONYMS AND ABBREVIATIONS

NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	operation and maintenance
ORNL	Oak Ridge National Laboratories
OSHA	Occupational Safety and Health Administration
OU5	Operable Unit 5
PCB	polychlorinated biphenyls
PRSC	Peconic River Sportsman's Club
RA	Remedial Action
RAB	Restoration Advisory Board
RAO	Remedial Action Objectives
RFA	Resource Conservation and Recovery Act Facility Assessment
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RFI	Resource Conservation and Recovery Act Facility Investigation
RI	Remedial Investigation
RME	reasonable maximum exposure
ROD	Record of Decision
RSL	Regional Screening Level
SARA	Superfund Amendment and Reauthorization Act
SCDHS	Suffolk County Department of Health Services
SWBM	Surface Water Bench Marks
SWQS	Surface Water Quality Standards
TCA	1,1,1-trichloroethane
TBC	to be considered
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
µg/L	microgram per liter



Reference Number	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
1	NYSDOH Drinking Water Standards	Section 1	New York State Department of Health (NYSDOH), 2007. New York State Department of Health. New York Public Supply Regulations, 10 NYCRR Part 5, Subpart 5-1 Public Water Systems, Table 3-Organic Chemicals Maximum Contaminant Level Determination and Table 9D - Organic Chemicals - Principal Organic Contaminants, from the NYSDOH website at http://www.health.state.ny.us/environmental/water/drinking/part5/subpart5.htm
2	used in the testing of aircraft fuel and engine systems from the late 1950's to 1996	Section 2.1	Initial Assessment Study of NWIRP Bethpage and NWIRP Calverton, New York. Section 2.3.1.6. Rogers, Golden, and Halpern, December 1986.
3	drainage swale	Section 2.1	Phase 2 RCRA Facility Investigation for NWIRP Calverton for Sites 6A, 10A, 10B, and Southern Area, NWIRP Calverton, New York. Section 5.1.1. C.F. Braun, January 1998.
4	groundwater from Site 6A was discharged into this drainage swale and culvert	Section 2.1	Phase 2 RCRA Facility Investigation for NWIRP Calverton for Sites 6A, 10A, 10B, and Southern Area, NWIRP Calverton, New York. Section 5.2.1. C.F. Braun, January 1998.
5	remediation of site soils	Section 2.1	Construction Completion Report Remediation of Site 10B-Engine Test Building, NWIRP Calverton, New York. Section 2.8.1. AGVIQ, CH2M HILL, August 2010. Construction Completion Report Remediation of Site 6A-Old Fuel Calibration Area, Remedial Action, NWIRP Calverton, New York. Section 2.3.1. AGVIQ, CH2M HILL, November 2010.

REFERENCES

Reference Number	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
6	chlorinated solvents were detected in Navy and Suffolk County monitoring wells	Section 2.1	Phase 2 RCRA Facility Investigation for NWIRP Calverton for Sites 6A, 10A, 10B, and Southern Area, NWIRP Calverton, New York. Section 5.2.1. C.F. Braun, January 1998.
7	gamma logs from the southeastern portion of Site 6A-Southern Area	Section 2.2	Corrective Measures Study/Feasibility Study Southern Area Groundwater Plume NWIRP Calverton, New York. Section 2.2.2. Tetra Tech NUS, Inc. March 2011.
8	Phase 2 Remedial Investigation (RI)	Section 2.2 Table 1	Phase 2 Remedial Investigation for Site 6A – Fuel Calibration Area, Site 10B – Engine Test House, and Southern Area, NWIRP, Calverton, New York. Tetra Tech NUS, Inc. December 2001.
9	water level data collected during 2010	Section 2.2	Data Summary Report for Groundwater Investigation Activities at Site 2-Fire Training Area, Site 6A-Fuel calibration Area, Site 10B-Engine Test House and Southern Area NWIRP Calverton, New York. Section 2.2.4. Tetra Tech NUS, Inc. January 2011.
10	two pumping tests conducted in 2010	Section 2.2	Corrective Measures Study/Feasibility Study Southern Area Groundwater Plume NWIRP Calverton, New York. Appendix A-Section 1.0. Tetra Tech NUS, Inc. March 2011.
11	COCs at the Southern Area	Section 2.3	Corrective Measures Study/Feasibility Study Southern Area Groundwater Plume NWIRP Calverton, New York. Sections 2.2.5. Tetra Tech NUS, Inc. March 2011.
12	RCRA Facility Investigation (RFI) Report	Section 2.4 & 2.5 Table 1	RCRA Facility Investigation, Sites 1, 2, 6A, and 7, NWIRP Calverton, New York. Halliburton NUS, August 1995.
13	New York State Department of Health (NYSDOH) MCLs	Section 2.3, 2.5.3, 2.7, 2.8.2, 2.9.4 Table 2 & 5	New York State Department of Health (NYSDOH) Maximum Contaminant Level (MCL). 10 NYCRR, Part 5, Subpart 5-1 Public Water Systems, Tables 1 through 3. http://www.health.ny.gov/regulations/nycrr/title_10/part_5/subpart_5-1_tables.htm#table1
14	municipal water line	Section 2.3 & 2.4 Table 1	Action Memorandum Water supply Line for the Off-Site Southern Area Site 6A-Souther Area NWIRP Calverton, New York. Section 1. Tetra Tech NUS, Inc. May 2010.
15	CMS/FS	Section 2.3, 2.4, 2.5, 2.8.1 Table 1 & 4	Corrective Measures Study/Feasibility Study Southern Area Groundwater Plume NWIRP Calverton, New York. Sections 2.2.6, 5.2, Table 2-6, Appendix E. Tetra Tech NUS, Inc. March 2011.
16	Data Summary Report for 2010 Groundwater Investigation Activities	Section 2.3 Table 1	Data Summary Report for Groundwater Investigation Activities at Site 2-Fire Training Area, Site 6A-Fuel calibration Area, Site 10B-Engine Test House and Southern Area NWIRP Calverton, New York. Tetra Tech NUS, Inc. January 2011.

REFERENCES

Reference Number	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
17	conceptual site model (CSM)	Section 2.3 Table 1	Corrective Measures Study/Feasibility Study Southern Area Groundwater Plume NWIRP Calverton, New York. Section 2.2.5 p.2-19. Tetra Tech NUS, Inc. March 2011.
18	CMS Addendum	Table 1 Section 2.8.1	Corrective Measures Study Addendum Southern Area Groundwater Plume NWIRP Calverton, New York. Table 1. Tetra Tech NUS, Inc. March 2011.
19	VOC-impacted groundwater	Section 2.3	Corrective Measures Study/Feasibility Study Southern Area Groundwater Plume NWIRP Calverton, New York. Section 2.2.5. Tetra Tech NUS, Inc. March 2011.
20	USEPA MCLs	Section 2.3 Section 2.7 Table 2 Table 5	United States Environmental Protection Agency (USEPA, 2007) Drinking Water Contaminants National Primary Drinking Water Regulations, from the USEPA website at http://www.epa.gov/safewater/contaminants/index.html#primary
21	National Ambient Water Quality Criteria (NAWQC)	Section 2.3 Table 2	National Ambient Water Quality Criteria. http://water.epa.gov/scitech/swguidance/waterquality/standards/current/upload/nrwqc-2009.pdf
22	NYSDEC Class "C" Surface Water Quality Criteria (SWQS)	Section 2.3 table 2	NYSDEC Surface Water and Groundwater Quality Standards (6 NYCRR Part 703, Section 703.5[f], Table 1). Peconic River is Class C Surface Water . http://www.dec.ny.gov/regs/4590.html .
23	Oakridge National Laboratories (ORNL) Surface Water Bench Marks (SWBMs)	Section 2.3 table 2	Oak Ridge National Laboratories (ORNL) Surface Water Bench Marks (SWBM) - Table 3 (secondary chronic values), Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1997 Revision (Hull, Jones, and Suter II, 1997). http://www.esd.ornl.gov/programs/ecorisk/documents/tm95r4.pdf .
24	USEPA Regional Screening Levels (RSLs) for Tap Water	Section 2.3 table 2	RSL (Regional Screening Levels) for Tap water http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm
25	plume area measures	Section 2.3	Corrective Measures Study/Feasibility Study Southern Area Groundwater Plume NWIRP Calverton, New York. Section 2.2.5 p.2-18. Tetra Tech NUS, Inc. March 2011.
26	supply wells at the PRSC have been impacted	Section 2.4	Corrective Measures Study/Feasibility Study Southern Area Groundwater Plume NWIRP Calverton, New York. Section 2.1.3 p.2-6. Tetra Tech NUS, Inc. March 2011.

REFERENCES

Reference Number	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
27	Human Health Risk Assessment performed for Site 6A in the 1995 RI	Section 2.5	RCRA Facility Investigation, Sites 1, 2, 6A, and 7, NWIRP Calverton, New York. Section 6.6. Halliburton NUS, August 1995.
28	baseline risk assessment	Section 2.5.1	RCRA Facility Investigation, Sites 1, 2, 6A, and 7, NWIRP Calverton, New York. Section 6.6. Halliburton NUS, August 1995.
29	incremental life-time cancer risk (ILCR)	Section 2.5.1	RCRA Facility Investigation, Sites 1, 2, 6A, and 7, NWIRP Calverton, New York. Section 6.6. Halliburton NUS, August 1995.
30	hazard index	Section 2.5.1 Table 4	RCRA Facility Investigation, Sites 1, 2, 6A, and 7, NWIRP Calverton, New York. Section 6.6.6. Halliburton NUS, August 1995.
31	Applicable Relevant and Appropriate Requirements (ARARs)	Section 2.7 & 2.8.2	Corrective Measures Study/Feasibility Study Southern Area Groundwater Plume NWIRP Calverton, New York. Section 3.2. Tetra Tech NUS, Inc. March 2011.
32	nine evaluation criteria	Section 2.82	Corrective Measures Study/Feasibility Study Southern Area Groundwater Plume NWIRP Calverton, New York. Section 3.2.1. Tetra Tech NUS, Inc. March 2011.
33	ARAR and TBC criteria	Section 2.82	Corrective Measures Study/Feasibility Study Southern Area Groundwater Plume NWIRP Calverton, New York. Section 5.1. Tetra Tech NUS, Inc. March 2011.

Detailed site information referenced in this ROD in bold blue text is contained in the Administrative Record and Naval Installation Restoration Information Solution (NIRIS)