

Site Management Plan

Fiscal Year 2010

Naval Weapons Industrial Reserve

Plant

Bethpage

Bethpage, New York



Naval Facilities Engineering Command

Mid-Atlantic

Contract No. N62470-08-D-1001
Contract Task Order WE-06

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**Site Management Plan
Fiscal Year 2010**

**NWIRP Bethpage
Bethpage, New York**

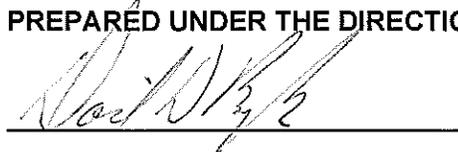
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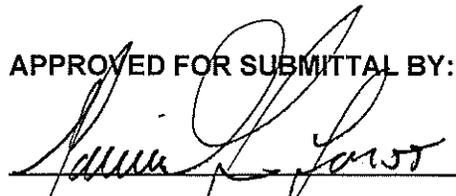
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Acronyms and Abbreviations

1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCA	1,2-dichloroethane
1,2-DCE	1,2-dichloroethene
1,1,1-TCA	1,1,1-trichloroethane
ACM	asbestos-containing material
APU	Air Purification Unit
AOC	area of concern
AS/SVE	air sparging/soil vapor extraction
ASTM	American Standard of Testing Materials
bgs	below ground surface
btu	British Thermal Units
BWD	Bethpage Water District
CCR	Construction Completion Report
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
cis-1,2-DCE	cis-1,2-dichloroethene
CLB	Closed-Loop Bioreactor
CLEAN	Comprehensive Long-Term Environmental Action Navy
COC	chemical of concern
CQC	Construction Quality Control
CRP	Community Relations Plan
CTO	Contract Task Order
CY	cubic yards
DMRACR	Document Memorializing Remedial Action Completion Report
DRO	diesel range organics
EBS	Environmental Baseline Survey
EBST	Environmental Baseline Survey for Transfer
ECP	Environmental Conditions of Property
EE/CA	Engineering Evaluation Cost Analysis
EIS	Environmental Impact Statement
ESA	Environmental Site Assessment
FFA	Federal Facilities Agreement
FFS	Focused Feasibility Study
FOST	Finding of Suitability to Transfer
Freon 12	dichlorodifluoromethane
FS	Feasibility Study
FSAP	Field Sampling and Analysis Plan
FY	fiscal year
GAC	granular activated carbon
gpm	gallons per minute
GOCO	Government-owned/Contractor operated
HASP	Health and Safety Plan
HNUS	Halliburton NUS
IAS	Initial Assessment Study
IR	Installation Restoration
LBP	lead-based paint
LOD	limits of detection
MCL	maximum contaminant level
mg/kg	milligrams per kilogram

Acronyms and Abbreviations (cont.)

MIDLANT	Mid-Atlantic
MPP	Master Project Plan
NACIP	Navy Assessment and Control of Installation Pollutants
NAVAIR	Naval Air Systems Command
NAVFAC	Naval Facilities Engineering Command
NCP	National Contingency Plan
NFA	No Further Action
NGC	Northrop Grumman Corporation
NPL	National Priorities List
NTCRA	non-time critical removal action
NWIRP	Naval Weapons Industrial Reserve Plant
NYSDEC	New York State Department of Environmental conservation
NYSDOH	New York State Department of Health
O&M	operation and maintenance
ONCT	On-Site Containment System
OU	Operable Unit
PA	Preliminary Assessment
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyls
PCE	tetrachloroethene
ppb	parts per billion
PMT	project management team
ppm	parts per million
POTW	publicly owned treatment works
PRAP	Proposed Remedial Action Plan
PRG	preliminary remediation goal
RA	remedial action
RAB	restoration advisory board
RAC	remedial action contract
RAO	remedial action objectives
RCRA	Resource Compensation and Recovery Act
RD	remedial design
RD/RA	Remedial Design/Remedial Action
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RIP	remedy in place
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SFWD	South Farmingdale Water District
SGC	Standards, Criteria, and Guidance
SI	Site Investigation
SMP	Site Management Plan
SSD	Subslab Depressurization Unit
SVOC	semi-volatile organic compound
TAGM	Technical and Administrative Guidance Memorandum
TCE	trichloroethene
TCL	target compound list
TCLP	Toxicity Characteristic Leaching Procedure
TPH	total petroleum hydrocarbons
TOC	total organic carbon
TVOC	total volatile organic compounds

Acronyms and Abbreviations (cont.)

VPB	vertical profile boring
VOC	volatile organic compound
µg/kg	microgram per kilogram
USEPA	United States Environmental Protection Agency
UST	underground storage tank
µg/L	micrograms per liter
µg/m ³	micrograms per cubic meter

1.0 INTRODUCTION

This report has been prepared for the Mid-Atlantic Division (MIDLANT) of the Naval Facilities Engineering Command (NAVFAC) by Tetra Tech NUS, Inc. (Tetra Tech), under Contract Task Order (CTO) WE-06 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) III Contract Number N62470-08-D-1001. This document presents the Site Management Plan (SMP) for Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage for the Fiscal Year 2010.

1.1 PURPOSE

The purpose of the SMP is to provide a management tool for NAVFAC MIDLANT personnel to aid in planning and scheduling of environmental remedial response activities to be conducted at NWIRP under Navy's Installation Restoration (IR) Program and RCRA. The schedules and work descriptions consist of:

- Detailed schedules, near-term milestones, and descriptions of proposed activities for Fiscal Year (FY) 2010,
- Conceptual schedules and general work approaches for activities planned for the five year period FY 2011 through FY 2015.

1.2 SMP REPORT ORGANIZATION

This SMP consists of four sections. Section 1.0 provides the introduction and purpose of the SMP. Section 2.0 presents a history of environmental activities at NWIRP Bethpage and describes each of the sites at the NWIRP Bethpage that are currently included, or are being addressed under the IR Program. Section 3.0 presents the proposed activities for each site, including environmental investigations and remediation activities that are currently planned. Section 4.0 presents the references.

2.0 BACKGROUND

NWIRP Bethpage was originally situated on 109 acres in Nassau County in the Hamlet of Bethpage, Town of Oyster Bay, New York (see Figure 2-1) and was a Government-Owned Contractor Operated (GOCO) facility that was operated by the Northrop Grumman Corporation (NGC) until September 1998. The NWIRP was located within the secure portion of the NGC complex, and between the Navy and NGC totaled approximately 605 acres (see Figure 2-2).

As a result of Northrop Grumman's decision to terminate operations at NWIRP Bethpage, in 1997, the U.S. Congress passed special legislation, PL 105-85 Sec 2852 FY-1998 that was issued as a part of the National Defense Authorization Act of 1998, authorizing conveyance of the Navy's real property at NWIRP Bethpage to Nassau County, New York for economic redevelopment. NWIRP Bethpage originally included a main parcel of approximately 105 acres and a separate parcel of approximately 4.5 acres located to the north of the main parcel (Figure 2-2). The parcel to the north (Plant 20) of the main parcel formerly housed a vehicle maintenance facility was transferred to Nassau County on December 10, 2002.

Another cluster of buildings, designated by NGC as Plant 05, was formerly owned by the Navy but situated on land owned by NGC. Plant 05 was located south of the main parcel (Figure 2-2). The Navy also transferred the Plant 05 buildings to Nassau County on December 10, 2002.

On February 26, 2008, the Navy transferred 96 acres of the 105-acre main parcel to Nassau County and is leasing the remaining nine acres to Nassau County. The 9-acre parcel is being retained by the Navy for environmental investigations and remediation. Upon successful remediation of the 9-acre parcel, it will also be transferred to Nassau County. The transfer and lease documents provide land use controls and notifications of areas in which residual contamination is present.

The 105-acre main parcel included the former Northrop Grumman main aircraft manufacturing building (Building 03-01), ancillary facilities associated with Plant 03, as well as all of the facilities designated as Plants 10 and 17. Plant 10 consisted of a former quality control laboratory building (Building 10-01) plus associated support structures in the southwestern part of the main parcel. Plant 17 consisted of a cluster of six warehouses in the northwestern part of the parcel (Plant 17 North) and a cluster of ten warehouses in the southeastern part of the parcel (Plant 17 South). Since 1998, except for three of the Plant 17 North warehouses, all of the facilities on the 105-acre main parcel have been inactive. One warehouse (Building 17N-02) houses the Navy caretaker and Nassau County offices, another warehouse (Building 17N-01) is used by the Bethpage Fire Department for storage, and another warehouse (Building 17N-05) is used by Nassau County to store impounded vehicles.

The 105-acre parcel includes the four sites that the Navy is addressing under the IR Program (Figure 2-3). Two of the sites are located on the 9 acre parcel, IR Site 1 – the Former Drum Marshalling Area and IR Site 4 – Former Underground Storage Tank area south of Plant 03. Two of the sites are located on the 96-acre parcel that was transferred, IR Site 2 – Recharge Basins and IR Site 3- Salvage Storage Area. These sites were determined to not require further environmental investigation or remediation. Both Sites 2 and 3 are subject to land use controls and environmental restrictions and are subject to five-year reviews.

2.1 ACTIVITY HISTORY

The NWIRP Bethpage was established in 1941. The plant's primary mission was the research prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. The facilities at NWIRP Bethpage included four plants used for assembly and prototype testing; a group of quality control laboratories, two warehouses complexes (north and south), a salvage storage area, storm and non-contact cooling water recharge basins, the Industrial Wastewater Treatment Plant, and several smaller support buildings. In 1998, operations ended at the facilities. On February 26, 2008, 96 of the 105 acre parcel was transferred to Nassau County for economic redevelopment. The remaining 9-acre parcel is being retained by the Navy for further environmental investigation (Figure 2-3).

The NWIRP Bethpage environmental areas (Figure 2-2 and 2-3) consist of the following:

- Operable Unit 1, Site 1 – Former Drum Marshalling Area is relatively flat area with a 4-foot vegetated windrow located along the eastern end of the site, and is mounded on the north to partially bury the abandoned sanitary settling tank (Figure 2-4). The site is enclosed by a facility perimeter fence along the north, east and south and an interior facility fence along the west. Site 1 originally consisted of two former drum marshalling pads located in the center of the site that were used to store drums containing waste materials from operations at Plant No. 3 and potentially other sources at the facility. Transformers and PCB-filled autoclaves were also stored at the site. The waste drums reportedly contained chlorinated and non-chlorinated solvents, and liquid cadmium and chromium wastes. In addition, underlying most of Site 1 is approximately 120 abandoned cesspools that were designed to discharge sanitary waste waters from Plant No. 3. These cesspools were approximately 10 feet in diameter and 16 feet deep. Based on field observations, the cesspools are currently filled with soil. It is possible that non-sanitary wastes may have been discharged into this system. The drum marshalling areas and extent of the leach field were the original extent of Site 1. Site 1 remains part of the 9-acre parcel retained by the Navy. An air sparging/soil vapor extraction system was operated to treat chlorinated solvents in site soils and shallow groundwater to eliminate a continuing impact to the regional groundwater.

Contaminants, including metals and PCBs in site soils remain and will require remediation. In January 2009, an off-site soil vapor intrusion investigation was initiated. Between February and May 2009, 18 homes were evaluated, and 15 air purification units (APUs) and 6 subslab depressurization (SSD) systems were installed in offsite residential homes. Between May and December 2009, at the request of the home owners, several APUs and one SSD system were removed. Between October and December 2009, a fence-line soil vapor containment system was installed. Operation of the system started in late December 2009. In June/July 2009, buildings, tanks, and concrete aprons within the fenced in portion of Site 1 were demolished and disposed/recycled off site.

- Operable Unit 1, Site 2 – Recharge Basins, except for three recharge basins, is relatively flat area located in the northeast corner of the Navy's former property and is north of Site 1 (Figure 2-5). The site is enclosed by a facility perimeter fence along the north, east and south and an interior facility fence along the west. It contained three recharge basins which currently receive storm water from catch basins located on current and former Navy property and former NGC property to the north. Historically, the recharge basins were used primarily for single pass non-contact cooling water for air conditioning units and storm water. Originally, these basins also received rinse waters from NGC's operations. Also located on this site is former sludge drying beds, which no longer exist and were filled in. Sludge from the Plant 02 industrial waste treatment facility was dewatered in these beds before being disposed of off-site. PCB-contaminated soils were excavated from this site and disposed off site. Portions of the sludge drying beds were excavated during a PCB remedial action in 1995 and 1996. In addition, a soil and gravel cover was installed in 2001 and 2002 is present through out most of the site. The recharge basins and soil south of the recharge basins were determined to meet cleanup goals for intended site use and do not require a cover. Site 2 was transferred as part of the 96-acre transfer to Nassau County. Land use controls requiring cap maintenance and limiting future uses of the site were included in the transfer document.
- Operable Unit 1, Site 3 – Salvage Storage Area is relatively flat area located north of Plant No. 3 and west of Site 2 (Figure 2-6). Currently, it is mostly covered with asphalt. Fixtures, tools, and metallic wastes were stored here from the early 1950s through 1969, prior to recycling. Stored materials included aluminum and titanium scraps and shavings. While in storage, cutting oils dripped from some of this metal. Site 3 – Salvage Storage Area consisted of a parking area, salvage storage area, and three warehouses. During a general cleanup of the facility by NGC as part of it exiting the NWIRP in 1998, surface soils were scrapped and disposed off site. During a pre-remedial design investigation of surface soils at the site in 2001, remaining surface soils were determined to meet cleanup goals for intended site use and do not require a cover. Site 3 was

transferred as part of the 96-acre transfer to Nassau County. Land use controls limiting future uses of the site were included in the transfer document

- Operable Unit 2, Site 1 – VOC-contaminated groundwater is an extensive (3,000 acres plus) area of VOC-contaminated groundwater that extends south of Hempstead Turnpike (Figure 2-7) and extends to a depth of approximately 750 feet. Other sources of the groundwater contamination are present, including Northrop Grumman and the Hooker Ruco Superfund Sites. Three of the Bethpage Water District (BWD) well fields have been impacted by the plume and VOC treatment has been in place for over 10 years. Aqua New York Well field has recently been impacted and VOC (Trichloroethene) concentrations are increasing in the well field. Construction of an offsite groundwater hot spot remediation system (GM-38 Area) was completed in December 2009 and is currently in operation. The Navy is negotiating with South Farmingdale Water District for treatment on one of it's well fields. In 2009, six vertical profile borings were installed to establish depth specific contamination. The borings were drilled to a depth of 750 to 841 feet bgs. A work plan for additional vertical profile borings and monitoring wells were submitted for regulatory comment in May 2010.
- Operable Unit 3, Site 4 – Former Underground Storage Tanks (USTs) is relatively flat area located south of Plant No. 3 (Figure 2-8) and west of Site 1. Site 4 is also referred to as Area of Concern (AOC) 22. USTs were reportedly removed sometime between 1980 and 1984. Environmental concerns for this area were first identified based on soil and groundwater investigations conducted in 1997 and 1999. The 1997 investigation found evidence of petroleum in the soils from near the bottom of the former USTs to depths near the water table (UST Nos. 03-01-1, 2, and 3). A second investigation conducted in 1999 included the installation of groundwater monitoring wells, and the subsequent discovery of free petroleum product on the groundwater table. Between 2004 and 2006, a pilot-scale system that incorporated biodegradation, soil washing, and chemical oxidation was conducted at the site. AOC 22 is still being investigated and a decision document has not been yet prepared. Site 4 remains part of the 9-acre parcel retained by the Navy.

2.2 REGULATORY HISTORY

NWIRP Bethpage was a Government-owned/Contractor-operated (GOCO) facility owned by NAVAIR and operated by Northrop Grumman Corporation (NGC). When NWIRP Bethpage was operational it was considered to be a large quantity generator of hazardous waste and was classified as a Treatment, Storage, and Disposal (TSD) facility, for storage of hazardous wastes beyond 90 days. Due to this designation, NWIRP Bethpage was under a federal Hazardous and Solid Waste Amendment of 1984

(HSWA) permit issued as part of the Resource Conservation and Recovery Act (RCRA) (EPA ID NYD002047967) in which the Navy was identified as the property owner and Northrop Grumman was listed as the operator. Due to its TSD Designation, NWIRP Bethpage was also subject to NYSDEC's Permit to Operate a Hazardous Waste Management Facility under state implementing regulations 6 NYCRR Part 373. In August 2007, NYSDEC removed the 96-acre parcel from the 373 Permit, including IR Sites 2 and 3. The 9-acre parcel retains the RCRA permit, with requirements limited to corrective action components only.

NWIRP Bethpage is also classified as an "Inactive Hazardous Waste Disposal Site" under NYSDEC 6 NYCRR Part 375 (Registry No. 1-30-003B). The Part 375 program is a risk-based program and closely parallels the United State Environmental Protection Agency's Superfund Program. NWIRP Bethpage is not on the National Priorities List (NPL). The four sites are addressed under the Navy's IR program.

2.3 HYDROGEOLOGICAL SETTING

The Upper Glacial Formation and the Magothy Formation comprise the aquifer of concern at the NWIRP. Regionally, these formations are generally considered to form a common, interconnected aquifer as the coarse nature of each unit near their contact and the lack of any regionally confining clay unit allows for the unrestricted flow of groundwater between the formations. The bottom of the Magothy Formation is the Raritan Clay Layer at a depth of approximately 700 to 800 feet below ground surface (bgs).

Groundwater is encountered at a depth of approximately 50 feet bgs at the facility. Historically, because of pumping and recharge at the facility, groundwater depths have been measured to range from 40 to 60 feet bgs.

The Magothy aquifer is the major source of public water in Nassau County. The most productive waterbearing zones are the discontinuous lenses of sand and gravel that occur within the generally siltier matrix. The major water-bearing zone is the basal gravel. The Magothy aquifer is commonly regarded to function overall as an unconfined aquifer at shallow depths and a confined aquifer at deeper depths. The drilling program on the NWIRP has revealed that clay zones beneath the facility are common but laterally discontinuous. No confining clay units of facility-wide extent were encountered. This agrees with observations noted in the literature (S-F, 1992).

The regional groundwater flow in the area is to the south southeast. Groundwater generally sinks as it flows as a result of precipitation infiltration. In addition, because of the influence of deep groundwater extraction wells (production or water supply), groundwater can sink over much smaller distances. Prior to 1998, the groundwater flow dynamics beneath the NWIRP and Grumman were complex. A total of 16

deep production wells (7 on the NWIRP and 9 on Grumman property) were located on the facility. All of the production wells on the Navy's property have been abandoned. The extracted water was mostly used for non-contact single pass cooling and then discharged into three sets of recharge basins located on Navy and Northrop Grumman property. Based on extraction and recharge rates and locations, groundwater on the Navy property flowed predominately west and southwest. In addition, the production wells extracted groundwater from depths of approximately 500 feet and the water was recharged in basins at near grade. The extraction from depth and near surface recharge resulted in vertical gradients at the site.

The Magothy aquifer is highly conductive. For example, in the 1995 FS investigation's pumping test no. 2, the pumping of production well PW-11 located on the Navy's property at nearly 1,000 gpm for 72 hours produced little or no measurable drawdown in the nearby observation wells or other production wells.

2.4 CERCLA PROCESS

The objective of the CERCLA process is to evaluate the nature and extent of contamination at a site, and to identify, develop, and implement appropriate remedial actions (Ras) in order to protect human health and the environment. NWIRP Bethpage follows regulations under both CERCLA and RCRA. The major elements of the CERCLA and RCRA process are:

Preliminary Assessment (PA)	RCRA Facility Assessment (RFA)
Site Investigation (SI)	RCRA Facility Assessment (RFA)
Remedial Investigation (RI)	RCRA Facility Investigation (RFI)
Feasibility Study (FS)	Corrective Measures Study (CMS)
Engineering Evaluation/Cost Analysis (EE/CA) and Removal Action (may be implemented at any time in the CERCLA process),	RCRA Removal Actions
Proposed Remedial Action Plan (PRAP) and Record of Decision (ROD),	Permit Modification
Remedial Design and Remedial Action (RD/RA)	Corrective Measures Implementation
Post-Remedial Action Monitoring and Reporting, and Community Participation	Restoration Advisory Board

Preliminary Assessment: The RCRA Facility Assessment (RFA) corresponds to the CERCLA Preliminary Assessment (PA). A PA assists in differentiating among sites that warrant immediate attention, sites which require further evaluation and sites that pose no concerns to the public health or the environment and may thus be removed from further consideration. The overall objectives of the PA is to use existing data to distinguish between those sites that pose little or no threat to human health or the environment (including ecological resources) and those sites that pose a potential threat and require

further evaluation. The PA also identifies sites requiring assessment for possible emergency removal actions. If the PA indicates a need for further investigation, then an SI is conducted.

Site Investigation: The RCRA Facility Assessment (RFA) corresponds to the CERCLA Site Investigation (SI). Some sites warrant preliminary or interim investigations, studies, or removal/remedial actions. If it is unclear as to whether a site should be included in the CERCLA RI/FS process, an SI is sometimes conducted to make general determination if activities at the site have impacted environmental media. SI investigations typically include the collection of environmental waste samples to determine what hazardous substances are present at a site, and to determine if these substances have been released to the environment.

Remedial Investigation/Feasibility Study: The RCRA Facility Investigation (RFI) and Corrective Measures Study (CMS) correspond to the CERCLA Remedial Investigation (RI) and Feasibility Study (FS). The RI serves as the mechanism for collecting data to characterize the site conditions, determine the nature of the waste, assess risk to human health and the environment; and if necessary conduct treatability testing to evaluate the potential performance and cost of the treatment technologies that are being considered.

The FS is the mechanism for the development, screening, and detailed evaluation of alternative RAs. The RI and FS can be conducted concurrently; data collected in the RI influences the development of remedial alternatives in the FS, which in turn affect the data needs and scope of treatability studies and additional field investigations. This phased approach encourages the continual scoping of the site characterization effort, which minimizes the collection of unnecessary data and maximizes data quality.

Treatability studies are performed to assist in the evaluation of a potentially promising remedial technology. The primary objectives of treatability testing are to:

- Provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the FS, and
- Support the RD of a selected alternative.

Treatability studies may be classified as either bench-scale (laboratory studies) or pilot-scale (field-studies). For technologies that are well developed and tested, bench-scale studies are often sufficient to evaluate performance. For innovative technologies, pilot tests may be required to obtain the desired information. Pilot tests simulate the physical and chemical parameters of the full-scale process, and are designed to bridge the gap between bench-scale and full-scale operations.

Engineering Evaluation/Cost Analysis and Removal Action: Removal actions are implemented to clean up or remove hazardous substances from the environment at a specific site in order to mitigate the spread of contamination. Removal actions may be implemented at any time during the CERCLA process. Removal actions are classified as either time-critical or non-time-critical. Actions taken immediately to mitigate an imminent threat to human health or the environment, such as the removal of corroded or leaking drums, are classified as time-critical removal actions. Removal actions that may be delayed for 6 months or more without significant additional harm to human health or the environment are classified as non-time critical removal actions (NTCRA).

For a NTCRA, an EE/CA is prepared rather than the more extensive FS. An EE/CA focuses on the media/substances to be addressed by the action and not necessarily on all contaminated media/substances at the site. It is possible for a removal action to become the final remediation action if the risk assessment results indicate that no further action (NFA) is required in order to protect human health and the environment.

Proposed Remedial Action Plan and Record of Decision: A RCRA Permit Modification corresponds to the CERCLA Proposed Remedial Action Plan (PRAP) and Record of Decision (ROD). A PRAP presents the remedial alternatives developed in the FS, and recommends a preferred remedial method. The public has an opportunity to comment on the PRAP during an announced formal public comment period. Site information is compiled in an Administrative Record and placed in the general IR Program Information Repositories at NAVFAC MIDLANT for public review. The public comments are reviewed and the responses are recorded in a document called a Responsiveness Summary. Subsequent to the public comment period, RD/RA activities are initiated.

Remedial Design/Remedial Action: RCRA Corrective Measures Implementation corresponds to CERCLA Remedial Design/Remedial Action (RD/RA). The final stage in the process is the RD/RA. The RD phase is where the technical specifications for cleanup remedies and technologies are designed. The RA is the actual construction or implementation phase of the cleanup process.

Interim Ras are implemented to provide temporary mitigation of human health risks or to mitigate the spread of contamination in the environment. Similar to removal actions, they may be implemented at any time during the process. Examples of interim Ras include installing a pump-and-treat system for product recovery from the groundwater or installing a fence to prevent direct contact with hazardous materials.

For interim Ras, a focused FS (FFS) is prepared rather than the more extensive FS. As with the removal action, an interim action may become the final RA if the results of the risk assessment indicate that no further RA is required in order to protect human health and the environment.

Following implementation/construction of the RD, the Remedy in Place (RIP) is considered complete. A Construction Completion Report (CCR) provides factual documentation of the implementation/construction activities for the RIP. Information in the CCR provides the supporting documentation for a Document Memorializing Remedial Action Completion Report (DMRACR) that memorializes the completion of the RA. If the RIP is the final remedy then Response Complete is established for the site.

Post-Remedial Action Monitoring and Reporting: Five-year reviews are generally required by CERCLA or program policy when hazardous substances remain on-site above levels which permit unrestricted use and unlimited exposure. Five-year reviews provide an opportunity to evaluate the implementation and performance of a remedy to determine whether it remains protective of human health and the environment. Generally, reviews are performed 5 years following the initiation of a CERCLA response action, and are repeated every succeeding 5 years so long as future uses remain restricted. Five-year reviews can be performed by USEPA or the lead agency for a site, but USEPA retains responsibility for determining the protectiveness of the remedy.

2.5 FACILITY-WIDE INVESTIGATIONS

Various facility-wide studies and investigations, including preliminary studies and detailed investigations, have been completed at NWIRP Bethpage since 1986 in response to the Navy's IR program. Preliminary assessments conducted to identify and assess sites posing a potential threat to human health or the environment resulting from past or current operations or waste management activities include:

- Initial Assessment Study (IAS),
- Remedial Investigation (RI) Report
- Feasibility Study (FS)
- Environmental Baseline Survey (EBS)
- Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA)
- RCRA Facility Investigation (RFI)
- Phase 2 Remedial Investigation (RI)

Three potential contaminated sites were identified for evaluation in the IAS (Sites 1, 2, and 3). These sites were further investigated in a RI and FS. Site 4 was not identified until 1997. Additional detail is provided in Section 2.6.

Initial Assessment Study of Naval Weapons Industrial Reserve Plant, Bethpage, New York, Rogers, Golden, and Halpern, December 1986. The purpose of the IAS was to identify and assess

sites posing a potential threat to human health or to the environment due to contamination from past hazardous materials operations. Based on information from historical records, aerial photographs, field inspections, and personnel interviews, a total of three potentially contaminated sites were identified at NWIRP Bethpage. Each of the sites were evaluated with respect to contamination characteristics, migration pathways, and pollutant receptors (Rogers, Golden, & Halpern, 1986).

The study concluded that, while none of the sites posed an immediate threat to human health or the environment, three sites warranted further investigation under the Navy Assessment and Control of Installation Pollutants (NACIP) program to assess potential long-term impacts. A confirmation study, involving sampling and monitoring of the three sites, was recommended to either confirm or refute the presence of suspected contamination and to better define the extent of any problems that may have existed. The three sites recommended for confirmation studies were:

- Site 1 – Former Drum Marshalling Area
- Site 2 – Recharge Basins
- Site 3 – Salvage Storage Area

Final Remedial Investigation Report, Naval Weapons Industrial Reserve Plant Bethpage, New York, Halliburton NUS (HNUS), May 1992. In 1992 an RI was conducted to characterize the nature and extent of potential environmental contamination and associated risks to human health and the environment at the NWIRP Bethpage. The data collected were used to evaluate potential remedial options. The specific objectives for the Bethpage activity were to identify the location and concentration of potential soil and groundwater contamination by solvents and metals at the three sites identified in the IAS and to determine whether these sites were the source or one of the sources of an volatile organic compound (VOC) contaminated groundwater plume in the Bethpage area (HNUS, 1992). The RI confirmed the presence of VOC, SVOC, and metal contamination at Sites 1, 2, and 3, including Site 1 as a likely source of some of the VOC groundwater plume in the Bethpage area.

Phase 2 Remedial Investigation Report, Naval Weapons Industrial Reserve Plant Bethpage, New York, Halliburton NUS (HNUS), October 1993. The overall objective of the Phase 2 RI was to further characterize the nature and extent of environmental contamination and associated risks to human health and the environment at Sites 1,2, and 3 NWIRP Bethpage (HNUS, 1993). The primary areas addressed during the Phase 2 RI were to determine the nature of soils contaminated with polychlorinated biphenyls (PCBs) and to determine the extent of off-site (Navy property) groundwater contaminated with volatile organics. In addition, an investigation was conducted in an attempt to locate the source of significant trichloroethene (TCE) contamination in groundwater southwest of Plant No. 3. The data collected during the Phase 2 RI, in conjunction with the Phase 1 results, were used to develop and evaluate potential

remedial options in a FS. The groundwater investigation did not extend down gradient of the Northrop Grumman property.

Final Feasibility Study Report, Naval Weapons Industrial Reserve Plant Bethpage, New York, Halliburton NUS (HNUS), March 1994. An FS was conducted at NWIRP Bethpage in 1994 for Sites 1, 2, and 3. The overall objective of the FS was to develop, evaluate, and select potential remedial alternatives that could be implemented and that would protect human health and the environment from risks associated with environmental contamination at the NWIRP Bethpage (HNUS, 1994). The FS consisted of four tasks; to develop RA objectives and goals, identify and screen technologies, develop RA alternatives, and a detailed analysis of alternatives.

The alternatives for soil were as follows:

- Alternative S1 – No Action
- Alternative S2A – Clay Capping (Current Industrial Use)
- Alternative S2B – Clay Capping (Future Residential Use)
- Alternative S3 – Fixation of Metals, Incineration of PCBs > 50 ppm, and In-Situ Vapor
- Alternative S4 – Fixation of Metals, Landfilling of PCBs > 50 ppm, and In-Situ Vapor Extraction
- Alternative S5 – Fixation of Metals, Incineration of PCBs > 50 Darn. Landfill of PCBs between
- Alternative S6 – Fixation of Metals, Incineration of PCBs > 50 wm, Landfill of PCBs between 10 ppm and 50 ppm, and Limited In-Situ Vapor Extraction of VOCs
- Alternative S7 – Fixation of Metals, Incineration of PCBs > 50 ppm, On-site Consolidation and clay capping of PCBs between 10 ppm and 50 ppm. And Limited In-Situ Vapor Extraction of VOCs
- Alternative S8A – Fixation of Metals, Incineration of PCBs > 50 ppm, In-Situ Vapor Extraction of VOCs, and Off-site Landfill of Other Metals/Organics (Current Industrial Use Scenario)
- Alternative S8B – Fixation of Metals, Incineration of PCBs > 50 porn, In-Situ Vapor Extraction of VOCs, and Off-site Landfill of Other Metals/Organics (Future Residential Use Scenario)
- Alternative S9A – Fixation of Metals, On-site Low Temperature Stripping of VOCs and PCBs >50 ppm, and Off-site Landfill of Other Metals/Organics (Current Industrial Use Scenario)
- Alternative S9B – Fixation of Metals, On-site Low Temperature Stripping of VOCs and PCBs > 50 ppm, and Off-site Landfill of Other Metals Organics (Future Residential Use Scenario)
- Alternative S10A – Soil Washing/On-site Fill of Metals and Organics (Current Industrial Use Scenario) with Off-site Landfill of Metal Treatment Residuals, and Incineration of Organic Treatment Residues
- Alternative S10B – Soil Washing/On-site Fill of Metals and Organics (Future Residential Use Scenario) with Off-site Landfill of Metal Treatment Residues, and Incineration of Organic Treatment Residues

The alternatives for groundwater were as follows:

- Alternative GW1 – No Action
- Alternative GW2 – Monitoring of Existing Potable Water Supplies
- Alternative GW3A – Air Stripping of Existing Potable Water Supplies
- Alternative GW3B – GAC Treatment of Existing Potable Water Supplies
- Alternative GW4A – Extraction (On-site/Near Site Groundwater > 100 µg/L VOCs), Precipitation/Filtration (Inorganics), Air Stripping (VOCs), and Reuse
- Alternative GW4B – Extraction (All Contaminated Groundwater), Precipitation/Filtration (Inorganics), Air Stripping (VOCs), and Reuse
- Alternative GW5A – Extraction (On-site/Near Site Groundwater > 100 µg/L), Precipitation/Filtration (Inorganics), GAC (VOCs), and Reuse
- Alternative GW5B – Extraction (All Contaminated Groundwater), Precipitation/Filtration (Inorganics), GAC (VOCs), and Reuse
- Alternative GW6A – Extraction (On-site/Near Site Groundwater), Precipitation/Filtration (Inorganics), Enhanced Oxidation (VOCs), and Reuse
- Alternative GW6B – Extraction (All Contaminated Groundwater), Precipitation/Filtration (Inorganics), Enhanced Oxidation (VOCs) and Reuse

Due to the limited number of alternatives for each medium, all alternatives developed were retained for detailed analysis.

Final Proposed Remedial Action Plan for Operable Unit 1 Sites 1, 2, and 3 Naval Weapons Industrial Reserve Plant Bethpage, New York, Naval Facilities Engineering Command (NAVFAC), October 1994. The preferred remedy that was chosen for remediating contaminated soils at the NWIRP Bethpage, New York was described in this PRAP. Based upon the information available, the Navy and NYSDEC proposed Alternative S6 (Fixation of Metals, Incineration of Soils Containing PCBs at Concentrations Greater than or Equal to 500 parts per million (ppm), Land filling of Soils Containing PCBs at concentrations between 10 and 500 ppm, and In-Situ Vapor Extraction of VOCs as the preferred remedy for on-site soils at NWIRP Bethpage (NAVFAC, 1994). The depth of PCB contamination was believed to be limited to approximately 7 feet.

Final Phase 1 Environmental Baseline Survey Volume 1 – Text Naval Weapons Industrial Reserve Plant Bethpage, New York, C.F. Braun Engineering Corp. (C.F. Braun), January 1998. The Phase I EBS documented the Navy's assessment of the environmental condition of real property on NWIRP Bethpage. The Navy's Phase I EBS was intended to serve as a unified environmental document that assessed the past environmental status of all Navy-owned real property at NWIRP Bethpage using all

available information. It thus drew heavily from documents produced under the IR Program and from the Grumman Phase I Environmental Site Assessment (ESA). It was expected that many of the recommendations for further investigation made by the Phase I EBS would have already been adequately pursued once the ongoing IR and Grumman Phase II EBS investigations were completed. Other investigation activities recommended by the Phase I EBS were conducted as part of a future Phase II EBS by the Navy (C.F. Braun, 1998).

The Phase I EBS was prepared using American Standard of Testing Materials (ASTM) PS 37 – 95, Provisional Standard Practice for Conducting EBSs (ASTM, 19951, as a guide). The Provisional Standard Practice incorporated practices initially developed in Standard EI 527-94, Standard Practice for ESAs: Phase I ESA Process (ASTM, 1994). These standards described practices used to identify recognized environmental conditions in connection with real property. The practices include a review of records pertaining to the subject real property (Section 1.3.11, visual site reconnaissance of the real property and adjacent properties (Section 1.3.21, and interviews with persons knowledgeable of the property (Section 1.3.3). ASTM PS 37 – 95 specifically notes that while many elements of EBS preparation follow due diligence practices initially developed as part of Standard EI 527-94, EBS preparation does not constitute appropriate inquiry necessary to establish an “innocent landowner defense” under CERCLA.

Former Dry Well Investigation South of Plant 3 Area of Concern 20 Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), January 2000. The objective of this investigation was to confirm the presence of RCRA metals in soils at a former AOC 20 dry well south of Plant No. 3; and if present, to delineate the approximate extent of contamination. A subsurface soil investigation was conducted in June 1999. The investigation concluded that based on testing, the extent of the metal contaminated soils was very small. Based on the results of this evaluation, no additional activities at this former dry well were proposed (Tetra Tech, 2000a). The results were included in property transfer documents.

Groundwater Feasibility Study Grumman Aerospace-Bethpage NY Site # 130003A and Naval Weapons Industrial Reserve Plant, Bethpage, New York Site # 130003B, Arcadis, October 2000. This FS was prepared for the Navy and Northrop Grumman to evaluate remedial alternatives for contaminated groundwater that resulted from historic operations, chemical storage, and waste disposal practices at the former Grumman Aerospace (now Northrop Grumman) facility and the NWIRP located in Bethpage, New York. In addition, this FS summarized information about the RUCO Polymer (Hooker Chemical) site, which is a Federal Superfund site located in Hicksville, New York adjacent to the northwest property boundary of the Northrop Grumman facility (Arcadis G&M, Inc., 2000).

The objective of this FS was to develop, evaluate, and select potential remedial alternatives that could protect human health and the environment from risks associated with the contaminated groundwater attributed to the NWIRP and Northrop Grumman facilities.

Final Environmental Impact Statement Transfer and Reuse of Naval Weapons Industrial Reserve Plant Bethpage, New York, Navy Facilities Engineering Command (NAVFAC), November 2000. The Navy proposed to transfer NWIRP Bethpage to Nassau County, New York, in accordance with federal special legislation. Nassau County prepared a Preferred Reuse Plan for the property. This Environmental Impact Statement (EIS) considered the potential effects of the transfer of NWIRP Bethpage to Nassau County, including the indirect effects of the property's reuse, and the effects of a No Action Alternative (NAVFAC, 2000).

The proposed federal action was the transfer of NWIRP Bethpage by the Navy to Nassau County. This EIS considered the direct, indirect, and cumulative impacts of the transfer, including the anticipated indirect impacts from future reuse of the property by Nassau County or by another future owner or developer. Under the proposed action, the county was to receive ownership of the property in two phases. The first phase was anticipated to occur in fall 2000, with the transfer of the 105-acre parcel containing about 1,275,670 sq ft (118,510 sq m) of space. The second phase, which would involve the transfer of the 4.5-acre parcel, Plant 5, and six other Navy-owned structures located on Northrop Grumman-owned land, would occur at a later, to-be-determined date. This second transfer would include approximately 654,336 sq ft (60,788 sq m) of space owned by the Navy.

The transfer to Nassau County would result in continued public/governmental ownership of the NWIRP Bethpage property. However, this public ownership was intended to be temporary. Nassau County indicated its intent to sell the property into private ownership for future redevelopment and conducted a reuse planning study to identify the property's preferred reuse. In this EIS, the reuse of NWIRP Bethpage was considered an indirect effect of the Navy's transfer of NWIRP Bethpage.

Legislation stated that if within five years of the conveyance of NWIRP Bethpage to Nassau County if the Secretary of the Navy determined that the property was not being used for economic redevelopment purposes or such other public purposes as the County determined appropriate, title to the property would revert to the United States.

Reuse Alternative A proposed mostly light industry and warehouse uses for NWIRP Bethpage, although some office use would occur on the 105 acre parcel. Overall, this alternative would result in about 160,000 sq ft (14,864 sq m) less building area on the site than what currently existed in major buildings.

An estimated 2,190 full-time jobs would likely be generated by Reuse Alternative A. Total construction costs were estimated at \$53 million.

Under Reuse Alternative B, NWIRP Bethpage would be reused entirely for office uses. Overall, this alternative would result in about 2.2 million sq ft (204,380 sq m) of office space on the NWIRP Bethpage site. This alternative represented the highest employment generation of the reuse alternatives, with 9,900 estimated full-time employees. Total construction costs were estimated at \$188 million

Under the No Action Alternative, NWIRP Bethpage would not be transferred to Nassau County and would remain in US government ownership. The property would be placed in federal caretaker status. No reuse or redevelopment would occur at the facility. Continued federal ownership would provide no benefit to the local community or region since such ownership would prevent any possibility of a viable, productive reuse of the land.

Report of Results for Plant 3 Air Sampling Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc., (Tetra Tech), February 2001. Air sampling was conducted to determine if residual airborne concentrations of chlorinated solvents historically used and/or stored at the facility were present within ambient air or if potentially unidentified areas of VOC contaminants adversely impacted the air quality in the investigation areas. The sample results indicated positive detection of some VOCs above the laboratory's limits of detection (LOD). Specifically, 10 VOCs were detected above the laboratory's LOD. However, LOD for all target compounds were in the part per billion (ppb) range (Tetra Tech, 2001a).

Final Phase 2 Environmental Baseline Survey of Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), May 2002. The following Phase II EBS report documented the environmental condition of real property at the NWIRP Bethpage in January 2002. It updated a Phase I EBS report which was prepared by the Navy for NWIRP Bethpage in January 1998. The Phase I EBS, which was completed in January 1998, identified areas of real property on NWIRP Bethpage with potential environmental concerns that could have limited their suitability for transfer in compliance with Section 120(h) of CERCLA (Tetra Tech, 2002a).

Most property on NWIRP Bethpage was found to be suitable for transfer at the time without further environmental action. Exceptions included the following:

- Building 03-01, all exterior areas surrounding Building 03-01 and containing UIC 20-08 and Drywell 34-07 still required additional remediation.
- An exterior area east of Building 03-13, along the eastern perimeter of NWIRP Bethpage, where soils were found to be contaminated by metals from a former sludge drying bed documented to

have once occurred at that location. Several storage sheds, including Buildings 03-14, 03-1, 03-45, and 03-51, were constructed at this location after abandonment of the sludge drying bed and were razed by Grumman in 1997. Although this contamination was confirmed by the investigation of AOC 35 in the Phase II ESA for Plant 03 (Radian, 1998a), it was not remediated by NGC and instead was included in a future RA under the Navy's IR Program.

- The Former Drum Marshalling Areas and Former Plant 03 Leachfield east of Building 03-01, investigated as Site 1 under the Navy's IR Program. An air sparging/soil vapor extraction program was implemented at that location in 1996 and 1997 to begin remediation of contaminated soil and groundwater. This effort was to be continued as funds became available under the IR Program.

Finding of Suitability to Transfer for Plant 20 Naval Weapons Industrial Reserve Plant Bethpage, New York, Naval Facilities Engineering Command (NAVFAC), June 2002. This report summarized the property transferred from NWIRP Bethpage to Nassau County. All real estate, buildings and structures located on what was termed as the "Plant 20 Parcel" (4.5 acres) were transferred. This parcel was part of the overall conveyance of land and building associated with NWIRP Bethpage to Nassau County as mandated by special legislation (PL 105-85 Set 2852 FY-1998), issued as part of the National Defense Authorization Act of 1998. This legislation was issued subsequent to Naval Air Systems Command's (NAVAIR) determination that NWIRP Bethpage was no longer needed to meet mission requirements (NAVFAC, 2002a).

NWIRP Bethpage's Plant 20 Parcel was found suitable to transfer under the terms and conditions of this FOST consistent with and for non-residential redevelopment. Environmental Covenants, Conditions, Reservations, and Restrictions were included in the transfer deed. The United States and the State of New York have access to the property in any case in which an investigative, response, or corrective action is found to be necessary at the property since the transfer by deed, or such access as is necessary to carry out a response action or corrective action on adjoining property.

The information summarized in the Environmental Baseline Survey for Transfer (EBST) supported a conclusion that the Plant 20 property was environmentally suitable, in accordance with CERCLA Section 120(h), for transfer to Nassau County for industrial redevelopment. The EBST served as the notice required by Section 120(h)(l) regarding the type and quantity of hazardous substances known to have been stored, released, or disposed of on the property. In accordance with Section 120(h)(3)(a)(ii) and (iii), the transfer documentation contained a covenant warranting that any response action or corrective action found to be necessary since the date of transfer should be conducted by the Navy and include a clause granting the Navy access to the Plant 20 property for such an action.

Finding of Suitability to Transfer Building 5 Naval Weapons Industrial Reserve Plant Bethpage, New York, Naval Facilities Engineering Command (NAVFAC), August 2002. In this report it was concluded that the Plant 5 Building was environmentally suitable for transfer. The conditions of the building did not pose a threat to health or the environment based on available information. The known existing conditions were fully disclosed within the Final Phase II EBS Report, Revision I, dated May 2002 (NAVFAC, 2002b).

RCRA Facility Assessment/Focused Feasibility Study for Former Underground Storage Tanks Plant No. 3 Area of Concern (AOC) 22 Tank Nos. 03-01-1, -2 and -3 Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), January 2003. The RFA Report summarized field activities that took place at the former USTs AOC 22 south of Plant No. 3 (Tetra Tech, 2003a).

Environmental concerns for this area were based on a 1997 NGC investigation of USTs near Plant No. 3. The 1997 investigation found evidence of petroleum in the soils near the bottom of the former USTs to depths near the water table (UST Nos. 03-01-1, 2, and 3). The USTs were reportedly removed sometime between 1980 and 1984.

The purpose of this investigation was to collect additional soil data to further characterize the horizontal extent of contamination in subsurface soils, determine if groundwater had been impacted, and determine if a free floating product layer was present.

Fourteen soil borings were installed in order to delineate the vertical and horizontal extent of potential free product within the area of concern. Split spoon samples were collected for 13 of the 14 soil borings and sampled for total petroleum hydrocarbon (TPH), VOC and semi-volatile organic compounds (SVOCs). Five of the 14 soil borings were converted into permanent groundwater monitoring wells and sampled for Target Compound List (TCL) VOCs and SVOCs. The thickness of free product in each monitoring well was measured using an interface probe and analyzed for High Concentration TCL VOCs, High Concentration TCL SVOCs, High Concentration TCL PCBs, High Concentration TCL Pesticides, RCRA Metals, Flash point, british thermal units (btu), and Chloride.

Final Finding of a Suitability to Transfer 105-Acre Parcel at the Former Naval Weapons Industrial Reserve Plant Bethpage, Nassau New York, Naval Facilities Engineering Command (NAVFAC), January 2003. The property was proposed for transfer to the County of Nassau, New York under special legislation (PL 105-85 Set 2852 FY-1998) that was issued as part of the National Defense Authorization Act of 1998. This legislation was issued subsequent to the NAVAIR determination that this parcel was no longer needed to meet mission requirements (NAVFAC, 2003a).

The property proposed for transfer was one parcel out of three that comprised the entire NWIRP Bethpage facility. This FOST document applied only to the main 105-Acre parcel. The property proposed for transfer was defined as being all property contained within the main fenced boundary of the 105-Acres minus that area designated as Navy IR Sites 1 and 4 and a connecting roadway (approximately 9 acres). The 105-Acres contained Plant 3, Plant 10, Plant 17 North, Plant 17 South, Building 03-34, IR Site 2 (Recharge Basin Area), and IR Site 3 (Salvage Storage Area).

Phase 1 Environmental Baseline Survey for the GM-38 Groundwater Remediation Area Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), February 2007. This Phase I EBS and Environmental Condition of Property (ECP) Report addressed property designated as the GM-38 Groundwater Remediation Facility Site in Bethpage, New York (Tetra Tech, 2007a).

Based on the information reviewed to complete the EBS/ECP Report, it was concluded that the Site was environmentally suitable for the Navy to lease for the purpose of constructing, operating, and decommissioning a groundwater treatment system to treat contamination originating at the former NWIRP Bethpage and other former Northrop Grumman aircraft manufacturing facilities in the region. The following are presented as recommendations to protect the environmental quality of the Site:

1. The proposed groundwater treatment facilities will have to be sited, designed, and constructed in a manner that does not interfere with existing overhead and underground utilities on the Site. Land use and height limitations established for the overhead electric transmission lines will have to be observed, and ground disturbances must avoid impacting buried utility, water, and sewer lines.
2. Site activities should avoid physical disturbance to the abandoned roadbed of the former Long Island Motor Parkway, which may be of historic significance.
3. To preserve the aesthetic qualities enjoyed by residents of homes bordering the Site, tree removal should be minimized. The treatment facilities should be screened using trees and/or shrubbery, and exposed soils should be seeded in accordance with local soil erosion and sediment control practices.

Environmental Baseline Survey of 96-acre Parcel Update Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), September 2007. This memorandum was an

update to an EBST for the Main Parcel of NWIRP Bethpage initially drafted in September 2000 and revised in February 2002 and January 2003 (Tetra Tech, 2007b).

The following recommendations were made in response to the updated ECP observations:

1. The 96-Acre Parcel is environmentally suitable for non-residential reuse only.
2. The damaged, friable, and accessible asbestos-containing material (ACM) should be abated before the 96-Acre Parcel is environmentally suitable for transfer.
3. After property transfer, if one or more buildings are to become occupied, it is recommended that the buildings be sealed to prevent further access by animals, and that remains of animals be removed.
4. After property transfer, in the event that one or more buildings are to become occupied, it is recommended that moisture be prevented from entering those buildings and/or otherwise controlled, and that the buildings to be occupied be treated for mold.
5. Recipients of the 96-Acre Parcel must be informed of the presence of ACM and lead-based paint (LBP).
6. It is recommended that buildings on the 96-Acre Parcel (unless they will be razed) be inspected for structural stability and measures be taken to remove physical hazards such as warped floors and damaged roofs.

Environmental Baseline Survey for 9-acre Parcel Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), September 2007. This updated EBS Report addressed a tract of approximately 9 acres (9-Acre Parcel) on the east side of the former NWIRP Bethpage Main 105-Acre Parcel in Bethpage, New York (Tetra Tech, 2007b).

Based on the information reviewed in this report in order to complete the updated EBS Report, it was concluded that the 9-Acre Parcel was environmentally suitable for lease by the Navy to Nassau County. The following was presented as recommendations to protect the environmental quality of the 9-Acre Parcel.

1. Groundwater from within the 9-Acre Parcel should not be extracted or otherwise used.
2. To prevent possible exposure to the contaminated subsurface soil and groundwater, lessees should not excavate any area within the 9-Acre Parcel without consultation with the Navy, and prior to excavation be prepared to deal with excavated soil and groundwater that are potentially contaminated.
3. To prevent possible exposure to contaminated surface soil at Site 1, lessees should not conduct any operation that would allow regular contact with contaminated surface soil, generate excessive dust, or contribute to erosion of contaminated soils.

4. Because of ongoing groundwater remediation activities and the history of industrial use of surface areas, the leased property should not be used for residential use.
5. To preserve the aesthetic qualities enjoyed by residents of homes to the east of the 9-Acre Parcel, it was recommended that trees along the eastern perimeter fence not be removed.
6. In the event that buildings are constructed and/or occupied on 9-Acre Parcel during the proposed lease, steps may have to be taken to prevent intrusion of contaminated soil vapor.

Finding of Suitability to Transfer (FOST) for the 96-Acre Parcel at the Naval weapons Industrial Reserve Plant (NWIRP) Bethpage, New York, Naval Facilities Engineering Command (NAVFAC), February 2008. The 96-acre transfer was consistent with the CERCLA Section 120 (h) (3) as amended by the National Defense Authorization of Fiscal Year 1997, 42 U.S.C. Section 9620 (h) (3). The 96-acre transfer was for non-residential development. The property was one parcel out of four that comprised the entire NWIRP Bethpage facility. In August 2007, NYSDEC removed the 96-acre parcel from the part 373 permit (Permit to Operate a Hazardous Waste Management Facility). On February 26, 2008, the 96-acre parcel was transferred to Nassau County (NAVFAC, 2008a).

Finding of Suitability to Lease (FOSL) 9-Acre Parcel Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, New York, Naval Facilities Engineering Command (NAVFAC), February 2008. This FOSL summarized how the requirements and notifications for hazardous substances, petroleum products, and other regulated materials on the subject property were satisfied. The uses of the 9-acre parcel were anticipated to be continued use of existing roadways and parking areas. The 9-acre parcel includes IR Sites 1 and 4, which require a final remedy in place prior to property being considered for transfer. The 9-acre parcel is listed on the New York State list of Inactive Hazardous waste Sites (Registry # 1-30-003B) and is regulated under Corrective Action portions of a RCRA Permit (EPA ID #NYD0002047967). The property was declared suitable for lease on February 26, 2008 (NAVFAC, 2008b).

Final Asbestos Abatement Completion Report Naval Weapons Industrial Reserve Plant, Bethpage, New York, ECOR, March 2008. This report summarizes the abatement activities that were performed during January 2008 (ECOR, 2008). An asbestos survey was conducted in 1998 and 1999 by Dewberry and Davis LLC. The buildings were re-inspected in July 2007 by Accredited Environmental Technologies, Inc. (AET). This re-inspection identified damaged friable and non-friable asbestos containing materials (ACM). These results served as the basis for the removal action performed by ECOR under CTO# 0159. The overall objective of the asbestos abatement at the Former NWIRP Bethpage was to remove ACM including vinyl floor tile, pipe insulation, and mastics that were identified as damaged during the period of inactivity since the site was decommissioned. Various ACM were removed from numerous buildings and warehouses across the site.

Evaluation of Recharge Basin Capacity and Storm Water Inflow Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), April 2008. This report presented calculations and methodology used to determine the capacity of three recharge basins that receive runoff from parking lots and roof drains at NWIRP Bethpage and former NGC property. In addition, this document identified additional capacity that these basins may have had to receive from other potential controlled sources (Tetra Tech, 2008a).

The conclusions from the storm water calculations were as follows:

1. The two large (northeast and southeast) recharge basins could individually handle projected storm events.
2. The small (southwest) recharge basin could marginally handle projected storm events.
3. Each of the basins were able to handle 32,000,000 to 70,000,000 gallons per day of continuous flow. During intense storm events, any continuous (non storm) flow into the basins may have to be reduced or stopped.
4. These estimates assumed that the basins were maintained to prevent the buildup of fine grained sediment that would significantly reduce the capacity of the basins.
5. If the basins are to be used for a continuous flow, at least two basins should be retained, one to accept the flow and one to be periodically cleaned.

Environmental Evaluation of County Motor Vehicle Impound Lots Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), April 2008. This report documented the findings of an environmental investigation of areas associated with the storage of County impounded motor vehicles and recharge basins that receive runoff from parking lots and roof drains at NWIRP Bethpage (Tetra Tech, 2008b).

Conclusions and recommendations developed during this study are presented as follows.

1. The asphalt appears to have adsorbed most of the oils and similar fluids.
2. Several stains are located around cracks in the asphalt.
3. Based on metal data in soils, there is evidence of a limited release of metal constituents to the underlying soils.
4. There is evidence that fluids and metals from the vehicles migrated to the impound lot catch basins during precipitation events.
5. VOCS, phthalates, diesel range organics (DRO), and metals were detected in surface water in the catch basins and the inlet to the recharge basins. Of these detections, only iron in one catch

basins sample exceeded New York State Department of Health (NYSDOH) maximum contaminant level (MCLs).

6. Polynuclear aromatic hydrocarbon (PAHs), DRO, and metals are present in the basin sediments.
7. No environmental action is recommended at this time.
8. Access into the recharge basins should be restricted and personnel entering the recharge basins should be notified of the presence of the PAHs and wear appropriate personal protective equipment while in the basin.

Five-Year Review for Sites 1, 2, and 3 Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), December 2008. A five-year review was conducted to evaluate the implementation and performance of the remedies at the sites to determine whether the remedies are protective of human health and the environment. The methods, findings, and conclusions of the review are documented in the five-year review report. In addition, the report identifies deficiencies found during the review, if any, and provides recommendations to address those (Tetra Tech, 2008g).

2.6 DETAILED SITE INVESTIGATIONS

The following major investigations were conducted or proposed in order to investigate contamination at individual sites. These investigations are chronologically summarized below. Additional investigations may have been conducted at individual sites to fill data gaps; these investigations are identified in the individual site descriptions (Section 2.2). Site-specific actions for FY 2009 are summarized in Section 3.0.

2.6.1 Operable Unit 1, Site 1 Soil and Shallow Groundwater

Final Record of Decision Naval Weapons Industrial Reserve Plant Bethpage, New York Sites 1, 2, and 3, Naval Facilities Engineering Command (NAVFAC), May 1995. The Record of Decision (ROD) determined that actual or threatened releases of hazardous substances from Site 1, if not addressed by implementing the response action described in this ROD, would present a current or potential threat to human health and the environment.

An interim remedial action was initiated by the Navy in July 1993 to address the area at Site 1 where the significant hit of PCBs was detected (1,470 ppm) in the surface soil. Because of the high concentration, this area posed a threat to on-site workers in excess of USEPA's acceptable risk range established in the National Contingency Plan (NCP). This area was tested using field screening kits to identify the outer edges of the significant PCB contamination (those areas greater than 50 ppm) and the area which was roughly 4,000 square feet, was then covered with eight to ten inches of soil to eliminate risks associated

with fugitive dust and dermal contact. The risk posed by PCBs at this site was originally 2.0×10^{-4} for the on-site worker, however, the residual risks to PCBs after the interim action was reduced to 9.8×10^{-6} , which is within the range of acceptable risk as defined by the USEPA. The PCBs, as well as the associated cover, will all be removed as part of a final remedial action.

Another interim remedial action was conducted by the Navy to address groundwater contamination emanating from the NWIRP facility and migrating down gradient towards the BWD public water supply wells. The interim action included either an air stripping or granular activated carbon (GAC) treatment system(s) for the potable well of concern at BWD Plant #5. The treatment system was to be designed by the BWD and would allow the well to pump contaminated groundwater through the treatment system to remove the VOCs. The treated groundwater would then be distributed (NAVFAC, 1995).

Based upon the results of the RI/FS, criteria for selecting a remedy, and public input received during the public comment period, the Navy and NYSDEC selected Alternative S6 described below:

Alternative S6 – Fixation of Metals, Incineration of Soils Containing PCBs at Concentrations Greater than or Equal to 500 ppm, Land filling of PCBs between 10 ppm and Less than 500 ppm, and In-Situ Vapor Extraction of VOCs

Soils contaminated with VOCs at concentrations greater than the modified action levels would be processed via in-situ vapor extraction and air sparging. The modified action levels for VOCs were equal to three times the VOC-action levels considered under other alternatives because the levels which were to be left in place were not expected to contaminate the groundwater.

Soil volumes for Site 1 included:

- 600 cubic yards of arsenic-contaminated soil for off site disposal.
- 300 cubic yards of PCB-contaminated soil to be incinerated off-site
- 1,100 cubic yards of PCB-contaminated soil with concentrations between 10 ppm and 500 ppm for off site disposal.
- 87,000 cubic yards of VOC-contaminated soil (Site 1 and underneath Plant No. 3) to undergo in-situ vapor extraction.
- Placement of a 6-inch soil/gravel cover over residual contaminated soils at the site.

Final Submission for Remedial Design Sites 1 and 2, Phase 1 Naval Weapons Industrial Reserve Plant Bethpage, New York, Halliburton NUS (HNUS), May 1995. This Design Basis Report summarized the information and methodologies used to prepare the plan drawings and specifications for

the remedial design. There were several areas of PCB contamination and one area of arsenic contamination that required excavation and disposal at an off-site facility (HNUS, 1995a).

Existing Conditions Survey and Site Report for Remedial Design Site 1 at Naval Weapons Industrial Reserve Plant Bethpage, New York, C.F. Braun Engineering Corp. (C.F. Braun), June 1995. This Existing Conditions Survey and Site Investigation Report for Site 1, NWIRP, Bethpage, New York, was produced based on a 1995 site visit and from historic environmental data collected at the site. The purpose of this report was to establish what historic information was available pertaining to the site and its accuracy with the site's current condition. This Report also evaluated 1995 conditions to determine if physical conditions would have impeded or deterred the design and implementation of the design (C.F. Braun, 1995a).

No significant changes were noted when comparing the historical information to the 1995 site conditions. Because the facility was inactive, equipment was being removed; however, this finding did adversely affect the design or implementation of the design. There were no physical obstacles that would have prevented completing the remediation at the site.

Remedial Design, Phase II Pre-Design Investigation Supplemental Sampling Letter Report Number 2 for Site 1 Former Drum Marshalling Area NWIRP Bethpage, New York, C.F. Braun Engineering Corp. (C.F. Braun), September 1995. This report summarized the results of the August 1995 sampling and analysis activities and made recommendations for future project activities. Two of the five soil boring locations indicated volatile contamination above RA levels of 10 micrograms per kilogram ($\mu\text{g}/\text{kg}$) for 1,1,1-trichloroethane (1,1,1-TCA) and TCE and 27 $\mu\text{g}/\text{kg}$ for tetrachloroethene (PCE). The highest concentrations were determined to be in the upper several feet of soil. Based on the sampling results, it was recommended that a pilot-scale system be installed within the area of contamination. The exact location of the system would be determined based on review of all historic data, as well as minimizing conflicts with the proposed remediation effort for Phase I. The purpose of the pilot-scale study was to evaluate the success of the air sparging system to achieve concentration reductions for the chlorinated volatiles in the soil and in the upper 10 feet of the aquifer (C.F. Braun, 1995b).

Analytical Results from the Pre-Excavation Soil Sampling and Estimate on Excavation Naval Weapons Industrial Reserve Plant Bethpage, New York, Foster Wheeler Environmental Corp. (Foster Wheeler), December 1995. A pre-excavation field investigation was performed from November 7 through November 17, 1995, in accordance with the Work Plan and the Sampling and Analysis Plan for Sites 1 and 2. The field activities consisted of mobilization/demobilization, a site survey, surface soil sampling, and subsurface soil sampling. Based on the results; approximately 6,820 cubic yards of PCB contaminated soil was proposed to be excavated from Sites 1 and 2 (Foster Wheeler, 1995).

Draft Site 1 Pre-Excavation Sampling Results Naval Weapons Industrial Reserve Plant Bethpage, New York, Foster Wheeler Environmental Corp. (Foster Wheeler), July 1996. This draft report (acting as final) presents the analytical results from the additional pre-excavation soil sampling at Site 1 conducted March through April, 1996. The results of the pre-excavation sampling at Site 1 indicated that the volume and depth of contaminated soil was greater than the original estimate (from 12 milligrams per kilogram (mg/kg) to 3,800 mg/kg in the 0 feet to 4 feet bgs soils and from 12 mg/kg to 310 mg/kg in the soils greater than 4 feet bgs. This volume evolved with the inclusion of additional sampling data. The estimated volume was 5,938 cubic yards of soil contaminated with total PCB concentrations between 10 and 500 mg/kg. The RD report identified this soil for off site land filling. Seven hundred and sixty (760) cubic yards of soil were contaminated at total PCB concentrations higher than 500 mg/kg. An additional 207 cubic yards were suspected of being contaminated with volatile organics above their toxicity characteristic leaching procedure (TCLP) regulatory limit. A portion of this soil was also contaminated with PCB and/or cadmium. Soils with total PCB concentrations above 500 mg/kg, or with volatile organics above TCLP regulatory limits, were to be incinerated off site. An additional 113 cubic yards of soil were contaminated with cadmium above its TCLP regulatory limit, and 127 cubic yards of soil were contaminated with total PCB between 10 mg/kg and 500 mg/kg and cadmium above TCLP regulatory limits. These soils would require stabilization prior to land disposal. Soils contaminated by volatiles or cadmium above TCLP regulatory limits were located within and below several leach pits located at the site (Foster Wheeler, 1996).

Results Letter Report for Air Sparging/Soil Vapor Extraction System at Site 1 – Former Drum Marshalling Area Volume 1 Text and Volume 2 Appendices Naval Weapons Industrial Reserve Plant Bethpage, New York, C.F. Braun Engineering Corp. (C.F. Braun), October 1997. The purpose of this letter report was to present the results of the physical parameter testing and thereby achieve the first objective. As stated in the project Work Plan, the specific objectives of the pilot study were as follows:

- Determine the physical parameters required for a full scale system design (well spacing, extraction/injection rates, and well depths).
- Evaluate the effectiveness of the air sparging/ soil vapor extraction (AS/SVE) in removing VOCs from site soils, cesspools, and shallow groundwater.
- Estimate the time required for cleanup of soils, groundwater, and cesspool contents.
- Determine the requirements for off gas treatment (C.F. Braun, 1997a).

The conclusions derived from the pilot study are summarized as follows:

Based on the soil data, some soils at Site 1 could have possibly been cleaned up in as little as three months. However, because of the presence of pockets of contamination at the site, and potential interferences to uniform flow (i.e. sludges or clay lenses), the total site remediation schedule for VOCs is expected to be approximately two years.

An AS/SVE system could effectively remove VOCs from groundwater. The time to comply with groundwater Preliminary Remediation Goals (PRGs) was uncertain at that time.

Report for Additional Soil Investigation to Assess the Performance of the Soil Vapor Extraction/Air Sparging System Naval Weapons Industrial Reserve Plant Bethpage, New York, Foster Wheeler Environmental Corp. (Foster Wheeler), April 2000. This report presented the results of the additional soil investigation activities completed at NWIRP Bethpage during September and October 1999. The objective of the additional soil investigation was to map horizontally and vertically the extent of source contamination from the leachate pits identified as having levels of contamination. Additionally, this investigation was designed to determine the progress of remediation at Site 1 in areas previously containing the greatest concentrations of VOCs. Analysis of the additional soil investigation samples indicated that VOCs above the PRGs were present in several of the soil boring locations (Foster Wheeler, 2000).

Final Close-Out Report Construction of a Soil Vapor Extraction/Air Sparging System Naval Weapons Industrial Reserve Plant Bethpage, New York, Foster Wheel Environmental Corp. (Foster Wheeler), April 2001. The Close-Out Report described the field activities performed during the period of March 9, 1998 through December 20, 2000 associated with the AS/SVE. The purpose of the project was to reduce the VOC contamination in soil at Site 1 in the most cost-effective manner. The soil was remediated by in situ soil vapor extraction and air sparging. During the soil remediation, it was anticipated the air sparging would also partially remediate groundwater contamination under the site.

The AS/SVE system was not intended to treat metals or PCBs that were present in the site soils. Additionally, Foster Wheeler's original Work Plan, dated November 7, 1997, called for operation of the system until December 1999. The system was shut down on December 28, 1999. At which time a total of 2,254.20 pounds of VOCs had been removed. As directed by the Navy, Foster Wheeler Environmental extended operations for an additional 9-month period, from April 2000 to December 2000, removing an additional 693.51 pounds of VOCs from the soil.

The original intent of the AS/SVE system was to reduce VOCs in soil as an interim remedial measure. Based on the decline in VOCs in the average influent and on the 1999 soil boring results, Foster Wheeler Environmental recommended that the interim RA had met the project objectives and soils were below

PRGs of 10 µg/kg for 1,1,1-TCA and TCE and 27 µg/kg for PCE. Based on subsequent discussions between Navy, NYSDEC, and Foster Wheeler Environmental on April 26, 2001, the following actions were to be pursued: Sampling and analysis of groundwater using existing extraction and monitoring wells, additional operation of the AS/SVE system for one season, and Additional groundwater and soil sampling to be conducted after extended operation (Foster Wheeler, 2001a).

Letter Report on the Pre-Operational Groundwater Sampling and Analysis Results Naval Weapons Industrial Reserve Plant Bethpage, New York, Foster Wheel Environmental Corp. (Foster Wheeler), September 2001. As part of the ongoing remediation, an evaluation of groundwater contamination beneath Site 1 was conducted to assess its impact on the performance of the AS/SVE formerly used to remove volatile organic vapors from the site soils. Although VOCs occurred in groundwater throughout most of the southern portion of the site, there was significant variation in the concentrations and spatial distribution of individual compounds (Foster Wheeler, 2001b). TCE was the most predominant VOC detected at concentrations ranging from 2.4 to 230 µg/L. Maximum concentrations of TCE occurred along the southern margin of the site. 1,1,1-TCA was detected at concentrations ranging from 2.2 to 190 µg/L. The highest concentration of 1,1,1-TCA was detected near the treatment building. PCE was found in wells at concentrations ranging from 2.8 to 85 (micrograms per liter) µg/L. Other compounds (1,1-dichloroethane (1,1-DCA), cis-1,2-dichloroethane (cis-1,2-DCA), xylenes, and 2-butanone were detected at low concentrations at several locations throughout the site.

A post-operational round of groundwater samples was to be collected at the conclusion of operation and maintenance (O&M). The post-operational sampling results were to be compared to the pre-operational sampling results in the Annual Operating Report submitted at the close-out of this project.

Evaluation Report- Remediation of Former Drywells 20-08 and 34-07 Naval Weapons Industrial Reserve Plant, Bethpage Plant 3 Facility, Bethpage, New York, Holzmache, McLendon, and Murrell, P.C. (H2M Group), October 2003. The purpose of this evaluation report was to provide the RAB with an independent environmental review of the investigation, remediation and remedial feasibility study associated with PCB contamination at former drywells 20-08 and 34-07. Drywells 20-08 and 34-07 were utilized as part of the NGC facility storm water drainage system and were interconnected with other drainage structures and on-site recharge basins (H2M Group, 2003).

H2M concluded that the soil characterization efforts were thorough and extensive. H2M did not disagree with the Exposure Assessment that concluded soil excavation was not warranted due to an incomplete exposure pathway. With proper site maintenance, paving of the impacted drywell areas and future property use for commercial or industrial applications, exposure was not a concern. The conclusion of the FFS, which specified “no action” as the recommended alternative, also seemed appropriate.

However, H2M recommended that with regards to groundwater, additional delineation be performed to determine the lateral extents of PCB impacts even though, as concluded in the Exposure Assessment that an incomplete pathway existed for exposure to groundwater. This may have been accomplished by, at a minimum, incorporating PCBs as a monitored parameter in the existing groundwater monitoring and treatment system. It was H2M's understanding that there were other areas of the NWIRP site that were historically impacted with PCBs (i.e., recharge basins). Since no up gradient groundwater samples were collected as part of the Site Characterization Study, the possibility that the PCBs detected in the groundwater samples collected near the drywells were attributable to an up gradient source could not be eliminated. Consequently, they recommended that the existing groundwater monitoring program should have been expanded to include testing for PCBs in select wells. Testing was not necessary at all groundwater containment and treatment locations but at locations in the vicinity of Plant 3, the recharge basins and drywells 20-08 and 34-07, and, specifically, locations hydraulically down gradient from these areas.

Final Closeout Report Construction of Soil Vapor Extraction/Air Sparging System at the Naval Weapons Industrial Reserve Plant Bethpage, New York, Foster Wheeler Environmental Corp. (Foster Wheeler), December 2003. This Close-Out Report described the field activities performed at Site 1 during the period of August 2001 through August 2002; this project was an extension of site activities that began in 1997. Based on the decline in VOC influent concentrations from 25,740 ppb to 1,856 ppb Foster Wheeler recommended that the interim RA was complete (Foster Wheeler, 2003).

Site 1 Soil Vapor Investigation Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), April 2008. This Data Report presented soil vapor investigation activities that took place from January 21, to January 30, 2008 at the NWIRP Bethpage (Tetra Tech, 2008c). Remediation goals for the former AS/SVE system that ran from 1998 through 2002 did not consider possible soil vapor migration to an adjacent residential neighborhood. This report summarized soil gas samples collected along the eastern side of Site 1 next to the residential neighborhood.

Conclusions based on the data collected during the investigation are as follows:

1. Soil gas samples collected along the eastern border of Site 1 exceeded NYSDOH for subslab criteria for TCE and PCE of 250 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) and 1,000 $\mu\text{g}/\text{m}^3$, respectively. Maximum TCE and PCE concentrations were 180,000 $\mu\text{g}/\text{m}^3$ and 5,300 $\mu\text{g}/\text{m}^3$, respectively.
2. Chemical concentrations in soil gas samples collected along the southern edge of Site 2 and the northeast corner of Site 1 (BPS1-1004, BPS1-1005, and BPS1-1006) were much lower than concentrations detected along the central and southeast corner of Site 1. Maximum TCE and

PCE concentrations were 820 $\mu\text{g}/\text{m}^3$ and 78 $\mu\text{g}/\text{m}^3$, respectively. These concentrations were detected at a depth of 46 feet below ground surface (bgs). Shallower samples contained lower concentrations of these chemicals.

3. The highest concentrations of TCE and PCE were generally detected at depths of 20 and 50 feet. However, shallow samples BPS1-SG1001-07 (7 feet bgs) and BPS1-SG1002-08 (8 feet) contained TCE (19,000 $\mu\text{g}/\text{m}^3$ and 3,300 $\mu\text{g}/\text{m}^3$) and PCE (170 $\mu\text{g}/\text{m}^3$ and 1,700 $\mu\text{g}/\text{m}^3$) at concentrations greater than NYSDOH subslab criteria of 250 $\mu\text{g}/\text{m}^3$ and 1,000 $\mu\text{g}/\text{m}^3$ for indoor air, respectively.
4. Based on the data, potential migration of contaminated soil vapor to adjacent residents may have been possible.

Groundwater Sampling Data Summary Site 1 – Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), May 2008. This Data Report presented groundwater analytical data collected in January 2008 from Site 1 – Former Drum Marshalling Area at NWIRP Bethpage (Tetra Tech, 2008d). The objective of this sampling event was to assess the concentrations of PCBs in down gradient groundwater monitoring wells at the site. PCBs were detected in each of the four monitoring wells sampled during the January 2008 sampling event. Concentrations of PCBs ranged from 0.46 $\mu\text{g}/\text{L}$ to 1.4 $\mu\text{g}/\text{L}$. Monitoring wells BP-SI-FW-MW03 and BP-SI-FW-HN29I contained concentrations of PCBs above the NYSDOH MCL of (0.5 $\mu\text{g}/\text{L}$) at 1.4 and 0.85 $\mu\text{g}/\text{L}$, respectively.

Technical Memorandum for Evaluating Soil Remediation Technologies Site 1-Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), September 2008. This report supports the preparation of a Work Plan to conduct a pilot test for in-situ remediation of deep PCB-contaminated soil. This evaluation report was based on information developed in 2007 during a “Tiger Team” evaluation of alternatives for soil remediation of Site 1 (Tetra Tech, 2008e).

Indoor Air Sampling Work Plan Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), November 2008. This Work Plan was prepared for the subslab vapor and indoor air sampling activities at properties adjacent to the NWIRP Bethpage, Long Island, New York. The sampling activities included indoor air, sub-slab vapor, and outdoor air sampling at residential homes located adjacent to Site 1. Initially, six homes along Eleventh Street and one home on Ninth Street (reference location) were targeted for indoor air sampling. Testing in these homes was dependent on approval of the homeowners. Vapor and air samples were analyzed for VOCs via USEPA TO-15 method (Tetra Tech, 2008f).

Site 1-Phase 2 Soil Vapor Testing Letter Report Naval Weapons Industrial Reserve Plant, Bethpage, New York, EPA ID # 002047967, Tetra Tech NUS, Inc. (Tetra Tech), January 2009. This letter report was prepared to present the initial results from the Phase II Soil Vapor Testing activities conducted from October 20 through October 30, 2008 along the Town of Oyster Bay right-of-ways adjacent to the NWIRP. The Phase II soil vapor testing was conducted to delineate the extent of contaminated soil vapor and determine if contaminated soil vapor has migrated off-site into the adjacent residential area (Tetra Tech, 2009a).

Based on the need to evaluate the potential vapor intrusion into residential homes adjacent to Site 1, subslab vapor and indoor air sampling was conducted during the week of January 19, 2009. Indoor air sampling was to initially target residential homes along closest to the site. A SVE pilot test was conducted in January 2009 to provide site specific information to aid in the design of an SVE system at Site 1.

Work Plan Addendum Supplemental Indoor Air Testing, Basement Sealing, and Installation of Residential Vapor Phase Carbon Units Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), February 2009. A work plan addendum was prepared to address supplemental indoor air and sub slab soil vapor testing, sealing of basement openings, and installation of portable vapor phase carbon units in residential housing east of Site 1 at NWIRP Bethpage (Tetra Tech, 2009b).

Design Analysis Report for Soil Vapor Extraction Containment System at Site 1-Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), April 2009. This report presented the results of pilot-scale testing of a soil vapor extraction (SVE) system conducted in January 2009 and the design basis for a full-scale SVE containment system to address VOC contaminants east of IR Site 1 – Former Drum Marshalling Area (Tetra Tech, 2009c).

The remedial objectives for this project are as follows.

- Prevent further offsite migration of VOC-contaminated soil vapor, and
- To the extent practical, capture contaminated soil gas that has migrated off site with VOC concentrations that represent a potential threat to residential receptors via soil vapor intrusion without the operation of individual home mitigation measures. The associated remediation goal is TCE in soil vapors at a concentration of 250 µg/m³.

The construction and start-up of the SVE system is scheduled for November and December of 2009.

Final Removal Action Work Plan for Installation Restoration (IR) Site 1-Former Drum Marshalling Area Non-Time Critical Removal Action Naval Weapons Industrial Reserve Plant, Bethpage, New York, ECOR, May 2009. This Work Plan details a planned removal action for Site 1 (ECOR, 2009a). The work to be performed included decontamination, demolition, transportation and disposal of structures at Site 1. Specific demolition and well abandonment activities, as outlined in the Statement of Work, included the following:

- Demolition of Building 03-13
- Demolition of Building 03-38
- Demolition of Building 03-31
- Demolition of Building 03-33
- Demolition of 7 concrete pads
- Demolition of settling tank adjacent to Building 03-13
- Abandonment of 33 Air Sparge (AS) / Soil Vapor Extraction (SVE) Wells

Time-Critical Removal Action – Off-site Soil Vapor Intrusion, Site 1- Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New, Navy, June 2009. The purpose of this Action Memorandum is to document the decision by the United States Navy (Navy) to conduct time critical removal actions (TCRAs) to initially reduce exposure to and then prevent the intrusion of volatile organic compound (VOC)-contaminated soil vapor into off-base residential houses adjacent to Site 1.

The proposed action consists of continued operation of up to 14 APU's in 12 homes (less than six months), long-term operation of 7 APUs in 7 homes (approximately 2 years), installation and operation of 6 SSD systems in six homes (approximately 2 years), and monitoring of subslab soil vapor and indoor air in 15 homes for a period of approximately 2 years. APUs are a granular activated carbon-based filtration system that remove VOCs through recirculation of indoor air and chemical adsorption. The SSD systems operate by purging TCE-contaminated soil vapors from underneath the houses and prevent soil vapor intrusion by creating a vacuum underneath the structure. Monitoring will be used to determine the protectiveness of the removal actions and to be the basis for removal of APUs and SSD systems.

Site 1 Phase II Soil Vapor Report Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), August 2009. This Data Summary Report presented the soil vapor investigation activities that took place from October 2008 through January 2009 along the Town of Oyster Bay right-of-ways to the east of Site 1 NWIRP Bethpage. TCE, PCE, and TCA represent the primary site contaminants of concern. Soil gas samples collected along the eastern border of Site 1 (January 2008) indicated maximum TCE, PCE, and TCA concentrations of 180,000 $\mu\text{g}/\text{m}^3$, 5,300 $\mu\text{g}/\text{m}^3$ and 90,000 $\mu\text{g}/\text{m}^3$ respectively. Offsite soil gas sampling showed maximum concentrations of TCE at 89,000 $\mu\text{g}/\text{m}^3$, PCE at 5,000 $\mu\text{g}/\text{m}^3$, and TCA at 52,000 $\mu\text{g}/\text{m}^3$ (Tetra Tech, 2009d).

Based on the data collected during this offsite soil gas investigation in the residential neighborhood, indoor air and sub-slab soil vapor testing was recommended to determine if soil vapor intrusion is a concern in residential homes.

Final Removal Action Completion Report for Installation Restoration (IR) Site 1-Former Drum Marshalling Area Non-Time Critical Removal Action Naval Weapons Industrial Reserve Plant, Bethpage, New York, ECOR, September 2009. The removal action consisted of the demolition of four buildings, seven concrete pads, the upper six feet of a settling tank adjacent to Building 03-12, and the abandonment of 24 air sparge (AS)/soil vapor extraction (SVE) wells. The demolition consisted of all roofs, walls, floors, drains, sumps, piping, foundations, and concrete pads associated with the following structures:

- Building 03-13
- Building 03-38
- Building 03-31
- Building 03-33
- Seven concrete pads
- Settling tank adjacent to Building 03-13 (upper six feet)
- Steel Sheet Wall
- Abandonment of 24 Air Sparge (AS)/Soil Vapor Extraction (SVE) Wells

Site activities began May 18, 2009 and concluded on July 10, 2009 (ECOR, 2009b).

Engineering Evaluation and Cost Analysis (EE/CA) Non-Time Critical Removal Action Site 1 – Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), September 2009. The objective of the Non-Time Critical Removal Action (NTCRA) at Site 1 was to contain, control, and remove impacted soil vapor to reduce the potential risk to human health (Tetra Tech, 2009e). The removal action alternatives evaluated are as follows:

- Alternative 1 – No Action
- Alternative 2 – Long-Term Operation and Maintenance (O&M) and Monitoring (OM&M) of Engineering Controls
- Alternative 3 –SVE Containment System, Engineering Controls, and OM&M

This EE/CA recommended Alternative 3 – SVE Containment System, Engineering Controls, and OM&M as the remedial alternative. This alternative meets the objective of the NTCRA and provides the best balance of trade-offs based on the evaluation criteria.

Quarterly Data Summary Report Indoor Air and SSD Monitoring (May, June, and July 2009) Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech),

October 2009. This Report summarizes field activities conducted in May, June, and July 2009, and includes indoor air, outdoor air, and sub-slab depressurization (SSD) monitoring activities that took place in June 2009 in the residential neighborhood east of Site 1 (Tetra Tech, 2009f).

The June 2009 results from outdoor air samples associated with several homes showed concentrations of TCE ranging from 0.17 J to 4.2 $\mu\text{g}/\text{m}^3$, PCE ranging from 0.24 J to 32 $\mu\text{g}/\text{m}^3$, and TCA ranging from 0.13 J to 1.1 $\mu\text{g}/\text{m}^3$. In particular, outdoor air sample BPS1-AR013-ODA, the upwind sample associated with one home contained concentrations of VOCs greater than those detected in the corresponding indoor air sample.

Data Summary Report Soil Vapor Intrusion Investigation Site 1- Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), October 2009. This Data Summary Report presented sub-slab vapor and indoor air sampling results from offsite residential properties. The soil vapor intrusion sampling activities consisted of indoor air, sub-slab vapor, and outdoor air sampling in the residential neighborhood located east and adjacent to Site 1. A total of 18 residential homes were sampled during investigation activities, which were conducted from January 2009 through May 2009. Air and vapor samples were analyzed for VOCs via USEPA TO-15 method (Tetra Tech, 2009g).

Based on the evaluation of the indoor air sampling results the following conclusions were developed:

1. TCE, PCE, and TCA are the primary COCs for evaluating soil vapor intrusion in residential homes adjacent to NWIRP Bethpage - Site 1.
2. TCE was detected at concentrations above the NYSDOH maximum sub-slab soil vapor guideline value of 250 $\mu\text{g}/\text{m}^3$ in six homes.
3. TCE was detected at concentrations above the NYSDOH indoor air guideline value of 5 $\mu\text{g}/\text{m}^3$ in four homes.
4. APUs were effective in reducing contaminant concentrations below NYSDOH air guideline values in all but one residential home.
5. Based on the NYSDOH decision matrices, mitigation was recommended for six homes.
6. Based on the NYSDOH decision matrices, mitigation and/or monitoring were recommended for seven additional homes.
7. Based on the NYSDOH decision matrices, no further action was required for five homes.

Recommendations to address soil vapor intrusion from Site 1 included:

1. Install a Soil Vapor Extraction (SVE) at NWIRP Bethpage to address long term remediation of contaminated soil vapor on or near Site 1.
2. Install sub-slab depressurization systems (SSD) in homes exhibiting sub-slab TCE concentrations greater than 250 $\mu\text{g}/\text{m}^3$, which includes seven homes.
3. Conduct future indoor air sampling in six homes to evaluate and monitor indoor air quality in these homes.

Final Work Plan for the Design, Installation and Operation of Soil Vapor Extraction System Site 1, Former Drum Marshalling Area at Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech EC (TtEC), October, 2009. TtEC prepared this Work Plan for design, installation and operation of a SVE system for the containment of VOC in soil at Site 1.

The remedial objective for this project was to use an on-site soil vapor extraction system to prevent further off-site migration of VOC contaminated soil vapor and to the extent practical, capture contaminated soil gas with TCE concentrations greater than $250 \mu\text{g}/\text{m}^3$. A secondary objective was to address soil gas with a TCE concentration greater than $5 \mu\text{g}/\text{m}^3$. The system is expected to operate for approximately 2 to 5 years (TtEC, 2009).

The construction and start-up of the SVE system is took place October to December of 2009.

Quarterly Data Summary Report Indoor Air and SSD Monitoring (August, September, and October 2009) Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), December 2009. This Report summarizes field activities conducted in August, September, and October 2009, and includes indoor air, outdoor air, and sub-slab depressurization (SSD) system and stack monitoring activities that took place in August 2009 in the residential neighborhood east of Site 1. During this quarterly monitoring event, six homes were sampled in August 2009. As of August 2009, TCE concentrations have decreased by an average of 78% in basement air of each home and 94% in the living space air, since the initial sampling in January 2009. Outdoor air samples were collected to evaluate ambient VOC concentrations during the indoor air sampling, and to determine whether the operation of the SSD systems was affecting downwind air quality.

The August 2009 results from outdoor air samples associated with five homes showed concentrations of TCE ranging from non-detect to $0.73 \mu\text{g}/\text{m}^3$, PCE ranging from 0.31 J to $0.39 \text{ J } \mu\text{g}/\text{m}^3$, and TCA ranging from non-detect to $0.39 \text{ J } \mu\text{g}/\text{m}^3$. Outdoor air concentrations observed during this sampling event were below the respective NYSDOH Air Guideline Values.

To evaluate the potential influence from SSD system stack discharges to outdoor air, a separate outdoor air evaluation was conducted on August 25 and 26, 2009. This evaluation included two rounds of outdoor air sampling targeting a lower and higher wind speed scenario in the neighborhood. During this evaluation, four of the nine site-specific VOCs were detected. The four compounds included TCA, PCE, TCE, and 1,2-dichloroethane. PCE was most frequently detected compound (nine of the ten samples) with concentrations ranging from 0.3 to $7.7 \mu\text{g}/\text{m}^3$. TCA, TCE, and 1,2-dichloroethane were detected in only one of ten samples with the maximum concentrations of TCE at $14 \mu\text{g}/\text{m}^3$, TCA at $2.8 \mu\text{g}/\text{m}^3$, and

1,2-dichloroethane at $0.97 \mu\text{g}/\text{m}^3$. The highest detections of PCE, TCE, and TCA were observed in sample BPS1-ODA109 during the higher wind evaluation.

Quarterly Data Summary Report Soil Vapor Intrusion Monitoring (November and December 2009, and January 2010) Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), February 2010. This Report summarizes field activities conducted in November and December 2009, and January 2010, and includes indoor air, outdoor air, and sub-slab depressurization (SSD) system stack monitoring activities that took place in November 2009 in the residential neighborhood east of Site 1 (Tetra Tech, 2010a). Air and vapor samples were analyzed for volatile organic compounds (VOCs) via United States Environmental Protection Agency (EPA) TO-15 method.

During this quarterly monitoring event, ten homes were sampled in November 2009. The APUs and SSD systems installed in the residential homes are working and have mitigated vapor intrusion. An SVE Containment System was installed at the border of Site 1 in late 2009 and is currently operating to prevent further off site migration of contaminated soil vapor and to the extent practical remediate contaminated soil vapor located off site. Indoor air monitoring will continue in the residential homes to evaluate the effectiveness of the mitigation systems and off site soil gas testing will be conducted throughout the residential neighborhood to confirm the effectiveness of the SVE Containment System.

During the sampling event, outdoor air samples were collected to evaluate potential influence of outdoor air on indoor air quality. The outdoor air samples were collected to represent upwind ambient air data at the time of indoor air sampling in individual homes. For some samples, a single upwind outdoor air sample was used to evaluate multiple homes. TCE and PCE were detected in one outdoor air sample, BPS1-AR0012-ODA2, at $0.3 \text{ J } \mu\text{g}/\text{m}^3$ and $0.56 \text{ J } \mu\text{g}/\text{m}^3$, respectively. 1,2-dichloroethane was detected in two outdoor air samples at concentrations of $0.1 \text{ J } \mu\text{g}/\text{m}^3$ and $0.14 \text{ J } \mu\text{g}/\text{m}^3$. Outdoor air concentrations observed during this sampling event were below the respective NYSDOH Air Guideline Values.

Action Memorandum Non-Time Critical removal Action for Soil Vapor Extraction System Site 1 Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), February 2010. The purpose of this Action Memorandum was to document the decision by the U.S. Navy (Navy) to conduct a non-time-critical removal action (NTCRA) to expedite and/or complete long-term risk mitigation for current and future residents potentially exposed to volatile organic compound (VOC)-impacted-soil vapor in off-facility residential houses adjacent to Site 1.

The proposed action consists of continued OM&M of up to 13 APU's in 11 homes (less than 6 months), long-term OM&M of 7 APUs in 7 homes (approximately 2 years), OM&M of 6 SSD systems in six homes (approximately 6 months to 2 years), and monitoring of sub-slab soil vapor and indoor air in 12 homes

(approximately 2 years). An SVE Containment System will be installed at Site 1 to remove and contain impacted soil vapor. OM&M will be used to determine the protectiveness and effectiveness of the removal action, as well as when the engineering controls (APUs and SSDs) and SVE Containment System can be shut down and removed.

The APUs were installed in February and March 2009. The SSD systems were installed in May 2009. Operation and monitoring of the APUs and SSD systems are anticipated to continue through December 2011 considering the SVE Containment System installation and startup in December 2009. The SVE Containment System is expected to operate through December 2013. The cost for the interim removal action is approximately \$2 million. Capital costs are estimated at 1.2 million, and OM&M costs through December 2014 (conservative 5 years) are estimated to total \$760,000 (Present Value).

Draft Final Sampling and Analysis Plan PCB Investigation Site 1-Former Drum Marshalling Area Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), March 2010. Tetra Tech NUS, Inc. (Tetra Tech) prepared a Sampling and Analysis Plan (SAP) for an additional Polychlorinated Biphenyl (PCB) Investigation at Site 1 – Former Drum Marshalling Area (Site). This PCB investigation will focus on delineating the vertical extent of PCB-contaminated soils in the source areas and determining if PCBs have impacted groundwater beyond the Site boundary.

2.6.2 Operable Unit 1, Site 2 Soil

Final Record of Decision Naval Weapons Industrial Reserve Plant Bethpage, New York Sites 1, 2, and 3, Naval Facilities Engineering Command (NAVFAC), May 1995. The ROD identified actual or threatened releases of hazardous substances from Site 2, if not addressed by implementing the response action described in this ROD, would present a current or potential threat to human health and the environment.

Based upon the results of the RI/FS, criteria for selecting a remedy, and public input received during the public comment period, the Navy and NYSDEC selected Alternative S6 described below:

Soil volumes for Site 2 included:

- 2,600 cubic yards of PCB-contaminated soil with concentrations between 10 ppm and 500 ppm for off site disposal.
- Placement of a 6-inch soil/gravel cover over residual contaminated soils at the site.

Final Submission for Remedial Design Sites 1 and 2, Phase 1 Naval Weapons Industrial Reserve Plant Bethpage, New York, Halliburton NUS (HNUS), May 1995. This Design Basis Report summarized the information and methodologies used to prepare the plan drawings and specifications for the remedial design. There were several areas of PCB contamination at Site 2 that required excavation and disposal at an off-site facility (HNUS, 1995a).

Analytical Results from the Pre-Excavation Soil Sampling and Estimate on Excavation Naval Weapons Industrial Reserve Plant Bethpage, New York, Foster Wheeler Environmental Corp. (Foster Wheeler), December 1995. A pre-excavation field investigation was performed from November 7 through November 17, 1995, in accordance with the Work Plan and the Sampling and Analysis Plan for Sites 1 and 2. The field activities consisted of mobilization/demobilization, a site survey, surface soil sampling, and subsurface soil sampling. Based on the results; approximately 6,820 cubic yards of PCB-contaminated soil was proposed to be excavated from Sites 1 and 2 (Foster Wheeler, 1995).

Post Remedial Action Letter Report for Site 2, Phase 1 Naval Weapons Industrial Reserve Plant Bethpage, New York, C.F. Braun Engineering Corp. (C.F. Braun), June 1996. The Remedial Action Contract (RAC) performed RA activities for Site 2 at NWIRP. The purpose of the RA was to remove PCB contaminated soil that had concentrations in excess of 10 ppm. During the RA, a total of 7,239 tons of PCB-contaminated soil was excavated and disposed of at the Grayback Mountain hazardous waste landfill located in Clive, Utah (C.F. Braun, 1996a).

Surface Soil Sampling Results Site 2-Recharge Basin, Site 3-Salvage Storage Area Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), June 2001. The objective of this soil sampling program was to characterize the existing condition of the surface soils at Sites 2 and 3 and to delineate those areas that required permeable cover in accordance with the ROD. The chemicals of concern were listed in the 1995 ROD and consisted of SVOCs – primarily PAHs, pesticides, PCBs, and several metals. VOCs were found to be only a minor issue at Sites 2 and 3 and were to be addressed through a natural-flushing (Tetra Tech, 2001b).

Final Construction Completion Report for Site 2 – Recharge Basin Area and Site 3 – Salvage Storage Area Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), May 2002. A final CCR was prepared summarizing remedial activities that took place at Site 2 – Recharge Basin Area and Site 3 – Salvage Storage Area at the NWIRP Bethpage, New York. This report presented the final testing and construction activities for IR Sites 2 and 3 as identified in the Operable Unit (OU) 1 ROD dated July 1995.

The construction activities completed in December 2001 which consisted of installing a soil cover at Site 2 completed the necessary field work identified under the 1995 OU 1 ROD, in order to transfer property to Nassau County, New York (Tetra Tech, 2002b).

2.6.3 Operable Unit 1, Site 3 Soil

Final Record of Decision Naval Weapons Industrial Reserve Plant Bethpage, New York Sites 1, 2, and 3, Naval Facilities Engineering Command (NAVFAC), May 1995. The ROD identified that actual or threatened releases of hazardous substances from Site 3, if not addressed by implementing the response action described in this ROD, would present a current or potential threat to human health and the environment.

Based upon the results of the RI/FS, criteria for selecting a remedy, and public input received during the public comment period, the Navy and NYSDEC selected Alternative S6 described below:

- Alternative S6 – Fixation of Metals, Incineration of Soils Containing PCBs at Concentrations Greater than or Equal to 500 ppm, Land filling of PCBs between 10 ppm and Less than 500 ppm, and In-Situ Vapor Extraction of VOCs

No soils at Site 3 were identified as requiring excavation and off site disposal. However, the ROD identified placement of a 6-inch soil/gravel cover over residual contaminated soils at the site.

Surface Soil Sampling Results Site 2-Recharge Basin, Site 3-Salvage Storage Area Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), June 2001. The objective of this soil sampling program was to characterize the existing condition of the surface soils at Sites 2 and 3 and to delineate those areas that required permeable cover in accordance with the ROD. The chemicals of concern were listed in the 1995 ROD and consisted of SVOCs – primarily PAHs, pesticides, PCBs, and several metals. VOCs were found to be only a minor issue at Sites 2 and 3 and were to be addressed through a natural-flushing (Tetra Tech, 2001b).

Final Construction Completion Report for Site 2 – Recharge Basin Area and Site 3 – Salvage Storage Area Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), May 2002. A final CCR was prepared summarizing remedial activities that took place at Site 2 – Recharge Basin Area and Site 3 – Salvage Storage Area at the NWIRP Bethpage, New York. This report presented the final testing and construction activities for IR Sites 2 and 3 as identified in the OU 1 ROD dated July 1995.

The test data from February 2001 confirmed that the 1998 scrapping and covering conducted at Site 3, in combination with natural degradation completed the necessary field work identified under the 1995 OU 1 ROD, in order to transfer property to Nassau County, New York.

2.6.4 Operable Unit 2, Site 1 Off-Site Groundwater

On-Site Monitoring Well Installation Summary Report Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), October 2000. A total of 12 monitoring wells were installed to complete a monitoring network to satisfy anticipated requirements to be established in the OU 2 groundwater ROD for the U.S. NWIRP Bethpage and NGC sites (Tetra Tech, 2000b). These wells were installed on or near former Northrop Grumman property and were used to support evaluation of the Onsite Groundwater Containment System.

Vertical Profile Borings VPB-38, -76, and -77 Summary Report Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), November 2000. This report summarized the installation of three vertical profile borings (VPB) located off of the property owned by the NWIRP. The VPBs were installed to collect subsurface lithology and depth specific groundwater samples to establish a vertical profile of groundwater contamination at each location. Soil and groundwater samples were collected at depth specific intervals from each VPB (Tetra Tech, 2000c).

Groundwater samples from VPB-38 for total VOCs ranged from 4 µg/L at 150 feet bgs to 3,420 µg/L at 250 feet bgs. Groundwater samples from VBP-76 for total VOCs ranged from 1 µg/L at 100 feet bgs to 212 4 µg/L at 610 ft bgs. Groundwater samples from VPB-77 for total VOCs ranged from 1 µg/L at 200 ft bgs to 125 µg/L at 250 ft bgs.

Record of Decision Operable Unit 2 Groundwater Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites Inactive Hazardous Waste Disposal Sites Town of Oyster Bay, Nassau County, New York Site Nos. 1-30-003A & B, New York State Department of Environmental Conservation (NYSDEC), March 2001. Based on the results of the RI/FS for the Northrop Grumman and the NWIRP Class 2 Inactive Hazardous Waste Disposal Sites and the criteria identified for evaluation of alternatives, the NYSDEC selected Alternative 3. The selected remedy included a number of response measures which have been categorized into a Groundwater Remedial Program and a Public Water Supply Protection Program (NYSDEC, 2001).

The selected remedy, Alternative 3, consisted of the following Groundwater Remedial Program components: the ongoing On-Site Containment System (ONCT) system (formerly known as the IRM), the off-site GM-38 area groundwater extraction and treatment system, a vinyl chloride treatment contingency

plan for the ONCT, long-term groundwater monitoring including monitored natural attenuation, and long-term operation and maintenance of all operating treatment systems on-site and off-site. Additionally, the selected Alternative included the following Public Water Supply Protection Program components: the operation and maintenance of air strippers for BWD well fields 4, 5 and 6, and preparation of a contingency plan for wellhead treatment or comparable alternative measures for public supply wells not currently affected but that may become affected by site-related VOCs in the future.

Southern Area Vertical Profile Boring Installation Summary Report Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), February 2002. This report summarized the installation of five VPBs in the Southern Area located off of the NWIRP Bethpage. The VPBs were installed to collect subsurface lithology and depth specific groundwater samples from these borings to establish a vertical profile of groundwater contamination at each location (Tetra Tech, 2002c).

Soil samples were collected from five VPBs drilled at locations south of the Hempstead Turnpike in order to establish the southern extent of VOC groundwater contamination between an area of confirmed VOC contaminated groundwater near the Hempstead Turnpike and the down gradient water suppliers. Samples were collected from VPBs 44, 45, 46, and 50 for lithology and description from depths ranging from 50 to 850 feet bgs. Soil samples were collected at two different intervals in each VPB and submitted for analysis of Total Organic Carbon (TOC).

Groundwater samples were collected from depth specific intervals in each boring for analysis of VOCs for the analytes listed in, and in accordance with, GC method SW846-8260B. Total VOC concentrations in VPB-44 ranged from none detected at 50 feet bgs to 54 µg/L at 240 feet bgs. Total VOC concentrations in VBP-45 ranged from 2 µg/L at 50 ft bgs to 170 µg/L at 500 ft bgs. Total VOC concentrations in VBP-46 ranged from 19 µg/L at 50 ft bgs to 106 µg/L at 220 ft bgs. Total VOC concentrations in VBP-50 ranged from 1 µg/L at 50 ft bgs to 13 µg/L at 150 ft bgs.

Final Off-site Monitoring Well Installation Summary Report Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), April 2002. This report summarized the installation of seven new monitoring wells (hereinafter referred to as “off-site wells”) located near NWIRP Bethpage. The wells were installed to complete a monitoring network to satisfy requirements set forth in the OU 2 groundwater ROD for the U.S. Navy-owned NWIRP Bethpage and NGC sites. Seven monitoring wells (GM-18D, GM-21D, GM-75D2, GM-78-S GM-781, GM-791, GM-79D) were drilled and installed to support the On-site Containment System effectiveness. Surveying of the wells was completed at the end of the project (Tetra Tech, 2002d).

Final GM-38 Area Vertical Profile Boring Installation Summary Report Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), May 2002. This report summarized the installation of six VPB in the GM-38 Area located southeast of the Navy property. The VPBs were installed to collect subsurface lithology and depth specific groundwater samples from these borings to establish a vertical profile of groundwater contamination at each location (Tetra Tech, 2002e).

Six VPBs (VPB-40, VPB-47, VPB-48, VPB-51, VPB-42 and VPB-49C) were drilled at locations in the GM-38 Area, which is located north of the Hempstead Turnpike and west of the Seaford-Oyster Bay Expressway. The purpose of these VPBs was to define the extent of VOC groundwater contamination around the GM-38 Area and to collect subsurface lithology and depth specific groundwater samples from these borings to establish a vertical profile of groundwater contamination at each location. The VPBs were installed up gradient, down gradient, and side gradient of the GM-38 Area, which is up gradient of Plant 5 of the Bethpage Water District. Soil and groundwater samples were collected at depth-specific intervals from each VPB.

Soil samples were collected from VPBs for lithology description and, at selected intervals determined in the field, soil samples were collected at two different intervals in each VPB and submitted for analysis of TOC with the exception of VPB-40, VPB-42 and VPB-49C, which did not have TOC samples collected. TOC analysis samples were collected at depths where highly permeable zones existed (typically between 200 and 500 feet).

Groundwater samples were collected from depth specific intervals in each boring for analysis of VOCs for the analytes listed in, and in accordance with, GC method SW846-8260B. Groundwater samples were collected from VPBs 40, 47, 48, and 51 from depths ranging from 50 to 800 feet bgs. Total VOC concentrations in boring VPB-40 ranged up to 327 µg/L at 280 ft bgs. Total VOC concentrations in VBP-47 ranged from 8 µg/L at 50 ft bgs to 945 µg/L at 400 ft bgs. Total VOC concentrations in VBP-48 ranged up to 104 µg/L at 200 ft bgs. Total VOC concentrations in VBP-51 ranged from 2 µg/L at 50 ft bgs to 3,144 µg/L at 240 ft bgs.

Conceptual Design Report for GM-38 Area Groundwater Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), October 2002. This report presented pre-design activities that were intended to evaluate and screen the number of viable options to be considered in more detail. A subsequent document was prepared to develop a Basis of Design for this project (Tetra Tech, 2002f).

A concentration of 500 µg/L total volatile organic compounds (TVOCs) in groundwater was used to define the GM-38 Area. At this concentration, the horizontal and vertical extents of the GM-38 Area groundwater

contamination were adequately defined and covered a total area of approximately 67 acres. The groundwater contamination was present at depths ranging from 220 to 480 feet bgs, but is not continuous throughout the area.

Two groundwater recovery wells with a combined extraction rate of 1,100 gallons per minute (gpm) would effectively capture this contaminated groundwater. These wells would need to operate for a period of approximately 5 to 10 years to reduce the concentration of TVOCs in groundwater to an average of 100 µg/L in the GM-38 Area. This final concentration would result in the removal of approximately 90% of the TVOC contamination in the area and residual TVOC concentrations in GM-38 Area groundwater would then be similar to the balance of the OU 2 ROD groundwater.

Several treatment options for the extracted groundwater were considered, including air stripping, GAC adsorption, and off-site treatment. Of these options, air stripping with vapor-phase GAC adsorption was the best demonstrated technology, most effective at recovering contaminants, and lowest cost.

Several options for discharge of the treated groundwater were considered, including injection wells, surface water discharge through the Publicly Owned Treatment Works (POTW), and recharge basins. Of these options, injection wells near the southern edge of the plume were selected as the most viable.

The GM-38 Area was a densely populated area with only limited space available. However, because of the presence of town roads, an expressway, and a high tension power transmission line, there was adequate property available for siting the wells, piping, and treatment system.

GM-39 and GM-73 Vertical Profile Boring and Monitoring Well Installation Summary Report Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), November 2002. This report summarized the installation of two VPBs and three monitoring wells on former NGC property. The VPBs were installed to determine contaminant distribution, lithology, and the screen intervals for the monitoring wells. The monitoring wells were installed to collect groundwater samples for chemical testing and to obtain water level measurements to help evaluate the effectiveness of the ONCT System (Tetra Tech, 2002g).

Record of Decision for Operable Unit 2 Groundwater NYS Registry: 1-30-003B Naval Weapons Industrial Reserve Plant Bethpage, New York, Naval Facilities Engineering Command (NAVFAC), January 2003. This ROD document presented the RA for OU 2 that would be conducted by the Navy. This ROD parallels the NYSDEC ROD, but excludes activities that would be conducted by Northrop Grumman. The site was not listed on the National Priorities List (NPL); however, a copy of this document was sent to the USEPA Region II offices for information (NAVFAC, 2003b).

The Navy's decision for groundwater was based on the Administrative Record for NWIRP Bethpage. The Navy's remedy for groundwater was also based upon public input to a PRAP for regional groundwater prepared and was presented by NYSDEC in December 2000. NYSDEC then issued a related ROD for OU 2 Groundwater NGC and NWIRP Sites, Nassau County Site Numbers 7-30-003A&B in March 2001.

The selected remedy that was implemented by the Navy, for the purposes of the Navy's Groundwater ROD, was subdivided into an on-site and off-site component. The Navy's selected remedy for On-Site groundwater included the following:

- An institutional control which consists of the placement of a restriction in the deed of transfer to the County of Nassau, New York prohibiting extraction of groundwater from within the boundaries of the 105-acre or Plant 20 parcels. In order to aid in the compliance with the deed restriction, the Navy completed the abandonment of the seven (7) deep production wells formerly located on the 105-acre parcel. The production wells were used for the extraction of groundwater as non-contact cooling water to support operations conducted by NGC during a time when NGC leased the 105-acres from the Navy. If a future occupant of the Navy's 105 acre parcel wished to pursue groundwater extraction, language would be included in the appropriate deed(s) of transfer requiring prior notification to and securing written permission from the Nassau County Department of Health and/or NYSDEC.

Alternative 3 contained the addition of a groundwater extraction and treatment system at the GM-38 area. The purpose of the GM-38 groundwater extraction and treatment system would have been to accelerate off-site contaminant mass removal and to restore the off-site portion of the impacted aquifer in the vicinity of BWD Supply Well fields 4, 5 and 6 to remedial action objectives (RAOs) in a shorter time frame than under Alternative 2. The GM-38 area is located approximately 4,500 feet southeast of the NGC south recharge basin area, and is defined by the inferred 1,000 ug/L TVOC contour line drawn around Well GM-38D2.

Final GM-38 Area Groundwater Remedy Analysis Report Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), February 2003. This report presented the preliminary analysis activities that were intended to establish baseline conditions, an initial remedy development, and cost estimate for GM-38. Design, construction, and O&M activities were conducted by the Navy, through a separate contract (Tetra Tech, 2003b).

Final Outpost Monitoring Well Installation Summary Naval Weapons Industrial Reserve Plant Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), March 2004. This report summarized the

installation and development of nine Outpost Monitoring Wells (BPOW 1-1, 1-2, 1-3, 2-1, 2-2, 3-1, 3-2, 4-1, and 4-2), drilled and installed between June 2003 and December 2003, located south and hydraulically down gradient of the NWIRP. The wells were installed in support of the Navy's ROD for OU 2 (April 2003) to provide advance warning of potential contaminant impact to local public water suppliers.

Groundwater samples were collected from each well and analyzed for VOC compounds. BPOW 1-1 was the only well that showed the presence of several site related VOCs (Tetra Tech, 2004a).

Final Work Plan for Pre-Design Investigation Tasks GM-38 Area Groundwater Remediation Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech FW, Inc. (TtFW), November 2004. Tetra Tech FW, Inc. (TtFW) performed pre-design tasks for the GM-38 Area groundwater remediation (TtFW, 2004). The following pre-design tasks were included in the scope of work:

- Geotechnical investigation to develop design parameters for the groundwater treatment system building foundation and slab.
- Pre-design groundwater investigation, to determine extraction and reinjection rates and verify the influent groundwater quality to the treatment system.
- Treatability study to gather additional information for the detailed design of the groundwater treatment process.

Final Design for GM-38 Area Groundwater Remediation at Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech EC, Inc. (TtEC), May 2006. This report detailed the development of a groundwater treatment system design to remediate contaminated groundwater at an area referred to as the GM-38 area in Bethpage, New York. The RA at the GM-38 area was in response to the off-site groundwater plume that had migrated off the NWIRP Bethpage property and Northrop Grumman Site (TtEC, 2006a).

Letter Work Plan for Pre-Design Field Investigation Off-Site Location GM-75 Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), September 2008. This letter work plan describes activities to install 8 VPBs (to a depth of approximately 800 ft bgs) in the GM-75 off-site groundwater area in order to better define the horizontal and vertical extent and concentrations of VOC contamination in groundwater that is south of the Navy/Northrop Grumman complex and that cannot be captured by the Northrop Grumman ONCT, and groundwater that is up-gradient of the Aqua New York well field (Tetra Tech, 2008h).

Final Operation, Maintenance, and Monitoring Plan for Groundwater Treatment Plant GM-38 Area Groundwater Remediation Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech EC, Inc. (Tetra Tech EC), April 2010. The purpose of this OM&M Plan is to facilitate the

understanding of key operations and maintenance features of the Groundwater Treatment Plan (GWTP) (TtEC, 2010).

As stated in the Navy's Record of Decision (ROD), the purpose of the groundwater treatment system is to "Eliminate, to the extent practical, site-related contaminants from the affected public water supplies and to prevent, to the extent practical, the future contamination of public water supplies through the implementation of the offsite groundwater remediation." The treatment system has been designed for a 5 to 10 year operational life. The intent of the system is to remove mass, reduce elevated VOC levels to levels similar to those in the surrounding aquifer, and in doing so will minimize the impacts on water supply wells and currently unaffected portions of the aquifer.

2.6.5 Site 4 Soil and Groundwater

RCRA Facility Assessment/Focused Feasibility Study for Former Underground Storage Tanks Plant No. 3 Area of Concern (AOC) 22 Tank Nos. 03-01-1, -2 and -3 Naval Weapons Industrial Reserve Plant Bethpage, New York, January 2003. This report summarized the results of soil and groundwater investigations conducted at the site through 2002 and presented remedial options for addressing soil contamination (Tetra Tech, 2003a).

Soil and Groundwater Monitoring Report AOC 22 Site 4 Former Underground Storage Tanks Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), March 2007. This monitoring report summarizes groundwater monitoring and soil activities that took place from 2004 to 2006. In summary, the following conclusions can be made from the 2006 site conditions at AOC 22 (Tetra Tech, 2007c).

- Concentrations of TPH remained in the soil at AOC 22 that ranged from 14 mg/kg in shallower depths to 36,000 mg/kg in deeper depths.
- The horizontal extent of TPH contamination included soil locations SB-105 and SB-106 at concentrations that ranged from 1,700 to 3,600 mg/kg in the 50 to 60 foot depth interval.
- Free product was present in soil at depth intervals of 50 to 70 feet in soil borings SB-101, SB-102, and SB-103 and in monitoring wells MW-01 and MW-02.
- Soil contaminants, including TPH and PAHs, had not migrated into the groundwater.
- The Closed Loop Bioreactor (CLB) system was approximately 16% effective in remediation of contaminated soil.
- Soil concentrations exceeded NYSDEC Technical and Administrative Guidance Memorandum (TAGM) #4046 criteria for PAH compounds from 50-foot to 70-foot depth intervals in the four boring locations.

- Groundwater concentrations exceeded NYSDEC groundwater standards for TCE and several metals including iron, manganese, sodium, selenium, and cadmium in the up gradient and down gradient monitoring wells. The TCE contamination was not considered to be site-related.

Soil and Groundwater Report in Support of Closed Loop Bioreactor Pilot Scale Study for AOC 22/Site 4 Former Underground Storage Tanks Naval Weapons Industrial Reserve Plant, Bethpage, New York, Tetra Tech NUS, Inc. (Tetra Tech), September 2007. This work was conducted to evaluate the effectiveness of a CLB pilot-scale bioremediation study at the site and to document the post-treatment conditions of soil and groundwater at the site (Tetra Tech, 2007d). The primary site contaminant was No. 6 Fuel Oil. Based on previous testing at the site, limited quantities of diesel fuel may have also been present. Groundwater in the area was also contaminated with low concentrations (less than 100 µg/L) of chlorinated solvents that are a regional issue. A CLB Pilot Study System was constructed and operated at the site by the CLB System vendor from the fall of 2004 to the spring of 2006, at which time the system was shut-down. The CLB system consisted of injecting iron, peroxide, soil vapor, oxygen, surfactant, and biomass into the soil and extracting soil vapor. An ex-situ bioreactor was used to treat the extracted vapors, prior to re-injection.

2.7 DESCRIPTION OF SITES

A comprehensive list of all sites identified during all previous assessments and investigations is provided in Table 2-1. The location of each site is shown in Figure 2-2. Table 2-2 contains no further action AOCs.

2.8 COMMUNITY RELATIONS

The documents prepared for the program are maintained in information repositories for review by the public. NAVFAC MIDLANT is the public repository for NWIRP Bethpage Administrative Record; however documentation is also available in the Bethpage Public Library. In addition, the Administrative Record is found online listed below. NWIRP Bethpage has developed a Community Relation Plan (CRP) and established a Restoration Advisory Board (RAB) comprised of members of the community, local environment group members, and state and federal officials, that meet semi-annually to inform the community on environmental issues at NWIRP Bethpage. Other public meetings and the soil vapor intrusion website are also listed below. All advertisements and public notices for Bethpage community relations appear in The Bethpage Tribune, listed below.

Public Repository:

Bethpage Public Library
47 Powell Avenue
Bethpage, NY 11714
(516) 931-3907

Online Administrative Record: The administrative record can be accessed on line through NIRIS.
Electronic copies are available at the NWIRP Bethpage and at MIDLANT.

Listed below is a list of all Community RAB meetings held since its inception.

Restoration Advisory Board (RAB) Meetings

Meeting to Establish RAB	May 24, 1999
1 st RAB Meeting	February 17, 2000
2 nd RAB Meeting	August 31, 2000
3 rd RAB Meeting	October 25, 2000
4 th RAB Meeting	March 13, 2001
5 th RAB Meeting	September 20, 2001
6 th RAB Meeting	June 27, 2002
7 th RAB Meeting	January 8, 2003
8 th RAB Meeting	May 20, 2003
9 th RAB Meeting	August 6, 2003
10 th RAB Meeting	November 5, 2003
11 th RAB Meeting	April 14, 2004
12 th RAB Meeting	August 4, 2004
13 th RAB Meeting	November 3, 2004
14 th RAB Meeting	April 6, 2005
15 th RAB Meeting	June 7, 2006
16 th RAB Meeting	August 2, 2006
17 th RAB Meeting	November 1, 2006
18 th RAB Meeting	August 1, 2007
19 th RAB Meeting	November 7, 2007
20 th RAB Meeting	April 16, 2008
21 st RAB Meeting	July 30, 2008
22 nd RAB Meeting	November 5, 2008
23 rd RAB Meeting	March 11, 2009
24 th RAB Meeting	September 17, 2009
25 th RAB Meeting	April 21, 2010

Other public meetings:

- October 7, 2008 – Community Meeting and Availability Session on Soil Vapor Intrusion
- March 3, 2009 – Public Availability Session on Soil Vapor Intrusion

List for Advertisements:

The Bethpage Tribune
329 Broadway
Bethpage, NY 11714
(516) 681-0440 ext. 21
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3.0 PLANNED ACTIVITIES

This section summarizes ongoing and planned CERCLA activities at each site. The discussion focuses on activities that are proposed for FY 2010, but also includes planned activities that extend beyond October 2010. Section 3.1 discusses facility wide activities and Section 3.2 describes site-specific characterization, remediation and long-term monitoring and maintenance activities.

3.1 FACILITY-WIDE ACTIVITIES

Facility-Wide activities for 2010 consist of the following actions:

- Site Management Plan Update
- Restoration Advisory Board Meetings (April and November)
- Five-Year Review - Annual Inspections
- NIRIS Updates (ongoing)
- RCRA Permit Reporting

The purpose of the SMP is to provide a management tool for NAVFAC MIDLANT personnel for planning and scheduling of environmental remedial response activities to be conducted at NWIRP Bethpage under CERCLA and RCRA. The SMP is updated annually.

NWIRP Bethpage has established a RAB comprised of members of the community, local environment group members, and state and federal officials, that meet semi-annually to inform the community on environmental issues at NWIRP Bethpage.

The purpose of the five-year review is to evaluate the implementation and performance of the remedies at the sites to determine whether the remedies are protective of human health and the environment. In addition, five-year reviews identify deficiencies found during reviews, if any, and provide recommendations to address them. Five-year reviews are required by statute. The Navy must implement five-year reviews consistent with CERCLA § 121 (c) and the NCP.

The schedule for facility-wide activities is presented as Figure 3-1. These schedules will be adjusted annually in the SMP, as the future site activities are further defined and various administrative issues, including funding, are addressed.

The purpose of Naval Installation Restoration Information System (NIRIS) is to store all Administrative Record Documents in a secure database online. NIRIS is also capable of storing analytical data and GIS data for extraction and interpolation.

The RCRA permit is up for renewal on August 2, 2012. The permit renewal application needs to be submitted by February 2, 2012.

Listed below are facility-wide documents not included with the individual site descriptions included in Section 3.2.1.

Documents and Milestones

Document Title /Milestone	Author/Date	Administrative Record (AR) Document Number ⁽¹⁾
Groundwater Feasibility Study Grumman Aerospace-Bethpage NY Site # 130003A and NWIRP Bethpage, New York Site # 130003B	Arcadis G&M, Inc., 2000	NA
Final Environmental Impact Statement Transfer and Reuse of NWIRP Bethpage	NAVFAC, 2000	NA
Former Dry Well Investigation South of Plant 3 Area of Concern 20	Tetra Tech, 2000	NA
Report of Results for Plant 3 Air Sampling	Tetra Tech, 2001	NA
Final Phase 2 Environmental Baseline Survey	Tetra Tech, 2002	NA
Finding of Suitability to Transfer for Plant 20.	NAVFAC, 2002	NA
Finding of Suitability to Transfer Building 5	NAVFAC, 2002	NA
Finding of Suitability to Lease (FOSL) 9-Acre Parcel	NAVFAC, 2002	NA
Final Finding of a Suitability to Transfer 105-Acre Parcel	NAVFAC, 2003	NA
Environmental Baseline Survey of 96-acre Parcel Update	Tetra Tech, 2007	NA
Finding of Suitability to Transfer (FOST) for the 96-Acre Parcel	NAVFAC, 2008	NA
Environmental Evaluation of County Motor Vehicle Impound Lots	Tetra Tech, 2008	NA
Final Asbestos Abatement Completion Report	ECOR, 2008	NA

Quitclaim Deed 96-acre parcel	Naval Facilities Engineering Command, 2008	NA
Lease between US and Nassau County	Naval Facilities Engineering Command, 2008	NA

1. Documents are currently being loaded into NIRIS. Document numbers listed correspond to Admin Record Document numbers used through 2009. During the 2011 update of the SMP, NIRIS document numbers will be assigned. NA is assigned to newer documents that were not placed in the pre-2010 Admin Record.

3.2 SITE-SPECIFIC ACTIVITIES

3.2.1 Operable Unit 1, Site 1 – Former Drum Marshalling Area

Site Description: Site 1 is relatively flat with a 4-foot vegetated windrow located along the eastern end of the site, and is mounded on the north to partially bury the abandoned sanitary settling tank. The site is enclosed by a facility perimeter fence along the east and interior facility fences along the north, south, and west. The interior fence was installed in 1998 as an interim measure to restrict exposure of facility personnel to areas with residual soil contamination. The area bounded by this fence is lightly vegetated and includes AOCs 23, 30, and 35. The remainder of Site 1 is covered with concrete or gravel. Dry Wells 20-08 and 34-07 are located outside of the fenced area, but are covered with gravel, (Figure 2-4).

Site 1 - Former Drum Marshalling Area originally consisted of two former drum marshalling pads that were used to store drums containing waste materials from operations at Plant No. 3 and potentially other sources at the facility. The waste drums reportedly contained chlorinated and non-chlorinated solvents, and liquid cadmium and chromium wastes. In addition, underlying most of Site 1 is approximately 120 abandoned cesspools that were designed to discharge sanitary waste waters from Plant No. 3. These cesspools were approximately 10 feet in diameter and 16 feet deep. Based on field observations, the cesspools are currently filled with soil. It is possible that non-sanitary wastes may have been discharged through this system. The drum marshalling areas and extent of the leach field were the original extent of Site 1. A summary of relevant documents and action milestones is presented in the table below.

The 1992 Phase 1 Remedial Investigation revealed soils that contained sufficient residual volatile organic contamination to confirm the source of groundwater contamination as being near or at the former drum marshaling areas. The 1993 Phase 2 soil testing program results indicated wide spread low-level PCB contamination of the surface soils at Site 1. Therefore, an interim cover of approximately 6 inches of soil was placed over the contaminated soils and was intended to protect site workers at that time from contact with contaminated soil. According to the 1993 Phase 2 groundwater results there was enough evidence to proceed with an FS.

The 1994 FS included the selected alternative: fixation of metals, incineration of soils containing PCBs at concentrations greater than or equal to 500 ppm, land filling of soils containing PCBs at concentrations between 10 and 500 ppm and In-Situ Vapor Extractions of VOCs. The selected remedy was documented in a ROD signed in May 1995.

In 1998, a full-scale AS/SVE System was installed at the site. In March 2002, the AS/SVE system at the NWIRP Site 1 was shut down because RA goals for shallow groundwater were achieved.

Based on the 2008 soil vapor testing results, potential migration of contaminated soil vapor to adjacent residents may have been possible. In January 2009, an off-site soil vapor intrusion investigation was initiated. Between February and May 2009, 18 homes were evaluated, and 15 air purification units (APUs) and 6 subslab depressurization (SSD) systems were installed in offsite residential homes. Between May and December 2009, at the request of the home owners, several APUs and one SSD system were removed. Between October and December 2009, a fence-line soil vapor containment system was installed. Operation of the system started in late December 2009. In June/July 2009, buildings, tanks, and concrete aprons within the fenced in portion of Site 1 were demolished and disposed/recycled off site.

Documents and Milestones

Document Title /Milestone	Author/Date	Administrative Record (AR) Document Number ⁽¹⁾
Initial Assessment Study	Rogers, Golden & Halpern, 1986	0040
Final Remedial Investigation Report	Halliburton NUS, 1992	0043
Phase 2 Remedial Investigation Report	Halliburton NUS, 1993	0054
Final Feasibility Study Report	Halliburton NUS, 1994	0047
Final Proposed Remedial Action Plan for Operable Unit 1 Sites 1, 2, and 3	Naval Facilities Engineering Command, 1994	0131
Record of Decision-sites 1,2, and 3,	Naval Facilities Engineering Command, 1995	0370
Final Submission for Remedial Design Sites 1 and 2, Phase 1	Halliburton NUS, 1995	0068
Existing Conditions Survey and Site Report for Remedial Design Site 1	C.F. Braun Engineering Corp., 1995	NA
Remedial Design, Phase II Pre-Design Investigation Supplemental Sampling Letter Report Number 2 for Site 1	C.F. Braun Engineering Corp., 1995	0071
Analytical Results from the Pre-Excavation Soil Sampling and an Estimate on Excavation	Foster Wheeler Environmental Corp., 1995	0322
Site 1 Pre-Excavation Sampling Results Draft Report	Foster Wheeler Environmental Corp., 1996	0074

Results Letter Report for Air Sparging/Soil Vapor Extraction System at Site 1	C.F. Braun Engineering Corp., 1997	NA
Report for Additional Soil Investigation to Assess the Performance of the Soil Vapor Extraction/Air Sparging System	Foster Wheeler Environmental Corp., 2000	0306
Final Close-Out Report Construction of a Soil Vapor Extraction/Air Sparging System	Foster Wheeler Environmental Corp., 2001	0311
Letter Report on the Pre-Operational Groundwater Sampling and Analysis Results	Foster Wheeler Environmental Corp., 2001	0393
Time-Critical Removal Action – Off-site Soil Vapor Intrusion, Site 1	US Navy, 2009	NA
Evaluation Report- Remediation of Former Drywells 20-08 and 34-07 Plant 3 Facility	Holz mache, McLendon, and Murrell, P.C., 2003.	NA
Final Close-Out Report, Construction of a Soil Vapor Extraction/Air Sparging System	Foster Wheeler Environmental Corp., 2003	0392
Site 1 Soil Vapor Investigation	Tetra Tech NUS, Inc., 2008	NA
Groundwater Sampling Data Summary Site 1	Tetra Tech NUS, Inc., 2008	NA
Technical Memorandum for Evaluating Soil Remediation Technologies Site 1	Tetra Tech NUS, Inc., 2008	NA
Indoor Air Sampling Work Plan	Tetra Tech NUS, Inc., 2008	NA
Five-Year Review for Sites 1, 2, and 3	Tetra Tech NUS, Inc, 2008	NA
Site 1-Phase 2 Soil Vapor Testing Letter Report	Tetra Tech NUS, Inc., 2009	NA
Work Plan Addendum Supplemental Indoor Air Testing, Basement Sealing, and Installation of Residential Vapor Phase Carbon Units	Tetra Tech NUS, Inc., 2009	NA
Design Analysis Report for Soil Vapor Extraction Containment System at Site 1-Former Drum Marshalling Area	Tetra Tech NUS, Inc., 2009	NA
Final Removal Action Work Plan for Installation Restoration (IR) Site 1-Former Drum Marshalling Area Non-Time Critical Removal Action	ECOR, 2009	NA
Site 1 Phase II Soil Vapor Report	Tetra Tech NUS, Inc., 2009	NA
Final Removal Action Completion Report for Installation Restoration (IR) Site 1-Former Drum Marshalling Area Non-Time Critical Removal Action	ECOR, 2009	NA
Non-Time Critical Removal Action, Site 1 Soil Vapor Intrusion	US Navy, 2009	NA
Engineering Evaluation and Cost Analysis (EE/CA) Non-Time Critical Removal Action Site 1 – Former Drum Marshalling Area	Tetra Tech NUS, Inc., 2009	NA
Quarterly Data Summary Report Indoor Air and SSD Monitoring (May, June, and July 2009)	Tetra Tech NUS, Inc., 2009	NA
Data Summary Report Soil Vapor Intrusion	Tetra Tech NUS, Inc., 2009	NA

Investigation Site 1- Former Drum Marshalling Area

Final Work Plan for the Design, Installation and Operation of Soil Vapor Extraction System Site 1, Former Drum Marshalling Area	Tetra Tech EC, Inc., 2009	NA
Quarterly Data Summary Report Indoor Air and SSD Monitoring (August, September, and October 2009)	Tetra Tech NUS, Inc., 2009	NA
Quarterly Data Summary Report Soil Vapor Intrusion Monitoring (November and December 2009, and January 2010)	Tetra Tech NUS, Inc., 2010	NA
Action Memorandum Non-Time Critical Removal Action for Soil Vapor Extraction System Site 1 Former Drum Marshalling Area	Tetra Tech NUS, Inc., 2010	NA
Draft Final Sampling and Analysis Plan PCB Investigation Site 1-Former Drum Marshalling Area	Tetra Tech NUS, Inc., 2010	NA

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2. Documents are currently being loaded into NIRIS. Document numbers listed correspond to Admin Record Document numbers used through 2009. During the 2011 update of the SMP, NIRIS document numbers will be assigned. NA is assigned to newer documents that were not placed in the pre-2010 Admin Record.

Nature and Extent of Potential Contamination: The waste drums at Site 1 that reportedly contained chlorinated and non-chlorinated solvents and liquid cadmium and chromium wastes are the likely source of contamination to soil and groundwater at Site 1. Soil and groundwater testing confirmed the presence of chlorinated solvents, cadmium, and chromium in soil and groundwater at the site. In addition, during the RI, PCBs were found in several locations of the site at depths up to 5 feet below ground surface. Deeper soils were not evaluated for PCB contamination.

Supplemental soil investigations at the site determined that the extent of PCB-contaminated soils was much more extensive vertically that had been estimated in the 1995 ROD. In particular, the ROD has estimated that the vertical extent of PCB contamination was approximately 7 feet and that 1,400 cubic yard of soil would have to be addressed for PCB contamination. Subsequent testing determined that the vertical extent of PCB contamination is approximately 65 feet and extends into the groundwater (Figure 3-2). The actual bottom of the PCB contaminated soils has not been confirmed. Based on current data, approximately 78,100 cubic yard of PCB-contaminated soils (greater than 10 mg/kg) are present and the Navy is evaluating other options for addressing the remaining soil contamination at Site 1. In addition to PCBs, the site also includes metals and PAHs at concentrations greater than potential cleanup goals.

The 1995 ROD did not identify soil gas migration as a pathway of potential concern. In January 2008, the Navy collected soil gas samples at the facility fence line, approximately 70 feet from residential housing. Samples were collected at depths of approximately 8, 20, and 45 feet bgs. TCE was detected at concentrations up to 19,000 $\mu\text{g}/\text{m}^3$ at 7 feet bgs, 180,000 $\mu\text{g}/\text{m}^3$ at 20 feet bgs, and 150,000 $\mu\text{g}/\text{m}^3$ at 50 feet bgs. For comparison, NYSDOH Indoor Air Quality Criteria for TCE is 5 $\mu\text{g}/\text{m}^3$ and sub slab guidance

for action is $250 \mu\text{g}/\text{m}^3$. Based on distance from the site to the residential housing, lower concentrations of TCE would be expected under the housing slabs. Other VOCs, including PCE and 1,1,1-TCA, were also detected at concentrations up to $90,000 \mu\text{g}/\text{m}^3$ in the soil gas samples.

Residual VOCs at the site have impacted the residential community located east of Site 1. A soil vapor study conducted in January 2008 confirmed the presence of VOCs in the soil gas at the fence (Tetra Tech, 2008c). Evaluation of this data will be required to determine the risks to residents in adjacent housing.

Potential Risks: Except for soil gas migration and soil vapor intrusion, the contaminants in the soils at the NWIRP (under the current or in future scenarios) do not represent a significant, direct, non-carcinogenic risk to on-site workers or off-site residents (hazard index is less than 1.0). Likewise, incremental carcinogenic risks are not indicated for off-site residents under the current soil scenario (excess cancer risk less than 1×10^{-6}). However, carcinogenic risks to on-site workers (under the current and future soil scenarios) and off-site residents (under future soil scenarios) exceed an excess cancer risk of 1×10^{-6} . The risks do not, however, exceed an excess cancer risk of 1×10^{-4} .

The groundwater at the NWIRP Bethpage, if used as a potable water source, would be expected to result in significant carcinogenic risks (excess cancer risk greater than 1×10^{-4}) and non-carcinogenic risks (hazard index greater 1.0) to residents and employees under the current and future groundwater scenarios. The one exception to this is that the hazard index to employees under the future groundwater exposure would be about 0.5 (HNUS, 1994)

An updated feasibility study has not been conducted for the off-site residents that have been impacted by soil gas vapors. According to NYSDOH guidance soil vapor concentrations exceed indoor air criteria for TCE of $5 \mu\text{g}/\text{m}^3$ and sub slab indoor criteria of $250 \mu\text{g}/\text{m}^3$. An indoor air TCE concentration of $5 \mu\text{g}/\text{m}^3$ corresponds to a risk of approximately 4×10^{-6} for offsite residents.

Remedial Action(s): Remedial actions are conducted to prevent a potential release of contaminants and/or migration of contaminants. The Navy will continue to identify possible remedial and removal actions as investigation activities proceed. Past and potential remedial or removal actions for Site 1 include:

- 1993 interim soil cover was placed over PCB contaminated soil
- 1998 full scale AS/SVE system was installed
- 1998 dry wells 20-08 and 34-07 were partially excavated
- 2009 APUs (13 homes) and SSDs (6 homes) were installed next to Site 1

- 2009 Soil Vapor Intrusion Action Memorandum
- 2009 Installation of APUs
- 2009 Installation of SSDs
- 2009 Design of SVE Containment System
- 2009 Demolition of AS/SVE System and Site 1 structures
- 2009 Installation and operation of SVE Containment System

A ROD for Site 1 soil was signed in 1995 to address PCB- and VOC-contaminated soil. Residual soil contamination consists of metal, VOC, PAH, and PCB contamination at concentrations greater than TAGM 4046. In 2006, NYSDEC started using Part 375 Soil Cleanup Objectives instead of TAGM 4046.

A full-scale AS/SVE System was installed at the site in 1998 and operated seasonally until 2002. In total, the AS/SVE System removed approximately 4,520 pounds of VOCs.

In 1998 dry wells 20-08 and 34-07 were excavated to a depth of 28 feet. During post excavation sampling, PCBs were detected in the bottom of the excavation at concentrations greater than 10 mg/kg, the cleanup goal. Subsequent soil borings determined that the contamination extended to the water table.

In 2009, the SVE system and components were removed from Site 1. The removal action consisted of the demolition of four buildings, seven concrete pads, the upper six feet of a settling tank adjacent to Building 03-12, and the abandonment of 24 air sparge (AS)/soil vapor extraction (SVE) wells. The demolition consisted of all roofs, walls, floors, drains, sumps, piping, foundations, and concrete pads associated with the following structures:

- Building 03-13
- Building 03-38
- Building 03-31
- Building 03-33
- Seven concrete pads
- Settling tank adjacent to Building 03-13 (upper six feet)
- Steel Sheet Wall
- Abandonment of 24 Air Sparge (AS)/Soil Vapor Extraction (SVE) Wells

Site activities began May 18, 2009 and concluded on July 10, 2009 (ECOR, 2009b).

Currently, the off-site residential housing exceeds indoor air criteria in several homes. As a result of a time critical removal action (TCRA), 13 APUs were installed in 11 homes from February to March 2009, and 6 SSDs were installed in 6 homes in May 2009, in homes next to Site 1, to protect the residents from

TCE and PCE detected in the soil gas. Operation and monitoring of the APUs and SSD systems are anticipated to continue through December 2011. The SVE Containment System is expected to operate through December 2013.

Path Forward

Activities planned for 2010 are as follows:

- PCB-contaminated Soil and Groundwater Investigation (2010/2011)
- Annual Inspection (2010)
- Operation of the SVE Containment System (2010)
- SVE Containment System Optimization (2010)
- APU and SSD System Operation, Maintenance, and Monitoring (2010)

Planned activities beyond 2010 for Site 1 are presented in Figure 3-3 and consist of:

- APU and SSD System Operation, Maintenance, and Monitoring (2011)
- PCB-Soil/Groundwater Report (2011)
- Annual Inspection (2011 through 2014)
- SVE Containment System Operation (2011 through 2014).
- Pilot Test (2012).
- Five-year review (2013).
- Feasibility Study for Site 1 PCB-contaminated Soil and Soil Vapor Migration (2013).
- PRAP to address PCB-contaminated soil, and if any, outstanding Soil. Vapor Intrusion issues (2014).
- ROD amendment to address PCB-contaminated soil and residual solvent contaminated soil (if any) (2014).
- Remedial Design – Soil (2014).
- Remedial Action Site 1 Soil Remedy Implementation (2015).
- Remedy In Place 04/2016

3.2.2 Operable Unit 1, Site 2 – Recharge Basins

Site Description: Site 2, except for three recharge basins, is a relatively flat area located in the northeast corner of former Navy property and is north of Site 1 (Figure 2-4). The site is enclosed by a facility perimeter fence along the north, east and south and an interior facility fence along the west. It contains three recharge basins which currently receive storm water from current and former Navy

property and former Northrop Grumman property to the Navy. Historically, these basins also received non-contact cooling water from Plant No. 3 and potentially rinse water. Also located on this site are the former sludge drying beds which no longer exist and have been filled in. Sludge from the Plant 02 industrial waste treatment facility was dewatered in these beds before being disposed of off-site.

Documents and Milestones

Document Title /Milestone	Author/Date	Administrative Record (AR) Document Number ⁽¹⁾
Initial Assessment Study	Rogers, Golden & Halpern, 1986	0040
Final Remedial Investigation Report	Halliburton NUS, 1992	0043
Phase 2 Remedial Investigation Report	Halliburton NUS, 1993	0054
Final Feasibility Study Report	Halliburton NUS, 1994	0047
Final Proposed Remedial Action Plan for Operable Unit 1 Sites 1, 2, and 3	Naval Facilities Engineering Command, 1994	0131
Record of Decision-sites 1, 2, and 3	Naval Facilities Engineering Command, 1995	0370
Final Submission for Remedial Design Sites 1 and 2, Phase 1	Halliburton NUS, 1995	0068
Analytical Results from the Pre-Excavation Soil Sampling and an Estimate on Excavation	Foster Wheeler Environmental Corp., 1995	0322
Post-Remedial Action Letter Report for Site 2, Phase 1	C.F. Braun Engineering Corp., June 1996	0089
Surface Soil Sampling Results Site 2-Recharge Basin, Site 3-Salvage Storage Area	Naval Facilities Engineering Command, 2001	0286
Final Construction Completion Report for Site 2- Recharge Basin Area and Site 3- Salvage Storage Area	Tetra Tech NUS, Inc., 2002	0081
Five-Year Review for Sites 1, 2, and 3	Tetra Tech NUS, Inc., 2008	NA
Evaluation of Recharge Basin Capacity and Storm Water Inflow	Tetra Tech NUS, Inc., 2008	NA

1. Documents are currently being loaded into NIRIS. Document numbers listed correspond to Admin Record Document numbers used through 2009. During the 2011 update of the SMP, NIRIS document numbers will be assigned. NA is assigned to newer documents that were not placed in the pre-2010 Admin Record.

The 1991 Phase 1 Remedial Investigation concluded that Site 2 was not likely a significant source of on-site groundwater contamination. However, the surface water entering the recharge basins contained sufficient concentrations of VOCs (up to 50 ug/L based on Permit) to result in some groundwater contamination. Also, the concentrations were not high enough to account for the VOC concentrations detected at Site 1 (10,000 plus ug/L). Based on the relative concentration of VOCs found in the production wells, it was likely that the recharge basins were just redistributing the contaminated groundwater.

The 1992 Phase 2 Remedial Investigation revealed limited PCB contamination of the basin sediments. Also, basin sediment was routinely removed by NGC and therefore PCBs would not accumulate in the basins.

Based on the results of groundwater investigations and computer modeling, it was likely that the recharge basins at Site 2 acted as a secondary source of solvent contaminated groundwater. Contaminated water extracted from deep production wells at other areas of NWIRP and NGC were reintroduced into the shallow groundwater at Site 2. NGC pursued well head treatment of this water prior to re-injection.

Following the Phase II RI, a FS was completed in 1994. An alternative that included excavation of soils contaminated with PCBs between 10 and 500 mg/kg and disposal of the contaminated soil off-site, natural flushing to remove residual VOC contamination and covering the site and residual contaminated soil with 6 inches of permeable material (soil or gravel) was selected for the site. The selected remedy was documented in a ROD signed in May 1995 (NAVFAC, 1995).

In 1996, 7,239 tons of PCB contaminated soil was excavated and disposed of at the Grayback Mountain hazardous waste landfill located in Clive, Utah. In 2001, soil and gravel cover was installed from October 31, 2001 through December 6, 2001.

Nature and Extent of Contamination: Based on volatile organic isoconcentration contour maps and soil data, Site 2 is not a likely source of the significant on-site volatile organic groundwater contamination. However, based on computer modeling, off-site monitoring well data, and the consideration that the recharge basin water contains solvents, the recharge basins probably act as a secondary source of groundwater contamination. This secondary source forms a second groundwater plume to the east and south of the NWIRP, which is much lower in concentration than that associated with Site 1, but covers a significantly greater area, depth, and volume of groundwater.

Potential Risks: The contaminants in the soils at the NWIRP (under the current or in future scenarios) do not represent a significant, direct, non-carcinogenic risk to on-site workers or off-site residents (hazard index is less than 1.0). Likewise, incremental carcinogenic risks are not indicated for off-site residences under the current soil scenario (excess cancer risk less than 1×10^{-6}). However, carcinogenic risks to on-site workers (under the current and future soil scenarios) and off-site residents (under future soil scenarios) exceed an excess cancer risk of 1×10^{-6} . The risks do not, however, exceed an excess cancer risk of 1×10^{-4} (HNUS, 1994).

Remedial Action(s): Remedial actions are conducted to prevent a potential release of contaminants and/or migration of contaminants. The Navy will continue to identify possible remedial and removal actions as investigation activities proceed. Past and potential remedial or removal actions for Site 2 include:

- 1996 7,239 tons of PCB contaminated soil was excavated

Remedial Actions at Site 2 were identified in the 1995 Soils ROD. In 1996, 7,239 tons of PCB contaminated soil was excavated and disposed of at the Grayback Mountain hazardous waste landfill located in Clive, Utah. In 2001, soil and gravel cover was installed from October 31, 2001 through December 6, 2001.

The remedy at Site 2 – Recharge Basins is currently protective of human health and the environment. Access to the site is currently restricted through fencing and security

Path Forward

- Annual Inspection
- A five-year review will be conducted in 2013

3.2.3 Operable Unit 1, Site 3 – Salvage Storage Area

Site Description: Site 3 - Salvage Storage Area- is a relatively flat area located north of the Plant No. 3 (Figure 2-5). Fixtures, tools, and metallic wastes were stored here from the early 1950s through 1969, prior to recycling. Stored materials included aluminum and titanium scraps and shavings. While in storage, cutting oils dripped from some of this metal. Site 3 - Salvage Storage Area currently consists of a parking area.

Documents and Milestones

Document Title /Milestone	Author/Date	Administrative Record (AR) Document Number ⁽¹⁾
Initial Assessment Study	Rogers, Golden & Halpern, 1986	0040
Final Remedial Investigation Report	Halliburton NUS, 1992	0043
Phase 2 Remedial Investigation Report	Halliburton NUS, 1993	0054
Final Feasibility Study Report	Halliburton NUS, 1994	0047
Final Proposed Remedial Action Plan for Operable Unit 1 Sites 1, 2, and 3	Naval Facilities Engineering Command, 1994	0131

Record of Decision-sites 1, 2, and 3	Naval Facilities Engineering Command, 1995	0370
Surface Soil Sampling Results Site 2-Recharge Basin, Site 3-Salvage Storage Area	Naval Facilities Engineering Command, 2001	0286
Final Construction Completion Report for Site 2- Recharge Basin Area and Site 3- Salvage Storage Area	Tetra Tech NUS, Inc., 2002	0081
Five-Year Review for Sites 1, 2, and 3	Tetra Tech NUS, Inc., 2008	NA

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1. Documents are currently being loaded into NIRIS. Document numbers listed correspond to Admin Record Document numbers used through 2009. During the 2011 update of the SMP, NIRIS document numbers will be assigned. NA is assigned to newer documents that were not placed in the pre-2010 Admin Record.

The 1991 Phase 1 RI concluded Site 3 is not a likely significant source of on-site groundwater contamination. Only low concentrations of VOCs were detected in the soils at Site 3. The Phase 1 and 1992 Phase 2 data indicated that PCBs were not a significant concern at the areas tested at Site 3. The Phase 1 RI data did find VOC and inorganic soil and groundwater contamination at Site 3.

The 1994 FS alternative, including natural flushing to remove residual VOC contamination and covering the site and residual contaminated soil with 6 inches of permeable material (soil or gravel) was selected for the site. The selected remedy was documented in a ROD signed in May 1995 (NDNFEC/NYSDEC, 1995).

The test data from February 2001 confirmed that the 1998 scraping and covering conducted at Site 3, in combination with natural degradation completed the necessary field work identified under the 1995 OU 1 ROD (Tetra Tech, 2002). A notification was entered into the Deed of Transfer to Nassau County, New York that described the location where residual compounds will remain and specified that written consultation with NYSDEC and appropriate precautions must be taken prior to disturbing soils at this site.

Nature and Extent of Potential Contamination: Based on volatile organic isoconcentration contour maps, Site 3 is not likely a significant source of on-site groundwater contamination. Only low concentrations of volatile organics were detected in the soils at Site 3. Therefore, the source area of the volatile organic plume either is no longer present or was not found during the RI (HNUS, 1993).

Potential Risks: The contaminants in the soils at the NWIRP (under the current or in future scenarios) do not represent a significant, direct, non-carcinogenic risk to on-site workers or off-site residents (hazard index is less than 1.0). Likewise, incremental carcinogenic risks are not indicated for off-site residences under the current soil scenario (excess cancer risk less than 1×10^{-6}). However, carcinogenic risks to on-site workers (under the current and future soil scenarios) and off-site residents (under future soil scenarios) exceed an excess cancer risk of 1×10^{-6} . The risks do not, however, exceed an excess cancer risk of 1×10^{-4} (HNUS, 1994).

Remedial Action(s): Remedial actions are conducted to prevent a potential release of contaminants and/or migration of contaminants. The Navy will continue to identify possible remedial and removal actions as investigation activities proceed. Past and potential remedial or removal actions for Site 3 include:

- 1988 scraping and covering

As part of the ROD issued in May 1995 selected remedies for Site 3 included natural flushing to remove residual VOC contamination and to cover the site with residual contaminated soil with 6 inches of permeable material (soil or gravel) (NAVFAC, 1995).

The test data from February 2001 confirmed that the 1998 scraping and covering conducted at Site 3, in combination with natural degradation completed the necessary field work identified under the 1995 OU 1 ROD (Tetra Tech, 2002). A notification was entered into the Deed of Transfer to Nassau County, New York that described the location where residual compounds would remain and specified that written consultation with NYSDEC and appropriate precautions must be taken prior to disturbing soils at this site.

Path Forward

- Annual Inspection (2010 through 2014)
- A five-year review will be conducted in 2013

3.2.4 Operable Unit 2, Site 1 - Off-Site Groundwater

Site Description

Off-site groundwater is areas off-site of Northrop Grumman and NWIRP Bethpage property in areas around the town of Bethpage. Figure 3-2 portrays VOC contaminated isoconcentration contours.

Documents and Milestones

Document Title /Milestone	Author/Date	Administrative Record (AR) Document Number ⁽¹⁾
On-Site Monitoring Well Installation Summary Report	Tetra Tech NUS, Inc., 2000	0396
Vertical Profile Borings VPB-38, -76, and -77 Summary Report	Tetra Tech NUS, Inc., 2000	0098

New York State Department of Environmental Conservation (NYSDEC) Record of Decision Operable Unit 2	NYSDEC, 2001.	NA
Southern Area Vertical Profile Boring Installation Summary Report	Tetra Tech NUS, Inc., 2002	0085
Final Off-site Monitoring Well Installation Summary Report	Tetra Tech NUS, Inc., 2002	0086
Final GM-38 Area Vertical Profile Boring Installation Summary Report	Tetra Tech NUS, Inc., 2002	0095
Conceptual Design Report for GM-38 Area Groundwater	Tetra Tech NUS, Inc., 2002	0428
GM-39 and GM-73 Vertical Profile Boring and Monitoring Well Installation Summary Report	Tetra Tech NUS, Inc., 2002	0429
Record of Decision for Operable Unit 2 Groundwater NYS Registry: 1-30-003B	NAVFAC, 2003	0049
Final GM-38 Area Groundwater Remedy Analysis Report	Tetra Tech NUS, Inc., 2003	0083
Outpost Monitoring Well Installation Summary	Tetra Tech NUS, Inc., 2003	0105
Outpost Monitoring Well Installation Data	Tetra Tech NUS, Inc., 2004	0395
Final Design for GM-38 Area Groundwater Remediation	Tetra Tech EC, Inc., 2006	0486
Phase 1 Environmental Baseline Survey for the GM-38 Groundwater Remediation Area	Tetra Tech NUS, Inc., 2007	NA ¹
Letter Work Plan for Pre-Design Field Investigation Off-Site Location GM-75	Tetra Tech NUS, Inc., 2008	NA
Final Operation Maintenance, and Monitoring Plan for Groundwater Treatment Plant GM-38 Area Groundwater Remediation	Tetra Tech EC, Inc., 2010	NA

1. Documents are currently being loaded into NIRIS. Document numbers listed correspond to Admin Record Document numbers used through 2009. During the 2011 update of the SMP, NIRIS document numbers will be assigned. NA is assigned to newer documents that were not placed in the pre-2010 Admin Record.

Nature and Extent of Potential Contamination: The offsite groundwater contamination consists of three general plumes:

- Shallow Plume
- Deep Eastern Plume
- Deep Western Plume

The shallow plume was likely formed by multiple sources on Navy and Northrop Grumman Property that was not directly influenced by the onsite production wells and from infiltration of contaminated recharge basin water. The shallow plume contains relatively low TVOC concentrations (generally 50 ug/L or less) and is normally found at depths of 50 to 250 feet bgs. The deeper contaminant plumes contain higher concentrations of TVOCs (100 to 10,000 ug/L) are typically found between 250 and 750 feet bgs. The plumes flow to the south southeast in the direction of groundwater flow toward the ocean.

On NWIRP Bethpage, Site 1 was identified as a significant contributor to the offsite groundwater plume. Other potentially significant sources of the off site groundwater contamination include the Bethpage Community Park, Northrop Grumman Plants 1 and 2, and the Hooker Ruco Superfund Site. Other smaller sources of the off site plume were likely present at NWIRP Bethpage, including the HN-24 Area, the Site 2 – Recharge Basins, and small spills at Site 3 – Salvage Storage Area. Current site groundwater data do not indicate the presence of a significant continuing source of VOC-contaminated groundwater on NWIRP Bethpage.

The shallow plume encompasses the eastern and western plume and extends beyond the Hempstead Turnpike. Based on the width of this plume (approximately 8,000 feet), it is most likely associated with discharges from recharge basins in which deep groundwater, with variable concentrations of VOCs, were mixed, partially treated through volatilization, and discharged into the shallow groundwater. Recharge basins on both Northrop Grumman and NWIRP Bethpage were used to discharge this water. The shallow plume contains lower concentrations of VOCs (less than 50 ug/L) and is discontinuous both horizontally and vertically. The furthest down gradient groundwater samples (15,000 feet) contain VOCs, and therefore the shallow plume has not been defined to the south. The VOCs include TCE, PCE, 1,1-DCE, 1,1-DCA, 1,1,1-TCA, 1,2-TCE, Freon 12, and chloroform. Several vertical profile borings located along the southern edge of the investigation area consist of VPB-43, -44, -45, -46, and -50.

VPB-43 contained TVOC concentrations ranging up to 15 µg/L at 200 ft bgs and included TCE at 2 µg/L, 1,1-DCE at 2 µg/L, 1,1-DCA at 4 µg/L, 1,1,1-TCA at 4 µg/L, and dichlorodifluoromethane (Freon 12) at 1 µg/L. VPB-44 contained TVOC concentrations ranging up to 54 µg/L at 240 feet bgs and included TCE at 30 µg/L, PCE at 1 µg/L, 1,1-DCE at 7 µg/L, 1,1-DCA at 9 µg/L, 1,1,1-TCA at 6 µg/L, and chloroform at 1 µg/L. VPB-46 contained TVOC concentrations ranging up to 106 µg/L at 220 feet bgs and included TCE at 23 µg/L, PCE at 28 µg/L, 1,1-DCE at 7 µg/L, 1,2-DCE at 6 µg/L, 1,1-DCA at 32 µg/L, 1,1,1-TCA at 8 µg/L, and chloroform at 2 µg/L. VPB-50 contained TVOC concentrations ranging up to 13 µg/L at 150 feet bgs and included TCE at 1 µg/L, 1,1-DCE at 3 µg/L, 1,1-DCA at 5 µg/L, and 1,1,1-TCA at 4 µg/L, (Tetra Tech, 2002c).

The western plume is directly south and southwest of NWIRP Bethpage. The plume starts near the southwest corner of NWIRP Bethpage, runs along the western boundary of the former Northrop Grumman Plant, including underneath Plant No. 2, continues off site toward the Aqua New York Well Field located 15,000 feet to the south of NWIRP Bethpage. This plume is predominately TCE, but can contain other VOCs. Northrop Grumman Product Well GP-3, located on the western edge of the plume on Northrop Grumman property is screened at a depth of approximately 500 ft bgs and contains TVOC concentrations of 2,920 µg/L and includes TCE at 2,400 µg/L and vinyl chloride at 210 µg/L. Vinyl chloride detections in this well are generally attributed to the Hooker Ruco Superfund Site located to the northwest of the well. Off gas treatment for vinyl chloride is being addressed by Occidental. Production Well GP-3 is part of the Onsite Groundwater Containment system.

Monitoring wells GM-34D and -34D are located off site and down gradient of GP-3 (5,200 feet) and are screened at depths of approximately 310 feet and 500 feet bgs, respectively. These wells contained TCE at 840 µg/L and 350 µg/L, respectively. Except for Outpost Monitoring Wells BPOW 3-1 and 3-2 (just north of the Aqua New York Well Field), wells GM-34D and -34D2 are the furthest down gradient permanent monitoring wells that evaluate the western plume. A portion of this plume is being intercepted by the western-most Bethpage Water District Well Field (Plant No. 6). Northrop Grumman installed treatment on this well field.

Monitoring well GM-13D is located between the eastern and western plumes and is the only off-NWIRP Bethpage monitoring well directly linked to Site 1 and that is not likely to be influenced by non-Navy sources. This well is screened at a depth of approximately 210 feet bgs, and contains TVOC concentrations of 289 µg/L including TCE at 55 µg/L, PCE at 200 µg/L, cis-1,2-DCE at 22 µg/L, and 1,2-DCE at 12 µg/L. Based on modeling efforts, contaminated groundwater in this area flows to the south and then southeast and is currently being intercepted by Onsite Containment Wells ONCT Wells 17, 18, and 19. Prior to the installation of the Onsite Containment Wells, this groundwater flowed to the southeast toward the GM-38 Area and the eastern plume.

The ONCT wells are screened at depths of approximately 500 feet bgs. Well 17 contained TVOC concentrations of 234 µg/L, which includes TCE at 210 µg/L and PCE at 24 µg/L. Well 18 contained TVOC concentrations of 101 µg/L, which includes TCE at 91 µg/L and PCE at 10 µg/L. Well 19 contained TVOC concentrations of 209 µg/L, which includes TCE at 180 µg/L, cis-1,2-DCE at 21 µg/L, and PCE at 8 µg/L. Operation of these three ONCT wells is critical to capturing groundwater associated with the NWIRP Bethpage.

The eastern plume is located southeast of NWIRP Bethpage. This plume starts in the area of NWIRP Bethpage Site 1 and the Bethpage Community Park, continues south through the GM-38 Area, impacts

the eastern-most Bethpage Water District Well Field (Plant No. 4), and then flows in the general direction of South Farmingdale Well Field No. 1, located 5,200 feet south of GM-38 Area.

VPB-109 (located north of the GM-38 Area) contained TVOC concentrations ranging up to 7,754 µg/L. Samples collected at 45 feet bgs contained TVOC of 37.1 µg/L, which includes TCE at 18 µg/L, cis-1,2-DCE at 18 µg/L, and toluene at 1 µg/L. Samples collected at 285 feet bgs contained TVOC of 7,754 µg/L, which includes TCE at 5,200 µg/L, cis-1,2-DCE at 2,500 µg/L, 1,2-dichloroethane (1,2-DCA) at 35 µg/L, and 1,2-DCE at 19 µg/L.

VPB-111, located 1,500 feet south of VPB-109, contained TVOC concentrations ranging up to 10,500 µg/L. VPB-111 samples collected at approximately 270 feet bgs contained TVOC of 24.1 µg/L. VPB-111 samples collected at approximately 450 feet bgs contained TVOC of 10,500 µg/L, which includes TCE at 9,100 µg/L and cis-1,2-DCE at 1,400 µg/L. The eastern plume exhibits concentrations of TCE, PCE and degradation products on these chemicals.

Potential Risks: The 2000 Groundwater FS for off-site groundwater did not contain a HHRA (Arcadis, 2000). Contaminants found in off-site groundwater are similar to contaminants and concentrations found in OU-Site 1. Refer to section 3.2.1 Potential Risks for HHRA information.

Remedial Action(s): Remedial actions are conducted to prevent a potential release of contaminants and/or migration of contaminants. The Navy will continue to identify possible remedial and removal actions as investigation activities proceed. Past and potential remedial actions for OU 1 & 2 (Site 1)-Off-site Groundwater include:

- Operation of the On-site Containment System (by Northrop Grumman)
- VOC well head treatment at Bethpage Water District
- Eastern Groundwater VOC Plume
 - GM-38 construction, operation, and monitoring

Path Forward

Activities planned for 2010 are as follows:

- Eastern Groundwater VOC Plume
 - GM-38 operation, and monitoring (2010)
 - SFWD design and construction (2010/2011)
 - Outpost Monitoring Well installation and Well Repair (2010/2011)

- Western Groundwater VOC Plume
 - GM-75 groundwater investigation, sampling and OPMW installation (2010/2011)
 - Aqua New York design (2010)
 - OPMW for Aqua New York (2010)
- Installation of 3 VPB and approximately 6 monitoring wells (2010/2011)

Planned activities beyond 2010 for OU 1&2 (Site 1)-Off-Site Groundwater are represented in Figure 3-4 and consist of:

- Eastern Groundwater VOC Plume
 - GM-38 operation, and monitoring
 - SFWD start-up and operation (2012)
 - RW2 evaluation (2012)
- Western Groundwater VOC Plume
 - GM-75 OPMW install and reporting
 - Aqua New York construction and operation (2011)
 - SFWD Plant 6/Massapequa Design Outpost Wells (2011)
 - SFWD reporting (2013)
- Five-Year Review (2013)
- Annual Inspection

3.2.5 Site 4 – Former USTs

Site Description: Site 4 - Former USTs - is relatively flat area located south of Plant No. 3 (Figure 2-6). Site 4 is also referred to as Area of Concern (AOC) 22. Prior to 1980, three USTs were used to store No. 6 Fuel Oil. The USTs were reportedly removed sometime between 1980 and 1984. Environmental concerns for this area are based on the results of site investigations conducted in 1997 and 1999. The 1997 investigation found evidence of petroleum in the soils from near the bottom of the former USTs to depths near the water table (UST Nos. 03-01-1, 2, and 3). A second investigation conducted in 1999 included the installation of groundwater monitoring wells, and the subsequent discovery of free petroleum product on the groundwater table. A pilot-scale system that incorporated biodegradation, soil washing, and chemical oxidation was conducted at the site between 2004 and 2006. AOC 22 is still being investigated and a decision document has not been yet prepared.

Documents and Milestones

Document Title /Milestone	Author/Date	Administrative Record (AR) Document Number ⁽¹⁾
Final Phase 1 Environmental Baseline Survey	C.F. Braun Engineering, 1998	NA
RCRA Facility Assessment/Focused Feasibility Study for Former Underground Storage Tanks Plant No. 3 Area of Concern (AOC) 22 Tank Nos. 03-01-1, -2 and -3	Tetra Tech NUS, Inc., 2003	0099
Soil and Groundwater Monitoring Report AOC 22 Site 4 Former Underground Storage Tanks	Tetra Tech NUS, Inc., 2007	NA ⁽³⁾
Soil and Groundwater Report in Support of Closed Loop Bioreactor Pilot Scale Study for AOC 22/Site 4 Former Underground Storage Tanks	Tetra Tech NUS, Inc., 2007	NA ⁽³⁾

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The 2003 RFA and FFS confirmed the presence and the extent of petroleum contaminated soils in the area of Site 4 (AOC 22). Evaluation of the groundwater data found only limited fuel-related contamination in the groundwater (Tetra Tech, 2003a).

The 2007 monitoring report concluded that concentrations of TPH remained in the soil at AOC 22 that ranged from 14 mg/kg in shallower depths to 36,000 mg/kg in deeper depths. Groundwater concentrations exceeded NYSDEC groundwater standards for TCE and several metals including iron, manganese, sodium, selenium, and cadmium in the up gradient and down gradient monitoring wells. The TCE contamination was not considered to be site-related (Tetra Tech, 2007c).

Nature and Extent of Contamination: In the immediate area of the former AOC 22 USTs, petroleum-contaminated soil starts at a depth of approximately 10 to 20 feet bgs and extends to the water table (55 to 60 feet bgs). The vertical extent of petroleum below the water table was confirmed through evaluation of soil samples. At a distance of 10 to 40 feet from the former AOC 22 USTs, petroleum-contaminated soils are only found at the water table. The soils above the water table were relatively clean. This area corresponds to approximately 0.25 acres. At a distance greater than 60 feet from the former USTs, petroleum contaminated soils were not observed (Tetra Tech, 2003a).

Potential Risks: A formal risk assessment has not been conducted for Site 4.

Remedial Action(s): Remedial actions are conducted to prevent a potential release of contaminants and/or migration of contaminants. The Navy will continue to identify possible remedial and removal actions as investigation activities proceed. Past and potential remedial or removal actions for Site 4 include:

- Treatment or capping of petroleum-contaminated soils and groundwater monitoring.

Path Forward

Activities planned for 2010 are as follows:

- PAH soil investigation and Reporting (2010)
- Bench scale field testing and treatability study (2010)
- PAH groundwater investigation planning (2010)

Planned activities beyond 2010 for Site 4 are represented in Figure 3-5 and consist of:

- FS/CMS (2011)
- PRAP/ROD (2012)
- ROD decision - design and implementation (2013)
- ROD decision - construction completion (2013)
- Remedy in Place 09/2013
- PAH groundwater investigation sampling and reporting every two years
- Five-Year Review

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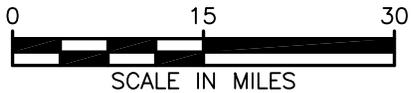
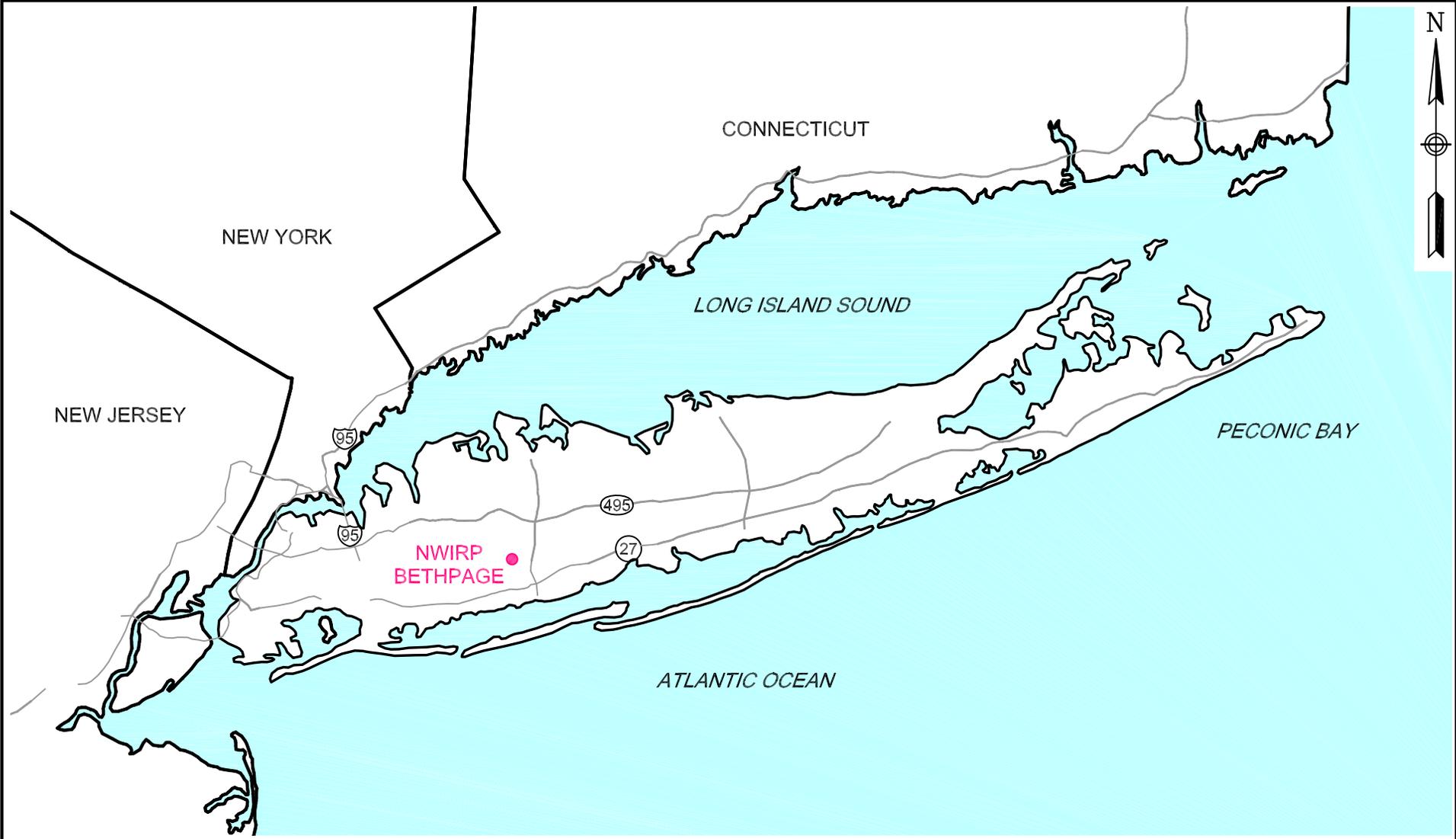
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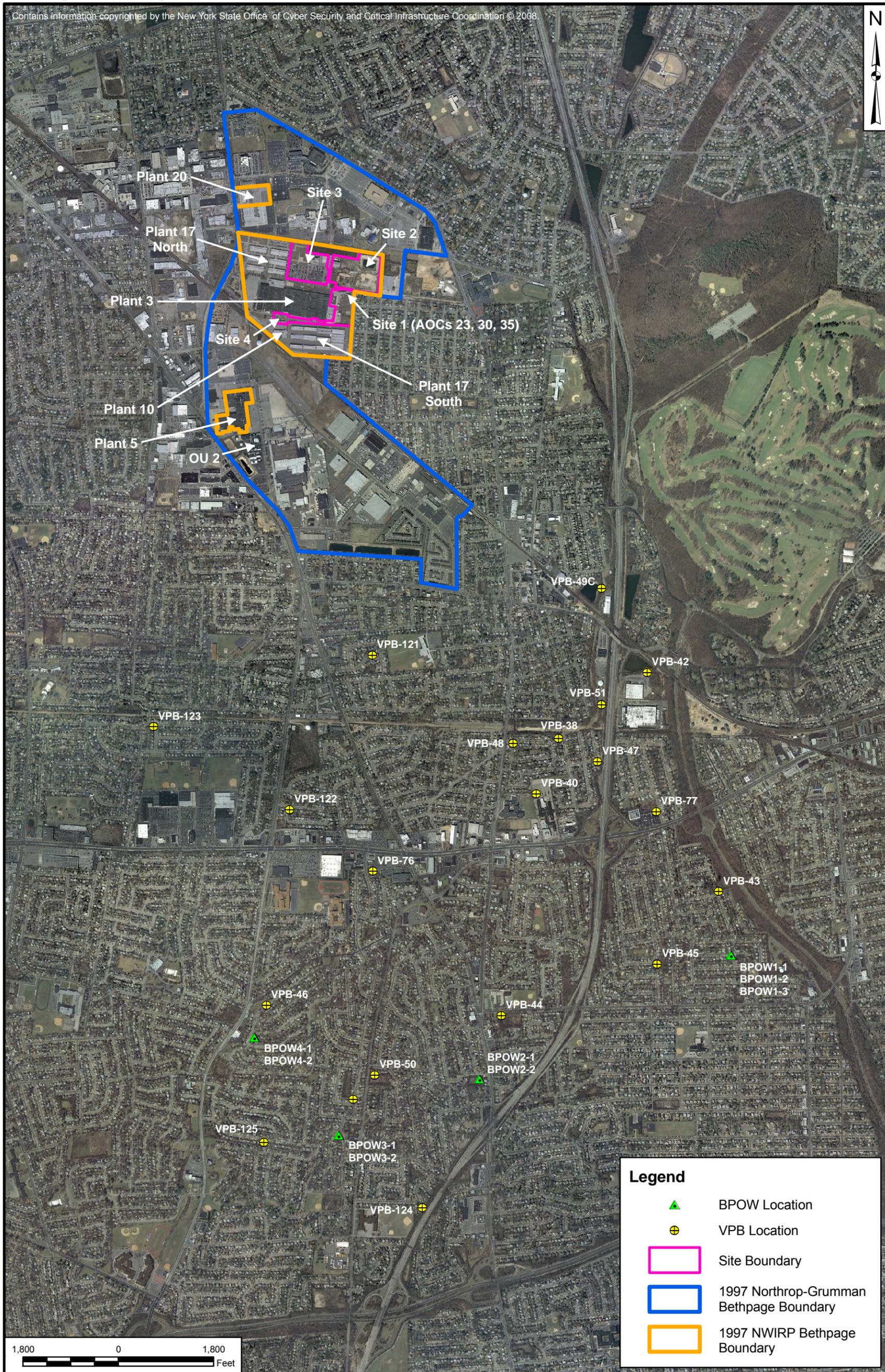
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GENERAL LOCATION MAP
NWIRP BETHPAGE
BETHPAGE, NEW YORK

SCALE NOT TO SCALE	
FILE 112G00622CM01	
REV 0	DATE 08/02/10
FIGURE NUMBER FIGURE 2-1	



Legend

-  BPOW Location
-  VPB Location
-  Site Boundary
-  1997 Northrop-Grumman Bethpage Boundary
-  1997 NWIRP Bethpage Boundary



DRAWN BY	DATE
J. ENGLISH	01/23/09
CHECKED BY	DATE
M. CUSHING	06/10/09
REVISED BY	DATE
SCALE	
AS NOTED	



SITE MAP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER	
CTO WE06	
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO.	REV
FIGURE 2-2	0

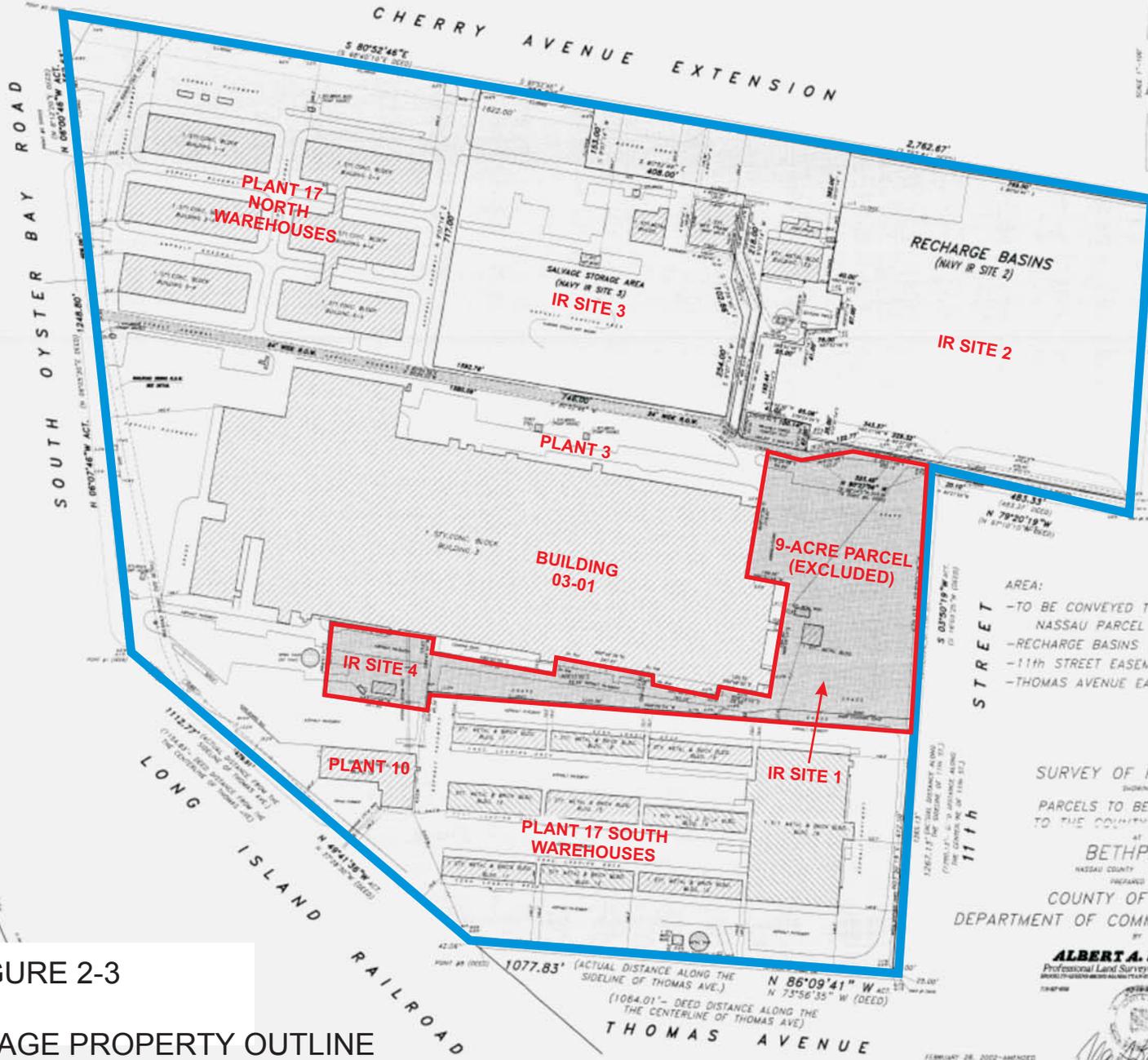
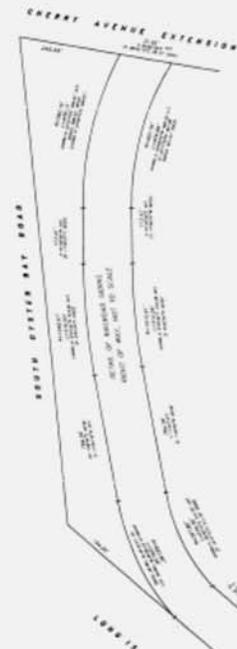
Ref. No. N46-G-NAVY

SECTION: 46

BLCK: G

LOTS: 5, 8

DETAIL OF RAILROAD SIDING



- AREA:
- TO BE CONVEYED TO COUNTY OF NASSAU PARCEL AREA-80.8476 ACRES
 - RECHARGE BASINS 14.0071 ACRES
 - 11th STREET EASEMENT 0.5813 ACRES
 - THOMAS AVENUE EASEMENT 0.6204 ACRES

SURVEY OF PROPERTY
 PARCELS TO BE CONVEYED TO THE COUNTY OF NASSAU
 AT
BETHPAGE
 NASSAU COUNTY NEW YORK
 PREPARED FOR
 COUNTY OF NASSAU
 DEPARTMENT OF COMMERCE & INDUSTRY

ALBERT A. BIANCO

Professional Land Surveyor - City Surveyor

1084.01' - DEED DISTANCE ALONG THE CENTERLINE OF THOMAS AVE.

1077.83' (ACTUAL DISTANCE ALONG THE SIDELINE OF THOMAS AVE.)

N 86°09'41" W ACT. N 73°56'35" W (DEED)

FEBRUARY 28, 2002 - AMENDED
JULY 18, 2001 - AMENDED
APRIL 18, 2001 - REVISED



FIGURE 2-3

NWIRP BETHPAGE PROPERTY OUTLINE



Legend

- Abandoned Dry Well Location
- Fence
- 2009 Property Line
- Site Boundary

DRAWN BY J. ENGLISH	DATE 06/02/09
CHECKED BY M. CUSHING	DATE 07/28/09
REVISED BY	DATE
SCALE AS NOTED	



SITE 1 - FORMER DRUM MARSHALLING AREA
LAYOUT MAP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER CTO WE06	
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO. FIGURE 2-4	REV 0



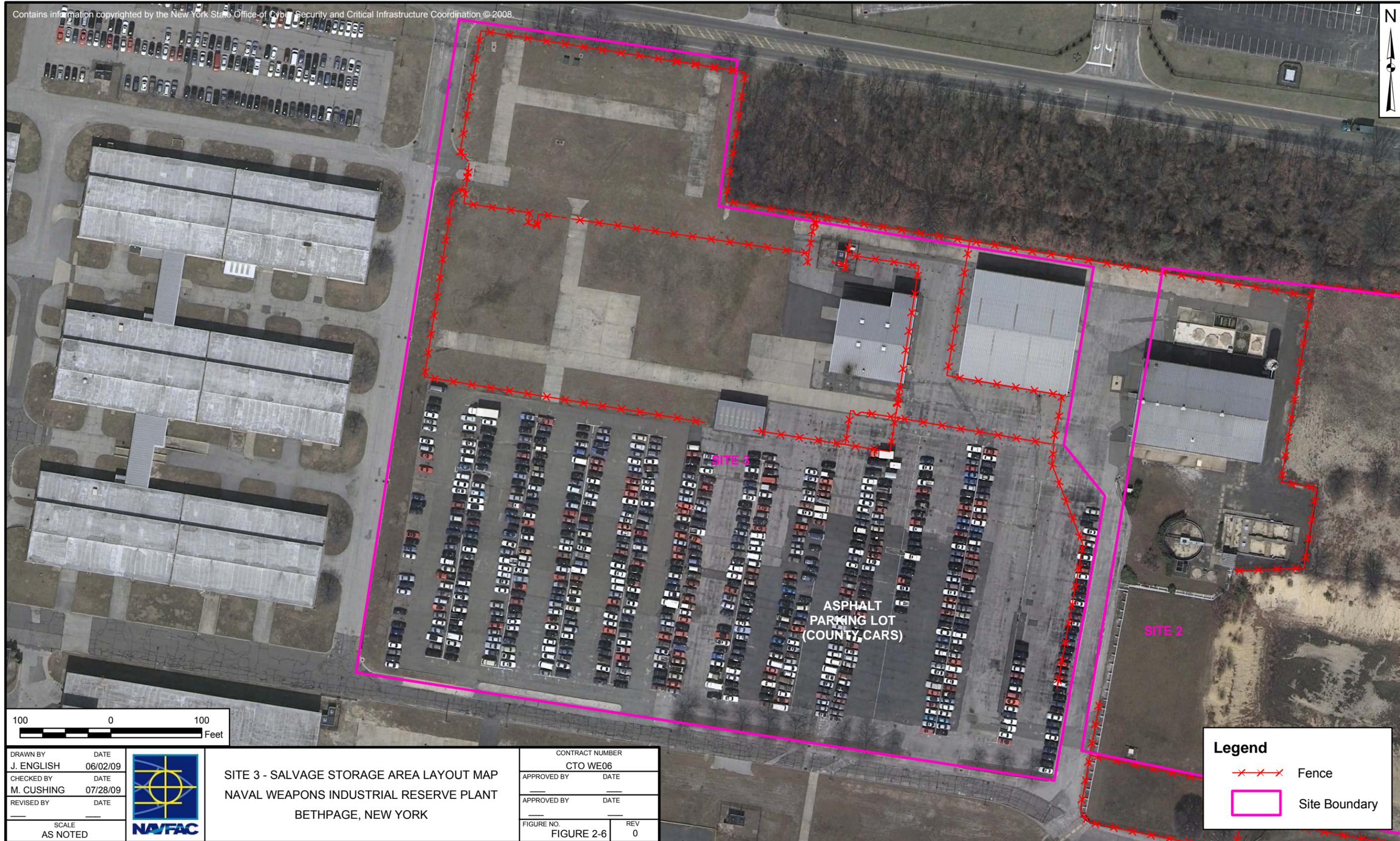
DRAWN BY J. ENGLISH	DATE 06/02/09
CHECKED BY M. CUSHING	DATE 07/28/09
REVISOR 	DATE
SCALE AS NOTED	



SITE 2 - RECHARGE BASIN
LAYOUT MAP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER CTO WE06	
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO. FIGURE 2-5	REV 0

Legend	
	Fence
	2009 Property Line
	Site Boundary



DRAWN BY J. ENGLISH	DATE 06/02/09
CHECKED BY M. CUSHING	DATE 07/28/09
REVISOR BY	DATE
SCALE AS NOTED	

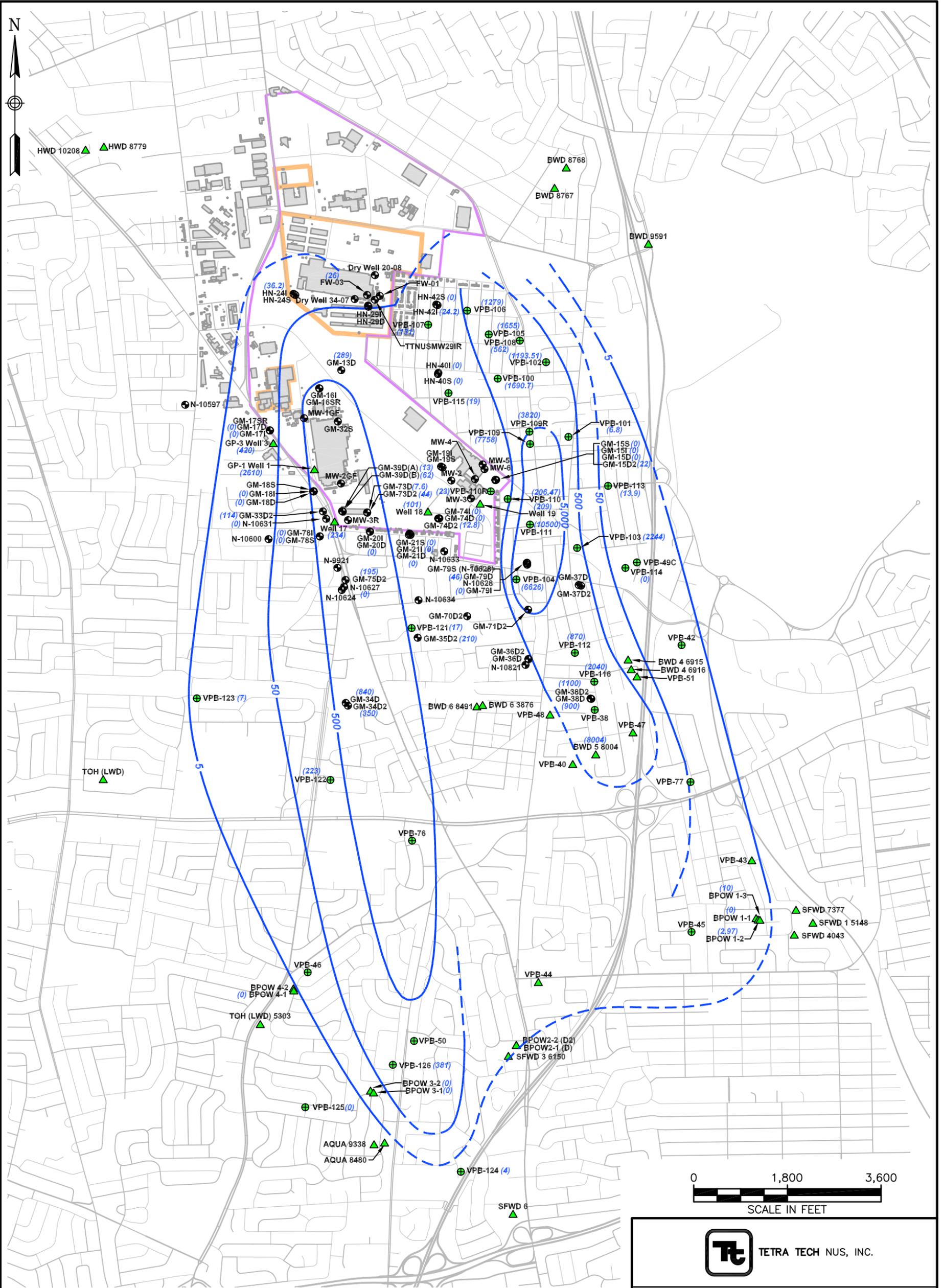


SITE 3 - SALVAGE STORAGE AREA LAYOUT MAP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER CTO WE06	
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO. FIGURE 2-6	REV 0

Legend

- Fence
- Site Boundary



LEGEND

- GROUNDWATER SAMPLING LOCATION
- ⊕ VERTICAL PROFILE BORING
- ▲ WATER SUPPLY WELL
- (840) TVOC CONCENTRATION IN ug/L
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED, IN ug/L)
- ▭ 1997 NORTHROP-GRUMMAN BETHPAGE BOUNDARY
- ▭ 1997 NWIRP BETHPAGE BOUNDARY
- BUILDING
- HIGHWAY
- MAJOR LOCAL ROAD
- MINOR LOCAL ROAD

OPERABLE UNIT 2 (SITE 1) GROUNDWATER TOTAL VOLATILE ORGANIC COMPOUND NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

FILE 112G00622GM03.dwg	SCALE AS NOTED
FIGURE NUMBER FIGURE 2-7	REV DATE 0 07/06/10



DRAWN BY	DATE
J. ENGLISH	06/02/09
CHECKED BY	DATE
M. CUSHING	07/28/09
REVISOR	DATE
SCALE AS NOTED	



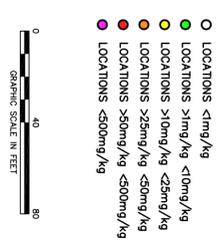
SITE 4 LAYOUT
AOC 22 (FORMER USTs)
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER	
CTO WE06	
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO.	REV
FIGURE 2-8	0

Legend	
	Abandoned Dry Well Location
	Fence
	2009 Property Line
	Site Boundary

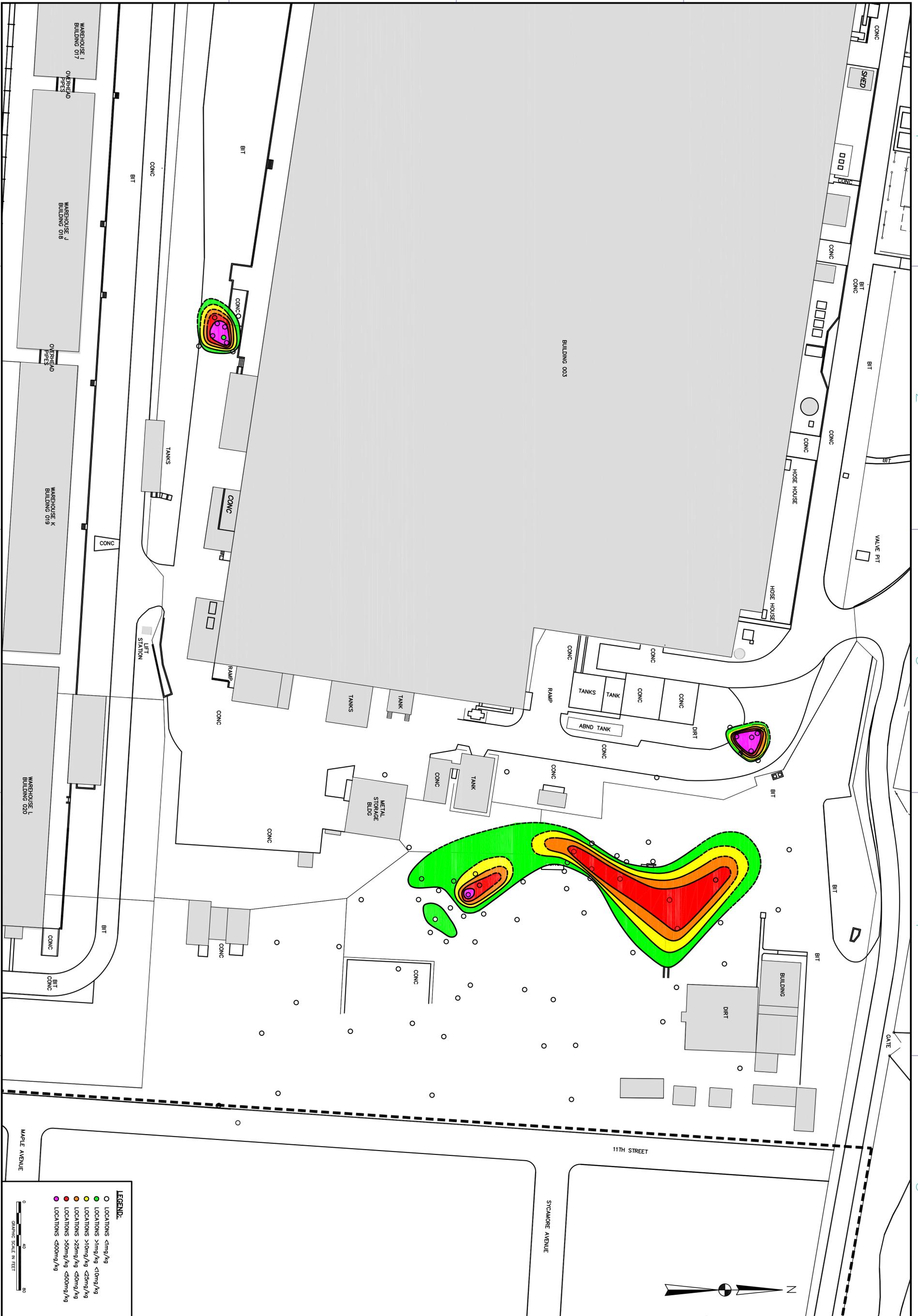


LEGEND:
 ○ LOCATIONS <1mg/kg
 ● LOCATIONS 1-10mg/kg <10mg/kg
 ● LOCATIONS 10-100mg/kg <25mg/kg
 ● LOCATIONS >25mg/kg <50mg/kg
 ● LOCATIONS >50mg/kg <500mg/kg
 ● LOCATIONS >500mg/kg

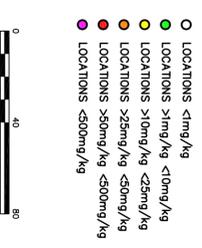


DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND NAVAL FACILITIES ENGINEERING COMMAND - MID-ATLANTIC NAVAL STATION - NORFOLK, VIRGINIA NORTH EAST IPT NWIRP BETHPAGE BETHPAGE, NEW YORK PCBs CONCENTRATIONS > 25 FEET BGS		NAVFAC 	
DRAWING NO. SHEET NO. DATE	SCALE CODE NO.	DRAWING NO. SHEET NO. DATE	DRAWING NO. SHEET NO. DATE
DESIGNED BY CHECKED BY DRAWN BY IN CHARGE PROJECT MANAGER BRANCH MANAGER ENGINEERING DIR.	DATE TIME DATE TIME DATE TIME DATE TIME	DATE TIME DATE TIME DATE TIME DATE TIME	DATE TIME DATE TIME DATE TIME DATE TIME

FIGURE-29



LEGEND:
 ○ LOCATIONS <1mg/kg
 ● LOCATIONS 1-10mg/kg <10mg/kg
 ● LOCATIONS 10-100mg/kg <25mg/kg
 ● LOCATIONS >25mg/kg <50mg/kg
 ● LOCATIONS >50mg/kg <500mg/kg
 ● LOCATIONS >500mg/kg

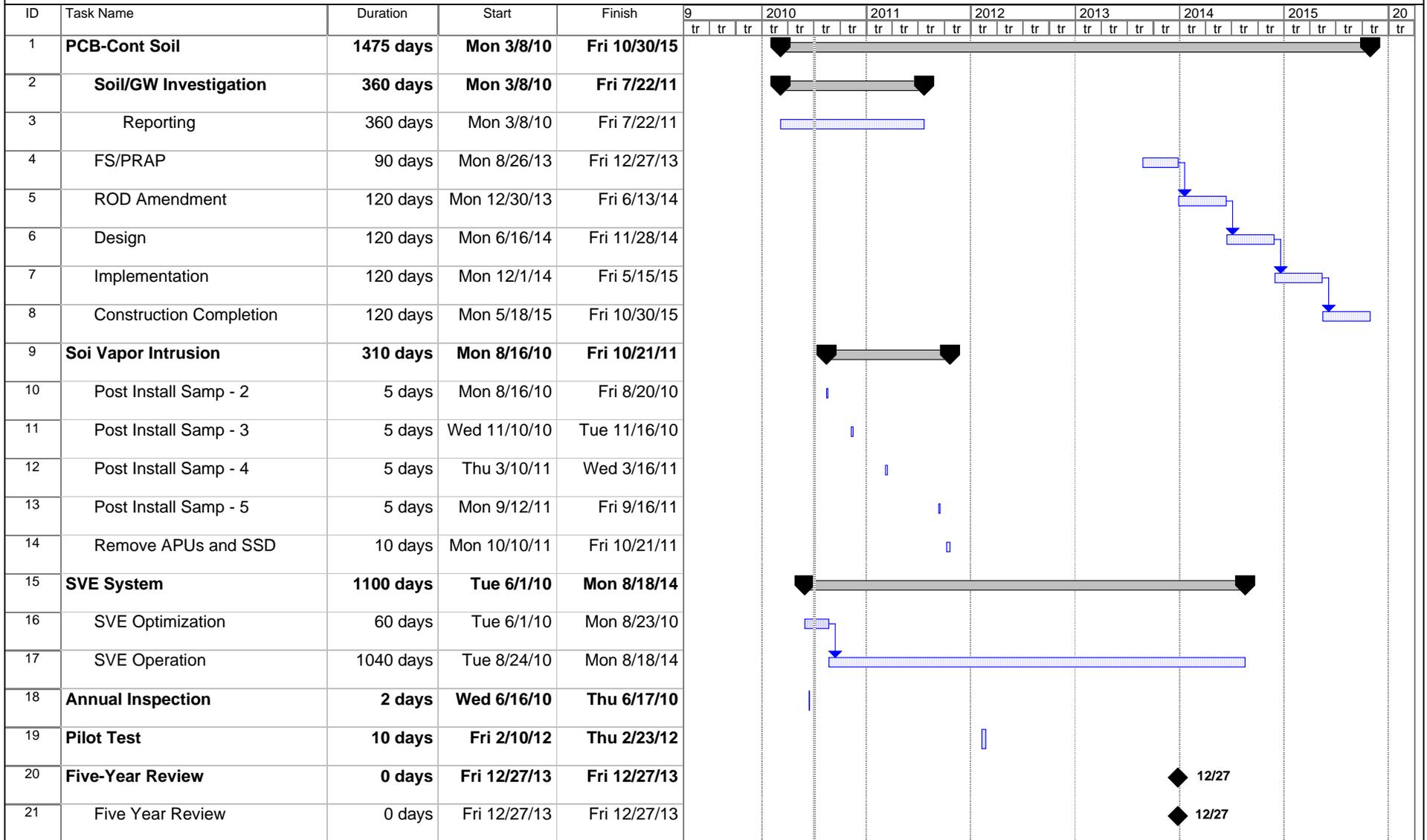


DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND NAVAL FACILITIES ENGINEERING COMMAND - MID-ATLANTIC NAVAL STATION - NORFOLK, VIRGINIA NORTH-EAST IPT		BETHPAGE, NEW YORK NWIRP BETHPAGE PCBs CONCENTRATIONS > 25 FEET BGS	
DRAWN BY: [Name] CHECKED BY: [Name] DESIGNED BY: [Name] REVISIONS BY: [Name] SPECIAL MANAGER: [Name] FIELD PRODUCTION: [Name] BRANCH MANAGER: [Name] ENGINEERING DIR: [Name]	DATE: [Date] TIME: [Time] DC: [DC] DR: [DR] JLF: [JLF]	NAVY COMMANDER: [Name] DATE: [Date]	APPROVED: [Signature] DATE: [Date]
SHEET NO. [Number] OF [Total]	NAVFAC DRAWING NO. [Number]	SYM	DESCRIPTION



FIGURE-3-2

FIGURE 3-3
 FY 2010 SITE MANAGEMENT PLAN
 SITE 1 ACTIVITIES SCHEDULE
 NWIRP BETHPAGE, NEW YORK



Project: BP SMP Fig 3-2 Site Wide Date: Thu 7/1/10	Task		Milestone		External Tasks	
	Split		Summary		External Milestone	
	Progress		Project Summary		Deadline	

FIGURE 3-5
 FY 2010 SITE MANAGEMENT PLAN
 SITE 4 ACTIVITIES SCHEDULE
 NWIRP BETHPAGE, NEW YORK

ID	Task Name	Duration	Start	Finish	Predecessors	2009				2010				2011				2012				2013				2014		
						tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	
1	PAH-Contaminated Soil	936 days	Mon 3/1/10	Mon 9/30/13						[External Task Bar]																		
2	Soil Invest/Treat Study	331 days	Mon 3/1/10	Mon 6/6/11						[External Task Bar]																		
3	Planning Documents	130 days	Mon 3/1/10	Fri 8/27/10						[Task Bar]																		
4	Field Investigation	67 days	Mon 8/30/10	Tue 11/30/10	3					[Task Bar]																		
5	Treatability Testing	67 days	Wed 12/1/10	Thu 3/3/11	4					[Task Bar]																		
6	Reporting	67 days	Fri 3/4/11	Mon 6/6/11	5					[Task Bar]																		
7	Finalize CMS/FS	90 days	Tue 6/7/11	Mon 10/10/11	6					[Task Bar]																		
8	PRAP	120 days	Tue 10/11/11	Mon 3/26/12	7					[Task Bar]																		
9	ROD	120 days	Tue 3/27/12	Mon 9/10/12	8					[Task Bar]																		
10	Design	120 days	Tue 9/11/12	Mon 2/25/13	9					[Task Bar]																		
11	Implementation	120 days	Tue 2/26/13	Mon 8/12/13	10					[Task Bar]																		
12	Construction Completion	30 days	Tue 8/13/13	Mon 9/23/13	11					[Task Bar]																		
13	Remedy in Place	1 day	Mon 9/30/13	Mon 9/30/13																								
14	Groundwater Investigation	1180 days	Tue 6/16/09	Mon 12/23/13						[External Task Bar]																		
15	Planning	175 days	Tue 6/16/09	Mon 2/15/10						[Task Bar]																		
16	Year 1 Samp & Analysis	5 days	Tue 2/16/10	Mon 2/22/10	15					[Task Bar]																		
17	Reporting	255 days	Tue 2/23/10	Mon 2/14/11	16					[Task Bar]																		
18	Year 2 Samp & Analysis	5 days	Tue 2/15/11	Mon 2/21/11	17					[Task Bar]																		
19	Reporting	255 days	Tue 2/22/11	Mon 2/13/12	18					[Task Bar]																		
20	Year 3 Samp & Analysis	5 days	Tue 2/14/12	Mon 2/20/12	19					[Task Bar]																		
21	Reporting	255 days	Tue 2/21/12	Mon 2/11/13	20					[Task Bar]																		
22	Year 4 Samp & Analysis	5 days	Tue 2/12/13	Mon 2/18/13	21					[Task Bar]																		
23	Reporting	220 days	Tue 2/19/13	Mon 12/23/13	22					[Task Bar]																		
24	Five-Year Review	0 days	Fri 12/27/13	Fri 12/27/13																						◆ 12/27		
25	Five Year Review	0 days	Fri 12/27/13	Fri 12/27/13																						◆ 12/27		

Project: BP SMP Figure 3-5 FW 2010 Date: Thu 7/1/10	Task		Milestone		External Tasks	
	Split		Summary		External Milestone	
	Progress		Project Summary		Deadline	