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SITE MANAGEMENT PLAN FISCAL YEAR 2015 NAS WILLOW GROVE PA

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Site Management Plan
Fiscal Year 2015

Former Naval Air Station
Joint Reserve Base (NAS JRB)
Willow Grove, Pennsylvania

Naval Facilities Engineering Command
Mid-Atlantic

October 2015

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ACRONYMS

ARS	Air Reserve Station
BRAC	Base Realignment and Closure
BTAG	Biological Technical Assistance Group
BTEX	Benzene, toluene, ethylbenzene, and xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
COCs	Chemicals of concern
CVOCs	chlorinated volatile organic compounds
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
ECOR	ECOR Solutions, Incorporated
EE/CA	Engineering Evaluation/Cost Analysis
EFANE	Engineering Field Activity Northeast
EM	Electromagnetic
EPA	U.S. Environmental Protection Agency
EPIC	Environmental Photographic Interpretation Center
ESI	Extended Site Inspection
FFA	Federal Facilities Agreement
FFS	Focused Feasibility Study
FS	Feasibility Study
FWENC	Foster Wheeler Environmental Corporation
FY	Fiscal Year
HHRA	Human Health Risk Assessment
HHRSE	human health risk screening evaluation
HJII	Horsham Joint Interagency Installation
HLRA	Horsham Land Redevelopment Authority
HRA	Historical Radiological Assessment
HWSA	Horsham Water and Sewer Authority
IAS	Initial Assessment Study
IDW	investigation-derived wastes
IGWM	Interim Groundwater Monitoring
IR	Installation Restoration
IRA	Interim remedial action
IRACR	Interim Remedial Action Completion Report
IRP	Installation Restoration Program

ACRONYMS (Continued)

JII	Joint Interagency Installation
LNAPL	Light non-aqueous phase liquid
LUC	Land use control
LUCIP	Land Use Control Implementation Plan
MCL	Maximum contaminant level
MNA	monitored natural attenuation
MSC	Medium-specific concentration
NAPL	non-aqueous phase liquid
NAS JRB	Naval Air Station Joint Reserve Base
NEESA	Naval Energy and Environmental Support Activity
NFA	No further action
NPL	National Priorities List
OPS	Operating properly and successfully
OU	Operable Unit
PA	Preliminary assessment
PADEP	Pennsylvania Department of Environmental Protection
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PFC	Perfluorinated Compounds
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonate
PMO	Program Management Office
RA	Remedial Action
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RBC	Risk-Based Concentration
RC	Response complete
RD	Remedial design
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RIP	Remedy in place
RMC	Resource Management Concepts, Incorporated
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
RTC	Response to comments

ACRONYMS (Continued)

SAP	Sampling and Analysis Plan
SDWA	Safe Drinking Water Act
SI	Site inspection
SMP	Site management plan
SSA	Site screening area
SVOC	Semivolatile organic compound
TCL	Target Compound List
TCRA	Time Critical Removal Action
TPH	Total petroleum hydrocarbons
UCMR	Unregulated Contaminant Monitoring Rule
UFP	Uniform Federal Policy
USGS	United States Geological Survey
UST	Underground storage tank
VOC	Volatile organic compound

1.0 INTRODUCTION

This report presents the fiscal year 2015 updated Site Management Plan (SMP) for the former Naval Air Station Joint Reserve Base (NAS JRB), Willow Grove, Pennsylvania. The SMP is the management tool for planning, reviewing, and setting priorities for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial response activities to be performed at the facility. This SMP presents the sequence of future investigation and remediation activities, the rationale for the prioritization of investigation and remediation events, and an estimated schedule for the completion of these activities. The SMP allows for adjustments to scheduled activities to account for potential impacts created by federal budget constraints, changes in the scope of investigation or remediation activities, or other unanticipated events. A Federal Facilities Agreement (FFA) was finalized June 27, 2005 between the Navy, the U.S. Environmental Protection Agency (EPA), and the Pennsylvania Department of Environmental Protection (PADEP). The FFA ensures that environmental impacts associated with the sites at NAS JRB Willow Grove are fully investigated, and that proper response actions are taken. The FFA also requires preparation and annual updates to this SMP. Requirements of the FFA are incorporated into this SMP.

In 2005, NAS JRB Willow Grove, Pennsylvania was designated for closure under the authority of the Defense Base Realignment and Closure Act (BRAC) of 1990, Public Law 101-510 as amended. BRAC legislation requires that the base closure be in full compliance with the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). Section 2 (Definitions) of the FFA identifies Navy Engineering Field Activity Northeast (EFANE) as the primary Navy local contact entity. Since the EFANE office was designated for closure under the 2005 round of BRAC, EFANE has been replaced by the BRAC Program Management Office (PMO) East, 4911 South Broad Street, Philadelphia, PA, as the primary local Navy contact office.

In May 2007, Special Legislation was enacted that stated, "The Secretary of the Navy shall, notwithstanding any other provision of law, transfer to the Secretary of the Air Force, at no cost, all lands, easements, Air Installation Compatible Use Zones, and facilities at NAS JRB Willow Grove designated for operation as a Joint Interagency Installation (JII) for use by the Pennsylvania National Guard and other Department of Defense components, government agencies, and associated users to perform national defense, homeland security, and emergency preparedness missions." Subsequent legislation in 2008 authorized the Secretary of the Air Force to convey all transferred Navy property to the Commonwealth of Pennsylvania at no cost for operating the Horsham Joint Interagency Installation (HJII).

In September 2009, the Navy transferred 18.25 acres to the Air Force as part of the BRAC 2005 requirement to construct a consolidated Armed Forces Reserve Center. In December 2011, an additional

27 acres was transferred to the Air Force. The transfer obligates the Air Force to comply with all provisions of the three-party FFA between the Navy, EPA, and PADEP dated June 27, 2005; and all associated CERCLA actions and requirements related to the FFA for this property.

In November 2009 the governor of Pennsylvania announced that the Commonwealth of Pennsylvania had withdrawn its plan to own, operate, and maintain the Horsham JII proposed for NAS JRB Willow Grove. As a result, the Under Secretary of Defense advised all parties that the Navy would then dispose of NAS JRB Willow Grove in accordance with the laws and regulations governing the disposal of property made available as a result of the closure or realignment of a military installation under BRAC, as amended.

NAS JRB Willow Grove was officially disestablished on March 30, 2011. The base continued to provide services and facilities, on a limited basis, until September 2011. The facility was transferred to BRAC PMO and entered caretaker status at that time. Decisions regarding the future use of the land are coordinated by the Horsham Land Redevelopment Authority (HLRA). On March 21, 2012, the HLRA officially approved the proposed NAS JRB Willow Grove Redevelopment Plan and Homeless Assistance Submission. The final plan identified the most appropriate uses for the redevelopment of the 862-acre property declared surplus by the Navy in 2010. On April 27, 2012, NAS JRB Willow Grove Redevelopment Plan and Homeless Assistance Submission was submitted to the U.S. Department of Housing and Urban Development and the Navy. In January 2013, three acres were transferred to the Federal Aviation Administration for their airport surveillance system.

In November 2012, the Navy published the Notice of Intent to prepare an Environmental Impact Statement for the disposal and reuse of the Former Naval Air Station Joint Reserve Base Willow Grove in the Federal Register. Public scoping meetings were held in December 2012. The Notice of Availability of the Draft Environmental Impact Statement (DEIS) was published in the Federal Register in December 2013, and comments provided in February 2014. The final EIS was completed in March 2015.

1.1 FACILITY DESCRIPTION

NAS JRB Willow Grove is located in Horsham Township, Montgomery County in southeastern Pennsylvania; approximately 20 miles north of the city of Philadelphia (see Figure 1-1). NAS JRB Willow Grove occupies approximately 900 acres of 1,100 acres the Department of Defense (DoD) maintains at the Air Station. The Willow Grove Air Reserve Station (ARS), also known as the Horsham Air Guard Station, occupies approximately 200 adjacent acres of land northeast of NAS JRB. Figure 1-1 shows the location of NAS JRB Willow Grove and ARS. NAS JRB Willow Grove has flat to slightly rolling terrain and

is generally bounded by State Route 611 to the east, State Route 463 to the southwest, and Keith Valley Road to the north.

The primary mission of NAS JRB Willow Grove was to provide support for operations involving aviation training activities, and to train Navy reservists. NAS JRB Willow Grove had supported DoD tenants such as the Marine Reserve and the Army Reserve, and shared facilities/services with the Air Force Reserve. The Air Force presence has been reduced since the Air Force 913th Airlift Wing unit activities were ended on September 28, 2007. NAS JRB Willow Grove was officially disestablished on March 30, 2011, and it was transferred to Navy BRAC PMO Northeast and entered caretaker status in September 2011. Only personnel required for caretaking and environmental cleanup of the base remain.

1.2 ENVIRONMENTAL STATUS AND PREVIOUS INVESTIGATIONS

NAS JRB Willow Grove is being investigated through the Department of Defense's Installation Restoration Program (IRP). The identified sites are in various stages of the multi-step IRP process toward final disposition which the Navy is pursuing jointly with state and federal regulatory agencies. Table 1-1 provides a list of NAS JRB Willow Grove sites and their status in the Navy's IRP.

In 1986, the Department of Navy initiated an Initial Assessment Study (IAS) conducted by the Naval Energy and Environmental Support Activity (NEESA). The purpose of the IAS was to assess sites posing potential threats to human health or the environment resulting from hazardous materials handling at the facility. Historical records and aerial photographs were reviewed, interviews with site personnel were conducted, and field inspections were performed. Based on this information, nine potentially contaminated sites were identified. Each of these sites was evaluated for potential health or environmental impacts by evaluating the characteristics of potential contaminants, and the migration pathways and potential receptors for these contaminants. The study concluded that five sites (Sites 1, 2, 3, 4, and 5) should be subject to a confirmation study.

The 1988 confirmation study included Site Inspection (SI) studies at 10 sites (the 9 sites identified in the IAS and the Navy Fuel Farm). These investigations included electromagnetic (EM) terrain conductivity surveys and soil vapor surveys, both performed in 1988 (EA Engineering, 1990). The surveys were conducted to provide data for the placement of test borings and monitoring wells. EM surveys were conducted at Sites 2, 3, 4 and 7. Soil vapor surveys were conducted at Sites 3, 5, 7, 8, 9 and the Navy Fuel Farm.

In 1989, additional field activities included the installation of monitoring wells at eight different sites, and measurement of water levels from the wells to determine groundwater flow direction. Three rounds of

groundwater sampling were conducted. Test borings in areas of soil vapor or EM anomalies were performed, and samples were obtained. Surface soil samples were also collected at two sites. To evaluate potential surface water impacts, aqueous and sediment samples were obtained along the surface water migration pathway at one off-Base and 11 on-Base locations (EA Engineering, 1990).

In 1990, results were presented in the Site Inspection Studies Report (EA Engineering, 1990) and the Plan of Action for Extended Site Inspections and Remedial Investigations (EA Engineering, 1991). Recommendations were no further action (NFA) at Sites 4, 6, 8, and 9; and the performance of a Remedial Investigation (RI) at Sites 1, 2, 3, 5, and the Fuel Farm (Site 10). In addition, an Extended Site Inspection (ESI) was recommended for Site 7 because the SI data were inconclusive.

In 2014, certain perfluorinated compounds, including perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) were detected above the Environmental Protection Agency's (EPA) provisional health advisory (PHA) levels in groundwater on and around the base. A Time Critical Removal Action was initiated in 2014 to provide alternate water supplies to affected residents and to provide treatment at Horsham Water and Sewer Authority (HWSA) supply wells with PFOA or PFOS at or above the PHA levels. A draft PA/SI was submitted in May 2015, and a remedial investigation SAP is being prepared.

NAS JRB Willow Grove was placed on the final National Priorities List (NPL) on September 29, 1995. Navy continued to follow the CERCLA process for the sites at NAS JRB Willow Grove. Work conducted at each site following issuance of the Site Inspection Studies Report is further discussed in Section 3.

1.3 REPORT ORGANIZATION

The remaining three sections of this report are: Section 2.0, which summarizes the procedures comprising the CERCLA process; Section 3.0, which describes each of the sites included in this SMP [Sites 1 through 9, the Navy Fuel Farm (Site 10), Site Screening Area (SSA) 11, Site 12, and PFCs]; and Section 4.0, which discusses the ranking system used to prioritize the sites, provides the current status of each site, presents the generic schedule durations for planned CERCLA activities, and includes assumptions provided in the FFA used to develop the schedule and this SMP. A list of references used in this SMP follows Section 4.0.

2.0 CERCLA PROCESS ACTIVITIES

Guidelines established by the EPA for the CERCLA process will continue to be followed for the sites at NAS JRB Willow Grove. The CERCLA process provides guidelines for investigation activities prior to the RI, including preliminary assessments (PAs) [completed at NAS JRB Willow Grove (IAS, 1986)] and Site Investigations (SIs) [completed at NAS JRB Willow Grove Sites 1 through 10 (EA Engineering, 1990), and SSA 11 and Site 12 (U.S. Department of Defense, 1996b)]. This section discusses the CERCLA processes required to complete investigative and remediation activities at the facility.

After the site inspection and risk screening process is conducted, if a site is deemed to present a potential risk to human health and/or the environment, the site is subject to the full remedial investigation/feasibility study (RI/FS) process. Depending on the severity of site conditions, a removal action or interim remedial action (IRA) may be appropriate to mitigate immediate threats to human health or the environment. Potentially applicable CERCLA processes for the NAS JRB Willow Grove sites are described in the following sections.

2.1 PA/SI PROCESS

The PA and SI are used to evaluate the potential for a release of hazardous substances from a site.

The PA usually consists of a review of available site data and information, interviews, and a non-sampling site visit to observe areas of potential waste disposal and migration pathways. If the PA results in a recommendation for further investigation, an SI is performed.

The purpose of an SI is to determine the need for additional action or investigation at the site, and to eliminate from further consideration those sites that pose no significant threat. The SI is conducted prior to the RI.

2.2 RI/FS PROCESS

Figure 2-1 presents a schematic of the RI/FS process. The RI is a field investigation, more extensive than an SI, with the goal of determining the nature and extent of contamination at the site. The baseline risk assessment, performed as part of the RI, is an analysis of potential adverse health and/or ecological effects arising from site conditions in the absence of any mitigating actions. The FS presents options for cleanup by screening alternatives for remediation, and conducting an analysis of the alternatives. Factors for evaluation include overall protection of health and the environment, short- and long-term effectiveness, and cost. The proposed plan presents the proposed alternative for remediation of the site

selected from the FS. The record of decision (ROD), when signed by the Navy and EPA, presents the remedy selected after consideration of the public comments. The remedial design (RD) is the development of the actual design of the selected remedy, including the preparation of technical specifications and drawings. The remedial action (RA) is the construction, implementation, and operation of the selected remedy.

2.3 REMOVAL ACTIONS

Removal actions are implemented to clean up or remove hazardous substances from the environment; or to mitigate, minimize, or prevent damage to human health or the environment from a release or threat of release by limiting exposure to those substances. Removal actions may be either time-critical or non-time-critical. Time-critical removal actions are taken when there is an imminent threat to human health and/or the environment. An example of such a threat would be corroded drums that are leaking hazardous substances that would threaten ecological or human receptors. Non-time-critical removals are actions that may be delayed for 6 or more months without immediate risk to human health or the environment. Although removal actions often begin prior to the completion of RI/FS activities to reduce the spread of contaminants, they may occur at any point during the RI/FS process.

If a non-time-critical removal action is implemented, an Engineering Evaluation/Cost Analysis (EE/CA) is prepared rather than an FS. The EE/CA is prepared for the substances to be removed rather than all potentially contaminated media. Media not addressed in the EE/CA will still be considered in the RI/FS process. Figure 2-2 presents the general process for non-time-critical removals.

Removal actions generally are smaller in scope than a typical site RI/FS; therefore, the time required to perform a removal action, including preparation of an EE/CA, removal design, and implementation, is usually significantly less than the time needed to complete an RI/FS. Under a non-time critical removal action, there is still an evaluation of options and an opportunity for public comment. The selected removal action is documented in an Action Memorandum.

If the risk assessment from the RI/FS process indicates that no further remedial action is required for the entire site after a removal action is completed, the removal action may negate the need for a remedial action. In that case, a no-further-action ROD would be prepared for signature by the concerned parties.

2.4 INTERIM REMEDIAL ACTIONS

Interim remedial actions are designed to mitigate potential risks posed by site contaminants to human health and/or the environment until a final remedial action is implemented. Interim remedial activities

usually occur prior to initiation of a full FS. Interim remedial actions, if implemented early in the CERCLA process, often reduce long-term RA costs by limiting the extent of contamination at a site. For example, installation of a groundwater pump and treat system to control plume migration would be considered an interim remedial action, if initiated prior to selection of the final remedy. Interim remedial actions are limited in scope and should address only areas or media for which a remedy will be developed during the RI/FS process.

Figure 2-3 shows the interim remedial action process. Because these actions are usually taken prior to initiation of the full FS, a focused feasibility study (FFS) is prepared addressing only the media and contaminants subject to the interim remedial action. Results of the FFS are incorporated into a Proposed Plan for the interim remedy that is subject to public comment. Similar to the full RI/FS process, after the public comment period, an interim ROD is prepared and signed, the interim remedial design is developed, and the interim action implemented. If the risk assessment from the RI/FS process indicates that no further remedial action is required for the entire site after an interim remedial action is completed, the interim action may become the final remedial action for the site.

2.5 TREATABILITY STUDIES

Before a ROD is signed, and possibly even before final FS development, laboratory-based or pilot treatability studies may be required. These studies evaluate the effectiveness of a potential remedial technology's performance. The goal of performing treatability studies is to support the remedial design process. Treatability studies are typically performed when insufficient data are available from the RI to support full-scale design and implementation of the preferred alternative, or where there is a need to determine the effectiveness of a particular technology prior to full-scale implementation.

2.6 ROD AND POST ROD ACTIVITIES

The ROD is used to support and document the remedy selected for an NPL Site. It describes why the selected remedial actions were chosen over other candidate actions, how much the remedial actions are expected to cost, and how the public responded to the Proposed Alternative (combination of technologies proposed for site remediation).

Evaluating a federal agency's demonstration that a remedial action is "operating properly and successfully" is a precondition to the deed transfer of federally-owned property to a non-federal government entity. Post ROD demonstration that any remediation systems are operating properly and successfully (OPS) according to EPA’s Guidance (EPA, 1996) will be required at some NAS JRB Willow Grove sites.

3.0 SITE DESCRIPTIONS AND INVESTIGATIONS

3.1 SITE DESCRIPTIONS

This section presents a history of disposal practices and current status of each of the 12 sites and site screening areas addressed in this SMP. This information is based on data from previous investigations and progress made to date in the Navy's IR program. Site locations are identified on Figure 3-1.

3.1.1 Site 1 - Privet Road Compound

The former Privet Road Compound is located west of Privet Road, across from the steam plant (Building No. 6). Figure 3-2 shows the current Site 1 layout. The entire site area was approximately 2 acres and consisted of a bowling alley, parking lot, and a 0.5-acre fenced area. Trash handling operations at the Privet Road Compound began in 1967 when the Ninth Street Landfill (Site 3) was closed. To replace the landfill, regular trash pickup and off-site disposal were initiated. The Privet Road Compound site was used to process wastes from 1967 to 1975. A fence was erected around the compound area in 1972 to control waste disposal and handling within the compound. The suspected waste handling area, however, is believed to have extended throughout Site 1, including the area where the Bowling Alley and parking lot were located.

The Privet Road Compound was constructed as a transfer station to handle materials not accepted by the trash pickup service. During operations at the compound, wastes were temporarily stored on site to await off-site disposal or were burned and/or buried on site. Burning and burial ceased by 1975; however, stored waste material was not completely removed from the site until 1977 (NEESA, 1986).

Wastes reportedly disposed at the site included: paint wastes, paint stripper and solvents, Freon, general refuse, asbestos, battery acid, sewage sludge containing heavy metals, oils and lubricants, and mercury-containing dental amalgam. Transformers containing polychlorinated biphenyls (PCBs) were also stored at the site. PCB-containing liquids spilled when stored transformers overturned during an incident at the compound (NEESA, 1986).

Brown & Root Environmental (B&RE) (formerly Halliburton NUS Corporation) conducted RI field activities at Site 1 in 1991. The RI report concluded that additional sampling was needed to further delineate the extent of contamination and/or potential sources at the site. The RI report recommended a Phase II RI and an FS (HNUS, 1993).

In 1997, the Phase II RI fieldwork was conducted, and in 1998 a draft Phase II RI report was submitted to regulators for review (B&RE, 1998].

In 1999, the Navy decided to de-link the reporting process for the IR sites (1, 2, 3, and 5), and submit four separate Phase II RI report documents. Also in June 1999, a removal action for PCB-contaminated soil at Site 1 was completed. A total of approximately 1,100 tons of soil was removed for disposal off-site.

In 2000, basewide water-level studies were completed in cooperation with local municipal authorities and the United States Geological Survey (USGS). Access to the two deep Navy production well boreholes (NW-1 and NW-2) was necessary for geophysical, groundwater quality, and production rate studies performed by the USGS. These two wells are the sole supply of potable and emergency (fire fighting) water for the entire Willow Grove Air Station facility. This project allowed the Navy to obtain the Navy supply well water quality analytical data requested by EPA to help analyze Site 1 groundwater conditions.

In 2002, the Site 1 RI report was finalized and submitted to the regulators and the Restoration Advisory Board (RAB) (Tetra Tech, 2002a).

In 2004, a draft Addendum RI Report was submitted. The draft Addendum RI Report determined that the chlorinated solvents found in the local groundwater do not originate substantially from the Privet Road Compound area; instead, they appear to be from an off-Base location southeast of Site 1, across Pennsylvania Route 611 in the vicinity of the former Kellet Aircraft manufacturing facility. Also in 2004, the Navy Public Works Officer had the fence removed from around the compound area, and reseeded the soil with grass to improve the appearance of the area.

In September 2004, the Navy submitted the final Proposed Plan for Site 1 soil (Tetra Tech, 2004a). A public meeting was held to present the Navy's plan for no further action for Site 1 soil, based on the PCB-contaminated soil removal. A public comment period was set for September 27 through October 27, 2004, to encourage public participation in the decision process for the Privet Road Compound.

Based on concerns from EPA, the Navy performed two additional studies to support the no further action recommendation in the Site 1 soil Proposed Plan. The Site 1 RI Addendum 1 (Tetra Tech, 2005a) reviewed the residual risk remaining after the Site 1 soil removal was completed. RI Addendum 2 (Tetra Tech, 2005b) and RI Addendum 3 (Tetra Tech, 2005c) provided additional evaluation of groundwater conditions at Site 1. Site 1 RI Addendum 4 (Tetra Tech, 2006a) confirmed earlier RI results regarding the absence of volatile organic compounds (VOCs) in soil. Both of these reports confirmed earlier RI results and the conclusions found in the Proposed Plan, leading to the NFA recommendation.

The Site 1 Soil [Operable Unit (OU) 1] ROD (Tetra Tech, 2006b), specifying no further action for Site 1 soil, was accepted by PADEP (PADEP, 2006) and signed by the Navy and EPA in September 2006.

The Navy installed three new monitoring wells upgradient of Site 1 at the Base property line in accordance with the work plan approved by PADEP and EPA. The three new monitoring wells were installed and sampled in 2006 by ECOR. Sampling results from the new wells confirmed that the major contributor to solvent contamination in groundwater beneath Site 1 is an off-Base source (Tetra Tech, 2006c). However, based on information presented in the Site 1 RI Addendum 5 for Groundwater (Tetra Tech, 2006c), EPA requested that the document be reissued to include more of the background information from previous study reports that had been only referenced. In July 2007, the revised draft Site 1 RI Addendum 5 for Groundwater was submitted to regulators for review. In January 2008, the Navy submitted the final Site 1 RI Addendum 5 for Groundwater report (Tetra Tech, 2008a). This RI addendum report demonstrated that VOCs are migrating onto the Base from an upgradient, off-Base source area.

In September 2007, Tetra Tech prepared a draft FFS report for Site 1 Groundwater and submitted it to regulators for review. In January 2008, the Navy submitted the final Focused Feasibility Study for Site 1 Groundwater (Tetra Tech, 2008b). The FFS report developed the remedial alternatives for Site 1 groundwater, and provided a detailed analysis and comparison of these alternatives which would be used by the Navy and EPA in agreement with PADEP to select a preferred remedy to deal with contaminated groundwater.

In January 2008, the draft Proposed Plan for Site 1 groundwater (OU 3) was submitted to regulators for review. In April 2008, the Navy submitted the final Proposed Plan for Site 1 groundwater (Tetra Tech, 2008c). This Proposed Plan recommended that limited action, including implementation of institutional controls and periodic groundwater monitoring in conjunction with a review of site conditions and risks every 5 years, would be taken as an interim measure to address risks associated with the groundwater located beneath Site 1. Interim measures were in effect while EPA investigated the off-site source of the groundwater contamination. A public meeting was held to present the Navy's plan for the interim action for the groundwater of Site 1. A public comment period was set for April 16 through May 30, 2008 to encourage public participation in the decision process for the Privet Road Compound. Several comments were received from the public during the public meeting, but no additional comments were received during the public comment period.

The ROD for Site 1 Groundwater (OU 3) (Tetra Tech, 2008d) incorporated all comments from regulatory agency reviewers, and included comments from the public. The interim ROD for Site 1 Groundwater

(OU 3) was signed by the Navy and forwarded to EPA for signature on September 5, 2008. EPA signed the OU 3 ROD on September 26, 2008.

The selected interim remedy for Site 1 Groundwater (OU 3) consisted of Land Use Controls (LUCs), periodic groundwater monitoring, and five-year reviews. In February 2009, Tetra Tech prepared a draft Remedial Design (RD) for LUCs for Site 1 Groundwater (OU 3), and submitted it to regulators for review (Tetra Tech, 2010a). The RD for LUCs for Site 1 Groundwater was finalized in August 2010 and defines the land use controls required by the OU 3 ROD. The RD includes land use restrictions on the property to protect the integrity of groundwater monitoring structures, and to prohibit the use of untreated groundwater from the site. Figure 3-2 shows the Site 1 LUC boundary. Annual LUC inspections have been conducted at Site 1 to verify compliance with the LUCs identified in the Site 1 ROD. In November 2010, the Site 1 Land Use Controls - 2010 Annual Inspection Report was submitted to the regulators (Tetra Tech, 2010b). The 2011 Annual Inspection Report was submitted to the regulators in September 2011 (Tetra Tech, 2011a). The 2012 Annual Inspection Report was submitted by the Navy to the regulators in September 2012.

Under provisions of BRAC 2005, the land associated with Site 1 and Site 10 was conveyed to the U.S. Air Force to construct an "Armed Forces Reserve Center" to consolidate regional Army Reserve training activities into a central location at a military enclave to be established at NAS JRB Willow Grove. Construction planning for the Armed Forces Reserve Center commenced in 2008. Preliminary planning included a concept design for placement of structures and utility facilities needed for the Army Reserve. Issues such as proper building construction and planning to take into account the existing environmental restrictions at Site 1 and Site 10 were included in the preliminary design effort by the Army. In September 2009, the Navy transferred 18.25 acres of land (including Site 1) to the Air Force as part of the BRAC 2005 requirement to construct a consolidated Armed Forces Reserve Center. The construction of the Armed Forces Reserve Center training enclave was completed in 2011.

In July 2009, Tetra Tech prepared the draft Sampling and Analysis Plan (SAP) for Site 1 Groundwater Monitoring and submitted it to the regulators for review. The SAP for Site 1 Groundwater Monitoring was finalized in July 2011 (Tetra Tech, 2011b). Groundwater samples were collected from three on-site monitoring wells and two Navy supply wells to monitor the nature of contamination. Since the interim ROD was signed, two rounds of biennial groundwater monitoring have occurred. The first round of Site 1 Groundwater Monitoring was conducted in September 2009. The final Site 1 Groundwater Monitoring Results report was distributed in November 2009 (Tetra Tech, 2009a). Because of the construction of the Army Reserve Training Center and an associated storm water retention basin, monitoring wells 01MW01SO and 01MW01S were abandoned and replaced with monitoring wells 01MW01SO-R and 01MW01S-R in May 2011. The second round of groundwater monitoring was conducted in August 2011,

and the report was finalized in April 2012 (Tetra Tech, 2012a). The third round of Site 1 Groundwater Monitoring was performed by the Air Force in September 2013, and the report was issued in December 2013 (National Guard Bureau, 2013).

An Interim Remedial Action Completion Report (IRACR), which documents the remedial actions completed for Site 1 groundwater (implementation of LUCs, periodic groundwater monitoring) was prepared in December 2011 (Tetra Tech, 2011c). The IRACR was signed by the Navy on December 15, 2011 and by EPA on December 21, 2011.

The Five-Year Review for Former NAS JRB Willow Grove was completed on September 27, 2013. The triggering action for this statutory review is the date of EPA's signature date on the interim ROD for Site 1 Groundwater (OU 3). The five-year review is required because the selected remedial actions result in contaminants remaining above levels that allow for unlimited use and unrestricted exposure.

A final ROD for groundwater will be prepared pending completion of EPA's investigation of the off-site source.

3.1.2 Site 2 - Antenna Field Landfill

The Antenna Field Landfill is located in the southern portion of the Naval Air Station, southwest of Runway 10/28 (Figure 3-1). The landfill has been estimated to be approximately 4 acres in size. Figure 3-3 shows the site layout.

The landfill was used between 1948 and 1960 as the principal disposal area for solid waste generated by the facility. Waste disposal activities included the excavation of trenches where wastes were subsequently burned and/or buried. In addition to general wastes, bulk items such as furniture, tires, and shingles were disposed. Paint wastes and sewage sludge were also reportedly disposed (NEESA, 1986).

In the mid 1990's, an antenna array consisting of five antennae was constructed at the site to replace an older antenna array.

B&RE conducted RI field activities at Site 2 in 1991. The RI concluded that additional sampling was needed to further delineate the extent of contamination and/or the sources at the site. The RI recommended a Phase II RI and a FS (HNUS, 1993).

In 1997 Phase II RI fieldwork was conducted, and in 1998 a draft Phase II combined Sites 1, 2, 3, and 5 RI report was submitted to regulators for review (B&RE, 1998). In 1999 the Navy decided to de-link the reporting process for IR Sites 1, 2, 3, and 5, and submit four separate Phase II RI documents.

A draft (Navy internal) Site 2 RI report was completed in 2002 (Tetra Tech, 2002b). During this time period, the Navy discovered debris and discarded empty drums in an area between Site 2 and Site 5, and subsequently designated this area as SSA 12. The Navy contracted with Resource Management Concepts, Inc. (RMC) to remove the drums, obtain samples of the drum/contents (residues only) and soils that could have been impacted. When field conditions were appropriate, RMC removed drums and sampled beneath the drums at SSA 12 (RMC, 2003). Information from the RMC report was sent to the Navy's contractor Tetra Tech for tabulation, evaluation, and possible incorporation into a Final RI Report for Site 2. Tetra Tech combined the results and conclusions of the drum removal and confirmatory sampling into the revised draft Site 2 RI report (Tetra Tech, 2004). However, because of unacceptably high analytical detection limits, comparisons to typical health-based benchmarks [e.g., EPA Risk-Based Concentrations (RBCs) and PADEP medium-specific concentrations (MSCs)] did not lead to a clear resolution of the status of SSA 12. The draft Site 2 RI report remained on hold as the Navy waited to evaluate results of the drum and debris removal from SSA 12. In September 2006, the Navy directed Tetra Tech to prepare a work plan to resample soils at SSA 12. At that time, the Navy also directed Tetra Tech to proceed with preparation of the draft RI report for Site 2.

In May 2007, after a preliminary draft (Navy internal) Site 2 RI report was reviewed, the Navy instructed Tetra Tech to update the ecological risk assessment approach to comply with current EPA and Navy guidelines, including food-chain modeling. In August 2008, a draft Site 2 RI report was submitted to the regulators for review. Based on EPA comments, a draft final Site 2 RI report was completed and the Navy response to comments was also submitted to EPA. There were no further comments on the March 2009 draft final Site 2 RI report, so it was considered as final in April 2009 (Tetra Tech, 2009b).

In April 2009, EPA reviewers of the Site 2 RI Report expressed concern with the date of the most recent Site 2 human health risk assessment (HHRA) update (July 2006), and the age of the groundwater data (1997) used in the Site 2 RI Report. These concerns prompted the Navy to agree to perform an updated evaluation of the Site 2 HHRA, and to sample and analyze groundwater at all Site 2 monitoring wells in May 2009.

At the NAS JRB Willow Grove Team meeting held on June 10, 2009 at EPA Region 3 offices, the Navy submitted the draft Remedial Investigation Report Addendum for Site 2 (Tetra Tech, 2009c) and the Site 2 Groundwater Confirmation Sampling Report (Tetra Tech, 2009d). The draft RI Report Addendum included an updated evaluation of risk to supersede the July 2006 HHRA evaluation using updated risk

calculations for Site 2 which complied with the EPA HHRA guidelines current in May 2009. The draft RI Report Addendum also incorporated the revised data set corresponding to the reduced size of the exposure unit for Site 2 which resulted after SSA 12 was designated as Site 12 in December 2008, and the Site 2 boundaries changed (see section 3.1.12). There were no comments on the June 2009 Remedial Investigation Report Addendum; therefore, it was considered as final in June 2009. The Site 2 Groundwater Confirmation Sampling Report summarized the results of groundwater sampling of all Site 2 monitoring wells performed in May 2009 in accordance with the Uniform Federal Policy Sampling and Analysis Plan (UFP-SAP) for Site 2 Groundwater Sampling (Tetra Tech, 2009e). The Site 2 Groundwater Confirmation Sampling Report was accepted by all parties at the Team meeting with no revision.

In June 2009, the draft Proposed Plan for Site 2 was submitted to regulators for review. In July 2009, the Navy submitted the final Proposed Plan for Site 2 (Tetra Tech, 2009f). This Proposed Plan recommended that no action be taken at Site 2. A public meeting was held August 5, 2009 to present the Navy's plan for Site 2. A public comment period was established from July 29 through September 11, 2009, to encourage public participation in the decision process for the Antenna Field Landfill.

In August 2009, the draft ROD for Site 2 was submitted to regulators for review. The final ROD for Site 2 (Tetra Tech, 2010c) incorporated all comments from regulatory agency reviewers, and included comments from the public. On March 30, 2010, the No Action ROD for Site 2 was signed by the Navy and forwarded to the regulators. PADEP concurred with the Site 2 ROD selected remedy (no action) in a letter dated May 14, 2010. On June 17, 2010, the No Action ROD for Site 2 was signed by EPA.

3.1.3 Site 3 - Ninth Street Landfill

The Ninth Street Landfill site is located at the western boundary of the facility, immediately north of Ninth Street (Figure 3-1). Disposal operations at the 9-acre site were initiated as a replacement for the Antenna Field Landfill in 1960. Wastes were burned and then buried in excavated trenches. Wastes were similar to those at Site 2, and included general wastes, bulk items, paint waste, asbestos, and sewage sludge (NEESA, 1986). Transformers containing PCBs were also stored and serviced in a salvage yard established on the landfill after the landfill's closure in 1967 (EA Engineering, 1990). Figure 3-4 shows the site layout.

B&RE conducted RI field activities at Site 3 in 1991. The RI concluded that additional sampling was needed to further delineate the extent of contamination and/or the sources at the site. The RI recommended a Phase II RI and a FS (HNUS, 1993).

In 1997 the Phase II RI fieldwork was conducted, and in 1998 a draft Phase II RI report was submitted to regulators for review (B&RE, 1998). In 1999, the Navy decided to de-link the reporting process for the IR sites (1, 2, 3, and 5) and submit four separate Phase II RI documents. In response to comments, the Navy performed minor investigations at Site 3 since the draft Phase II RI report was submitted to regulators for review in 1998. USGS performed geophysical logging of two irrigation wells owned by the golf course (the adjacent, downgradient off-site property) in March 1998. Sediments from the retention basin located north of Site 3 (part of the NAS JRB Willow Grove storm water control system) were sampled and analyzed for contamination in 2002 (Woodward and Curran, 2002).

During the period from 1999 through 2004, Site 3 was a lower priority than other IRP sites at NAS JRB Willow Grove. During that time, no individual Site 3 RI report was prepared for submission or separate review, and Site 3 did not progress past Phase II RI investigations because there were funding and priority issues, and a lack of cooperation from the nearby golf course. Requests for access to golf course monitoring wells for RI efforts were met with limited acceptance (e.g., geophysical logging of only some of the golf course wells was permitted). In 2007, the Navy requested and was granted access by the golf course managers to sample the flowing irrigation well and obtain two surface water samples on Lot 1.

With the passage of BRAC 2005, priority and funding issues changed for Site 3. To ensure compliance with the timetable for Base Closure stipulated by BRAC 2005, the Navy engaged its contractors ECOR and Tetra Tech to begin a series of IR program RI/FS tasks at Site 3. By agreement among the Navy, EPA, and PADEP, two new monitoring wells were installed to investigate potential groundwater contamination sources upgradient of Site 3 near the Army Reserve vehicle maintenance facility. Fieldwork completed in 2005 through 2006 included resampling and analysis of all Site 3 monitoring wells (including the new upgradient wells), and additional sampling and analysis of soil near the Army Reserve Hangar. The Navy and EPA agreed on a methodology for preparation of a new HHRA to help determine the eventual disposition of Site 3.

The preliminary (Navy internal) draft Site 3 RI report, reviewed by the Navy in January 2007, concluded that Site 3 soils do not pose a threat to public health or the environment (Tetra Tech, 2007a). However, the Navy considered that the soil analytical data generated during the RI up to that time may not have been representative of actual site conditions. In order to confirm that the conclusion of the preliminary draft RI report regarding site soils was correct, the Navy prepared a work plan for additional test pits and soil sampling in April 2007. Site 3 test pits and soil sampling were carried out according to the approved work plan in April and May 2007. Significant quantities of buried waste material at several Site 3 locations were encountered during this investigation, and soil samples associated with some of the buried waste contained elevated levels of semivolatile organic compounds (SVOCs), pesticides, PCBs, dioxins, and metals. In January 2008, a draft Test Pit and Soil Sampling Letter Report for Site 3 Landfill was

submitted to regulators for review. The Navy responded to EPA comments on the draft Letter Report in May 2008. This Test Pit and Soil Sampling Letter Report was finalized in September 2008 (Tetra Tech, 2008e).

To further delineate the extent of the buried waste and soil contamination discovered during the test pit investigation, and to further characterize the soil contamination, the Navy initiated a landfill delineation investigation which included: brush clearing, EM geophysical surveying, additional test pit excavating and soil sampling, and surface soil and surface water/sediment sampling for ecological screening.

In April 2008, the draft SAP for the landfill delineation study at Site 3 was submitted to the regulators for review. The SAP for the Site 3 landfill delineation was finalized in November 2008 (Tetra Tech, 2008f). The EM geophysical survey of Site 3 was completed in April 2008, and an EM geophysical survey report was submitted in July 2008. Surface soil, surface water, and sediment samples were collected in December 2008. Additional test pit investigation and soil sample collection were conducted in January 2009. The Site 3 Landfill Delineation Report was submitted on June 10, 2009 (Tetra Tech, 2009g). In August 2009, an additional twelve surface soil samples were collected to provide additional data for the ecological risk evaluation.

To update the RI groundwater data while the Navy and EPA attempted to delineate the extent of landfill cells discovered at Site 3 in 2007, a draft SAP for Site 3 Interim Groundwater Monitoring (IGWM) was submitted to regulators for review in December 2007. The SAP for Site 3 IGWM was finalized in March 2008 (Tetra Tech, 2008g). Tetra Tech performed the first round of IGWM at Site 3 in March 2008. The Site 3 IGWM Report Round 1 was submitted in August 2008 (Tetra Tech, 2008h). Round 2 of IGWM at Site 3 was conducted in October 2008, and the Site 3 IGWM Report Round 2 was submitted in December 2008). Round 3 of IGWM at Site 3 was conducted in April 2009, and the Site 3 IGWM Report Round 3 was submitted in August 2009 (Tetra Tech, 2009h).

In order to further investigate the VOC plume at Site 3, two additional monitoring wells, 03MW09O and 03MW09S, were installed east of the perimeter fence road, down gradient of the Site, in January and February 2010. In February 2010, the two new monitoring wells 03MW09O and 03MW09S were sampled for EPA Target Compound List (TCL) VOCs. The analytical results from the new monitoring wells were similar to nearby monitoring wells.

Based on results from the draft Phase II RI and all subsequent activities (including the test pit investigation, landfill delineation investigation and interim groundwater monitoring investigations), Tetra Tech prepared a draft RI report that included an updated human health risk assessment and ecological risk assessment for Site 3. In May 2010, the draft Site 3 RI report was submitted to the regulatory agencies for review. In

response to comments, a revised draft Site 3 RI was prepared and submitted in April 2011 to the regulatory agencies for review. The final Site 3 RI was submitted to the regulators in October 2011 (Tetra Tech, 2011d). Based on the results of the RI, additional sampling for chromium speciation in soils was recommended to determine the appropriate remediation goals. The plan for the work was included in the Site 12 – South Landfill Sampling and Analysis Plan (Tetra Tech, 2011e), and included resampling of soils where elevated levels of chromium were detected. Analysis for total chromium and hexavalent chromium was performed on samples collected in December 2011, and the results will be incorporated in the FS.

Site 3 has been identified in the Final NAS JRB Willow Grove Historical Radiological Assessment (HRA) as a site where radiologically contaminated materials potentially may exist (Tetra Tech, 2013a). Site 3 will be subject to further evaluation including a radiological survey. The Basewide Radiological Management Plan (BRMP) was completed in March 2014 (Tetra Tech, 2014b). Scoping Survey task specific plans (TSP), prepared under the BRMP, were completed in October 2014 (Tetra Tech, 2014c). Results of the radiological survey will be incorporated into the FS. After completion of radiological assessment, the draft Site 3 FS will be submitted to the regulators for review.

3.1.4 Site 4 - North End Landfill

Limited information exists on the operations at the North End Landfill; however, the landfill reportedly was used from approximately 1967 to 1969 to accept overflow wastes from the Privet Road Compound. The site is approximately 3.5 acres in size and is located between the northern end of Runway 15/33 and the Perimeter Road (Figure 3-1). Disposed waste materials are believed to be items not collected during routine trash pickup such as bulk items, sewage sludge, and oils and lubricants. During the site's operation, it is reported that wastes were covered; however, observations from the IAS showed waste materials, including oil, at the surface (NEESA, 1986). Figure 3-5 presents an aerial view of the site.

Based on the SI (EA, 1990), combined with the results of the site screening process, the Navy recommended NFA for this Site. PADEP concurred with the Navy recommendation for NFA at this site (PADEP, 2005). The Navy prepared a summary discussion of review and presented a status update at the December 19, 2006 Navy Willow Grove IRP partnering team meeting. All available past investigation results, correspondence and notes were summarized, and recommendations for future actions were presented for discussion among the team. EPA's Biological Technical Assistance Group (BTAG) visited Site 4 on March 28, 2007 to review conditions. BTAG did not recommend further investigation or action at this site.

The IAS (NEESA, 1986) and the SI (EA Engineering, 1990) described a pool of tarry waste that covered about 50 square feet and was underlain by very soft tarry earth at Site 4. The Navy contracted Tetra Tech to conduct a site screening investigation at Site 4 to further identify the nature of this tarry waste. Site screening investigation field work was carried out, and the location of historical soil boring NELB-1 that reportedly was obtained from the tarry waste area was located in March 2008. The Status of Investigation for Site Screening Area 4 was submitted to the Navy in April 2008. To obtain information about the nature and extent of contamination, a soil sampling investigation at Site 4 tarry waste area was conducted in May 2008. A test pit investigation for the Site 4 tarry waste was conducted in September 2008. The tarry waste and related soil were excavated for off-Base disposal. In January 2009, the Test Pit Investigation Report for SSA 4 was submitted to the regulators (Tetra Tech, 2009i).

Based on discussion at the NAS JRB Willow Grove partnering team meeting held at EPA Region 3 in June 2007 between the Navy, EPA, and PADEP, the Navy agreed to prepare an individual site screening process consensus agreement for No Action at Site 4. An Internal draft Record of Consensus Agreement was prepared in July 2007. Based on the results of the Site Screening Process performed in accordance with the FFA, the Record of Consensus Agreement No Action Decision for Site 4 was signed by the Navy BRAC Environmental Coordinator, EPA Remedial Project Manager (RPM) and PADEP Case Manager on January 21, 2009 (Tetra Tech, 2009j).

3.1.5 Site 5 - Fire Training Area

The Fire Training Area is located in the south-central portion of NAS JRB, approximately midway between Runway 10/28 and State Route 463 (Figure 3-1). The site is located immediately south of Taxiway Juliet and covers an irregularly shaped area of approximately 1.25 acres, as shown on Figure 3-6. The training area was used from 1942 to 1975 for large-scale firefighting exercises, which included the disposal and burning of flammable liquid wastes generated by the Naval Air Station. Wastes, including solvents, paint chemicals, xylenes, toluene, and various petroleum compounds, were consumed at the rate of up to 4,000 or more gallons per year in these firefighting exercises. The area was also reportedly used for the drum storage of these flammable materials during the periods between burning exercises.

The Fire Training Area is primarily covered by grasses, with some woody and brushy vegetation present within the southern portion of the area. The burn area consisted of a "burning ring" that was actually a section of a partially buried steel tank, wide open at the top with an intact bottom below the surrounding grade, which was located in the south-central portion of the site (Tetra Tech, 2002c).

B&RE conducted RI field activities at Site 5 in 1991. The RI concluded that additional sampling was needed to further delineate the extent of contamination and/or the sources at the site. The Phase I RI report recommended a Phase II RI and a FS (HNUS, 1993).

In 1997 Phase II RI fieldwork was conducted, and in 1998 a draft Phase II RI report was submitted to regulators for review (B&RE, 1998). In 1999, the Navy decided to de-link the reporting process for IR sites (1, 2, 3, and 5), and submit four separate Phase II RI documents.

In 2000 additional field work was completed at Site 5 to verify that site groundwater contamination was not moving off-Base toward the Horsham Township Municipal water supply well number 26 (HTMW 26). Sentinel monitoring wells installed on Navy property to monitor water quality between Site 5 and HTMW 26 are now sampled annually by the Base to verify that contamination is not migrating closer toward the municipal water supply well.

The final RI report for Site 5, completed in February 2002, documented halogenated VOC contaminants in groundwater and a range of organic compounds [mainly polycyclic aromatic hydrocarbons (PAHs)] in limited site surface soils (Tetra Tech, 2002c). The final RI Report for Site 5 combined the results from the draft Phase II RI Report, previous findings for Site 5, and the results of activities performed from April 1998 through October 2000 (Tetra Tech, 2002c).

In 2002, Tetra Tech prepared the draft FS report for Site 5 groundwater and submitted it to regulators and the RAB (Tetra Tech, 2002d). Based on RAB member comments, the Navy decided to reconsider emerging (biological and chemical treatment in-situ) technologies, and resubmit a revised draft Site 5 groundwater FS for regulatory and public review. In response to requests from the RAB to include additional remedial alternatives for Site 5 groundwater, the 2002 draft Site 5 groundwater FS was revised and reissued as revised draft in 2004 (Tetra Tech, 2004b).

After submission of the RI Report (Tetra Tech, 2002c), the Navy contracted for installation of an additional airport runway perimeter security fence. Part of the new security fencing was installed in or near the area of known PAH soil contamination. Because of this potential change to Site 5 surface soil conditions in the area of the identified PAH "hot spots," surface and shallow subsurface soil samples were collected in June 2004 for a side-by-side comparison with the 1997 data. The Navy submitted the Site 5 RI Addendum 1, PAH Confirmation Sampling and Analysis Report (Tetra Tech, 2004c) to confirm the status of petroleum compounds in Site 5 soil.

Based on the Action Memorandum for Site 5 - Fire Training Area Soil Removal (Tetra Tech, 2005d), a soil removal action for PAH-contaminated soil at Site 5 began in December 2005. Initial excavation

confirmation samples indicated that PAHs remained at some spots at concentrations above cleanup levels. A second round of excavation and confirmation samples (including sampling and analysis for dioxins as requested by EPA) was followed by soil backfilling in October 2006. The Navy's Site 5 RI Addendum 6 for Soil (Tetra Tech, 2007b) contained the Navy's residual risk calculation approved by EPA, the RMC final closeout report, and an analysis of the potential impact from dioxins (as requested by EPA), and was submitted in July 2007.

The revised draft FS for Site 5 groundwater (submitted in September 2004) generated a list of comments and questions from the EPA that were received in January 2005. The Navy responded with a series of RI work plans and reports of findings to address EPA concerns about past RI field sample collection practices, past HHRA practices, and the site conceptual model. In February 2007, EPA issued a letter of concurrence with the Navy response to comments (RTC) document which provided a response to each of the EPA comments on the Site 5 groundwater FS. In November 2008, the Navy submitted the final FS for Site 5 groundwater (Tetra Tech, 2008j).

Site 5 RI Addendum 2, Soil Investigation for VOC Soil to Groundwater Impact (Tetra Tech, 2006d) was submitted to validate the Navy's RI sample results for VOCs in soil which were obtained in 1997. The 1997 RI sample analysis results were very comparable to the results obtained from the same sample locations using the (2006 current) EPA-preferred method of sample collection and preservation.

Site 5 RI Addendum 3, Technical Memorandum of Risk Assessment Evaluation for Site 5 Groundwater (Tetra Tech, 2007c), and Site 5 RI Addendum 4, Technical Memorandum of Risk Assessment Evaluation for Site 5 Soil (Tetra Tech, 2006e), applied current EPA HHRA guidance, toxicity factors and other current assumptions used for calculating estimated risk, and presented an evaluation of variances from the HHRA performed in 1997. The HHRA Tech Memo for Site 5 soil concluded that the risk drivers and potential chemicals of concern (COCs) remained the same, and highlighted any differences from the 1997 HHRA.

Site 5 RI Addendum 5, Remedial Investigation Addendum Report for Groundwater (OU 2) (Tetra Tech, 2006f) presented results and conclusions from RI activities performed by the Navy in response to EPA comments on the revised draft FS for Site 5 groundwater (Tetra Tech, 2004b). The Navy installed five new boreholes and eight new monitoring wells, performed geophysical logging, packer studies, and analysis of groundwater samples to respond to EPA hydrochemistry, hydrogeology and health risk concerns noted in these comments.

The final Proposed Plan for Site 5 Soil (OU 4) (Tetra Tech, 2007d), proposed no further action for soil at Site 5, and was presented for public comment at a public meeting on July 11, 2007. Several comments

were received from the public during the public meeting, but no additional comments were received during the balance of the public comment period that ran from June 15, 2007 through July 30, 2007. The ROD for Site 5 Soil (OU 4) (Tetra Tech, 2007e) addressed all comments from regulatory agency reviewers, and included comments from the public. The Site 5 Soil (OU 4) ROD was signed by the Navy and forwarded to EPA for signature on September 13, 2007. EPA signed the OU 4 ROD on September 21, 2007.

Preliminary soil sampling and monitoring well installation for the Site 5 groundwater pilot study commenced in May 2008. The Pilot Study SAP for Site 5 Groundwater (OU 2) was finalized in October 2008 (Tetra Tech, 2008k). Field demonstration testing for bioremediation was conducted by the Navy to evaluate the effectiveness of several different electron donors. In April 2009, Tetra Tech began implementation of a bioremediation pilot study to remediate the groundwater of Site 5. The first injection and groundwater recirculation segment of the biostimulation phase of the bioremediation pilot test was initiated on April 7, 2009 and concluded on June 26, 2009. The primary objective of biostimulation was to promote population growth of native bacterial populations by creating more favorable environmental conditions. Two post-biostimulation sampling events indicated that environmental conditions conducive to bioremediation were being created but were not fully achieved, and that the transformation towards these conditions was not sustained. The Navy proposed to conduct a second biostimulation injection event.

The Navy, EPA, and PADEP agreed to proceed with a further testing step consisting of injection of additional sodium bicarbonate and sodium lactate into the aquifer with groundwater recirculation. The second round of biostimulation at Site 5 consisted of approximately two times the quantity of sodium bicarbonate and six times the quantity of sodium lactate added in the first injection segment, and commenced on February 17, 2010 and finished on April 26, 2010. Analytical sampling associated with the second biostimulation injection segment included two sampling events. The first sampling event was performed between March 15 and March 22, 2010. A second sampling event was performed between May 5 and May 10, 2010. The analytical results indicated success (e.g., degradation of VOCs, generation of secondary products, favorable oxidation reduction potential and dissolved oxygen readings) with most of the parameters being monitored, except for the lack of a convincing bacterial population capable of degrading vinyl chloride. Figure 3-6 presents the configuration of the pilot study system.

In June 2010, the Navy, in consultation with EPA and PADEP, decided to continue pilot testing at Site 5 with the addition of appropriate biological stocks (bioaugmentation phase), which included bacteria capable of degrading vinyl chloride. Bioaugmentation Event 1 at Site 5 commenced on July 14, 2010 and was completed on July 16, 2010. In order to accelerate the biodegradation process, the KB-1 Plus culture was injected into wells TW-1, TW-3, 05MW17S, and 05MW01S; this introduced large numbers of

dihalococcoides (Dhc) and dehalobactor (Dhb) bacteria (which contain the required functional genes) into the aquifer's bacterial population. The third round of biostimulation at Site 5 commenced on November 12, 2010 and was completed on December 10, 2010. Similar to the first and second biostimulation events, this round included groundwater extraction, the addition of chemical amendments, and the reinjection of groundwater.

The Pilot Test Report for Site 5 Groundwater (OU 2) was finalized in May 2011 (Tetra Tech, 2011f). The test report indicates that bioremediation has proven to be an effective strategy in destroying the Site 5 groundwater contaminants through the anaerobic, reductive dechlorination process, and that the Site 5 groundwater recirculation system was very effective at distributing the biostimulation amendments throughout the remediation cell.

In order to maintain the conditions favorable for anaerobic degradation of chlorinated volatile organic compounds (CVOCs) for an extended period of time, the fourth round of biostimulation at Site 5 commenced on April 12, 2011 and was completed in May 2011. This was the first injection of lactoil which replaced the original substrate of sodium lactate. The switch to a slow-release substrate was meant to create long-term favorable conditions without the need for frequent amendment injection and recirculation.

In June 2011, the Proposed Plan for Site 5 Groundwater (OU 2) was finalized (Tetra Tech, 2011g). A public meeting was held to present the Navy's plan for Site 5 Groundwater on June 22, 2011. The public comment period was set for June 15 through August 1, 2011 to encourage public participation in the decision. The ROD for Site 5 Groundwater (OU 2) (Tetra Tech, 2012b) addressed all comments from regulatory agency reviewers, and comments from the public. The Site 5 Groundwater (OU 2) ROD was signed by the Navy and forwarded to EPA for signature on September 18, 2012. EPA signed the OU 2 ROD on September 25, 2012. The selected remedy includes in-situ anaerobic bioremediation combined with monitored natural attenuation (MNA) for remediation of VOC-contaminated groundwater within the source area, MNA with long-term monitoring for the diffuse portion of the plume, and LUCs to prevent human contact with COCs until contaminants in the groundwater are at levels that allow for unlimited use and unrestricted exposure.

A round of groundwater monitoring was conducted in August 2012. The results indicated that bioremediation was continuing, and that the environmental conditions were generally favorable, although oxidation reduction potential readings were increasing; therefore, injection of Lactoil was needed to maintain the anaerobic environment. The fifth round of biostimulation, consisting of the injection of 55 gallons of Lactoil, commenced on December 27, 2012 and was completed on February 14, 2013.

In December 2012, the draft Remedial Design for Installation of Additional Injection Wells at the Source Area Bioremediation for Site 5 Groundwater (OU 2) was submitted to regulators for review. The Final RD was submitted in May 2013 (Tetra Tech, 2013b). Seven additional injection wells will be installed to introduce additional bioremediation amendments to the shallow groundwater in the areas that may be beyond the influence of the injections into 05MW01S. Amendments will be added manually to these wells.

The draft Remedial Design for LUCs for Site 5 Groundwater (OU 2) was submitted to the regulators in January 2013 and finalized in May 2013 (Tetra Tech, 2013c). LUCs will be implemented within the Site 5 boundaries to: prohibit the use of untreated groundwater; to require that when future buildings are constructed that the potential for vapor intrusion of VOCs from the subsurface into the buildings is mitigated; and to require that existing buildings install a system to mitigate potential intrusion of VOCs from the subsurface into the structure, or be subject to a vapor intrusion investigation that documents that an unacceptable risk to future occupants is not present.

The remedial action for installation of additional injection wells was completed in July 2013. The implementation of LUCs was completed in April 2014 (Navy BRAC PMO, 2014). A Remedial Action Completion Report (RACR), completed in September 2014, documents the remedial actions completed for Site 5 Groundwater (Tetra Tech, May 2014e). A report demonstrating that the remedy is operating properly and successfully was finalized in May 2015 (Tetra Tech, May 2015a), and the Operation, Maintenance and Monitoring Plan was also finalized in May 2015 (Tetra Tech, May 2015b).

3.1.6 Site 6 - Abandoned Rifle Range No. 1

Abandoned Rifle Range No. 1 is located adjacent to Horsham Road near the southwestern corner of the Marine Reserve Compound (Figure 3-1). The Marine Reserve Training Center building and parking area that was constructed in the mid-1990s now covers virtually all of what is estimated as Site 6 (Figure 3-7).

The range was built in 1942 and consisted of a firing mat and an earthen rampart. The rampart was approximately 1 acre in size. It is not known when the range was closed; however, because the second range was not built until 1965, it is assumed that this site was active until that time. After the site was closed, the rampart was regraded. There are no records indicating whether or not the lead from the fired rounds was removed; therefore, it is assumed that the lead was mixed with the earth from the rampart during the regrading (NEESA, 1986).

EA Engineering performed ESI fieldwork at Site 6 in 1991. Results indicated no apparent threat to health or the environment, and no further action was recommended (EA Engineering, 1992).

PADEP concurred with the Navy recommendation for NFA at this site (PADEP, 2005). The Navy prepared a summary review and presented a status update at the scheduled December 19, 2006 Navy Willow Grove IRP Partnering Team Meeting. All available past investigation results, correspondence and notes were summarized, and recommendations for future actions were presented for discussion among the team.

Based on the results of the Site Screening Process performed in accordance with the FFA, the Record of Consensus Agreement No Action Decision for Site 6 was signed by the Navy BRAC Environmental Coordinator and the EPA RPM on December 12, 2007. PADEP agreement with the decision was documented in a letter from PADEP that was included as an attachment to the Record of Consensus Agreement document. Copies of the fully-executed Site 6 Record of Consensus Agreement document were distributed in January 2008 (Tetra Tech, 2008l).

3.1.7 Site 7 - Abandoned Rifle Range No. 2

The site is located in the northwestern corner of the facility, west of the north end of Runway 15/33 (Figure 3-1). Construction and operation of the range were similar to Site 6, and consisted of a 1-acre earthen rampart to collect fired rounds of ammunition. The range operated from 1965 until 1977, when the current range located in Building 176 at the Army Reserve Compound was constructed. The rampart, along with the spent ammunition, was regraded in 1977. This area was subsequently used as a landfill for inert materials including clean fill, broken concrete, asphalt, and cinderblocks. In addition, dry wastewater treatment sludge and emulsified oil and grease from on-site oil/water separators were reported to have been buried at the site (NEESA, 1986). Figure 3-8 presents an aerial view of the site.

Based on the ESI (EA, 1992) and also the results of the site screening process, the Navy recommended NFA for this Site. PADEP concurred with the Navy recommendation for NFA at this site (PADEP, 2005). The Navy prepared a summary review and presented a status update at the scheduled December 19, 2006 Navy Willow Grove IRP partnering team meeting. All available past investigation results, correspondence and notes were summarized, and recommendations for future actions were presented for discussion among the team. EPA's BTAG visited Site 7 on March 28, 2007 to review conditions. BTAG did not recommend further investigation or action at this site.

In January 2008, the Navy prepared a technical memorandum presenting a human health risk screening evaluation (HHRSE) of soil and groundwater at Site 7. The HHRSE compared existing data to EPA Region III RBCs to conservatively estimate the potential for adverse carcinogenic and non-carcinogenic health effects from exposures to soil and groundwater. Concentrations of all chemicals detected in soil

were less than their respective RBCs for residential exposures to soil with the exception of arsenic. Concentrations of arsenic exceeded the RBC at most sampling locations, but concentrations of arsenic were within background levels for soil. Manganese was the only chemical detected in groundwater at concentrations exceeding the full RBCs for tap water. Manganese slightly exceeded its full RBC in one sample.

Based on discussion at the NAS JRB Willow Grove partnering team meeting held at EPA Region 3 in June 2007 between the Navy, EPA, and PADEP, the Navy agreed to prepare a site screening process consensus agreement for No Action at Site 7. The Record of Consensus Agreement No Action Decision for Site 7 (Tetra Tech, 2008m) was signed by the Navy BRAC Environmental Coordinator, EPA RPM, and PADEP Case Manager on August 20, 2008.

3.1.8 Site 8 - Building 118 - Abandoned Fuel Tank

The site consists of a former underground 500-gallon heating fuel tank located approximately 50 feet north of Building 118 (Figure 3-1). The tank was placed in service in 1959, and was abandoned in place in 1980 when it was replaced with a 290-gallon above ground tank. The tank contained only No. 2 heating fuel and serviced Building 118. In 1980, oil was observed seeping into the basement of Building 118. This occurred on an intermittent basis, and the oil was removed after each occurrence. The tank was investigated as a result of the seepage. The tank was empty and soils in the excavation around the tank did not indicate the presence of released materials; however, the fill and riser pipes were removed and the tank was buried in place (NEESA, 1986). Figure 3-9 presents an aerial view of the site.

PADEP issued a notice of agreement (PADEP, 2005) with the Navy recommendation for NFA at Site 8 under Pennsylvania storage tank regulations (Act No. 32; P.L. 169 and PA Code Title 25, Chapter 245). EPA sent a letter agreeing that the site had non-CERCLA issues and could be closed out from a CERCLA perspective (EPA, 2006).

3.1.9 Site 9 - Steam Plant Building 6 Tank Overfill

When the main steam plant (Building 6) was converted from coal to oil in 1969 through 1970, spill containment for the fuel oil tank was not constructed. In 1978, a fuel oil supplier delivered No. 2 fuel oil to a filled tank while leaving the delivery truck unattended. The fuel backed up through the vent pipe, and approximately 3,000 to 5,000 gallons of fuel oil were released. The spill was located in the area between Building 6 and Building 114 (Figure 3-1). This area is now bermed to contain spills resulting from fuel delivery. An aerial view of the site is presented on Figure 3-10.

The NAS JRB Willow Grove fire department responded to the spill event and flushed the fuel with water. Runoff was directed to drainage swales downstream of the steam plant. The spill was directed toward the Air Reserve Facility's detention basin on the northern side of the facility. The basin was equipped with oil spill containment devices. The total affected area was less than 1 acre (NEESA, 1986).

PADEP issued a notice of agreement (PADEP, 2005) with the Navy recommendation for NFA at Site 9 under Pennsylvania storage tank regulations (Act No. 32; P.L. 169 and PA Code Title 25, Chapter 245). EPA sent a letter agreeing that the site had non-CERCLA issues and could be closed out from a CERCLA perspective (EPA, 2006). The property with Site 9 was transferred by the Navy to the Air Force in 2009.

3.1.10 Site 10 - Navy Fuel Farm

Site 10 is located south of the Air Reserve facility along the north side of Privet Road (Figure 3-1). Figure 3-11 presents the site layout. The site formerly had two partially buried, 210,000-gallon fuel tanks (Tank No. 115 and Tank No. 116) containing aviation fuel. Two smaller underground storage tanks (USTs) were located in the southeastern corner of the site. One of the smaller tanks contained diesel fuel, and the other was used for storage of waste oil. The waste oil tank was formerly used for fuel storage. In 1986, Tank No. 115 was overfilled and fuel was released to the ground. The same year, during excavation for utility work on the southern side of the site, non-aqueous phase liquid (NAPL) was observed floating on top of the water in the trench. The NAPL was observed in the area of a dry well located near the northeastern corner of Building 81, which is located south of the 210,000 gallon tanks. The dry well was used to discharge effluent water siphoned from the bottom of the fuel tanks (EA Engineering, 1990). In March 1989, aviation fuel was detected emanating from two patches of dead grass on the west side of Tank No. 115. In 1991 the two main fuel tanks and the waste oil and diesel fuel USTs were removed. Inspection of the waste oil tank during removal revealed that the tank was not intact, and reportedly had holes up to 1 inch in diameter.

In 1995, groundwater remediation pilot systems were investigated to address the petroleum (aviation fuel) contamination at Site 10 (Navy Fuel Farm) under the PADEP UST program. The Final Study Report for the Product Recovery Pilot System was completed in 1996 (EA, 1996).

In 1998, a light non-aqueous phase liquid (LNAPL) recovery system designed to remediate the fuel spill was installed.

In 2001, the Navy discontinued active operation of the LNAPL recovery system for the jet fuel spill. Quarterly floating product recovery by bailing, or capture by absorption onto recovery "socks" placed in the well continued until January 2003.

PADEP approved the final Work Plan for various fieldwork efforts at Site 10 (EA, 2003a). Field work included installing and sampling of monitoring wells and soil borings to evaluate current site conditions. A final RI for Site 10 soil was submitted in December 2003 to support no further investigation at this time (EA, 2003b).

In September 2004, the Navy submitted the Request for No Further Action for IR Program Site 10 Groundwater (EA, 2004). PADEP agreed with the Navy that no further remedial action or investigation was appropriate at that time for Site 10 soils or groundwater. However, PADEP noted in their letter (PADEP, 2004a) that groundwater and soil at Site 10 do not meet criteria for unrestricted use, and that it may be appropriate to seek full closure under Act 2 if land use changes.

Under provisions of BRAC 2005, the land associated with Site 1 and Site 10 was conveyed to the U.S. Air Force to provide an enclave to construct an “Armed Forces Reserve Center” to consolidate regional Army Reserve training activities into a central location at a military enclave to be established at NAS JRB Willow Grove. Proper building construction techniques to take into account the existing environmental restrictions at Site 1 and Site 10 were included in the design effort by the Army. In September 2009, the Navy transferred 18.25 acres (including Site 10) to the Air Force. The consolidated Armed Forces Reserve Center was completed in 2011.

3.1.11 Site Screening Area 11 - Aircraft Parking Apron (SSA 11)

In 1992, during construction of footers for an Air Force building, organic odors were detected by the construction crew. This area, designated SSA 11, is located at the north end of the main runway, between the Navy and Air Force parking aprons (Figures 3-1 and 3-12). It is suspected that fuel was spilled in this area in the past. Although soil samples were analyzed and the suspected contaminated soil was excavated, confirmation sampling was not conducted in 1992. Also, the analytical method was not stipulated and the laboratory reporting units were questionable (the samples consisted of soil; however, the reporting units indicated aqueous samples). Therefore, PADEP requested that confirmation soil samples be collected and evaluated to determine if attainment of Act 2 liability protection for closure could be demonstrated for SSA 11. In addition, PADEP requested that groundwater be sampled downgradient of the site to determine if the petroleum-contaminated soil had affected the groundwater in the area.

PADEP approved the final Work Plan for various fieldwork efforts at SSA 11 dated March 2003 (EA, 2003a). Field work included installing and sampling monitoring wells and soil borings to evaluate current site conditions to determine if any of the previously reported petroleum contamination remained.

In March 2004 the Navy submitted the final report of PADEP Act 2 soil sampling and analysis (EA, 2004) at SSA 11. PADEP agreed with the Navy conclusion that this "site" did not meet the criteria necessary to be considered under any program for potential remediation. This "site" has never formally entered either the IR or UST program. It was agreed by PADEP and the Navy that no further action of any kind is required for SSA 11 (PADEP, 2004b). The Navy received a letter from EPA dated February 12, 2007 indicating concurrence that no further remedial actions are needed for SSA 11 (EPA, 2007). The property with SSA 11 was transferred by the Navy to the Air Force in 2009.

3.1.12 Site 12- South Landfill

In 2003 the Navy contractor RMC removed drums and debris and sampled soil at the Environmental Photographic Interpretation Center (EPIC) drum and debris site, SSA 12 (the site screening area between Site 2 and Site 5 described in section 3.1.2 and shown on Figure 3-1). Information from the drum removal and soil sampling report (RMC, 2003) at SSA 12 was sent to the Navy's contractor Tetra Tech for tabulation, evaluation, and incorporation into a final report of cleanup. However, because of unacceptably high analytical detection limits, comparisons to typical health-based benchmarks (e.g., EPA RBCs and PADEP MSCs) did not lead to a clear resolution of the status of the SSA 12 drum removal area.

Based on the inconclusive nature of the soil report for the SSA 12, the Navy contracted Tetra Tech to obtain confirmation samples from this area. SSA 12 was defined at that time as the portion of Site 2 northeast of the usually dry drainage ditch running through Site 2, roughly cutting Site 2 in half. The draft Work Plan for Soil Investigation at Site Screening Area 12 was submitted for regulatory agency review and comment in May 2007. In November 2007, the Navy submitted the final Work Plan for Soil Investigation at SSA 12 (Tetra Tech, 2007f). A confirmation soil investigation for SSA 12 was conducted in December 2007, and EM geophysical surveys were performed in March 2008. An EM geophysical survey report was submitted in July 2008, and the SSA 12 Confirmation Soil Investigation Report was submitted in September 2008.

After reviewing conditions at SSA 12 (including visual observations of a “hummocky” appearance), and extensively clearing brush and conducting an EM survey of subsurface conditions, it was determined that buried waste was present on the northeast side of the drainage ditch. Consequently, in December 2008 the Navy in agreement with EPA and PADEP initiated a separate Remedial Investigation and CERCLA decision process for SSA 12. The area then became designated as Site 12, South Landfill.

To further delineate the nature and extent of any buried waste at the site, and to further characterize the nature and extent of the soil contamination discovered during previous investigations, the Navy initiated the Phase I Remedial Investigation process at Site 12. In August 2009, the draft SAP for the Phase I RI at Site 12 was submitted to the regulators for review. The RTC document which addressed EPA comments on the Site 12 Phase I RI SAP was submitted in November 2009. The SAP for the Phase I RI at Site 12 was finalized in December 2009 (Tetra Tech, 2009k).

In January 2010, the Navy initiated the Phase I Remedial Investigation at Site 12, which included installing test pits and collecting subsurface soil samples, as well as surface water, sediment, and surface soil samples for ecological screening. In June 2010, the draft Site 12 Phase I RI Data Report was submitted to the regulators for review. The Phase I Remedial Investigation Data Report for Site 12-South Landfill was finalized in January 2011 (Tetra Tech, 2011h). The report describes the data collection effort and the analytical results of: the geophysical survey; test pits; and surface/subsurface soil, sediment, and surface water sampling. Contaminants with concentrations that exceeded the EPA RSLs and/or the PADEP MSCs consisted of: SVOCs, pesticides, and metals in surface soil; SVOCs, pesticides, dioxins and metals in subsurface soil; SVOCs, pesticides and metals in surface water; and VOCs, SVOCs, pesticides and metals in sediment. To further determine the nature and extent of contamination and to evaluate risks to human health and the environment, a draft UFP-SAP for the Phase II Remedial Investigation at Site 12 was prepared and submitted to the regulatory agencies in April 2011. Comment resolution was completed and the final UFP-SAP for the Phase II Remedial Investigation at Site 12 was submitted in October 2011 (Tetra Tech, 2011e).

The Phase II Remedial Investigation field work commenced in December 2011. Soil sampling was completed in January 2012, and the groundwater monitoring well construction and sampling was completed in March 2012. Figure 3-13 presents the site layout showing monitoring well locations. Results of the Phase II RI confirmed the findings of the Phase I investigation, and provided further delineation of the extent of contamination. A draft Phase II RI report for Site 12 was submitted to the regulators for review in April 2013 (Tetra Tech, 2013d). The final Phase II RI report was completed in February 2014. (Tetra Tech, 2014a).

Site 12 has been identified in the Final NAS JRB Willow Grove Historical Radiological Assessment (HRA) as a site where radiologically contaminated materials potentially may exist (Tetra Tech, 2013a). The results of the radiological investigation will be incorporated in the FS. The Basewide Radiological Management Plan (BRMP) was completed in March 2014 (Tetra Tech, 2014b). Scoping Survey task specific plans (TSP), prepared under the BRMP, were completed in October 2014 (Tetra Tech, 2014d).

3.1.13 Perfluorinated Compounds

Perfluorinated compounds (PFCs), a class of “emerging contaminants” were detected in groundwater, at and near the former NAS JRB Willow Grove installation. EPA defines an emerging contaminant as a chemical or material that is characterized by a perceived, potential, or real threat to human health or the environment or by a lack of published health standards. The Navy is addressing the PFCs under the IRP in accordance with CERCLA.

EPA has established an Unregulated Contaminant Monitoring Rule (UCMR) program as part of the 1996 Safe Drinking Water Act (SDWA) amendments. Under the UCMR program, drinking water is tested nationwide for various chemical, biological, and radiological contaminants that are suspected to be present, but for which health-based standards have not been established under the SDWA (EPA 2014a). In June 2014, HWSA collected water samples from Horsham Township public water supply wells in accordance with the third cycle of EPA’s UCMR program, called UCMR 3. Under UCMR 3, HWSA sampled their public water supply wells for 21 of the 30 UCMR 3 constituents. PFOS was detected in wells 26 and 40 above the PHA level of 0.2 micrograms per liter (µg/L” (EPA 2014a). PFOA also was detected in wells 26 and 40 but at levels below the PHA level of 0.4 µg/L. EPA established the PHA levels for PFOS and PFOA in 2009 to assess the potential risk from short-term exposure to the chemicals through drinking water. The PHA levels reflect “reasonable, health-based hazard concentrations above which action should be taken to reduce exposure to unregulated contaminants in drinking water” (EPA 2014b). In response to the UMCR 3 sampling results, HWSA took wells 26 and 40 off-line in July 2014. PFOS and PFOA were also detected, at levels below the PHA level, at other public water supply wells and HWSA is continuing to monitor those wells.

PFOS and PFOA are emerging contaminants that the EPA is now monitoring because the constituents have been widely distributed in the environment throughout the United States. PFOS and PFOA are surface-active agents (also known as surfactants) that provide lifting properties to products such as foaming agents, detergents, and emulsifiers. They are also used in industrial and commercial applications such as metal plating, the photographic industry, paper and packaging, coating additives, cleaning products, household products, and pesticides. PFOS-based aqueous film-forming foam (AFFF) is used to extinguish fuel fires” (EPA 2014b).

Based on the locations of HWSA wells 26 and 40 and typical sources of PFOS and PFOA, it is suspected that the use of firefighting foam at the former NAS JRB Willow Grove and nearby Horsham Air Guard Station is likely the primary source of the elevated PFOS and PFOA levels. Limited sampling conducted in 2011 at IRP Site 5 – Fire Training Area identified PFOS and PFOA in groundwater. The Site 5 ROD required PFCs to be reevaluated during the IRP Five-Year Review.

In addition to the Site 5 Fire Training Area, the use of AFFF to disperse fuel spills adjacent to hangars (buildings) 80 and 175, inadvertent activation of fire suppression systems in the Hangars, and spills of AFFF are potential sources of site-wide PFC contamination. Potential PFC source areas are shown on Figure 3-14 (Resolution Consultants 2015). In response to the PFOS and PFOA detections in HWSA wells 26 and 40 as well as other information, the Navy sampled perimeter groundwater monitoring wells at the former NAS JRB Willow Grove property for PFOS and PFOA between July and August 2014. The perimeter groundwater monitoring wells that were sampled consisted of 20 sets of single wells and clustered wells of varying depths that comprise a total of 34 wells. Of the 34 wells sampled, 30 PFOS results and 14 PFOA results exceeded their respective PHA levels. There were only two well locations where neither the PFOS nor the PFOA result exceeded the PHA level. In September 2014, the Air Force tested water samples from the two drinking water wells at the Horsham Air Guard Station (HAGS). The PFOS and PFOA results for the samples exceeded the respective PHA levels.

In August 2014, the Navy initiated a Time Critical Removal Action (TCRA) to address the discovery of PFCs in Horsham Township. As part of the TCRA, the Navy is working with HWSA to provide treatment systems on public supply with wells at or above the PHA levels. The Navy (with EPA support) is also analyzing samples from private water wells surrounding the base, and providing alternate drinking water supplies to private well users where PFOS/PFOA concentrations exceed the PHA levels. An Action Memo describing the TCRA is being prepared.

Soils at the former NAS JRB Willow Grove property have not been tested for PFCs; therefore, it is unknown whether PFCs are present in soils at the installation. However, if PFOS and PFOA have been found in groundwater, they may also be present in subsurface soil in certain areas. In their anionic forms, PFOS and PFOA are water-soluble and can migrate readily from soil to groundwater. The EPA has not established action levels for PFOS and PFOA in soil. The primary exposure pathway for PFOS and PFOA would be the ingestion of contaminated drinking water.

The Navy has initiated an RI for PFCs on the installation, which is tentatively scheduled to be completed in 2016. The RI will characterize site conditions, the nature and extent of contamination, and risks posed by that contamination to human and/or environmental receptors. The RI will provide the information needed to evaluate and select appropriate remedial alternatives. The Navy will complete the investigation and appropriate remedial activities as required under CERCLA.

4.0 SITE RANKING AND SMP SCHEDULES

4.1 SITE RANKING

A site ranking methodology was developed by the DoD to rank Defense Environmental Restoration Program (DERP) sites based on the degree of risk posed to human health and the environment. Results of the ranking were used to prioritize sites and focus investigation and remediation efforts. Sites were categorized into High, Medium and Low relative risk groups to assure that investigations of sites currently impacting human or ecological receptors, or with the potential for significant migration from the site, are conducted before sites posing less significant threats. However, following the inclusion of NAS JRB Willow Grove on the BRAC 2005 for closure, relative risk site ranking will no longer be used to prioritize sites for cleanup. Cleanup priorities will be determined according to property disposal schedules.

The following list presents the status for site investigation and/or remediation activities:

- Site 1 (Long-Term Groundwater Monitoring and Land Use Controls)
- Site 2 (No Action ROD)
- Site 3 (RI/FS Process)
- Site 4 (Consensus Agreement for No Action)
- Site 5 [Groundwater Remedy (ongoing)]
- Site 6 (Consensus Agreement for No Action)
- Site 7 (Consensus Agreement for No Action)
- Site 8 (No Further Action Agreement)
- Site 9 (No Further Action Agreement)
- Site 10 (No Further Action at This Time)
- SSA 11 (Eliminated From Consideration)
- Site 12 (RI/FS Process)
- Perfluorinated Compounds (RI/FS Process, TCRA)

Historical summaries for major investigative and project activities for each site are provided in Section 3.0. Projected schedules for the sites are presented in this section. These schedules are based on currently available information and are intended to be adjusted periodically during the decision-making process or after new data become available. Appendix A presents master schedules showing milestones, up to and including “response complete” (RC) or "remedy in place" (RIP) (also known as "project end date" in the FFA). Primary documents and review cycles planned for each site and SSA are shown in the Appendix A schedules.

4.2 SCHEDULING ASSUMPTIONS

4.2.1 Document Preparation and Review Assumptions

Durations for work plan and draft report preparation activities are based on available site information, site complexity, and the anticipated amount of new data to be generated by future field investigations. The time required for document review varies based on the length and complexity of the document. For purposes of this SMP, documents have been categorized as either primary or secondary. Primary documents are the major deliverables associated with each phase of the remedial process as discussed in Section 2.0. Secondary documents fulfill portions of phased requirements and are assumed to be relatively straightforward in complexity and shorter in length than primary documents. Table 4-1 presents the primary documents for the various remedial process phases and their associated secondary documents. Table 4-2 presents the schedule for completion of review and response to comments for primary and secondary documents.

Time required to complete draft deliverables has been based on historical data for preparation and submittal of similar documents. Estimated schedules will be included in site-specific work plans. These schedules will be adjusted to account for impacts from new data or availability of funding.

Estimated document preparation times for preliminary draft documents are presented in Table 4-3. These durations are the time required to complete various preliminary draft deliverables after completion of field activities. The review and comment process for draft and final documents is discussed in Section 10 (Consultation) of the FFA.

4.2.2 Field Investigation and Sample Analysis Validation Assumptions

The schedule for field investigations includes mobilization/demobilization of all equipment and personnel (including procurement and oversight of subcontractors where required), and conducting all field activities. The schedule also allows for proper handling and disposal of investigation-derived wastes (IDW). The duration of these events is dependent on the number and types of samples collected, role of subcontractors (e.g., drilling and monitoring well installation, surveying, etc.), and accessibility of the site to complete the field activities.

It has been assumed for scheduling purposes that samples will be analyzed and reported using standard 28-day laboratory turnaround time. Data validation activities are scheduled for completion within 21 days of receipt of laboratory data.

4.3 SITE MANAGEMENT PLAN ASSUMPTIONS

The timely flow of work and report/milestone development durations outlined in this SMP assume that the necessary funding, when requested by the Navy in a timely manner, will be approved by Congress (see Section XXVII - FUNDING of the FFA). This SMP provides the document preparation durations for the NAS JRB Willow Grove sites. Schedules for RI/FS and RD/RA activities shown in Appendix A are compressed to the greatest extent possible by overlapping tasks and reducing redundancy in data collection efforts wherever possible. The degree of dependency between the various tasks and documents determines the extent of overlap. Key dependencies between tasks and related assumptions are:

- Remedial Investigation: Preparation of the preliminary draft RI report is assumed to start once all analytical data are received. Some RI tasks can begin before data are validated.

- Feasibility Study: Preparation of the preliminary draft FS may start as early as 2 months after the start of the RI report, provided there is general consensus between the Navy and the regulators and sufficient funding is available.

- Proposed Plan: Preparation of the preliminary draft Proposed Plan is assumed to start following receipt of EPA and state comments on the draft FS. Selection of the proposed remedial action(s) is dependent on regulatory approval of the recommended alternative(s) presented in the FS.

- Record of Decision: Preparation of the draft ROD is assumed to start after completion of the public comment period on the Proposed Plan. Community acceptance of the Proposed Plan must be considered in the selection of the interim or final remedial action(s).

- Remedial Design: The remedial alternative(s) must be selected prior to initiation of the remedial design; therefore, RD activities will commence following finalization of the ROD.

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TABLES

TABLE 1-1

SITE SUMMARY
INSTALLATION RESTORATION PROGRAM
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

SITE	NAME	OPERABLE UNIT (OU)	STATUS
1	Privet Road Compound	Soil - OU 1 Groundwater - OU 3	Soil (OU 1) NFA ROD signed September 2006. Groundwater (OU 3) Interim ROD signed September 2008. Groundwater (OU-3) IRACR Signed December 2011.
2	Antenna Field Landfill	Soil - OU 5 Groundwater- OU 9	No Action ROD Signed June 17, 2010
3	Ninth Street Landfill	Soil - OU 6 Groundwater- OU 10	RI completed October 2011/FS Pending
4	North End Landfill	---	Consensus Agreement for No Action Jan. 2009
5	Fire Training Area	Soil - OU 4 Groundwater - OU 2	Soil (OU 4) NFA ROD signed Sept. 2007 Groundwater (OU 2) ROD signed Sept. 2012. Groundwater (OU2) RACR Signed September, 2014
6	Abandoned Rifle Range No. 1	---	Consensus Agreement for No Action December 2007
7	Abandoned Rifle Range No. 2	---	Consensus Agreement for No Action August 2008
8	Building 118 Abandoned Fuel Tank	---	NFA Agreement October 2006
9	Steam Plant Building 6 Tank Overfill	---	NFA Agreement October 2006
10	Navy Fuel Farm	---	NFA at this time Property transferred to Air Force
SSA 11	Aircraft Parking Apron	---	Eliminated From Consideration
12	South Landfill	OU 11	Final RI February 2014, FS to Follow
PFCs	Perfluorinated Compounds	N/A	TCRA 2014-2015, Draft PA/SI May 2015, RI to Follow

TABLE 4-1

PRIMARY AND SECONDARY DOCUMENTS
INSTALLATION RESTORATION PROGRAM
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

Primary Documents	Secondary Documents
Site Screening Process (PA, SI) Work Plans	Health and Safety Plans
Site Screening Process Reports	Non-Time Critical Removal Action Plans
RI/FS and FFS Work Plans	Pilot/Treatability Study Work Plans
Remedial Investigation Reports	Pilot/Treatability Study Reports
FS and FFS Reports	No secondary documents
Proposed Plans	Engineering Evaluation/Cost Analysis Reports
Record of Decision	No secondary documents
Remedial Action Work Plans • Remedial Action Sampling Plan • Remedial Action Construction Quality Assurance Plan • Remedial Action Environmental Monitoring Plan • Remedial Design for Land Use Controls (RD for LUCs) (formerly referred to as Land Use Control Implementation Plan (LUCIP))	Preliminary Conceptual Design or Equivalent
Final Remedial Designs	Well Closure Methods and Procedures
Remedial Action Completion Reports	Prefinal Remedial Designs
Operation and Maintenance Plans	Periodic Review Assessment Reports
Site Management Plan	Removal Action Memoranda
Community Relations Plan	No secondary documents
Long-Term Remedial Action Monitoring Plan	No secondary documents

PA = Preliminary Assessment
SI = Site Inspection
RI/FS = Remedial Investigation/Feasibility Study
FFS = Focused Feasibility Study
N/A = Not Applicable

TABLE 4-2

DOCUMENT REVIEW AND REVISION SCHEDULE
INSTALLATION RESTORATION PROGRAM
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

Document	Review Duration	Response Duration [2]
Draft Primary or Secondary Document	60 Days [1]	60 Days
Draft Final Primary Document	N/A	N/A
Final Primary Document	N/A	N/A

N/A = Not Applicable
[1] Agency (PADEP, EPA) Review
[2] Incorporation of comments on Draft Report and submittal of Draft Final Report shall occur within 60 days after close of the comment period on the Draft Report

TABLE 4-3

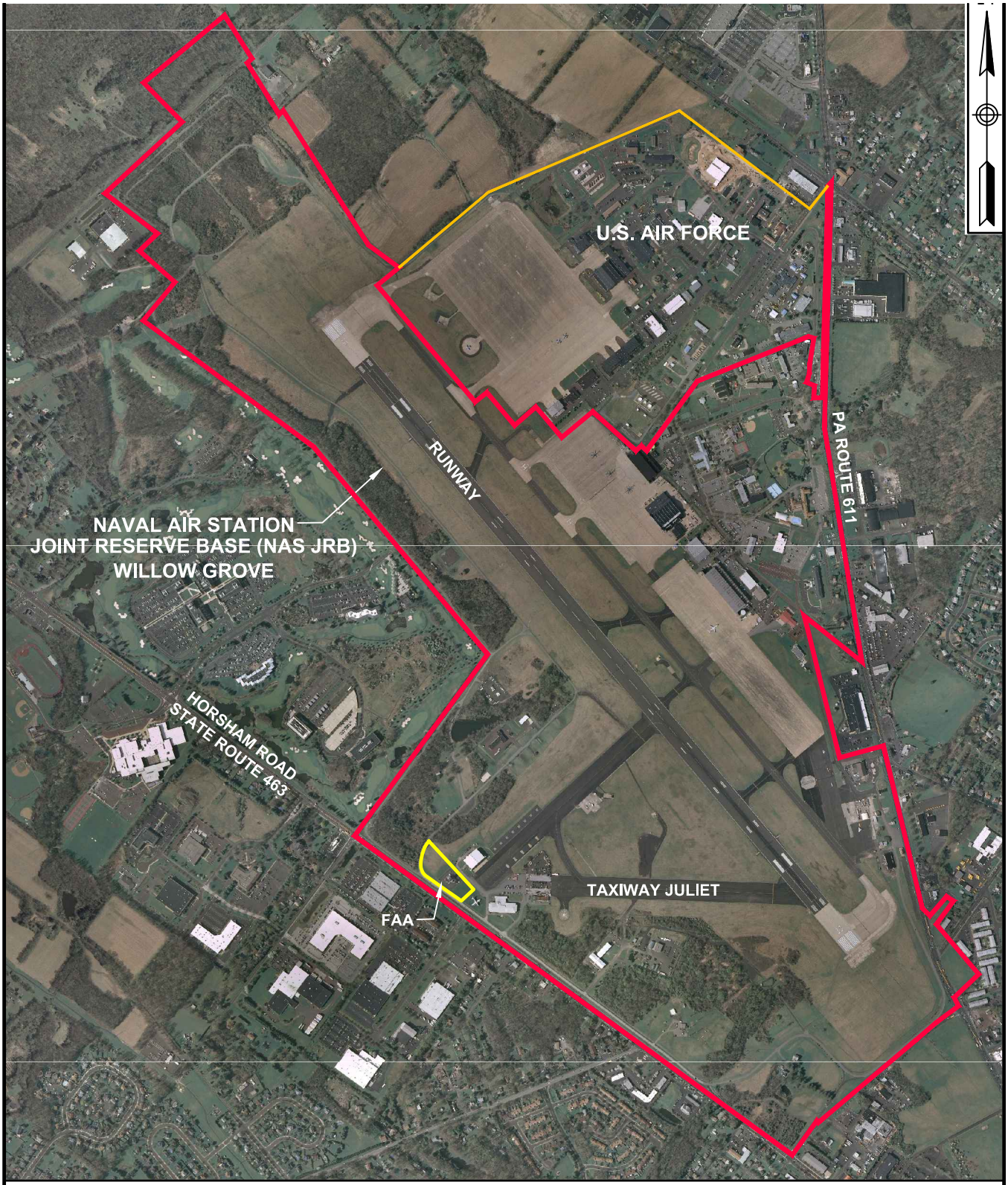
DOCUMENT PREPARATION DURATIONS
INSTALLATION RESTORATION PROGRAM
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

Document	Duration (Months) [1]
Site Inspection Report	2
Remedial Investigation Report	4
Feasibility Study	4
Proposed Plan	2
Record of Decision	2
Draft Remedial Design/Work Plan	5
Prefinal Remedial Design/Work Plan	2
Final Design/Work Plan	2
Engineering Evaluation/Cost Analysis, Focused Feasibility Study	1
Removal Action Memorandum	1
30% Removal Action Design	1
90% Removal Action Design	2
Final Removal Action Design	1
Treatability Study Work Plan	2
Treatability Study Report	1

[1] Durations represent estimated time required to complete preliminary draft documents after completion of field activities.

FIGURES

112G02014\1902\112G02014BM01.DWG 06/14/13 MK



AERIAL BASE MAP PROVIDED BY THE PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY

0 1,400 2,800

SCALE IN FEET

TETRA TECH

FACILITIES LOCATION MAP
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

SCALE	AS NOTED
FILE	112G02014BM01
REV	0
DATE	06/14/13
FIGURE NUMBER	FIGURE 1–1

FIGURE 2-1

RI/FS PROCESS
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

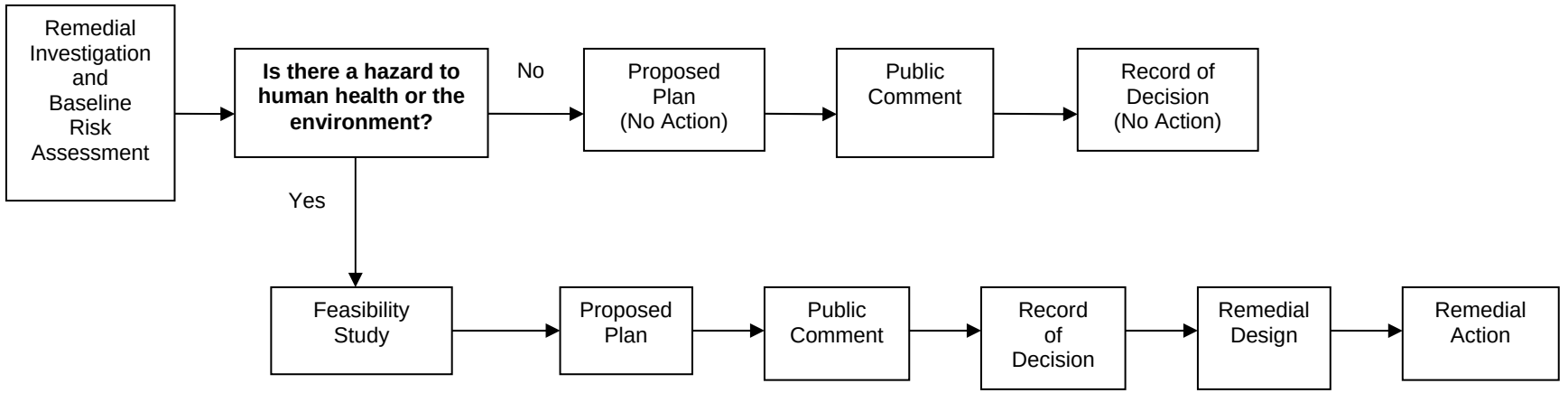


FIGURE 2-2

NON-TIME-CRITICAL REMOVAL ACTION PROCESS
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

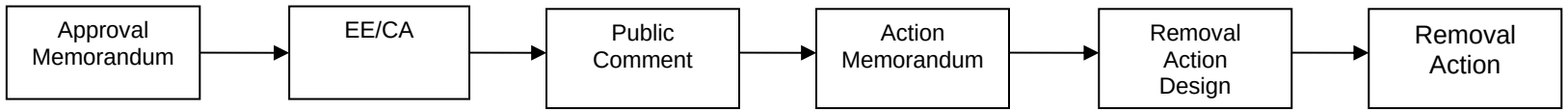


FIGURE 2-3

INTERIM REMEDIAL ACTION PROCESS
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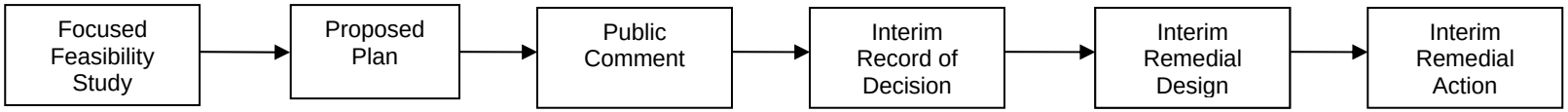
WILLOW GROVE, PENNSYLVANIA



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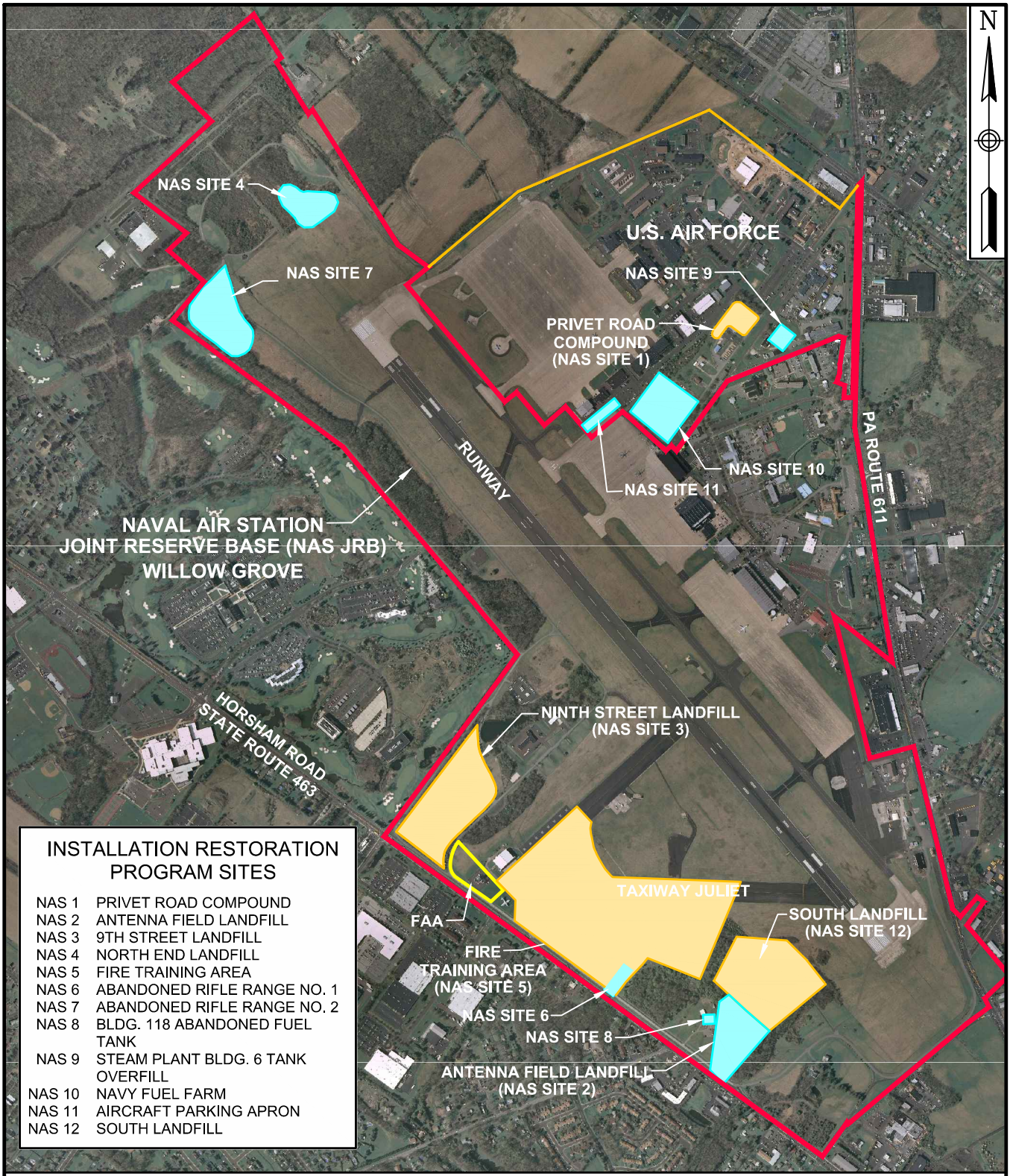

INSTALLATION RESTORATION PROGRAM SITES

NAS 1	PRIVET ROAD COMPOUND
NAS 2	ANTENNA FIELD LANDFILL
NAS 3	9TH STREET LANDFILL
NAS 4	NORTH END LANDFILL
NAS 5	FIRE TRAINING AREA
NAS 6	ABANDONED RIFLE RANGE NO. 1
NAS 7	ABANDONED RIFLE RANGE NO. 2
NAS 8	BLDG. 118 ABANDONED FUEL TANK
NAS 9	STEAM PLANT BLDG. 6 TANK OVERFILL
NAS 10	NAVY FUEL FARM
NAS 11	AIRCRAFT PARKING APRON
NAS 12	SOUTH LANDFILL

LEGEND

ACTIVE SITE

COMPLETED SITE*

* SEE TABLE 1

AERIAL BASE MAP PROVIDED BY THE PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY

0 1,400 2,800

SCALE IN FEET

TETRA TECH

LOCATION OF IR SITES
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

SCALE: AS NOTED

FILE: 112G02014BM01-1

REV: 0 DATE: 06/14/13

FIGURE NUMBER: FIGURE 3-1

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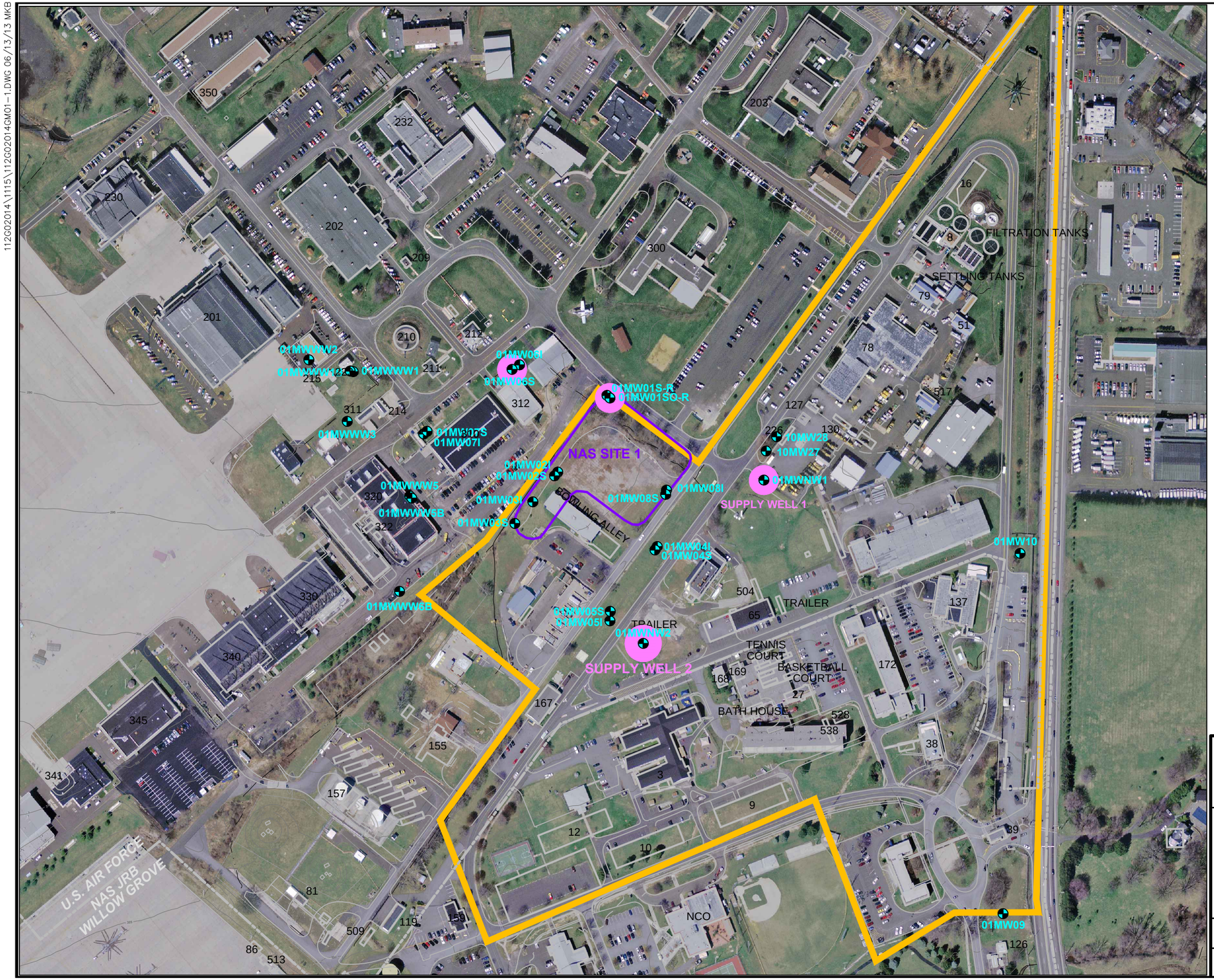

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LEGEND

- MONITORING WELL LOCATION
- PERIODIC GROUNDWATER MONITORING WELL LOCATION
- BOUNDARY OF INSTITUTIONAL CONTROLS
- SITE BOUNDARY
- INSTALLATION BOUNDARY

0 250 500

SCALE IN FEET

TETRA TECH

SITE LAYOUT
SITE 1 – PRIVET ROAD
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

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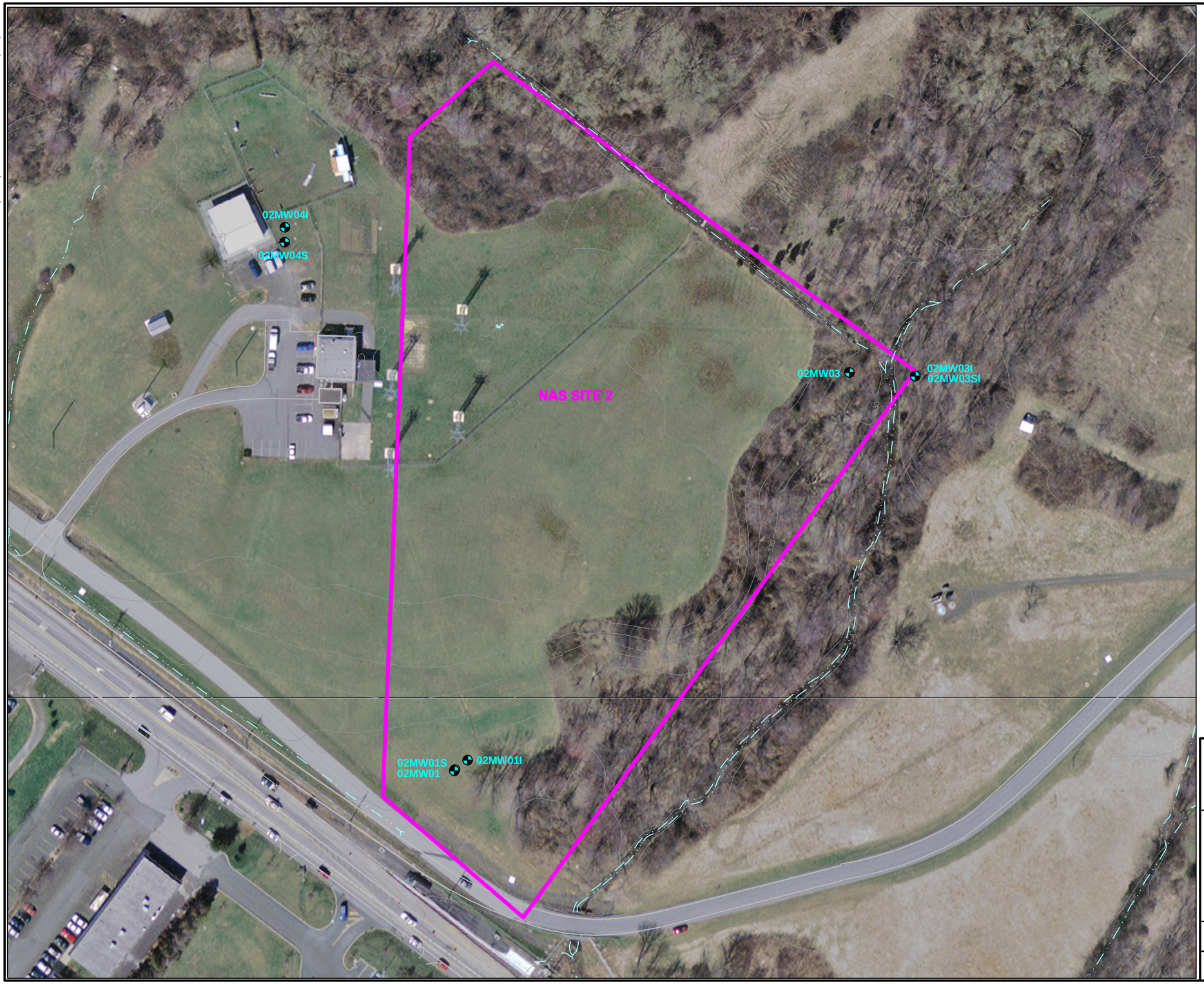

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LEGEND

- MONITORING WELL
- SITE BOUNDARY
- INSTALLATION BOUNDARY

0 100 200

SCALE IN FEET

TETRA TECH

SITE LAYOUT
SITE 2 – ANTENNA FIELD LANDFILL
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

FILE	SCALE
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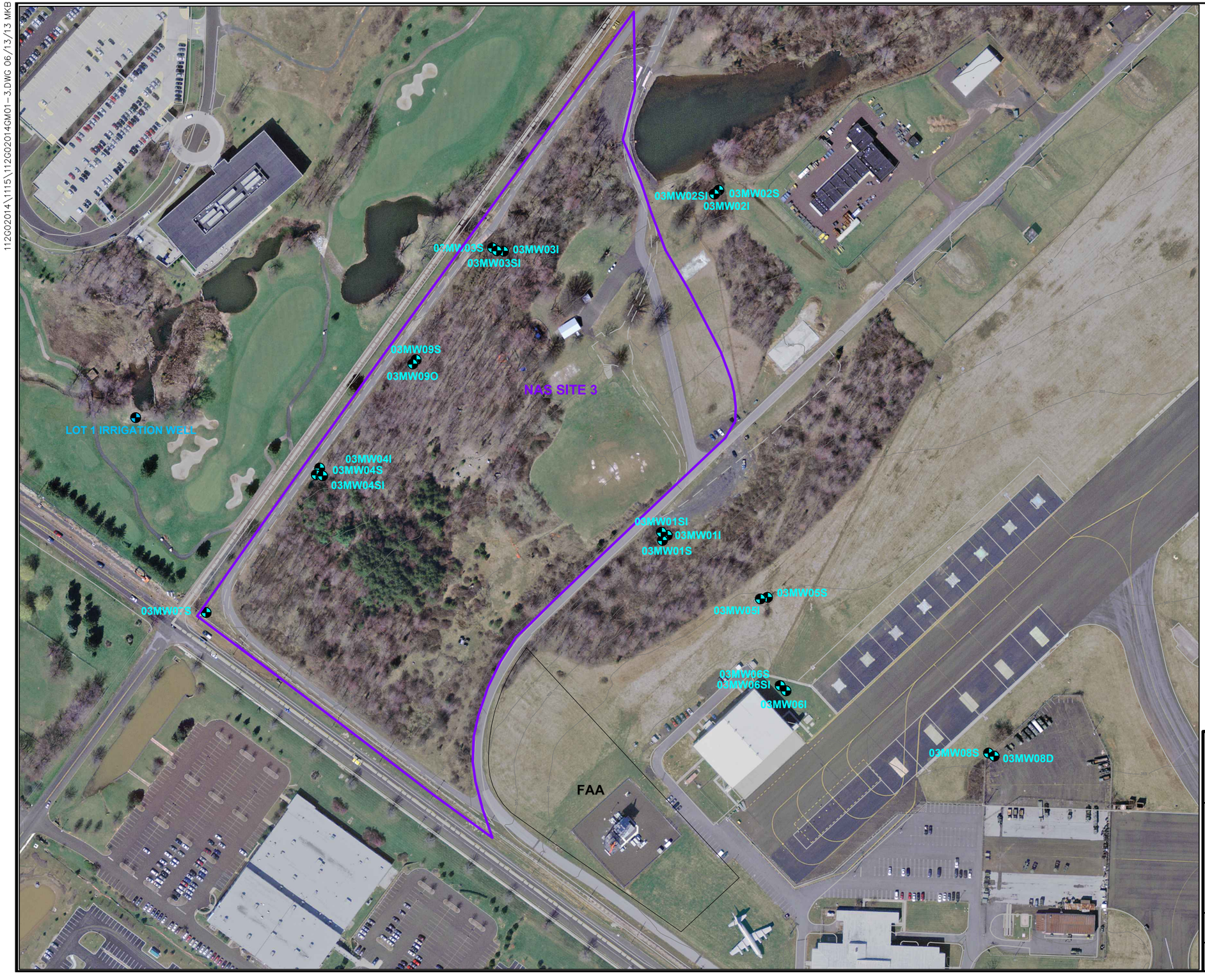

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LEGEND

- ON-SITE MONITORING WELL LOCATION
- OFF BASE WELL LOCATION
- SITE BOUNDARY
- INSTALLATION BOUNDARY

0 200 400

SCALE IN FEET

TETRA TECH

SITE LAYOUT
SITE 3 – NINTH STREET LANDFILL
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

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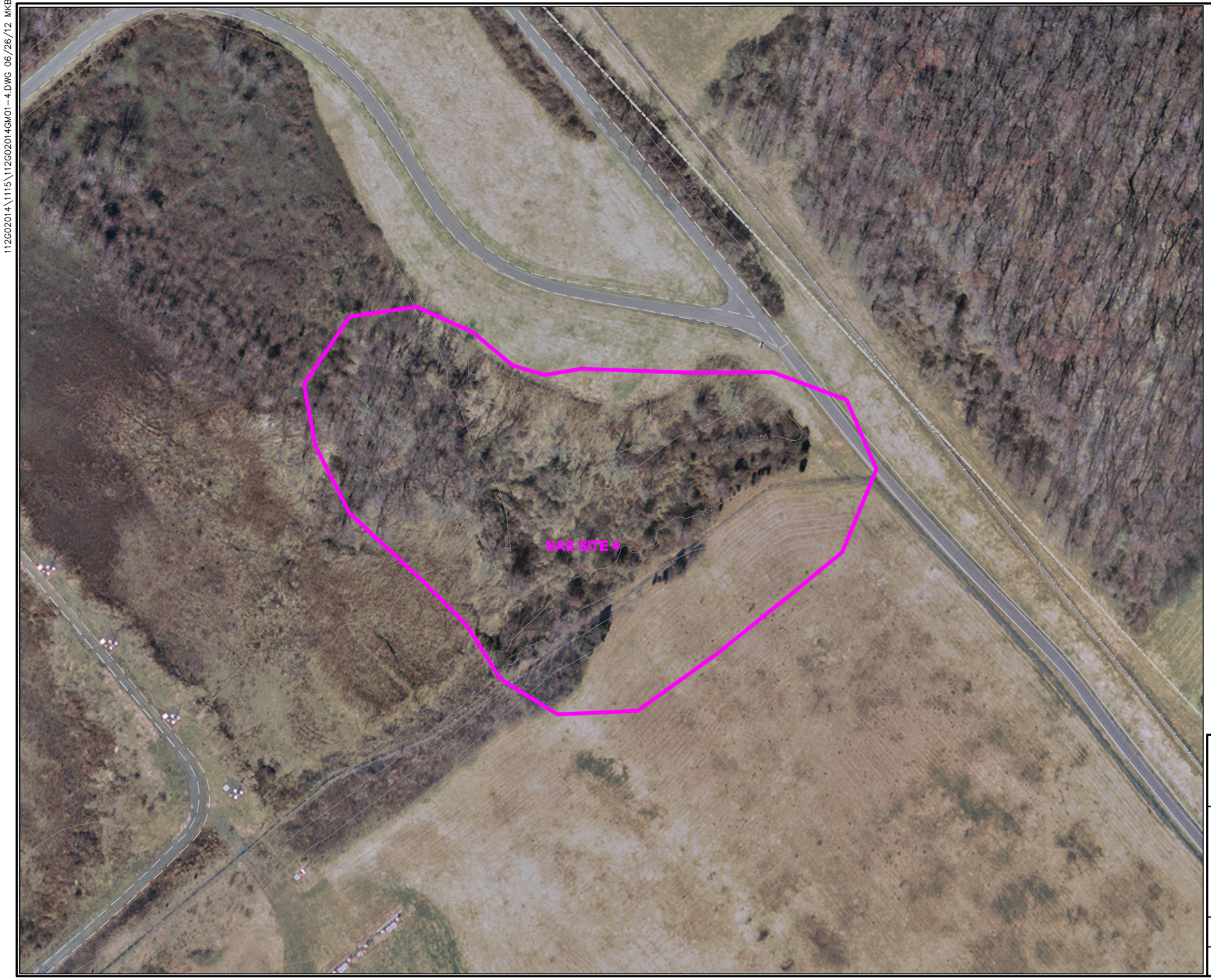

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LEGEND

SITE BOUNDARY

INSTALLATION BOUNDARY

0 100 200

SCALE IN FEET

TETRA TECH

SITE LAYOUT
SITE 4 – NORTH END LANDFILL
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

FILE	SCALE
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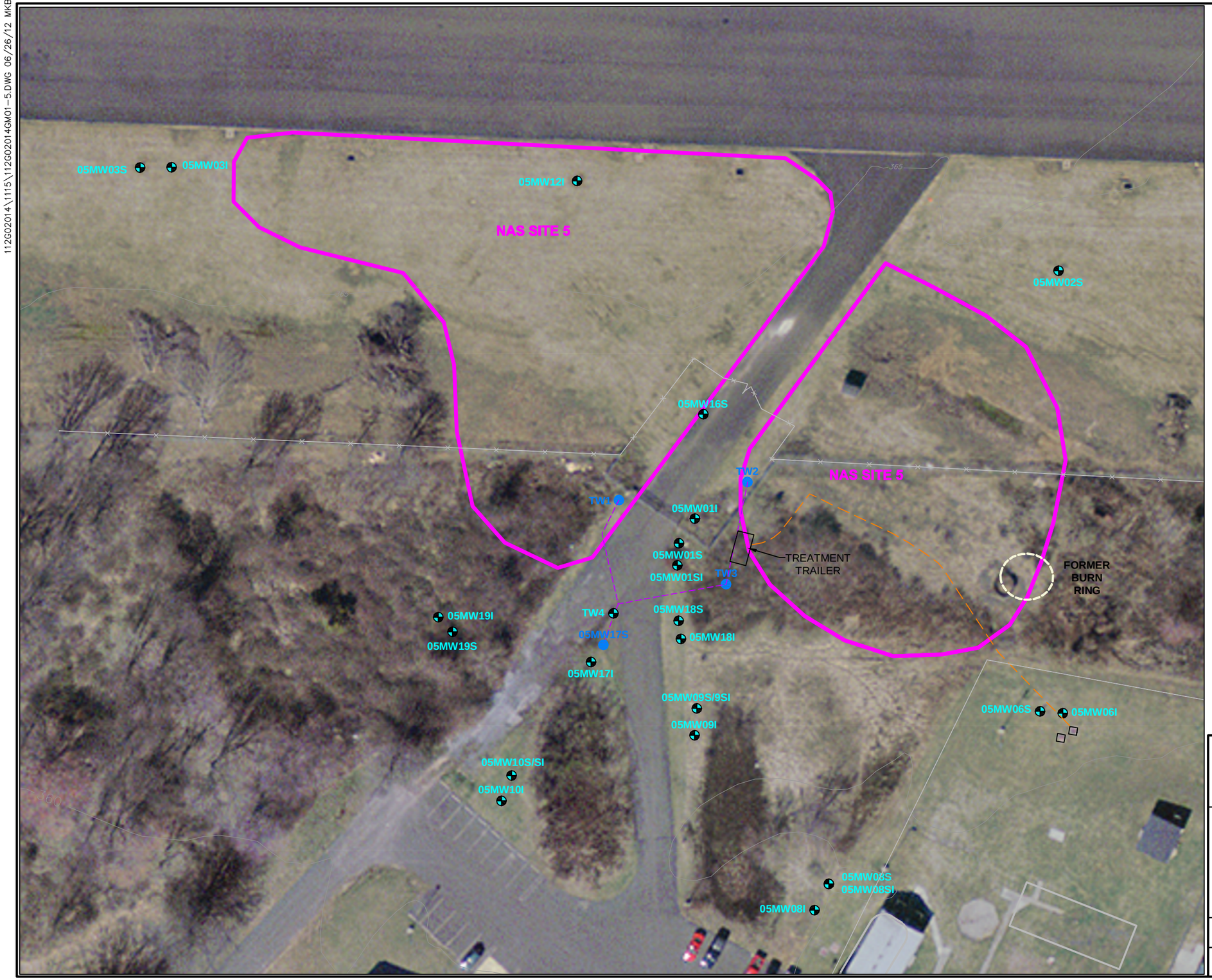

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LEGEND

- MONITORING WELL LOCATION
- INJECTION/EXTRACTION WELL LOCATION
- UNDERGROUND ELECTRIC AND WATER LINE
- UNDERGROUND ELECTRIC LINE
- SITE BOUNDARY
- INSTALLATION BOUNDARY

0 50 100

SCALE IN FEET

TETRA TECH

SITE LAYOUT
SITE 5 – FIRE TRAINING AREA
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

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LEGEND

SITE BOUNDARY

INSTALLATION BOUNDARY

0 120 240

SCALE IN FEET

TETRA TECH

SITE LAYOUT
SITE 6 – ABANDONED RIFLE RANGE 1
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

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LEGEND

SITE BOUNDARY

INSTALLATION BOUNDARY

0 120 240

SCALE IN FEET

TETRA TECH

SITE LAYOUT
SITE 7 – ABANDONED RIFLE RANGE 2
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

FILE	SCALE
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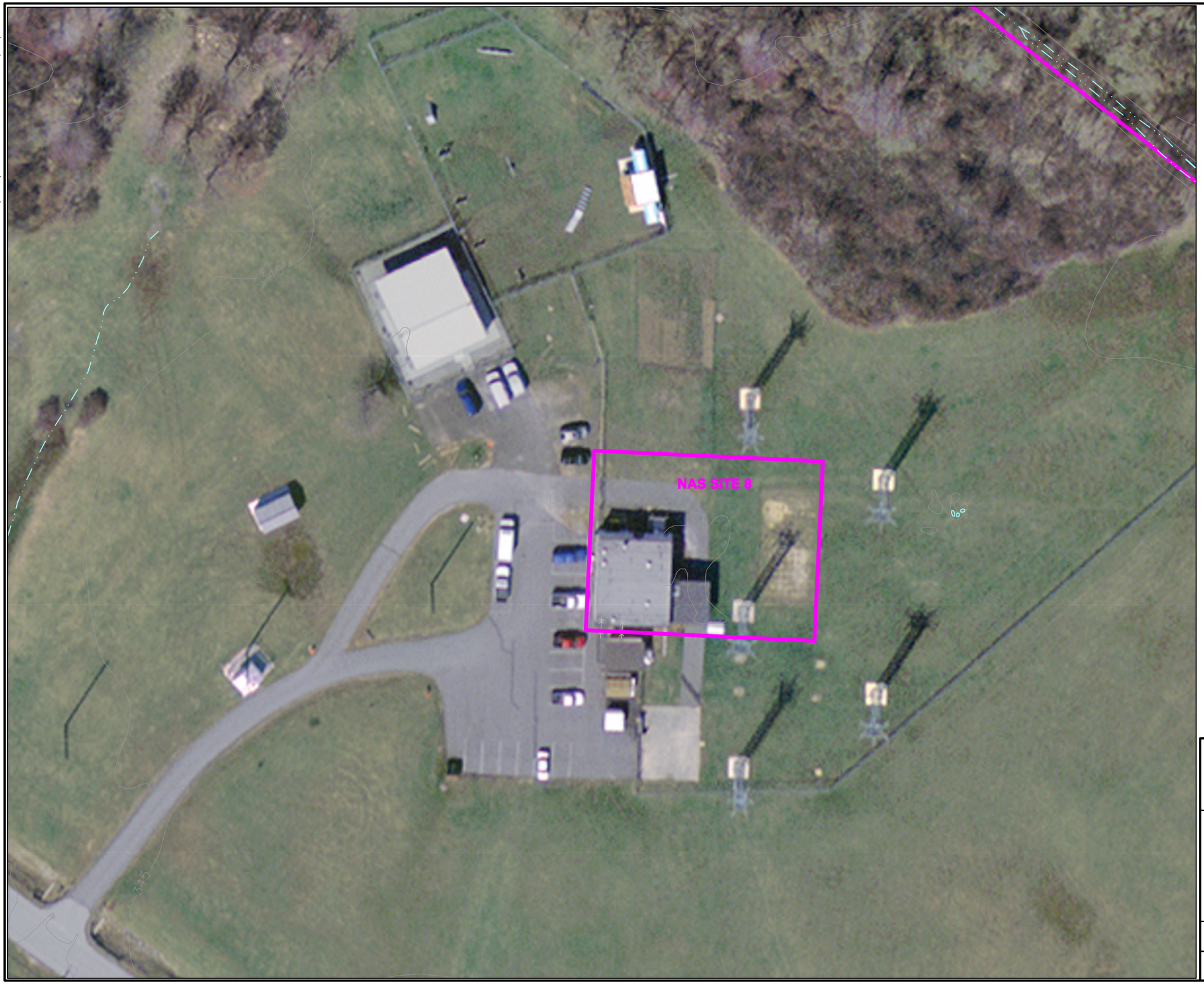

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LEGEND

SITE BOUNDARY

INSTALLATION BOUNDARY

0 50 100

SCALE IN FEET

TETRA TECH

SITE LAYOUT
SITE 8 – BUILDING 118
ABANDONED FUEL TANK
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

FILE	SCALE
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LEGEND

SITE BOUNDARY

INSTALLATION BOUNDARY

0 50 100

SCALE IN FEET

TETRA TECH

SITE LAYOUT
SITE 9 – BUILDING 6
STREAM PLANT TANK OVERFILL
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

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N

LEGEND

SITE BOUNDARY

INSTALLATION BOUNDARY

0 80 160

SCALE IN FEET

TETRA TECH

SITE LAYOUT
SITE 10 – NAVY FUEL FARM
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

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LEGEND

SITE BOUNDARY

INSTALLATION BOUNDARY

0 60 120

SCALE IN FEET

TETRA TECH

SITE LAYOUT
SITE 11 – AIRCRAFT DE-FUELING AREA
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

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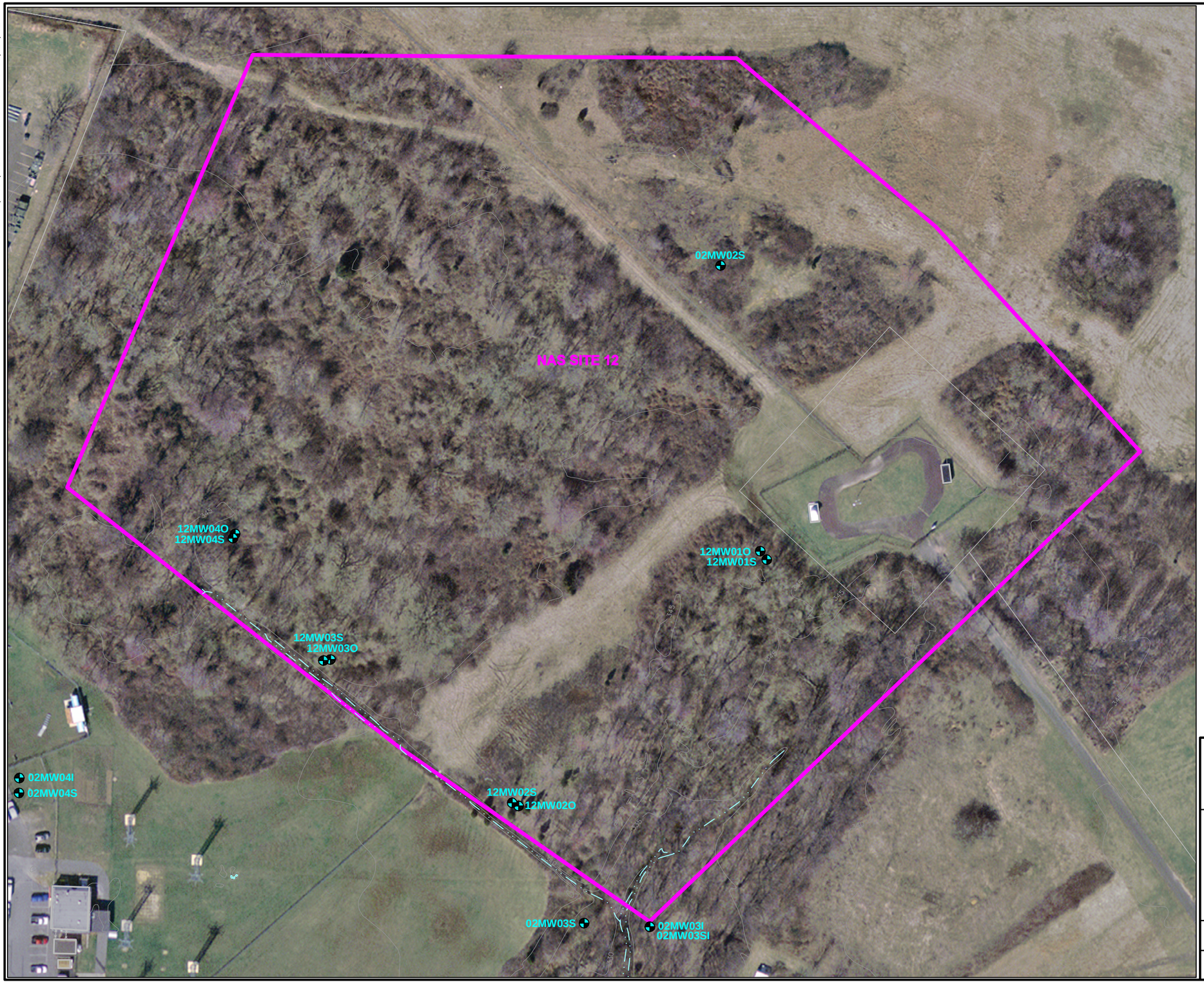

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LEGEND

- MONITORING WELL LOCATION
- SITE BOUNDARY
- INSTALLATION BOUNDARY

0 50 100

SCALE IN FEET

TETRA TECH

SITE LAYOUT
SITE 12 – SOUTH LANDFILL
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

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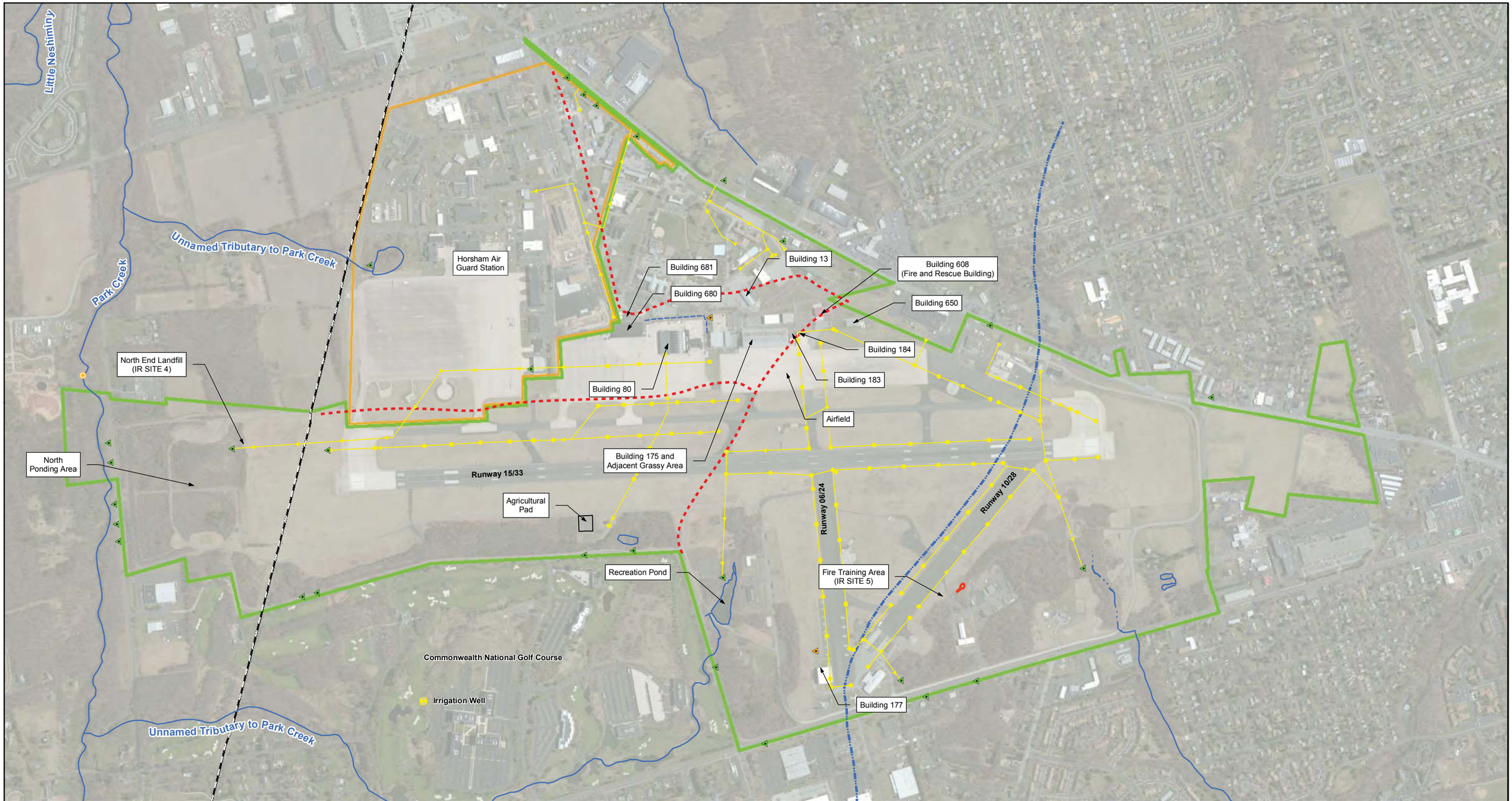

RESOLUTION CONSULTANTS

Drawn:	BC	4/9/2015
Approved:	PJ	4/9/2015
Project #:	60276503	

Legend

- NAS JRB Willow Grove Boundary
- Horsham Air Guard Station Boundary
- Outfall
- Recovery Tank Outfall
- WasteaterTreatment Plant NPDES Discharge
- Irrigation Well
- Williams Pipeline
- Culvert
- Surface Water
- Intermittent Stream
- Storm Sewer
- Watershed - Divide
- Drainage - Divide
- Fire Ring

N

0 500 1,000

Scale in Feet

FIGURE 3-14
PERFLUORINATED COMPOUND INVESTIGATION
POTENTIAL SOURCE AREAS
NAS JRB
WILLOW GROVE, PENNSYLVANIA

Path: W:\Govt\Projects\Navy CLEAN AECOM-EnSafe JV\WillowGrove\GIS\112G00845\0410\PFA_PFOS\Maps\SAP - RI\Figure 10-3 Potential Source Areas - 20150407.mxd

APPENDIX A

MASTER SCHEDULES FOR ACTIVE REMEDIAL RESPONSE ACTIVITIES

DOCUMENT/MILESTONE SCHEDULE
SITE 1 - PRIVET ROAD COMPOUND
NAS JRB WILLOW GROVE, PENNSYLVANIA

	DOCUMENT/MILESTONE TITLE	DOCUMENT/MILESTONE DUE DATE	COMMENTS DUE DATE	GENERAL COMMENTS
SITE 1 Privet Road Compound Groundwater OU 3				
	Site 1 GW Final RI Addendum 5	**01/31/08**	NA	
	Site 1 GW Final FFS	**02/01/08**	NA	
	Site 1 GW Final PRAP for Public Comment	**04/17/08**	NA	Public Comments addressed in ROD Responsiveness Summary
	Site 1 GW Final ROD Signatures	**09/29/08**	NA	
	Site 1 GW Final RD for LUCs	**08/27/10**	NA	
	Project End Date (Remedy In Place)	**08/27/10**	NA	
	Site 1 GW Draft UFP SAP for GWM	**07/17/09**		
	Site 1 GW Draft Final UFP SAP for GWM	**06/30/11**		
	Site 1 GW Final UFP SAP for GWM	**06/30/11**		
	Site 1 GW First Round LTM Report	**11/18/09**		
	Site 1 GW Field Work Second Round LTM	**08/26/11**		
	Site 1 GW Second Round LTM Report	**10/20/11**		
	Draft IRACR	**08/09/11**		
	Respond to Comments	**11/22/11**		
	Final IRACR	**12/23/11**		Signed by Navy and EPA
	Five Year Review - Draft	**05/03/13**		
	Five Year Review - Final	**09/24/13**		Navy signed 9/24/13; EPA concurrence received 9/27/13
	Site 1 GW Final ROD - Draft	TBD		
	Site 1 GW Final ROD - Draft Final	TBD		
	Site 1 GW Final ROD - Final	TBD		

DATE	
NA	= Not applicable; comments are not typically required/received on the final version of a document.
Red Text	= Action overdue

DOCUMENT/MILESTONE SCHEDULE
SITE 3 - NINTH STREET LANDFILL
NAS JRB WILLOW GROVE, PENNSYLVANIA

	DOCUMENT/MILESTONE TITLE	DOCUMENT/MILESTONE DUE DATE	COMMENTS DUE DATE	GENERAL COMMENTS
SITE 3 Ninth Street Landfill Groundwater OU 10 and Soil OU 6				
	Final Test Pit and Soil Sampling Report	**09/19/08**	NA	
	Final IGWM QAPP	**03/07/08**	NA	
	Report – Site 3 IGWM	**08/29/08**	NA	
	Report – Site 3 IGWM - Round 2	**12/31/08**	NA	
	Report – Site 3 IGWM - Round 3	**08/27/09**	NA	
	Final Landfill Delineation SAP	**11/18/08**	NA	
	Final Report – Site 3 Landfill Delineation	**06/10/09**	NA	
	Site 3 Draft RI Report	**05/14/10**		
	Site 3 Draft Final RI Report	**03/21/11**		
	Site 3 Final RI Report	**10/19/11**		
	Site 3 Draft FS	01/31/16	03/31/16	Pending Radiological Assessment
	Site 3 Draft Final FS	04/30/16	06/30/16	
	Site 3 Final FS	07/30/16	NA	
Soil OU 6	Site 3 Draft PRAP OU 6	FY16	FY16	
	Site 3 Final PRAP OU 6 for Public Comment	FY16	NA	Public Comments will be addressed in ROD Responsiveness Summary
	Site 3 Draft ROD OU 6	FY17	FY17	
	Site 3 Final ROD OU 6	FY17	NA	
	Site 3 Draft RD for LUCs OU 6	FY17	TBD	
	Site 3 Final RD for LUCs OU 6	FY17		
Groundwater OU 10	Site 3 Draft PRAP OU 10	FY16	FY16	
	Site 3 Final PRAP OU 10 for Public Comment	FY16	NA	Public Comments will be addressed in ROD Responsiveness Summary
	Site 3 Draft ROD OU 10	FY17	FY17	
	Site 3 Final ROD OU 10	FY17	NA	
	Site 3 Draft RD for LUCs OU 10	FY17	TBD	
	Site 3 Final RD for LUCs OU 10	FY17		
	Remedial Action	FY17		
	Draft LTM Plan	FY18		
	Final LTM Plan	FY18		

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DOCUMENT/MILESTONE SCHEDULE
SITE 5 - FIRE TRAINING AREA
NAS JRB WILLOW GROVE, PENNSYLVANIA

	DOCUMENT/MILESTONE TITLE	DOCUMENT/MILESTONE DUE DATE	COMMENTS DUE DATE	GENERAL COMMENTS
Site 5 Fire Training Area Groundwater OU 2	Site 5 Final FS	**11/24/08**	NA	
	Submit Final Pilot Study QAPP	**10/23/08**	NA	
	Perform Field Activities (Proof of Technology)	**5/26/08 to 10/26/10**	NA	
	Draft (for Regulatory Agencies) Report of Results	**01/25/11**	**04/07/11**	
	Final Report of Results	**05/03/11**	NA	
	Site 5 Draft PRAP OU 2	**03/07/11**	**04/07/11**	
	Site 5 Final PRAP OU 2 for Public Comment	**06/15/11**	NA	
	Public Meeting	**06/22/11**	NA	
	Site 5 Draft ROD OU 2	**08/19/11**		
	Site 5 Final ROD OU 2	**09/25/12**	NA	
	Site 5 Draft RD and Work Plan OU 2	**12/14/12**	**02/15/13**	
	Site 5 PreFinal RD and Work Plan OU 2	NA	NA	
	Site 5 Final RD and Work Plan OU 2	**05/03/13**	NA	
	Site 5 Draft LUC RD	**01/23/13**	**02/23/13**	
	Site 5 Final LUC	**05/29/13**	NA	
	Construction Start (Remedial Action Phase I)	**07/08/13**	NA	
	Construction Complete (Remedy In Place)	**08/01/13**	NA	
	Draft Site 5 RACR	**11/19/13**	**01/28/14**	
	Final Site 5 RACR	**09/24/14**	**NA**	RACR Signed by Navy/EPA
	Draft Site 5 LTM Plan	**07/29/14**	11/30/14	Draft OM&M Plan submitted 07/29/14; Draft OPS submitted 10/2/14
	Draft Final Site 5 LTM Plan	NA	NA	Comment resolution completed 4/23/15
	Final Site 5 LTM Plan	**05/08/15**	NA	Final OM&M Plan submitted 05/07/15; Final OPS submitted 05/08/15
Soil OU 4	Site 5 Soil Final NFA ROD	**09/22/07**	NA	
	Project End Date OU 4 (Remedy In Place)	**09/22/07**	NA	
	Administrative Record File Index OU 4	**10/15/08**		

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DOCUMENT/MILESTONE SCHEDULE
SITE 12 - SOUTH LANDFILL (OU 11)
NAS JRB WILLOW GROVE, PENNSYLVANIA

	DOCUMENT/MILESTONE TITLE	DOCUMENT/MILESTONE DUE DATE	COMMENTS DUE DATE	GENERAL COMMENTS
Site 12 South Landfill	Drum and Debris Removal	**05/01/03**	NA	
	RMC Report of Drum Removal	**07/31/03**	NA	
	Site 12 Final UFP Phase I RI SAP	**12/02/09**		
	Final Site 12 Phase I RI Data Report	**06/25/10**		
	Site 12 Draft Phase II UFP SAP	**04/20/11**	**10/11/11**	
	Respond to Regulatory Agency Comments	**10/11/11**		
	Site 12 Final Phase II UFP SAP	**10/27/11**		
	Phase II RI Field Activities	**03/09/12**		Field work start date 11/28/11
	Site 12 Draft Phase II RI Report	**04/12/13**		
	Respond to Regulatory Agency Comments	**08/01/13**		Comments received 7/31/13; EPA rebuttal received 10/29/13
	Site 12 Final Phase II RI Report	**02/19/14**		
	Site 12 Draft FS	02/28/16	04/30/16	
	Site 12 Draft Final FS	05/31/16	07/31/16	
	Site 12 Final FS	08/31/16	NA	
	Draft Proposed Plan	FY16		
	Final Proposed Plan	FY17		Public Comments will be addressed in ROD Responsiveness Summary
	Draft Record of Decision	FY17		
	Final Record of Decision	FY17		
	Draft RD for LUC	FY17		
	Final RD for LUC	FY17		
	Remedial Action	FY18		
	Draft LTM Plan	FY18		
	Final LTM Plan	FY18		

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TBD = To Be Determined

DOCUMENT/MILESTONE SCHEDULE
SITE MANAGEMENT PLAN
NAS JRB WILLOW GROVE, PENNSYLVANIA

	DOCUMENT/MILESTONE TITLE	DOCUMENT/MILESTONE DUE DATE	COMMENTS DUE DATE	GENERAL COMMENTS
SMP - FY 2008	FINAL UPDATE TO SMP (FY 2008)	**09/03/08**	NA	
SMP - FY 2009	FINAL UPDATE TO SMP (FY 2009)	**10/02/09**		
SMP - FY 2010	FINAL UPDATE TO SMP (FY 2010)	**10/18/10**		
SMP - FY 2011	DRAFT UPDATE TO SMP (FY 2011)	**06/30/11**	**12/14/11**	
	FINAL UPDATE TO SMP (FY 2011)	**12/31/11**	NA	
SMP - FY 2012	DRAFT UPDATE TO SMP (FY 2012)	**06/28/12**	07/28/12	
	FINAL UPDATE TO SMP (FY 2012)	**10/03/12**	NA	
SMP - FY 2013	DRAFT UPDATE TO SMP (FY 2013)	**06/17/13**	07/15/13	
	FINAL UPDATE TO SMP (FY 2013)	**12/15/13**	NA	Final issued 21 days after notification that Congress has appropriated funds for new FY
SMP - FY 2014	DRAFT UPDATE TO SMP (FY 2014)	**06/12/14**	07/16/14	
	FINAL UPDATE TO SMP (FY 2014)	**12/10/14**	NA	Final issued 21 days after notification that Congress has appropriated funds for new FY
SMP - FY 2015	DRAFT UPDATE TO SMP (FY 2015)	**06/10/15**	07/16/15	
	FINAL UPDATE TO SMP (FY 2015)	**10/01/15**	NA	Final issued 21 days after notification that Congress has appropriated funds for new FY
SMP - FY 2016	DRAFT UPDATE TO SMP (FY 2016)	06/15/16	07/16/16	
	FINAL UPDATE TO SMP (FY 2016)	09/30/16	NA	Final issued 21 days after notification that Congress has appropriated funds for new FY

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DOCUMENT/MILESTONE SCHEDULE
PFC INVESTIGATION
NAS JRB WILLOW GROVE, PENNSYLVANIA

	DOCUMENT/MILESTONE TITLE	DOCUMENT/MILESTONE DUE DATE	COMMENTS DUE DATE	GENERAL COMMENTS
PFC Investigation	Draft Source Evaluation Report (PA/SI)	**3/7/2015**	5/7/2015	
	Final Source Evaluation Report (PA/SI)	10/30/2015		
	Draft Action Memorandum (TCRA)	**9/28/2015**		
	Final Action Memorandum (TCRA)	**9/29/2015**		
	Draft EE/CA (NTCRA)	1/30/2016		
	Final EE/CA (NTCRA)	3/30/2016		
	Draft Action Memorandum (NTCRA)	4/30/2016		
	Final Action Memorandum (NTCRA)	6/30/2016		
	Draft RI Report	6/30/2016		
	Draft Final RI Report	9/30/2016		
	Final RI Report	11/30/2016		
	Draft FS Report	5/30/2017		
	Draft Final FS Report	8/30/2017		
	Final FS Report	12/30/2017		
	Draft PRAP	1/30/2018		
	Final PRAP	4/30/2018		
	Draft ROD	4/30/2018		
	Final ROD	9/30/2018		