

ABBREVIATED WORK PLAN – JANUARY 2016
VERTICAL PROFILE BORINGS (VPB 161, VPB 162, VPB 163, VPB 164, VPB 165,
VPB 166, and VPB 167) PRE-DESIGN FIELD INVESTIGATION, OPERABLE UNIT 2
GROUNDWATER NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NWIRP),
BETHPAGE, NEW YORK

This abbreviated work plan has been prepared for the Mid-Atlantic Division of the Naval Facilities Engineering Command (NAVFAC) pursuant to Contract Task Order (CTO) WE15, issued under Comprehensive Long-term Environmental Action Navy (CLEAN) contract number N62470-11-D-8013. This abbreviated work plan will follow the requirements for installation and sampling of vertical profile borings (VPBs) and monitoring wells within Operable Unit (OU) 2, which are detailed in the Uniform Federal Policy (UFP) Sampling and Analysis Plan (SAP) Addendum – VPB and Monitoring Well Installation and Sampling (Resolution Consultants, October 2013). This investigation is being conducted to better define the extent of solvent-contaminated groundwater off site of the Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, Long Island, New York (Figure 1). Regional groundwater flow is south-southeast, but is locally affected by the operation of recharge basins and public water supply wells.

Scope and Objectives

The objectives of the field investigation are to better define the horizontal and vertical extent of groundwater contamination, evaluate migration, and determine concentrations of volatile organic compounds (VOCs) in groundwater that is south of the Navy and Northrop Grumman (NG) properties. This contamination is up-gradient of several potable water supply wells in the area and continues to migrate to the south-southeast.

This investigation will consist of the installation of seven VPBs (VPBs 161 – 167) to a depth of approximately 1,000 feet (ft) below ground surface (bgs) in order to confirm the presence of the Raritan Clay Unit. During installation of the VPBs, groundwater samples will be collected for VOC analysis. Based on the groundwater sample results, permanent monitoring wells will be installed at the VPB locations. The permanent monitoring wells will be surveyed and one round of groundwater samples will be collected for VOC analysis.

Sampling Locations

The work will be conducted at seven locations, designated as VPBs 161, 162, 163, 164, 165, 166, and 167. At each location, a VPB will be completed followed by installation of up to three monitoring wells targeting different depths. Figure 2 provides the regional location of each of the proposed VPBs. The boring locations are shown aerially in Figure 3 for VPB 161, Figure 4 for VPB 162, Figure 5 for VPB 163, Figure 6 for VPB 164, Figure 7 for VPB 165, Figure 8 for VPB 166, and

Figure 9 for VPB 167. The accompanying monitoring wells will be placed within 40 ft of each of the VPB locations.

The VPBs and monitoring wells will be installed south of the NWIRP Bethpage and NG parcels. The VPBs are proposed at the following locations:

- VPB 161 and up to three associated monitoring wells, (RE127D1, RE127D2, and RE127D3) will be located in or near Sump 20 on the west side of North Woodward Avenue between North Michigan Avenue and North Wisconsin Avenue, North Massapequa, NY. Due to the limited space in Sump#20 the monitoring wells may need to be located along a grass strip south of 402 North Woodward Drive, North Massapequa, NY, on the east side of North Woodward Drive, south of the intersection of North Wisconsin Avenue and North Woodward Drive and north of the intersection of North Michigan Avenue and North Woodward Drive.
- VPB 162 and up to three monitoring wells (RE128D1, RE128D2, and RE128D3) will be located 180 feet southwest of 400 North Virginia Avenue, North Massapequa, NY, on the west side of East Service Road, south of the intersection of North Virginia Avenue and East Service Road.
- VPB 163 and up to three monitoring wells (RE129D1, RE129D2, and RE129D3) will be located approximately 50 feet southeast of 1004 Whitebirch Lane, Wantagh, NY, on the south side of the curve of Whitebirch Lane, east of the intersection of Sarah Drive and White Birch Lane and south of the intersection of Ferndale Drive and White Birch Lane.
- VPB 164 and up to three monitoring wells (RE130D1, RE130D2, and RE130D3) will be located approximately 100 feet south of 635 Wantagh Avenue, Wantagh, NY and directly west of 370 West Red Maple Drive, Wantagh, NY, on the west side of West Red Maple Drive and to the east of Wantagh Avenue.
- VPB 165 and up to three monitoring wells (RE131D1, RE131D2, and RE131D3) will be located approximately 75 feet east of 3683 Hawk Road, Levittown, NY along the east side of Oriole Road, southeast of the intersection of Cardinal Road and Oriole Road and north of the intersection of Hawk Road and Oriole Road.
- VPB 166 and up to three monitoring wells (RE132D1, RE132D2, and RE132D3) will be located inside the Sump# 213 between Miller place and Wadsworth Avenue, Levittown, NY, north of Miller Place and south of Wadsworth Avenue.
- VPB 167 and up to three monitoring wells (RE133D1, RE133D2, and RE133D3) will be located approximately 30 feet east of 3925 Howard Avenue, Seaford, NY on the west side of Wicks Avenue, north of the intersection of Howard Avenue and Wicks Avenue.

Site History

NWIRP Bethpage is located in east-central Nassau County, Long Island, New York, approximately 30 miles east of New York City (Figure 1). NWIRP Bethpage is in the Hamlet of Bethpage, Town of Oyster Bay, New York. Since its inception in 1941, the plant's primary mission was the research prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. The facilities at NWIRP included four plants used for assembly and prototype testing, a group of quality control laboratories, two warehouse complexes (north and south), a salvage storage area, water recharge basins, the Industrial Wastewater Treatment Plant, and several smaller support buildings.

The Navy's property originally totaled 109.5 acres and was formerly a Government-Owned Contractor-Operated (GOCO) facility that was operated by the NG until September 1998. Prior to 2002, the NWIRP property was bordered on the north, west, and south by current or former NG facilities, and on the east by a residential neighborhood. By March 2008, approximately 100 acres of NWIRP property were transferred to Nassau County in three separate actions. The remaining 9 acres and access easements were retained by the Navy to continue remedial efforts at Installation Restoration (IR) Site 1 – Former Drum Marshalling Area and Site 4 – Former Underground Storage Tanks (Area of Concern [AOC] 22). A parcel of land connecting the two sites was also retained. Currently, the 9-acre parcel of NWIRP is bordered on the east by the residential neighborhood and on the north, south, and west by Nassau County property. Access to the NWIRP is from South Oyster Bay Road.

Field Investigation Task Plan

Details of the field investigation are provided below. All aspects of the field investigation specified in the UFP SAP Addendum – VPB and Monitoring Well Installation and Sampling (Resolution Consultants, November 2013) will be followed.

Vertical Profile Borings

The seven VPBs will be drilled to the top of the Raritan Clay Unit. Soil and groundwater samples will be collected during installation of the VPBs. Field sampling regimes are presented in Table 1. Sample nomenclature and analysis are presented in Table 2.

Soil Sampling

Up to 10 split spoon samples per VPB will be collected from ground surface to the top of the Raritan Clay (approximately 800 to 1,000 ft bgs). Verification of the Raritan Clay formation will be confirmed when three consecutive 5 ft split spoon samples are representative of a significant clay unit. Up to two soil samples for total organic carbon (TOC) analysis will be collected per VPB.

Groundwater Sampling during VPB Installation

For each VPB, groundwater grab samples will be collected for screening purposes from a hydropunch-type sampler at the following depth intervals:

- 50-Foot intervals from 50 to 200 ft bgs (four samples per boring).
- 20-Foot intervals from 200 up to 1,000 ft bgs (up to 40 samples per boring).

Groundwater samples will be analyzed by a local laboratory (48 hour turnaround time [TAT]) that is New York State and Navy approved for VOC analysis using the SW846 8260C method. Trip blanks will also be collected and submitted for VOC analysis with the sample shipment.

During the collection of groundwater samples, field parameters will be measured (pH, temperature, specific conductivity, and turbidity) as volume permits.

Geophysical Logging

After encountering the Raritan Clay, borehole geophysical logs (specifically gamma activity logs) will be performed to determine lithology within each VPB boring.

Air Monitoring

One air sample per VPB will be collected to document ambient levels of VOCs in the work area air during installation of the VPB borings. A community air monitoring plan (CAMP) will also be followed during installation of the VPBs and monitoring wells; details of the CAMP are provided in the Health and Safety Plan – Site 1 OU-2 Off Site TCE Groundwater Plume Investigation (Resolution Consultants, 2012) which follows procedures outlined by the New York State Department of Environmental Conservation (NYSDEC) DER 10.

Monitoring Well Installation

Groundwater monitoring wells will be installed during this investigation (the anticipated number of wells at each VPB is shown in Table 3). The monitoring wells will be installed using mud rotary drilling techniques. Table 3 provides a summary of the proposed wells and screen intervals. Final screen intervals will be determined from lithology and groundwater data collected from the vertical profile borings. A typical well construction detail is provided in Attachment 1.

The groundwater monitoring wells will be constructed of 4-inch diameter, schedule 80 National Sanitation Foundation (NSF)-grade Polyvinyl Chloride (PVC) well casing and screen. Well screen depths at each VPB location will be determined following completion of the VPB by evaluating the

geologist log, the geophysical log, and the trichloroethene (TCE) profile from the hydropunch sampling. Well screens will be 10 slot (0.010 inches) with 20 feet of screen. After setting the well screen and casing, the gravel pack (W.G. No. 1) will be placed within the boring annulus, to a depth as indicated in Table 3. The well gravel pack will be dependent on the total depth of the wells and will be placed as follows:

- Well total depth (TD) 50 to 350 ft bgs: to a minimum of 10 feet above top of screen.
- Well TD 350 to 600 ft bgs: to a minimum of 20 feet above top of screen.
- Well TD 600 to 850 ft bgs: to a minimum of 25 feet above top of screen.

A fine sand layer (finer than gravel pack) will be placed in the annulus on top of the gravel pack in the same manner as the gravel pack, as follows:

- Well TD 50 to 350 ft bgs: 5 feet thick above the top of the gravel pack.
- Well TD 350 to 600 ft bgs: 10 feet thick above the top of the gravel pack.
- Well TD 600 to 850 ft bgs: 15 feet thick above the top of the gravel pack.

The gravel pack and fine sand thickness may be changed based on subsurface conditions. A bentonite/cement grout will be installed within the annular space above the bentonite seal. Wells will be completed at grade using a 12-inch diameter, locking curb box in place over the wells. Fine sand will be installed above the top of the box to drain. A 0.5-foot thick concrete apron measuring 2 ft by 2 ft square will be installed around each well. Well locks will be used to secure the wells.

Monitoring Well Groundwater Sample Collection and Analysis

Monitoring wells will be developed using a combination of air lift and mechanical surging. Field parameters, including pH, temperature, specific conductivity, and turbidity will be monitored and recorded throughout well development.

Well development will also include purging stagnant water from the well above the screen interval and rinsing the interior well casing above the water table using only water from that well. The well will be covered with a clean well cap.

In compliance with NYSDEC policy, wells will be developed until turbidity is less than 50 nephelometric turbidity units (NTU). However, in some instances, the 50 NTU standard may not be attainable. If after a "best well development effort", the 50 NTU standard cannot be attained and turbidity stabilizes (above the 50 NTU standard), the well will be considered acceptable.

After initial sampling, which will be conducted according to the UFP SAP Addendum - Groundwater Sampling Using Low Stress (Low Flow) Purging and Sampling Protocol (Resolution Consultants, 2013), a dedicated sampling pump system may be installed in the monitoring wells. If installed, these pumps will be stainless steel bladder pumps equipped with a pump inlet drop tube. The pumps will be installed no deeper than 50 to 70 feet below the water table (100 ft bgs) and the drop tube inlet will extend to the middle of the screen interval.

All groundwater and QA/QC samples will be analyzed by a New York State and Navy Approved Laboratory using EPA Methods 8260C and 8270C.

Investigation Derived Waste

Investigation Derived Waste (IDW) accumulated during drilling activities will be collected, containerized, accumulated at NWIRP Bethpage, and disposed of off-site. All IDW activities will be consistent with the UFP SAP Addendum – VPB and Monitoring Well Installation and Sampling (Resolution Consultants, November 2013).

Decontamination

A centrally-located decontamination pad at NWIRP Bethpage will be used for the collection of all decontamination-generated fluids. All decontamination fluids will be collected and staged for characterization and subsequent disposal. All decontamination activities will be consistent with the UFP SAP Addendum – VPB and Monitoring Well Installation and Sampling (Resolution Consultants, November 2013).

Surveying

The location of each VPB and all newly installed wells will be surveyed by a New York State licensed surveyor. All surveying activities will be consistent with the UFP SAP Addendum – VPB and Monitoring Well Installation and Sampling (Resolution Consultants, November 2013).

Data Validation

Data validation will be conducted for the groundwater and air samples. Data will be reviewed and qualified in accordance with the requirements of the EPA National Functional Guidelines, modified as appropriate for the DoD Quality Systems Manual (QSM) version 4.2 and method-specific requirements. Validation will consist of reviewing the associated QA/QC samples and measurement performance indicators as presented on the summary forms provided in the laboratory deliverable, and will not include confirmation of calculations or review of raw data. The results of the data

validation will be documented in reports which will detail any issues impacting the data quality along with qualifications affecting data bias and usability. All data validation activities will be consistent with the UFP SAP Addendum – VPB and Monitoring Well Installation and Sampling (Resolution Consultants, November 2013).

Reporting

Form 1 results from the analytical lab will be provided as soon as the data are available; Subsequent summary reports including VPB and well installation and sampling results will be developed to provide documentation of this investigation. Documentation required to support this project will consist of the following items:

- Scanned copies of the fieldbook during VPB and well installation.
- Updated plume maps based on the groundwater samples.
- Updated cross sections based on the boring logs.
- Field copies of the boring log for each boring.
- Paired graphic of VPB VOC concentration in groundwater with gamma log.
- Groundwater, soil, and air sample log sheets.
- Well completion form for each well.
- Well development record.
- Initial well sampling results.
- Map identifying newly installed monitoring wells and VPBs.

Tables

Table 1
 Vertical Profile Boring Sampling Program
 Page 1 of 1

Boring Number	Drilling Method	Total Depth (feet) ⁽¹⁾	Depth (feet)	Split Spoon Sampling	Groundwater Sampling	Gamma Log	Air Sample ⁽²⁾
VPB 161	MR	~1,000	50 to 200	0 to 1	50, 100, 150, and 200 feet (4 samples)	Yes	Yes
			200 to 800	Up to 5	20-foot intervals (40 samples)		
			800 to ~1,000	Up to 5, at 5 foot intervals			
VPB 162	MR	~1,000	50 to 200	0 to 1	50, 100, 150, and 200 feet (4 samples)	Yes	Yes
			200 to 800	Up to 5	20-foot intervals (40 samples)		
			800 to ~1,000	Up to 5, at 5 foot intervals			
VPB 163	MR	~1,000	50 to 200	0 to 1	50, 100, 150, and 200 feet (4 samples)	Yes	Yes
			200 to 800	Up to 5	20-foot intervals (40 samples)		
			800 to ~1,000	Up to 5, at 5 foot intervals			
VPB 164	MR	~1,000	50 to 200	0 to 1	50, 100, 150, and 200 feet (4 samples)	Yes	Yes
			200 to 800	Up to 5	20-foot intervals (40 samples)		
			800 to ~1,000	Up to 5, at 5 foot intervals			
VPB 165	MR	~1,000	50 to 200	0 to 1	50, 100, 150, and 200 feet (4 samples)	Yes	Yes
			200 to 800	Up to 5	20-foot intervals (40 samples)		
			800 to ~1,000	Up to 5, at 5 foot intervals			
VPB 166	MR	~1,000	50 to 200	0 to 1	50, 100, 150, and 200 feet (4 samples)	Yes	Yes
			200 to 800	Up to 5	20-foot intervals (40 samples)		
			800 to ~1,000	Up to 5, at 5 foot intervals			
VPB 167	MR	~1,000	50 to 200	0 to 1	50, 100, 150, and 200 feet (4 samples)	Yes	Yes
			200 to 800	Up to 5	20-foot intervals (40 samples)		
			800 to ~1,000	Up to 5, at 5 foot intervals			

Notes:

1. Total depth will be approximately 15 feet into the Raritan Clay Unit, at a depth of approximately 1,000 feet below ground surface.
2. Work area summa canister (6 to 8 hours).

VPB: Vertical Profile Boring

MR: Mud Rotary

Table 2
 Vertical Profile Boring Analytical Summary
 Page 1 of 1

Location	Sample ID	Matrix	Number of Samples		
			VOCs – Quick Turn ⁽¹⁾	TOC ⁽²⁾	VOCs – TO 15 ⁽³⁾
VPB 161	VPB-161-Soil- MMDDYY XX-XX	Soil	--	0 to 2	--
	VPB-161-GW- MMDDYY XX-XX	Groundwater	~44	--	--
	VPB-161-AIR-MMDDYY	Air	--	--	1 per VPB
VPB 162	VPB-162-Soil- MMDDYY XX-XX	Soil	--	0 to 2	--
	VPB-162-GW- MMDDYY XX-XX	Groundwater	~44	--	--
	VPB-162-AIR-MMDDYY	Air	--	--	1 per VPB
VPB 163	VPB-163-Soil- MMDDYY XX-XX	Soil	--	0 to 2	--
	VPB-163-GW- MMDDYY XX-XX	Groundwater	~44	--	--
	VPB-163-AIR-MMDDYY	Air	--	--	1 per VPB
VPB 164	VPB-164-Soil- MMDDYY XX-XX	Soil	--	0 to 2	--
	VPB-164-GW- MMDDYY XX-XX	Groundwater	~44	--	--
	VPB-164-AIR-MMDDYY	Air	--	--	1 per VPB
VPB 165	VPB-165-Soil- MMDDYY XX-XX	Soil	--	0 to 2	--
	VPB-165-GW- MMDDYY XX-XX	Groundwater	~44	--	--
	VPB-165-AIR-MMDDYY	Air	--	--	1 per VPB
VPB 166	VPB-166-Soil- MMDDYY XX-XX	Soil	--	0 to 2	--
	VPB-166-GW- MMDDYY XX-XX	Groundwater	~44	--	--
	VPB-166-AIR-MMDDYY	Air	--	--	1 per VPB
VPB 167	VPB-167- Soil- MMDDYY XX-XX	Soil	--	0 to 2	--
	VPB-167-GW- MMDDYY XX-XX	Groundwater	~44	--	--
	VPB-167-AIR-MMDDYY	Air	--	--	1 per VPB

Notes:

1. 48-hour results from local laboratory via method SW846 8260C or equivalent method.
2. 21-day results from Navy-approved laboratory via 9060A.
3. 21-day results from Navy-approved laboratory via TO-15.

VOCs: Volatile organic compounds

TOC: Total organic carbon

MMDDYY: Sample date in month, day, and year. For example, April 1, 2015 would be 040115.

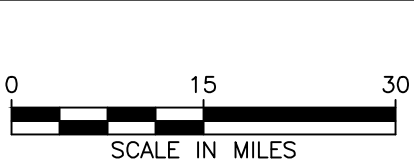
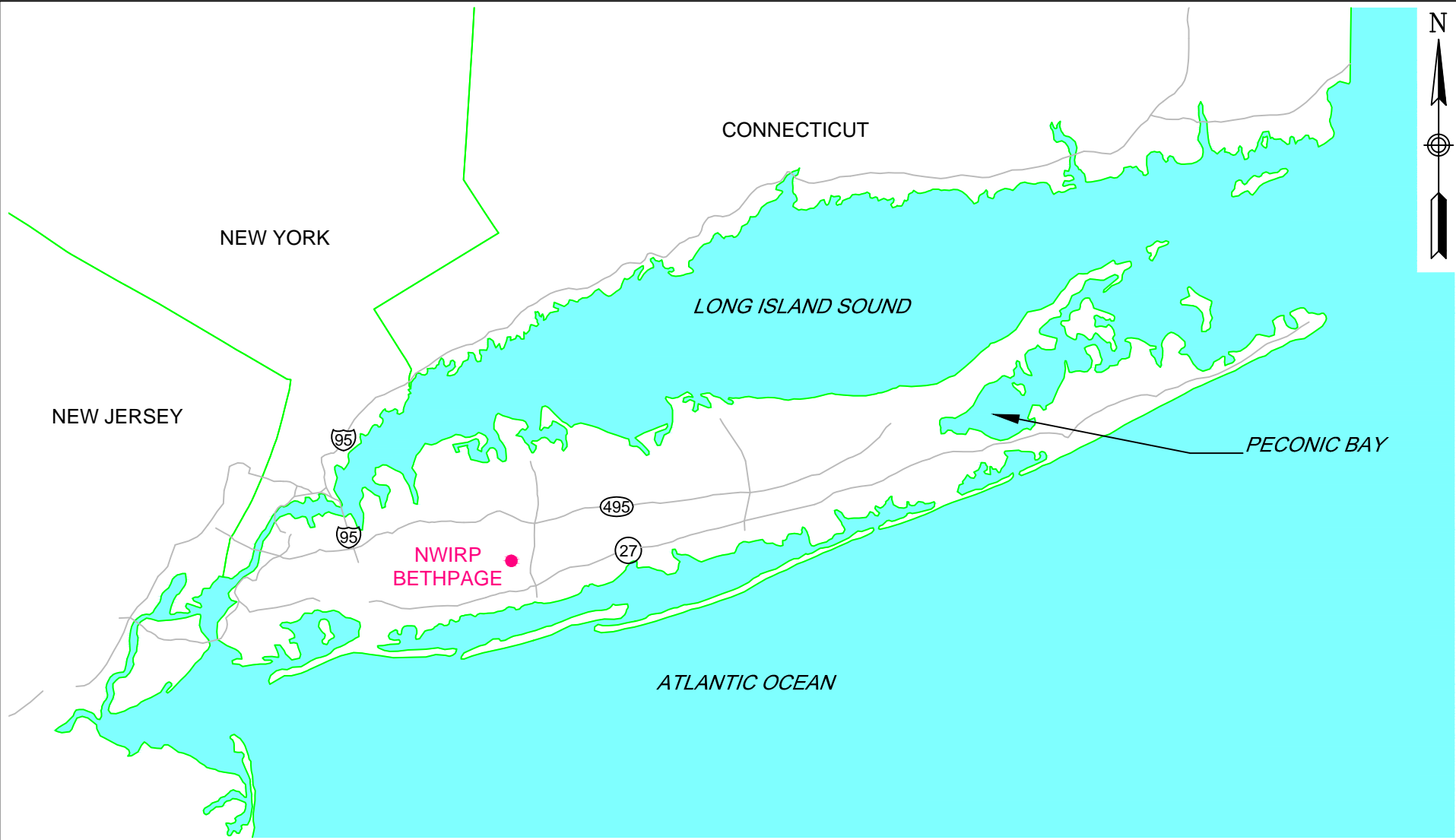
XX-XX: Bottom of sample interval, in feet. For example, a groundwater sample collected in VPB-162 at 100 to 102 feet below ground surface on April 1, 2016 would be VPB162-GW-0401165(100-102).

Table 3
 Proposed Monitoring Well Installation Summary
 Page 1 of 1

Location	VPB	Screened Interval Feet	Total Depth	Height of Sand Feet	Height of Fine Sand Feet
RE127D1	VPB 161	20	TBD	10 feet above screened interval	5 feet above sand
RE127D2		20	TBD	20 feet above screened interval	10 feet above sand
RE127D3		20	TBD	25 feet above screened interval	15 feet above sand
RE128D1	VPB 162	20	TBD	10 feet above screened interval	5 feet above sand
RE128D2		20	TBD	20 feet above screened interval	10 feet above sand
RE128D3		20	TBD	25 feet above screened interval	15 feet above sand
RE129D1	VPB 163	20	TBD	10 feet above screened interval	5 feet above sand
RE129D2		20	TBD	20 feet above screened interval	10 feet above sand
RE129D3		20	TBD	25 feet above screened interval	15 feet above sand
RE130D1	VPB 164	20	TBD	10 feet above screened interval	5 feet above sand
RE130D2		20	TBD	20 feet above screened interval	10 feet above sand
RE130D3		20	TBD	25 feet above screened interval	15 feet above sand
RE131D1	VPB 165	20	TBD	10 feet above screened interval	5 feet above sand
RE131D2		20	TBD	20 feet above screened interval	10 feet above sand
RE131D3		20	TBD	25 feet above screened interval	15 feet above sand
RE132D1	VPB 166	20	TBD	10 feet above screened interval	5 feet above sand
RE132D2		20	TBD	20 feet above screened interval	10 feet above sand
RE132D3		20	TBD	25 feet above screened interval	15 feet above sand
RE133D1	VPB 167	20	TBD	10 feet above screened interval	5 feet above sand
RE133D2		20	TBD	20 feet above screened interval	10 feet above sand
RE133D3		20	TBD	25 feet above screened interval	15 feet above sand

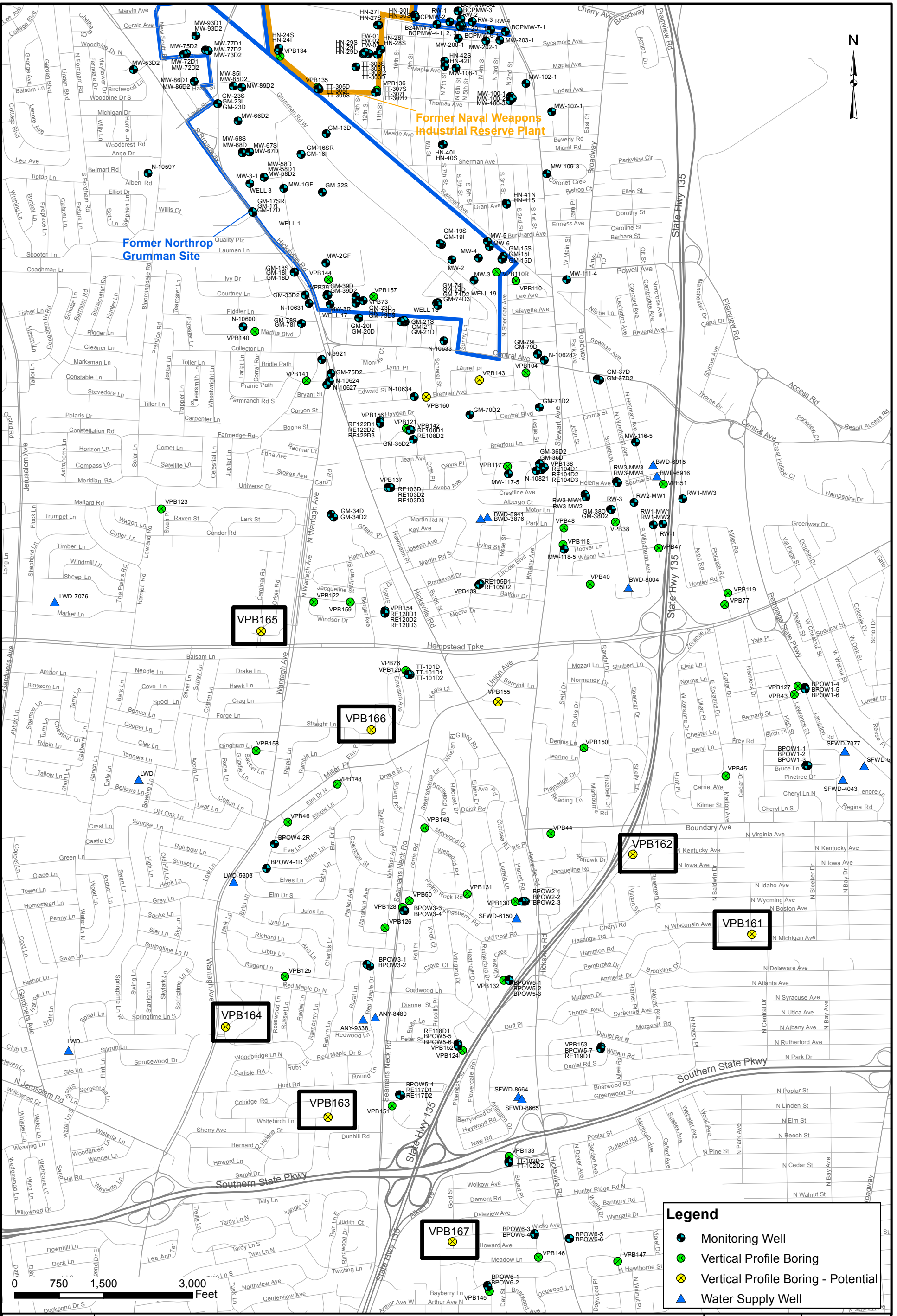
Note:
 TBD – To be determined

Figures



GENERAL LOCATION MAP
NWIRP BETHPAGE
BETHPAGE, NEW YORK

CONTRACT NUMBER N62470-11-D-8013		CTO NUMBER WE15	
APPROVED BY ---		DATE ---	
APPROVED BY ---		DATE ---	
FIGURE NO. 1			REV 0




POTENTIAL VERTICAL PROFILE BORINGS
 NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
 BETHPAGE, NEW YORK



CONTRACT NUMBER N62470-11-D8013	CTO NUMBER WE15
APPROVED BY EV	DATE 10/2/2015
APPROVED BY	DATE
FIGURE NO. 2	REV 0



Legend

 Vertical Profile Boring



VPB161 LOCATION MAP
 NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
 BETHPAGE, NEW YORK

CONTRACT NUMBER N62470-11-D8013	CTO NUMBER WE15
APPROVED BY PS	DATE 11/13/2015
APPROVED BY —	DATE —
FIGURE NO. 3	REV 0



Legend

Vertical Profile Boring




VPB162 LOCATION MAP
 NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
 BETHPAGE, NEW YORK

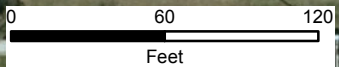
CONTRACT NUMBER N62470-11-D8013	CTO NUMBER WE15
APPROVED BY PS	DATE 11/13/2015
APPROVED BY —	DATE —
FIGURE NO. 4	REV 0

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Legend

 Vertical Profile Boring



VPB163 LOCATION MAP
 NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
 BETHPAGE, NEW YORK

CONTRACT NUMBER N62470-11-D8013	CTO NUMBER WE15
APPROVED BY PS	DATE 11/13/2015
APPROVED BY —	DATE —
FIGURE NO. 5	REV 0



Legend

● Vertical Profile Boring




VPB164 LOCATION MAP
 NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
 BETHPAGE, NEW YORK

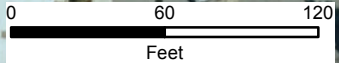
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APPROVED BY PS	DATE 11/13/2015
APPROVED BY —	DATE —
FIGURE NO. 6	REV 0

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Legend

 Vertical Profile Boring



VPB165 LOCATION MAP
 NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
 BETHPAGE, NEW YORK

CONTRACT NUMBER N62470-11-D8013	CTO NUMBER WE15
APPROVED BY PS	DATE 12/1/2015
APPROVED BY —	DATE —
FIGURE NO. 7	REV 0



Legend

Vertical Profile Boring




VPB166 LOCATION MAP
 NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
 BETHPAGE, NEW YORK

CONTRACT NUMBER N62470-11-D8013	CTO NUMBER WE15
APPROVED BY PS	DATE 11/10/2015
APPROVED BY —	DATE —
FIGURE NO. 8	REV 0



Legend

 Vertical Profile Boring



VPB167 LOCATION MAP
 NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
 BETHPAGE, NEW YORK

CONTRACT NUMBER N62470-11-D8013	CTO NUMBER WE15
APPROVED BY PS	DATE 10/1/2015
APPROVED BY —	DATE —
FIGURE NO. 9	REV 0

Attachment 1

Client:	Navy	WELL ID:
Project Number:		
Site Location:	Bethpage NY	Date Installed:
Well Location:		Inspector:
Method:	Mud rotary	Contractor:

MONITORING WELL CONSTRUCTION DETAIL

