ABBREVIATED WORK PLAN – NOVEMER 2013
VERTICAL PROFILE BORINGS (VPB-140, VPB-141, VPB-142, VPB-143, and VPB-144)
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 UFP 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/Northrop Grumman complex. 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 five VPBs 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 land surveyed and one round of groundwater samples will be collected for VOC analysis.

Sampling Locations

The work will be conducted at five locations, designated as VPBs 140, 141, 142, 143, and 144. At each location, a VPB will be completed followed by installation of up to three monitoring wells targeting different depths. Figure 2 shows the proposed locations of the VPBs. 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 existing monitoring wells in this area are no deeper than approximately 600 ft bgs and do not extend into the Raritan Clay Unit. This investigation will specifically address groundwater in five locations as follows (Figure 2):

- VPB-140 and associated monitoring wells RE106D, and RE106D2, will be located near the intersection of Arrandale Road and Martha Boulevard, Bethpage, NY.

- VPB-141 and associated monitoring wells RE107D, and RE107D2, will be located near the intersection of Farmedge Road and Farmedge Court, Bethpage, NY.

- VPB-142 and associated monitoring wells RE108D and RE108D2 will be located near the intersection of Corona Drive and Ceil Place, Bethpage, NY.

- VPB-143 and associated monitoring wells RE109D and RE109D2 will be located near the intersection of Laurel Place and St. Martin Street, Bethpage, NY.

- VPB-144 and associated monitoring wells RE110D and RE110D2 will be located northeast of an existing well cluster (GM-39D) in the parking lot behind the Federal Express delivery vehicles north of Sunbeam 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 Northrop Grumman Corporation (NGC) until September 1998. Prior to 2002, the NWIRP property was bordered on the north, west, and south by current or former Northrop Grumman 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 five 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 feet bgs). Verification of the Raritan Clay formation will be confirmed when three consecutive 5 ft split spoon samples are representative of 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 feet bgs, (four samples per boring).
- 20-Foot intervals from 200 up to 1,000 feet 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. Trip blanks will also be collected and submitted on a daily basis for VOC analysis.

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

Geophysical Logging

Borehole geophysical logs (specifically gamma activity logs) will be performed to determine lithology for each VPB boring.

Air Monitoring

One air sample per VPB will be collected to document ambient levels of VOC in the work area air during installation of the VPB borings. A community air monitoring plan (CAMP) will be followed during installation of the VPBs and monitoring wells.

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. 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 TCE profile from the hydropunch sampling. Well screens will be 10 slot (0.010 inches). 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 feet bgs: to a minimum of 10 feet above top of screen.
- Well TD 350 to 600 feet bgs: to a minimum of 20 feet above top of screen.
- Well TD 600 to 850 feet 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 feet bgs: 5 feet thick above the top of the gravel pack.
- Well TD 350 to 600 feet bgs: 10 feet thick above the top of the gravel pack.
- Well TD 600 to 850 feet 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 4- to 8- foot thick bentonite seal will be installed above the fine sand layer. 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. A fine sand will be installed above the top of the box to drain. A 0.5 foot thick concrete apron measuring 2 feet by 2 feet square will be installed around each well. Well locks will be used to secure the wells.

Monitoring Well Groundwater Sample Collection

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 New York State Department of Environmental Conservation (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. These pumps will be 3-inch variable speed submersibles with an associated packer system. The pumps will be installed at a depth of approximately 20 feet above the screen interval, but no deeper than 500 feet below top of well casing.

IDW

Investigation Derived Waste (IDW) accumulated during drilling activities will be collected, containerized, accumulated at NWIRP Bethpage, and disposed 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 vertical profile boring 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

A summary report will be developed to provide documentation of this investigation. Documentation required to support this project will consist of the following items:

- Field notebook
- Boring log for each boring
- Paired graphic of VOC concentration in groundwater with gamma log
- Groundwater, soil, and air sample log sheets

- Well completion form for each well
- Well development record
- Map identifying newly installed monitoring wells and VPBs and changes in TCE isocontours.

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-140	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-141	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-142	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-143	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-144	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 2

Location	Sample ID	Matrix	Number of Samples		
			VOCs – Quick Turn [1]	TOC[2]	VOCs – TO 15[3]
VPB-140	VPB-140-Soil- MMDDYY XX-XX	Soil	--	0 to 2	--
	VPB-140-GW- MMDDYY XX-XX	Groundwater	~44	--	--
	VPB-140-AIR-MMDDYY	Air	--	--	1 per VPB
VPB-141	VPB-141-Soil- MMDDYY XX-XX	Soil	--	0 to 2	--
	VPB-141-GW- MMDDYY XX-XX	Groundwater	~44	--	--
	VPB-141-AIR-MMDDYY	Air	--	--	1 per VPB
VPB-142	VPB-142-Soil- MMDDYY XX-XX	Soil	--	0 to 2	--
	VPB-142-GW- MMDDYY XX-XX	Groundwater	~44	--	--
	VPB-142-AIR-MMDDYY	Air	--	--	1 per VPB
VPB-143	VPB-143- Soil- MMDDYY XX-XX	Soil	--	0 to 2	--
	VPB-143-GW- MMDDYY XX-XX	Groundwater	~44	--	--
	VPB-143-AIR-MMDDYY	Air	--	--	1 per VPB
VPB-144	VPB-143- Soil- MMDDYY XX-XX	Soil	--	0 to 2	--
	VPB-143-GW- MMDDYY XX-XX	Groundwater	~44	--	--
	VPB-143-AIR-MMDDYY	Air	--	--	1 per VPB

Table 2

Vertical Profile Boring Analytical Summary
Page 2 of 2

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, November 1, 2013 would be 110113.
XX-XX: Bottom of sample interval, in feet. For example, a groundwater sample collected in VPB-142 at 100 to 102 feet below ground surface on November 1, 2013 would be VPB142-GW-110113(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 choke sand Feet
RE106D	VBP 140	20	TBD	10 feet above screened interval	5 feet above sand
RE106D2		20	TBD	20 feet above screened interval	10 feet above sand
RE107D	VPB 141	20	TBD	10 feet above screened interval	5 feet above sand
RE107D2		20	TBD	20 feet above screened interval	10 feet above sand
RE108D	VPB 142	20	TBD	20 feet above screened interval	10 feet above sand
RE108D2		20	TBD	25 feet above screened interval	15 feet above sand
RE109D	VPB 143	20	TBD	20 feet above screened interval	10 feet above sand
RE109D2		20	TBD	25 feet above screened interval	15 feet above sand
RE110D	VPB 144	20	TBD	20 feet above screened interval	10 feet above sand
RE110D2		20	TBD	25 feet above screened interval	15 feet above sand

Figures

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HWD-10208 HWD-8779 BWD-8768 BWD-8767 BWD-9591

S Broadway State Hwy 135 Hempstead Tpke

VPB-21 VPB-27 VPB-19A MW-201-1 MW-200-1 MW-202-1 MW-203-1
HN-24S HN-24I HN-29IR HN-29D FW-01 FW-02 FW-03
VPB-134 VPB-135 VPB-136 VPB-107 VPB-106 MW-108-1 HN-42S HN-42I
VPB-105 VPB-108 MW-102-1 MW-100-1 MW-100-2 MW-100-3 MW-107-1 VPB-102
GM-13D GM-16I GM-16SR HN-40S HN-40I VPB-100 VPB-115
N-10597 GP-3 WELL 3 MW-1GF GM-32S MW-109-3
GM-17I GM-17D GM-17SR VPB-109R VPB-109 VPB-101
GP-1 WELL 1 MW-5 MW-6 GM-19I GM-19S GM-15S GM-15I GM-15D GM-15D2
MW-2GF MW-2 VPB-110R VPB-113 MW-111-4
GM-18S GM-18I GM-18D GM-39DA GM-39DB VPB-39 MW-3 Well-19 VPB-110
GM-33D2 N-10631 GM-73D GM-73D2 VPB-73 Well 18 GM-74I GM-74D GM-74D2 VPB-111
VPB-144 MW-3R Well-17 GM-20I GM-20D GM-21I GM-21S GM-21D
N-10600 GM-78S GM-78I VPB-140 N-10633 VPB-103
N-9921 N-10628 GM-79D GM-79I VPB-49C VPB-114
GM-75D2 N-10624 N-10627 GM-37D GM-37D2
VPB-141 N-10634 VPB-143 VPB-104 GM-71D2 GM-70D2 VPB-112
VPB-121 GM-35D2 VPB-142 MW-116-5 VPB-116 VPB-42
GM-36D GM-36D2 VPB-117 MW-117-5 VPB-138 N-10821 BWD-6915 BWD-6916 VPB-51
VPB-137 GM-38RW03 GM-38D2 GM-38D
VPB-123 GM-34D GM-34D2 BWD-8941 BWD-3876 VPB-48 VPB-38 GM38-RW01 VPB-47
VPB-118 MW-118-5
VPB-139 VPB-40 BWD-8004 VPB-119 VPB-77
LWD-7076 VPB-122

VPB-76 VPB-129 TT-101D TT-101D1 BPOW 1-4 BPOW 1-5 VPB-127 VPB-43
VPB-S3 BPOW 1-1 BPOW 1-2 BPOW 1-3 SFWD-7377 SFWD-5148 SFWD-4043 VPB-45
VPB-S2 VPB-46 VPB-S4 VPB-44
BPOW 4-1 BPOW 4-2 LWD-5303
VPB-50 VPB-128 VPB-131 VPB-130 BPOW 2-1 BPOW 2-2 BPOW 2-3
VPB-126 BPOW 3-3 BPOW 3-4 SFWD-6150
VPB-125 BPOW 3-1 BPOW 3-2
AQUA-9338 AQUA-8480 BPOW 5-1 BPOW 5-2 VPB-132
VPB-124 VPB-S5 VPB-S7
SFWD-6866 SFWD-8665 VPB-S6
VPB-133

N

0 750 1,500 3,000 Feet

Legend

- Monitoring Well
- Monitoring Well Proposed
- Water Supply Well
- Vertical Profile Boring
- Vertical Profile Boring Potential

NAVFAC

APPROXIMATE LOCATION OF
POTENTIAL VPBS
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY —	DATE —
APPROVED BY —	DATE —
FIGURE NO. 1	REV 0

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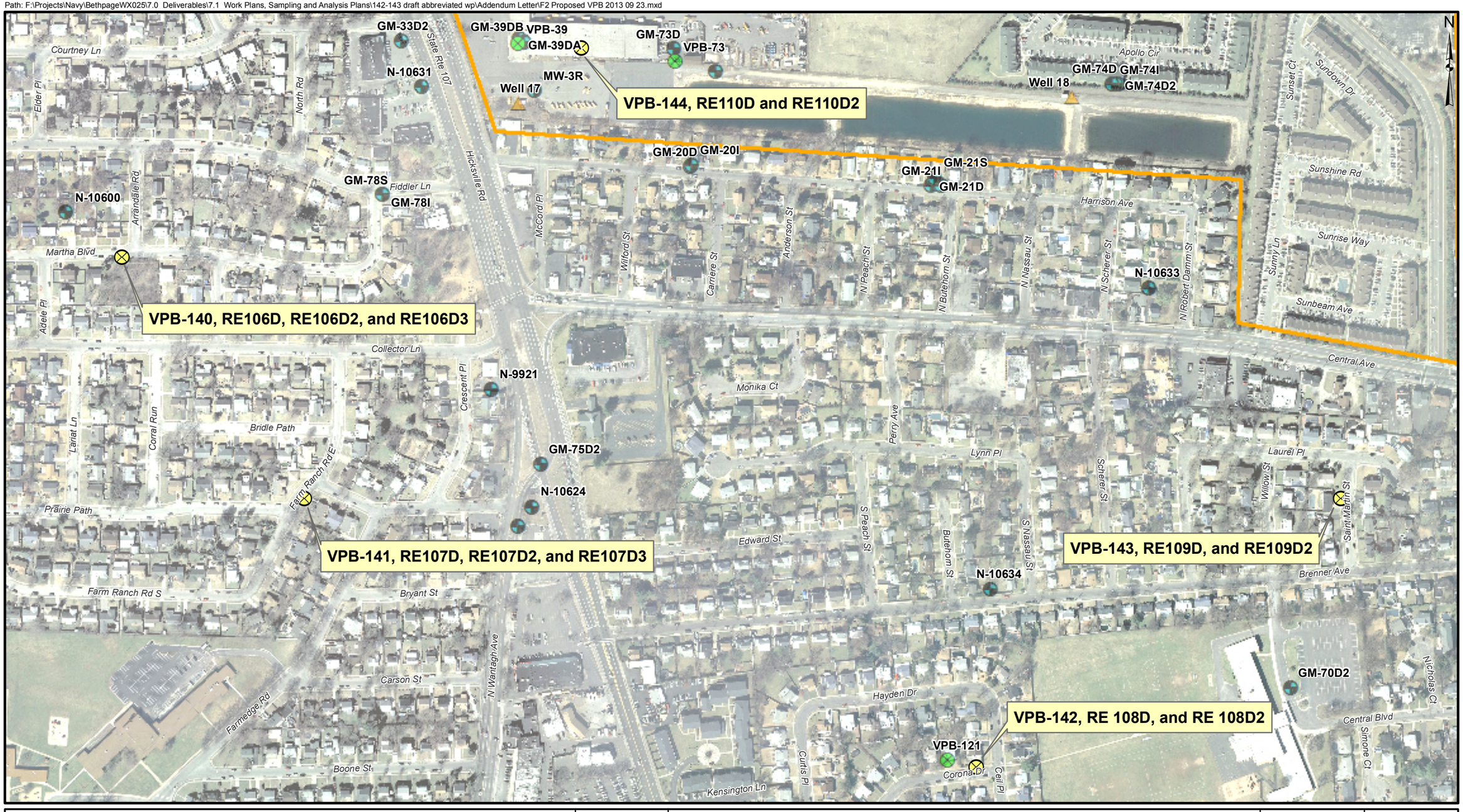


Potential Vertical Profile Boring (VPB)

Vertical Profile Boring

Monitoring Well

Water Supply Well

NAVFAC

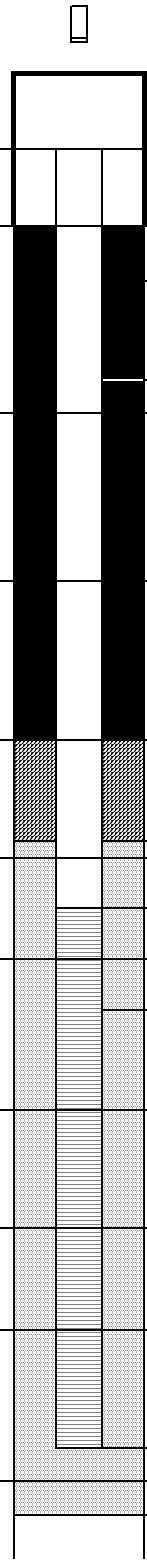
POTENTIAL VPB LOCATIONS
OU2 SITE 1
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D-8013	WE15
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO. 2	REV 1

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



	Depth from G.S. (feet)	Elevation(feet)
Top of Flush Mount Well Cap	0.0	
Top of Riser Pipe	0.000	
Steel surface casing : 55 feet		
Riser Pipe:		
Length 0.00		
Inside Diameter (ID) 4-Inches		
Type of Material PVC		
% Cement		
% Bentonite		
% Native		
Top of Bentonite		
Bentonite Seal Thickness 8		
Top of Sand		
Top of Screen		
▲ Stabilized Water Level		0
Screen:		
Length 40 feet		
Inside Diameter (ID)		
Type of Material Schedule 80 PVC		
Bottom of Screen		0
Bottom of Borehole		

Borehole Diameter: 10 inch

Date