TETRA TECH

NOR-01285

December 8, 2011

Mr. Steve Scharf
New York Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Remedial Action A
625 Broadway, 11th Floor
Albany, New York 12233-7015

Reference: CLEAN Contract No. N62472-03-0057
Contract Task Order 66

Subject: Revised VPB-133 Letter Work Plan Addendum (December 2011) for
OU 2 Off-Site Groundwater Investigation
NWIRP Bethpage, New York

Dear Mr. Scharf:

On behalf of the Navy, please find enclosed a copy of the subject document. This document outlines the approach for installation of one vertical profile boring (VPB-133) and two monitoring wells (TT-102D and TT-102D2) for the OU2 Off-Site Groundwater Investigation. This document incorporates the November 2011 responses to comments.

If you have any questions please contact Ms. Lora Fly, NAVFAC Mid-LANT, at (757) 341-2012.

Sincerely,

David D. Brayack, P.E.
Project Manager

Enclosure: (1) Revised VPB-133 Work Plan Addendum for OU 2 (December 2011)
Off-Site Groundwater Investigation NWIRP Bethpage, New York

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VPB-133 WORK PLAN ADDENDUM – DECEMBER 2011
OU 2 OFF-SITE GROUNDWATER INVESTIGATION
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NWIRP)
BETHPAGE, NEW YORK

1.0 INTRODUCTION

This Letter Work Plan Addendum has been prepared by Tetra Tech NUS, Inc. (Tetra Tech) for the Naval Facilities Engineering Command Mid-Atlantic under Contract Task Order (CTO) 066 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) contract number N62472-03-D-0057. This Work Plan outlines the approach for installation of vertical profile boring (VPB) - 133 and monitoring wells TT-102D and -102D2. Based on lithology and groundwater data (VOC analytical results) collected from VPB-133, a third monitoring well (TT-102D1) may be installed at this well cluster location. Because of the distance from the boring location to Massapequa Water District (MWD) (4,000 feet), the boring and monitoring wells are not outpost monitoring wells. In addition, even though this work plan indicates that two separate monitoring wells will be installed, the use of an alternative monitoring well design that features a single well with multiple screens and a packer system is being evaluated. If an alternative monitoring well design is selected, an addendum to this plan will be prepared. This document serves as a supplement to the 2010 Letter Work Plan, Pre-Design Field Investigation, OU2 Off-Site Groundwater Investigation, NWIRP Bethpage, New York. These investigations are 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. Delineation and potential remediation of groundwater in these areas are addressed under the Navy Operable Unit No. 2 Record of Decision.

1.1 SCOPE AND OBJECTIVE

The objectives of the pre-design field investigations 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. The installation of vertical profile boring VPB-133 and the monitoring wells will specifically assess the condition of groundwater north of Massapequa Water District (MWD) public water supply wells N-06442 and N-06443 (Figure 2).

The scope of work consists of the drilling, sampling, and soil/groundwater analysis of one vertical profile boring and installation and development of two monitoring wells. Vertical profile boring VPB-133 will be

installed to a depth of approximately 860 feet below ground surface (bgs) and monitoring wells TT-102D and -102D2 will be installed to a depth up to 825 feet bgs. A geological cross section presenting the proposed vertical profile boring and monitoring wells is provided as Figure 3.

During installation of the vertical profile borings, groundwater samples will be collected on 20- to 50-foot intervals and analyzed for VOCs. Screen intervals for monitoring wells will be determined from an evaluation of lithology and groundwater data collected from VPB-133 and well screen intervals for MWD public water supply wells N-06442 and N-06443.

1.2 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 Bethpage is bordered on the east by a residential neighborhood and on the north, south, and west by Nassau County property. Access to the NWIRP Bethpage is from South Oyster Bay Road.

2.0 FIELD ACTIVITIES

The scope of work consists of the drilling, sampling, and soil/groundwater analysis of one vertical profile boring and installation and development of two monitoring wells. The specific activities to be conducted are as follows.

2.1 VERTICAL PROFILE BORING

Vertical profile boring VPB-133 will be installed to the top of the Raritan Clay layer (approximately 860 feet bgs). Field activities are presented in Table 1. A cross section depicting the location of VPB-133 is presented in Figure 3. Sample nomenclature and analysis are presented in Table 2. Sample containers will be labeled with a unique sample identifier. Groundwater grab samples will be collected from a hydropuch-type sampler at the following depth intervals:

- 50-Foot intervals from 50 to 200 feet bgs, (4 samples per boring).
- 20-Foot intervals from 200 to 860 feet bgs, (30 samples per boring).

Five or more split spoon samples will be collected per vertical profile boring to confirm lithology. These samples are used to correlate gamma logs with soil type. Up to two soil samples per boring will be submitted to a laboratory for Total Organic Carbon (TOC) analysis. The majority of the split spoon samples will be collected to confirm the top of the Raritan Confining Unit. Once the boring has been advanced to the suspected top of the Raritan Confining Unit (see below), split spoon samples will be collected every five feet, until four consecutive samples are collected that are indicative of the confining unit. Evidence of Raritan Confining Unit is as follows.

- A gravel unit has been typically identified to be present at the bottom of the Magothy aquifer.
- A noticeable change in the color of the drilling fluid and/or a decrease in the quantity of sands and gravels in the drilling mud would provide evidence of the Raritan Confining Unit.
- Split spoon samples being predominately dense clay and/or split spoon refusal would provide evidence of the Raritan Confining Unit.

The following provides the analytical program requirements for the vertical profile borings:

- Groundwater samples will be analyzed by a Navy-approved laboratory (72-hour turnaround time) that is New York State approved for VOC analysis. Trip blanks will also be submitted with each sample shipment which contains samples for VOC analysis.

During the collection of groundwater samples, typical field parameters will be measured (pH, temperature, specific conductivity, and turbidity) as volume permits. Gamma ray logging will be performed to determine lithology. During installation of the vertical profile boring, one air sample will be collected and analyzed for VOCs to evaluate potential emissions.

2.2 MONITORING WELL INSTALLATION

Two monitoring wells (TT-102D and -102D2) will be installed during this investigation (Figure 2). As discussed in Section 1.0, an alternative monitoring well design (e.g., single well will multiple screens and a packer system) is being evaluated. A cross section illustrating the anticipated screen intervals of the monitoring wells is presented in Figures 3. Screen intervals will be finalized based on data collected from VBP-133 and the MWD water supply well screen intervals.

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, groundwater data collected from the vertical profile borings, and associated supply well screen intervals. A typical well construction detail is provided in Attachment 1.

The monitoring wells will be constructed of 4-inch diameter, schedule 80 National Sanitation Foundation (NSF)-grade Polyvinyl Chloride (PVC) well casing and screen. Well screens will be 10 slot (0.010 inches) and approximately 40 feet in length. Based on local lithology, alternative screen lengths may be used. 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 placed as follows:

- Well total depth (TD) 50 to 365 feet bgs: to a minimum of 10 feet above top of screen.
- Well TD 365 to 530 feet bgs: to a minimum of 20 feet above top of screen.
- Well TD 530 to 825 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 365 feet bgs: 5 feet thick above the top of the gravel pack.
- Well TD 365 to 530 feet bgs: 10 feet thick above the top of the gravel pack.
- Well TD 530 to 780 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 drain hole will be installed at the bottom of the curb box to allow water 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 and a permanent well tag will be installed.

2.3 MONITORING WELL DEVELOPMENT

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.

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.

2.4 SAMPLING PUMP INSTALLATION

A dedicated sampling pump system will be installed in each monitoring well. 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.

2.5 INVESTIGATION DERIVED WASTE

Investigation Derived Waste (IDW) accumulated during drilling activities will be collected, containerized, accumulated at NWIRP Bethpage, and disposed off site.

2.6 DECONTAMINATION

A centrally located decontamination pad located 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.

2.7 SURVEYING

The location of the vertical profile boring and newly installed monitoring wells will be surveyed by a New York State licensed surveyor.

2.8 DOCUMENTATION

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
- Groundwater, soil, and air sample log sheets
- Well completion form for each well
- Well development record

Once the summary report is prepared for submittal, a copy will be sent to NYSDEC for review.

TABLES

TABLE 1
VERTICAL PROFILE BORING VPB-133 SAMPLING PROGRAM
OFF-SITE LOCATION OU-2 WORK PLAN ADDENDUM
NWIRP BETHPAGE, NEW YORK

Boring Number	Drilling Method	Total Depth (feet)[1]	Depth (feet)	Split Spoon Sampling	Groundwater Sampling	Gamma Log	Air Sample[2]
VPB-133	MR	860	50 to 200	0 to 1	50, 100, 150, and 200 feet (4 samples)	Yes	Yes
			220 to 600	1 to 2	20-foot intervals (20 samples)		
			620 to 860	1 to 2	20-foot intervals (13 samples)		
			800 to 860	Up to 5, at 10-foot intervals	Up to 3, at 20-foot intervals, if sand is encountered.		

[1] Total depth will be to the top of the Raritan Clay Unit, at a depth of approximately 860 feet below ground surface.
[2] Work area summa canister (6 to 8 hours).
VBP: vertical profile boring.
MR: mud rotary.

TABLE 2
VERTICAL PROFILE BORING VPB-133 SAMPLING AND ANALYTICAL SUMMARY
OFF-SITE LOCATION OU-2 WORK PLAN ADDENDUM
NWIRP BETHPAGE, NEW YORK

Location	Sample ID	Matrix	Number of Samples		
			VOCs - Quick Turn[(1)]	TOC[(2)]	VOCs – TO-15A[(3)]
VPB-133	BP-VPB133-SB-XXX	Soil	--	0 to 2	--
	BP-VPB133-GW-XXX	Groundwater	37	--	--
	BP-VPB133-AIR- MMDDYY	Air	--	--	1

VOCs: Volatile organic compounds.
TOC: Total Organic Carbon.
BP: Bethpage
VPB: Vertical Profile Boring
SB: Soil Boring
GW: Groundwater
XXX: Bottom of sample interval, in feet. For example, a groundwater sample collected in VPB 133 at 100 to 102 feet below ground surface would be BP-VPB133-GW-102.
MMDDYY: Sample date in month, day, and year. For example, September 2, 2011 would be 090211.

[1] 72-Hour results from local laboratory via method EPA 524.2 or equivalent method.
[2] 21-Day results from Navy-approved laboratory via Walkley-Black Method.
[3] 21-Day results from Navy-approved laboratory via method TO-15A.

TABLE 3
MONITORING WELLS TT-102D AND 102D2
PROPOSED CONSTRUCTION DETAILS
OFF-SITE LOCATION OU-2 WORK PLAN ADDENDUM
NWIRP BETHPAGE, NEW YORK

Monitoring Well Designation	Screend Interval (ft bgs) [1]	Total Well Depth (ft bgs) [1]	Height Gravel Pack (ft bgs) [2]	Height Fine Sand (ft bgs) [2]	Purpose
TT-102D	560 to 600	605	535	520	Monitor groundwater upgradient of Massapequa Water District Supply Well N-06642
TT-102D2	760 to 800	805	735	720	Monitor groundwater upgradient of Massapequa Water District Supply Well N-06443

bgs - below ground surface

ft - feet

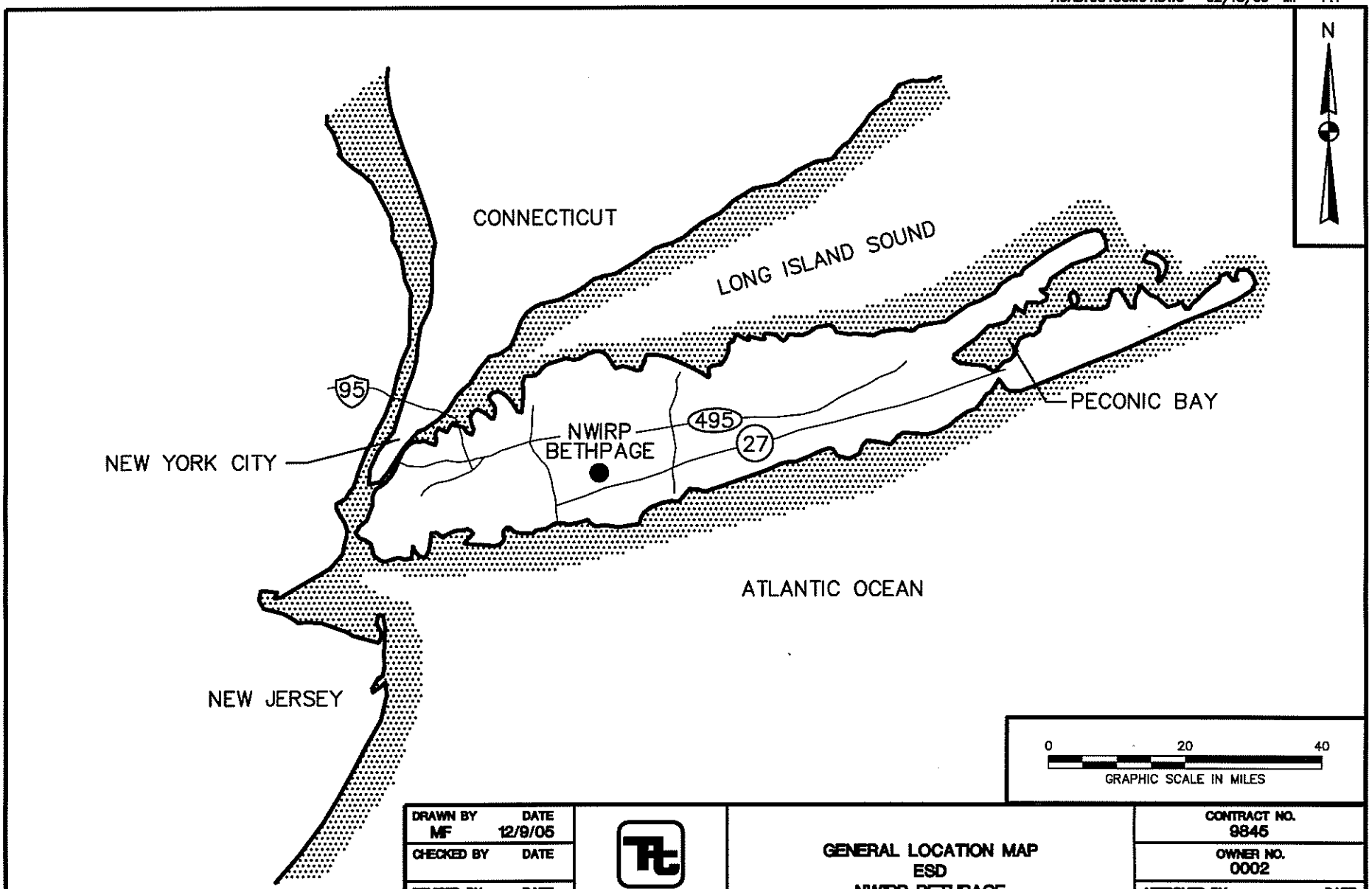
TBD - to be determined

[1] Based on the local USGS quad sheet, ground surface is assumed to be 33 feet above mean sea level. Depth presented are approximate, final depths will be determined based on lithology and groundwater data collected from vertical profile borings and screen intervals from water supply wells.

[2] Height of gravel pack and fine sand layer will be determined by total well depth. Details are provided in Section 2.2 of the work plan.

FIGURES

ACAD: 9845CM04.DWG 02/15/06 MF PIT



DRAWN BY MF DATE 12/9/05	Tetra Tech NUS, Inc.	GENERAL LOCATION MAP ESD NWIRP BETHPAGE BETHPAGE, NEW YORK	CONTRACT NO. 9845
CHECKED BY DATE			OWNER NO. 0002
REVISED BY DATE			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 1 REV. 0

FORM CADD NO. TTNUS-AH.DWG - REV 1 -9/10/98

N

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

Dry-Well-20-08 Dry-Well-21-07

VPB-21 VPB-27 VPB-19A MW-201-1 MW-202-1 MW-200-1 MW-203-1 HN-24I HN-24S FW-03 FW-02 FW-01 HN-29IR HN-29D HN-42I HN-42S VPB-106 MW-108-1 VPB-105 MW-102-1 VPB-107 VPB-108 MW-100-1 MW-100-2 MW-100-3 MW-107-1 VPB-102

GM-13D GM-16I GM-16SR HN-40I HN-40S VPB-100 VPB-115 MW-109-3 N-10597 GP-3 WELL 3 MW-1GF GM-32S GM-17SR GM-17I GM-17D VPB-109R VPB-109 VPB-101 MW-4 GP-1 WELL 1 GM-19I GM-19S MW-5 MW-6 GM-15S GM-15I GM-15D MW-111-4 VPB-110

MW-2GF GM-18S GM-18I GM-18D VPB-39 GM-39DA GM-39DB MW-2 VPB-110R VPB-113 Well 18 MW-3 Well 19 GM-33D2 N-10631 GM-73D VPB-73 GM-73D2 MW-3R GM-74I GM-74D GM-74D2 VPB-111 N-10600 Well 17 GM-78S GM-78I N-9921 GM-20I GM-20D GM-21S GM-21I GM-21D N-10633 VPB-103 GM-79I GM-79D N-10628 VPB-49C VPB-114 GM-75D2 N-10627 N-10624 GM-37D GM-37D2 VPB-104 N-10634 GM-71D2 GM-70D2 VPB-112 VPB-121 GM-35D2 MW-116-5 VPB-116 VPB-42 GM-36D2 GM-36D VPB-117 N-10821 BWD-P4-6915 BWD-P4-6916 VPB-51 VPB-123 GM-34D GM-34D2 (N-10820) BWD-8941 BWD-3876 GM38-RW03 GM-38D GM-38D2 VPB-38 GM38-RW01 VPB-48 VPB-118 VPB-47 LWD-7076 VPB-40 BWD-P5-8004 VPB-119 VPB-77 VPB-122 SFWD-7516

VPB-76 VPB-129 TT-101D TT-101D2 BPOW 1-4 BPOW 1-5 BPOW 1-6 VPB-127 VPB-43 BPOW 1-1 BPOW 1-2 BPOW 1-3 SFWD-7377 VPB-45 SFWD-5148 SFWD-4043 VPB-46 BPOW 4-2 BPOW 4-1 VPB-44 LWD-5303 BPOW 2-3 VPB-50 VPB-131 BPOW 2-1 BPOW 2-2 VPB-126 BPOW 3-3 BPOW 3-4 VPB-128 SFWD-6150 VPB-130 VPB-125 BPOW 3-2 BPOW 3-1 BPOW 5-1 BPOW 5-2 ANY-9338 ANY-8480 VPB-124 SFWD-8664 SFWD-8665 SFWD-6148 VPB-133 TT-102D TT-102D2 MXD MWD-6442 MWD-6443

FWD-6644 Fv

A A' B B' C C' D D' E E' F F' G G' H H' I I'

0 2,000 4,000
SCALE IN FEET

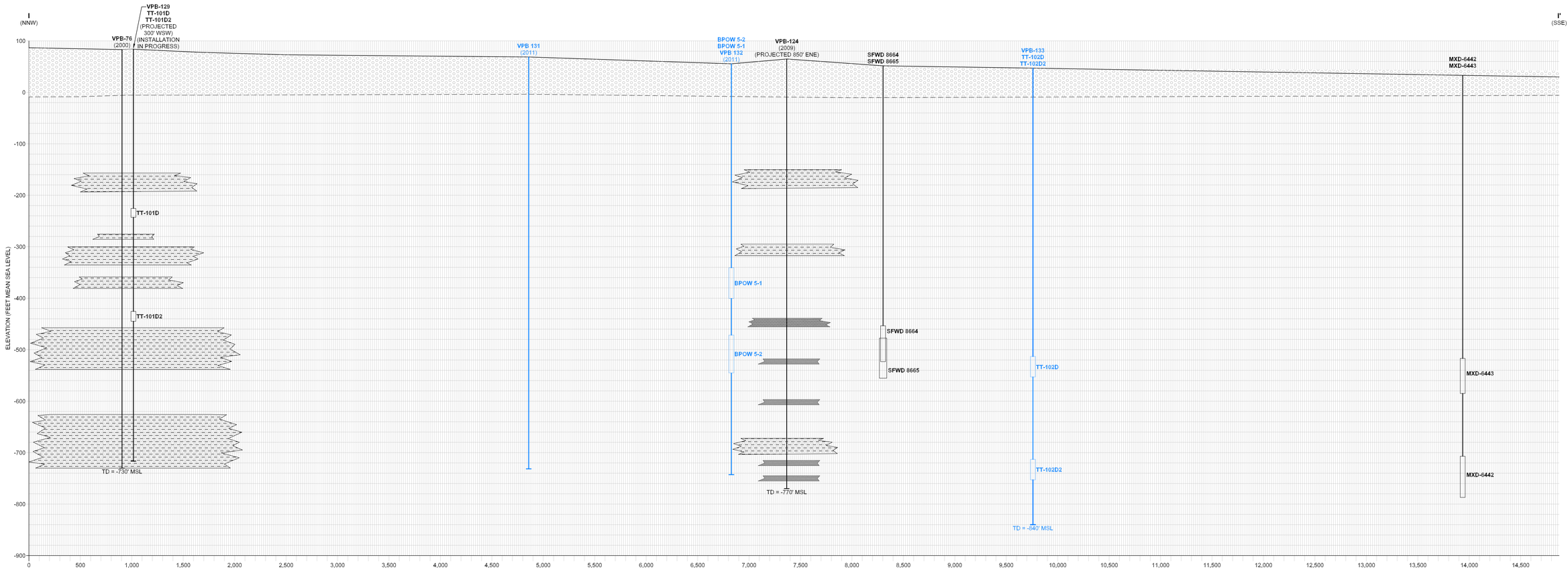
LEGEND

- GROUNDWATER SAMPLING LOCATION
- PROPOSED GROUNDWATER SAMPLING LOCATION
- WATER SUPPLY WELL
- VERTICAL PROFILE BORING
- PROPOSED VERTICAL PROFILE BORING
- BUILDING
- HIGHWAY
- MAJOR LOCAL ROAD
- MINOR LOCAL ROAD
- 1997 NORTHROP-GRUMMAN BETHPAGE BOUNDARY
- 1997 NWIRP BETHPAGE BOUNDARY

TETRA TECH NUS, INC.

OPERABLE UNIT 2 (SITE 1)
CROSS SECTION MAP
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

FILE	SCALE
112G01041GM07	AS NOTED
FIGURE NUMBER: FIGURE 2	REV: 0 / DATE: 10/05/11



CROSS SECTION LOCATION MAP

LEGEND

- SAND AND GRAVEL
- F-M SAND WITH VARYING AMOUNTS OF SILT, CLAY, AND C. SAND
- CONFINING UNITS
- INTERBEDDED CLAY AND SAND
- SANDY CLAY
- CLAY

- TT-101D — MONITORING WELL ID
- (2000) — INSTALLATION YEAR
- (PROJECTED 300' WSW) — PROJECTION
- GROUND SURFACE (APPROXIMATED TO BE FLAT)
- CONFINING UNIT (DASHED WHERE INFERRED)
- TT-101D — MONITORING WELL SCREEN
- TD = -730' MSL — TOTAL DEPTH (MEAN) SEA LEVEL

- BPOW 5-2 — PROPOSED MONITORING WELL ID
- (2011) — PROPOSED INSTALLATION YEAR
- (PROJECTED 850' ENE) — PROJECTION
- PROPOSED MONITORING WELL
- BPOW 5-2 — PROPOSED MONITORING WELL SCREEN

160
80
0
VERTICAL SCALE IN FEET

0
400
800
HORIZONTAL SCALE IN FEET

TETRA TECH NUS, INC.

CROSS SECTION I – I'
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

FILE	SCALE
112G01041GS29	AS NOTED
FIGURE NUMBER	REV / DATE
FIGURE 3	0 / 10/05/11

ATTACHMENT 1
TYPICAL MONITORING WELL
CONSTRUCTION DETAIL

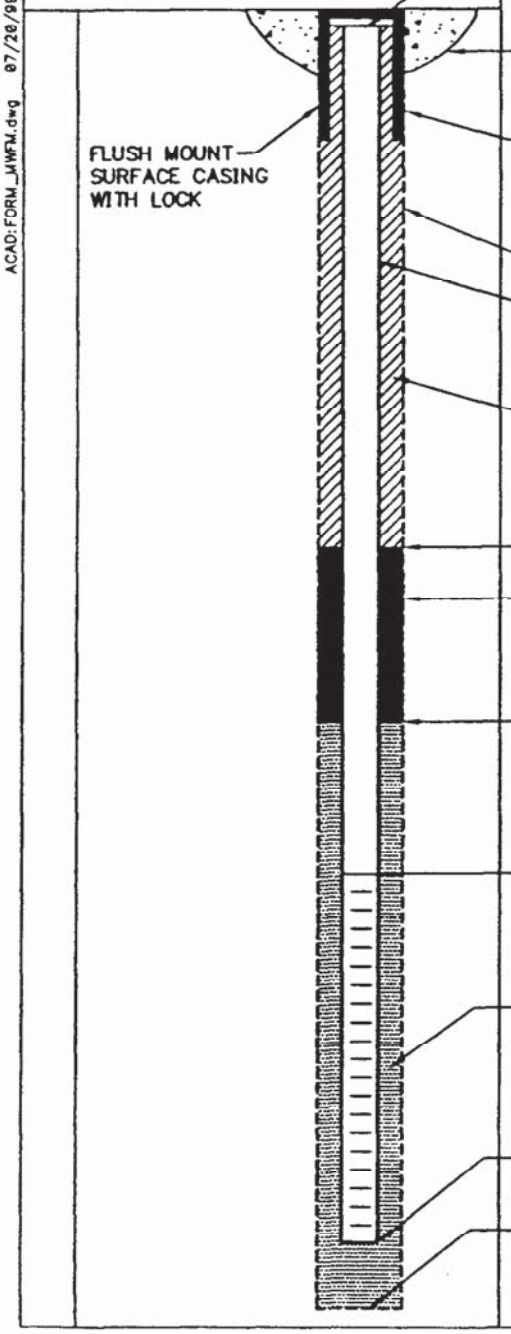
FIGURE 4
TYPICAL MONITORING WELL CONSTRUCTION

WELL NO.: _____

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
FLUSH - MOUNT

PROJECT NWTRP Bethpage	LOCATION _____	DRILLER _____
PROJECT NO. N4037	BORING _____	DRILLING METHOD Mud Rotary
DATE BEGUN _____	DATE COMPLETED _____	DEVELOPMENT METHOD Air Lift / Pump
FIELD GEOLOGIST _____		
GROUND ELEVATION _____	DATUM _____	



ELEVATION TOP OF RISER: _____

TYPE OF SURFACE SEAL: 2'x2' Cement Pad

TYPE OF PROTECTIVE CASING: Steel

I.D. OF PROTECTIVE CASING: 12"

DIAMETER OF HOLE: 8"

TYPE OF RISER PIPE: PVC-Sch. 80

RISER PIPE I.D.: 3.8

TYPE OF BACKFILL/SEAL: Bent / Cement to 100' below ground surface

ELEVATION/DEPTH TOP OF SEAL: 1

TYPE OF SEAL: Bentonite

ELEVATION/DEPTH TOP OF SAND: 1

5' to 15' Fine Sand (WG00)
10' to 25' Coarse Sand (WG#1) above Screen

ELEVATION/DEPTH TOP OF SCREEN: 1

TYPE OF SCREEN: PVC-Schedule 80

SLOT SIZE x LENGTH: No 10 Slot, ~40'

TYPE OF SAND PACK: WG #1 Silica Sand

ELEVATION / DEPTH BOTTOM OF SCREEN: 1

ELEVATION / DEPTH BOTTOM OF SAND: 1

ELEVATION/DEPTH BOTTOM OF HOLE: 1

BACKFILL MATERIAL BELOW SAND: _____

ACAD:FORM_MWFM.dwg 07/20/99 INL