DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
9324 VIRGINIA AVENUE NORFOLK, VA 23511-3095

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OPTE3/18
April 3, 2017

Edward J. Hannon
Environmental, Safety, Health and Medical Manager
Northrop Grumman Systems Corporation
925 South Oyster Bay Road
M/S Q06305/BP15
Bethpage, NY 11714

Dear Mr. Hannon,

Subj: OPERABLE UNIT 2 GROUNDWATER SAMPLING

Due to the need to continue delineating the Operable Unit (OU) 2 plume, the Navy is continuing to install addition vertical profile borings and groundwater monitoring wells. Based on the 2016 Annual Groundwater Monitoring Report, NG is currently sampling 98 Navy and NG-owned monitoring wells including the outpost monitoring wells near South Farmingdale Water District Plants 1, 3 and 6, New York American Water, Levittown and Massapequa Water District. In the spirit of cooperation in evaluation of the OU-2 plumes, by way of this letter, the Navy memorializes its request that NG sample 17 additional Navy-owned wells listed in table 1.[1]

Table 1 - Wells Ready for Sampling - Offsite Groundwater Investigation, NWIRP Bethpage

Well	NG Sampling Anticipated (Semi-Annual)
Monitoring Wells	
RE106D1	2nd Qtr
RE106D2	2nd Qtr
RE106D3	2nd Qtr
RE115D1	2nd Qtr
RE115D2	2nd Qtr

[1] Please note that the Navy does not waive, and expressly reserves the right to maintain that NG is jointly and severally obligated to undertake any and all of the OU-2 groundwater sampling.

RE124D1	2nd Qtr
RE124D2	2nd Qtr
RE127D1	2nd Qtr
RE127D2	2nd Qtr
RE128D1	2nd Qtr
RE128D2	2nd Qtr
RE129D1	2nd Qtr
RE129D2	2nd Qtr
RE130D1	2nd Qtr
RE130D2	2nd Qtr
RE133D1	2nd Qtr
RE133D2	2nd Qtr

All Navy-owned wells already being sampled by Northrop Grumman and those to be added are shown on Enclosure 1 - Outpost and Monitoring Well Sampled by NG.

The Navy requests that NG's consultants utilize the New York State Department of Environmental Conservation (NYSDEC) approved Uniform Federal Policy (UFP) Sampling and Analysis Plan (SAP) Addendum: Groundwater Sampling Using Low Stress (Low Flow) Purging and Sampling Protocol (Resolution Consultants, 2013) in Enclosure 2 for wells in Tables 1 and 2. Periodically wells will need to be re-developed. Based on information provided by NG, the Navy will redevelop our wells as the Navy deems necessary.

In addition, as part of the quarterly and semi-annual sampling, the Navy will work with the water districts to determine if they would like to collect split samples from Navy-owned wells. For these Navy owned-wells, the Navy requests that Northrop Grumman provide a two-week notice so the Navy can coordinate with the appropriate water districts. Of course, Northrop Grumman will continue to coordinate with the water districts directly for Northrop Grumman-owned wells. As requested by NYSDEC, the Navy will need the laboratory Form 1s immediately upon completion of third party data validation.

Thank you in advance for your cooperation in the continued evaluation of the OU-2 plumes. If you have any questions,

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please contact the Navy's remedial project manager, Lora Fly, at (757) 341-2012.

Sincerely,

Nina M. Johnson

NINA M. JOHNSON
North IPT
Environmental Business Line
Team Leader
By direction of the
Commanding Officer

Enclosures: 1. Outpost Monitoring Well Sampling Responsibilities
2. Uniform Federal Policy (UFP) Sampling and Analysis Plan (SAP) Addendum: Groundwater Sampling Using Low Stress (Low Flow) Purging and Sampling Protocol (Resolution Consultants, 2013)

Copy to:
NAVAIR, William Cords (e-mail)
NYSDEC, Jason Pelton (e-mail)
USEPA Region II, Lorenzo Thantu (e-mail)
Public Respository (e-mail)

Enclosure 1: Groundwater and Outpost Wells Sampled by NG

Well (in approx order of install)	Frequency	1Q 2017	2Q 2017
BPOW1-1	S-A		ARCADIS
BPOW1-2	S-A		ARCADIS
BPOW1-3	S-A		ARCADIS
BPOW1-4	S-A		ARCADIS
BPOW1-5	S-A		ARCADIS
BPOW1-6	S-A		ARCADIS
BPOW2-1	S-A		ARCADIS
BPOW2-2	S-A		ARCADIS
BPOW2-3	S-A		ARCADIS
BPOW3-1	S-A		ARCADIS
BPOW3-2	S-A		ARCADIS
BPOW3-3	S-A		ARCADIS
BPOW3-4	S-A		ARCADIS
TT102D	S-A		ARCADIS
TT102D2	S-A		ARCADIS
FW-03	A		ARCADIS
GM-15D	S-A		ARCADIS
GM-15D2	S-A		ARCADIS
GM-17D	S-A		ARCADIS
GM-17I	S-A		ARCADIS
GM-18D	S-A		ARCADIS
GM-21D	A		ARCADIS
GM-39DA	S-A		ARCADIS
GM-39DB	S-A		ARCADIS
GM-73D	S-A		ARCADIS
GM-73D2	S-A		ARCADIS
GM-74D	S-A		ARCADIS
GM-74D2	S-A		ARCADIS
GM-74I	S-A		ARCADIS
GM-75D2	S-A		ARCADIS
GM-78I	A		ARCADIS
GM-78S	A		ARCADIS
GM-78D	S-A		ARCADIS
GM-78D2	S-A		ARCADIS
GM-79D	S-A		ARCADIS
GM-79I	S-A		ARCADIS
HN-24I	A		ARCADIS

Enclosure 1: Groundwater and Outpost Wells Sampled by NG

Well (in approx order of install)	Frequency	1Q 2017	2Q 2017
HN-40I	A		ARCADIS
HN-40S	A		ARCADIS
HN-42I	A		ARCADIS
HN-42S	A		ARCADIS
BPOW5-1	Q	ARCADIS	ARCADIS
BPOW5-2	Q	ARCADIS	ARCADIS
BPOW5-3	Q	ARCADIS	ARCADIS
BPOW4-1R	S-A		ARCADIS
BPOW4-2R	S-A		ARCADIS
BPOW6-1	Q	ARCADIS	ARCADIS
BPOW6-2	Q	ARCADIS	ARCADIS
BPOW6-3	Q	ARCADIS	ARCADIS
BPOW6-4	Q	ARCADIS	ARCADIS
BPOW6-5	Q	ARCADIS	ARCADIS
BPOW6-6	Q	ARCADIS	ARCADIS
BPOW5-4	Q	ARCADIS	ARCADIS
BPOW5-5	Q	ARCADIS	ARCADIS
BPOW5-6	Q	ARCADIS	ARCADIS
RE118D1	S-A		ARCADIS
BPOW5-7	Q	ARCADIS	ARCADIS
RE119D1	S-A		ARCADIS
RE107D1	S-A		ARCADIS
RE107D2	S-A		ARCADIS
RE107D3	S-A		ARCADIS
RE114D1	S-A		ARCADIS
RE114D2	S-A		ARCADIS
RE114D3	S-A		ARCADIS
RE121D1	S-A		ARCADIS
RE121D2	S-A		ARCADIS
Additional Wells for Sampling by Northrop Grumman			
Well (in approx order of install)	**Frequency**	**1Q 2017**	**2Q 2017**
RE106D1	S-A		ARCADIS
RE106D2	S-A		ARCADIS
RE106D3	S-A		ARCADIS
RE115D1	S-A		ARCADIS
RE115D2	S-A		ARCADIS
RE124D1	S-A		ARCADIS

Enclosure 1: Groundwater and Outpost Wells Sampled by NG

Well (in approx order of install)	Frequency	1Q 2017	2Q 2017
RE124D2	S-A		ARCADIS
RE127D1	S-A		ARCADIS
RE127D2	S-A		ARCADIS
RE128D1	S-A		ARCADIS
RE128D2	S-A		ARCADIS
RE129D1	S-A		ARCADIS
RE129D2	S-A		ARCADIS
RE130D1	S-A		ARCADIS
RE130D2	S-A		ARCADIS
RE133D1	S-A		ARCADIS
RE133D2	S-A		ARCADIS

Q - Quarterly

S-A – Semi Annual

A - Annual

UFP SAP ADDENDUM

GROUND WATER SAMPLING USING LOW STRESS (Low Flow) PURGING AND SAMPLING PROTOCOL
BETHPAGE
BETHPAGE, NEW YORK

Revision: 1

Prepared for:

Department of the Navy
Naval Facilities Engineering Command, Mid-Atlantic
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Norfolk, Virginia 23511-3095

Prepared by:

RESOLUTION CONSULTANTS

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Contract Number: N62470-11-D-8013
CTO WE15

November 2013

UFP SAP Addendum — Protocol for Ground Water Sampling Using Low Stress (Low Flow) Purging and Sampling, NWIRP Bethpage

This addendum provides a standard protocol for performing ground water sampling using low stress (low flow) purging and sampling of groundwater wells. Two different methods will be utilized to sample the wells, depending on whether a well has a dedicated pump installed within it. The first method is for those wells that do have a dedicated pump; these wells were installed with a submersible pump, packer and sampling tube assembly. During sampling of these wells, the packer is inflated to isolate the screen intervals, the well volume within the well below the packer is purged and sampled, and then the packer assembly is deflated until the next sampling. The second method is intended for wells not equipped with a dedicated pump: this method utilizes a bladder pump which is set no deeper than approximately 50 to 70 feet below the water table (100 feet below ground surface), with a pump inlet drop tube attached to the bottom of the bladder pump. The length of the inlet drop tube is variable between wells, but will extend down to the middle of the screen interval of the well being sampled. This UFP SAP Addendum outlines the specific procedures to be followed for low-flow sampling of either type of well.

SAMPLING PREPARATION

Planning Documentation and Equipment

1. Obtain Well construction data, location map, field data from the prior sampling event, and a sample chain of custody.
   For the non-dedicated pump method: Based on existing well construction information, identify the target depth to which the pump intake should be lowered.

2. Obtain necessary field equipment:
   a. Logbook – all information associated with sampling mobilization, sampling, and sampling demobilization are to be recorded in the field logbook, consistent with worksheet 11 (systematic planning process);
   b. Polyethylene sheeting;
   c. Photo Ionization Detector (PID).
   d. *For dedicated pump method*: Adjustable rate bladder pump constructed of stainless steel;
   e. Interface probe capable of detecting product and water level, with an accuracy of 0.01 ft;
   f. *For the non-dedicated pump method*: Teflon, Teflon-lined polyethylene, or

polyethylene sampling tubing of enough length to sample each individual well;

g. Flow measurement device (in-line flow meter, graduated cylinder, graduated bucket, timing device, etc) to record discharge volume over time;
h. Generator;
i. *For the dedicated pump method:* Nitrogen tank (for inflating packers);
j. Monitoring instrument and in-line flow-through cell to monitor indicator parameters (eg, Horiba or equivalent)
k. Decontamination supplies;
l. Analytical lab supplies (sample bottles, preservative as required; sample chain of custody, sample coolers; ice).

SAMPLING PROCEDURES

Pre-Sampling Activities

1. If more than one well is to be sampled, start at the well which is known or believed to have the least contaminated ground water and proceed systematically to the well with the most contaminated ground water. Check the well, the lock, and the locking cap for damage or evidence of tampering. Record observations.

2. Lay out sheet of polyethylene for placement of monitoring and sampling equipment.

3. Remove well cap.

4. Measure volatile organic compounds (VOCs) at the rim of the opened well with a PID instrument and record the reading in the field log book.

5. If the well casing does not have a reference point (usually a v-cut notch or indelible mark in the well casing), make one. Note that the reference point should be surveyed for correction of ground water elevations to the mean geodesic datum (MSL).

6. Measure and record the depth to water (to 0.01 ft) in wells to be sampled prior to purging. Care should be taken to minimize disturbance in the water column and dislodging of any particulate matter attached to the sides or settled at the bottom of the well. *For the non-dedicated pump method,* measure and record the total well depth; for the dedicated pump method, record the depth to the top of the packer assembly.

Sampling Procedures

7. *For the non-dedicated pump method*: Slowly lower the pump, safety cable, tubing, drop tube, and air lines into the well. The pump should be set approximately 100 feet below ground surface with the drop tube extending to the middle of the screen interval for that well. Record the depth to which the pump and drop tube are lowered.

8. Before starting the pump, measure the water level again with the pump in the well. Leave the water level measuring device in the well.

9. Purge Well: Start pumping the well at 200 to 500 milliliters per minute (ml/min) for every 10 feet of screen (maximum of 2,000 ml/min). The water level should be monitored approximately every five minutes. Ideally, a steady flow rate should be maintained that results in a minimal drawdown-stabilized water level (drawdown of 0.3 ft or less, and a minimum of three consecutive drawdown readings within 5% of each other). Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level and minimize stress to the water column. As noted above, care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment. *For dedicated pumps and packer assemblies*, after the initial water level and depth to the packer assembly are measured and recorded, the packer assembly should be inflated to a pressure equal to 0.433 psi/foot of water in the well (the difference between the total depth of the well and the static water level from the top of casing). After inflation of the packers, purging will consist of evacuation of three screen volumes of the well.

*Note that if excessive drawdown occurs during purging (as measured with a water level indicator with the non-dedicated pump method, or a significant decrease or termination in flow with the dedicated pump method), then sampling should be terminated and the well evaluated for re-development.

10. Monitoring Stabilization Indicator Parameters: During purging of the well, monitor and record the field indicator parameters (turbidity, temperature, specific conductance, pH, Eh, and DO) approximately every five minutes. The well is considered stabilized and

ready for sample collection when a minimum of one screen volume has been removed and the indicator parameters have stabilized for three consecutive readings as follows:

Primary Parameters:
±0.1 for pH
±3% for specific conductance (conductivity)
±10% for turbidity
±3% for temperature

Secondary Parameters:
±10 mv for redox potential
±10% for DO (with values > 0.5mg/L)

For non-dedicated pump method: The pump must not be removed from the well between purging and sampling. In the event the primary parameters fail to stabilize after 2 hours, collect the groundwater sample and record the parameters in the field notebook/sample log sheet/sample purge sheet.

11. Collect Samples: Collect samples at a flow rate between 100 and 250 ml/min and such that drawdown of the water level within the well does not exceed the maximum preferred drawdown of 0.3 ft. VOC samples must be collected first and directly into sample containers. All sample containers should be filled with minimal turbulence by allowing the ground water to flow from the tubing gently down the inside of the container.

Ground water samples to be analyzed for VOCs require pH adjustment. The analytical laboratory will provide pre-preserved sample vials for VOCs and metals.

Samples must be collected directly from the well, any in-line equipment must be removed prior to collection (in-line flow meter, flow-through cell, etc.).

12. *For non-dedicated pump method*: For breakdown, remove the bladder pump and tubing. The tubing will be dedicated to the well for future resampling by hanging the tubing inside the well. Prior to hanging the tubing in the well, measure and record the total well depth.

13. *For dedicated pump method*: Deflate the packers completely, and secure the airline and sample tubing inside the well.

14. Close and lock the well.

LABORATORY ANALYSIS

15. Samples will be analyzed for VOCs via EPA Method 8260C, and/or trace elements via EPA Method 6010C by a DoD ELAP accredited laboratory. If collecting split samples with the water districts, samples will be analyzed for VOCs via OLM4.3 and Method 524.2 Sampling analysis requirements are outlined in worksheets 18, 19, 20, 30, 21, 22 (standardized field sampling methodologies), 12 (field QA/QC), 17 (sampling design and rationale), 15 (reference limits), 23 (analytical SOP), and 28 (lab QA/QC)
.

IDW MANAGEMENT

16. Investigation Derived Waste (IDW) management is outlined in worksheet 17 (sampling design and protocol). IDW (including purge water) accumulated during sampling activities will be collected, containerized, accumulated at NWIRP Bethpage, and disposed off-site. An alternative for liquid IDW will be to process the waste through a mobile granular activated charcoal treatment unit, followed by discharge of the treated liquid to the municipal sewer system in accordance with an approved Nassau County sewer discharge permit.

DECONTAMINATION

All non-dedicated sampling equipment (the pump and support cable and air lines which contact the sample, interface probes, etc.) must be decontaminated thoroughly each day before use ("daily decon") and after each well is sampled ("between-well decon"). Dedicated, in-place pumps and tubing must be thoroughly decontaminated using "daily decon" procedures (see #18, below) prior to their initial use.

17. **Daily Decon**

A) Pre-rinse: Operate pump in a deep basin containing 8 to 10 gallons of deionized water for 5 minutes and flush other equipment with deionized water for 5 minutes.

B) Wash: Operate pump in a deep basin containing 8 to 10 gallons of a non-phosphate detergent solution, such as Alconox, for 5 minutes and flush other equipment with fresh detergent solution for 5 minutes. Use the detergent sparingly.

C) Rinse: Operate pump in a deep basin of deionized water for 5 minutes and flush other equipment with deionized water for 5 minutes.

D) For bladder pumps, disassemble pump; discard bladder and replace with new bladder after pump parts decon.

E) Wash pump parts: Place the disassembled parts of the pump into a deep basin containing 8 to 10 gallons of non-phosphate detergent solution. Scrub all pump parts with a test tube brush.

F) Rinse pump parts with deionized water.

G) Rinse the following pump parts with distilled/deionized water: inlet screen, the shaft, the suction interconnector, the motor lead assembly, and the stator housing.

H) Rinse impeller assembly with distilled water.

I) Place impeller assembly in a large glass bleaker and rinse with isopropanol.

J) Rinse impeller assembly with distilled/deionized water.

K) Reassemble pump

18. **Between-Well Decon (non-dedicated pump method only)**

A) Pre-rinse: Operate pump in a deep basin containing 8 to 10 gallons of deionized water for 5 minutes and flush other equipment with deionized water for 5 minutes. Disassemble the pump and replace the bladder prior to continuing.

B) Wash: Operate pump in a deep basin containing 8 to 10 gallons of a non-phosphate detergent solution, such as Alconox, for 5 minutes and flush other equipment with fresh detergent solution for 5 minutes. Use the detergent sparingly.

C) Rinse: Operate pump in a deep basin of deionized water for 5 minutes and flush other equipment with deionized water.

D) Final Rinse: Operate pump in a deep basin of deionized water to pump out 1 to 2 gallons of this final rinse water.