NAVFAC- Midlant RESPONSE TO COMMENTS ON THE "LETTER WORK PLAN ADDENDUM – SEPTEMBER 2011 PRE-DESIGN FIELD INVESTIGATION, OU 2 OFF-SITE GROUNDWATER INVESTIGATION NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NWIRP), BETHPAGE, NEW YORK

Comments from Carol Stein, RCRA-RPM, dated October 20, 2011

CS1. **Comment:** The report is well-written. It is nice to see that two to three monitoring wells are planned at different screening intervals. Figure 3 indicates that screen depth of proposed TT-102D seems to be consistent with the depth of the upgradient South Farmingdale Well field SFW8665. This positioning could help the new wells to serve as markers regarding the extent to which the South Farmingdale water supply system is capturing the plume. I have only a few comments to add:

(1) On page 1, the text of Section 1.1 "Scope and Objective" states that "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." Additional wording should be added to clarify that the proposed wells are not meant to serve as *outpost wells*, as defined by the ROD for OU-2, (e.g., they are not meant to give Massapequa a 5-year warning to start designing a treatment system). This clarification can help to avoid misunderstanding in the future.

Response: Agreed. The following statement will be added to the first paragraph. "Because of the distance from the boring location to MWD (4,000 feet), the boring and monitoring wells are not outpost monitoring wells."

CS2. **Comment:** (2) Although the cover letter notes that the well locations (at the intersection of Aiken Avenue and Stewart Place) will be approximately 4000 feet north of the (northernmost) Massapequa Well Field, I did not see this information in the actual report. This information regarding the distance from MWD wells N-06552 and N-064443 should be added to the report.

Response: The distance was not stated in the report, but can be measured from Figure 2. The additional text identified under the response to CS1 addresses this comment.

Comments from Rob Alvey, EPA, P.G. dated October 20, 2011

I have completed a courtesy review of the Letter Work Plan Addendum (LWPA), dated October 2011, as prepared by Tetra Tech NUS for the vertical profile boring (VPB-133) and monitoring wells installation being planned by the Navy under the current NYSDEC program. Please note that the USGS is also conducting a review of the LWPA in accordance with the existing EPA-USGS Interagency Agreement (IA) task and I anticipate they will submit comments on October 24, 2011. In the interest of time, I have briefly reviewed their initial draft comments and requested few modifications that may be helpful to clarify their comments.

It is noted that this Letter Work Plan Addendum serves as a supplement to the 2010 Letter Work Plan that was previously approved by NYSDEC. EPA and USGS have been providing assistance on this overall effort as requested by the EPA Regional Administrator, Judith Enck. An assignment to observe current drilling progress was tasked by EPA under the IA, and an additional task to conduct a supplemental geophysical log of VPB-129 has been authorized and conducted. The results of the USGS geophysical logging effort are being finalized and communicated with the Navy and their contractor, and will be made available to NYSDEC and you as soon as practical.

My comments regarding the LWPA for VPB-133 are below. These are for consideration only and no formal response is required.

RA1 **Comment:** The current 'gamma logging" task does not appear to be sufficient to provide the details needed to get as much information from the boring as can be useful for an understanding of the hydrogeology and monitoring well design. Further, it would be particularly useful to "save" the actual electronic log of geophysical equipment readings so that it can be accessed and further analyzed in the future. I suggest that the suite of logging techniques recently conducted by USGS for VPB-129 be considered for future VPBs. In the future, this task should be funded by the Navy.

Response: The "gamma logging" being conducted by the Navy has been very successful at identifying target lithological units at each location. As requested, "electronic logs" of the readings have been provided to EPA and USGS.

Regarding the logging techniques being conducted by USGS, the Navy will need to further evaluate the benefit of using these tools in determining the screen interval location for monitoring wells. Based on observations during the testing at VPB-129, the use of USGS logging techniques has three distinct disadvantages, as follows.

1. The Navy incurred additional cost of approximately $10,000 to support the testing.
2. The testing required field work to be conducted at times outside of the access agreement allowed work hours.
3. The USGS test equipment requires that the drill rods be first removed from the hole. Under these conditions, the bore hole is not always stable. During the VPB-129 testing, at one point, the USGS equipment had become stuck. Fortunately, the driller was able to retrieve the equipment. In the future, the retrieval may not be successful, and the test equipment would then have to remain in the hole and become encased in the grout.

RA2. **Comment:** The design of the actual monitoring wells is not consistent with EPA Superfund protocols. I concur with installing more than one monitoring well screen zone based on the VPB, but the stated screen lengths for each well appear excessive. The proposed well designs for future wells should be more targeted to enable sampling of aquifer areas of concern more definitively. With the extensive costs involved in the deep drilling, it may be cost beneficial to consider a multiple port well, such as the Westbay well systems installed at the Old Roosevelt Field Superfund site, another extensive and deep groundwater contaminated area of Nassau County potentially affecting a number of public supply wells. The Westbay wells require specialized sampling equipment, but have proven practical and enable, in some instances 10, or more monitoring points in a single well. There may be alternate multiple well screen designs that can prove more cost effective.

Response: The EPA proposes an interesting alternative approach for installing and sampling monitoring wells as part of the OU2 Plume. The current monitoring wells are used to evaluate potentiometric surfaces at location and depths and provide water quality data that is representative of flow into potable water supply wells. In the future, some of the wells may also be used to support capture zone analysis for individual well fields. The evaluation will focus on the type of data required (e.g., water levels and analytical), whether the data can be used to estimate impacts to water supply wells (e.g., how to average multiple data points within a single flow zone), and the usability of the approach over a 30 to 50 year timeframe. The Navy will evaluate this approach and make a determination as to whether this approach is viable for this site. Since this evaluation is expected to require more time than is currently available for this work plan and collection of the data is time critical, the Navy will proceed with the installation of the VPB, but delay the design and installation of monitoring wells at this location. The permanent monitoring wells will be installed only after consensus on the use, type, and depth of well screens is reached.

RA3 **Comment:** The use of mud rotary as a drilling method might be re-evaluated, although my observation of the drilling company and their work was very positive. Possibly reverse mud rotary or 'rotosonic' methods may be a better alternate and should be considered when planning additional monitoring locations.

Response: Alternative drilling techniques have been evaluated for this operation several times over the past 20 years. The use of rotosonic drilling was conducted during an onsite program in 2010. Collection of representative water samples during the drilling portion of the program was problematic because of running sands, and despite being 60 to 200 feet from the nearest residents, there were considerable complaints regarding vibration within the home. Based on this experience, current work will continue using mud rotary techniques. Regarding reverse mud rotary drilling, this technique does not offer any clear advantage over the current technique.

RA4 **Comment:** The inclusion of suma-canister air monitoring may not be necessary, particularly when the drilling is far off-site of the known sources. I suggest a review of previous results as that may help assess if it is necessary. For work-related exposures, the Site Safety Officer should have portable real time air monitoring tools available to ensure protection of human health in the work environment.

Response: The collection of off-site suma canister testing is conducted to provide real data to evaluate potential exposure to the community during the drilling program. For worker safety, the Site Safety Officer conducts real-time air monitoring. This data is recorded on the soil boring log sheets.

RA5 **Comment:** I question the planned extensive use of gravel pack above the well screens. This enables some additional water flow into the screen interval and reduces the certainty of the elevation of sample collection. Again, the purpose of this modification of typical EPA monitoring well construction protocols should be understood if it is to be continued.

Response: The use of gravel packs above the well screens is conducted to reduce or eliminate the migration of bentonite and cement into the screen interval during grout installation. This design is based on over 20 years of experience of installing deep monitoring wells at the site and takes into account the presence of relatively thick portions of the aquifer being monitored and the relatively high pressure exerted by the bentonite and cement above the gravel pack during installation.

Regarding uncertainty of sample collection elevation, during the drilling process, the boring walls become coated with the bentonite slurry. After well installation, most of the bentonite slurry above the well screen remains in place and would inhibit groundwater migration into the screen interval from gravel pack above the well screen. Residual bentonite in the screen interval of the boring is removed during the development process.

RA6 **Comment:** The positioning of the dedicated well pumps above the screen interval should be justified, and I do not concur with limiting the depth of the pump placement to 500 feet below the top of the well casing. There are various hanging tools available to protect the equipment when placed at depth. Access for collection of water levels still needs to be considered, whether a tape is used or transducers. The sampling method is not defined, but in accordance with EPA Superfund protocols, we usually specify the pump is set in the middle of the screened interval, except for well screens that straddle the water table. The actual sampling methodology is not stated, but I have concerns that EPA Low-Flow Sampling procedures would not ensure sufficient purging of the casing volume if the pump is too far removed from the screen interval.

Response: The pump placement is limited to 500 feet because at a certain depth, the voltage drop across the power cables affects the pump and control operation. The manufacturer recommends that the pumps not be installed greater than 300 feet; however, the pump can be operated at a depth of 500 feet if an appropriate type of generator is used.

The sample collection technique consists of purging at least one volume of the water column between the packer and the bottom of the well. Therefore, there is no need to install the pump in the middle of the well screen.

The monitoring well cap design includes a port for use of a tape water level indicator during testing. This information is recorded during sample collection. The well covers are not designed to allow data loggers to the installed. However, for short term testing, the pressure transducers can placed in the well by lifting the well cover.

RA7. **Comment:** It appears that the drilling targets the “Raritan” as proposed final depth, but this formation is not consistent at its upper surface. It would be appropriate to clarify the need to actually drill into and sample the material when it is suspected the Raritan has been encountered. This is an important formation that drives some of the decision processes regarding the site and contamination. Since solvents do exhibit greater density than water, I suggest that monitoring of the top of this confining layer may be advisable.

Response: The drilling program includes the collection of split spoons to identify the top of the Raritan formation. What has been observed in some borings is that the top of Raritan is not always clearly defined. The top of the Raritan clay unit appears to be a series of clay, silt, and sand units that vary in thickness. Groundwater samples are attempted in this interval, but are minimally successful. Our current plan is to collected split spoon samples every five feet, until the Raritan formation is confirmed.

Since there is not a clear “top of the confining layer” and there are several other “confining layers” above the Raritan clay unit, the installation of a well or wells to address this concern is not practical.

RA8. **Comment:** Everything in the LWPA is in “depths” below ground surface, including reference to the existing public supply wells screen zones. It is important to consider elevations as Long Island, to many people’s surprise, is not level and the variation in surface elevations may result in misplaced well screens when only targeted “depths” are referenced.

Response: In preparation of the work plan, drawings utilizing elevations relative to mean sea level (see Work Plan Figure 3) are used. The letter work plan converts the elevations to depth below ground surface to allow the field personnel to practically implement the drilling and sampling program.

RA9. **Comment:** The sample monitoring well construction figure is not sufficient. It is a hand-drawn field sketch that does not identify the driller, dates, or locations on the sample figure. And, note that gravel pack isn't included on the form, nor is any dedicated pump. It is critical that the completed monitoring well construction diagrams must also have the associated lat/long/and elevations with a location sketch included so that people in the future know where to look and what they are looking at. The driller might access and use the NYSDEC well forms as an example. Many contractors, consultants, and drilling firms are familiar with and use these forms, whether or not the well is designed as a supply well or monitoring well,

Response: The referenced Figure 4 is presented as "Typical Monitoring Well Construction" as part of a work plan. The requested information is added after the well is complete and is presented in Data Reports.

RA10. **Comment:** Section 2.2 includes a description of the monitoring well construction completion including "curb box" and concrete apron. Based on my experience and a site visit, I recommend that a permanent identification marker tag be placed at each well. There are various inexpensive metal tags available, and they are much more reliable and permanent than spray painting the cover or apron. The tags prevent well mis-identification and provide a reference for communications with the well owner.

Response: Permanent well markers will be added to each of the monitoring wells.

RA11. **Comment:** Section 2.7. The surveying, I assume is referenced in the original Work Plan. However, this section of the LWPA the does not include requirements for elevations, nor reference standards and precision required by the surveyor. This needs to be addressed as the locational data for new wells needs to be incorporated into the electronic base map used by Navy, their contractors, and others involved with the groundwater contamination issues regarding this region.

Response: Once completed, the monitoring wells are surveyed to an accuracy of 0.1 feet horizontally and 0.01 feet vertically in the New York state plane system.

RA12. **Comment:** Section 2.8 does not include any reference to obtaining and providing the data associated with this task for submittal to NYSDEC in the required EDD format (currently Equis 5 based). As EPA also uses this system, it is very important to coordinate submittals on a timely basis. The information regarding the wells is critical to be able to communicate.

Response: The Navy collects and assemblies its data in the Naval Installation Restoration Information Solution (NIRIS) in the Naval Electronic Data Deliverable (NEDD) format. This data can be accessed by NYSDEC and EPA through the Navy's NIRIS portal.

Comments from Paul Misut,Hydrologist, dated October 24, 2011

The U.S. Geological Survey (USGS) was requested by U.S. Environmental Protection Agency (USEPA) to review the workplan for Navy vertical profile boring (VPB) 133 at Bethpage, N.Y. (fig. 1), and to offer recommendations that would optimize the results anticipated through the VPB. The VPB133 workplan proposes collection of data that would increase confidence in approaches to anticipated future public water supply impacts from VOC plume migration, particularly in the northwest of Massapequa Water district including supply wells N 6442/ N 6443 (fig. 1). In addition to N 6442/N 6443, other supply wells at nearby upgradient wellfields in the AquaNY (N 9338) and South Farmingdale (N 8664) water districts may be expected to influence groundwater levels and flows at VPB133.

The completed and proposed VPB work is a helpful step and this letter will present a few suggestions for improved data collection and analysis, and to re-iterate recent suggestions given the "Remedy Optimization Team Report for the Bethpage Groundwater Plume Remedy" Hare and others, 2011), and "Simulation of Groundwater Flow in a VOC-Contaminated Area near Bethpage, Nassau County New York – A discussion of Modeling Considerations" (Misut, 2011).

The following comments have been extracted by the Navy from the October 24, 2011 to Mr. Robert Alvey from USGS.

PM1 **Comment:** The main purpose of the current boring program is summarized by the following introduction statement (pg. 1of VPB133 workplan): *"These investigations are being conducted to better define the extent of*

solvent-contaminated groundwater offsite of the Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, Long Island, New York (Figure 1)." Given this purpose, it is likely useful to collect information types including the following: VOC concentrations, inorganic chemical concentrations, vertical and horizontal variations in geology and head values; and to conduct analyses such as aquifer tests and modeling. Better information on vertical and horizontal variations in water chemistry, geology and head values may be used to better delineate and understand how the plumes are migrating. These ideas are described in more detail in (Hare, 2011).

Response: The overall purpose of the Regional Groundwater Investigation is to "*better define the extent of solvent-contaminated groundwater offsite of the Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, Long Island, New York*". The purpose of this work plan is to install a vertical profile boring VPB-133 and the monitoring wells to assess the condition of groundwater north of Massapequa Water District (MWD) public water supply wells N-06442 and N-06443. In a letter from EPA dated 15 Jun 2011, EPA and the New York State Department of Environmental Conservation agreed that this well should be installed to expedite the remedial decisions and help address some of the major concerns of the MWD. Because of the long distance from this location to the Massapequa Water Supply wells, an analysis of aquifer tests and modeling is not viable. Also, the OU2 Remedy identifies the chemicals of concern, which are limited to volatile organic compounds.

PM2 **Comment:** According to the Optimization Team Report (Hare and others, 2011) VPB133 would be one of three monitoring sites, each of which would feature multi-level monitoring. The VPB133 workplan calls for two single-level monitoring wells with an optional third single-level monitoring well. Instead of sealing the VPB 133 boring, casing a monitoring well in the boring would help to provide the multi-level information (strings of passive diffusion bag samplers or the Westbay system) recommended by (Hare and others, 2011).

Response: VPB-133 is too far north of the Massapequa Water Supply wells to meet the requirements of outpost monitoring wells. The use of alternative methods for installing wells points is being evaluated. This evaluation will take into account the actual location of the well and its purpose.

PM3 **Comment:** Casing the VPB boring in the basal Magothy would lead to collection of important hydraulic data.

Response: A well in the basal Magothy can be installed if the data collected would support the objective of the OU 2 ROD.

PM4 **Comment:** Waste handling procedures appear to be conservative given the isolated fingers of low (parts per billion) levels of VOCs expected to be encountered. It may not be necessary to remediate extremely low or non-detected levels of contamination; thus, it may be cost effective to downscale waste handling procedures to what would be typical for a supply well drilling operation in this area. It may be greener to eliminate procedures which generate an unnecessary carbon footprint and introduce low levels of VOC contamination themselves.

Response: Since the wells are being drilled in residential area, the access agreements require the Navy to take off all waste generated on a daily basis.

PM5 **Comment:** Borehole geophysical logging of open boreholes provides high resolution information on the hydrogeology and water quality at a site. Gamma logging through the drill stem will produce a log that is reduced in it's gamma signatures due to the inverse-square law and the density of the materials the gamma rays must pass through before being measured by the scintillation counters in a gamma probe. While gamma logs alone will provide some lithologic information, the addition of a full suite of electric and electromagnetic logs will add significant information on clay content, hydraulic property estimates, stratigraphic correlations, and water quality changes. The USGS plans to collect gamma, spontaneous potential, single-point resistance, long-medium short normal resistivity, and electromagnetic induction at deep open boreholes.

Response: The Navy will need to further evaluate the benefit of using these tools in the borings and monitoring wells at other locations. Based on the Navy experience with this equipment at VPB-129, there are several technical issues that will need to be resolved. Currently, the Navy doesn't have an existing contract with USGS therefore this evaluation cannot be conducted at this time.

PM5 **Comment:** Electric logs from VPB 129 indicate a conductivity contrasts with depth in the formation that do not appear to be caused by differences in hydrogeology, and may be related to elevated concentrations of dissolved metals. Investigation into the nature of these conductive anomalies at the proposed VPB would benefit the outpost well objective.

Response: The OU2 ROD chemicals of concern are limited to VOCs, which generally do not cause conductivity contrasts at the part per billion range. The conductivity contrasts may be related to the presence of dissolved salts, not necessarily metals.

PM6 **Comment:** Dedicated monitoring well pumps need equipment blanks to ensure adequate QA/QC.

Response: Dedicated equipment does not require the collection of equipment blanks.

PM7 **Comment:** The selection of screen zones for monitoring well construction purposes needs to be conducted in an optimized manner. More detail concerning questions about the assignment of monitoring well screen zones and their relative priority may be useful. Currently there is uncertainty by the USGS about how screen intervals are chosen. Appendix A provides some data concerning adjacent public supply wells.

Response: The well screens depths are selected at each location based on lithology, VOC concentrations within the vertical profile boring, the presence/depth of upgradient contamination, and the depth of potential downgradient receptors.

PM8 **Comment:** The use of pressure transducers in multi-level monitoring wells located near public water supply wells should be implemented to collect water level time series that adequately characterize pumping stresses on the screened aquifer zones (Hare and others, 2011, pg. 14). It is important to collect water-level time series because it documents and quantifies the transient nature of aquifer heads. Monitoring well screens may be ideally located in layers demonstrating the maximum response to water supply pumping stress.

Response: VPB-133 is too far north of the Massapequa Water Supply wells to be used to evaluate capture zone analysis.

Comments from Kent Smith, Northrop Grumman on 24 October 2011

KS1 **Comment:** From Section 2.1 Vertical Profile Boring and Figure 3. It would be informative if Figure 3, Section I-I', included VOC and lithologic data from VPBs and public supply wells to help better understand the proposed VPB and well placement.

Response: The VPB location was selected by the EPA and NYSDEC. Lithology and chemical data on cross section I-I' is very limited. Most of the borings and wells presented are in the work plan and installation stage.

KS2 **Comment:** The USGS has documented sandy transmissive zones in the upper portion of the Raritan. Based on this information, we suggest that continuous split-spoon sampling be performed in the upper 10-foot interval of the Raritan, after it is first encountered, followed by gamma logging. This information will help show that the confining portion of the Raritan has been reached by the boring and that the permeable sections of the Magothy aquifer, which could contain VOC impacts, have been delineated.

Response: As indicated under the response to EPA comments, our current plan is to collected split spoon samples every five feet, until the Raritan formation is confirmed.

KS3 **Comment:** From 2.2 Monitoring Well Installation. We have found that use of stainless steel wire wrapped screens for the monitoring wells will provide more open area and will result in better well development.

Response: The use of alternative well installation techniques is being evaluated and the use of stainless steel wrapped screens will be considered during this evalation.