United States Environmental Protection Agency
One Congress Street, Suite 1100 (HBT)
Boston, MA 02114-2023

September 7, 2004

Mr. Fred Evans
Engineering Field Activity - North East (EFANE)
10 Industrial Highway, Code 182/FE - Mail Stop 82
Lester, PA 19113-2090

Re: *"Interim Ground-Water Sampling Event 03 - February 2004, Naval Construction Battalion Center, North Kingston, Rhode Island"*, dated July 2004 at the Former Davisville Naval Construction Battalion Center (NCBC), Rhode Island

Dear Mr. Evans:

Pursuant to § 7.6 of the Davisville Naval Construction Battalion Center Federal Facility Agreement dated March 23, 1992, as amended (FFA), the Environmental Protection Agency has reviewed the subject document. EPA has submitted comments on the previous monitoring event reports for this site. Those same general comments apply to this document and additional comments have been enclosed. EPA believes that the ground-water elevation contours indicate a possible additional source area in the overburden at the northeastern portion of the NIKE PR-58 FUDS in addition to the known hot-spot near MW03-14 in the central portion of the FUDS. If this theory tests out to be valid, a different sampling strategy may be warranted for this site. These ongoing concerns suggest that a comprehensive review of the conceptual site model (CSM) is needed, in much the same manner as was recently completed for Site 07 (*Draft Revised Conceptual Site Model and Monitoring Optimization Report for Site 07, Calf Pasture Point, NCBC, by Battelle, August 2004*). The impetus for the site 07 report arose from numerous EPA observations similar to those offered above (and previously) for site 03. We look forward to working with you in developing a work-plan for additional wells to more comprehensively monitor the contamination at this site. If you have any questions with regard to this letter, please contact me at (617) 918-1384.

Sincerely,

Christine A.P. Williams
Remedial Project Manager
Federal Facilities Superfund Section

cc: Louis Maccarone, RIDEM
Richard Gottlieb, RIDEM (via e-mail only)
Bill Brandon, EPA (via e-mail only)

Marilyn Cohen, ToNK
Steven King, RIEDC
Kathleen Campbell, CDW (via e-mail only)
Jim Shultz, EA Engineering, Science and Technology

EPA Comments on the Draft Site 3 Interim ME#3 Report

GENERAL COMMENTS

1. The Interim Groundwater Sampling Event 03 provides information as specified in the Interim Groundwater Sampling Event Program. Groundwater samples and water table elevations were collected from the monitoring wells identified in the plan. To that extent, the information contained in this monitoring event is compliant with requirements. Due to the limited number of sampling events, definitive conclusions cannot be made at this time regarding data collected. However, as expressed in previous Site 03 monitoring event reviews, EPA still has concerns in regard to the adequacy of the existing Interim Groundwater Sampling Event Program.

2. The limitations of the monitoring program are most relevant to evaluation of the potential for chlorinated volatile organic compounds (CVOC) from this area to contribute, or to have contributed, to contamination of groundwater at down gradient locations, especially in the area of Site 16. Also, a significant level of uncertainty exists as to whether the stated Navy assumption that the bulk if not all of the observed CVOC contamination in the Site 03 area derives from the former Nike PR-58 site is correct. These questions remain unresolved due to the lack of comprehensive delineation of the site hydrogeology and sufficient monitoring of groundwater over a relatively extensive area, both in area and vertical extent.

3. The results of the limited sampling and number of monitoring wells placed in the Site 03 area, for instance, preclude definitive establishment as to whether CVOC contaminants in groundwater are attenuating or are migrating vertically downward into the bedrock of areas of the deep aquifer that are not currently monitored. Additionally, assessment of the presented (and previous) groundwater contours continues to suggest that the origin of groundwater flow and hence observed CVOC originates from an area to the northeast of the former Nike PR-58 site. This suggests an additional source, if not a main source area in that direction.

4. These ongoing concerns suggest that a comprehensive review of the conceptual site model (CSM) is needed, in much the same manner as was recently completed for Site 07 (*Draft Revised Conceptual Site Model and Monitoring Optimization Report for Site 07, Calf Pasture Point, NCBC, by Battelle, August 2004*). The impetus for the site 07 report arose from numerous EPA observations similar to those offered above (and previously) for site 03. Some of these key concerns are repeated briefly here as they point to many of the items a comprehensive CSM reevaluation needs to address.

- Clearly, the ground water flow patterns at site 03 are more complex than can be resolved with the current well network. A more comprehensive analysis of ground water flow patterns is needed in order to resolve the 3-dimensional flow patterns over the larger catchment area which includes site 03. This would require a much more comprehensive, integrated *water level measurement program* that goes beyond the monitoring wells included for routine site 03 monitoring. Synoptic water level data should be collected on a bi-monthly or quarterly basis from all existing wells, piezometers and surface water

(e.g., staff gages) in the large general area encompassed by the following sites: NIKE, sites 01/02/03/04, site 16, and Allen Harbor Landfill. BCT discussions should be held to confirm consensus on the initial well list selected for increased water level measurements.

- The first comprehensive set of water level data should be evaluated, and BCT consensus should be reached concerning appropriate alignments for a series of representative hydro-geologic cross sections. Using the hydraulic data alone, flow-nets should be prepared for these alignments as well as in plan view.

- Historical water quality data should be superimposed on the flow-nets in order to produce a series of comprehensive hydrogeologic cross sections (e.g., see Figure 13 of the aforementioned Battelle report dated August 2004).

- Review of these initial efforts will serve to clarify lateral and vertical flow patterns, and may point to obvious gaps in monitoring coverage, potential additional source areas, recharge areas, discharge areas, or other aspects of the current CSM which need updating.

- Expeditious follow-through on these items will allow for optimization of monitoring with respect to the forthcoming SER pilot at the NIKE site as well as the HRC pilot at site 16.

EPA intends to analyze the existing data more comprehensively in the November-December 2004 time-frame. However, based on experiences at similar sites, we believe it is ultimately in the Navy's best interest to update the CSM as indicated *before the pilot tests are initiated*, if for no other reason than to insure that performance data collected before, during, and after the pilot tests are implemented are meaningful, technically defensible and allow for sound decision-making with respect to the appropriate next steps in the remedial process (e.g., expanding the pilot studies to full-scale).

5. Although several recommendations for additional bedrock monitoring well coverage are suggested by the current data, EPA notes that the CSM for the greater site 03 area also needs to be considerably improved with respect to the fractured bedrock aquifer given the multiple lines of evidence which suggest a significant bedrock component to flow and contaminant transport. For example, the location, orientation, hydraulic properties, and significance with respect to fate and transport of the primary bedrock fractures need to be better understood. EPA anticipates that a better understanding of the bedrock fracture network at the site will require additional field work, e.g., 2-D electrical resistivity surveys, as a precursor to additional well installations. Further BCT discussions will be needed once the overall CSM for the site, focusing on current data, is updated. EPA would be prepared to provide a presentation at a future BCT meeting illustrating techniques and approaches used recently at similar sites in efforts to improve bedrock monitoring effectiveness.

SPECIFIC COMMENTS

EPA Comments on the Draft Site 3 Interim ME#3 Report

6. *Page 2 of 12 3rd paragraph:* EPA notes that disposal of vehicle maintenance wastes may have occurred virtually anywhere west of Sayers street, according to the exisiting information. As such, the "new" potential source areas suggested by this review (i.e., stump debris area west of the northwest corner of the site) may represent such disposal.

7. Page 4 of 12, First Paragraph: The stated objective is to monitor the delineated area for contaminants that have/are migrating from the former Nike PR-58 site. However, inspection of the groundwater contours suggests that this is not being adequately accomplished. The groundwater contours depicted on Figures 3A and 3B indicate that there is limited monitoring down gradient of the Nike PR-58 site. Additional groundwater monitoring should be in place to the south of MW03-08D/R and MW03-10D, including installation of a bedrock well at the latter location. The monitoring that is occurring actually appears to be assessing the impacts from a past release to the northeast of the former Nike PR-58 site. With respect to the proposed additional bedrock monitoring wells, EPA believes it would be advisable to conduct additional surface geophysical surveys, e.g., 2-D electrical resistivity surveys, as a precursor to additional bedrock well installations.

9. Page 9 of 12, Section 3.1.1: The comments related to positive or neutral vertical hydraulic gradients for most wells at the site are noted. However, inspection of Table 2 shows that this is not a consistent condition for all wells. Many of the wells have historically exhibited downward vertical gradients. Therefore, it must still be noted that historic groundwater table gradients give cause to suspect downward vertical migration of CVOC into the deep and rock aquifers.

10. Page 9 of 12, Section 3.1.1, First Bullet: Inspection of the figure shows that origination of groundwater is not from the Nike PR-58 site, but instead from a location to the northeast. How does this relate to the stated intent of the selected monitoring wells to assess CVOC migrating onto the site from the former Nike PR-58 site?

11. Page 9 of 12, Section 3.1.1, Second Bullet: Groundwater for the bedrock also appears to originate from a location to the north of the former Nike PR-58 site. How does the current monitoring program comply with stated objectives?

12. Page 11 of 12, 1st Bullet: The apparent slight increases in contamination at wells MW01-14D, MW02-03D/R and MW02-11D are interesting in that, based on the Navy's contours, flow lines from these wells all track back to the area roughly located near the intersection of Sayers Street and Parade Rd. Although these increases may be linked to the decreases noted at MW03-03D, an additional (as-yet unidentified) source may be located in that general area, in the vicinity of Building 224, or both. Although these increases are not alarming at this time, an argument can be made for expanding the monitoring well network to the east and southeast of the current limits so that these "perimeter" increases may be more effectively tracked moving forward. For example, additional coverage (e.g., D/R) appears to be needed in the area east of MW02-11D and north of EA-110D (e.g., along Marine Road). Bedrock control in the MW02-11D area would

also be useful. Similarly, additional coverage (e.g., D/R) appears to be needed in the area east of MW02-03 D/R and south of MW01-14D.

13. Page 11 of 12, 2nd Bullet: Review of the data presented in this monitoring report does not support the interpretation that the current monitoring well network is adequate for the interim monitoring purpose. The groundwater contours, described below, indicate that the bulk of the CVOC contamination appears to originate from a location other than the interpreted former Nike PR-58 site. This location appears to be near a stump/debris dump to the northeast of the former Nike PR-58 site. There are no monitoring wells immediately down gradient of this location. While EA-104/R is located in this area it is actually shown as being up gradient of the disturbed area.

Additionally, while several well pairs indicate a neutral hydraulic gradient between the deep overburden aquifer and the bedrock, evaluation of historic gradients still shows at least intermittent migration of groundwater into the bedrock. This combined with the density of CVOC contaminants suggests that more rigorous monitoring of bedrock is necessary, especially given that individual rock wells may or may not intercept fracture zones. In particular, there is limited spatial resolution of groundwater quality in bedrock, particularly at MW03-10D and MW02-11D and to the south of MW03-08D/R. EPA further notes, that if a new source area is identified in the vicinity of the stump debris area, additional monitoring well coverage would be needed in adjacent areas to the north and northeast of the site (i.e., along Perimeter Road, and north of Perimeter road), which have been previously identified as areas of interest.

14. Page 12 of 12, Section 3.2: Consideration should be given to re-evaluating the groundwater monitoring program for Site 03. There appears to be an additional source area to the northeast of the former Nike PR-58 site that is contributing the bulk of CVOC contamination detected. An additional monitoring well pair appears to be warranted to the southeast of the stump/debris ump encircled by the triangular trail/road west of Seabee Avenue and northeast of the former Nike PR-58 site. Additionally, there is a scarcity of monitoring points in the southern portion of the monitoring area that appear to be necessary to evaluate the potential migration of CVOC from the inferred former Nike PR-58 release area. In particular, there is a lack of down gradient monitoring south of MW03-08D/R and a lack of bedrock monitoring at MW03-10D.

15. Figure 3A: The groundwater contours depicted on this figure (deep groundwater) do not support the interpretation that the CVOC contaminants observed in groundwater at Site 03 are derived from the former Nike PR-58 site. Using the groundwater flow paths that would be interpreted from the contours presented suggests that the bulk of CVOC in deep groundwater at the site are derived from a location west of monitoring well MW-Z3-01. This area is identified by the apparent trail/road that encircles a present day stump dump that has been identified by recent field inspection. Additionally, it is not clear what the operational history of this area has been in the past. It is noted that while monitoring well EA-104 and EA-104R have been installed in this general area, they appear to be up gradient of the bulk of this disposal area. Nonetheless,

elevated CVOC has been detected in groundwater at those locations.

Also, while there are clearly CVOC contaminants in groundwater to the east of the former Nike PR-58 site these locations appear to be cross gradient from the area in question. Previous discussions provided in the other documents addressing the former Nike PR-58 site state that no release area has been identified for the former Nike PR-58 location. This is not to say that releases from that area have not occurred, particularly from possible disposal into abandoned missile silos or the acid disposal pit. However, the hydraulic data shown on this figure indicates that those possible releases will likely have migrated further to the south of Site 03. How is the hydraulic data depicted on this figure to be reconciled with the observed distribution of CVOC in groundwater?

16. Figure 3B: The groundwater contours depicted on the figure (bedrock wells) are similar to those for the deep overburden. A reverse flow path for groundwater using these contours leads back to the same area described for Figure 3A above. That is, there is not a clear pathway originating at the former Nike PR-58 site to account for the observed CVOC contamination in groundwater to the west of Site 03. How do the groundwater contours on this figure support the Navy interpretation that the observed groundwater CVOC contamination shown on subsequent figures and tables of this monitoring event report are derived from the former Nike PR-58 site? Again, release from the former Nike PR-58 site is not discounted. Rather, it appears that there is another significant source area that is contributing to the observed groundwater contamination in the area to the west of the Site 03 area.

While past and recent geophysical investigations indicate that there may be a zone of bedrock fractures that trend to the northeast from the former Nike PR-58 site with the potential to transport CVOC contaminants along that pathway, i.e. a potential explanation for transport of CVOC to the EA-104R location, the groundwater contours do not support groundwater flow in that direction. The bedrock structure described, to date, in various reports also do not suggest dipping bedding planes, etc. in that direction. Review of the CVOC distribution patterns presented in a past meeting presentation "USACE – NED Characterization of CVOC Concentration Former PR-58 Nike Site North Kingston, Rhode Island" show a pattern of CVOC distribution in the deep wells (Figure 15) and bedrock wells (Figure 17). However, groundwater patterns from this time frame strongly suggest an additional source area to the northeast of the MW03-14D/R hot spot. This groundwater flow pattern correlates with the groundwater contours presented in this figure 3B. Therefore, it is also possible that the major release could have occurred in the vicinity of EA-104/Z3-01 area with transport along bedrock fractures to the southwest back towards the MW03-14 location. Please discuss.

17. Figure 4: The CVOC contaminants depicted on this figure include a range of CVOC constituents including trichloroethylene (TCE) and tetrachloroethane (1, 1, 2, 2, TCA) as well as degradation products including trichloroethanes and dichloroethanes (TCA and DCA) in addition to dichloroethylenes (DCE). The Navy has postulated that low levels of certain degradation

products of 1, 1, 2, 2, TCA noted in down gradient groundwater, such as 1, 1, 2 trichloroethane and 1, 1 DCA are attributable to impurities in the production of TCE. However, those degradation products may clearly be derived from degradation of 1, 1, 2, 2 TCA, of which elevated concentrations have been detected in groundwater. Also, as EPA has noted previously, 1, 1, 2, 2 TCA may abiotically degrade to TCE. In order to further advance the understanding of this issue, it is requested that the Navy provide the technical references that support the contamination of TCE with elevated concentrations of 1, 1, 2, 2 TCA and likely degradation products.

18. Figure 5: See Specific Comment for Figure 4 above.

19. Table 2: While the Navy interprets that there are minimal downward vertical gradients at this site, review of this table suggests that this is not the case. Measurements during this monitoring event or other monitoring events may not indicate a downward vertical gradient from the deep aquifer zone to the bedrock. However, over the historic record, there has been evidence of significant downward gradients. For instance, at MW03-08D/R, the current water level measurements show a slight upward gradient. However, review of Table 2 indicates that historically there have been periods where there is clearly a strong downward vertical gradient, for instance, July 2000 and November 2001. This pattern is true also of other well pairs. Coupled with the tendency of chlorinated compounds to sink, intermittent patterns of downward vertical gradients still point to the potential for migration of CVOC contaminants deeper into the bedrock.

20. Appendix A: Review of the field sampling forms continues to show higher pH values for groundwater in EA-110R and EA-111R than other bedrock wells. For EA-110R the initial value was 8.0 with an ending value of 8.46. For EA-116 the initial value was 9.3 with an ending value of 7.90. The elevated pH values for groundwater are higher than the ambient values for other wells including bedrock wells that are showing values around 6.5. What is the explanation for these anomalies?