MEMORANDUM

TO: Mr. Orlando Monaco
Naval Facilities Engineering Command
Northern Division
Environmental Contracts Branch, Mail Stop No. 82
10 Industrial Highway
Lester, PA 19029

From: W. David Fennimore, P.G., Earth Data Incorporated
J. Anthony Sauder, P.E., Pennoni Associates, Inc.
Anthony S. Bartolomeo, P.E., Pennoni Associates, Inc.

Date: October 9, 1996

Subject: NAWC Warminster

The purpose of this memorandum is to provide comments on the following documents:

1. *Nature and Extent of Contamination Excerpt for Focused RI for Groundwater Report, NAWC Warminster Pennsylvania - Brown and Root Environmental, June 1996.*

2. *Feasibility Study Report for Groundwater in Areas A, B & D NAWC Warminster, Pennsylvania - Brown and Root Environmental, June 1996.*

We have reviewed the above referenced documents on behalf of Warminster Township, The Warminster Township Municipal Authority and the Federal Lands Reuse Authority - Bucks County, Environmental Subcommittee.

Comments:

- By definition under CERCLA, the Remedial Investigation (RI) defines the full nature and extent of contamination and provides the technical basis for the selection of remedial action alternatives addressed by the Feasibility Study (FS).

In its present form the "Nature and Extent Excerpt" provides an incomplete and technically unsound basis for the selection of remedial alternatives. In that RI activities are currently underway in Areas A and B it is unclear how it can be stated that there is "sufficient information to identify a final remedy for all groundwater zones for Areas A and B" as is stated on page E-2 of the draft FS.

Accordingly, we believe that the selection of a final remedy for areas A and B groundwater at this time is premature.

- The regional hydrogeologic model adopted by the Navy's consultants characterizes the subsurface beneath the site as three different zones. The use of this model is inappropriate as it attempts to over simplify a complex hydrogeologic flow regime and ignores the importance of structural geology and subsurface fracturing in the migration of contaminants through the subsurface. Numerous hydrogeologic investigations conducted at sites in the Stockton Formation indicate that the surficial deposits and the fractured bedrock form a hydraulically connected hydrogeologic system.

- The dimensions of on-site and off-site plumes attributable to the Navy have not been determined. For example, it is unclear whether the contamination in HN-52 came from Area A or Area D and how far beyond HN-52 the contaminants extend. An analysis of plume(s) shape(s), orientation and extent both on-site and off-site should be performed. Data presentation should include, at a minimum, a site plan showing contaminant isoconcentration contours, a fracture trace analysis, identification of potential contaminant migration pathways and geological cross-sections.

- An analysis of the vertical extent of contamination attributable to the Navy both on-site and off-site should be provided. The analysis should present adequate quantitative data on the distribution of hydraulic head within the aquifer to reasonably support the Navy's conclusion that "an upward vertical flow gradient from deeper to shallow water bearing zones within the Stockton Formation has limited the vertical extent of contamination".

- An analysis of the effect of pumping on-site and off-site water supply wells (including the former Wagner well) should be performed.

- It is stated on page 4-10 of the FS that WTMA Well 26 serves as a collection point for contaminated groundwater between the base and the municipal well. It is acknowledged that Well 26 has the incidental benefit to the Navy of minimizing

migration of some hazardous substances from NAWC Warminster by influencing the regional hydraulic gradient. However, analysis of the capture zone for WTMA Well 26 shows that some of the off-base contamination (i.e. HN-52) may be outside the Well 26 capture zone. If fractures and joint systems are oriented in the directions indicated by fracture trace analysis, then the theoretical capture zone would tend to be narrower, drawing water from further upgradient and intercepting less of the contaminant plume than would be included for unfractured rock. Additional off-base extraction wells may be needed to intercept all of the off-base contamination attributable to the Navy.

- Concentrations of Trichloroethylene (TCE) in on-site monitoring well HN-111 indicate the presence of Dense Non-Aqeous Phase Liquids (DNAPL) within the bedrock. The concentrations of TCE detected in the Wagner well and off-site monitoring well cluster HN-16 indicate significant groundwater impact off-site of Area A. Further, there appears to be a direct correlation between intrusive activities conducted in Area A and the increase in contaminant levels seen in the Wagner well. The FS lists the restoration of affected groundwater as a Remedial Action Objective for Area A.

  Recent research conducted by the EPA has concluded that while groundwater extraction and treatment systems are generally effective in maintaining hydraulic containment of dissolved phase contaminant plumes, complete aquifer restoration t health based levels may not be technically feasible in fractured rock media contaminated by DNAPL's. As a result, it is the opinion of the undersigned that the community should be made fully aware that it may not be possible to ever restore the aquifer to the levels suggested in the FS.

- The nature and extent document states that chemicals "occasionally" associated with the degradation of TCE and PCE were detected in Area A groundwater. However, the document makes a point of stating that vinyl chloride and chloroethane were not detected in any of the groundwater samples in Area A.

  It is widely accepted within the scientific community that chlorinated solvents such as TCE and PCE can be transformed microbiologically or abiotically into other compounds some of which have been shown to be more hazardous in drinking water than the parent compounds. Of particular concern is vinyl chloride which has been clearly demonstrated to be the terminal product of the transformation of TCE. Vinyl chloride is a known carcinogen which is more mobile in groundwater than TCE. The current MCL for vinyl chloride is 2 ug/l, while the Navy's contract detection level is 10 mg/l. Because the Navy has chosen a detection level that is higher than existing

drinking water standards, it cannot say, and should not imply that vinyl chloride is not present at levels that could potentially threaten public health, safety or welfare (since it is possible that vinyl chloride exists above the drinking water standard, but below the contract quantification limit). The final documents released to the public should therefore contain some discussion regarding the discrepancy between the Navy's sample detection levels and the drinking water standards, so that the public is not misled concerning the risks that have not been quantified.

- If the stream bordering Area A is above the groundwater level, what is the source of the stream? A perched water table or surface source? These would have implications for contamination migration pathways.

- The statement is made that the "groundwater downgradient of Area A does not appear to be impacted by releases of inorganics at the base." However, well HN-15 shows high metal concentrations at an intermediate depth. HN-15 is located along a fracture trace that is shown as passing through Area A. If the fracture trace represents a system of fractures or joints, the metals found at an intermediate depth may have originated in Area A.

- An extraction well near MW-2 would be more effective at intercepting the contaminant plume west of the proposed line of extraction wells.

- Long term monitoring is proposed for 24 monitoring wells. Before a long term monitoring plan is finalized, it will be necessary to delineate the extent of contamination from Area A and D.

- Data to date show that there has been no decrease in TCE concentrations in Area B over the last three years. The chemical fate and transport model shows a decrease to below the MCL in eight years. This may not occur if there is a contribution from a source of TCE. Efforts should be made to identify and remove sources of contamination before other remedial alternatives are considered.

- The contamination shown for well HN-02 is not shown within any of the proposed extraction well capture zones. This area of contamination should be addressed.

- The proposed reinjection wells are to be 100 feet deep. This appears deeper than the present contamination plume. If there is a malfunction in the treatment system, there is the risk of pumping contamination deeper into the aquifer.

- If the Navy's historical activities at NAWC-Warminster included the use of radioactive substances/radionuclides, the investigation must include an investigation for these substances, which it so far has not done. None of the publicly-released reports prepared to date have even discussed this issue, including an explanation for why such substances are not on any of the target compound lists developed for the site.

1311.m5