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Date: August 2, 1996

Mr. Richard N. Stryker
Atlantic Division, Naval Facilities Engineering Command
Environmental Quality Division
Code: 1822
Building N 26, Room 54
1510 Gilbert Street
Norfolk, Va 23511-2699

Re: Naval Weapons Station, Yorktown, Va.
Sites 6 and 7
Review of the Navy's draft *RI/FS Report*

Dear Mr. Stryker:

The U.S. Environmental Protection Agency (EPA) has reviewed the Navy's draft *Remedial Investigation Report* for Sites 6 and 7, located at the Naval Weapons Station-Yorktown, and we offer the following comments and concerns:

GENERAL COMMENTS

Remedial Investigation

1. Through the review of the RI report and available data collected during the two rounds of investigations, EPA felt that one major question has not been answered. In soils and groundwater north of Building 109 near the drainage (6SB08), high levels of VOCs were detected. It is assumed that the original source is due to past operations in Buildings 109 and 110 (Site 6); but the presence of an existing secondary source of the VOCs is not clear. VOCs were likely dumped in the drains and seeped into the soils and groundwater from the drainage area. However, available data shows that very little VOCs are present in the sediments in the drainage and impoundment, indicating rapid volatilization of VOCs before they could enter the soils and groundwater. This leads to another possible spill scenario for VOCs near Building 109. The VOCs found in soils and groundwater near 6SB08 were possibly due to solvents seeping through the shallow soils (above the Yorktown Confining unit), creating a secondary source. If this is the case, subsurface samples should be placed in the area immediately north of Building 109 to see if additional secondary sources of contamination still exist.

2. Similarly, it is not clear from existing data for Site 7 whether the contaminated groundwater is due to the drainage or from a secondary source such as contaminated soils resulting from dumping of contaminants near the operation buildings. It is therefore necessary to have some additional samples placed between the contaminated groundwater location and the building upgradient.

3. The draft RI document was reviewed to insure that the necessary ground water information has been collected and analyzed at Sites 6 and 7 in order to make a final decision. The document was found to be a statement of sample results and lacking in serious analysis of data. It is insufficient for the narrative to be primarily a data summary. The following comments need to be addressed.

-The geologic cross-sections are good. However, they need to be enhanced by making them hydrogeologic cross-sections. To do this vertical flow nets need to be added to the Figures 3-3 thru 3-7 by posting the potentiometric head in each well at the mid-point of the screened interval and contouring the heads. A discussion of the results should be added to the narrative.

- The above mentioned cross-sections need to be utilized in the analysis of the nature and extent of contamination. This can be done by selecting key contaminants of concern and posting the concentrations of these contaminants on individual cross-sections. Isopleth of these concentrations can be interpreted and the analysis of the results included in the narrative. Hydropunch data should be included in on these cross-sections and the marked differences in concentrations between HS06/SB08 and 6GW01 and 01A explained. Horizontal isopleths for the selected contaminants also need to be constructed and analyzed. This exercise will help pin point the location of the sources of contamination (i.e. possibly the OWTU near 6HP/SB08 or 1903). It is not good enough to say only "It is possible that Building 375 may have contributed VOCs and nitramine compounds to the drainage area and is the source of contamination." We assumed that at the beginning of this investigation!

- It states in the discussion of contaminant distribution at both sites that no ground water contamination was found in the Cornwallis Cave Aquifer. This a misleading statement since only one well in this study encountered any groundwater in this aquifer. This fact needs to be incorporated in the narrative on site contamination.

- The discussions on the fate and transport needs to more to thoroughly analyze the biotransformation of organic compounds. What evidence is there that this is occurring at the site. Was vinyl chloride used at the facility or is its occupance the result of the breakdown of PCE and TCE. Are there areal variations in the Eh, dissolved oxygen levels, iron/manganese ratios, etc. that can be associated with biologic activity and attenuation of contaminants. What affect do wetland conditions have on the biologic transformation processes. These and other questions need to be answered in this section.

Human Health Risk Assessment

4. When calculating risks for future construction workers at both sites, only subsurface soil data was used. These risk calculations should include both surface and subsurface soil data, because future construction workers must dig through the surface soil to get to the subsurface soil. Therefore, they will also be exposed to the surface soil during construction.

5. Data from two rounds of sampling and several areas of Site 6 and 7 were analyzed separately. Please organize Appendix L so that it is easier to see how the different risk calculations were combined and consequently presented in the tables throughout the report. Also, please explain why separate rounds of data from the same area were analyzed separately.

6. The assumed total child body surface available for dermal contact with surface water should be 100%.

Ecological Risk Assessment

7. Detection limits for the ordnance compounds in soils and sediment seemed elevated, ranging from the hundreds of µg/kg to the tens of thousands of µg/kg. There are neither sediment toxicity data for the ordnance compounds and their metabolites nor any sediment toxicity guidelines. Lower detection limits may have revealed that the ordnance compounds had a wider distribution at Sites 6 and 7 and in Felgates Creek than indicated in the RI report. It is suggested that future drafts of the round two RI for Sites 6 and 7 provide some information on the aquatic and sediment toxicity of the ordnance compounds, if this information is available. Because ordnance compounds are not routinely analyzed for at hazardous waste sites, some information should be provided regarding the method detection limits for these compounds in various media and interferences that may affect detection limits. It is suggested that future drafts of the RI provide the reader with some information on the environmental fate, chemistry, and toxicity of the ordnance compounds. This type of information would assist the reader in understanding why ordnance compounds were not considered as contaminants of concern in the risk assessment.

8. The risk assessment was intended to evaluate the potential health threat to biota in Felgates Creek due to possible impacts from Sites 6 and 7 and was limited in scope. Because Felgates Creek receives inputs from a number of other sites at the facility, it is possible that there may be other areas within the creek that could present a potential risk to aquatic receptors. To date, sampling within Felgates Creek has been limited to those areas receiving inputs from other sites on the facility. The extent of contamination within the creek has not been evaluated, nor has there been a comprehensive assessment of the health of the aquatic community using the creek.

9. Additional studies need to be conducted in Felgates Creek to better characterize the types of and extent of contamination within the creek. In particular, a sediment sampling program should be designed to collect surficial sediments (0-5 cm) throughout the creek for analysis of semi-volatile organic compounds, pesticides and PCBs, trace elements, and ordnance

compounds. In addition, the macrobenthic community within the creek should be better characterized. If the results of these additional studies indicate impacted areas, then laboratory or *in situ* bioassays may also be necessary. There are currently insufficient data to allow an evaluation of conditions throughout the creek.

10. The first step of an ERA is the reduction in the number of Potential Chemicals of Concern (PCOCs) by comparing site concentrations to established screening values. This screening was conducted in this ERA; however, the surface water screening values used were for salt water not freshwater. Since the areas evaluated are tidally influenced freshwater, the BTAG freshwater screening values should be used to screen PCOCs to Chemicals of Concern (COCs). The comparison of background concentrations of chemicals to site concentrations was appropriate, but further substantiates the need to screen site concentrations using freshwater screening values. Comparing the site concentrations to the freshwater background and salt water screening values is not appropriate. The screening of site contaminants in surface water to both freshwater background concentration and freshwater screening levels needs to be conducted and presented. It is suspected that the listing of COCs will change and potentially include more COCs than are currently presented when this screening is re-addressed.

11. Since the screening stage is the first step in the ERA, subsequent conclusions regarding the risk posed by these COCs may not be truly representative and can not be relied upon. The surface water screening that must be re-evaluated is currently presented on Tables 7-3b, 7-5a, 7-7b, and 7-8a.

12. On all of the tables used for screening PCOCs to COCs not all of the contaminants analyzed were presented on the tables. The inclusion of all of the contaminants analyzed, along with the sample quantitation limit (SQL) would have been useful to document that other chemicals were not of a concern. Many of the tables did not include a listing of nitroaromatics. Since this group of compounds is of concern onsite, it would have been beneficial to include them, along with the SQLs in the table. This is particularly important when the SQL is above the particular screening level.

13. On all of the sediment screening tables, the background freshwater concentrations were presented under the heading "Tidal Freshwater Stream Background". Although the concentrations appear to be for sediment, please clarify that the background concentrations were for sediment not surface water.

14. The risk from contaminated sediments at the two sites covered in this ERA was conducted based on comparing screening values to site concentrations. No exposure equation was developed for a species that primarily feeds in sediments. An exposure equation should be developed for probing birds, using the spotted sandpiper as a surrogate. Probing birds often consume high quantities of sediment when feeding on invertebrates. No exposure scenario was presented to evaluate this potential risk.

15. There are several problems with the exposure effects evaluation conducted using the shrew. Page 7-26 states that the short-tailed shrew was used as a terrestrial indicator species even

though Page 7-7 does not indicate that the shrew is a terrestrial endpoint. The dietary composition of the shrew, identified and presented on Table 7-18 under "small mammal" as 100 percent vegetation, does not accurately depict the diet of an omnivorous mammal. The USEPA Wildlife Exposure Handbook states that a large portion of the shrew's diet is earthworms not vegetation. Since earthworms ingest a large amount of soil and shrew's diet is largely earthworms, the soil ingestion rate for the shrew would be greater than is currently presented in the Appendix. This change in the shrew soil ingestion would be expected to increase the shrew's exposure to contaminated soil. This change in the shrew's exposure would increase the likelihood for transferring of contaminants through the food chain from contaminated soil through the shrew to the red fox. Therefore, the exposure and potential risk to the red fox would be expected to increase.

16. The report does not state or otherwise discuss the risk to the shrew based on the current concentrations and calculations. Appendix M indicates that there is a high risk to the shrew (QI greater than 100), but the text does not present, discuss, or interpret the consequences of the high QI. The risk to the shrew from direct exposure of contaminated soil should be presented and discussed for all areas at both Sites 6 and 7.

17. The use of the shrew for food-chain transfer does not appropriately depict the entire potential risk to the red fox. The exposure equation used, shown in the Appendix, does not take into account the amount of contaminant bioaccumulated in the shrew. The Concentration in Small Mammal (Cm) expressed in the equation does not terminate in a concentration in the shrew but rather in a exposure rate for the shrew (mg/kg-day). The equation does not establish the shrew's duration of exposure, the bioaccumulative properties of the COCs, and concentration of contaminant in the shrew passed on to the red fox. The exposure to the shrew also does not take into account the high ingestion rate of lower level invertebrates who injest contaminated soil.

    We recommend that the dietary composition, ingestion rate, and exposure to the shrew be re-evaluated and presented for each area containing contaminated soil. We further recommend that the red fox exposure calculations be updated after re-evaluating the shrew exposure.

SPECIFIC COMMENTS

Remedial Investigation

1. Page ES-4, last paragraph.

    The second sentence is ambiguous in terms of the exact locations referenced by "downgradient from the drainage area to the impoundment area." In addition, the concentration ranges of VOCs found during both Phase I and Phase II should be provided, as is for the nitramines discussed in the same section.

2. Page ES-5, second paragraph.

The concentration ranges for VOCs in groundwater (wells and HydroPunch samples) should be listed here.

3. Page ES-5, last sentence.

   The last two sentences suggest the buildings were the sources, but no longer in operation. Although this is true, such references in the groundwater section can be misleading. There may not be active operations in the buildings that discharge contaminants to the groundwater. However, this does not necessarily mean there is no existing sources for groundwater contamination. As indicated by the data collected from Round I and Round II, subsurface soils are quite contaminated and are definitely acting as a source of contamination for groundwater.

4. ES-6, first paragraph.

   The concentration ranges of VOCs in surface water should be provided.

5. ES-6, 3rd paragraph.

   Based on the subsurface soil results, it appears that the contaminated soils are probably a more significant contamination source than the impoundment. There is no current operations in the buildings that contribute contaminations. However, there may be residual substances near the buildings that are either on the ground or percolated into shallow subsurface soils. These materials may constitute significant sources of contamination.

6. Page ES-7, first paragraph.

   The suggestion that the SVOCs in sediments in the impoundment and drainage are due to "anthropogenic contamination and general storm water runoff from the roadways which cross the site" is inappropriate and can not be supported by existing data. Soil samples at several sampling locations including those near the conveyor belt and Buildings 109 and 110 contain SVOCs that appear to be quite different than those SVOCs found in the sediments of the impoundment and drainage. First, the concentrations of SVOCs found in the sediments appear to be much higher than those in soil samples. Secondly, more SVOC compounds are found in sediments than in soils. All this suggest that the SVOCs found in the sediments were probably from some point sources rather than general runoff.

7. Page ES-7, last paragraph.

   See the previous comment.

8. Page ES-20, first bullet.

   All is true except for the zinc (about 2,000 ppm) found in the soil of the former excavation area at Site 6.

9. Page ES-21, second bullet.

   Available boring logs indicate that the shallow aquifer (Cornwallis Cave) is missing or incomplete at many locations. Based on cross sections in Section 3, all the groundwater samples appear to have been collected from the deep aquifer, probably because there was not much water above the Yorktown Confining unit. Therefore, it may be premature to conclude that there is no contamination above the confining unit. Reliefs appear to cut through the Yorktown Confining unit at valley and drainage locations. If past operations in Building 109 released VOC contaminants to the ground near the building, the contaminants would have most likely seeped to top of the Yorktown Confining unit and migrated into the deep aquifer at locations where the Yorktown Confining unit becomes thin or non-existent.

10. Page 2-7, last paragraph.

    Discussions should be provided to evaluate whether removal of the several inches of top soil would invalidate the data for risk assessment.

11. Table 2-7.

    Please add the aquifer unit for the HP samples.

12. Figure 2-1.

    The sampling locations 6S26 through 6S30 are not shown.

13. Page 4-2, Section 4.1.1, second paragraph.

    Field and laboratory blanks should be applied only to the specific groups or batches of samples collected or analyzed during a similar time. Simply applying the maximum blank concentrations to all samples is not appropriate.

14. Page 4-4, Section 4.1.2.

    It is necessary to compare the inorganics data with various backgrounds (site specific, Station-wide, and anthropogenic samples). However, it should be made clear that comparison with these backgrounds will not provide exclusive evidence in terms of whether the detected inorganics are naturally occurring or originated from site specific operations.

15. Page 4-7.

    Insert a heading within Section 4.2.1.1 for the surface soil investigation results after the first paragraph.

16. Page 4-8, fourth paragraph.

    The use of term "essential nutrients" here and in other sections of the report do not seem to

be appropriate for the purpose of this discussion. Suggest using major elements of the earth's crust or soil composition as alternative. This is because many essential nutrients, such as nitrate, phosphate, are considered contaminants if present at high concentrations. Therefore, an essential nutrient can still be a contaminant related to site operation. Calcium, iron, magnesium and many others are not considered contaminants in most cases because they are so abundant in the earth's crust.

17. Page 4-11, first paragraph.

    Based on our review of the cross sections, most groundwater samples (HydroPunch and wells) appear to be in the Yorktown Eastover aquifer. It is therefore not prudent to conclude that the shallow aquifer has not been contaminated. As discussed in earlier comments, if the past operations in Building 109 had discharged contaminants in soils outside the building, the contaminants most likely have reached the top of the Yorktown confining layer and found their ways into the deep aquifer. Contaminant distribution in soils and groundwater near 6SB/HP08 indicates such possibility.

18. Page 4-18, last paragraph.

    Similar to Site 6, all HydroPunch and wells appear to be in the deep aquifer based on review of the cross sections. It is difficult to judge which layer the wells or HydroPunch samples not shown in the cross sections were actually located. If there are some samples from the shallow aquifer, the locations should be indicated. If no or insufficient data are available from the shallow aquifer, it may not be prudent to conclude it is not contaminated.

19. Page 4-24, last paragraph.

    It is not appropriate to state that the SVOCs found in the site are part of the PAHs "commonly found in the environment." As discussed earlier, the SVOCs found in the sediments of the impoundment and drainage, and those found in the surficial soils elsewhere, do not appear to be the same source.

20. Page 4-25, fifth line.

    Please correct the depth interval.

21. Page 4-25, last paragraph.

    Although Buildings 109 and 110 are no longer in operation, contaminant distribution in soil and groundwater near 6SB08 indicates the possibility that the soils behind the buildings may be contaminated.

22. Page 4-26, second paragraph under Section 4.3.1.2.

    When referring the Cornwallis Cave aquifer not being contaminated, please indicate the sampling locations where there is data to support this conclusion.

23. Page 4-26, third paragraph under Section 4.3.1.2.

    The high concentration of TCE found in 6HP08 (37 ppm) should also be discussed here.

24. Page 4-27, second paragraph.

    Although the two buildings are no longer in operation, the contaminated soils will still act as source of contamination for the groundwater. See earlier comments on similar subject.

25. Page 4-27, last paragraph.

    The major current sources for surface water contamination should also include the soils and sediments in the drainage, mostly for nitramines and groundwater for VOCs.

26. Page 4-28, Section 4.3.1.4, second paragraph.

    The discussions on the source of the SVOCs are not convincing. See earlier comments on the subject.

27. Page 4-29, first two lines.

    The majority of the nitramines in the drainage of Buildings 109 and 110 is found less than 1.5 feet deep. This is relatively the shallow portion of the sediments.

28. Page 4-29, third paragraph.

    The source of SVOCs. See earlier comments.

29. Page 4-30, Section 4.3.2.2.

    See earlier comments on contamination in the shallow aquifer.

30. Page 4-32, first paragraph.

    The difference between the surface water results in Round I and Round II could also be normal seasonal variations, or due to other factors such as infiltration and discharge. If tidal cycles are the cause, it may be necessary to collect surface water samples through a tidal cycle.

31. Page 5-4, second paragraph under Section 5.2.1

    The discussions about the source of VOCs and nitramines in the deep aquifer (Yorktown-Eastover) can not supported by available data. There is not much VOCs in the sediments of the impoundment and drainage, indicating that most VOCs out of the discharge pipes of Buildings 109 and 110 probably evaporated before reaching the impoundment. The VOCs found in soil and groundwater near 6SB08 likely were from contaminated soils that possibly

exist(ed) near the two buildings.

Chapter 6 - Human Health Risk Assessment

32. Page 6-2, Section 6.2.1

It should be mentioned here that the latest edition of the "Risk-Based Concentration Summary Table, Jan.-June 1996" was used to compare with the maximum detected concentration in each medium.

33. Page 6-5, Section 6.2.1

Although it standard practice to leave essential nutrients out of the risk assessment, iron can not be left out if it is present at levels significantly above background.

34. Page 6-7, Section 6.2.3

Please reference the figures where these sample locations are shown. If they are not located on figures in the RI report, figures showing the sample locations should be added to this section of the RA.

35. Page 6-29, Section 6.3.2.3

"4-DNT" appears to be incorrect. Please remove this or replace it with the correct compound.

36. Figure 6-1

Please add ingestion, dermal contact, and inhalation of surface soil as exposure pathways for future construction workers.

Chapter 7 - Ecological Risk Assessment

37. Section 7.3.3

The text states that a sediment pathway was not evaluated because current guidance for terrestrial receptors does not exist. The guidance indicates that all reasonable exposure pathways should be evaluated. The incidental ingestion of contaminated soil of terrestrial receptors, i.e. probing bird, when feeding in an aquatic ecosystem, i.e. wetland, can be evaluated using the current guidance. We recommend that this exposure pathway be evaluated.

38. Section 7.3.4

The text states that no air pathway was evaluated because the current guidance does not exist. The current guidance indicates that all reasonable exposure pathways should be evaluated.

Please explain the reasoning for not including the air pathway.

39. Pages 7-15 and 7-21

Please clarify the descriptions of the flooding frequency of the impoundment area and the existence of surface water at Site 6. The descriptions on these two pages differ because one indicates that tidal flow regularly flows into the area and the second one indicates that it does not.

40. Section 7.6

The Risk Characterization section needs to be re-written after the development of the COCs are re-evaluated. The conclusions presented in this section are correct for the data provided but if the list of COCs increases then further descriptions are necessary. Currently, this section does not present the calculated risk to the shrew. Therefore, after the shrew calculations are updated, the risk to the shrew at each area with contaminated soil will need to be evaluated and presented in this section. The red fox calculations are likely to also change and will need to be presented in this section.

41. Sections 7.6.2 and 7.6.3

The use of receptors and contaminant transfer modelling are the methods used to develop risk based statements. The information presented in these sections do not indicate whether the risk from contaminant exposure is high or low to receptors. The statements about Quotient Indices (QIs) need to be re-addressed for exposure scenarios and conclusions made on the basis of exposure, rather than on the basis of comparison to screening levels.

42. Section 7.7

The elimination of PCOCs because of a lack of information, such as screening values, is not an acceptable reason. PCOCs without screening values should be included in the risk assessment, have an exposure dose calculated, and compared to toxicity information before elimination from further evaluation. The listing of PCOCs evaluated in this section should be re-addressed.

43. Table 7-3a

This table indicates that RDX was excluded from detailed investigation because it is a common laboratory contaminant. Since nitroaromatics are a concern at the Naval Weapons Station Yorktown the exclusion of RDX from detailed investigation is not appropriate without additional supporting information. Please provide additional information or evaluate the potential exposure risk to all applicable receptors from this chemical. Re-sampling may be necessary.

44. Table 7-3b

This table indicates that HMX and RDX were excluded from detailed investigation. The specific comment for Table 7-3a also applies for this table.

45. Table 7-3c

This table indicates that HMX and RDX were excluded from detailed investigation because of a low frequency of detections. Although only two detections were recorded for each chemical, the upper limit of the concentration range was 710,000 ppb for HMX and 160,000 ppb for RDX and could indicate a "hot spot". Since nitroaromatics are a concern at the Naval Weapon Station Yorktown, the exclusion of a "hot spot" of a nitroaromatic is not appropriate. We recommend that the HMX and RDX concentrations be further evaluated for potential exposure risk to all applicable receptors.

46. Table 7-8b

This table indicates that mercury was deleted from detailed evaluation because of background concentrations. Although this table indicates that both the sample concentration and the background concentrations are estimated, the sample concentration is greater than the background concentration and should be evaluated for risk. More importantly, the bioaccumulative properties of mercury justify its inclusion for detailed evaluation.

47. Tables 7-12, 7-13, 7-14

The first box in this table header is labelled incorrectly, it should read "Benthic Macroinvertebrate Taxonomy beginning with Class".

48. Tables 7-28, 7-29, 7-30, 7-31

The calculation of the Quotient Index (QI) for surface water concentrations when the values compared were used for screening is redundant and does not provide significantly useful data. These calculations merely re-iterate that the COCs presented have concentrations above the screening values. However, that is the significance of a COC. PCOCs are compared to established screening criteria and those chemicals that have concentrations above the screening levels are considered COCs. To then calculate the magnitude of the difference between the site concentration and the screening level does not provide any further information except to document how much greater the site concentration is above the screening criteria. The conclusions reached from these calculations, such as the benthic macroinvertebrate community is potentially at risk from chemical concentrations above the sediment screening level, can also be stated without conducting these calculations. Please provide the rationale and relevance of these calculations.

This concludes EPA's review comments concerning the draft *Remedial Investigation Report* for Sites 6 and 7, located at the Naval Weapons Station-Yorktown. If you have any questions regarding the above, please feel free to call me at (215) 566-3357,

Sincerely,

Robert Thomson

Robert Thomson, P.E, AEP
Office of Superfund

cc: Steve Milhalko (VDEQ, Richmond)
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