

EPA's Comments
Draft Remedial Investigation Work Plan
for SWMU 4 at the
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico
June 2004

1. Change the cover page to read Naval Ammunition Support Detachment (NASD) instead of Atlantic Fleet Weapons Training Facility (AFWTF).

Navy Response: The cover page has been changed to read: "Former Naval Ammunition Support Detachment (NASD)."

2. Page IV, Executive Summary: This section notes that 40 soil samples, 15 groundwater samples, six surface water samples, and six sediment samples are proposed to be collected. These numbers do not coincide with the number of samples presented in Tables 4-2, 4-3, 4-4 and 4-5. This discrepancy should be corrected.

Navy Response: The Executive Summary text and Tables 4-2 through 4-5 have been revised to reflect the appropriate number of samples that will be collected during the RI. The Executive Summary, Page IV, second paragraph has been edited as follows: "During the RI there will be a total of approximately 71 surface soil samples, 64 subsurface soil samples, 16 groundwater samples, 4 surface water samples, and 4 sediment samples. The ephemeral stream sample locations have been included above as surface soil samples, but if at the time of sampling the stream is wet then the samples will be collected as surface water and sediment samples. These samples are proposed to be analyzed for VOCs, SVOCs, pesticides, PCBs, metals, explosives, and perchlorate to evaluate the nature and extent of potential contaminants. In addition, ion chromatography (IC) anions and alkalinity analyses will be done for the groundwater samples; TOC, pH, and grain size analyses for the soil samples; hardness and alkalinity analyses for the surface water samples, and TOC, pH, grain size, and AVS/SEM for the sediment samples. The additional parameters are included to both assist in potential risk decisions and to develop site specific SSL values." Tables 4-2 through 4-5 are included in Attachment A.

2A. Please note that in general the BTAG does not recommend conducting Acid Volatile Sulfide/Simultaneously Extracted Metals (AVS/SEM) analyses, due to uncertainties regarding spatial and seasonal variability. Further, while AVS is effective in binding divalent metals in anoxic sediments, it is generally less applicable to the more oxic conditions in the upper 2 cm of sediments, considered the primary biotic zone (benthic organisms require oxygen and would not be present in its absence).

Navy Response: While the potential uncertainties associated with the AVS/SEM method are recognized, this analysis will contribute to the overall weight of evidence for the ERA. Thus, the Navy will conduct the analysis but the uncertainties associated with the methodology will be discussed in the uncertainty section of the ERA.

3. Page IV and 2-3: All detections of anthropogenic compounds during the PA/SI should be noted, not just those which exceeded PRGs. The text should be amended to indicate all compounds that were detected and which ones were above PRGs. Appendix A does show these other compounds, but in planning an investigation, all compounds known to be present at the site are relevant.

Navy Response: All detections from the analytical data (PA/SI and RI) have been included in this RI Work Plan. Table 2-1, 2-2 and 2-3 have been revised to reflect all detections and analytes that exceeded PRGs, SSLs, and ecological screening values have been highlighted. Revised Tables are included in Attachment B. Table 2-1 includes the references for the ecological screening values presented in the table. Because the screening data has changed since the Draft SWMU 4 RI Work plan submittal in June 2004, there are changes in the number of exceedances found, however these changes do not affect the overall sampling strategy of this Work Plan. Section 2.3.4.1 Soil Sampling Results, and Section 2.3.4.2 Groundwater Sampling Results will be edited to discuss the revised list of exceedances.

4. Section 1-1: The objectives listed in this section should clearly define the problem to be addressed by this study in unambiguous terms. The objectives should reflect the expected final disposition of the site, the potential contaminants of concern and the required action levels. It is recommended that the DOE DQO web site be consulted for ways to formulate the objectives in a manner that will provide focus to the project:
<http://www.hanford.gov/dqo/>

Navy Response: It is unclear why a change in the DQO process is being proposed at this time, given that previous investigations have been conducted in accordance with approved work plans that have not included the systematic approach cited, which has heavy statistical emphasis, and requires team planning specifying the details of the specific decision input factors and the expected outcomes. The existing DQO process is commonly accepted as providing data with a level of confidence adequate for the risk management decisions made at these types of sites. It is recommended that the proposed change in the DQO process is not implemented due to the significant change required in the programmatic approaches that would unlikely tangibly alter the end site management.

5. Figure 1-1: The location of the dashed line suggests that Tortola is part of the U.S. Virgin Islands. Please revise the figure to more accurately delineate the US Virgin Islands from the British Virgin Islands.

Navy Response: Figure 1-1 has been revised and is included in Attachment C.

6. Page 2-2, Section 2.1, Site Setting: This section summarizes the materials that were disposed of or detonated in SWMU-4. Somewhere in the work plan, there should be a more detailed accounting of potential contaminants that are associated with these materials. It should include information on what contaminants may be associated with each of the types of munitions which have been detected at the site, as well as better chemical descriptions of each of the materials noted in this section.

Navy Response:

The following text has been added to Section 2.3.4 Expanded PA/SI, second sentence in the second paragraph: "Additional munitions items known to have been disposed of at SWMU 4 are 8-inch, 105mm, 106mm, and 175mm projectiles."

The following text will be added to the end of Section 2.3.6 MEC RI: "A complete accounting of all munitions items, munitions related items, and materials associated with the OB/OD operations is not available. However, during the PA/SI (CH2M HILL, October 2000), MEC RI (CH2M HILL, March 2004), and ongoing investigations/removal actions at the Former

Vieques Naval Training Range (VNTR) specific munitions and munitions related items were identified. Table 2-4 lists the munitions items identified at SWMU 4 during the MEC RI. Additional items were located and are known to have been disposed of at SWMU 4 as described in Section 2.3.4 and below. It is noted here that potential contaminants associated with the munitions items identified to date on Vieques are included in the analytical protocol for samples proposed for the RI (see Section 4) or do not have established regulatory screening criteria."

7. Page 2-2, Section 2.2.2, Site-Specific Geology and Hydrology: The work plan notes that no perennial streams are present in the vicinity of the Site and that during storm events local runoff is toward the drainage feature that runs from the northeast to southwest across the Site. The "drainage feature" should be referred to as an "ephemeral stream" and information should be provided in this document on the habitat provided by this stream. The work plan also needs to provide a better description of the wetland area and lagoon present onsite and the hydrology that supports these areas. The approximate boundaries of the wetland area (mangrove swamp?) should be depicted on a map; the National Wetland Inventory (NWI) map of the area may be sufficient at this stage of the investigation. This information is necessary to determine whether areas that could potentially be impacted by the Site via surface runoff are being properly sampled. Figure 2-1, Topography and Drainage Map, does little to clarify this issue as the area occupied by SWMU 4 is highlighted with a blue grid, making it difficult to ascertain any details regarding topography or drainage on the Site.

Navy Response:

The term "drainage feature" has been changed to "ephemeral stream" in this section, as well as in Section 4.3.4 (page 4-7, fourth bullet), and Table 5-2 (page 5-11, Note g).

The NWI map for the western side of Vieques Island has been added to Section 2.2.2 (see Figure 2-2, Attachment C). Based on the information illustrated in this map, the following paragraph describing the wetland, lagoon, and drainage features present onsite has been added:

"Figures 2-1 and Figure 2-2 illustrate the wetland habitats associated with the western side of Vieques Island, including SWMU 4. SWMU 4 is drained by several ephemeral streams, the largest of which leads to an adjacent estuarine wetland system at the northwestern corner of the island, while several smaller ephemeral streams drain southwest toward the beach along the Caribbean Sea. Other large ephemeral streams occur to the northeast of SWMU 4 and also drain to this estuarine wetland. The northwest estuarine wetland is predominantly subtidal and therefore continuously inundated with salt water. The inundated portions of this wetland are primarily open water with sparse vegetation. Laguna Boca Quebrada, Laguna Kiani, Laguna El Pobre, and Laguna Arenas are the named open water areas of this wetland system. The relatively elevated wetland perimeter, as well as some internal portions of the wetland, occur in the intertidal zone and are more heavily vegetated with mangroves and other wetland plant species. Sediment in this wetland is predominantly mud and sand. This estuarine system is hydrologically connected to the Caribbean Sea through inlets at the western and northeastern parts of the wetland."

Figure 2-1, Topography and Drainage Map, has been modified to remove the blue grid which blocks the view of the topography and drainage information (see Attachment C, Figure 2-1). In addition, the locations of the ephemeral streams have been denoted on the revised figure.

Regarding the selection of lagoon sample locations, please see the response to EPA Comment 39.

8. Page 2-2, Section 2, Site Background and Physical Setting: Section 2.3.1 presents a discussion of ecological receptors observed during an ecological survey conducted in 2000. It is noted that no endangered or threatened species were observed during the survey. The work plan should also include, a tabulation of Federally-listed plants and animals on and around Vieques Island, including marine species (similar to Table 1-1 in the Phase I RCRA Facility Investigation Report). The section on wildlife should include discussions of aquatic receptors such as those that would be expected in the onsite lagoon, in the mangrove swamps, or in the ephemeral streams. A discussion of the diverse coral reefs found in the waters surrounding the island should also be presented. The possibility that these habitats could be impacted from surface runoff from the Site will need to be evaluated as part of the RI.

Navy Response:

Section 2.3.1 (page 2-2) has been updated to include a tabulation of federally-listed species. Two new figures (Figures 2-3 and 2-4) have also been added (see Attachment C). The first paragraph of this section has been replaced with the following:

"An ecological survey was conducted at SWMU 4 to describe the site flora and fauna (Geo-Marine, 2000). Figure 2-3 identifies the areas surveyed (both site and control).

Table 2-1A provides the federally-listed species occurring or potentially occurring at former NASD Vieques. Biologists walked transects through the site and identified any federally protected species seen and noted the presence or absence of preferred habitat for these species. Survey results indicated that no endangered or threatened species were observed at this site and, as discussed below, no preferred habitat of any of these species is present at SWMU 4.

Cobana negra (*Stahlia monosperma*), the only federally listed threatened tree known to occur on former NASD Vieques, has been found between the boundary of black mangrove (*Avicennia germinans*) communities, salt flats and the upland communities at former NASD Vieques. This species is also known to occur in coastal forests of southeastern Puerto Rico. The preferred habitat for *Cobana negra* is not present at this site. *Chamaecrista glandulosa* var. *mirabilis*, a federally listed endangered tree, occurs in open areas with fine, white, highly permeable, and strongly acid sands, a habitat type which does not occur at the site. Some 10 to 12 individuals of *Calyptanthes thomasiana* (federally listed endangered tree) are known to occur within the subtropical moist forest life zone on Monte Pirata, where the elevation is 300 meters. This subtropical moist forest life zone on Monte Pirata is not located at SWMU 4. *Goetzea elegans*, another federally listed endangered tree, has a very narrow ecological niche, and is restricted to ravines and ledges in semi-evergreen seasonal forests on limestone, of which only ravine habitats occur at this site. *Eugenia woodburyana* (federally listed endangered tree) is found in deciduous and semi-evergreen seasonal forests of the

subtropical dry forest life zone. Though SWMU 4 occurs within the subtropical dry forest life zone, this species was not observed during the ecological survey.

Federally threatened and endangered sea turtles such as the green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), leatherback (*Dermochelys coriacea*), and loggerhead (*Caretta caretta*) sea turtles, and endangered marine mammals such as the West Indian manatee (*Trichechus manatus*), sperm whale (*Physeter macrocephalus*), fin whale (*Balaenoptera physalus*), and humpback whale (*Megaptera novaeangliae*) would not occur at this site because they require marine habitats.

Federally endangered marine birds such as the brown pelican (*Pelecanus occidentalis occidentalis*) and the roseate tern (*Sterna dougalli dougallii*) would not likely occur at this terrestrial site, but could occur in the nearby lagoons and coastal marine waters of the Caribbean Sea. During the ecological surveys, brown pelicans were observed flying over the adjacent marine habitat, but not at SWMU 4."

TABLE 2-1A
 Federally Listed Species Occurring or Potentially Occurring at Former NASD Vieques

Scientific Name (Common Name)	Federal Status
Plants	
<i>Chamaecrista glandulosa</i> var. <i>mirabilis</i> (Herb)	Endangered
<i>Calyptanthes thomasiana</i> (Tree)	Endangered
<i>Stahlia monosperma</i> (Cobana negra)	Threatened
<i>Goetzea elegans</i> (Beautiful Goetzea)	Endangered
<i>Eugenia woodburyana</i> (Evergreen tree)	Endangered
Corals	
<i>Acropora palmata</i>	<u>Threatened</u>
<i>Acropora cervicornis</i>	<u>Threatened</u>
Reptiles and Amphibians	
<i>Chelonia mydas</i> (Green sea turtle)	Threatened
<i>Dermochelys coriacea</i> (Leatherback sea turtle)	Endangered
<i>Eretmochelys imbricata</i> (Hawksbill sea turtle)	Endangered
<i>Caretta caretta</i> (Loggerhead sea turtle)	Threatened
Birds	
<i>Pelecanus occidentalis occidentalis</i> (Brown pelican)	Endangered
<i>Sterna dougalli dougalli</i> (Roseate tern)	Threatened
Mammals	
<i>Physeter macrocephalus</i> (Sperm whale)	Endangered
<i>Balaenoptera physalus</i> (Fin whale)	Endangered
<i>Megaptera novaeangliae</i> (Humpback whale)	Endangered
<i>Trichechus manatus</i> (West Indian manatee)	Endangered

The following paragraph has been inserted at the end of Section 2.3.1 to describe the possible aquatic receptors in the ephemeral streams, adjacent lagoon/estuary, and offshore coral reefs:

“The ephemeral streams that occur onsite are not expected to support significant populations of aquatic organisms. In general, they contain water only following storm events and are quickly drained of water once the storm events end. There may be isolated areas of standing water, such as at the mouth of the ephemeral streams if dammed by sand berms. If present, these locations will be specifically targeted for sampling as part of the RI.

Diverse communities of wetland plants, invertebrates, and fish are expected to occur in the adjacent estuarine wetland (lagoon). The common marine flora likely includes multiple species of algae (e.g., calcareous algae including *Halimeda simulans*, *Udotea flabellum*, and *Penicillus pyriformis*), angiospermae species like turtle-grass (*Thalassia testudinum*), manatee-grass (*Syringodium filiforme*), sea vine (*Halophila decipiens*), and green seagrass (*Halodule wrightii*), and three semiaquatic species that consist of mangroves: red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and white mangrove (*Laguncularia racemosa*).

Benthic communities associated with the soft mud/sand bottom areas are likely to be dominated by various polychaete worm species such as the southern lugworm (*Arenicola cristata*), crustaceans (e.g., amphipods, copepods, *Callinectes* sp., and *Portunus* sp.), and mollusks (e.g., queen conch, *Strombus gigas*). The mangrove areas likely support a diverse community of similar invertebrates, along with various attached sponge and coral species.

Mangroves also support a variety of fish species. These typically include adult and/or juvenile Nassau grouper (*Epinephelus striatus*), mutton snapper (*Lutjanus analis*), gray snapper (*Lutjanus griseus*), yellowtail snapper (*Ocyurus chrysurus*), white grunt (*Haemulon plumieri*), banded butterfly (*Chaetodon striatus*), and schoolmaster (*Lutjanus apodus*).

Coral reefs do occur in the Caribbean Sea along the west coast of Vieques Island. Figure 2-4 illustrates the types of reef habitats (as well as seagrass and other benthic habitats) that occur in this area. SWMU 4 occurs in close proximity to reef communities growing along the western shoreline. Coral reefs are highly diverse communities of invertebrate and fish species. Dominant coral species expected to occur here include *Montastraea annularis*, *Agaricia agaricites*, *Montastraea cavernosa*, *Porites asteroides*, and *Colpophyllia natans*. These are the major contributors to reef accretion and are often the most conspicuous corals found in shallow water. In slightly deeper waters (0 to 15 meters), *Acropora palmata* and *Acropora cervicornis* (both listed as threatened species) often form dense, high relief monospecific thickets. Somewhat less conspicuous on the reefs are invertebrates that include various species of other hard corals, soft corals, sponges, sea urchins, starfish, anemones, tube worms, shrimp, lobsters, crabs, and mollusks. Reef fish diversity is also high and includes multiple species within the following groups: snappers, groupers, grunts, goatfishes, porgies, squirrelfishes, tilefishes, jacks, parrotfishes, surgeonfishes, triggerfishes, filefishes, boxfishes, wrasses, and angelfishes."

Regarding sampling of the various habitats, the ephemeral stream(s) and lagoon are included in the RI sampling protocol. The current SWMU 4 study area does not include the marine environment. Any off-shore studies necessary will be scoped after the investigations have been completed. If off-shore investigation adjacent to SWMU 4 is deemed necessary in the future, the area can be studied as part of a larger off-shore effort or identified as a separate study area or within an expanded SWMU 4.

9. Page 2-3, Section 2.3.2, Environmental Baseline Study: EPA has not seen the report on the aerial photography review. This needs to be provided in order to properly evaluate the RI work plan. It is noted that, although a number of locations to the north were identified in the aerial photos, for the most part these areas are not being investigated. Barring information justifying their exclusion, these areas should be included in the sampling program.

Navy Response: The Final Environmental Baseline Study Report (Program Management Company, October 17, 2000) is located on the Vieques public website and can be downloaded at this address: <http://public.lantops-ir.org/sites/public/vieques/>.

As stated in the text in Section 2.3.2, the features identified by the firm specializing in aerial photography analysis are summarized in Figure 2-2 of the Work Plan. Four soil boring locations will be added to the northern ground scar/probable stain areas at PI-01, PI-02, PI-03, and PI-04 (one boring at each location). These newly added sampling locations are shown on Figure 4-2 (Attachment D) and have been added to Table 4-3 (Attachment A).

10. Page 2-3, Section 2.3.4.1, Soil Sampling Results: Since data were not screened against ecological values, soils may be associated with unacceptable risk to ecological receptors.

Navy Response: Although the soil sampling data were not screened against ecological soil screening values in the draft work plan, they were screened against background levels (which are available for inorganics). Thus, only those inorganic constituents that exceeded background in surface soil samples (ecological receptors generally have limited exposure to subsurface soils) may be associated with potential ecological risks above background levels, based upon the results of these samples. All surface soil data (including relevant historical samples) will be screened against ecological soil screening values in the RI Report. Comparison of site data to background data is done in Step 3a of the ecological risk assessment, in accordance with EPA guidance.

11. Page 2-4, Section 2.3.4.1, Soil Sampling Results: The description of detections from the previous sampling need to be more fully discussed in relationship to the known pits and site features. The site conceptual model for contaminant release and distribution will be very different depending on whether it is believed that soil contamination is limited to small areas such as pits, versus spread more broadly throughout the area. Existing data needs to be used to this end – and the RI sampling should be geared towards evaluating any preliminary conclusions which can be drawn.

Navy Response: The PA/SI sampling locations were selected based on magnetometer survey results. Because the exact pit locations were identified after the PA/SI sampling, a new round of soil samples will be collected from directly within each OB/OD pit during the RI. If constituent concentrations associated with former releases at the site exist, these pit areas likely represent the most conservative estimate (i.e., “worst case”) of site concentrations. Further, site characteristics have been evaluated (e.g., aerial photographs, geophysical survey, site visits) to help identify where contamination, if present, likely migrates, accumulates, and discharges. These are the areas specifically targeted for sampling as part of the RI.

Appendix A of the Expanded PA/SI Report presents the detailed sample specific analytical data for the Expanded PA/SI soil and groundwater samples, and the data comparison with screening criteria and the exceedences are included in Tables 2-1 and 2-2 of the RI Work Plan for soils. Section 4.0 presents figures that include previously collected sample locations along with the newly proposed soil sample locations selected based on results of the previous sampling and analysis, as well as the identified munition related scrap material presence, and other relevant site features (e.g., ephemeral streams, lagoon). This information is adequate to characterize the site based on existing data and to determine the need and locations for additional sampling.

12. Page 2-4, Section 2.3.4.1, Soil Sampling Results: In the third paragraph on this page, the last sentence reads, “Therefore, the present of thallium in these samples is likely attributable to background conditions.” It may be premature to draw these conclusions based on only 4 samples collected from SWMU 4. Please remove this language from the paragraph. Also in Paragraph 3, the work plan incorrectly states that six surface soil samples contained individual metals (barium and thallium) at concentrations above PRGs and background levels. It was six subsurface samples that exhibited these results, as per Table 2-2.

Navy Response: The last sentence in the third paragraph has been removed. The "surface soil" in the third paragraph on Page 2-4 has been changed to "subsurface soil." Also last sentence in the fifth paragraph, "Therefore, the presence of thallium in these samples is likely attributable to background conditions." has been deleted.

13. Page 2-4, Section 2.3.4.2, Groundwater Sampling Results: As always please report and discuss all detections of anthropogenic compounds. Also, review of Appendix A shows that acetone was detected in one sample and several other VOC results were rejected. The text mentions that VOCs were included in the analysis suite, but no mention of the results are included. Include and discuss all results.

Navy Response: The following text has been added to Section 2.3.4.2, after the fourth paragraph. "Acetone was the only VOC that was detected in the groundwater at a concentration above the PRG. Acetone was detected in one of the eight monitoring wells (MW-08). Detections of 2-butanone and acetone were rejected in three samples. Both acetone and 2-butanone are often associated with laboratory contamination. Further, there is no likely source of either constituent at the site."

The following text has been added to end the last paragraph of Section 2.3.4.2. "Additionally, total barium was detected in all but one of the groundwater samples at a concentration above the PRG; however, these detections were all below the background UTL. Total manganese was detected in all of the groundwater samples at concentrations above the PRG, but these detections were below the background UTL. The one detection of thallium (in MW-04 primary sample, but not in the duplicate) was above the PRG, but below the background UTL. Dissolved antimony was detected in two samples (MW-05 and MW-08). These detections were above the PRG, but below the background UTL. This was also true for the two detections of dissolved arsenic in samples in MW-05 and MW-06. The majority of the detections of dissolved barium were above the PRG; however, only two were above the background UTL, as discussed above. All but one detection of dissolved manganese exceeded the PRG, but all were below the background UTL."

14. Page 2-8, Section 2.3.5, Crab Study: The last sentence of this paragraph reads, "The study did not attribute these metal concentrations to SWMU 4 activities." This implies that the conclusions of the study specifically stated that SWMU 4 activities were not associated with increased metals concentrations in fiddler and land crab tissue, rather than implying that no conclusions could be drawn regarding the potential cause or source of metals that were found to bioaccumulate in the crab tissue. Please revise the language to more accurately reflect the conclusions of the study.

Navy Response: The last sentence of this paragraph has been deleted.

15. Page 2-8, Section 2.3.6, MEC RI: The text states that only 16% of the anomalies removed were MEC. Please indicate what made up the other 84% of the material and what was done with it.

Navy Response:

The following text was added to Section 2.3.6, paragraph 4 following the second sentence:

"The remaining 84% of the metallic items excavated were non-hazardous scrap metal comprising ordnance related scrap (containing no energetic material), rebar, angle iron, sheet

metal, beverage cans, nuts/bolts, vehicle parts, railroad track, etc. All scrap metal was transported and disposed of at a scrap metal recycling facility on the main island of Puerto Rico."

16. Page 2-8, Section 2.3.6, MEC RI: It is not clear if the MEC RI is considered complete or ongoing. Also, in previous discussions, it seemed that the plan was to go through remedial action for MEC prior to an environmental investigation. Please clarify and justify the intended sequencing of investigations and remedial efforts.

Navy Response: The MEC RI fieldwork is complete. The MEC removal process is ongoing at SWMU 4. An EE/CA for MEC removal was submitted for regulatory review in December 2005. The MEC removal action, which encompasses the entire SWMU area (approximately 400 acres), is scheduled, in phases, to begin around May 2006. During the May 2006 mobilization, MEC removal will take place over approximately 60 of the 400 acres. The remaining areas will be MEC cleared in the future, based on funding allocations. Figure 2-15 (see Attachment C) has been added to the Work Plan that shows the areas to be MEC cleared during the 2006 mobilization. The environmental RI will be implemented following completion of the 2006 MEC clearance. As shown in the figure, the MEC clearance to be conducted in 2006 will cover the vast majority of sampling locations proposed for the environmental RI, including the areas containing the former OB/OD pits and the areas with the highest concentrations of MEC scrap.

- 16A. As per Figure 2-15, it appears that the entire site will undergo MEC clearance. Therefore, it is confusing how Figure 2-3, could portray the area immediately north of the site as a "control" area for an ecological survey.

Navy Response: At the time of the Geo-Marine study, the control area was outside of the SWMU 4 boundary. The SWMU 4 boundary was later expanded to include the explosive protection area arch and the control area is now within that arch. Although this does not necessarily mean that the control area was impacted by SWMU 4 activities, it will not be used as a control due to this uncertainty. Figure 2-3 has been revised to remove the control area designation.

17. Figures in Sections 2 and 4: The presentation here makes it quite difficult to determine the relative locations of photo identified features, field identified pits/features and sample locations. Areas noted in the field and via aeriels are never presented on the same figure, and are given against different backdrops at different scales. Also, in most cases, the samples and features of concern are limited to a very small portion of the figure. As a result, it is not possible to determine where existing and planned sample locations are relative to the likely source areas. The figures need to be redone in order to adequately evaluate both the existing data and the RI sampling scheme.

Navy Response: Figures 4-5 and 4-6, which clarify the sampling locations, have been added to the Work Plan and can be found in Attachment D to this Response to Comment document.

18. Figure 2-3, PA/SI Sample locations in SWMU 4 Remedial Investigation: The Legend should identify the gray line traversing the Site, especially since many of the samples were collected along this line (e.g., is it a road and if so what type?). The legends of Figures 2-4 to 2-11 should also include this information.

Navy Response: Figures 2-3 through 2-11 have been edited to define the gray line as a dirt road. Figures are included in Attachment C.

19. Figure 2-6: Please indicate the tidal stage at the time when the water levels were collected. Also, in looking at other figures, it is unclear if perhaps there is a drainage feature to the east of the existing wells. Please clarify and include all features that may affect groundwater flow on the map.

Navy Response: The tidal stage was not recorded at the time of the water level measurements. The ephemeral streams identified on the NWI Map have been identified on revised Figures 2-5 through 2-14 (Attachment C) and Figures 4-1 through 4-6 (Attachment D). During the RI, at least two rounds of water levels will be collected, one at approximate high tide and one at approximate low tide. This information has been added to Section 4.

20. Figures 2-8 and 2-9: There appears to be an area to the east in columns S, T, U, and V with a high density of anomalies. Please indicate if there is an explanation for this. No pits are noted as located in the area.

Navy Response: A railroad track was found at excavations in the northeast portion of this area of dense anomalies. The excavations performed in the central and southern portions of this area resulted in "no finds" where the anomalies were greater than 2 ft in depth. The linear shape of the anomaly(s) and discovery of railroad track indicates that this feature is most likely buried railroad track. The railroad track was used for former sugar cane operations on the island, and not associated with Navy activities. Additionally, no materials typically associated with OB/OD pits, MEC, or munitions debris was unearthed at the excavations in this area.

21. Figure 2-10: Please indicate in the key what the difference is between red and black numbers.

Navy Response: Figure 2-10 has been revised, removing the grid numbers, and is shown in Attachment C.

22. Page 3-1, Section 3.1, Human Health and Ecological Protection Screening Criteria: Impact to groundwater is gauged against the DAF 20 values given in the Region 9 PRG tables. The User's Guide for the tables indicates that DAF 1 values are more appropriate for sites with a shallow water table or with source areas greater than 30 acres. These conditions, provisionally, appear to apply to the SWMU-4. The RI work will yield additional information as to what will be most applicable to the site. More groundwater information will be collected and the conceptual model of the site is likely to be refined. The later may indicate that the source area is either limited to a series of small source areas, or that contamination is more widespread across the SWMU. The site conceptual model section does suggest that contamination is limited to areas proximal to pits - but the data to support this conclusion is limited. Based on the RI results, the Navy should discuss with the Agencies what DAF should be used in preparing the report.

Navy Response: The comment describes in general terms the principles of SSL evaluations, whereas the RI Work Plan presented the site-specific information in Sections 2 and 4. The RI Report will include comparison of the site data against site-specific SSL values calculated following EPA methods using site-specific input parameters. A weight of evidence approach

will be used for leachability, similar to what is recommended in the EPA SSL guidance (EPA 1996, EPA540/R-96/018).

23. Pages 3-1 and 3-2, Section 3.1, Human Health and Ecological Protection Based Screening Criteria: Soil data should be screened against EPA's Ecological Soil Screening Levels (SSLs) (<http://www.epa.gov/ecotox/ecossl/>) and the Oak Ridge values (Efroymsen) referenced under the sediment/surface water list. Sediment values and surface water values should be listed separately and prioritized. National Oceanic and Atmospheric Administration (NOAA) Effects Range-Low (ER-L) values should be correctly cited as Long, E.R., D.D. MacDonald, S.L. Smith and F.D. Calder. 1995. *Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments*. Environmental Management 19: 81-97.

Navy Response: The nature and extent of potential contamination will be determined based on exceedences of detected chemicals above screening criteria protective of human health, ecological receptors, and also against potential leachability of contaminants from soil to groundwater.

The human health protection, leachability, and other screening criteria references included in the revised SWMU 4 Work Plan are included below by media.

The text/bullets in this section related to human health and leachability screening criteria have been changed as follows:

Groundwater

- EPA Region 9 PRGs - Tap Water Values (EPA, 2004a)
- Puerto Rico's Water Quality Standards Regulations (PREQB, 2002)
- EPA website for MCLs: www.epa.gov/safewater/mcl.html

• Soil

- Region 9 Preliminary Remedial Goals - Residential Soil Values (EPA, 2004b)
- Region 9 Preliminary Remedial Goals - Industrial Soil Values (EPA, 2004b)
- Region 9 Soil Screening Level, Migration to Groundwater - Site-specific Dilution Attenuation Factor (DAF) will be calculated per EPA guidance (EPA, 2002c)

Surface Water

- Region 9 Preliminary Remedial Goals - Residential Soil and Tap Water Values (EPA, 2004b).
- Puerto Rico's Water Quality Standards Regulations (PREQB, 2002),
- National Recommended Water Quality Criteria (EPA, 2002 and 2003).

The text/bullets in this section related to ecological screening criteria have been changed as follows:

Soil

Sources for ecological soil screening values will include, in general order of preference, the following:

- Ecological Soil Screening Levels (Eco-SSLs) (EPA, 2005)
- Toxicological benchmarks for screening contaminants of potential concern for effects on soil and litter invertebrates and heterotrophic process: 1997 revision. (Efroymson et al., 1997a)
- Toxicological benchmarks for screening contaminants of potential concern for effects on terrestrial plants: 1997 revision. (Efroymson et al., 1997b)
- Intervention Values and Target Values - Soil Quality Standards (Ministry of Housing, Spatial Planning, and Environment [MHSPE], 2000)
- U.S. Fish and Wildlife soil screening values (Beyer, 1990)
- Other relevant studies/sources from the literature

Sediment

Sources for ecological sediment screening values will include, in general order of preference (which will vary depending upon the salinity of the water body [i.e., freshwater versus marine]), the following:

- Freshwater sediment consensus values (MacDonald et al., 2000)
- Ecotox Thresholds, ECO Update (EPA, 1996)
- National Oceanic and Atmospheric Administration (NOAA) Effects Range-Low (ER-L) values (Long et al., 1995)
- Ontario freshwater sediment values (MOE, 1993)
- NOAA Squirts (Buchman, 1999)
- Toxicological benchmarks for screening contaminants of potential concern for effects on sediment-associated biota: 1997 revision (Jones et al., 1997)
- Interim Sediment Quality Guidelines (Environment Canada, 1995)
- Other relevant studies/sources from the literature

Surface Water

Sources for ecological surface water screening values will include, in general order of preference (which will vary depending upon the salinity of the water body [i.e., freshwater versus marine]), the following:

- Puerto Rico's Water Quality Standards (PREQB, 2003)
- National Recommended Water Quality Criteria (EPA, 2002f)
- Ecotox Thresholds, ECO Update (EPA, 1996)
- NOAA Squirts (Buchman, 1999)
- Toxicological benchmarks for screening potential contaminants of concern for effects on aquatic biota: 1996 revision (Suter and Tsao, 1996)
- Other relevant studies/sources from the literature

The following citations have been added to Section 10 (References):

Beyer, W.N. 1990. Evaluating soil contamination. U.S. Fish and Wildlife Service Biological Report 90(2). 25 pp.

Buchman, M.F. 1999. NOAA screening quick reference tables. NOAA HAZMAT Report 99-1, Seattle, WA. 12 pp.

Jones, D.S., G.W. Suter II, and R.N. Hull. 1997. Toxicological benchmarks for screening contaminants of potential concern for effects on sediment-associated biota: 1997 revision. Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-95/R4.

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. *Environmental Management*. 19:81-97.

MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines. *Archives of Environmental Contamination and Toxicology*. 39:20-31.

Ministry of Housing, Spatial Planning and Environment (MHSPE). 2000. *Circular on target values and intervention values for soil remediation*. February.

Ontario Ministry of Environment and Energy (MOE). 1993. Guidelines for the protection and management of aquatic sediment quality in Ontario. ISBN 0-7729-9248-7. 27 pp.

Suter, G.W. II and C.L. Tsao. 1996. Toxicological benchmarks for screening potential contaminants of concern for effects on aquatic biota: 1996 revision. Environmental Restoration Division, ORNL Environmental Restoration Program, ES/ER/TM-96/R2. 54 pp.

U.S. Environmental Protection Agency (USEPA). 2005. Guidance for developing ecological soil screening levels. Attachment 4-1. OSWER Directive 9285.7-55. February.

23A. Please note that the reference for the ecological soil screening values (MHSPE, 1994) has been updated to "Technical Evaluation of the Intervention Values for Soil/sediment and Groundwater" (MHSPE, February 2001). Please do not reference the Region IV process memo; reference the specific citations instead.

Navy Response: References to the Region 4 process memo have been deleted. The latest soil screening values from MHSPE that could be located are dated February 2000 (as cited above). The document cited in the comment could not be found. Please provide a copy of the 2001 document if available.

24. Page 3-2, Section 3.1, Human Health and Ecological Protection Based Screening Criteria:
A more complete citation for the document listed here as "EPA R4 2000" should be provided. It should also be noted that the EPA QAPP guidance is provided by *EPA Requirements for QA Project Plans (QA/R-5)*, March 2001.

Navy Response: The citation for EPA R4 2000 has been changed to "Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment Bulletins. EPA Region 4, originally published November 1995, Website version last updated May 2000: <http://www.epa.gov/region4/waste/oftecser/healthbul.htm> (USEPA, 2000)".
A Quality Assurance Project Plan (QAPP) for SWMU 4, consistent with the Uniform Federal

Policy (UFP) for QAPPs (USEPA, USDOD, USDOE, March 2005), has been prepared and included with the revised RI Work Plan. The UFP-QAPP for SWMU 4 is provided with these response to comments as Attachment E.

25. Pages 3-2 and 3-3, Section 3.2, Conceptual Site Model: It is unclear from the description provided or the figure (3-1) how the surface water in the wetland and water in the lagoon is supported. Further, it is unclear what the references to "tidal water flow channels near the Site" actually are. As noted above, a clear understanding of the overall surface hydrology of the Site is needed to properly evaluate the proposed RI sampling. The description of surface runoff in this section ("surface runoff is not expected to be a significant migration pathway and that any potential surface waste present may travel with rain or tidal water into the drainage ditches or into the groundwater") does not match surface flow illustrated in Figure 3-1 which depicts surface flow occurring along dirt access roads toward the Caribbean Sea.

Navy Response: Figure 3-1 does not depict surface flow along dirt access roads. Figure 3-1 depicts surface flow along quebradas, as labeled in the figure. The figure has been revised to identify the quebradas as "Ephemeral Streams."

During previous discussion on this proposed work plan, Fish and Wildlife indicated that flow to the north is possible along the northern and eastern edges of the SMWU 4, toward the west and northwest, where Laguna Boca Quebrada is located. The NWI map shows that an ephemeral stream may exist in the eastern part of the site that drains to Laguna Boca Quebrada. However, historically no OB/OD activities occurred in this area. Rather, the burn pits were located further to the south, in the general vicinity of an ephemeral stream that drains to the sea. This ephemeral stream could receive runoff from the site along the edges of the steep slopes from burn pit areas to the stream bed. The CSM in Section 3.2 has been revised to include the text below:

"Potential migration of soluble portions of the organic chemicals such as explosives from the surface to subsurface soil to groundwater is possible; however, previous subsurface soil and groundwater sampling did not detect elevated levels of organic chemicals attributed to historical site activities, including explosives. Because the site is relatively flat, with steep slopes to the south of the former burn pits, surface runoff from burn pits to the stream bed of the ephemeral stream in this area is a potential migration pathway. Additionally, though no OB/OD operations were believed to occur toward the northern portion of the site, an ephemeral stream drains this area to Laguna Boca Quebrada. Thus runoff from the site is expected to flow toward the ocean, via the ephemeral stream south of the OB/OD pit area, and toward Laguna Boca Quebrada, via the ephemeral stream in the east/northeast portion of the site. These migration pathways will be evaluated during the RI.

Thus, the media of interest for the site comprise soils (surface and subsurface), groundwater, surface water and sediment (if present) of the overland drainage features (e.g., ephemeral streams), and surface water and sediment of Laguna Boca Quebrada. Therefore, all of these media are included for sampling, as presented in Section 4."

26. Page 3-3, Section 3.3, Preliminary Remedial Action Objectives and Goals: Please include Puerto Rico standards for drinking water, groundwater, surface water, and coastal/estuarine waters in this section.

Navy Response: Section 3.3 will be deleted from the document because remedial action objectives and goals will be developed in a feasibility study, if necessary. The Puerto Rico standards are listed in Section 3.1

The ecological and human health risk assessment protocol to be used for Vieques sites (including SWMU 4), which will reside in the Master Quality Assurance Project Plan, will be referenced in Section 3.1 of the revised RI Work Plan.

27. Page 3-3, Section 3.3, Preliminary Remedial Action Objectives and Goals and Page 4-2, Section 4.1, Data Quality Objectives: The work plan notes that all existing analytical data results will be used to conduct a baseline risk assessment to determine the need for remedial actions to protect human health and the environment at the Site. The work plan should be clear regarding the sources of existing data. During the risk assessment process, data collected during the RI should be evaluated separately from the existing data to allow for an evaluation of any temporal variation in the data.

Navy Response: Please see response to comment 26. Data collected during the RI will be evaluated and compared to the existing data. If more recent data exist for the same sample location, the more recent data will be utilized. However, all applicable site data (historical and newly gathered) will be utilized for a more comprehensive understanding of nature and extent and potential risks.

28. Figure 3-1, Conceptual Site Model, SWMU 4: The depiction of North is incorrect. Please Revise.

Navy Response: Figure 3-1 Conceptual Site Model, the north arrow direction has been edited and is included in Attachment C.

29. Section 4-1 – This section should be expanded to include a discussion on the process used to develop Data Quality Objectives for this project. DQOs should be qualitative and quantitative statements derived from the outputs of the first six steps of the DQO Process that: clarify the study objective; define the most appropriate type of data to collect; determine the most appropriate conditions from which to collect the data; and specify tolerable limits on decision errors which will be used as the basis for establishing the quantity and quality of data needed to support the decision. DQOs are then used to develop a scientific and resource-effective data collection design. Please consult *Guidance for the Data Quality Objectives Process (QA/G-4)* EPA/600/R-96/05, 5 August 2000, available at: <http://www.epa.gov/quality1/qs-docs/g4-final.pdf> and the DOE DQO Page at: <http://www.hanford.gov/dqo/index.html>
- The term “high level DQOs” should be defined. DQOs should be determined by the DQO process described above.
 - One of the results of the DQO Process should be a clear rule that will describe the action to be taken if ARARs are exceeded and what will be done if they are not.

Navy Response: Please see response to Comment 4. In addition, the DQO process utilized in this work plan is consistent with the DQO process applied at other sites in the Environmental Response Program on Vieques and is consistent with what is commonly utilized in the broader CERCLA program. If a change to the DQO process is deemed

warranted, it should be consistent with what is being required by EPA at all CERCLA sites, should be discussed and concurred upon by the stakeholder agencies, and should be agreed upon prior to preparation of any site-specific work plan. The DQO guidance cited in the comment is cited within the guidance as non-mandatory. It states "It does not impose legally binding requirements and may not apply to a particular situation based on the circumstances. EPA retains the discretion to adopt approaches on a case-by-case basis that differ from this guidance where appropriate."

- a. Because much or all of the data collected during the RI will be utilized to make site characterization, risk assessment, and, if necessary, remedial action determinations, the DQOs require data collection that is of the quantity and quality appropriate for making these determinations. To clarify, the second sentence of Section 4.1 has been revised to read (referring to the first sentence of Section 4.1):

"These data quality objectives (DQOs) require a level of quality assurance/quality control (QA/QC) appropriate for making these evaluations."

In addition, the last sentence of Section 4.1 has been revised to read:

"Samples proposed as part of this RI will be collected and analyzed in a similar manner so the data meet the DQOs appropriate for making the evaluations outlined at the beginning of this paragraph."

- b. This is an example of where strict application of the DQO process is not warranted. The SWMU 4 RI work plan, consistent with other RI work plans, defines data to be collected such that site characterization can be accomplished and potential risks identified. The risk assessments are used to make remedial action and/or risk management decisions, as warranted. Until the risk assessments are completed, it cannot be determined what actions will be required at the site.
30. Page 4-1, Table 4-1, Previously Conducted Sampling at SWMU 4 as Reported in the Expanded PA/SI Report: The table notes that the Ecological Survey conducted during the expanded PA/SI concluded that neither threatened or endangered species nor impacts were identified. This survey was qualitative in nature and did not involve a level of effort sufficient to support this conclusion.

Navy Response: The text "no impacts" has been removed from Table 4-1.

31. Section 4.3.4, Soil Sampling and Analysis: It appears that the soil sample locations were chosen using a judgmental approach. Since the results of this sampling event will be used to make decisions affecting the entire site, it should be noted that this approach is not statistically valid. As stated in EPA QA/G-9, *Guidance for Data Quality Assessments: Practical Method for Data Analysis*, EPA/600/R-96/084, July 2000: "...This type of [judgmental] sampling should only be considered when the objectives of the investigation are not of a statistical nature, for example, when the objective of a study is to identify specific locations of leaks, or when the study is focused solely on the sampling locations themselves. Generally, conclusions drawn from authoritative samples apply only to the individual samples and aggregation may result in severe bias and lead to highly erroneous conclusions..." An explanation should be given detailing

how these sampling locations can be used for determining the risk for the entire study area.

Navy Response: The sample locations were selected using a judgmental approach, which is consistent with the approach commonly used in the CERCLA program and has been used for other sites in the Environmental Restoration Program on Vieques. The judgmental approach specifically targets areas most likely affected by releases. Therefore, if bias (in terms of contaminant levels and potential risks) is introduced by this process, it is high (i.e., conservative) bias.

32. Page 4-6, Section 4.3.4, Soil Sampling and Analysis: Subsurface samples should be targeted to the area of highest potential contamination. Contaminants are most likely to be present at horizons that are at or slightly below the historical bottom of the pits. Stratigraphy should be logged continuously in attempts to use the information to target the bottoms of the pits for sampling. Visible contamination or PID readings should also be used to select sampling horizons. Sampling from the horizon just above the water table should only be a fall back if stratigraphy or screening does not indicate the bottom of the pit. Note also that borings can be completed as wells, in line with the comments on well placement.

Navy Response: The Navy agrees with this judgmental sampling approach, noting that this comment is inconsistent with comment 31. The text of this section has been revised to reflect the most recent subsurface soil sampling procedure agreed upon by the Technical Subcommittee (modified slightly to include a sample from the bottom of the pits, if distinguishable and if below 6 feet). Another paragraph has been inserted after the fourth bullet in this section which describes the subsurface soil sampling procedures. The text has been revised as follows, "At each location, a subsurface soil sample will be collected at a 2-ft interval within the 2 to 6 ft zone, based on where visual and/or PID screening suggests the presence of contamination. In the absence of visual or screening evidence of potential contamination, the subsurface soil sample will be collected from the 4 to 6-ft interval (or just above the water table or bedrock, if encountered before this depth). If the bottom of the pits are identified below 6 feet, an additional sample will be collected from the interval that coincides with the bottom of each pit. If bedrock is found deeper than 6 feet, and if soil contamination is suspected below 6 feet (and/or bottom of pits), based on visual and/or PID screening, an additional subsurface soil sample will be collected from the interval where the highest level of contamination is suspected. The PID readings will be taken directly from the split-spoon or acetate liners upon opening them."

33. Page 4-6, Section 4.3.4, Soil Sampling and Analysis: Please indicate the common constituents of propellants and igniting fuels which are potentially present.

Navy Response: Please see response to comment 6. Igniting materials potentially used may have included petroleum products (e.g., diesel fuel), composed of VOCs and SVOCs.

34. Pages 4-6 - 4-7, Section 4.3.4, Soil Sampling and Analysis: The work plan notes that surface soil samples will be collected from a depth of 0-6 inches which is consistent with previously collected samples. However, the BTAG usually recommends that surface soil samples encompass the top 0-12 inches which better identifies the depth of concern for ecological risk assessment purposes. A discussion should be held with the Agencies

prior to collecting samples at these depths to ensure this sampling plan is consistent with assessment endpoints. For example, in the event that land crabs are present at this site, then a more appropriate depth to collect surface soil samples may be from a depth of 0-24 inches to account for the burrowing depth of these organisms of concern.

Navy Response: Since the Draft Work Plan was issued, the regulatory agencies for Vieques issued selection criteria guidance for surface soil samples specifically for Vieques. Based on the selection criteria, the majority of the SWMU 4 sampling area meets the selection criteria for collection of surface soil samples from 0 to 12 inches. That is, most of the area is not suitable for land crab habitat, and ecological receptors are potential receptors at the site. Further, no VOCs were detected in the surface or subsurface soil collected during the PA/SI. Therefore, the text of the Work Plan has been revised to identify a 0-to12-inch depth for surface soil sample collection at locations away from the lagoon and ephemeral stream, and a 0-to-24-inch depth for surface soil sample collection at the locations immediately adjacent to the lagoon and within the ephemeral stream (if the stream is dry at the time of sampling).

35. Page 4-6, Section 4.3.4, Soil Sampling and Analysis, Bullets: It would be helpful to number the soil sampling locations and show this on the figures. At present it is difficult to be sure which locations correspond to each bullet item. An enlarged figure is also needed to better assess the number and locations of the borings.

Navy Response: Figures 4-1, 4-2, and 4-3 have been edited to call out the names of the proposed sample locations. Additional figures have been created (Figure 4-5 and 4-6) which identifies all the proposed sampling points and depicts them on an aerial photograph. Figures are shown in Attachment D. It should be noted that sample identifications included in this Work Plan are intended to facilitate the discussion of sample locations. Actual sample designations made during the field event may vary.

36. Page 4-7, Section 4.3.4, Soil Sampling and Analysis, Second bullet: Please clarify if both surface soil and subsurface soil samples will be collected from the four soil borings proposed for the northwest of the site.

Navy Response: Both surface and subsurface soil samples will be collected from the proposed northwest sampling locations. Please refer to the Navy's response in comment 32 for the appropriate subsurface soil sampling procedures.

37. Page 4-7, Section 4.3.4, Soil Sampling and Analysis and Figure 4-2, Proposed Soil Boring Locations in SWMU 4 Remedial Investigation: The work plan notes that four soil borings will be completed at the northwest of the Site to assess if contaminants are transported via overland flow from the OB/OD pits to the mangroves and the wetland areas to the northwest of the Site. More details need to be provided on how the sample locations were selected.

Navy Response: The soil boring locations shown adjacent to the lagoon in Figure 4-2 are approximate. The actual locations will be based on field observations made upon mobilization. Further, if there are multiple obvious discharge locations from surface runoff observed by the field staff, additional samples will be collected during the field effort. The following has been added after the first sentence of the second bullet on page 4-7: "The locations of the borings are intended to coincide with locations where overland runoff from the site likely enters the wetland area. Therefore, the exact locations and exact numbers of

samples will be selected in the field. Field personnel will look for overland runoff features, such as ephemeral streams, small rivulets, topographically low and sloped areas, and deltas in the lagoon, to select the actual soil boring locations.”

38. Table 4-2 and 4-3 – The Contract Laboratory Protocol (CLP) SOWs cited here are out of date and should be replaced with the latest guidance. Please refer to:
<http://www.epa.gov/superfund/programs/clp/index.htm>

Navy Response: The Contract laboratory Protocol (CLP) SOWs have been upgraded in all project documentation to reflect the current promulgated CLP methods. Tables 4-2 through 4-5 are included in Attachment A.

39. Page 4-8, Section 4.3.5, Surface Water Sampling and Analysis and Section 4.3.6, Sediment Sampling and Analysis: More details need to be provided on the onsite wetland, lagoon, and mangrove swamp areas as well as the surface runoff patterns. Review of the Conceptual Site Model presented in Figure 3-1 suggests there may also be areas along the coast to the east and north of the Site that could have been impacted by site-related contaminants. Sampling will be needed in each of these areas (mangroves, ephemeral streams, along the coast, etc.). Please note whether these areas are associated with the Lagoon. The four locations proposed are in the Lagoon as shown in Figure 3-1 and Figure 4-3. Sample locations should be labelled. Additional samples may be necessary to better characterize the Lagoon. Further, Section 4.3.6 indicates that samples will be collected from the Laguna Arenas which is shown in Figure 4-4 and is the location of background samples collected for SWMU 6. Therefore, it appears as if this is an error. This should be clarified in the revised report.

Navy Response: In May 2005, the Technical Subcommittee conducted a site visit to SWMU 4 to help develop a common understanding of the site setting and potential contaminant transport mechanisms. The following is an excerpt from the Final Memorandum – Summary of Vieques Site Visits (CH2M HILL, June 21, 2005): “The attendees visited SWMU 4 to look at the sampling locations proposed in the Draft RI Work Plan (CH2M HILL, June 2004). The site visit focused on the proposed sampling locations relative to the locations of the OB/OD pits and with respect to the surface topography (to evaluate surface runoff pathways). In general, the sample locations were found to adequately represent areas where runoff from the OB/OD pit areas would be expected, but several additional samples in potential depositional areas may be recommended in the forthcoming Work Plan comments, such as where the quebrada terminates at the beach. This area is a depositional area and receives overland flow from the roadways that act as conduits for on-site surface water runoff.” Based on this information, the sample locations shown in the Draft Work Plan are deemed acceptable.

Although no specific additional sampling locations are proposed in the comment, based on the site visit summary, two additional samples within the ephemeral stream have been added (in addition to the one proposed in the Draft Work Plan). One sample will be collected upstream of where runoff from the site (OB/OD pits, the most likely source areas) likely enters the ephemeral stream, one sample will be collected near the mouth of the ephemeral stream (depositional area), and one sample will be collected where runoff from the site likely enters the ephemeral stream. The sampling protocol will be the same as that concurred upon for AOC R. That is if, during the sampling event, the streambed is

submerged, the solid sample collected from the streambed will be designated "sediment" and will be collected from 0 to 6 inches. If, during the sampling event, the streambed is not submerged (i.e., unsaturated), the solid sample collected from the streambed will be designated "soil" and will be collected from 0 to 24 inches in accordance with the surface soil sampling protocol for SWMU 4.

In addition to the above, the other ephemeral streams, if found upon mobilization (based on locations shown in Figure 2-A), will be walked to identify potential areas where runoff from the site (OB/OD pits, the most likely source areas) likely enters each ephemeral stream. If identified, one sample will be collected upstream of where runoff from the site likely enters the ephemeral stream, one sample will be collected near the mouth of the ephemeral stream (depositional area), and one sample will be collected where runoff from the site likely enters the ephemeral stream.

Regarding the lagoon samples, the lagoon has been labeled in Figure 4-3 as shown in Attachment D. The sample symbols designate them as surface water/sediment (see legend). Similar to the soil sample locations around the lagoon, the surface water/sediment sample locations shown in the lagoon are approximate. As stated in the response to comment 37, the soil sample number and locations adjacent to the lagoon will be selected in the field, based on visual observations of potential preferable runoff pathways. A similar logic will be used to select the surface water/sediment sampling locations in the lagoon. Preference will be given to where ephemeral streams, if identified, discharge to the lagoon. This information has been added to Section 4.3.5.

It is also noted that the number and locations of surface water and sediment samples shown in the work plan figures are approximate. The actual number and locations will be determined based on professional judgment during the initial site mobilization, with onsite regulatory input, if requested. The target locations will include not only obvious surface water drainage pathways and depositional areas (i.e., to address overland flow), but may include locations where direct "kick out" from OB/OD operations may have landed (e.g., lagoon areas).

The reference to Laguna Arenas in Section 4.3.6 is in error. The text in Section 4.3.5 and Section 4.3.6 will be edited to state that the surface water and sediment samples will be collected from Lagoona Boca Quebrada. The lagoon has been labeled in Figures 2-6 through 2-14 and Figures 4-1 through 4-3 and shown in Attachments C and D.

40. The work plan indicates that the samples from Laguna Arenas will also be used for background data for SWMU 4 (in addition to using these data as background for SWMU 6). It is unclear whether these are the data from the Soil, Groundwater, Surface Water and Sediment investigation completed in 2002. This should be clarified.

Navy Response: In Section 4.3.5 Surface Water Sampling and Analysis, third paragraph, text has been added which states: "The background surface water and sediment samples were collected during the SWMU 6 RI background sampling in September 2003. It is proposed that the data from these two locations, shown in Figure 4-4, also be used as background locations for the SWMU 4 RI."

41. Page 4-13, Section 4.6, Data Validation: It is recommended that Region 2 Data validation guidance be used for this project. Please refer to:
<http://www.epa.gov/region02/qa/documents.htm>

Navy Response: The independent validation contractor for this SMWU 4 project will use the current promulgated Region 2 data validation guidance.

42. Page 4-15, Section 4.7, Data Quality Evaluation: The process described in this section only discusses data QA/QC and as such, will not result in a Data Quality Evaluation (DQE) process that will meet EPA guidance. EPA QA/G-9, Guidance for Data Quality Assessment (available at <http://www.epa.gov/quality1/qs-docs/g9-final.pdf>) specifies that the quality of the data should be evaluated based upon its intended use.

Navy Response: Please see response to comment 29. The data quality evaluation proposed in this Work Plan is consistent with that used for previous work plans, and will result in data of sufficient quality to make risk management decisions consistent with remedial investigations.

43. Figure 4-1: It is not possible to fully evaluate monitoring well locations without additional information. For instance, the groundwater flow figure needs to be improved to show surface water drainage features. Also, given the unusual flow patterns indicated in the one round of water levels, it should not be definitively concluded that upgradient is to the north. Typically, groundwater would flow towards the ocean rather than away from it. Prior to finalizing well locations, additional data should be collected, including an additional round of water levels at existing wells and a study of the potential impact of tidal changes on wells that are close to the shoreline. Page 4-5 includes mention of such work, but details of the study should be given, as well as an indication that this information will be collected early in the field program so that it can be used to help site new wells. Well locations can then be finalized in consultation with the Agencies. That said, the following notes should be incorporated in the final citing of locations:
- a. Well that are focused on investigating a potential source should be placed directly in source areas rather than targeting an area downgradient. This will be the best barometer of whether or not an impact has occurred.

Navy Response: Existing data are sufficient to determine the locations of additional wells. Eight previously installed wells essentially ringed the OB/OD pit area, between the pits and the surface water bodies in the vicinity. The existing groundwater monitoring wells and the new wells proposed intercept groundwater flow in all potential downgradient directions from the OB/OD pits, which are most likely the areas with the highest non-natural constituent concentrations, if present. Figure 4-1 shows that there are/will be wells between the OB/OD pits and the lagoon to the north/northwest, the sea to the west, and the ephemeral stream to the south. Further, the well configurations have been adjusted to ensure wells are placed in the OB/OD pit area (see revised Figure 4-1, Attachment D).

- b. The two background wells are located in areas where metallic items have been detected, but it appears that no MEC was removed during the MEC RI. Please clarify what these metallic objects were and present a convincing argument as to why these areas are

appropriately deemed unimpacted. Note also that the 'boundary' of SWMU-4 based on the 3,000 ft kickout radius extends well beyond these locations. This should also be discussed in the justification.

Navy Response: Historical data indicate groundwater migration is northerly. In addition, the data from the eight wells surrounding the OB/OD pit area suggest the historical activities have had little to no effect on nearby groundwater. Although the two background wells proposed for the site are located more than 1,000 ft upgradient of the OB/OD pit area, they will be re-sited as far south as possible from the OB/OD pits, but within the same geologic setting. The actual locations will be identified upon field mobilization.

- c. The area of high geophysical anomaly density in the eastern portion of the figure does not presently include any investigation of groundwater. A better description of this anomaly is needed, but preliminarily, it seems appropriate to site a well here.

Navy Response:

Please refer to response to comment 20 above. Due to the nature of the anomalies (i.e., railroad track, not OB/OD-related items), a well at this location is not warranted.

44. Figure 4-2: The proposed soil boring locations shown on the figure do not seem to match up with the locations described in the text. For example, Page 4-7 states that 4 soil borings will be collected at the northwest area of the site, which is assumed to imply all of SWMU 4. However, Figure 4-2 only shows 2 proposed soil boring locations in an area that can be considered the northwest portion of SWMU 4. Also, no soil borings are proposed for the north area of SWMU 4 or the southernmost part of SWMU 4, and only one soil boring is proposed for the eastern portions of SWMU 4. Additional samples are requested in these areas in order to identify the nature and extent of chemical contamination in SWMU 4, which is the purpose of the RI.

Navy Response: The figures have been revised to clarify the sampling locations and can be found in Attachment C to this document. The bulleted text in Section 4.3.4 Soil Sampling and Analysis has been edited to include the soil boring numbers.

- Sixteen soil borings completed through the OB/OD pits (SB-17 through SB-22, SB-30, SB-32, SB-35 thru SB-42).
- Five additional soil borings in areas of high densities of buried metallic anomalies (SB-28, SB-29, SB31, SB-33, SB-34).
- Four soil borings to assess if contaminants are transported via overland flow to the mangroves to the northwest (SB-23 thru SB-26).
- Four soil borings located at formerly identified ground scars and stained areas (SB-27, SB-46 thru SB-48).
- Three surface soil samples (SS-43 thru SS-45) in the ephemeral stream downstream, adjacent to, and upstream of the OB/OD pits. Samples may be surface water and sediment samples depending on site conditions.
- Four surface soil samples (SS-50 thru 53) in the northern-most ephemeral stream which runs to the Laguna Boca Quebrada). Samples may be surface water and sediment samples depending on site conditions.

- One soil boring (SB-49) in grid number B-22, where Blow-in-Places have occurred in the past.
- Two soil borings completed south of the ephemeral stream, southeast of the OB/OD pits (SB-54 and SB-55).

With respect to the request for additional soil samples, additional soil boring locations have been added to the north where ground scars and staining have been noted. These additional soil borings will be labeled as SB-27, SB-46 thru SB-48. Two additional soil sampling locations have been added to the ephemeral stream and designated as SS-44 and SS-45. The proposed locations are shown on the revised Figure 4-2 and included in Attachment D.

45. Figure 4-3: Clarification is needed as to the nature of the drainage feature that runs NE-SW through the area. If this is an area where soils or sediments are likely to collect as a result of overland flow, then the area should be included in the sampling program.

Navy Response: The feature is part of an ephemeral stream. Figures 4-2, 4-3 and 4-5 have been revised to show two ephemeral streams, one that runs adjacent to the OB/OD pits and one that runs from SW to NE across the northern part of the site. Samples have been added to both ephemeral streams.

Three surface soil samples, SS-43 through SS-45, are proposed to be collected in the ephemeral stream adjacent to the OB/OD pits, and four surface soil samples, SS-50 through SS-53 are proposed in the northern-most ephemeral stream. If water is present at the time of collection, surface water samples will be collected and the soil samples will be collected from the top 6 inches of material and designated sediment samples. If the ephemeral stream is dry during collection, the samples will be collected from the top 24 inches of material and designated surface soil samples. The text of section 4.3.4, fourth bullet, has been revised as follows, "Three soil borings (SS-43 through 45) will be completed in the ephemeral stream to the south-southwest of OB/OD Pit #12, and four soil borings (SS-50 through 53) will be completed in the ephemeral stream to the north of the site to assess if there is contamination in the stream resulting from surface water runoff. The location of the soil borings are shown on Figures 4-2 and 4-3. The proposed locations on the figures are approximate and the actual placement of the sample locations (upstream for background, adjacent to runoff from site, and mouth of stream near outlet to the sea or lagoon) will be chosen based on field observations such as surface water runoff channels, depositional environments, and wetland vegetation. If the sample location is dry during collection, the depth of the surface soil sample will be 0 - 2 ft. If the sample location is wet during collection, the depth of the sediment sample will be 0 - 6 inches. The samples will be analyzed for the full TCL/TAL analyte list (SOM01.1, ILM04, which comprise volatiles, semi-volatiles, pesticides, PCBs, metals, and cyanide), explosives, and perchlorate."

Deleted: OLM04

46. Page 5-2, Section 5.2.1, Identification of Contaminants of Potential Concern: EPA Region 2 recommends retaining all Group A carcinogens as chemicals of potential concern (COPCs). Also, using a frequency of detection screen to further refine the list of COPCs is suggested.

Navy Response: The screening process to select COPCs will be consistent with what was used for other sites on west Vieques where an RI has been completed. The suggested alteration to the COPC selection is inconsistent with the process that has been in practice at west Vieques. While not including low frequency of detection as a basis in COPC selection

is an option EPA provides, not dropping COPCs makes the risk assessment more conservative. To ensure consistent application of risk assessment protocol across Vieques, Section 5 has been deleted from the document and the HHRA protocol in the Master Quality Assurance Project Plan referenced in Section 3.1. The COPC selection criteria is contained within the HHRA protocol.

47. Page 5-3, Section 5.2.2, Exposure Assessment: EPA Region 2 recommends using ProUCL software (v. 3.00.02), or similar, to identify data distributions and select appropriate exposure point concentrations (EPC). This version of ProUCL identifies data distributions as either normal, lognormal, or gamma and recommends an appropriate EPC based on the distribution, or if data do not follow any of these distributions, suggests an appropriate statistic based on a nonparametric test. Please use this approach when developing EPCs.

Navy Response: To ensure consistent application of risk assessment protocol across Vieques, Section 5 has been deleted from the document and the HHRA approach in the Master Quality Assurance Project Plan referenced in Section 3.1.

48. Page 5-4, Section 5.2.2, Exposure Assessment: In the first paragraph after the numbered list, please revise the depth of the subsurface exposure to the uppermost 8 feet.

Navy Response: To ensure consistent application of risk assessment protocol across Vieques, Section 5 has been deleted from the document and the HHRA approach in the Master Quality Assurance Project Plan referenced in Section 3.1.

49. Page 5-4, Section 5.2.2, Exposure Assessment: In the second paragraph after the numbered list, the text states that the evaluation of VOCs would be qualitative. However, EPA suggests that the Navy and CH2MHill wait until data are generated during the RI to determine the most appropriate way to evaluate potential exposure to contamination. Please revise the language accordingly.

Navy Response: To ensure consistent application of risk assessment protocol across Vieques, Section 5 has been deleted from the document and the HHRA approach in the Master Quality Assurance Project Plan referenced in Section 3.1.

50. Page 5-4, Section 5.2.3, Toxicity Assessment: Regarding the sources for toxicity values, please refer to the December 5, 2003 OSWER Directive 9285.7-53, "Human Health Toxicity Values in Superfund Risk Assessments", which is available at: <http://www.epa.gov/superfund/programs/risk/hhmemo.pdf>.

Navy Response: To ensure consistent application of risk assessment protocol across Vieques, Section 5 has been deleted from the document and the HHRA approach in the Master Quality Assurance Project Plan referenced in Section 3.1.

51. Page 5-5, Section 5.3, Ecological Risk Assessment Approach: The work plan indicates that the need for *additional* biological sampling at the Site will be identified during the ecological risk evaluation process. If biological sampling has already been conducted at the Site, those data should be included earlier in the discussion on ecological receptors.

Navy Response: To ensure consistent application of the risk assessment protocol across Vieques, Section 5 has been deleted from the document and the ERA approach in the Master

Quality Assurance Project Plan (draft included as Attachment F) is referenced in Section 3.1. The only known biological (tissue) sampling that has been conducted to date is the USFWS crab study (which is summarized in Section 2.3.5). Habitats and biota at the site have also been studied; the results of this study are summarized in Section 2.3.1.

52. Page 5-6, Section 5.3.1, Step 1 – Screening Level Problem Formulation and Ecological Effects Evaluation: The paragraph on Complete Exposure Pathways notes, “Although ecological habitats are minimal in most portions of the Former NASD, a conservative approach will be used in this screening evaluation so that potential ecological risks are not missed.” The statement regarding ecological habitats being minimal at the former NASD is not supported and should be deleted.

Navy Response: To ensure consistent application of the risk assessment protocol across Vieques, Section 5 has been deleted from the document and the ERA approach in the Master Quality Assurance Project Plan (draft included as Attachment F) is referenced in Section 3.1.

53. Page 5-6, Section 5.3.1.2 Screening-Level Ecological Effects Evaluation: Puerto Rico surface water screening values should be used in addition to those referenced here. Please see previous comments regarding the correct citation for the sediment and soil screening values.

Navy Response: To ensure consistent application of the risk assessment protocol across Vieques, Section 5 has been deleted from the document and the ERA approach in the Master Quality Project Plan (draft included as Attachment F) is referenced in Section 3.1. Ecological screening values that will be used in the ERA are summarized in Section 3.1 (please see the response to EPA Comment 23).

54. Page 5-6, Section 5.3.2.1, Screening Level Exposure Estimates: The work plan notes risk to selected receptors chosen to represent the assessment endpoints, may include fish, aquatic invertebrates, and directly exposed terrestrial organisms. Birds should also be included in this list.

Navy Response: To ensure consistent application of the risk assessment protocol across Vieques, Section 5 has been deleted from the document and the ERA approach in the Master Quality Project Plan (draft included as Attachment F) is referenced in Section 3.1. Relevant bird species will be included as receptors and will factor into the development of assessment endpoints in the ERA.

55. Tables 5-1, 5-2, and 5-3: These tables have not been exhaustively reviewed, as it is premature to develop tables of exposure parameters at the work plan stage. However, a cursory review identified the following issues:
- The soil ingestion rate for the utility worker should be 330 mg/day. The activities associated with this population are very contact-intensive, and the default soil ingestion rate recommended for the construction worker should be used.
 - The soil ingestion rate for the maintenance worker should be 100 mg/day. The activities associated with this population are consistent with an outdoor worker, and the default soil ingestion rate recommended for the outdoor worker/landscaper should be used.
 - The fraction ingested value for all populations should be 1.0.

- d) The exposure scenarios for all recreational populations will need to be revised once a more detailed description of the ultimate land use is developed.

The recreational adult is listed as a potentially exposed population for the surface water/sediment but not for soils. The recreational adult should be added to the soils scenarios.

Please note that the Region 9 PRG tables were updated in October 2004; future documents developed for SWMU 4 should utilize these values.

Navy Response: The Navy agrees with comments 55a and 55b in that it is premature to develop site-specific exposure factors at the work plan stages. To ensure consistent application of risk assessment protocol across Vieques, Section 5 has been deleted from the document and the HHRA approach in the Master Quality Assurance Project Plan referenced in Section 3.1. The HHRA protocol in the Master Quality Assurance Project Plan lists the default exposure parameters for some of the published exposure scenarios in EPA risk assessment guidance.

- c. Please see response above. Also, it is premature to determine FI term above, as the exposure unit area is not determined yet for SWMU 4.
- d. Please see response above. Also, the exposure scenarios for recreational visitors (along with all other exposure scenarios) will be developed and Table 4s will be provided for review by agencies prior to conducting the risk assessment for SWMU 4. The Region 9 PRG values available at the time the risk assessment is conducted will be used.
56. Section 7.1, Remedial Investigation Report: The outline includes a heading for "Aquifer Performance Testing" although none is detailed in the work plan. If such activities are planned, they need to be detailed in the work plan. Also, there should be a heading for the study of tidal effects on groundwater elevations, as well as for nature and extent of sediment and surface water contamination.

Navy Response: Section 7 is not necessary for an RI Work Plan; therefore, it has been deleted. The report format will be consistent with the general format of CERCLA RI Reports. Another subsection (4.3.3.1), entitled Hydraulic Conductivity Testing, has been added to the RI Work Plan and includes the following text: "In-situ hydraulic conductivity tests will be performed on eight monitoring wells areally distributed at SWMU 4 using the slug test method to obtain estimates of the aquifer hydraulic conductivity, groundwater flow velocity, and potential well yield at the site. Each test will involve installing a pressure transducer in the well connected to a data logger programmed to measure water level during the test. After the initial water level is measured, a 1-inch-diameter by 5-ft-long PVC slug will be lowered into the well. The rise and decline of the water level in the well will be observed until the approximate original water level elevation is achieved. The slug will then be quickly removed from the well, causing the water to drop rapidly. The data logger will measure and record the recovery of the water level in the well until the water level has reached the approximate pre-test groundwater elevation. The data will be analyzed using the methods described by Bouwer and Rice (1976) to develop an estimate of the hydraulic conductivity of the aquifer and its variability across the site."

It is stated in other related documents that these projects were to be accomplished following Superfund procedures. In accordance with EPA Superfund policy, a Quality Assurance Project Plan (QAPP) must be submitted for approval. The QAPP should comply with *EPA Requirements for QA Project Plans* (EPA QA/R-5, March 2001). Guidance on preparing QAPPs may be found in a companion document, *Guidance for Quality Assurance Project Plans*, EPA QA/G-5, December, 2002. These guidance documents can be found at: http://www.epa.gov/quality1/qa_docs.html <http://www.epa.gov/region02/desa/hsw/sops.htm>. If some of these elements are covered by a separate document, such as a site-wide Master Plan, then this plan should be referenced, and a copy provided to EPA Region 2 for review.

A Title and Approval Sheet should be provided which includes the title of the plan, the name of the organization(s) implementing the project, the effective date of the plan, and the names, titles, signatures, and approval dates of appropriate approving officials. Approving officials may include:

- Organization's Project Manager
- Organization's QA Manager
- EPA Project Manager
- EPA QA Manager
- Others, as needed (e.g., field operations manager, laboratory managers, State and other Federal agency officials)

The individuals or organizations participating in the project should be identified and their specific roles and responsibilities should be discussed. The project quality assurance manager must be independent of the unit generating the data. The individual responsible for maintaining the official, approved QA Project Plan should also be identified.

An organization chart should be provided showing the relationships and the lines of communication among all project participants. The organization chart must also identify any subcontractor relationships relevant to environmental data operations, including laboratories providing analytical services.

Navy Response: A Quality Assurance Project Plan (QAPP) for SWMU 4, consistent with the Uniform Federal Policy (UFP) for QAPPs (USEPA, USDOD, USDOE, March 2005), has been prepared and included with the revised RI Work Plan. The UFP-QAPP for SWMU 4 is provided with these response to comments as Attachment E.

57. Additional comment from June 1, 2006 CTC meeting: Put clarification in work plan that clarifies that the scope of this RI is for the terrestrial (including ephemeral streams and lagoons) environment at SWMU 4 and does not include the marine environment. Depending on the results of the RI and future offshore munitions response activities, additional investigation may be required offshore adjacent to the current study area.

Navy Response: Section 1.1 Objectives of the RI, at end of section a new paragraph will be added which states: "The objective of the RI will focus on the terrestrial environment which include ephemeral streams and lagoons at SWMU 4. The marine environment will not be addressed during this RI. Depending on the results of the RI and future offshore munitions response activities, additional investigation may be required offshore adjacent to the current study area."

58. Attachment F Ecological Risk Assessment: It is noted in the third paragraph on page 3, that "... the ERA process continues to Step 2 but only evaluates those pathways that have determined to be critical." Information should be provided on how "critical" will be defined.

Navy Response: The term "critical" is used in the USEPA 1997 guidance document to describe pathways (at the SERA stage) that are complete and potentially of ecological significance. Thus, a "critical" exposure pathway is defined as one that is complete and ecologically significant. The second sentence of the third paragraph on page three of Attachment F has been modified to read:

"If one or more complete exposure pathways are known to exist, or are likely to exist, the ERA process continues to Step 2 but only evaluates those pathways that have been determined to be critical (complete and ecologically significant)."

