



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

SEP 16 2011

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Mark E. Davidson
US Navy
BRAC PMO SE
4130 Faber Place Drive, Suite 202
North Charleston, SC 29405

Re: Naval Activity Puerto Rico (NAPR), formerly Naval Station Roosevelt Roads,
EPA I.D. Number PRD2170027203

- 1) SWMU 7/8 (Tow Way Fuel Farm) – Corrective Measures Implementation (CMI) Plan, dated February 2011
- 2) SWMU 14 (Fire Training Pit at Crash Crew Area) – Draft Final Additional Data Report in Support of Ecological Risk Assessment, dated March 11, 2011
- 3) SWMU 54 – Corrective Measures Study Addendum, Benzene Plume, and Corrective Measures Implementation Plan, Benzene Plume, dated March 2011
- 4) SWMU 54 – Corrective Measures Implementation Plan, TCE Plume, dated March 2011

Dear Mr. Davidson:

This letter is addressed to you as the Navy's designated project coordinator pursuant to the January 29, 2007 RCRA Administrative Order on Consent ("the Consent Order") between the United States Environmental Protection Agency (EPA) and the U.S. Navy (the Navy).

SWMU 7/8 (Tow Way Fuel Farm) – Corrective Measures Implementation (CMI) Plan

EPA has completed its review of both of the above document and the Responses to EPA's previous comments, both of which were submitted on behalf of the Navy by Mr. Tom Beisel's (of AGVIO/CH2MHill) letter of February 28, 2011. EPA does not fully approve the CMI Plan or the Responses to Comments, and has a number of comments, which are discussed below and in the enclosed Technical Review, dated August 26, 2011 (Enclosure #1), which was prepared by our consultant, TechLaw Inc.

The level of detail provided in the CMI for SWMU 7/8 is not consistent with the components presented in Chapter V (Corrective Measures Implementation) of the *Final RCRA Corrective Action Plan*, OSWER Directive 9902.3-2A, dated May 1994 (RCRA CAP). While EPA understands that the RCRA corrective action program allows for flexibility in CMI Plan presentation, the CMI for SWMU 7/8 lacks most of the components identified in the RCRA CAP. Furthermore, the CMI Plan in effect describes an extended duration, two year pilot plan for addressing the light non-aqueous phase liquid (LNAPL) plumes at SWMU 7/8, rather than a complete and final remedy proposal. While, EPA supports the proposal to develop an Engineering Evaluation Report (EER) after two years of system operation, to make recommendations as to the “long-term exit strategy for SWMU 7/8”, without a detailed proposal for additional remedial actions following the EER (such as a proposal for monitored natural attenuation following the EER), the current CMI proposal cannot be viewed as constituting the final remedy proposal.

In addition, the nature and extent of light non-aqueous phase liquid (LNAPL) at SWMU 7/8 is not sufficiently defined and may impact the implementation and success of any corrective measures at the site. Further, the proposed remedy does not propose a complete path towards achieving the Corrective Action Objective (CAO) of 0.01 inches of LNAPL at the site, which was developed in the 2005 Corrective Measures Study (CMS). The CMI does not identify a significant expected radius of influence (ROI) for the selected remedy (skimmer pumps and passive skimmers) and therefore it does not appear that the proposed extraction locations will be sufficient to meet the CAO.

In addition, vapor intrusion appears to represent a potential exposure pathway. It is not clear whether the CAOs reflect potential risk posed by that exposure pathway, as buildings are shown on Figure 6 of the CMI to be located over and immediately downgradient of the LNAPL plume. Please indicate whether the CAOs reflect potential risk posed by the vapor intrusion pathway under current and/or future site conditions, and if not discuss why. Also, as discussed in the next paragraph, changes to the proposed future land usage of the site may require that the vapor intrusion pathway and potential receptors be re-evaluated, based on the proposed future land usage as described in the May 2011 Draft Supplemental Environmental Assessment for Disposal of Naval Activity Puerto Rico.

In addition, the Navy has advised EPA that it has come to terms with the Puerto Rico Local Redevelopment Authority (LRA) on the LRA's application for an Economic Development Conveyance (EDC) transfer of the lands needed for the proposed “Caribbean Riviera” development, and the Navy has further advised that the “Port Parcel” which includes SWMUs 7 & 8 will also be transferred to the LRA for the proposed “Caribbean Riviera” development, instead of to the Puerto Rico Ports Authority as originally proposed. These transfers are expected to occur by September 30, 2011. Therefore, please address whether the CAOs developed in the 2005 CMS and reflected in the CMI Plan need to be updated to reflect changes in proposed future land usage (as described in the May 2011 Draft Supplemental Environmental Assessment for Disposal of Naval Activity Puerto Rico).

Also, the Puerto Rico Environmental Quality Board (PREQB) in its letter of April 4, 2011 addressed to myself, indicated that "the Responses to the comments were found adequate and appropriate revisions were made to the [CMI] document." Therefore, PREQB indicated it would not issue any additional comments. A copy of PREQB's letter is enclosed (Enclosure #2).

Within seventy five (75) days of your receipt of this letter, please submit revisions to the CMI Plan which address the above comments as well as those in the Enclosed Technical Review dated August 26, 2011 (Enclosure #1). Also, please include a proposed implementation schedule with the revised CMI plan.

SWMU 14 – Draft Final Additional Data Report in Support of Ecological Risk Assessment

EPA has completed its review of both of the above document and the Responses to EPA's October 3, 2008 comments, both of which were submitted on behalf of the Navy by Mr. Mark Kimes' (of your consultant Michael Baker Inc.) letter of March 11, 2011. Based on a review performed by our consultant, TechLaw Inc., several issues have not been fully clarified, and are discussed in the enclosed Technical Review dated August 26, 2011 (Enclosure #3).

In addition, the Puerto Rico Environmental Quality Board (PREQB) in its letter of May 11, 2011 addressed to myself, had a number of comments on the Report. A copy of PREQB's letter is enclosed (Enclosure #4).

Within sixty (60) days of your receipt of this letter, please submit as an Addendum to the Report, Responses to EPA's and PREQB's comments and any necessary revisions to the Report to address those comments.

SWMU 54 – Corrective Measures Study Addendum, Benzene Plume and Corrective Measures Implementation Plan, Benzene Plume, dated March 2001

EPA has completed its review of both of the above document and the Responses to EPA's previous comments, both of which were submitted on behalf of the Navy by Mr. Tom Beisel's (of AGVIO/CH2MHill) letter of March 28, 2011. EPA does not fully approve the CMS Addendum or the CMI Plan, and has a number of comments, which are discussed below and in the enclosed Technical Review, dated September 9, 2011 (Enclosure #5), which was prepared by our consultant, TechLaw Inc.

EPA notes that the CMS Addendum and CMI Plan do not meet the minimum requirements outlined in the Final RCRA Corrective Action Plan, OSWER 9902.3-2A, dated May 1994 (Corrective Action Guidance). While we realize that EPA allows flexibility in the corrective action process, the basic components outlined in the Corrective Action Guidance should be addressed in CMS and CMI documents. In General Comment 3 of the Enclosed Technical review prepared by our consultant TechLaw, they discuss the minimum requirements that should be addressed in the CMS Addendum and CMI Plan, as discussed in the Corrective Action

guidance. It should also be noted that the CMS and CMI documents do not provide the basis for the corrective action objective (CAO) of 550 ug/L for benzene or the receptors for which it is protective.

Please also note that with a remedial action with complexities such as those presented in CMS Addendum and CMI Plan, a stand-alone Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) should be provided. The lack of a stand-alone SAP/QAPP could have impacts on the long term success of the corrective measure, as the design is dependent on data generated to document its success. Thus, as discussed in General Comment 6 of the Enclosed Technical review, EPA requests that a stand-alone SAPP/QAPP be provided with the CMI Plan.

In addition, the CMS Addendum should include a groundwater potentiometric map that covers the entire SWMU 54 area, and shows the spatial and hydraulic relationship of the benzene plumes at SWMU 54 to the TCE plumes at SWMU 54, which are proposed to be addressed under a separate remedy (refer to the March 2011 CMI Plan for SWMU 54 TCE Plume) from that proposed for the benzene plumes.

The Puerto Rico Environmental Quality Board (PREQB) has reviewed the CMS Addendum and CMI plan, and their comments are given in their letter of May 23, 2011 addressed to myself. A copy of PREQB's letter is enclosed (Enclosure #6).

Within ninety (90) days of your receipt of this letter, please submit revisions to the CMS Addendum and CMI Plan which address the above comments and those given in the Enclosed Technical review prepared by our consultant TechLaw (Enclosure 5) and PREQB's May 23, 2011 letter (Enclosure #6). Also, please include an updated proposed implementation schedule with the revised CMI plan.

SWMU 54 – Corrective Measures Implementation Plan, TCE Plume, dated March 2011

EPA has completed its review of the above document, which was submitted on behalf of the Navy by Mr. Tom Beisel's (of AGVIO/CH2MHill) letter of March 28, 2011. EPA does not fully approve the CMI Plan, and finds that the same comments, which are made above for the SWMU 54 benzene plume CMI, regarding the minimum requirements that should be included in the CMI Plan, as per EPA's May 1994 Corrective Action Guidance, are equally applicable for the CMI plan for the TCE plume. Likewise, EPA requests that a stand-alone SAPP/QAPP be provided that covers the TCE plume CMI Plan. Also, it should also be noted that the CMI does not discuss the basis for the corrective action objective (CAO) of 22 ug/L for TCE or the receptors for which it is protective. Please include in the CMI a discussion of how the CAO for TCE was determined, and the receptors for which it is protective. Also, the CMI plan should cite the decision document (i.e., the CMS Final Report) where the CAO was established. Additional comments on the TCE plume CMI are given in the enclosed Technical Review, dated September 15, 2011 (Enclosure #7), which was prepared by our consultant, TechLaw Inc.

In addition, the CMI for the TCE plume should include a groundwater potentiometric map that covers the entire SWMU 54 area, and shows the spatial and hydraulic relationship of the TCE plumes at SWMU 54 to the benzene plumes at SWMU 54, which are proposed to be addressed under a separate remedy.

The Puerto Rico Environmental Quality Board (PREQB) has reviewed the TCE plume CMI plan, and their comments are given in their letter of May 23, 2011 addressed to myself. A copy of PREQB's letter is enclosed (Enclosure #6).

Within ninety (90) days of your receipt of this letter, please submit revisions to the TCE plume CMI Plan which address the above comment, i.e., that the same comments which are made above for the SWMU 54 benzene plume CMI, are equally applicable for the TCE plume CMI, as well as those given in the Enclosed Technical review prepared by our consultant TechLaw (Enclosure #7), and also those given with PREQB's May 23, 2011 letter (Enclosure #6). Also, please include an updated proposed implementation schedule with the revised TCE plume CMI plan.

If you have any questions, please telephone me at (212) 637- 4167.

Sincerely yours,



Timothy R. Gordon
Project Coordinator
Corrective Action and Special Projects Section
RCRA Programs Branch

Enclosure (7)

cc: Ms. Wilmarie Rivera, P.R. Environmental Quality Board, w/encls #1, #3, #5, & #7
Ms. Gloria Toro, P.R. Environmental Quality Board w/encls #1 #3, #5, & #7
Mr. Tom Beisel, AGVIO/CH2MHill, w/encls.
Mr. Mark Kimes, Baker Environmental, w/encls.
Ms. Cathy Dare, TechLaw Inc., w/o encls.
Mr. Felix Lopez, USF&WS, w/o encls.

**REVIEW OF THE CORRECTIVE MEASURES IMPLEMENTATION PLAN
SOLID WASTE MANAGEMENT UNIT 7/8
DATED FEBRUARY 2011**

**NAVAL ACTIVITY PUERTO RICO
CEIBA, PUERTO RICO
EPA ID No. PR2170027203**

Submitted to:

**U.S. Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866**

Submitted by:

**TechLaw, Inc.
205 West Wacker Drive
Suite 1622
Chicago, Illinois 60606**

| | |
|---------------------------|-----------------------|
| EPA Task Order No. | 002 |
| Contract No. | EP-W-07-018 |
| TechLaw TOM | Cathy Dare |
| Telephone No. | 315-334-3140 |
| EPA TOPO | Timothy Gordon |
| Telephone No. | 212-637-4167 |

**August 26, 2011
(slightly revised by EPA on Sept. 2, 2011)**

**REVIEW OF THE CORRECTIVE MEASURES IMPLEMENTATION PLAN
SOLID WASTE MANAGEMENT UNIT 7/8
DATED FEBRUARY 2011**

**NAVAL ACTIVITY PUERTO RICO
CEIBA, PUERTO RICO
EPA ID No. PR2170027203**

The following comments were generated based on a technical review of the *Corrective Measures Implementation Plan*, Solid Waste Management Unit 7/8, dated February 2011 (CMI), for the Naval Activity Puerto Rico facility in Ceiba, Puerto Rico. The CMI was reviewed for overall completeness and general compliance with the *Final RCRA Corrective Action Plan*, OSWER Directive 9902.3-2A, dated May 1994 (RCRA CAP).

GENERAL COMMENTS

1. The level of detail provided in the CMI is not consistent with the components presented in Chapter V (Corrective Measures Implementation) of the RCRA CAP. Based on the RCRA CAP, the conceptual design (15% Design Point) typically consists of corrective measures objectives, a conceptual model of contaminant migration, a discussion of project management, a project schedule, design criteria, a design basis, waste management practices, required permits, long-lead procurement considerations, and appendices. However, the CMI does not include these components. Similarly, the CMI does not include an Operation and Maintenance (O&M) Plan, Intermediate Plans and Specifications (30, 50, 60, 90 and/or 95% Design Point), or Final Plans and Specifications (100% Design Point). While it is understood that the RCRA corrective action program allows for flexibility in the CMI Plan presentation, it is not clear why the components identified in the RCRA CAP are not addressed in the CMI Plan for SWMU 7/8. Revise the CMI to address the components outlined in the RCRA CAP for CMIs and explain where streamlining of the corrective action process has taken place. A generic CMI document outline, derived from the RCRA CAP, is provided as Attachment A.
2. The CMI states, "Between June 1, 2009, and May 18, 2010, the following tasks were performed to determine the extent of LNAPL [light non-aqueous phase liquid] and collect data necessary to evaluate and select the most technologically sound and cost effective remedy to address LNAPL removal at SWMU [solid waste management unit] 7/8." However, it is not clear if an adequate suite of technologies were evaluated. For example, pilot testing of bioslurping was not conducted at the site. Bioslurping is identified as a common treatment technology in the Federal Remediation Technologies Roundtable (FRTR) Screening Matrix for fuels. Revise the CMI to indicate why certain technologies, such as bioslurping, were not evaluated at the site.

3. The nature and extent of LNAPL at SWMU 7/8 is not sufficiently defined. For example,

- Figure 4 (Historical Extent of LNAPL) indicates that releases occurred at former fuel tanks 82, 83, 84, and 1080; however, only six monitoring wells exist within the SWMU boundary north of Palau Street.
- No monitoring wells delineate the May 2010 detection of LNAPL at monitoring well UGW02 (0.10 feet) despite the monitoring well's location hydraulically downgradient of former fuel tank 1080, based on Figure 9 [SWMUS 7/8 and 55 Groundwater Piezometric Surface (April 9, 2010)] of Appendix B [Technical Memorandum: Well Installation to Determine Light Non-aqueous Phase Liquids (LNAPL) Extent at SWMU 7/8].
- Based on Figure 1-8 (CMS Soil Delineation Sample Locations and Proposed Excavation Areas) of the *Corrective Measures Study Addendum*, SWMUs 7 and 8 – Revised Soil Remedy, Tow Way Fuel Farm Area, Naval Activity Puerto Rico, Ceiba, Puerto Rico, dated March 2011 (CMS), polynuclear aromatic hydrocarbon (PAH) soil contamination exists west of UGW02 and former fuel tank 1080. As such, the potential exists for groundwater contamination. However, no monitoring wells exist within approximately 400 feet west of UGW02 and the former fuel tank.
- No monitoring wells exist within 200 feet northeast of CHRW24, CHRW13, and CHRW23 where the LNAPL thickness was detected at 3.91 feet, 2.10 feet, and 8.18 feet, respectively.
- No monitoring wells exist within 200 feet of CHRW45 where the LNAPL thickness was detected at 8.57 feet.
- Based on Figure 4, LNAPL thickness at UGW12 (0.50 feet), UGW13 (0.90 feet), UGW17 (0.06 feet), UGW21 (0.19 feet), and 7MW08 (0.15 feet) are not delineated by monitoring wells.
- The Well Installation subsection of Appendix B [Technical Memorandum: Well Installation to Determine Light Non-aqueous Phase Liquids (LNAPL) Extent at SWMU 7/8] indicates that if LNAPL was measured in a newly installed well, additional wells were installed in the cardinal compass directions until the thickness of LNAPL was less than 0.01 feet and/or site topography, the presence of utilities (subsurface or overhead) or site boundary conditions prevented the installation of additional wells. Information to clarify why additional wells were not installed in the cardinal compass directions from CHMW07 (0.19 feet), CHMW08 (0.22 feet), MTMW01 (2.81 feet), MTMW02 (2.27 feet) or MTMW04 (2.18 feet) is not provided.

As such, it is unclear if the implementation of active and passive skimming devices will sufficiently address LNAPL at SWMU 7/8 since the nature and extent of LNAPL remains unclear. Revise the CMI to provide a more accurate depiction of the nature and extent of LNAPL so that LNAPL at SWMU 7/8 can be sufficiently addressed.

4. The CMI presents the remedial approach and technologies that will be implemented to reduce the thickness of LNAPL to the corrective action objective (CAO) of 0.01 foot. However, the CMI does not adequately describe how the CAO of 0.01 foot of LNAPL was determined and

whether that CAO has been approved by EPA. Revise Section 2.1 (CMS Report) of the CMI to better describe the basis for how the CAO value of 0.01 foot of LNAPL was developed, and if previously approved by EPA, please cite the appropriate approval documents.

5. The proposed remedy includes the use of Hydro-Skimmer™ passive skimmers; however, these skimmers do not appear to have been pilot tested at the site. As such, it is not clear why these devices were not tested as part of the evaluation of remedies. Revise the CMI to include a rationale for using these passive skimmers without first pilot testing their effectiveness.
6. The proposed remedy includes four portable trailer-mounted skimmer control units that operate eight separate active skimmers. However, since all eight pumps discharge into a single storage tank, it is not clear how the effectiveness (e.g., LNAPL recovery volumes, water generation, etc.) of each individual skimmer devices will be evaluated and how changes to the float height or other operational parameters will be adjusted to have the system perform optimally. Revise the CMI to include additional details on how the system will be operated to recover LNAPL and how the effectiveness (e.g., LNAPL recovery volumes, water generation, etc.) of each individual skimmer devices will be evaluated.
7. While LNAPL was not detected at SWMU 55 during the May 2010 monitoring event, the potential relationship between contamination at SWMU 55 and SWMU 7/8 is not discussed. For example, it is unclear if groundwater contamination along the Forrestal Drive utility corridor is the source of contamination at SWMU 55. Further, it is unclear how the geology and hydrogeologic conditions at SWMU 55 are conducive to corrective measures which rely on groundwater permeability (e.g., in situ bioreactors, in situ chemical oxidation) when limited permeability conditions exist immediately north of Forrestal Drive. Revise the CMI to discuss whether a connection exists between contamination at SWMU 55 and SWMU 7/8. In addition, please discuss the variations in geology and hydrogeology north and south of Forrestal Drive.
8. The frequency that site personnel will routinely gauge wells to monitor variations in LNAPL thickness and adjust and maintain the active and passive skimmers is not specified in Sections 6.1 (Trailer-Mounted, Solar Powered Active Skimmer System) or 6.2 (Passive Skimmer System); however, Section 7.1 (Monitoring) indicates that all site wells will be gauged quarterly during the 2-year period of system operation. Information to support this frequency is not provided. Further, the decision criteria that will be utilized to determine if the gauging frequency can be reduced within the first month, as specified in the third bullet of Section 7.1, is not provided. As such, it is unclear if the LNAPL thickness will be gauged at an adequate frequency to adjust and maintain the active and passive skimmers and meet the CAO. Revise the CMI to justify the frequency that site personnel will routinely gauge wells to monitor variations in LNAPL thickness, and adjust and maintain the active and passive skimmers. In addition, revise the CMI to provide the decision criteria that will be utilized to determine if the gauging frequency can be reduced within the first month.

9. The hydraulic gradient is only presented on Figure 9 [SWMUS 7/8 and 55 Groundwater Piezometric Surface (April 9, 2010)] of Appendix B [Technical Memorandum: Well Installation to Determine Light Non-aqueous Phase Liquids (LNAPL) Extent at SWMU 7/8]. As a result, the relationship between the hydraulic gradient and LNAPL thickness is unclear. Revise Figure 4 (Historical Extent of LNAPL) to include the hydraulic gradient, as presented in Figure 9 of Appendix B.
10. Appendix E (Technical Memorandum: Light Non-aqueous Phase Liquid Baildown Test Summary for SWMUs 7 and 8) indicates that LNAPL in the area surrounding recovery well CHRW39 has a greater potential for mobility and recovery; however the CMI does not discuss how this impacts contaminant migration and the proposed active and passive skimmers. Revise the CMI to discuss the impact the subsurface conditions in the vicinity of CHRW39 have on contaminant migration and the proposed active and passive skimmers.
11. A significant partial-vacuum influence was noted during completion of the Aggressive Fluids Vapor Recovery (AFVR) pilot testing; however, almost no partial-vacuum influence was noted during soil vapor extraction (SVE) and vacuum-enhanced skimming pilot testing. The CMI does not appear to have an adequate assessment of the differences in partial-vacuum influence performance in these pilot tests. It is noted that the CMI hypothesized that short-circuiting may have been limited by saturated surface conditions during the AFVR; however, testing for short-circuiting does not appear to have been conducted in any of the pilot tests. In addition, the CMI does not appear to assess if the higher vacuums associated with the AFVR testing accounted for the greater partial-vacuum influence. Revise the CMI to assess the partial-vacuum influence noted during the AFVR and the potential for the use SVE or SVE enhancement technology for the site.
12. It is unclear if the operation of the Xitech brand skimmer for two days longer than the QED brand skimmer impacted the performance of the skimmers and resulted in a biased comparison of skimmers. Based on Section 4.2.4 (Active Skimmers), the active skimmer test was performed for approximately one week for both the Xitech and QED brand skimmers. However, Appendix F (Technical Memorandum: Light Non-aqueous Phase Liquids Recovery Using Active Skimmers) indicates that the Xitech skimmer operated from February 16, 2010 through February 23, 2010 (7 days) whereas the QED skimmer operated from February 18, 2010 through February 23, 2010 (5 days). Appendix F conclusions indicate that the Xitech skimmer outperformed the QED skimmer in nearly identical conditions. However, it is unclear if the additional operating time biased the performance of the skimmers. Revise the CMI to discuss how the operation of the Xitech brand skimmer for two days longer than the QED brand skimmer impacted the performance of the skimmers.
13. Seasonal fluctuations are not discussed in the CMI. As such, it is unclear how seasonal fluctuations will impact the proposed use of active and passive skimmers to address LNAPL at SWMU 7/8. Revise the CMI to discuss seasonal fluctuations at SWMU 7/8 and the impact they will have on the proposed use of active and passive skimmers.

SPECIFIC COMMENTS

- Section 1.1, Site History, Page 1-2:** This section states, “The locations of known fuel releases are shown on Figure 4, which also illustrates the historic distribution of light non-aqueous phase liquids (LNAPLs) based on the previous environmental studies.” However, the previous environmental studies are not identified and it is not clear how the extent of LNAPL was determined. Further, it is not clear if this LNAPL extent depicted in Figure 4 is from a single gauging event or series of events. Based on Figure 6 [SWMUs 7/8 LNAPL Thickness (May 18, 2010)] the historic extent presented in Figure 4, does not appear to capture the current extent show in Figure 6. In addition, the CMI does not include a discussion, or reference a discussion in a previous report, of the relationship between the various releases, the historic extent of LNAPL, the current extent of LNAPL and LNAPL migration. Revise the CMI to include a detailed conceptual model of LNAPL migration or reference this discussion in previous reports. In addition, revise Figure 4 to clarify the meaning of the extent of LNAPL depicted in the figure.
- Section 4.2.1, AFVR Pilot Test, Page 4-3:** This section states, “...the use of a mobile AFVR vacuum truck for long-term LNAPL recovery would also be cost prohibitive...” In addition, the CMI discusses the cost-effectiveness of several other potential remedies. However, specific cost information or a detailed cost analysis is not provided in the CMI. Revise the CMI to include specific cost information and a cost comparison between the potential remedies.
- Section 4.2.2, SVE Test, Page 4-4:** The text does not discuss the findings at CHMW03 or 470MW03 following completion of the SVE test. The text indicates that vacuum pressure was measured in seven monitoring wells located in the vicinity of the extraction wells (i.e., CHMW03, CHMW04, CHMW08, CHMW09, CHMW10, 470MW03, and 7MW01); however, the discussion of major findings only discusses five of the seven monitoring wells. As such, it is unclear whether vacuum influence was observed in CHMW03 or 470MW03. Revise Section 4.2.2 to discuss whether vacuum influence was observed in CHMW03 or 470MW03.
- Figure 4, Historical Extent of LNAPL:** The contents of former fuel tanks 56A and 56B are unclear. In addition, it is unclear when the former fuel tanks were removed. Figure 4 does not indicate the contents of the former fuel tanks and indicates that the fuel tanks were removed in 1984. Section 1.1 (Site History) indicates that closure of the tanks occurred in November 1996 and does not identify the previous contents of the fuel tanks. Therefore, it is unclear if releases from the former fuel tanks are related to groundwater contamination and LNAPL thickness in the vicinity of the former fuel tanks. Further, it is unclear when the former fuel tanks were removed and received closure. Revise the CMI to identify the contents of former fuel tanks 56A and 56B. In addition, revise the CMI to clarify when the former fuel tanks were removed and received closure.

5. **Appendix A (Technical Memorandum: Test Pit Excavation and Temporary Sump Installation for SWMU 7 and 8), Test Pit Excavation Activities, Page 1 of 12:** It is unclear why the eight test pits that were not excavated due to the presence of underground utilities along the north and south sides of Forrestal Drive were not relocated. The text indicates that only 41 test pits out of 49 planned test pit locations were excavated. Revise Appendix A to clarify why the eight test pits that were not excavated due to the presence of underground utilities along the north and south sides of Forrestal Drive were not relocated.

Attachment A
Corrective Measures Implementation (CMI) Outline

Final RCRA Corrective Action Plan, OSWER Directive 9902.3-2A, dated May 1994

Section I: Conceptual Design (15% Design Point)

1. Introduction/Purpose
2. Corrective Measures Objectives
3. Conceptual Model of Contaminant Migration
 - a. Description of phase (water, soil, gas, non-aqueous)
 - b. Location where contaminants are likely to be found
4. Description of Corrective Measures
 - a. Data Sufficiency
5. Project Management
6. Project Schedule
7. Design Criteria
8. Design Basis
 - a. Conceptual Process/Schematic Diagrams
 - b. Site plan showing preliminary plant layout and/or treatment area
 - c. Tables listing number and type of major components with approximate dimensions
 - d. Tables giving preliminary mass balances
 - e. Site safety and security provisions (e.g., fences, fire control, etc.)
9. Waste Management Practices
10. Required Permits
11. Long-Lead Procurement Considerations
12. Appendices
 - a. Design Data
 - b. Equations
 - c. Sample Calculations
 - d. Laboratory or Field Test Results

Section II: Operation and Maintenance Plan

1. Introduction/Purpose
2. Project Management
3. System Description
4. Personnel Training
5. Start-Up Procedures
6. Operation and Maintenance Procedures
 - a. Description of tasks for operation
 - b. Description of tasks for maintenance
 - c. Description of prescribed treatment or operation conditions
 - d. Schedule showing frequency of each O&M task

7. Replacement Schedule for Equipment and Installed Components
8. Waste Management Practices
9. Sampling and Analysis
10. Corrective Measure Completion Criteria
11. O&M Contingency Procedures
12. Data Management and Documentation Requirements

Section III: Intermediate Plans and Specifications (30, 50, 60, 90 and/or 95% Design)

1. General Site Plans
2. Process Flow Diagrams
3. Mechanical Drawings
4. Electrical Drawings
5. Structural Drawings
6. Piping and Instrumentation Diagrams
7. Excavation and Earthwork Drawings
8. Equipment Lists
9. Site Preparation and Field Work Standards
10. Preliminary Specifications for Equipment and Material

Section IV: Final Plans and Specifications (100% Design Point)

1. General Site Plans
2. Process Flow Diagrams
3. Mechanical Drawings
4. Electrical Drawings
5. Piping and Instrumentation Diagrams
6. Structural Drawings
7. Excavation and Earthwork Drawings
8. Site Preparation and Field Work Standards
9. Construction Drawings
10. Installation Drawings
11. Equipment Lists
12. Detailed Specifications for Equipment and Material



COMMONWEALTH OF PUERTO RICO
Office of the Governor
Environmental Quality Board



LAND POLLUTION CONTROL AREA

April 4, 2011

Timothy Gordon
US Environmental Protection Agency – Region II
290 Broadway – 22nd Floor
New York, New York 10007-1866

**Re: Review Response to Comments and
Final Corrective Measures Implementation
Work Plan for SWMUs 7/8
Naval Activity Puerto Rico
Ceiba, PR2170027203**

Dear Mr. Gordon:

The Federal Facility Coordinator (FFC) and the Hazardous Wastes Permits Division (HWPD) has finished the review of the above-mentioned document and responses to our comments.

The responses to the comments were found adequate and appropriate revisions were made to the document. Therefore, PREQB will not issue any additional comment and has no objection to consider the document as final.

If you have any additional comments or questions please feel free to contact Gloria M. Toro Agrait at (767) 787-8181 extension 3586 or Wilmarie Rivera at extension 6129.

Cordially,

María V. Rodríguez Muñoz
Manager
Land Pollution Control Area

cc. Ariel Iglesias, EPA-CEPD
Wilmarie Rivera, Federal Facilities Coordinator, PREQB

REVIEW OF NAVY RESPONSES TO EPA COMMENTS DATED OCTOBER 3, 2008
ON THE DRAFT ADDITIONAL DATA REPORT IN SUPPORT OF THE
ECOLOGICAL RISK ASSESSMENT AT SWMU 14
DATED JUNE 27, 2008

NAVAL ACTIVITY PUERTO RICO
CEIBA, PUERTO RICO
EPA ID No. PR2170027203

Submitted to:

U.S. Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866

Submitted by:

TechLaw, Inc.
205 West Wacker Drive
Suite 1622
Chicago, Illinois 60606

| | |
|--------------------|----------------|
| EPA Task Order No. | 002 |
| Contract No. | EP-W-07-018 |
| TechLaw TOM | Cathy Dare |
| Telephone No. | 315-334-3140 |
| EPA TOPO | Timothy Gordon |
| Telephone No. | 212-637-4167 |

August 26, 2011

**REVIEW OF NAVY RESPONSES TO EPA COMMENTS DATED OCTOBER 3, 2008
ON THE DRAFT ADDITIONAL DATA REPORT IN SUPPORT OF THE
ECOLOGICAL RISK ASSESSMENT AT SWMU 14
DATED JUNE 27, 2008**

**NAVAL ACTIVITY PUERTO RICO
CEIBA, PUERTO RICO
EPA ID No. PR2170027203**

The following comments were generated based on a technical review of the *Navy Response to EPA Comments Dated October 3, 2008 on the Draft Additional Data Report in Support of the Ecological Risk Assessment at SWMU 14, dated June 27, 2008* (RTCs), for the Naval Activity Puerto Rico facility in Ceiba, Puerto Rico. The responses to EPA comments adequately address the original comments, except for the responses presented below.

GENERAL COMMENTS

Evaluation of the Response to EPA General Comment 1: The response is partially adequate. While not noted in the Response to EPA General Comment 1, it is noted in the Response to EPA Specific Comment 5 that the Human Health Risk Assessment (HHRA) was updated to use the Johnson and Ettinger Model (JEM) available from http://www.epa.gov/oswer/riskassessment/airmodel/johnson_ettinger.htm rather than the on-line screening-level model to evaluate the vapor intrusion pathway.

However, within the context of evaluating vapor intrusion (VI) potential, it is somewhat misleading to state, "The most recent version of USEPA Regional Screening Levels ([R]SLs) (dated November 2010) used in this HHRA revealed no volatile COPCs [chemicals of potential concern] in soil" because the soil RSLs do not incorporate exposures via the VI to indoor air pathway, and currently there are no VI screening values for bulk soil data. Please ensure that the HHRA does not contain any conclusions regarding VI potential on the basis of bulk soil data. Also, please see the Evaluation of the Response to EPA Specific Comment 5.

Evaluation of the Response to EPA General Comment 3: The response is adequate, but note that the latest EPA RSLs were published in June 2011 and that future HHRAs should utilize the latest RSLs available.

Evaluation of the Response to EPA General Comment 5: The Navy's response is acknowledged. However, two apparent errors were noted in the response pertaining to the dietary intake of vanadium in surface soil by the mourning dove: (a) the FIR_j [food ingestion rate] was reported as 0.1723 kg/day, whereas Table 7-12 provided a value of 0.01732 kg/day, and (b) the FC_{xi} [maximum concentration of chemical x in food item i] was reported as 1.7765 mg/kg (derived by multiplying the vanadium maximum soil concentration of 420 mg/kg by the vanadium soil-to-plant bioconcentration factor of 0.0097, as reported in the response), even though that value should equal 4.074 mg/kg. Please double-check the example calculation, and ensure that the hazard quotients provided in Table 7-18 are accurate as stated in the response.

SPECIFIC COMMENTS

Evaluation of the Response to EPA Specific Comment 1: The response is partially adequate. While Section 6.3.1 has been revised to address the original comment, Section 6.2.2 (Selection of COPCs) still states, "Therefore, surface soil (0 to 1 foot bgs) and subsurface soil (1 to 10 feet bgs) data sets were combined to create one total soil column (0 to 10 feet bgs) data set..." and then states, "Soil samples up to a depth of 12 feet were used for evaluation of the subsurface soil exposure pathway in the HHRA. Subsurface soil samples were collected up to a depth of 12 feet bgs at SWMU 14. Given the small difference between 10 feet and 12 feet, the HHRA conservatively included the additional 2 feet, rather than exclude the data provided in that depth interval." Please revise the HHRA to resolve this discrepancy. Data within the depth interval from 10 to 12 feet below ground surface (bgs) are not appropriate to evaluate total soil exposures if data in this depth interval decrease the exposure point concentration (EPC) for any compound. If construction workers are not anticipated to encounter soil between 10 and 12 feet bgs, these data should not be used to evaluate associated exposures.

Evaluation of the Response to EPA Specific Comment 5: The response addresses the original comment. However, further detail regarding the VI assessment is requested. Several volatile compounds were detected in groundwater, however, only three compounds were modeled in the VI assessment: 1,2-dichloroethane (DCA), benzene and iodomethane. Based on the current presentation of the VI assessment and the groundwater data, it is unclear what criterion/criteria was/were used to select chemicals to be modeled for VI potential. If exceedances of soil or groundwater EPA RSLs were used to select chemicals for the VI assessment, this is not appropriate as the EPA RSLs do not take into account the vapor intrusion to indoor air pathway. If Table 2c target groundwater levels from the *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* dated November 2002 (Subsurface VI Guidance) were utilized in the selection of compounds to be evaluated in the VI assessment, this is not fully demonstrated in the HHRA (e.g., 1,2-DCA was detected in groundwater below Table 2c VI criteria, but was included in the VI assessment). Please revise the HHRA to model all volatile compounds detected in groundwater in the VI assessment, or alternatively, provide sufficient rationale for not following this approach (e.g., the Navy may elect to include a table that compares the maximum groundwater detections at SWMU 14 to the Table 2c VI criteria to demonstrate that the current VI assessment evaluates at least those compounds [e.g., benzene] that exceed Table 2c VI criteria). Also, please ensure that the HHRA is revised to thoroughly describe the criteria used to select VI COPCs.

Evaluation of the Response to EPA Specific Comment 8: The response is adequate. Section 6.3.4 and Appendix F have been revised to clarify that volatilization factors (VFs) used in the HHRA were calculated using Equation 4-8 and input parameters found in USEPA's *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA, 2002). However, it is recommended for completeness and transparency that the actual parameters used in the calculation are included along with the associated calculation sheet(s), though the exclusion of these calculations does not interfere with risk-management decisions.

Evaluation of the Response to EPA Specific Comment 16: The Navy response only partially clarifies the original comment. Section 7.9.1.2 states that benzene was detected in one subsurface soil sample, even though Table 7-15 shows a frequency of detection of 0/2. Please revise this section of the Screening Level Ecological Risk Assessment (SLERA) to be consistent with the data presented in Table 7-15, or amend the data in the table, if necessary. The overall frequency of detection for surface and subsurface soils should be revised to 1 of 23 in Section 7.9.1.2 of the SLERA if the frequency of detection shown in Table 7-15 (i.e., 0/2) is correct.

Evaluation of the Response to EPA Specific Comment 18: The response is acceptable. The evaluation of the drainage ditch sediment is completed and indicates that chromium levels are not statistically higher than background levels. However, it is recommended to explicitly mention the Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds in Section 7.9.1.4 of the SLERA. Including this information will further clarify why chromium was not retained as a contaminant of concern (COC) for further evaluation.



COMMONWEALTH OF PUERTO RICO
Office of the Governor
Environmental Quality Board



ENVIRONMENTAL EMERGENCIES RESPONSE AREA

May 11, 2011

Mr. Timothy Gordon
U.S. Environmental Protection Agency – Region II
290 Broadway – 22nd Floor
New York, New York 10007-1866

**RE: TECHNICAL REVIEW REVISED FINAL
ADDITIONAL DATA COLLECTION REPORT
IN SUPPORT OF THE ECOLOGICAL RISK ASSESSMENT
SWMU 14 – FIRE TRAINING PIT AT CRASH CREW AREA
NAVAL ACTIVITY PUERTO RICO (NAPR)
CEIBA, PR PR2170027203**

Dear Mr. Gordon:

The Hazardous Wastes Permits Division (HWPD) and the Federal Facility Coordinator (FFC) has finished the review of the above-mentioned document.

Joint comments of the HWPD and the office of EQB's FFC are being forwarded in order to avoid duplicity and facilitate the responses. Enclosed please find PREQB's comments to the reviewed document. If you have any additional comment or question please feel free to contact Gloria M. Toro Agrait at (787) 767-8181 extension 3586 or myself at extension 6141.

Cordially,

Wilmarie Rivera
Federal Facilities Coordinator
Environmental Emergencies Response Area

cc: Gloria M. Toro Agrait, EQB Hazardous Waste Permits Division

**Technical Review of the Draft Final Additional Data Collection Report in Support
of the Ecological Risk Assessment at SWMU 14, US Naval Activity Puerto Rico,
Ceiba, Puerto Rico dated March 11, 2011**

GENERAL COMMENTS

1. Please clarify how this report fits into the overall Facility Investigation process. Will a RFI report be prepared that presents more detailed information and data on prior investigations that incorporates the information presented in this Data Collection Report?
2. Puerto Rico's Water Quality Standards Regulation PRWQS has been updated since the draft report was prepared. The current version of the PRWQS, classifies all groundwater as SG, waters intended for use as a drinking water supply. Therefore, in order to comply with this Applicable or Relevant and Appropriate Requirement (ARAR), the human health risk assessment needs to evaluate future commercial/industrial worker exposure to groundwater. Also, please note that site closure decisions are based on compliance with current ARARs. Therefore, please clarify the path forward for evaluating compliance with PRWQS for groundwater.
3. Section I indicates that there is concern regarding the potential influx of contaminants from the fire pit into the nearby wetland. Please comment on why there were no samples collected directly from the wetland in order to quantify potential impacts.
4. According to the last paragraph of Section 7.2, all nondetect results from the February 2008 and September 2008 investigations were reported at the method detection limit (MDL) instead of the reporting limit (RL). This section also notes that all nondetect results from the previous 1996 and 2006 RFIs were reported down to the reporting limit. There are several issues with the use of MDLs identified below; therefore, the RL needs to be used.
 - Reporting of results down to the MDL is not consistent with EPA guidance (Risk Assessment Guidance for Superfund Volume I, Human Health Evaluation Manual [Part A] Interim Final, December 1989). EPA guidance states that "Because [sample quantitation limits (SQLs)] take into account sample characteristics, sample preparation and analytical adjustments, these values are the most relevant [quantitation limits] for evaluating non-detected chemicals (EPA, 1989)." This document ensures the use of the quantitation limit (or reporting limit) in all data evaluations. Note, Table 4-3 presented the quantitation limits that the laboratory was required to achieve, and not the MDLs.
 - Sections 7.5.1, 7.5.2, 7.6.1, and 7.6.2 state that maximum MDLs/RLs were conservatively used to estimate exposures for non-detected chemicals. Use of MDLs in this scenario will underestimate potential risk. It should be noted that reporting limits are typically 3-5 times higher than the MDLs prior to adjustment for sample-specific parameters, etc. The use of the MDL, unless equivalent to the reporting limit, will therefore likely underestimate potential risks by assuming a lower surrogate concentration for non-detects than a surrogate based on a

reporting limit. Please revise the evaluation of exposures for nondetects to only use the RLs.

- The MDL is a statistically derived value. The quantitation limits are accurately verified by laboratory analyses of standards at the unadjusted reporting limit with every initial calibration. The lack of accuracy in the MDL in combination with the underestimation of risk deems the use of the MDL in the ecological and human health risk assessments as inappropriate for determining potential risk.
- The use of both MDLs from 2008 and reporting limits from 1996 and 2006 in the risk assessments is an inconsistent approach to the risk assessment. The reporting limits should be used for all data in the risk assessments in order to be consistent and to demonstrate comparability for each investigation.

PAGE-SPECIFIC COMMENTS

1. Page 2-4, Section 2.4.1: Please ensure that the discussion of receptors and exposure pathways evaluated presented in this section is consistent with Section 6.3.1. For example, a commercial/industrial worker is evaluated in the HHRA but not listed in Section 2.4.1. As discussed in Section 6.3.1, construction workers are evaluated for ingestion, dermal and inhalation exposures from shallow groundwater, not just dermal exposure as stated in this section.
2. Page 3-5, Section 3.3.4, Paragraph 7: There is a discussion regarding the anticipated fate and transport of LNAPLs in this section, however, there is no discussion regarding the transport of DNAPL through this geologic regime. As there have been several references made in the text regarding the use of solvents in the fire test pits, please provide information or discussion regarding the transport of DNAPL through this area.
3. Table 4-1: Please indicate in the "Comment" section which samples were collected to establish background concentrations.
4. Page 4-1, Section 4, Paragraph 1: Please change the reference in the first sentence from the 2007 RFI to the 2006 RFI.
5. Page 5-1, Section 5.0, Paragraph 4: The second sentence of the text incorrectly refers to sediment samples 14D-SB11 through 14S-SB13 collected in February 2008 instead of September 2008. Please revise accordingly.
6. Page 5-2, Section 5.1.1: The text summarizes concentrations of 13 metals detected in surface sediment during the February 2008 sampling event.
 - a. The concentration of chromium listed is 75 mg/kg but the highest concentration detected was 60 mg/kg. Please revise accordingly.
 - b. Locations 14DSB03-00 and 14DSB04-00 are listed in the paragraph summarizing some of the concentrations detected but none of the concentrations listed were detected in these two samples. Please revise accordingly.

7. Page 5-2, Section 5.1.2:
 - a. Please correct the spelling of benzo(b)fluoranthene in the bulleted list of PAHs.
 - b. The concentrations of several metals listed were not accurate when compared to Table 5-1. Please revise the following concentrations to be consistent with Table 5-1: chromium (67 mg/kg), vanadium (340 mg/kg) and zinc (190 mg/kg).
8. Page 5-2, Section 5.2: Please include a reference in this section to Table 5-2 which outlines the 2008 background sediment sample results.
9. Page 5-4, Section 5.4: Please include a reference in this section to Table 5-4.
10. Page 5-5, Section 5.5, Paragraph 2: Please explain why there is a discussion of volatiles and results are included in Table 5-5 for volatiles in the field blanks when there were no samples analyzed for volatiles as part of this scope of work.
11. Tables 5-1 through 5-5: According to the last paragraph of Section 7.2, all nondetect results from the February 2008 and September 2008 investigations were reported at the MDL instead of the reporting limit. Since results are reported down to the MDL, please revise the notes section of the table and replace "quantitation limit" with "method detection limit" for the "U" qualifier.
12. Page 6-4, Section 6.2.2.1:
 - a. The Navy's response to EPA General Comment 1 indicates that the November 2010 version of the Regional Screening Table is used in the HHRA. However, this section states that the May 2010 version is used. Please clarify.
 - b. The RSLs for soil do not address vapor intrusion from soil or groundwater into overlying structures. Please clarify this in the text of the USEPA Regional Screening Levels development section. A separate evaluation of whether the vapor intrusion exposure pathway is potentially complete for future receptors needs to be conducted.
13. Page 6-5, Section 6.2.2.2, Total Soil: The depth of exposure for human receptors is 10 feet bgs, as discussed in Section 6.3.1. Unless it can be shown that higher contaminant concentrations are present from 10 to 12 feet bgs, please remove this data from the data set used in the HHRA.
14. Page 6-6, Section 6.2.2.2: Please clarify in the text whether any VOCs were retained as COPCs in the HHRA, consistent with the other paragraphs on this page.
15. Page 6-11, Section 6.3.4: Please add text discussing which method provided in ProUCL was used to calculate 95% UCLs for datasets with nondetects (i.e., were surrogates used, which is not recommended by EPA, or were nondetects identified). Appendix E output sheets indicate that datasets with nondetects were used, but considering the level of detail on the ProUCL software provided in this section,

please provide a discussion on how the UCLs were calculated for datasets with nondetects for clarity.

16. Page 6-29, Section 6.6.7: Two more recent soil background studies have been conducted by the Navy on Vieques that are considered quantitative studies: Final Background Investigation Report (October 2002) and East Vieques Background Soil Investigation Report (October 2007). This data is considered quantitative and has been agency approved. Please note that additional supporting documentation is needed to compare site data to background data from Culebra or Vieques Island. Please clarify whether the geology and soil types for these two areas are similar, and discuss the applicability of the Vieques dataset to fill material that has been incorporated into the native material at SWMU 14.
17. Page 8-3, Section 8.1.1: Please revise the recommendations to address groundwater contamination above PRWQS in the Corrective Measures Study.

Appendix A, 2008 Field Activities

1. The field notes associated with the February 2008 field investigation do provide the sample descriptions; however, do not appear to be complete as far as providing other project-related details (including details regarding the weather conditions, field team members also conducting work on the project, any pertinent details regarding equipment calibration, decontamination, collection methods, etc.). Also, the field notes related to the September 2008 deployment are not included. Please comment.
2. Please indicate why field blanks FB01 and FB02 were analyzed for VOCs and PCBs (as shown on the chain-of-custody).

Appendix C, 2008 Additional Data Collection Investigation Data Validation Summaries

1. For all validation reports in Appendix C, it appears that when blank qualification occurred in all analyses, the validator qualified the associated samples as nondetect (U) at the reported concentration. In many cases, the reported concentrations were below the reporting limit. Therefore, the new nondetect result at this "reported concentration" is not an accurate reflection of the actual nondetect value. As per the EPA Region 2 validation guidelines, sample results below the reporting limit should be raised to the reporting limit if affected by the blank contamination. Please revisit all validation memos and apply qualifications in accordance with EPA Region 2 procedures.

ENCLOSURE #5

**REVIEW OF THE CORRECTIVE MEASURES STUDY ADDENDUM
AND THE CORRECTIVE MEASURES IMPLEMENTATION PLAN
SWMU 54 BENZENE PLUME
DATED MARCH 2011**

**NAVAL ACTIVITY PUERTO RICO
CEIBA, PUERTO RICO
EPA ID No. PR2170027203**

Submitted to:

**U.S. Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866**

Submitted by:

**TechLaw, Inc.
205 West Wacker Drive
Suite 1622
Chicago, Illinois 60606**

| | |
|---------------------------|-----------------------|
| EPA Task Order No. | 002 |
| Contract No. | EP-W-07-018 |
| TechLaw TOM | Cathy Dare |
| Telephone No. | 315-334-3140 |
| EPA TOPO | Timothy Gordon |
| Telephone No. | 212-637-4167 |

**September 9, 2011
(Slightly Revised by EPA on September 13, 2011)**

**REVIEW OF THE CORRECTIVE MEASURES STUDY ADDENDUM
AND THE CORRECTIVE MEASURES IMPLEMENTATION PLAN
SWMU 54 BENZENE PLUME
DATED MARCH 2011**

**NAVAL ACTIVITY PUERTO RICO
CEIBA, PUERTO RICO
EPA ID No. PR2170027203**

The following comments were generated based on a technical review of the *Corrective Measures Study Addendum, SWMU 54 Benzene Plume*, dated March 2011 (CMS Addendum), and the *Corrective Measures Implementation Plan, SWMU 54 Benzene Plume*, dated March 2011 (CMI Plan), for the Naval Activity Puerto Rico facility in Ceiba, Puerto Rico.

GENERAL COMMENT

1. The CMS Addendum and CMI Plan are deficient in their technical presentation and lack design detail due in part to the complexities of the site conditions. In order to gather the data needed to optimize the corrective actions, the actions should be proposed as performance based. With that in mind, the CMS Addendum and CMI Plan should be revised to include a much more detailed and expansive sampling strategy which will be able to demonstrate the success of the proposed actions. This will allow the corrective action process to move forward while the data needed to optimize and fully design the system is obtained. This will also ensure the appropriate expense of the corrective actions is realized. A commitment to expand the system (i.e., additional air compressors, additional monitoring wells, piezometers, additional air sparge wells, more expansive air sparge well screen intervals) and a description of the duration of the proposed corrective actions is needed (including a significant contingency budget). The change to a performance based corrective action should also address the need for a better understanding of groundwater flow, radius of influence, air flow rate and the pulsing frequency, utility assessments, and the need for vapor extractions. Please revise the CMS Addendum and CMI Plan accordingly to include this level of detail, in order to support a performance based action.

2. The corrective action objective (CAO) for benzene provided in the CMS Addendum and CMI Plan is 550 ug/L. However, the text does not indicate whether this value was approved by the regulatory agencies. Revise the CMI Plan and the CMS Addendum to state whether the CAO value for benzene was approved by the regulatory agencies. In addition, revise the CMI Plan and the CMS Addendum to clarify the receptors of which this CAO is protective by presenting a site conceptual model which shows the exposure pathways determined to be complete, and how the proposed CAO and remedial actions will mitigate the at-risk exposure pathways.

3. The Final RCRA Corrective Action Plan, OSWER 9902.3-2A, dated May 1994 (Corrective Action Guidance) provides basic information that should be presented in CMS and CMI documents. While it is understood that there is flexibility in the corrective action process, basic information outlined in the Corrective Action Guidance, as outlined below, should be addressed as part of the CMS and CMI to document the overall protectiveness of the selected remedy and its short- and long-term reliability/effectiveness. For example:
- a. Detailed documentation of how the potential remedy will: (1) Protect human health and environment, (2) Attain media cleanup standards set by the implementing agency, (3) Control the source of releases so as to reduce or eliminate, to the extent practicable further releases that may pose a threat to human health and the environment, and (4) Comply with the applicable standards for management of wastes, is not provided in the CMS Addendum.
 - b. Detailed documentation of how the potential remedy will meet general decision factors including: (1) Long-term reliability and effectiveness, (2) Reduction in the toxicity, mobility or volume of wastes, and (3) Short-term effectiveness, and (4) Implementability, is not provided in the CMS Addendum.
 - c. The CMI does not include a conceptual model of contaminant migration. The conceptual model consists of a working hypothesis of how the contaminant may move from the release source to the receptor population and should include a description of the phase (water, soil, gas, non-aqueous) and location where contaminants are likely to be found.
 - d. A description of the management approach has not been provided, including levels of authority and responsibility (including an organizational chart), lines of communication and the qualifications of key personnel who will direct the corrective measure design and implementation effort.
 - e. The performance requirements for the overall corrective measure and for each major component have not been provided.
 - f. Site safety and security provisions (e.g., fences) have not been specified to ensure control of the remedial action implementation area. If this is deemed to be unnecessary, justification should be presented.
 - g. An Operation and Maintenance (O&M) Plan has not been provided even though reference to the need for additional requirements due to the tropical climate in which this remedy will be implemented is discussed in Section 3.1.2. Reliability.

Revise the CMS Addendum and CMI Plan to provide the basic requirements established in the Corrective Action Guidance, as described above, for the selected corrective measures.

4. The CMS Addendum and CMI Plan do not discuss the potential salinity of the groundwater and any influences this could have on the proposed treatment processes. Revise the CMS Addendum and CMI Plan to discuss the potential salinity of the groundwater and any influences this could have on the proposed treatment processes.
5. The Pilot-Scale Test Report contained in Appendix A of the CMS Addendum does not contain a data usability discussion. While data validation reports (DVRs) have been included in the CMS Addendum, a discussion of the extent of the quality control (QC) exceedances, and how qualifications affect data usability have not been included. The *Amended Final Sampling and Analysis Plan for the Pilot Test at SWMU 54 and 55*, dated January 31, 2011 states that a data quality evaluation will be provided as part of presentations to the Tier I Partnering Team, followed by a technical memorandum prepared to assess remedy effectiveness. The technical memorandum will identify any data usability limitations and make recommendations for corrective action if necessary. Revise the CMS Addendum to include the technical memorandum that discusses data usability.
6. The CMI Plan references the sampling and analysis plan (SAP) prepared for the pilot studies at SWMUs 54 and 55. However, a CMI-specific SAP and quality assurance project plan (QAPP) should be prepared that addresses the long-term monitoring activities presented in the CMI Plan. Revise the CMI Plan to include, or reference, a SAP and QAPP for the project specific activities presented in the CMI Plan.
7. The DVRs included in Appendix C of the CMS Addendum note that exceedances of quality control limits were found, but do not provide the extent of the exceedances. Therefore, it is not possible to determine if the samples have been qualified correctly, or to thoroughly assess the data quality. For example, the DVR dated October 19, 2009 indicates there were exceedances for the field duplicate (benzene and chemical oxygen demand) and the matrix spike (MS) (sulfide). However, the extent of the exceedances was not provided. Revise the DVRs to provide the extent of all exceedances.
8. The information in the CMI Plan is very similar to the CMS Addendum. Once revisions to the CMS have been made that address the concerns expressed in the comments on the CMS Addendum, please ensure that the revisions are also carried forward and applied similarly to the CMI Plan.

SPECIFIC COMMENTS FOR THE CMS ADDENDUM

1. **CMS Addendum, Section 1.0, Introduction, Page 1-1, Second paragraph:** Concerns exist with respect to selecting an aerobic corrective measure for the benzene plume at SWMU 54 when an anaerobic process has been selected for the proposed TCE plume at SWMU 54. Please provide a discussion about the compatibility of the proposed anaerobic process for the TCE plume at SWMU 54 (refer to the March 2011 CMI Plan SWMU 54 TCE Plume) with the proposed aerobic corrective measure proposed for the benzene plume at SWMU 54. The proposed actions at the benzene plume at SWMU 54 may have to overcome the anaerobic

environment created for the TCE plume at SWMU 54. The proposed actions have not accounted for overcoming conditions other than those that exist currently.

2. **CMS Addendum, Figure 1-2, Page 1-3:** Figure 1-2 does not illustrate flow direction or gradient, which is necessary for evaluating the proposed corrective action. This figure would be clearer if it contained groundwater contours or at a minimum a general groundwater flow direction arrow. Please consider revising the figure to show groundwater flow and therefore a better understanding of the conceptual site conditions. Please note that this comment also applies to Figure 1-2 in Appendix A as the figures are basically the same image.
3. **CMS Addendum, Section 1.2, First Bullet, Page 1-4:** The text indicates that air distribution in the subsurface at SWMU 54 is highly variable and is a function of the air injection rate and the heterogeneity of the formation. However, a thorough description of the conditions which comprise this heterogeneity is not provided. Please expand on the description of subsurface conditions which comprise this heterogeneity and the associated implications for vertical and horizontal migration of groundwater and dissolved oxygen (DO). The text should indicate how the proposed actions will be affected by the heterogeneity of subsurface conditions, specifically addressing its effect on the performance (duration) of the proposed biosparging action.
4. **CMS Addendum, Section 3.1.2, Reliability, Page 3-1:** Biofouling is a concern for a corrective action in the subtropics. Please include a reference to conditions encountered during the pilot study or a technical paper supporting concerns associated with the potential for biofouling, as this statement is currently unsupported. Please also ensure that the revised CMS Addendum includes an O&M Plan which details how biofouling will be monitored and controlled.
5. **CMS Addendum, Section 3.1.2, Reliability, Page 3-1:** The CMS Addendum does not adequately support the proposed 1-year quarterly post closure monitoring. Long term monitoring should be performed until trend analysis results demonstrate that further monitoring is not warranted and should be based on system performance. Please revise the CMS Addendum accordingly.
6. **CMS Addendum, Appendix A, Section 3.1.1, Geology, Page 3-1:** The geologic description of the clay unit is not sufficient and brings into question the potential performance of the proposed corrective action. It is not clear if this is uppermost weathered section of the saprolite or a distinct deposit of other origin (e.g., marine clay). The vertical and horizontal migration of groundwater and DO will be affected by the heterogeneity of this deposit, and the heterogeneity will affect the performance (duration) of the proposed biosparging action. Please provide additional detail on the clay unit and ensure that the detailed description supports the anticipated performance of the corrective action.

7. **CMS Addendum, Appendix A, Section 4, Conclusions, Page 4-1:** The seventh bullet presents performance expectations that are not supported. The seventh bullet states “Similar DO and ORP response is expected in shallow monitoring wells with proper placement of the injection well screen at the base of the zone”. However, Figures 3-1 and 3-2 indicate shallow wells will be screened in lean clay and deeper zone wells will be screened in silt. Please explain why a “similar response” would be expected in these different deposits with vastly different characteristics/physical properties. Concerns exist that the physical properties (porosity, permeability, transmissivity, etc.) of the lean clay will be dissimilar to the silt and may require longer cleanup time frames, require additional or closer spacing of injection wells, increased injection pressures, increased cost or a combination of these design aspects. Please revise the CMS Addendum to describe the information from the Pilot Study that supports the performance expectations or provide site specific details which substantiate the proposed approach.
8. **CMS Addendum, Appendix A, Section 4, Conclusions, Page 4-2:** Concerns exist with respect to the proposed maximum flow rate due to seemingly conflicting information presented in the document. The first bullet states the air sparge (AS) system should be designed with a maximum flow rate of 4 standard cubic feet per minute (scfm) ... to minimize the effects of volatilization. However, Section 3.4.1 Shallow Zone Wells, states that “No changes in DO were observed in any shallow monitoring wells at a rate of 4 scfm.” Please rectify this potentially conflicting information. This comment also applies to Section 2.0, Background, of the CMI Plan.
9. **Appendix C, Laboratory Data Sheets and CoCs, DVR dated October 19, 2009:** This DVR indicates the MS result for sulfide was below acceptance criteria and therefore the parent sample was qualified “UJ/Q”. However, for inorganic compounds, the entire sample delivery group should be qualified for MS exceedances. Revise the DVR to qualify the other samples in the sample delivery group as estimated due to the MS exceedance.
10. **Appendix C, Laboratory Data Sheets and CoCs, DVR dated March 12, 2010, Page 4:** This DVR indicates the concentration of trichloroethylene in sample JM04-54MW06-012810 exceeded screening criteria (1020 ug/L), but the laboratory data included in the DVR and Table 3.3 lists the result as nondetect (100U). Revise the DVR to correct this discrepancy.
11. **Appendix C, Laboratory Data Sheets and CoCs, DVR dated March 12, 2010:** The data validation written on the laboratory results pages indicate that several compounds (i.e., benzene, ethylbenzene, xylenes, and cyclohexane) were rejected because another analysis of these compounds was available; however this has not been discussed in the quality assurance memorandum. To avoid confusion with respect to the rejected data, it is recommended that the quality assurance memorandum discuss why the data were rejected.
12. **Appendix G, Table G-2, Soil Analytical Data Summary, Page 1 of 1:** The table does not indicate whether the soil results were based on dry weight or wet weight. Revise the table to ensure that soil samples results were dry weight corrected.

SPECIFIC COMMENTS FOR THE CMI PLAN

6. **CMI Plan, Section 3.4.1, Exit Strategy, Page 3-5:** This section states that the AS system will continue operation until “[s]ource area concentrations of Benzene have been reduced by at least 95 percent or to the point where monitored natural attenuation (MNA) can cost effectively reach the site CAO for Benzene (550 ug/L)” or until “additional mass removal is determined to be technically or economically infeasible.” It is unclear how it will be determined that MNA is cost effective or additional mass removal is ineffective, and if these evaluations and their conclusions will be submitted to EPA. Substantiation for the proposed design needs to be provided in order to ensure that any determinations regarding technically or economically infeasibility can be separated from an inadequate design. Revise this section to describe the exit strategy in greater detail, ensuring that appropriate data and data analysis occurs in support of any remedial completion determinations. Also ensure that documentation for the proposed design is supported by guidance to ensure that remedial failure is not due to an inadequate or undersized design.
7. **CMI Plan, Section 4.1, System Monitoring, Page 4-1:** The outline for the O&M manual does not have a section addressing biofouling. Please revise the O&M Manual outline to include a line item for monitoring for biofouling.
8. **CMI Plan, Section 4.3, Reporting, Page 4-2:** The reporting section does not cover progress reporting. This section indicates that the progress of site remedial activities will be presented in annual reports; however, the *Final Guidance on Completing Corrective Action Activities at RCRA Facilities*, Federal Register, V. 68, No. 37, February 25, 2003 indicates that more frequent progress reports may be necessary, especially during the system startup. In addition to the information presented for the annual reports, the progress reports should include a summary of system effectiveness, a summary of all contacts with representatives of the local community or government and public interest groups, a summary of all problems or potential problems encountered, actions taken or planned to rectify problems, and the projected work for the next reporting period. Revise the CMI Plan to indicate that progress reports will be submitted and include the aforementioned information.



COMMONWEALTH OF PUERTO RICO
Office of the Governor
Environmental Quality Board



ENCL # 6

ENVIRONMENTAL EMERGENCIES RESPONSE AREA

May 23, 2011

Mr. Timothy Gordon
U.S. Environmental Protection Agency – Region II
290 Broadway – 22nd Floor
New York, New York 10007-1866

**RE: TECHNICAL REVIEW OF DIFFERENT
DOCUMENTS ON SWMU 54
NAVAL ACTIVITY PUERTO RICO (NAPR)
CEIBA, PR PR2170027203**

Dear Mr. Gordon:

The Hazardous Wastes Permits Division (HWPD) and the Federal Facility Coordinator has finished the review of the following documents:

- Corrective Measures Study Addendum SWMU 54 Benzene Plume (March 2011)
- Corrective Measures Implementation Plan SWMU 54 Benzene Plume (March 28, 2011)
- Corrective Measures Implementation Plan SWMU 54 TCE Plume (March 28, 2011)

Enclosed please find PREQB's evaluation of responses to comments. If you have any additional comment or question please feel free to contact Gloria M. Toro Agrait at (787) 767-8181 extension 3586 or myself at extension 6129.

Cordially,

Wilmarie Rivera
Federal Facilities Coordinator
Environmental Emergencies Response Area

cc: Gloria M. Toro Agrait, EQB Hazardous Waste Permits Division

**Technical Review of the Draft Corrective Measures Study Addendum
SWMU 54 Benzene Plume
US Naval Activity Puerto Rico, Ceiba, Puerto Rico
March, 2011**

GENERAL COMMENT

Puerto Rico's Water Quality Standards Regulation has been updated since the original Corrective Measures Study was prepared. The current version, dated March 2010, classifies all groundwater as SG, waters intended for use as a drinking water supply. Therefore, in order to comply with this Applicable or Relevant and Appropriate Requirement (ARAR), the Corrective Action Objectives (CAOs) for all chemicals of potential concern need to be updated to reflect this current ARAR.

PAGE-SPECIFIC COMMENTS

1. Page 1-6, Section 1.2, Bullet 2: Please clarify that when referring to VOC concentrations observed, it is referring to VOC air monitoring at the storm sewer monitoring location SS#3. Also, the storm sewer monitoring locations should be depicted in a Figure.
2. Page 3-5, Section 3.1, Bullet 3: Please provide details as to how you will confirm that soils are suitable for use as backfill.

Appendix A, Pilot-Scale Test Report

1. Page 2-4, Section 2.2.1, Paragraph 1 & Page 2-7, Section 2.3.1, Paragraph 1: Please explain why the use of the EPA Region 4 protocols are referenced relative to work conducted in Region 2.

**Technical Review of the Draft Corrective Measures Implementation Plan
SWMU 54 Benzene Plume, US Naval Activity Puerto Rico, Ceiba, Puerto Rico
March 28, 2011**

GENERAL COMMENT

1. Puerto Rico's Water Quality Standards Regulation has been updated since the original Corrective Measures Study was prepared. The current version, dated March 2010, classifies all groundwater as SG, waters intended for use as a drinking water supply. Therefore, in order to comply with this Applicable or Relevant and Appropriate Requirement (ARAR), the Corrective Action Objectives (CAOs) for all chemicals of potential concern need to be updated to reflect this current ARAR.
2. Concurrent with the implementation of the proposed biosparge remedy to establish aerobic conditions sufficient to promote biological degradation of benzene, the Navy is proposing to perform injections of emulsified oils immediately upgradient to establish anaerobic conditions sufficient to promote the degradation of TCE. Please incorporate discussion within the document regarding how these two remedial approaches are expected to interact such that they will not interfere with the successful remediation of either contaminant plume. Additionally, describe specific monitoring that will occur to evaluate whether one remedy is negatively impacting the other and any associated corrective actions to be taken as necessary.

PAGE-SPECIFIC COMMENTS

1. Please carefully revise the Acronyms and Abbreviations section to include all the acronyms used through the document. For example, ISB, AS, CAO among others.
2. Page 2-3, Section 2.0, Bullet 2: Please clarify that when referring to VOC concentrations observed, it is referring to VOC air monitoring at the storm sewer monitoring location SS#3. Also, the storm sewer monitoring locations should be depicted in a Figure.
3. Page 4-2, Section 4.2, Performance Monitoring: The text states that sampling will be conducted in accordance with the January 2011 SAP. PREQB provided the following comment associated with the 2011 SAP: According to the EPA Region II low-flow sampling procedure, peristaltic pumps are only allowed for sampling inorganics. EPA guidance (EPA/540/P-87/001, 1987, page 8.5-11) also states that peristaltic pumps are not recommended because they may cause degassing, pH modification, and loss of volatile compounds. Since the main contaminants of concern for this site is benzene, adjustable-rate bladder pumps should be used. Please clarify.
4. Page 4-2, Table 4-1, Performance Monitoring Summary: Please include turbidity in the list of field parameters.
5. Page 5-1, Section 5.0: Please include Baker, 2005 in the list of references.

**Technical Review of the Draft Corrective Measures Implementation Plan
SWMU 54 TCE Plume
US Naval Activity Puerto Rico, Ceiba, PR
March 28, 2011**

GENERAL COMMENTS

1. Puerto Rico's Water Quality Standards Regulation has been updated since the original Corrective Measures Study was prepared. The current version, dated March 2010, classifies all groundwater as SG, waters intended for use as a drinking water supply. Therefore, in order to comply with this Applicable or Relevant and Appropriate Requirement (ARAR), the Corrective Action Objectives (CAOs) for all chemicals of potential concern need to be updated to reflect this current ARAR.
2. Concurrent with the implementation of the proposed biosparge remedy to establish aerobic conditions sufficient to promote biological degradation of benzene, the Navy is proposing to perform injections of emulsified oils immediately upgradient to establish anaerobic conditions sufficient to promote the degradation of TCE. Please incorporate discussion within the document regarding how these two remedial approaches are expected to interact such that they will not interfere with the successful remediation of either contaminant plume. Additionally, describe specific monitoring that will occur to evaluate whether one remedy is negatively impacting the other and any associated corrective actions to be taken as necessary.
3. Please provide additional lines of evidence to support the statement that reductive dechlorination is occurring at SWMU 54. Parameters that need to be evaluated in the case of reductive dechlorination include the strength the reducing conditions developed (highly negative ORP), the lack of dissolved oxygen, and the observation of reduced states of electron acceptors (iron, manganese, etc.). Additionally, the biological reduction of trichloroethene (TCE) produces at least temporary increases in concentrations of associated breakdown products such as cis 1,2-dichloroethene, vinyl chloride and dissolved gasses (ethane and ethane).
4. It appears as though the delineation of the TCE plume to date has been focused on the lateral extents. Please provide the data to support that the vertical extent of the plume has been adequately characterized.

PAGE-SPECIFIC COMMENTS

1. Table Page 4-1, Performance Monitoring Summary:
 - a. This table shows 14 samples will be collected. The text preceding this table shows only 13 samples will be collected. Please clarify.
 - b. Table 4-1 includes analyses for nitrate/nitrite, chloride and ferrous iron. However, these analyses are not included in the text preceding this table. Please clarify.

- c. Iron and manganese are not included in Table 4-1 but are included in the text preceding this table. Please clarify.
- d. The methods cited in Table 4-1 are different than the methods used during the pilot study for select parameters: TOC (SM 5310B), sulfate (300.0), sulfide (SM 4500 SD), and alkalinity (SM 2320B). Please clarify if the use of different methods will cause any adverse comparability issues between the two data sets.
- c. Please include turbidity in the list of field parameters.

Appendix A, Pilot-Scale Test and Investigation Results

1. Section 2.2.1:
 - a. Paragraph 1: Please explain why low-flow procedures from EPA Region IV were used instead of the low-flow procedures from EPA Region II.
 - b. Paragraph 1: Peristaltic pumps were used to collect all samples for VOCs and dissolved gases. My comments on the January 2011 SAP included a comment on the use of peristaltic pumps: According to the EPA Region II low-flow sampling procedure, peristaltic pumps are only allowed for sampling inorganics. EPA guidance (EPA/540/P-87/001, 1987, page 8.5-11) also states that peristaltic pumps are not recommended because they may cause degassing, pH modification, and loss of volatile compounds. Since the main contaminants of concern for these sites are VOCs, adjustable-rate bladder pumps should be used.
 - c. Paragraph 2: Please revise the text to also include total iron and manganese, as per the data provided in Appendix B.
 - d. Please explain why the 2011 SAP is cited for the work that was completed in 2009 and 2010.
2. Page 3-1, Section 3.1, Paragraph 3 & Page 2-4, Section 2.3, Paragraph 3: Please explain why the use of the EPA Region 4 protocols are referenced relative to work conducted in Region 2.
3. Section 3.2.1: Please revise the section title to state "54MW14" instead of "55MW14".
4. Page 3-17, Section 3.3.2: Please expand the discussion relative to Monitored Natural Attenuation (MNA) parameters to present more detailed evaluations of the various parameters relative to MNA monitoring to substantiate that TCE treatment via reductive dechlorination is occurring. For example:
 - a. Table 3-3: The data presented in Table 3-3 does not show the changes associated with active reductive dechlorination such as changes in electron acceptor species, increases in concentrations of DCE, or vinyl chloride, nor the generation of dissolved gasses such as ethane and ethane. In fact in several cases the concentrations of dissolved gasses was found to be higher in pre-injection sampling events as compared to the post-injection events. Please provide this information.
 - b. Appendix A: At a number of wells DO levels were measured to be zero mg/L prior to injection and increased to approximately 1 mg/L after injection. For an

injection of substrate to create conditions suitable for reductive dechlorination, it would be expected that the opposite of this trend would occur. To promote reductive dechlorination, ORP measurements need to be adjusted down to sufficiently negative values. At best the ORP levels achieved in a couple of the wells monitored may indicate weakly reducing conditions. But for most of the wells, ORP values conducive to reductive dechlorination were not achieved based on the data presented in Appendix A.

5. Table 3-3:

- a. Please explain why the dissolved iron and manganese results from August 2009 are listed as "NA". These analyses were performed as per the data provided in Appendix B.
- b. Please explain why the total iron and manganese results from September 2009 are listed as "NA". These analyses were performed as per the data provided in Appendix B.

Appendix B, Laboratory Data Sheets and COCs

1. Samples from August 18, 2009 through September 9, 2009 and Samples Collected February 17, 2010 through February 19, 2010: Please explain why blank qualifications were not performed in accordance with the data validation guidelines cited in the May 2009 or the January 2011 SAP.

**REVIEW OF THE CORRECTIVE MEASURES IMPLEMENTATION PLAN
SWMU 54 TCE PLUME
DATED MARCH 2011**

**NAVAL ACTIVITY PUERTO RICO
CEIBA, PUERTO RICO
EPA ID No. PR2170027203**

Submitted to:

**U.S. Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866**

Submitted by:

**TechLaw, Inc.
205 West Wacker Drive
Suite 1622
Chicago, Illinois 60606**

| | |
|---------------------------|-----------------------|
| EPA Task Order No. | 002 |
| Contract No. | EP-W-07-018 |
| TechLaw TOM | Cathy Dare |
| Telephone No. | 315-334-3140 |
| EPA TOPO | Timothy Gordon |
| Telephone No. | 212-637-4167 |

September 15, 2011

**REVIEW OF THE CORRECTIVE MEASURES IMPLEMENTATION PLAN
SWMU 54 TCE PLUME
DATED MARCH 2011**

**NAVAL ACTIVITY PUERTO RICO
CEIBA, PUERTO RICO
EPA ID No. PR2170027203**

The following comments were generated based on a technical review of the *Corrective Measures Implementation Plan, SWMU 54 TCE Plume*, dated March 2011 (CMI Plan), for the Naval Activity Puerto Rico facility in Ceiba, Puerto Rico.

GENERAL COMMENTS

1. The CMI Plan proposes a full-scale in-situ biodegradation (ISB) injection, including the installation of injection wells, substrate injection, and performance monitoring. The CMI Plan does not, however, provide sufficient information to demonstrate that the use of the selected remediation system will adequately remove trichloroethylene (TCE) at SWMU 54 to the corrective action objective (CAO) of 22 micrograms per Liter (ug/L). Unexpected results were observed during the pilot scale test including increases in TCE concentrations in monitoring wells 54MW10, 54MW14, and 54MW15, which may have resulted from movement of contaminated groundwater during the injections; and, there were generally no changes in dichloroethene (DCE), vinyl chloride (VC) or total organic carbon (TOC) in those wells. In addition, Figures 3-1 and 3-2 in Appendix A (Pilot-Scale Test Report) show a cross-section with variable subsurface materials. However, there is no discussion of appropriate injection well screen intervals keyed to the subsurface conditions shown in the cross-sections. Since increases of TCE were observed in some wells during the pilot test, alternative injection methods or intervals should be discussed in the CMI Plan. The proposal of a full-scale ISB injection should include refinement of the approach used during the pilot study to ensure that the proposed design will achieve the remediation goals and prevent the further migration of TCE.
2. The additional groundwater characterization completed as part of the pilot scale test (results presented in Appendix A of the CMI Plan) detected TCE in groundwater over a greater area than expected. As a result, it is unclear if the nature and extent of the TCE plume has been fully delineated. In addition, it is unclear if the uncertainty associated with the nature and extent of the TCE plume impacts the proposed design presented in the CMI Plan. For example, no monitoring wells exist on the west and southeast sides of the plume. Specifically: there are no wells with TCE concentrations below the CAO between 54MW17 and 54MW12 to the west (downgradient direction), a distance of over 160 feet; nor between 54MW17 and 54MW14 to the southeast (upgradient of historical center mass of the plume), a distance of over 100 feet. These distances represent a data gap associated with the nature and extent of the TCE plume. Section 2.3 (Monitoring and Injection Well Installation) indicates that data gaps on the southeastern and southwestern portions of the plume were defined with the installation of 54MW15 through 18; however three of the four wells are located within

the plume boundary. Revise the CMI Plan to demonstrate that the nature and extent of the TCE plume has been sufficiently delineated both vertically and horizontally. Based on the delineation of the TCE plume, revise the CMI Plan to demonstrate how the plume will be fully remediated to the proposed CAO, especially to the west and southeast of the plume.

3. Based on the analytical data provided in the Pilot-Scale Test Report, TCE may have migrated due to the Pilot Test injections, and may not be breaking down as would be expected, as indicated by the lack of increased breakdown products in the wells. For example, the TCE concentrations in wells 54MW10, 54MW11, and 54MW15 increased after the injection. Monitoring well 54MW10 increased from a baseline of 29.6 ug/L to 111 ug/L, 57.8 ug/L, 41.2 ug/L, and 30.3 ug/L, indicating that the TCE level in the well was still slightly higher than the baseline after a significant increase following the injection. Monitoring well 54MW11 increased from a baseline of 35.7 ug/L to 32.9 ug/L, 39.7 ug/L, 39.9 ug/L, and 44 ug/L, indicating that the TCE levels were steady to increasing in the well. Monitoring well 54MW15 increased from a baseline of 39.2 ug/L to 87.7 ug/L, 67.7 ug/L, 54.7 ug/L, and 57.9 ug/L, indicating that the TCE level in the well was still higher than the baseline after an increase following the injections. It is also noted that there were generally no changes in DCE, VC and TOC in these wells. The apparent increase in TCE in some wells and lack of breakdown products indicate that the TCE plume may be pushed downgradient during the injections. Revise the CMI Plan to address the potential for the TCE plume to be pushed during the injections and ensure that the remedial design accounts for this possibility. An appropriately expansive monitoring well network capable of determining contaminant migration and expansion should be proposed, installed and monitored.
4. The CAO for TCE provided in the CMI Plan is 22 ug/L; however, the text does not indicate whether this value was approved by the regulatory agencies. Revise the CMI Plan to state whether the CAO value for TCE was approved by the regulatory agencies. In addition, revise the CMI Plan to clarify the receptors of which this CAO is protective. Receptors should be addressed by presenting a site conceptual model which shows the exposure pathways determined to be complete, and how the proposed CAO and remedial actions will mitigate the at-risk exposure pathways.
5. The proposed injection solution of 1.5% emulsified vegetable oil (EVO) and potable water is stated to be injected at a flow rate ranging from 1 to 9 gallons per minute (gpm) and a pressure ranging from approximately 10 to 25 pounds per square inch (psi). It is also stated in Appendix A, Section 3.3.1, TCE ISB Injection Results, that the vertical distribution over the injection interval is not uniform and that the fluid was being exposed at the surface during injection at each well. The rationale for choosing the concentration, flow rate, and pressure are not discussed in the text and it is unclear if any or all of the parameters should be reevaluated. Further, observation of EVO approximately 10 to 12 feet from the injection locations after a very low injection volume does not on its own indicate that the vertical distribution is non-uniform. Revise the CMI Plan to present the rationale for the concentration, flow rate, and/or pressure of the solution and any appropriate revisions or considerations for the full-scale injection. Also provide other lines of evidence to support or refute the statement that the vertical distribution is non-uniform.

6. The source area is defined in Appendix A, Section 3.2.2 (Stage 2: 54MW15 through 54MW18 and 54IW01 through 54IW05), as being near the monitoring wells with the highest concentration of TCE. The section states: "The highest TCE concentrations at the site were encountered at injection wells 54IW02 (246 µg/L), 54IW03 (181 µg/L), and 54IW04 (256 µg/L), indicating the 'source area' had also been defined and was the area targeted by the ISB pilot-scale injections." As indicated on Figure 3-4 TCE Concentrations – Baseline August – December 2009, no additional source area wells are present to the south and west of the three wells with the highest concentrations of TCE. Revise the CMI Plan to provide additional information about how the source area was defined and characterized.

7. The Final RCRA Corrective Action Plan, OSWER 9902.3-2A, dated May 1994 (Corrective Action Guidance) provides basic information that should be presented in CMI documents. While it is understood that there is flexibility in the corrective action process, basic information outlined in the Corrective Action Guidance, as outlined below, should be addressed as part of the CMI to document the overall protectiveness of the selected remedy and its short- and long-term reliability/effectiveness. For example:
 - The CMI Plan does not include a conceptual model of contaminant migration. The conceptual model consists of a working hypothesis of how the contaminant may move from the release source to the receptor population and should include a description of the phase (water, soil, gas, non-aqueous) and location where contaminants are likely to be found.
 - A description of the management approach including levels of authority and responsibility (including an organizational chart), lines of communication and the qualifications of key personnel who will direct the corrective measure design and implementation effort has not been provided.
 - Performance requirements for the overall corrective measure and for each major component have not been provided.
 - Site safety and security provisions (e.g., fences) have not been specified to ensure control of the remedial action implementation area. If this is deemed to be unnecessary, justification should be presented.
 - A list and description of the permits needed to construct and operate the corrective measure has not been provided. While Section 3.1 (Injection Well Installation) of the CMI Plan states that the Puerto Rico Environmental Quality Board (PREQB) requires well construction permits, Section 2.3 (Monitoring and Injection Well Installation) states that well construction permits are not required. Clarify whether or not a permit is required for the installation of the wells and include the permitting process as a component of the project schedule.
 - An Operation and Maintenance (O&M) Plan has not been provided.

Revise the CMS Addendum and CMI Plan to provide the basic requirements established in the Corrective Action Guidance, as described above, for the selected corrective measures.

8. The CMI Plan does not discuss the potential salinity of the groundwater and any influences this could have on the proposed treatment processes. Revise the CMI Plan to discuss the potential salinity of the groundwater and any influences this could have on the proposed treatment processes.
9. The CMI Plan references the sampling and analysis plan (SAP) prepared for the pilot studies at SWMUs 54 and 55. However, a CMI-specific SAP and quality assurance project plan (QAPP) should be prepared that addresses the long-term monitoring activities presented in the CMI Plan. Revise the CMI Plan to include or reference, a SAP and QAPP for the project-specific activities presented in the CMI Plan.
10. The Pilot-Scale Test Report contained in Appendix A of the CMI Plan does not contain a data usability discussion. While data validation reports (DVRs) have been included in the CMI Plan, a discussion of the extent of the quality control (QC) exceedances, and how qualifications affect data usability have not been included. The *Amended Final Sampling and Analysis Plan for the Pilot Test at SWMU 54 and 55*, dated January 31, 2011 (Pilot Test SAP) states that a data quality evaluation will be provided as part of presentations to the Tier 1 Partnering Team, followed by the technical memorandum prepared to assess remedy effectiveness. The technical memorandum will identify any data usability limitations and make recommendations for corrective action if necessary. Revise the CMI Plan to include the technical memorandum that discusses data usability, or include this information in the CMI Plan.
11. The CMI plan does not contain an evaluation of overall trends, biases, or recommendations for corrective action. However, it appears that there is a trend related to low recoveries of sulfide in the matrix spike/matrix spike duplicates (MS/MSD). All but one of the six DVRs notes that the MS/MSD for sulfide exceeded acceptance limits. According to the Pilot Test SAP, a technical memorandum will be prepared to identify any data usability limitations and make recommendations for corrective action if necessary. Revise the CMI Plan to include a discussion of the consistent low recoveries of sulfide, and whether corrective action was performed or considered to address these low MS/MSD recoveries.
12. The DVRs appear to indicate that only the parent sample was qualified for sulfide MS/MSD exceedances. However, since the MS/MSD is a batch QC sample, all associated results in the sample delivery group should be qualified. Revise the DVRs to qualify all associated sulfide results where the MS/MSD recoveries exceeded acceptance criteria.
13. The DVRs included in Appendix C of the CMI Plan note that exceedances of quality control limits were found, but do not provide the extent of the exceedances. Therefore, it is not possible to tell if the samples have been qualified correctly, or to thoroughly assess the data quality. For example, the DVR dated April 2, 2010 indicates that the surrogate 4-bromofluorobenzene was below acceptance criteria, and the associated sample was qualified as estimated. However, the extent of the exceedance was not provided. Therefore, it could not be determined if the sample results should have been rejected rather than qualified as estimated. Revise the DVRs to provide the extent of all QC exceedances.

SPECIFIC COMMENTS

1. **CMI Plan, Section 2.2.1 Groundwater Sample Collection, Page 2-2 and Table 2-1 Groundwater Sampling Schedule:** The text indicates that the groundwater samples were analyzed for TCE, DCE, VC, dissolved iron, dissolved manganese, sulfate, sulfide, TOC, methane, ethane, ethane (MEE), and alkalinity; however the specifics of the sampling schedule including when and why certain wells were or were not sampled for certain analytes is not discussed. The table indicates that only wells 54MW15 through 54MW17 were sampled in February, April, and August 2010, and wells 54MW09 through 54MW14 and 54MW18 were sampled for a select analyte suite in November 2010. Clarify the details regarding the sampling schedule and analytes in the text of the CMI Plan.
2. **CMI Plan, Section 4.1 Post-Injection Performance Monitoring, Page 4-1:** The CMI Plan proposes three semi-annual sampling events to be conducted following the injection of EVO to evaluate system performance. No justification for this assessment frequency is provided. Revise the CMI Plan to substantiate the assessment time frame, duration, and sampling frequency.
3. **Appendix A, Section 2.7.1 TCE ISB Injection, Page 2-9:** It is stated that in order to evaluate the zone of influence, the area, including the monitoring wells are “visually inspected for EVO at adjacent monitoring and injection wells.” No additional details regarding how the wells are visually inspected are provided. Indicate how the wells are visually inspected for EVO, such as whether or not all wells in the area are opened, if their water levels are measured, if the injection proceeds until the EVO reaches the surface etc. and indicate to what extent “daylighting” is used to determine the zone of influence.
4. **Appendix A, Section 3.3.1 TCE ISB Injection Results, Page 3-11:** The discussion of the ISB Injection Results indicates that “daylighting” of injection fluid was observed frequently during field operations, specifically “daylighting” was observed during injections at each injection well. In order to address the presence of injection fluids as well as, presumably, contaminated groundwater at the ground surface, the injection pressure was decreased to avoid additional surfacing of injection fluid. In at least one case, the “daylighting” may have been due to poor well construction. No actions to contain the injection fluid and contaminated groundwater at the surface are discussed and no preventative measures are proposed to prevent the future “daylighting” of the injection fluid and contaminated groundwater in the full-scale injection process. As discussed, the pressures were decreased; however, since this occurred at each injection well, it does not appear that the corrective measures implemented were sufficient to prevent “daylighting” at the wells. The root cause of the excessive “daylighting” should be investigated and corrective measures should be implemented to prevent surfacing of the fluids during the injection process, including possibly replacing well 54IW02 if the well is found to be of poor construction.

5. **Appendix A, Section 3.3.1 TCE ISB Injection Results, Page 3-12:** This section states that the vertical distribution over the injection interval is not uniform. The vertical distribution is not further discussed and all wells that are monitored in the area have a screened interval between approximately 20 to 30 feet below ground surface (bgs). Due to the variable vertical extent and the “daylighting” of the fluids, monitoring of additional depths bgs in the area is recommended to ensure that the fluid is not shallower or deeper than intended during the remediation process.