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COMMONWEALTH OF PUERTO RICO
OFFICE OF THE GOVERNOR
ENVIRONMENTAL QUALITY BOARD

February 27,2004

Mi-. Adolf Everett, P.E.
Chief
RCRA Program Branch
Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866

Comments on the Draft Work Plan and Sampling and Analysis Plan
Soil and Groundwater Background Investigation

Dear Mr. Everett:

The Puerto Rico Environmental Quality Board (EQB) respectfully submits to EPA the comments contained herein regarding the environmental investigation in the former Atlantic Fleet Weapons Training Facility, Vieques Island. The reviewed document is "*Draft Work Plan and Sampling and Analysis Plan* ***Soil*** *and Groundwater Background Investigation Former Atlantic Fleet* ***Weapons*** *Training Facility, Vieques, Puerto Rico"* dated **December 2003**

If you have any questions or comments, do not hesitate to contact me at 787-365-8573.

Cordially,

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Technical Comments

Draft Work Plan and Sampling and Analysis Plan
Soil and Groundwater Background Investigation
Former Atlantic Fleet Weapons Training Facility
Vieques, Puerto Rico
December 2003

Introduction

The above-referenced document is a revision of the September 6, 2001 *Draft Final Work Plan and Sampling and Analysis Plan, Soil and Groundwater Background Investigation* prepared by CH2M Hill. TRC provided comments on the 2001 work plan to Don Elliott and Desiree Giler on October 30, 2002. Based on the review of the revised work plan, most of EQB's comments on the September 6, 2001 document were not addressed. Comments that were either not addressed or that were not addressed satisfactorily, are reissued herein, or are revised to address new concerns. New comments from the review of the revised document are also provided and identified as such.

Major Comments

1. New Comment. Page 2-2, Section 2.1, Paragraph 6 - The revised document states that inorganic levels within the various soil types found on Vieques Island were similar to those from earlier sampling. However, the previous background soil samples collected from the western portion of Vieques Island only included the Qa, Kv and KTd soil types. The Qb (beach and dune deposits) and TI (marine sedimentary rocks) soil types were not previously sampled. These soil types may contain different inorganic concentrations than the other soil types due to their different origins. There is no previously collected data for the Qb and TI soil types. If these two additional soil types are sampled, clarify how sample similarity will be assessed.

2. Page 2-4, Section 2.3.2, Paragraph 4 – TRC's 2001 comment stated that samples should be analyzed for non-inorganic parameters to check that the areas sampled are not contaminated. Although the revised document includes analysis for organics such as pesticides, explosives, and perchlorate, the suite of organics does not included polyaromatic hydrocarbons (PAHs) as a proxy indication of general manmade impacts. As stated in the prior comments, the representativeness of background samples collected along a roadway (as discussed on Page 2-3, Section 2.3, paragraph 5) is questionable, and compounds like PAHs may be elevated near roadways and thus not truly indicative of background. Including PAHs in the suite of analysis could serve as a check on the area selected for background sampling. If PAHs are present at elevated concentrations, then it would indicate that the sample location was not far enough removed from the roadway (e.g., impacted by road runoff or exhaust deposition) or other source of contamination and is potentially unsuitable as a background location. The pesticide sampling added by the Navy will also assist in the determination of a suitable background location as these areas may have been impacted by crop, weed or mosquito control.

   TRC also noted that photographs should be taken of each sample location to provide another line of evidence that the area is not impacted by contamination and that all photographs should be provided with the Background Investigation Report. The photograph(s) should show the sampling location and general surrounding area. Although interested parties are invited to participate in a pre-sampling tour of all proposed sampling locations (page 2-3), TRC still recommends photographing all sampling locations.

3. Page 4-9, Section 4.2.1, Paragraph 2 – TRC's 2001comment stated that analytical detection limits must be less than the EPA Region IX Preliminary Remediation Goals (PRGs) and ecological criteria. This comment was not addressed. The Background Investigation Report must provide a comparison of detection limits and analyte detections with PRGs and ecological criteria.

4. New Comment. Page 1-1, Section 1.0, Paragraph 1 – This paragraph should also reference the following applicable documents and the work plan should demonstrate that relevant content has been incorporated into the technical approach:

- Role of Background in the CERCLA Cleanup Program, *OSWER 9285.6-01P, April 26, 2002*
- Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites, *OSWER 9285.7-41, September 2002.*

These documents were developed by EPA to assist Superfund regional project managers (RPMs) and human health and ecological risk assessors during the remedial investigation process to evaluate background concentrations at Superfund sites. Since the Former Atlantic Fleet Weapons Training Facility may become a Superfund site, these documents are applicable and relevant.

5. New Comment. Section 2 – General comment on sample collection. Data concerning surface soil physico-chemical properties and heterogeneity between background and impact area sample locations should be collected and compared. For example, sample locations should be roughly equivalent in terms of plant species composition, structure, and estimated canopy cover for reliable background/impact area comparisons. Different plant species can respond in different ways to the physico-chemical properties of soils (e.g., species compostion, structure, and canopy cover) and thus can be indicative of differences in the physico-chemical properties of soils and disturbance regimes on fine spatial scales. Also, data concerning soil properties and characteristics (e.g., Munsell hue, value and chroma) should also be collected to support comparisons with impact areas with no or limited vegetation. The data concerning surface soil physico-chemical properties and heterogeneity between background and impact area sample locations should be collected to assist in selecting sample locations and/or the interpretation of the resulting analytical data.

6. New Comment. Page 2-1, Section 2.0 - This section should include a discussion of the appropriate numbers of samples (i.e., sample size) for background investigations. Section 3.5 of the "*Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites*" (September 2002) provides guidance on a statistical approach for selecting background sample size for soils.

7. New Comment. Page 2-2, Section 2.1 – The report indicates that "bedrock in the AFWTF area is predominantly unweathered", however, Figure 2-5 indicates that for soil types Kv and KTd that deep weathering is a possible feature of these soils. Provide geologic borings or cite references to establish that the bedrock is predominantly unweathered in this area.

8. New Comment. Page 2-4, Section 2.3.1 – The September 6, 2001 version of this work plan included collection of a groundwater sample from a water supply well. Clarify why this well is not proposed for sampling in the current document.

9. Page 2-4, Section 2.3.1, Paragraph 1 – TRC's 2001 comments stated that piezometers should not be used to collect samples for groundwater quality since they are typically constructed for obtaining water level measurements and are not constructed for obtaining representative samples for water quality analysis. Information provided in Table 3-1 in Appendix A of the Current Conditions report suggests that the piezometers have been constructed in a manner that potentially biases chemical results to lower

concentrations due to excessive screen or filter sand-pack length (e.g., over 100 feet in P-1). This comment was not addressed. Piezometers should be replaced with new or appropriately located existing monitoring wells.

10. Page 2-7, Section 2.3.1, Paragraph 1 – TRC's 2001 comment requested a discussion of how representative samples are to be obtained from wells with screens longer than 10 feet. Page 30 of *The Practical Guide for Ground-Water Sampling* (Illinois State Water Supply, 1985) acknowledges sample dilution resulting from long well screens. EPA's *RCRA Ground-Water Monitoring: Draft Technical Guidance* (EPA, 1993) recommends that well screens be no more than 10 feet long (page 4-41, page 5-7, and page 6-40). According to Table 3-1 of the Current Conditions, 5 out of 11 wells and 6 out of 8 piezometers have excessive screen or filter pack lengths that could impart a low bias to chemical results. In wells NW-1, NW-4, NW-6, NW-7, P-1, P-2, P-3, P-5, and P-9, the extra filter pack above the height of the well screen creates a longer length to intercept the aquifer and results in a potential dilution. In wells NW-6 and P-8, screens are longer than 10 feet also potentially resulting in dilution. This comment was not addressed. These wells are not suitable for obtaining representative groundwater samples.

11. Page 2-10. Figure 2-4 – TRC's 2001 comment requested that Figure 2-4 be provided in E size for review of the PI sites versus background locations. This comment was not addressed.

12. New Comment. Page 2-10. Figure 2-4 – The description of KTd soils is truncated

13. New Comment. Page 3-1, Section 3.1.1 – If box plots and/or tests for outliers are proposed to distinguish "natural innate variability" from laboratory error then they should be specified in this section. Rosners test for detecting up to *k* outliers is one such test (Rosner, 1983), and is appropriate when the sample size is greater than 25 samples. Since the Rosners test assumes a normal or lognormal distribution, then the data will have to be subjected to a goodness-of-fit test and if non-normally distributed, transformed.

14. New Comment. Page 3-2, Section 3.1.2 – It is the shape of the probability distribution that allows investigators to select the appropriate transformation to achieve a normal distribution. Parameters that influence the shape of the probability distribution include skewness and kurtosis. Goodness-of-fit tests are used to indicate whether the given data distribution departs significantly from normality. Examples of appropriate goodness-of-fit tests include the Shapiro-Wilk *W* test (Shapiro and Wilk, 1965), which is suitable for sample sizes less than 50; the Lilliefors test (Lilliefors, 1967; Lilliefors, 1969), which is suitable for sample sizes greater than 50; and the two-sample Kolmogorov-Smirnov *D*-test (Chakravarti, Laha, and Roy, 1967), or D_{MAX}, which can be applied to data sets that contain more than ten samples. These tests are suitable for most of the sample sizes and distributions likely to be encountered in environmental data analysis, but the underlying limitations of the tests should be understood to guard against misapplication and to identify when other tests should be used.

    Note that a suite of data transformations (and combinations of transformations) exist that are capable of converting even the most exotically distributed data sets to a normal distribution. Based upon the shape of the probability distribution histogram, it will become clear to the investigator whether to, for example, select an inverse transformation (1/x); $\log_{10}$; natural log (ln); square root; reflect; one of the trigonometric functions (e.g. arcsin); or some combination thereof e.g., $\log_{10}$ (1/x). Therefore, examination of the data's probability distribution using histograms or other suitable techniques is strongly recommended prior to selecting the appropriate data transformation or proceeding with non-parametric tests. For example, if the change in the relative distance between data points following transformation affects interpretation of results, then the raw, untransformed data should just be subjected to a non-parametric test.

15. New Comment. Page 3-4 (Two-Sample Test) - Indicate that statistically significant results will be

reported where $p<0.05$ α probability levels. Also, list a few descriptive statistics along with the test statistic (e.g., mean/median, standard deviation, standard error).

16. New Comment. Page 3-4 (Geochemical Techniques/Correlations of Major Elements) – If a parametric correlation analysis will be used (e.g., Pearson product-moment correlation coefficient), indicate that the data will be transformed to achieve normality before using the test. A Pearson product-moment correlation matrix (Pearson, 1896) would be very useful if multiple interactions are to be investigated. If the data do not lend themselves to transformation (i.e., skewness and kurtosis are extremely high), a non-parametric Spearman Rank Order correlation coefficient (Gibbons, 1985) would be appropriate. A Spearman Rank Order correlation matrix can also be constructed when examining multiple interations. In both instances, use the t-statistic (t_s) to identify significant correlation coefficient (r) and indicate in the narrative that all significant correlation coefficient (r) will be reported where $p<0.05$ α probability levels.

17. New Comment. Page 3-4 (Effects of Suspended Particulates) - In addition to using a correlation coefficient, an effective analysis of individual (or combined) effects of pH and turbidity on trace elements might include multivariate analyses such as Principal Components Analysis (PCA), or possibly non-metric multidimensional scaling (NMS). (Gauch 1982)) NMS is especially desirable in that it can be used with non-normally distributed data (examines ranks of data sets). In this manner, data can be ordinated along two axes of concern (e.g., pH and turbidity) and the most important variable(s) can be identified.

18. New Comment. Page 3-5, Figure 3-1 –

a. EPA-developed software programs like ProUCL (EPA, 2003) will not calculate a non-parametric upper confidence limit (UCL) for highly skewed data sets (σ >3.0). In those instances where the UCL cannot easily be determined for exotic distribution types (e.g. gamma), and a non-parametric method for calculating the UCL cannot be identified, the maximum sample value should be used rather than arbitrarily selecting a non-parametric UCL. Both the sample mean and the standard deviation should be reported along with the UCL value and the selected method for calculating the UCL.

b. Clarify why a non-parametric UCL would be calculated for a data set that follows a normal distribution following log transformation. This may be a typographic error, because parametric testing/calculation procedures are preferred when you have normally distributed data.

19. Page 4-1, Section 4.1.1.1 – TRC's 2001 comment stated that the qualifications of the laboratory must not only meet EPA Level D quality control, but also meet the QA requirements specified in the QAPP and the project-required reporting limits. In addition, the laboratory must be CLP-certified or EPA approved, as per Section X of the Consent Order. This comment was not addressed.

20. Page 4.2, Section 4.1.2.2, Paragraph 7 – TRC's 2001 comment stated that the submersible pump used for groundwater sampling must have a flow rate adjustable to less than 300 milliliters per minute (mL/min). Section V of Region II's March 16, 1998 Standard Operating Procedure (SOP) *Groundwater Sampling Procedure Low Stress (Low Flow) Purging and Sampling* (EPA, 1998) specifies that purging should be conducted at 200-500 mL/min. This SOP must be followed.

21. Page 4-3, Table 4-1 – TRC's 2001 comment requested revisions to Table 4-1 indicating that groundwater samples will be collected for total (unfiltered) metals analysis. Page 7-20 of EPA's *RCRA Ground-Water Monitoring Draft Technical Guidance* (EPA, 1993) discusses the inaccuracy of data from field-filtered samples. This comment was not addressed.

In addition, the number of inorganic groundwater samples should be doubled to account for the collection of filtered and unfiltered samples at each location.

22. New Comment. Page 4-3, Tables 4-1 and 4-2 - For soil and groundwater samples, the tables cite SW-846 methods 8081A and 8082 for the analysis of pesticides. SW-846 method 8081A is the correct method. If PCBs are also to be analyzed, then SW-846 method 8082 is appropriate and PCBs should also be listed on the tables; otherwise, the reference to SW-846 method 8082 should be eliminated.

23. New Comment. Page 4-3, Table 4-1 - The method reference for perchlorate analysis (314) should specify Revision 1 (November 1999).

24. New Comment. Page 4-4, Table 4-2 - There are no sample container, preservative, and holding time information entered for the perchlorate analysis of groundwater samples. These samples should be collected in a 1-liter polyethylene container, cooled to 4°C, and analyzed with 28 days of collection. This information must be added to Table 4-2.

25. New Comment. Page 4-5, Section 4.1.4 – Explain how sampling locations will be surveyed in areas where the forest canopy obstructs the GPS signal transmittal.

26. New Comment. Page 4-5, Section 4.1.5 – Sample locations should be identified with field markers such as wood or metal stakes in the event that resampling or reinspection of the area is required once the sampling has been completed.

27. Page 4-6, Table 4-4 – TRC's 2001 comment requested adding sample type designators for groundwater and surface water to Table 4-4. This comment was not addressed.

28. Page 4-9, Section 4.2 – TRC's 2001 comment requested clarification regarding the use of EPA National Functional Guidelines or Region II validation guidelines. There are various references to validation guidelines in this section. As per the Consent Order, Section X, Region II data validation guidelines must be used. Other validation guidelines may be used with prior EPA approval. It is unclear whether EPA approval has been given for use of other validation guidelines. References to both organic and inorganic validation guidelines are required since the metals data from the Baker (1999) investigation will also be validated. This comment was not addressed. The references should be as follows:

    For EPA National Functional Guidelines:

    - *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (October 1999)

    - *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (July 2002). Note that these guidelines have been updated since TRC's prior review of the September 2001 document.

    For Region II Guidelines (as per the Consent Order):

    - *CLP Organics Data Review and Preliminary Review* (March 2001)

    - *Evaluation of Metals Data for the Contract Laboratory Program* (January 1992)

Note that Region II has validation guidelines for SW-846 methods that may be more appropriate for this program. The guidelines listed above were in the Consent Order because the Consent Order assumed CLP methods would be used.

29. Page 4-9, Section 4.2.1, Paragraph 2 – TRC made a prior comment regarding the laboratory's submittal of a signed certificate of analysis with each data package. The certificate would state that all work was performed in accordance with the CLP SOW. However, as per the first sentence in this paragraph, all analyses are going to be performed using SW-846 methods. Therefore, this certificate would not be applicable to these analyses. The text should be edited. This comment was not addressed.

30. Page 4-10 to 4-11, Section 4.2.2 – TRC's 2001 stated that data validation results should be provided to the Puerto Rico Environmental Quality Board (EQB) with the Background Study Report. Validation methods and results should be confirmed. Validated data should be used to crosscheck the accuracy of data presented in the report. This comment was not addressed. This document should include a statement that this information will be provided to the EQB.

31. Page 4-10, Section 4.2.2, Paragraph 5 – TRC previous comment stated that the "U" qualifier is not defined as "not detected above the method detection limit." The laboratory must report down to the quantitation limit (as defined by the lowest calibration standard and as required by SW-846 methods), and not the method detection limit, which is a statistically derived value and not representative of the accurate limit of quantitation. This comment was not addressed.

32. New Comment. Page 8-1 - The listed data validation reference title is incorrect. This title is as follows: *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (July 2002). Based on Comment No. 26 above, this will need to be updated to the most recent revision (July 2002).

33. Appendix A, Checklist for Field Sampling and Analysis Plan, Site-Specific Quality Assurance Project Plan Checklist – TRC's 2001 comment stated that the site-specific QAPP must demonstrate that the analytical quantitation limits will achieve the risk-based standards. In addition, the site-specific QAPP must provide more details on QA criteria, which were not specified in the Master QAPP (see Master QAPP comments). This comment was not addressed.

34. Appendix A, Checklist for Field Sampling and Analysis Plan, Site-Specific Field Sampling Plan Checklist – The following comments were previously provided by TRC, but were not addressed in the new document.

    - Clarify why dissolved oxygen is not checked off as one of the field measurements to be taken. This parameter should be measured during groundwater sampling.

    - Clarify why oxidation-reduction potential is not included in the list of field measurements to be taken. This parameter should be measured during groundwater sampling and it is listed as one of the indicator parameters in Region II's SOP *Groundwater Sampling Procedure Low Stress (Low Flow) Purging and Sampling* (March 16, 1998).

    - The list of SOPs on the checklist did not always correspond to the titles of SOPs provided in

Volume 2 of the Master Project Plans. The following discrepancies were noted:

"Monitoring Well Installation" was entitled "General Guidance for Monitoring Well Installation" in Volume 2.

"Field Rinse Blank Preparation" was entitled "Equipment Blank and Field Blank Preparation" in Volume 2.

- An SOP listed on the checklist (Shallow Soil Sampling) was not provided in Volume 2 of the Master Project Plans.

- Several SOPs were present in Volume 2 of the Master Project Plans and are applicable to this site-specific Work Plan. These SOPs should also be included on this checklist and are as follows:

  "Volatiles Monitoring with an OVA"

  "Field Measurement of pH"

  "Field Measurement of pH and Eh"

  "Field Measurement of Specific Conductance and Temperature"

  "Field Measurement of Dissolved Oxygen"

  "Field Measurement of pH, Specific Conductance, Turbidity, Dissolved Oxygen, and Temperature Using the Horiba® U-10"

  "Preserving Non-VOC Aqueous Samples"

  "Groundwater Sampling from Monitoring Wells"

  "Soil Sampling"

  "Field Filtering"

  "Water-Level Measurements"

  Region II's SOP *Groundwater Sampling Procedure Low Stress (Low Flow) Purging and Sampling* (March 16, 1998).

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