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TREASURE ISLAND
SSIC NO. 5090.3.A

Department of Toxic Substances Control

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June 22, 2007

Mr. James B. Sullivan
BRAC Environmental Coordinator
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ANNUAL GROUNDWATER STATUS REPORT: SUMMARY OF GROUNDWATER MONITORING AT SITE 12, JULY AND NOVEMBER 2006, NAVAL STATION TREASURE ISLAND, SAN FRANCISCO, CALIFORNIA

Dear Mr. Sullivan:

The Department of Toxic Substances Control (DTSC) has received and reviewed the March 2007 *"Annual Groundwater Status Report: Summary of Groundwater Monitoring at Site 12, July and November 2006"* (Annual Report) for the Naval Station Treasure Island. The Annual Report evaluates whether contaminants are present in groundwater at concentrations posing a risk to human health or aquatic receptors. DTSC provides the following comments on the Annual Report:

1. Remedial Investigation: DTSC views the Annual Report as an integral appendix to the forthcoming Site 12 Remedial Investigation Report. The Navy would use the data and information presented in the Annual Report to support Site 12 remedial investigation and feasibility study efforts; therefore, the Navy should prepare and present the Annual Report for regulatory review as a primary CERCLA document. DTSC requests the Navy transmitting future Annual Report versions to both DTSC and the California Regional Water Quality Control Board as primary reviewers.

2. Soil Gas Contamination: During review of the Annual Report, DTSC checked the May 2, 2003 *"Technical Memorandum, Summary of Soil Gas Investigation Installation Restoration Site 12"* (Soil Gas Technical Memorandum). DTSC has preliminary comments on the Soil Gas Technical Memorandum that interrelate with the groundwater results in the Annual Report. Please clarify whether any

regulatory agency has reviewed the Soil Gas Technical Memorandum and forward all Responses to Comment and agencies' concurrences in PDF files to DTSC at hwong@dtsc.ca.gov.

3. Additional Comments: DTSC comments include the enclosed DTSC memorandum dated June 21, 2007.

DTSC is ready to work with the Navy and its consultant in resolving the comments. Please prepare a Response to Comment and revise the Annual Report accordingly for subsequent review. DTSC will provide comments on the Soil Gas Technical Memorandum separately. If you have any question, please contact me at (510) 540-3770.

Sincerely,

Henry Wong
Remedial Project Manager
Office of Military Facilities

Enclosure

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MEMORANDUM

TO: Henry Wong
Remedial Project Manager
Office of Military Facilities

FROM: Eileen Hughes, P.G. *Eileen Hughes*
Engineering Geologist
Office of Military Facilities

REVIEWER: Michael O. Finch, P.G. *Eileen Hughes for Michael O. Finch*
Senior Engineering Geologist
Geologic Services Unit

DATE: June 21, 2007

SUBJECT: **REVIEW OF DRAFT ANNUAL GROUNDWATER STATUS REPORT FOR SITE 12, JULY AND NOVEMBER 2006, NAVAL STATION TREASURE ISLAND, SAN FRANCISCO, CALIFORNIA**

ACTIVITY REQUESTED

Per your request, the following report has been reviewed: *Draft Annual Groundwater Status Report: Summary of Groundwater Monitoring at Site 12, July and November 2006, Naval Station Treasure Island, San Francisco, California* dated March 2007 (Annual Report). The Annual Report was prepared by Pacific Treatment Environmental Services, Inc. (PTES) for the U.S. Department of the Navy, Naval Facilities Engineering Command, Base Realignment and Closure Program Management Office West, San Diego, California (Navy). The focus of this review was on the extent of contamination, and on evaluation of the program with respect to recent investigations in groundwater monitoring areas. Other site documents were considered, and are cited below.

PROJECT SUMMARY

The former Naval Station Treasure Island (NAVSTA TI) comprised two connected islands in the San Francisco Bay – Yerba Buena Island (YBI, a natural island) and Treasure Island (TI, a manmade island). Military activities at NAVSTA TI date back to 1866, when the U.S. government took possession of YBI (147 acres) for defensive fortifications. In the late 1930s, TI (403 acres) was constructed over a sand spit (Yerba Buena Shoals) which extends north from YBI. Sand dredged from the Bay and the Sacramento River Delta was placed over the sand spit, within a retaining wall of rock and sand dikes.

Installation Restoration Site 12 (Site 12) is located on the northwestern shore of TI adjacent to the San Francisco Bay and comprises about 94 acres. Prior to 1968, Site 12 was used for ammunition storage in bunkers (the Old Bunker Area), solid waste disposal, an aircraft runway, and vehicle parking for the 1939 Golden Gate International Exposition. Incinerator(s) and burn pits are suspected. Since 1968, Site 12 has been predominantly residential housing. Most of the buildings are still in use: some buildings adjacent to excavations have been evacuated.

Limited areas of Site 12 are included in the groundwater monitoring program. Groundwater samples were collected from four source areas: two solid waste disposal areas (SWDA A/B and SWDA 1207/1209) and two petroleum release areas (Mariner Drive Petroleum Area and Building 1311/1313 Petroleum Area). Mariner Drive Petroleum Area is an upland source area: the other three source areas are adjacent to the Bay. Lead contaminated soil was excavated from portions of SWDAs A/B and 1207/1209. Polycyclic aromatic hydrocarbons (PAHs) were excavated from suspected solid waste disposal trenches in the Mariner Drive Petroleum Area. No excavations were conducted in Building 1311/1313 Petroleum Area. Additional removal actions are planned.

Other areas of concern on Site 12 include: a shoreline disposal area (SWDA 1231/1233, where radioactive compounds were recently found), an upland disposal area (Bigelow Court), a storage area (Halyburton Court), and various petroleum release areas. These areas are not included in the monitoring program. Excavations have been conducted in some of these areas. Site 20 (auto body shop and transportation center) is in the southern portion of Site 12.

During development of the housing, solid waste removed from beneath planned building foundations was mixed with sand, spread over larger areas, and covered with clean fill. The primary chemical of concern in debris is lead. Other metals, total petroleum hydrocarbon (TPH), PAHs, and polychlorinated biphenyls (PCBs) exceed screening levels.

The purpose of the monitoring program was to assess whether chemicals released to groundwater would have the potential to reach the Bay and adversely affect aquatic receptors. Sampling was conducted pursuant to:

- *Final Sampling and Analysis Plan Addendum 02 (Field Sampling Plan/Quality Assurance Project Plan) Facilitywide Groundwater Monitoring Program (Installation Restoration Site 12 and Petroleum Sites 6 and 25)*, PTES, June 2006 (SAP Addendum),
- *Final Technical Memorandum: Long-Term Monitoring Optimization of Groundwater at Site 12, Old Bunker Area, Naval Station Treasure Island, San Francisco, California*, Sultech, November 16, 2005 (LTMO TM),

- *Technical Memorandum: Investigation of Arsenic in Groundwater: Installation Restoration Site 12, Naval Station Treasure Island, Treasure Island, San Francisco, California*, Sultech, October 2004 (As TM), which evaluated arsenic (As) mobilization for four wells at Building 1311, and
- *Final Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan) Facilitywide Groundwater Monitoring Program*, Sullivan Consulting Group, Inc and Tetra Tech EM Inc., May 2004 (SAP).

GENERAL COMMENTS AND RECOMMENDATIONS

1) Criteria. The monitoring program was based on aquatic protection criteria only (page ES-1, Table 2-1, and Appendix A). Pursuant to the LTMO TM and SAP Addendum, limited sampling was conducted within or directly adjacent to plumes delineated by aquatic criteria for total petroleum hydrocarbons (TPH: 1,400 ug/L, combined TPH-extractable and TPH-purgeable), arsenic (As: 15 ug/L, ambient value) and manganese (Mn: 600 ug/L, "toxicity screening" value).
   Aquatic criteria may not be sufficient for all expected re-uses. Other considerations may include indoor air intrusion and construction worker safety (page 2-4), as well as nuisance concerns. The text says that consideration of other pathways is outside the scope of the report (Section 2.4.1).
   However, if aquatic criteria are not sufficient for all expected re-uses, the monitoring program may not be sufficient for feasibility study (FS) and remedial action decision-making. Additional monitoring may be required prior to the FS.
   Also, the monitoring program has not taken into consideration results of recent removal actions (e.g., radiological contamination): hence, the program may not be sufficient for FS purposes.
   Recommendations
   Include expected and potential reuses in the report (e.g., residential reuse, wetlands). Evaluate whether the existing data set, including results from soil removals, soil gas investigations, and other groundwater investigations, is sufficient for decision-making for all expected reuses. Identify new contaminants (e.g., radioactive compounds at SWDAs 1207/1209 and 1231/1233). Identify data gaps. Propose additional monitoring, as needed.

2) Metals. Increased mobility of As, and other metals (in particular: copper (Cu), iron (Fe), Mn, and zinc (Zn)) is associated with elevated TPH at Site 12. As, Cu, and Zn were measured above aquatic screening levels. Aluminum, As, barium, Cu, Fe, molybdenum, Mn, vanadium, and Zn were measured above ambient levels. Some exceedences were very significant: for example, Fe (42,000 ug/L) was two orders of magnitude above ambient (200 ug/L) at Building 1311/1313 (12-MW22).
   The concentration increase is not unexpected, since As and other metals can be mobilized during TPH biodegradation (As TM). Microbial reactions create reducing conditions. Fe^{+3} is reduced to Fe^{+2} and mobilized. As associated with Fe^{+3} is

mobilized at the same time. Other minerals (e.g., Cu, Mn, Zn) may also be mobilized.
Removal of TPH soil sources may eventually result in decreasing concentrations of As and other metals in groundwater. However, metal mobility may impact remedial decisions and/or design.
Recommendations
In addition to As, identify and discuss other metals that may be of concern for all expected and potential reuses (e.g., residential reuse, wetlands). Discuss all metals above ambient values. Discuss metals with regard to monitored natural attenuation (MNA) parameters and groundwater stabilization parameters (e.g., oxidation-reduction potential, or ORP). Evaluate whether all TPH areas on Site 12 have been characterized for metals. Discuss whether radiological contaminants may mobilize. Identify data gaps, propose monitoring (if needed) and provide criteria, accordingly.

3) DTSC concurs with Geomatrix's comment that the Navy's attribution of increasing arsenic in the Mariner Drive Area to TPH contamination is unsupported, given the absence of accompanying TPH data.
Recommendation
Add TPH to the analytical program for wells in the Mariner Drive Area.

4) Monitored natural attenuation (MNA). MNA data and field parameter data is presented from 1998 to 2006 (Appendix E). However, the data is not evaluated.
Recommendation
Please evaluate MNA results (as discussed in comments on Appendix E, below).

5) Turbidity. Low flow purging is supposed to result in low turbidity. However, high turbidity was measured at several wells, especially 12-MW20, where turbidity was measured at >1,100 nephelometric turbidity units (NTUs). High turbidity may increase uncertainty of sampling results.
Recommendation
Evaluate elevated turbidity at 12-MW20, and elsewhere (as discussed in comments on Appendix C, below).

6) Well depths are all similar, at about 13 to 14 feet below the ground surface. No sampling of deeper zones is included. Generally, monitoring of deeper zones is conducted, to evaluate whether vertical migration has occurred.
Recommendation. Explain why sampling of deeper zones is not included.

7) A tank is postulated as the source of the TPH in the Building 1311/1313 Petroleum Area (e.g., As TM: Figure 2). However, the large area of contamination (about the size of a football field) suggests that a more probable explanation may be disposal of petroleum waste, hazardous substances, and/or hazardous wastes. Moreover, the extent of contamination in the Building 1311/1313 area has not been fully determined, since samples to the east do not extend to the depth of the TPH smear zone.

Recommendations
With respect to sources of TPH contamination in the Building 1311/1313 area, please evaluate other options and revise the conceptual site model accordingly. Propose additional investigations, as needed.

8) Methane is a common degradation product in petroleum areas and SWDAs. In addition to being an MNA parameter, methane may present a risk of fire and/or explosion. Methane in soil gas may migrate along preferential pathways (e.g. utility lines) and may serve as a carrier gas for volatile organic compounds (VOCs). During this review, concentrations of methane in groundwater presented in the annual report were compared with methane in soil gas report: *Technical Memorandum, Summary of Soil Gas Investigation Installation Restoration Site 12 (SG TM),* Tetra Tech EM Inc., May 2, 2003.
In the soil gas report, source areas for methane and VOCs were indicated in SWDAs A/B, 1231/1233 and/or 1207/1209, and in the Mariner Drive Petroleum Area. Excavations were proposed for the SWDAs. Buildings overlie SWDAs and petroleum areas. Soil, soil gas, and groundwater under existing buildings has not been investigated. So, sources under buildings cannot be ruled out. But, soil under buildings will not be excavated.
No excavation or further investigation was proposed for the Building 1311/1313 Petroleum Area. A pipeline investigation was proposed for the Mariner Drive Petroleum Area.
Recommendation
Several deficiencies were observed with respect to the soil gas report. But since this memorandum is not the appropriate forum for comments on the soil gas report, it is recommended a meeting be scheduled to discuss the soil gas report and current vapor intrusion and methane guidance. For example, buildings overlying SWDAs and petroleum areas are scheduled for occupancy following excavation. But since sources may exist under buildings, sub-slab monitoring of buildings prior to and during occupancy is recommended. Another example (from DTSC's methane advisory): in order to limit methane generation, DTSC recommends that fill soils contain less than 0.5% total organic carbon.

9) It was observed that methane in groundwater was associated with methane in soil gas at SWDA A/B and Mariner Drive Petroleum Area. Therefore, methane in groundwater may serve as an indicator of source areas. Similarly, soil gas data may indicate additional analytes or locations for the groundwater program.
Recommendations
Evaluate groundwater data for methane with respect to potential source areas and potential risk of fire and/or explosion.
Discuss whether all petroleum areas and other areas of concern on Site 12 have been evaluated with regard to potential for methane (and VOCs) in soil gas. Identify potential data gaps. Compare results of investigations in various media, and propose changes to the groundwater program, as appropriate.

SPECIFIC COMMENTS

1) Title Page. All engineering or geologic work should be performed or supervised by a California Registered Professional in accordance with the Business and Professions Code, Chapters 7 and 12.5, and the California Code of Regulations, Title 16, Chapters 5 and 29. Confirm that the person in responsible charge is a California Professional Engineer or a California Professional Geologist. Provide name, signature, stamp and/or registration number on the title page.

2) Explain the differences between wells designated as inactive, abandoned, or destroyed (Figure 1-2). Confirm that all wells have been decommissioned in accordance with *California Well Standards Bulletin 74-91: Section 19: Requirements for Destroying Monitoring Wells and Explorations Holes*. Please include a table with well construction details for all wells and ground penetrations on Site 12. Include dates of decommissioning on the table. Provide copies of required decommissioning documentation.

<u>Figures</u>

1) Figure 1-2. Include the Mariner Drive Petroleum Area.
2) Figure 5-1. 12-MW29, with a groundwater elevation of 3.72 feet above mean sea level (MSL) is plotted between contours of 3.0 and 3.5 feet MSL. Please resolve this discrepancy.
3) Figure 5-4, 5-5a, and 5-5b. Generally, detection limits (DLs) are depicted on tables and figures (not ½ DLs). Explain why ½ DLs are shown on the figures. Please revise figures to show DLs. Also, revise figures so that connecting lines on both sides of non-detect (ND) values (hollow points) are dashed.

<u>Tables</u>

1) Include a table with summary results on a per well basis, with results of MNA parameters (anions, methane, ethane, ethane, nitrate and sulfide) and field test kits (e.g., alkalinity, Fe^{+2}, and Mn^{+2}). Similar tables are included in appendices (CD only): however, summary tables should be included as hardcopies in the front of the report.
2) Similarly, include a table with stabilization parameters for each well: these have a bearing on sample integrity and geochemistry of degradation (e.g., ORP, pH).
3) Table 2-1. Confirm that Table 2-1 lists all compounds detected on Site 12, with criteria and ambient values (when available).
4) Table 5-3 (and Remark 2). Include both values for duplicate results (not the average value).

<u>Appendix A</u>

1) Please resolve the following discrepancies:
   a) In the LTMO TM, the toxicity screening value for Mn was 900 ug/L. In this report, two values are presented. Table A-1 contains an ambient value for Mn of 900 ug/L (but no toxicity screening criteria). However, an ambient value of 600 ug/L

is included on Table 2-1. Identify the correct ambient value and revise the report accordingly. Verify whether there is a "toxicity screening criteria" for Mn.

b) For As, a screening criteria of 36 ug/L was used in this report: the ambient value (15 ug/L) was used in the LTMO. Explain why the value was changed.
c) Table A-2 lists 1,400 ug/L as the criteria for each individual TPH, including TPH as motor oil (TPH-mo). Table 5-3 says that the TPH criterion (1,400 ug/L) applies to the summed value of TPH-e and TPH-p. Verify the correct interpretation and revise the report accordingly.

2) Discuss ambient values in Appendix A. Describe when ambient values are selected as criteria.
3) Appendix A says that in 2006, "screening values for human health consumption of aquatic organisms were no longer deemed applicable for use" (page A-1). Expand this discussion. Are new values under consideration? If the criteria for "consumption of aquatic organism" are no longer applicable, explain why the criteria are still included on Table A-2.
4) Table A-1 contains "DTSC recommended screening criteria", calculated as one-tenth the lowest observable effect level, acute (LOEL, acute). According to the report, DTSC's more protective (lower concentration) criteria were provided in 2006. Add DTSC's criteria to Table A-2. Include DTSC's criteria in the discussion of tiers on page A-2.

<u>Appendix C</u>

1) Low flow purging is supposed to result in low turbidity. However, high turbidity was measured at several wells. High turbidity may influence interpretation of chemical analytical results and selection of sampling methodology (e.g., active vs. passive sampling), and may also suggest processes that require additional evaluation (e.g., microbial blooms) and possible revision of the site conceptual model.
   The highest value and the widest range was measured at 12-MW20 with a range >1,100 to 55, and a final reading of 800 nephelometric turbidity units (NTUs).
   For the first sampling on July 13, 2006, field notes for 12-MW20 say:

   > "First 7.0 L were extremely turbid due to iron precipitate perhaps due to weathering of the inner part of the well. Then we cleaned out YSI bc/H_20 from pumping well was clean but chamber of YSI was dirty. Turbidity reading at 8 L [57 NTUs] was from clean chamber. At 11.0 [L] took one last turbidity reading 21.3 (NTU)."

   The notes indicate that the field crew was attentive to the problem and tried to correct it. However, the final reading was still elevated, so it is not clear that corrective action was sufficient, despite perceptively "clean" water.
   For the second sampling on November 6, 2006, turbidity was still elevated (i.e., >1,100 NTUs, as mentioned previously). Iron was elevated to 3,000 ug/L (above ambient value of 200 ug/L). Zn was elevated to 480 ug/L (above ambient value of 4.4 ug/L). But the duplicate for Zn was ND: so, elevated Zn was considered an anomaly (Section 5.4.3.1). Total suspended solids (TSS) were 63,000 ug/L.
   12-MW20 is constructed of PVC so weathering of the well (as postulated by the field crew) does not seem a likely cause of turbidity in the well.

What is causing elevated turbidity in 12-MW20? Please investigate 12-MW20 further. For example, were similar conditions encountered during previous sampling events?

2) High initial values of turbidity may indicate that geochemical processes in well water are significantly different from processes in formation water. Elevated values are of concern even when final readings are stable (at +/- 10%). High values were measured at wells throughout Site 12, including (in NTUs): 12-MW15 (277 decreasing to 58.7), 12-MW17 (61 decreasing to 6.51), 12-MW20 (discussed above), 12-MW30 (175 decreasing to 3.80), 12-MW31 (55.3 decreasing to 4.73), and 12-MW34 (86.1 decreasing to 5.51).
In some cases, turbidity less than zero was recorded or "estimated" values were recorded when negative values were observed (e.g., field forms for As TM).
Recommendations
Evaluate whether elevated turbidity values are real or artifacts (e.g., due to an equipment malfunction or contamination from previous well).
Instruct the field crew to conduct corrective action when turbidity values are elevated or less than zero. Corrective action may involve re-measurement, cleaning equipment, calibrating equipment, and/or changing equipment.

3) Dissolved oxygen (D.O.) less than 0.5 mg/L is usually paired with low ORP (negative values). High D.O. and low ORP are inconsistent with each other and may indicate equipment problems. For example, 12-MW05 has D.O. of 2.96 mg/L and ORP of -206 mV and 12-MW16 has D.O of 1.5 mg/L and ORP of -168 mV.
D.O. and ORP are further discussed in Appendix E comments, below.

Appendices E: Monitored Natural Attenuation

1) The discussion in Appendix E1 is good but it is general in nature. A site-specific evaluation is not provided with regard to the MNA parameters and the field data included in Appendix E2 as well as the chemical analytical results presented in Appendix G.
Lines of evidence are mentioned for TPH and VOCs, but site-specific lines of evidence are not presented (e.g., trend analyses).
Metals are not fully discussed or evaluated. However, the mobilization of metals (above criteria and/or above ambient levels) with TPH degradation may be an important process at TI. Previously, mobilization of As and Fe was discussed in the As TM. And, mobilization of As and Mn was discussed in the LTMO TM. Mobilization of metals should be discussed wherever TPH is elevated in groundwater and soil. Metals may also be mobilized with degradation of VOCs: however, VOC concentrations in groundwater are typically low (less than 10 ppb) in the areas monitored.
Recommendations
Please expand the text to include a site-specific evaluation of the data: include figures illustrating trends and associations (e.g., "MNA polygons", as presented in the As TM). Continue the discussion (which was begun in the As TM and LTMO TM) regarding mobilization of As and other metals with degradation of TPH.

Evaluate whether the monitoring program is meeting its goal with regard to demonstrating MNA. Propose changes, as needed.

2) D.O. and ORP (as well as other field parameters) are used to demonstrate MNA. However, inconsistent values are presented in Appendix E2. For example, in many final readings, D.O. values in the aerobic range (e.g., above 1 mg/L) are paired with ORP values in the anaerobic range (e.g., below -50 mV). For example, at 12-MW21, D.O. at 11.9 mg/L was reported with ORP at -140 mV (May 30, 2003): many other examples of inconsistent values were reported.

   Initial readings from some wells are inconsistent and exhibit greater disparity than final readings. For example, for both 12-MW33 and 12-MW34 on October 7, 2003, initial D.O. values were about 8 mg/L and initial ORP values were about -300 mV. For wells sampled twice in the same day (As TM), D.O. concentrations in some wells quickly increased to above 1 mg/L between first and second sampling events, while ORP values were more stable (i.e., approximating the final reading of the first sampling).

   <u>Recommendations</u>

   To ensure that MNA data are robust enough to support the MNA model (and are not sampling or equipment artifacts), please instruct the field crew to conduct corrective actions for inconsistent values. Corrective actions may include repeating measurements, checking/cleaning/changing/re-calibrating equipment, and/or collecting samples for laboratory analysis.

3) Values presented in Appendix E2 were reviewed and, for some wells, values were checked against field forms in the As TM. Several errors (and/or anomalous values) were noted, which suggest that quality assurance/quality control (QA/QC) procedures could be improved. Errors may include transcription errors, inconsistent use of significant figures, incorrect units, or equipment malfunctions.

   For example, negative D.O values were reported (-1.55 mg/L at 12-MW17 on October 13, 2004 and -.10 mg/L at 12-MW23 on October 7, 2003). Very low ORP was reported (-7,140 mV at 12-MW22 on October 14, 2004). Very high specific conductivity was reported at several wells on November 6, 2006: 12-MW17 (10,900 mS/cm), 12-MW19 (1,870 mS/cm), 12-MW22 (1,740 mS/cm), 12-MW28 (9,590 mS/cm), 12-MW30 (5,050 mS/cm), 12-MW31 (1,210 mS/cm), and 12-MW34 (40,400 mS/cm). Values presented on field forms did not always agree with Appendix E2 values (e.g., 12-MW33 and 12-MW34 on December 16, 2002).

   <u>Recommendations</u>

   Please explain the QA/QC process for each field analyte, and discuss uncertainties. Several D.O. results were rejected (as indicated by the "R" qualifier). Discuss the criteria used to reject D.O. values. With respect to Mn, ">" signifies results greater than the calibration limit: on the table, please change "700>" to ">700". Please confirm that field test kits are not available for the range of Mn concentrations at the site. If kits are not available, perform lab analyses for Mn samples that are outside the range of field test kits. Check results in Appendix E2 against field forms with respect to transcription errors, significant figures, units, and possible equipment malfunctions. Comment on whether specific conductivity values for November 2006 are acceptable.

4) Field measurements of alkalinity, Fe^{+2}, and Mn^{+2}, as provided in Appendix E2, were not included on field forms in the As TM.
   <u>Recommendation</u>. Please include all field measurements on field forms.
5) pH values between 6 and 8 are required for VOC and TPH degradation. Metals are sensitive to pH. Some metals may be mobilized at both high and low values of pH (e.g., amphoteric metal hydroxides). pH values above 8 were observed at some locations, which may indicate increased potential for metal mobilization. For example, at 12-MW31, pH was usually above 8 (e.g., 8.7 on June 12, 2001). In May 2004, elevated pH was measured at several wells, including: 8.8 at 12-MW19, 8.6 at 12-MW21, 8.7 at 12-MW23, 8.4 at 12-MW28, 8.6 at 12-MW33 in May 2004.
   <u>Recommendation</u>
   Please comment on potential effects of high pH, including mobilization of metals and suppressed degradation of TPH and VOCs. Comment on whether elevated values (and by extension, all pH values) for May 2004 are acceptable.
6) Remark 1 says that average values of detected results are presented for duplicate samples. Please provide all results.
7) Typo. Appendix E1, page E1-3. Add a negative sign: change "400 mV" for anaerobic environments to "-400 mV".

EH:ckl:TIIR12GW062107final