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California Regional Water Quality Control Board Central Valley Region

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CROWS LANDING
SSIC NO. 5090.3.A

30 March 2009

Mr. Jim Sullivan
Department of the Navy
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

9 MARCH 2009 FINAL TECHNICAL MEMORANDUM PHASE 1 BIOREMEDIATION TREATABILITY STUDY, FORMER NASA CROWS LANDING FLIGHT FACILITY, CROWS LANDING, STANISLAUS COUNTY

The Regional Water Board has no comments to the work performed thus far or to the recommendations presented in the referenced Technical Memorandum.

The following summarizes the results of the Phase 1 Bioremediation Treatability Study at the three study areas at the site. The work was conducted in accordance with the approved 17 April 2008 *Final Work Plan, Bioremediation Treatability Study, Site 17 Administration Area*.

UST Cluster 1

Compressed air was injected into groundwater via a biosparge system at UST Cluster 1. The primary constituents of concern (COC) in the UST Cluster 1 area are petroleum hydrocarbons. Approximately 1,600 pounds of oxygen were injected into groundwater through the biosparge system to enhance the aerobic biodegradation of the petroleum hydrocarbons. After six months of operation, the oxygen content in groundwater increased approximately 20 percent. Benzene vapor concentration decreased from 250,000 microgram per cubic meter ($\mu\text{g}/\text{m}^3$) to 10,000 $\mu\text{g}/\text{m}^3$ in the 35 to 45 foot below ground surface (bgs) interval and from 440,000 $\mu\text{g}/\text{m}^3$ to 11,000 $\mu\text{g}/\text{m}^3$ in the 46 to 60 foot bgs interval. Based on the results of the biosparging, it was recommended that Phase 2 of the treatability study continue biosparging using compressed air.

UST Site 17

ORC-Advanced[®], an oxygen-releasing compound, was used to introduce oxygen into the shallow and mid-shallow aquifers at UST Site 17. The primary COCs at UST Site 17 were residual fuel products, 1,2-DCA, and benzene. Approximately 204 pounds of oxygen were injected into the shallow aquifer zone and 280 pounds of oxygen were injected into the mid-shallow aquifer zone to enhance aerobic biodegradation of 1,2-DCA and benzene.

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Concentrations of 1,2-DCA in the shallow zone monitoring wells decreased slightly in the in-plume well indicating that treatment was somewhat successful. However, the decreases were not enough to reduce the concentrations to the remedial action objective, which is the maximum contaminant level (MCL) of 0.5 micrograms per liter ($\mu\text{g/L}$), within the six months of the Phase 1 study.

Analytical results for benzene in the mid-shallow zone indicated decreasing trends in both the upgradient and in-plume wells. Because decreases were also observed in the upgradient well, it is unknown if the treatment in the mid-shallow zone was effective.

Based on the results of the first six months of the study, it was recommended to continue progress monitoring in accordance with the approved 17 April 2008 work plan.

IR Site 17

The primary COCs at IR Site 17 are carbon tetrachloride (CT) and chloroform. These COCs degrade under anaerobic conditions. As such, two types of substrates were injected into groundwater, HRC-Advanced[®] 3D micro emulsion (3DME) and EOS[®] 598B42 (EOS), to drive the aquifer into anaerobic conditions. Approximately 220 pounds of 3DME concentrate were injected into each of six temporary borings. Approximately 165 gallons of EOS were injected into each of two injection wells.

Concentrations of CT in the in-plume and downgradient wells in both the mid-shallow and mid-deep zones decreased during Phase 1 of the treatability study. Additionally, increasing concentrations of chloroform, the daughter product of the degradation of CT, were observed in the mid-shallow in-plume well and the mid-deep downgradient well. These results indicate that the treatment of CT using 3DME or EOS is generally effective in reducing CT concentrations.

Based on field logistics and cost, it was recommended that EOS be used for Phase 2 of the treatability study. The same lateral area delineated in the 17 April 2008 work plan will be targeted. Approximately 6,300 pounds of EOS will be injected into the mid-shallow zone and 3,780 pounds of EOS will be injected into the mid-deep zone during Phase 2.

General Order Applicability

General Order No. R5-2008-0149 provides waste discharge requirements for the in-situ groundwater remediation at sites with volatile organic compounds, nitrogen compounds, perchlorate, pesticides, semi-volatile compounds, hexavalent chromium, and/or petroleum hydrocarbons. This General Order was adopted by the Central Valley Regional Water Quality Control Board on 11 September 2008. A copy of this order can be found on our website at <http://www.waterboards.ca.gov/centralvalley/>. Once the year-long bioremediation treatability study is completed and a final remedial option is chosen, the Regional Water Board will require the Department of the Navy to apply to operate the final remediation system under the General Order if an in-situ remedial option is chosen.

Closing

The interpretation of data collected to-date and the proposed recommendations for Phase 2 of the treatability study appear reasonable. As such, the Regional Water Board has no objection with proceeding as recommended in the Technical Memorandum.

Please provide our office with a 48-hour notice prior to starting the next round of injections. If you have any questions regarding the above, please call Greg Issinghoff at 559-488-4390.



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