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US Environmental Protection Agency Comments on the
Draft Final Electrical Resistance Heating Pilot Study Workplan
Operable Unit No. 16 (Site 89)
Marine Corps Base Camp Lejeune, North Carolina

GENERAL COMMENTS

1. The monitoring plan described in Chapter Three needs a refinement to include a mass balance of VOCs. By comparing the soil and groundwater VOC and chloride concentrations at the start and finish of the project, one can assess the reduction of the contaminant concentrations. But that is only part of the picture. As a pilot study, one not only assesses the contaminant removal effectiveness of a technology but also the cost effectiveness of a technology. Commonly this is expressed in the cost per pound of contaminant removed. To get to this number, one must first calculate the mass of contaminant in place, then perform a mass balance on the operations and then calculate the mass remaining in place. Additionally, by calculating a mass balance, it will require a rigorous evaluation of the fate of the VOCs. It is important to understand whether they were destroyed in-situ or removed by the vapor extraction system or volatilized through the soil or migrated beyond the "system boundaries".

CH2M HILL RESPONSE: We will add a requirement for the contractor to develop a mass balance based on sampling of the environment prior to treatment system operation as well as in post treatment phases. Estimating DNAPL mass in the environment is inaccurate due to the nature of DNAPL. The estimates are based upon average conditions (including contaminant concentrations) across an area. The DNAPL forms in pools or ganglia that do not readily lend themselves to estimating based upon averages. The calculation of mass recovered is also inaccurate based upon the errors with calculating pretreatment (actual) mass and other compounding factors (primarily that ERH will treat contaminants via volatilization, steam stripping, biological degradation and chemical dechlorination). A rigorous evaluation of fate and transport of the suite of solvents comprising the DNAPL is indeed required and is still likely to be inaccurate. The initial mass and recovered mass will be calculated and compared but will not necessarily be indicative of DNAPL treatment efficiency. In addition, inaccurate estimates in treatment efficiency based upon mass may falsely represent treatment effectiveness implying that calculated losses indicate contaminant mass has "migrated" beyond the treatment zone. For these reasons, this pilot test was designed based upon concentration reduction of dissolved contaminants These dissolved concentrations can be modeled (as was performed for the site characterization) to state the change in DNAPL source area boundary. Based on the available data, the range of contaminant mass has been calculated to be from 5,000 to 60,000 pounds depending on the assumptions used.

The extensive network of monitoring wells will be employed prior to the test as well as for 52 weeks after treatment to check for rebound and observe for any DNAPL migration during the treatment period. This will provide "real time" data about the migration phenomena and will not be based upon implications from the uncertainties in estimating initial and recovered mass described above.

The monitoring plan calls for extensive air, water and soil sampling that will allow the contractor to track contaminant movement if any, SVE system efficiency, carbon break through, and the

need to implement contingency procedures. Cost per pound recovered can also be calculated based upon the data collected.

Contamination is expected to remain in place at the site after ERH operation as this technology is being used to remove DNAPL to the extent possible and not to address remediation of the extensive dissolved plume on site.

SPECIFIC COMMENTS

1. **Figure 2-4**. It appears that the electrode and steam vent well should have an electrode somewhere within the boring. If this is correct, please revise the figure as necessary.

CH2M HILL RESPONSE: That is correct. The figure has been revised to show the electrode element. The electrode element would be located at the steam vent portion of the shallow electrode.

2. **Page 3-4, Section 3.3.1**. Very recently, new EPA Region IX Preliminary Remediation Goals have been published. The table is available at this address: http://www.epa.gov/region09/waste/sfund/prg/index.htm . Please review this table and revise the table on this page as several of the numbers have been revised downward. For example, the number for TCE was revised two orders of magnitude downward (1.1 vs. 0.017). This could have a significant impact on the operations of this pilot test.

CH2M HILL RESPONSE: The appropriate PRGs have been added.