Tetra Tech EM Inc.

1099 18th Street, Suite 1960 ◆ Denver, CO 80202 ◆ (303) 295-1101 ◆ FAX (303) 295-2818

July 1, 1998

Mr. Stephen Chao
Department of the Navy
Engineering Field Activity West
Naval Facilities Engineering Command
900 Commodore Drive, Building 210
San Bruno, California 94066-5006

CLEAN Contract Number N62474-94-D-7609
Contract Task Order 153

Subject: **In Situ Abiotic Redox Manipulation (ISRM) Phase I Test Status**

Dear Stephen:

This letter is intended to provide you with an update on the status of ISRM Phase I activities. As we discussed during your recent visit to the laboratory at the University of Colorado at Boulder, concentrations of volatile organic compounds (VOCs) in groundwater samples did not appear to decrease with time during the initial VOC degradation tests. Subsequent preliminary testing has focused on elimination of factors that may have decreased the effectiveness of reduced soils in treating VOCs. Test soils were reduced using a higher dithionite concentration and used to prepare several sample series with higher soil-to-groundwater ratios. In addition, reduced sample series were injected with contaminated groundwater both inside and outside the glove box. Following is a summary of these preliminary findings (see also the attached plot):

Sample Series	Soil Weight[1]	Sample Prep.[2]	TCE Concentration (ppm)					Percent Decrease
			0 hrs	24 hrs	48 hrs	72 hrs	96 hrs	
1	5	I	7.27	4.11	4.07	3.82	3.71	49
2	7	I	7.14	3.86	3.46	3.08	2.37	67
3	7	O	7.35	3.13	2.98	2.45	2.67	64
4	10	I	7.03	2.46	1.87	1.47	1.14	84
Blank[3]	0	I	9.56	9.64	9.24	9.33	8.96	6

Notes:
[1] Grams per 22-ounce sample vial
[2] I = contaminated water injected into sample inside glovebox
O = contaminated water injected into sample outside glovebox (as in initial tests)
[3] Contaminated groundwater only
ppm = parts per million

These data indicate that use of soils reduced with the higher dithionite concentration, as well as use of higher soil-to-groundwater ratios, will result in effective degradation of VOCs in groundwater. As there was no apparent difference between results from samples prepared inside the glovebox versus those prepared outside the glovebox (all sample soils were weighed

into the containers within the glovebox), and use of the glovebox considerably complicates sample preparation procedures, all subsequent testing will involve preparation of samples outside the glovebox.

Based on discussions with Mr. Jim Szecsody of Pacific Northwest National Laboratory (PNNL) regarding preliminary column test results, it appears that the high clay content of soils collected during Phase I field work results in excessive pressure drop across soil columns after extended operation. As mentioned in my letter of May 6, 1998 regarding preliminary ISRM Phase I test results, recovery of coarse-grained sediments from the channel deposit was poor; as a result, samples collected for the bench-scale tests represented the finer-grained portion of the channel package. Although PNNL initially indicated that the high clay content of the soils would not inhibit column testing, according to Mr. Szecsody, development of high pressure drop across the test columns limited the time periods over which the tests could be conducted. Due to this fact, as well as the high costs associated with VOC-degradation column tests, it was decided that the column tests would be delayed until samples of the more permeable channel sediments could be collected.

Additional field work is therefore planned to collect the needed soil samples. This work will be conducted at Moffett Federal Airfield in concert with other drilling and sampling activities to minimize costs associated with field personnel travel and drill rig mobilization. Mr. Vince Vermeul with PNNL will accompany Tetra Tech EM Inc. (TtEMI) during sample collection, which will occur the week of July 6, 1998. Funds for Mr. Vermeul's trip were included in the subcontract cost estimate submitted by PNNL for their portion of the bench scale work. The samples collected during this field effort will be homogenized by TtEMI at the University of Colorado at Boulder in accordance with procedures outlined in the ISRM Phase I work plan, and a portion will be sent to PNNL for use in the column tests.

Due to the additional field work and associated laboratory activities, the tentative schedule outlined in the ISRM Phase I work plan will be delayed by approximately 3 months. TtEMI is currently evaluating the budgetary impact of this delay, as well as cost-saving options for conducting the remainder of the batch testing portion of the bench-scale work with the new soil samples.

Please call me at (303) 312-8845 with any questions.

Sincerely,

Ronna T. Ungs

Ronna T. Ungs
Project Engineer

cc: Mr. Donald Chuck (EFA West)

ISRM PHASE I
PRELIMINARY VOC DEGRADATION RESULTS