May 8, 2013
Environmental Stewardship Concepts, LLC

Mr. Galo Jackson and Mr. Jan Rogers:

Please review Environmental Stewardship Concepts' comments below regarding the CO_2 Sparging Proof of Concept Report for the LCP Chemical Site, Brunswick, GA.

Thank you for your attention and please do not hesitate to contact me for any additional information.

Sincerely,

Peter L. deFur, Ph.D.
TAG technical advisor

Comments on the CO_2 Sparging Proof of Concept Report

General Comments:

The report is well organized, carefully prepared and clearly written - for a technical audience. The report presents the problem and the nature of this particular solution and how the pilot test came about. The monitoring results and interpretation are clear and leave nothing unaddressed. The analyses of the groundwater system considered a range of possible consequences of the sparging, and the effort collected data to evaluate how the system responded in both physical and chemical characteristics.

Overall, the evidence presented in the Proof of Concept Report supports the conclusion that the pilot test was successful. The pilot test demonstrated the effectiveness of CO2 sparging as a method to lower the pH and reduce the extent of metals dissolving in the groundwater of the Caustic Brine Pool (CBP). I concur with the technical report that the method can be used at the CBP to lower the pH and metal concentrations in the groundwater of the CBP.

There are a few technical items that should be considered in the future and these are listed below. Please consider the following:

Conduct a lab titration after the CO2 sparging, to obtain another measure of the chemistry in the ground water.

Calibrate pH electrodes/meters more often than 1/week and do all of them, for consistency of measurements. Notwithstanding the high quality of electronics in the current era, losing the data from an equipment malfunction would be costly.

The report did not provide information on Field data-logger backup and downloading, which would be good to note the frequency and method of data storage and backup.

Variable sparge rates: it might be useful to include pulses of varying flow, i.e. start high (25) and gradually decrease over 2 hrs to minimum and then hold for 3-6 hours. The precise details of implementation are under development now, and with a number of wells in the "matrix," it should be possible to vary the sparging in both time and space to maximize efficiency, as noted in the report.

Additionally, the design needs to prevent significant mounding (see page 4-24). Varying the location of wells in use, it may be possible to avoid mounding and maintain sparging. In order to permit rebound and prevent adjacent wells from creating negative interactions, the well system can be separated into two groups of non-adjacent wells and switch between the two systems.

The CO2 added to the system has the potential to affect the soil ecosystem, recognizing that the CBP has almost certainly altered the soil ecosystem already. Nonetheless, I recommend sampling both groundwater and soil microbial communities to assess any potential impacts. Reference soil and water samples can be obtained from nearby areas that are not similarly affected by LCP site contaminants.