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MCRD PARRIS ISLAND
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EMAIL REGARDING U S EPA REGION IV COMMENTS ON PROPOSED PILOT STUDY FOR SOUTHERN PLUME AREA OF SITE 45 DRY CLEANING FACILITY SPILL AREA WITH ATTACHMENTS MCRD PARRIS ISLAND SC
9/4/2007
U S EPA REGION IV

From:	Koroma-Llamas.Lila@epamail.epa.gov
To:	huling.scott@epamail.epa.gov; art.sanford@navy.mil; koroma-llamas.lila@epa.gov; Sladic, Mark; timothy.j.harrington@usmc.mil; mmcrae@TechLawInc.com; AmickMS@dhec.sc.gov; darrel.pittman@usmc.mil; bowersjb@dhec.sc.gov
Cc:	Keeley.Ann@epamail.epa.gov; Pivetz, Bruce
Subject:	Re: Parris Island site
Date:	Tuesday, September 04, 2007 4:17:48 PM
Attachments:	ISCO Project Overview_Parris Island.doc

Hi all,

Way below you will find an e-mail from Scott Huling regarding the pilot study we have discussed as a possibility at the southern plume area of Site 45, and an attached 2 pager summary of the proposed study.

Scott originally provided this to Art and I as preliminary info, but I have copied the rest of you in case you have time to look this over. If you provide feedback or questions, please copy us all. If this project is to be continued, we will ask for a formal (although perhaps brief) Study Work Plan for review and approval at that time.

Just below here you will see my first glance questions back to Scott.

Hi Scott,

I glanced at this and had a few questions off the cuff.

1) I had mentioned to you that we had a previous treatability study which used Fenton's Reagent which was "unsuccessful". I am not sure if you ever got information on that previous study or not. (Since it was not successful, we never got a post study report.) If you have seen information on that study, how does this project differ from that, and what makes you think this project will be successful whereas that one was not. (The issues were largely that they did not get the results they had anticipated, and they used sampling techniques which were of question.) If you have not seen any information on it, perhaps Art could tell us where to find information on that study (e.g. study work plan? contact person for the study?, company conducting the study? was it thru ESTCP?, etc.)

2) For your objective #1: In general terms, what additional site information (rather than what you have to date) would you need to gather prior to implementation of this study? Who will fund getting the info? And how long will it take to get it?

3) For your objective # 2: How long will it take to "validate the effectiveness" of the peroxygen ISCO? Are we talking effectiveness over the short term or the long term? How long do you intend to monitor and for how long would you request that the site remain undisturbed in order for you to assess "subsequent degradation of contaminants"?

4) For your objective #3: Over what time period are you intending to do "multiple iterations between oxidant applications and performance monitoring"?

5) Under "Expected Benefits" you mention that you must use "process conditions that are specific to both the site and the contaminants."

What "process conditions" would be pertinent to the MCRD Site?

6) Under "Expected Benefits" you mention that you must use "process conditions that are specific to both the site and the contaminants." What "process conditions" would be pertinent to the presence of PCE and TCE (as DNAPL, etc.) as well as all daughter products (I am assuming we have a pretty typical site with respect to contaminants?)

7) Have you discussed field conditions with Don? The particular source area of the "secondary/southern plume area" appears to have DNAPL located immediately next to and perhaps even under a building, or at least under associated equipment (I believe the HVAC system? Ask Don what it is under). Would there be a problem with implementation (equipment access? injection? monitoring? etc.)? I believe I had suggested you visit the Site for this purpose.

8) How will the influence of tides and drainage ditches/pipes impact your study? (I assume you discussed this with Don.)

9) Please submit a schedule showing the duration of this project. It does not have to show exact dates yet, but show how long from start to finish, and project a start date. We are presently needing to start the FS/PP/ROD portion of the Site work, and want to make sure that what you are doing can be completed prior to completion of our ROD, if not sooner. (Obviously, sooner might allow us to consider your findings in our remedy selection.)

10) Regarding "Project Participants", I do not see a person from ESTCP. Who would that be?

11) Also, I am sure you recognize that if this does get implemented, the Parris Island Team will require a more detailed work plan be submitted for review and approval, and of particular interest to us that work plan will have to include a final schedule and a commitment for regular updates, as well as a post-study report with findings and conclusions.

That's all for now.....

Lila
404-562-9969

Scott Huling/ADA/USEPA/US
09/04/2007 02:50 PM

To art.sanford@navy.mil
cc Lila Koroma-Llamas/R4/USEPA/US@EPA, Ann Keeley/ADA/USEPA/US@EPA, "Pivetz, Bruce" <BPivetz@Dynamac.com>
Subject Parris Island site

Art, greetings from OK. My name is Scott Huling and I work at the EPA Kerr Research Center in Ada, OK. Based on a review of several documents and discussions with Lila Llamas, the Parris island site satisfies many of the criteria for a proposed project. Recently, Don Vroblosky (USGS) spoke with you about the possibility of conducting an in-situ chemical oxidation research study at the Parris Island site. He indicated that you would like to see a 1-2 pager summary of the project. Attached is a 2-pager summary of the proposed project. I understand that this site involves a team made up of the DoD, EPA and the SC State Environmental Agency. I would like to discuss the possibility of conducting this project at your site. Dr. Su (EPA) from the Kerr Research Center is currently conducting an emulsified zvi project at the site and our field support staff is already familiar with site conditions. This would give the project a strong start. Please give me a call when you have time to discuss this potential project. Scott.

(See attached file: ISCO Project Overview_Parris Island.doc)

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PROJECT TITLE Field Demonstration, Optimization, and Rigorous Validation of Peroxygen-Based ISCO for the Remediation of Contaminated Groundwater

PROJECT OVERVIEW

This project will involve the demonstration of in-situ chemical oxidation (ISCO) and will include the collaboration between the Department of Defense - Environmental Security Technology Certification Program (DOD-ESTCP), Washington State University (WSU), Environmental Research Management (ERM), FMC Corp., and the Environmental Protection Agency-Robert S. Kerr Environmental Research Center (EPA-RSKERC). An abstract of this project and Project Participants are included below.

Based on discussions with Lila Llamas (EPA-RPM) and a preliminary review of data and information from Don Vroblosky (USGS) the Parris Island Marine Corp Recruit Depot site is identified as a viable site where ISCO could be deployed. Further evaluation of this site will involve a critical review of existing data and information, and coordination with Regulatory Agencies involved in the cleanup of the site.

ABSTRACT

A. Objective. Contamination of aquifers with organic chemicals remains a significant concern even after decades of research of remedial technologies and field applications. In recent years, various methods of *in situ* chemical oxidation (ISCO) have been developed, including peroxygen processes that use hydrogen peroxide (H_2O_2), persulfate, or both. However, results from full-scale peroxygen ISCO have been mixed; sorbed and dense nonaqueous phase liquid (DNAPL) contaminants have been destroyed at some sites, while treatment has been minimal at others. A likely reason for these inconsistent results is the lack of application or optimization of peroxygen process chemistry in the field. Peroxygen chemistry is highly complex, with a variety of reactive species generated under specific conditions, but most ISCO vendors use one set of conditions, often not based on fundamental chemistry, for all sites.

The objectives of the proposed demonstration are: 1) To apply rational process chemistry to improve the design and implementation of peroxygen ISCO at the demonstration level, including maximizing H_2O_2 and persulfate distribution, evaluating H_2O_2/persulfate stabilization procedures, and comparing increased H_2O_2 stability to the stability of persulfate; 2) To validate the effectiveness of peroxygen ISCO in the field by detailed assessment of contaminant loss, fate, and product formation, including the potential for concurrent and subsequent biological degradation of contaminants; and 3) To implement an ISCO optimization approach that involves multiple iterations between oxidant applications and performance monitoring.

B. Technology Description. Peroxygen ISCO processes include modified Fenton's reagent and activated persulfate. Modified Fenton's reagent is based on the catalyzed decomposition of dilute H_2O_2 by iron (II) to form hydroxyl radical (OH•), an oxidant that reacts rapidly with a wide range of organic compounds. The use of high concentrations of H_2O_2 drives propagation reactions that also generate superoxide anion ($O_2\bullet^-$), which reacts with many organic contaminants that are unreactive with OH• including oxidized, sorbed, and DNAPL contaminants. This wide reactivity is an advantage of Fenton's ISCO, along with rapid treatment times and low reagent cost. Disadvantages include low H_2O_2 stability; oxygen generation that may volatilize contaminants; heat generation; and risk of explosion. However, recent results from SERDP CU-1288 have demonstrated that H_2O_2 can be stabilized through the addition of organic acids such as phytic acid

and malonic acid, minimizing heat generation while maintaining effective stoichiometric generation of OH•.

Activated persulfate is the use of persulfate anion ($S_2O_8^{-2}$) and an initiator, such as heat, iron, hydroxide, or H_2O_2, to generate sulfate radical ($SO_4•^-$). Persulfate also hydrolyzes to form the peroxygen compounds H_2O_2 and peroxymonosulfate. Therefore, activated persulfate may include a mixture of reactive species, similar to the mixture in modified Fenton's reagent, and it can destroy a wide range of contaminants. In addition to its reactivity, activated persulfate has several advantages for ISCO. Persulfate is more stable than H_2O_2, with a half-life of 10 to 20 days, and has relatively low reactivity with natural organic matter, allowing lower reagent dosing and providing the ability to treat organic-rich strata. Disadvantages of persulfate for ISCO include its higher cost relative to H_2O_2 and the lack of stability of many of the initiators.

C. Expected Benefits. Many DoD activities contract with vendors to implement ISCO groundwater remediation. Because vendors use one set of process conditions for all sites, which is not likely to be the most effective approach, DoD is currently funding ISCO processes that are not the most efficient and cost-effective. To be successful and cost-effective, peroxygen ISCO must incorporate process conditions that are specific to both the site and the contaminants. Furthermore, peroxygen ISCO has never been fully optimized at full scale, nor has its effectiveness been validated in the field. The proposed project will apply state-of-the-art peroxygen ISCO process chemistry and iterative optimization to a representative field site to demonstrate the full potential of peroxygen ISCO, validate its effectiveness, and give DoD field personnel and contractors knowledge of more effective process conditions for successful peroxygen ISCO implementation. Successful completion of the proposed project has the potential to provide rational design criteria for peroxygen ISCO, resulting in faster, more effective, and more economical cleanup of contaminated DoD sites.

PROJECT PARTICIPANTS

The project team members all have experience in ISCO from varied perspectives, and have a history of successful collaboration. **Dr. Richard Watts**, Professor of Civil and Environmental Engineering at Washington State University, has conducted research on ISCO for 19 years and will supervise the project. **Dr. Richard A. Brown** (609-895-0050) of ERM Inc. has 28 years of experience in ISCO and is co-inventor on three patent applications involving the activation and use of persulfate; he will provide technical advice. **Dr. Philip A. Block** (215-299-6645) of FMC Corp. is the co-inventor on five patent applications involving the use of persulfates for remediation of recalcitrant compounds, and will also provide technical advice. **Dr. Amy Teel,** who has worked with Dr. Watts at WSU for eight years as a Research Scientist and **Dr. Dennis Finn**, a Research Assistant Professor at WSU with a background in geology and environmental engineering, will be responsible for conducting treatability studies. **Dr. Scott Huling** (580-436-8610) of the EPA Robert Kerr Research Lab has been involved in fundamental and field investigations of ISCO for over a decade. He will be responsible for site characterization, application of state-of-the-art ISCO process conditions, and coordination of chemical analyses. **Dr. Ann Azadpour-Keely** of the EPA Kerr Lab, has been involved in assessing the subsurface microbiology at the Cape Canaveral permanganate demonstration project. She will be responsible for monitoring microbial dynamics pre- and post-injection. The U.S. EPA Kerr Lab will provide in-kind support through extensive field equipment.