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MCRD PARRIS ISLAND
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EMAIL REGARDING U S EPA REGION IV COMMENTS ON REMEDIAL INVESTIGATION ADDENDUM DRAFT 1 REVISION 2 FOR SITE 45 DRY CLEANING FACILITY SPILL AREA WITH ATTACHMENTS MCRD PARRIS ISLAND SC
5/26/2010
U S EPA REGION IV

From:	Llamas.Lila@epamail.epa.gov
To:	Sladic, Mark
Cc:	charles.cook2@navy.mil; Boerio, Megan; mmcrae@TechLawInc.com; Reed, Sarah M CIV NAVFAC SE, JAX; timothy.j.harrington@usmc.mil; charles.cook2@navy.mil; llamas.lila@epa.gov; Sladic, Mark; timothy.j.harrington@usmc.mil; mmcrae@TechLawInc.com; AmickMS@dhec.sc.gov; darrel.pittman@usmc.mil; Kelly.Taylor2@ch2m.com; GerryAM@dhec.sc.gov; KRIEGKM@dhec.sc.gov; Claggett, Libby; Stacey French; joe bowers; huling.scott@epamail.epa.gov; Pivetz.Bruce@epamail.epa.gov; llamas.lila@epa.gov
Subject:	RE: EPA comments on Site 45 RI Addendum D1 Rev 2
Date:	Wednesday, May 26, 2010 6:41:40 PM
Attachments:	7-27-09 PPT briefing Scott Huling EPA Ada OK.ppt 7-27-09 NOTES AND ACTION ITEMS FROM ISCO CALL.doc

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Hi Mark (and others - See Mark's original question below.),

In response to your question I can provide this immediate response. However, for further detail I would need to hear back from Scott and/or Bruce. I have calls into both of them, but I know Scott is out this week for sure. Let me know if you need more detail than what is provided herein. (Scott/Bruce - If he does, I will need you to help me.)

EPA's ISCO data and interpretation of the data was discussed on a team conference call on July 27, 2009 regarding the proposed ISCO treatability study and what the data gathered to date may mean to us. Notes were distributed after the call and were accompanied by the Powerpoint presentation of data and analysis used during the call (See attached.)

My recollection of the discussion was that Scott had taken a soil/sediment core at Transect 0 Location B and a sample from MW25 both located at the corner of the new dry cleaner immediately adjacent to the break in the drain system pipe believed to have transported and deposited PCE waste thru the sanitary system from the old dry cleaner. Now, let me clarify, I am not a hydrogeologist, therefore you are getting my "RPM understanding" now. Scott performed tests on the sediments which were to determine if contaminants were at or above saturation levels in the sediment samples. He also analyzed the GW sample. When looking at results of both, indications were that contaminant levels were indicative of DNAPL type concentrations. I guess since we did not pull a GW sample that had pure product PCE in it we cannot say for sure it is DNAPL. However, I believe the information should be sufficient to mention the potential of DNAPL in the immediate area and the need to address it in the FS, rather than simply stating there is no DNAPL, as the Draft RI Addendum did. WAIT - This does not mean necessarily that EPA thinks you have to actively treat the "DNAPL-ish" levels, but rather that it should be discussed and considered in the alternative analysis, and whether or not additional data may be needed at some point. This is based on what Scott also said in his presentation. He described the higher hits as being from 12 to 16-18 feet bgs in the silty sand layer. He described this zone as a highly reducing zone with a peat layer that appears to be containing the contamination below 12 feet. He also stated permeability is decreased, hydraulic conductivity drops, and TOC increases in this zone. Scott further suggested that the rate of transport may be slower than the rate of transformation below 12 feet. In closing Scott suggested we should consider the options available (treat and monitor, or don't treat and monitor, removal?, etc.) Basically, we would need to look at the cost and other criteria for monitoring for a longer period without treatment as compared to the cost of treating and monitoring for a shorter period,

etc. And now, let me say the dirty word, PTSM. The RI should address whether or not this material should be considered PTSM, which would potentially tip the scale to treatment of some kind.

This also raises the question of whether or not we have taken such core samples in the northern plume area (EZVI core depths and analysis?). I know there was a removal done around the time of the spill, but I believe only in the vadose zone? Anyway.....

I've included an excerpt of the notes of interest here. For full notes see the attachment.

" .... Proposal for EPA to conduct the Pilot Scale ISCO Demonstration: SCOTT HULING

Pilot scale treatability study in the secondary source area as previously designed and/or with modifications in support of the FS.
(SEE PPT PRESENTATION)

- discussed accomplishments to date
    - further site characterization, source zone id. at depth and distance, and
    Work plan already approved but may need slight modifications to adjust to PI Team desires, etc.)
- discussed new data (aquifer material from cores)
    - T-1 thru T-6
        - Majority of contamination at 9 - 12 feet in loose sand layer
            = migrating plume zone
            (- COCs as shallow as 3 feet = not shown in slide but in original data = pertinent to VI)
    - T-0 and Well 25
        - Majority of contamination at 9 - 12 feet in loose sand layer
            = migrating plume zone
            (- COCs as shallow as 6 feet - but no data above that YET = need it for VI)
        - And even higher hits (DNAPL-ish) at 12 feet bgs in Silty Sand layer down to 16 - 18 feet at clay layer
            - highly reduced zone and peat layer appears to be containing contamination below 12 feet
            - but also permeability is somewhat decreased
            - either way, rate of transport slower than rate of transformation below 12 feet
- discussed existing data impact on current study design, proposed treatment zone, etc.
    - pilot study will now target source area more closely
    - maybe not treat below 12 feet - hydraulic conductivity drops again and TOC increases,
        so may be reducing faster than transporting
        - however, given DNAPL levels -
            weigh cost of monitoring with no treatment .vs. treating and monitoring for shorter period."

(See attached file: 7-27-09 PPT briefing Scott Huling EPA Ada OK.ppt)
(See attached file: 7-27-09 NOTES AND ACTION ITEMS FROM ISCO CALL.doc)

From: "Sladic, Mark" <Mark.Sladic@tetratech.com>

To: Lila Llamas/R4/USEPA/US@EPA, "charles.cook2@navy.mil" <charles.cook2@navy.mil>, Lila
Llamas/R4/USEPA/US@EPA, "timothy.j.harrington@usmc.mil" <timothy.j.harrington@usmc.mil>,
"mmcrae@TechLawInc.com" <mmcrae@TechLawInc.com>, "Boerio, Megan" <Megan.Boerio@tetratech.com>

Cc: "Reed, Sarah M CIV NAVFAC SE, JAX" <sarah.reed@navy.mil>

Date: 05/26/2010 12:52 PM

Subject: RE: EPA comments on Site 45 RI Addendum D1 Rev 2

Hi Lila - EPA Comment 17 asks the following:

'EPA region 4 understands that the EPA Ada, Oklahoma lab performed some additional investigation through analysis of saturated soil cores near the southern plume source area which would speak to the potential for the presence of DNAPL. Determine whether or not these results confirmed any potential presence of DNAPL and address it in the Addendum.'

As with many of the pilot tests at this site that are not directly sponsored by Navy, data and interpretation is only received pretty much intermittently from the pilot test originator (with USGS being a remarkable exception). I do not recall seeing and data or interpretation from EPA. Please provide us with whatever data and/or documentation EPA has developed from research or pilot testing at Site 45. Thanks. MS

-----Original Message-----
From: Llamas.Lila@epamail.epa.gov [mailto:Llamas.Lila@epamail.epa.gov]
Sent: Monday, April 26, 2010 4:38 PM
To: charles.cook2@navy.mil; llamas.lila@epa.gov; Sladic, Mark; timothy.j.harrington@usmc.mil; mmcrae@TechLawInc.com; AmickMS@dhec.sc.gov; darrel.pittman@usmc.mil; Kelly.Taylor2@ch2m.com; GerryAM@dhec.sc.gov; KRIEGKM@dhec.sc.gov; Claggett, Libby
Subject: EPA comments on Site 45 RI Addendum D1 Rev 2

See attached. Hard copy coming in the mail.

Call me with any questions.

Lila

(See attached file: Site 45 RI Addendum D1 Rev 2 EPA Comments.pdf)(See attached file: 2010 RI Addendum D1 Rev2 Site 45 - EPA Comments.doc)

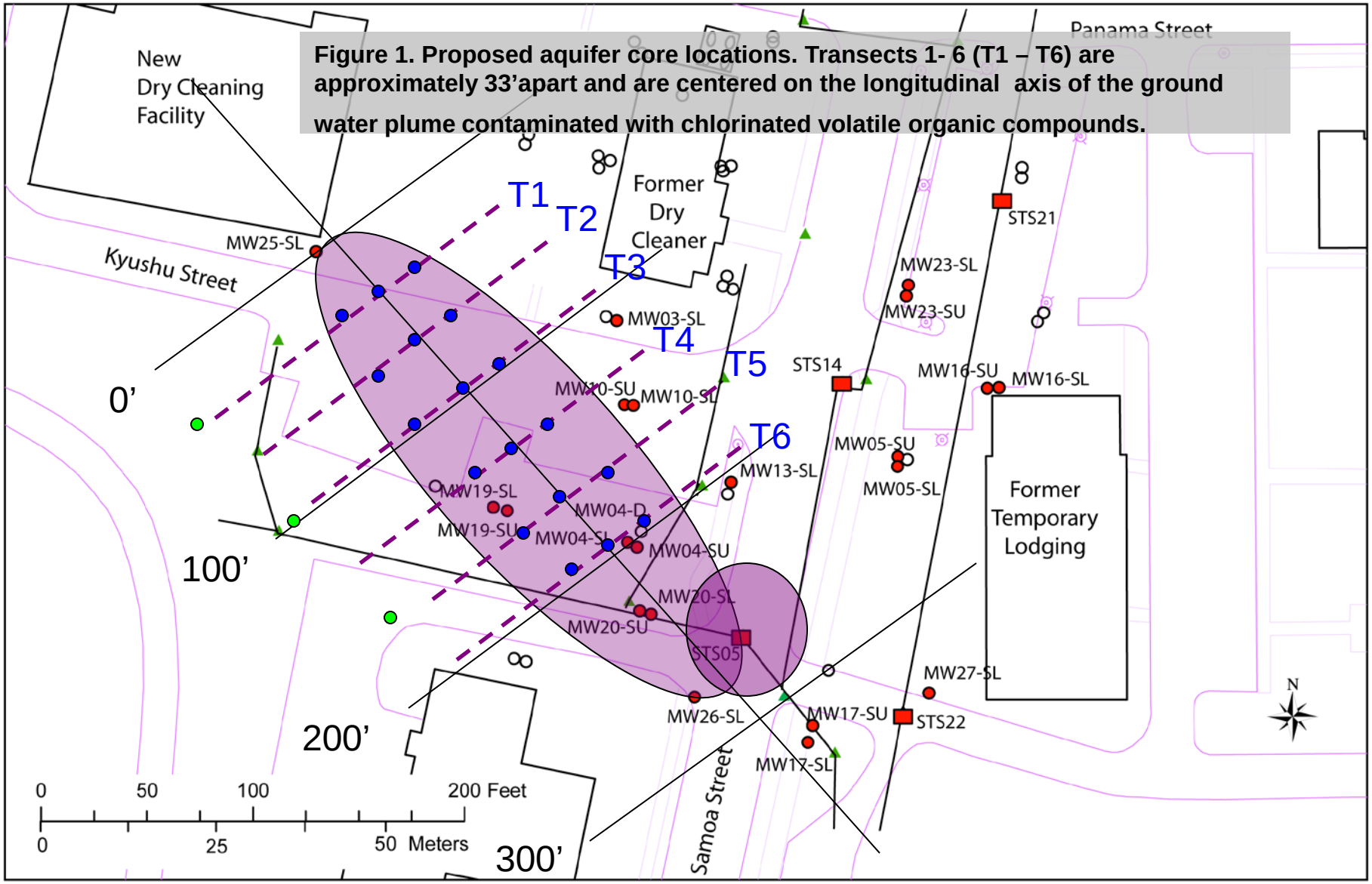


Figure 1. Proposed aquifer core locations. Transects 1- 6 (T1 – T6) are approximately 33'apart and are centered on the longitudinal axis of the ground water plume contaminated with chlorinated volatile organic compounds.

Phase I - Site Characterization (April 08)

- Two GeoProbe rigs and crews
- Pressure grouted
- Successfully recovered all planned cores

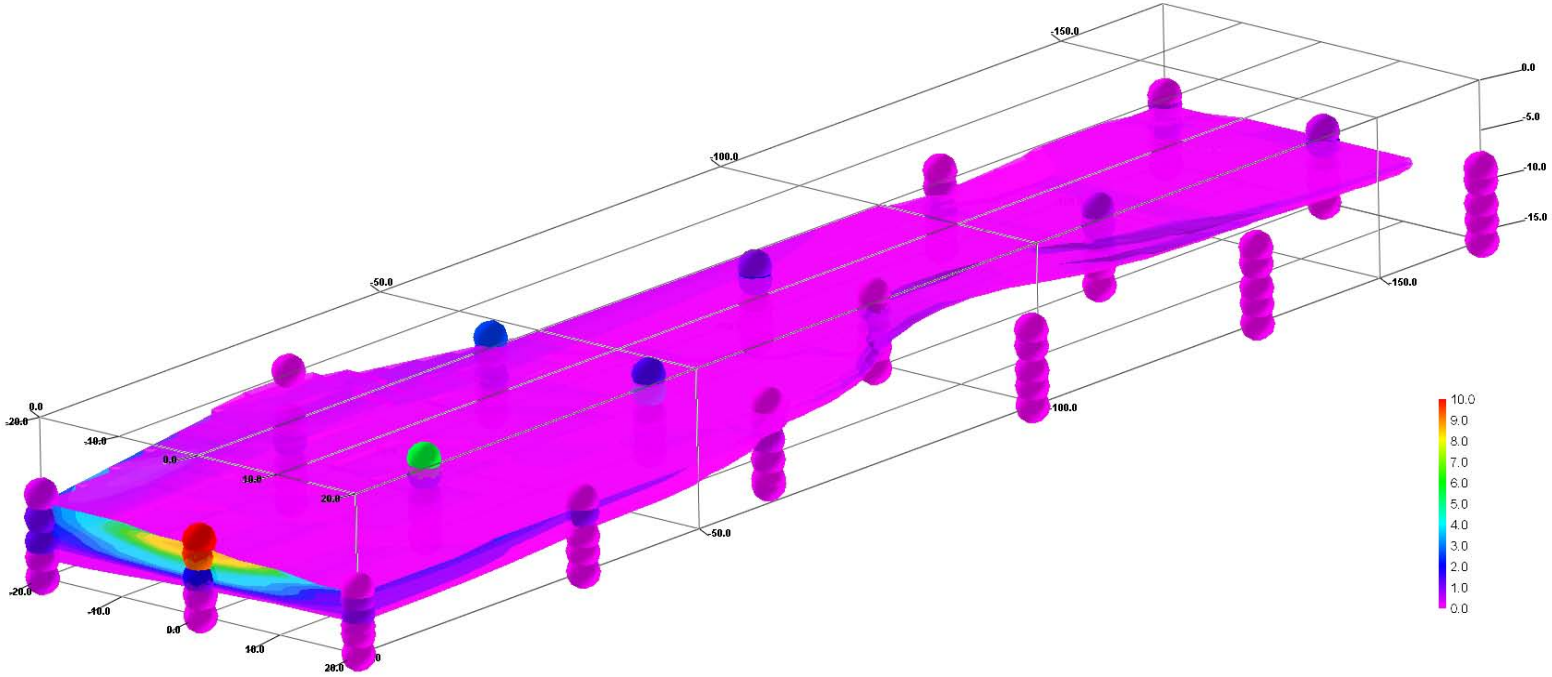
Phase I - Site Characterization Results

- Physical and chemical characteristics of aquifer core material varies with depth (photo of aquifer sub-cores)
- Shallow, light colored aquifer material – less reactive
- Deeper, darker colored aquifer material – more reactive
- Transect 2, location C (T2-C)

3.1’ 6’ 8.5’ 10’ 12.4’ 14’ 16’ 16’

Site Characterization Results

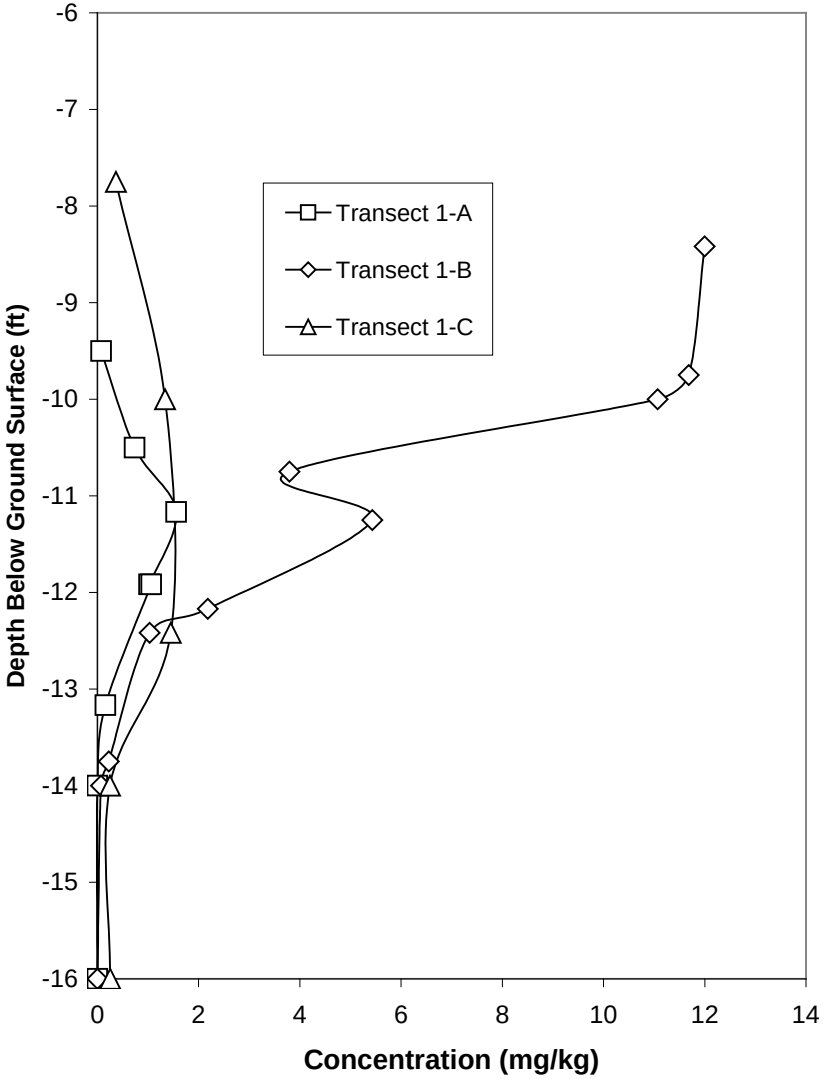
- Plan view map of total VOCs (PCE, TCE, DCE, VC)
- Total VOC (> 0.5 mg/kg), Contoured in 3D
- Transects T1 – T6; ground water flows from L to R
- Core location B – longitudinal axis of the plume



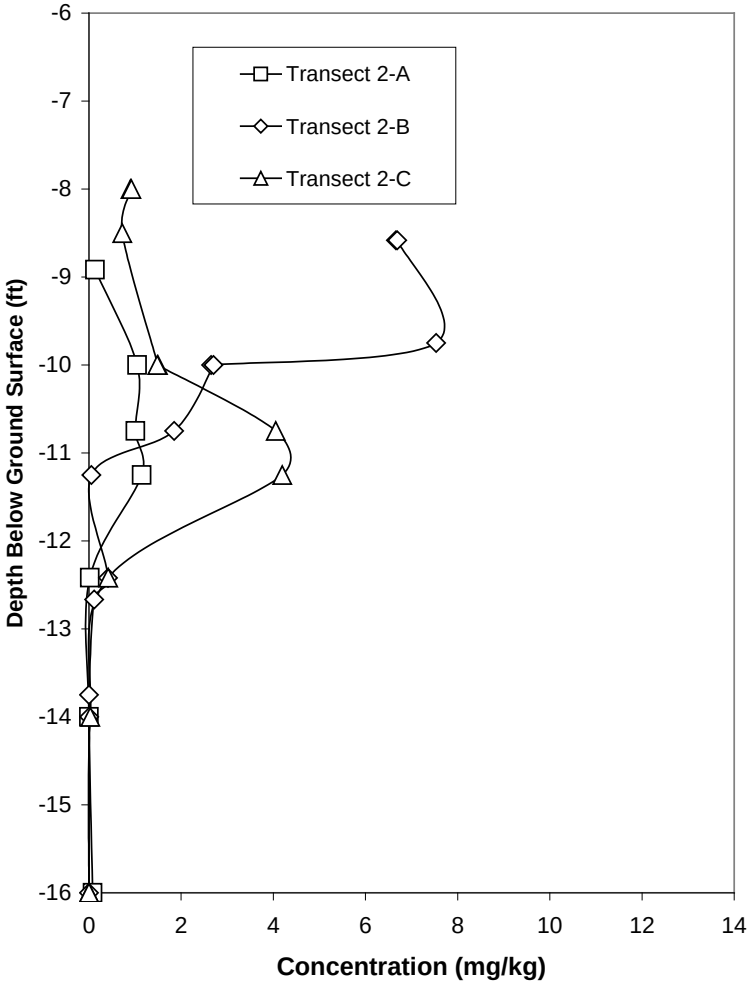
US MCRD, Site 45, Parris Island, SC

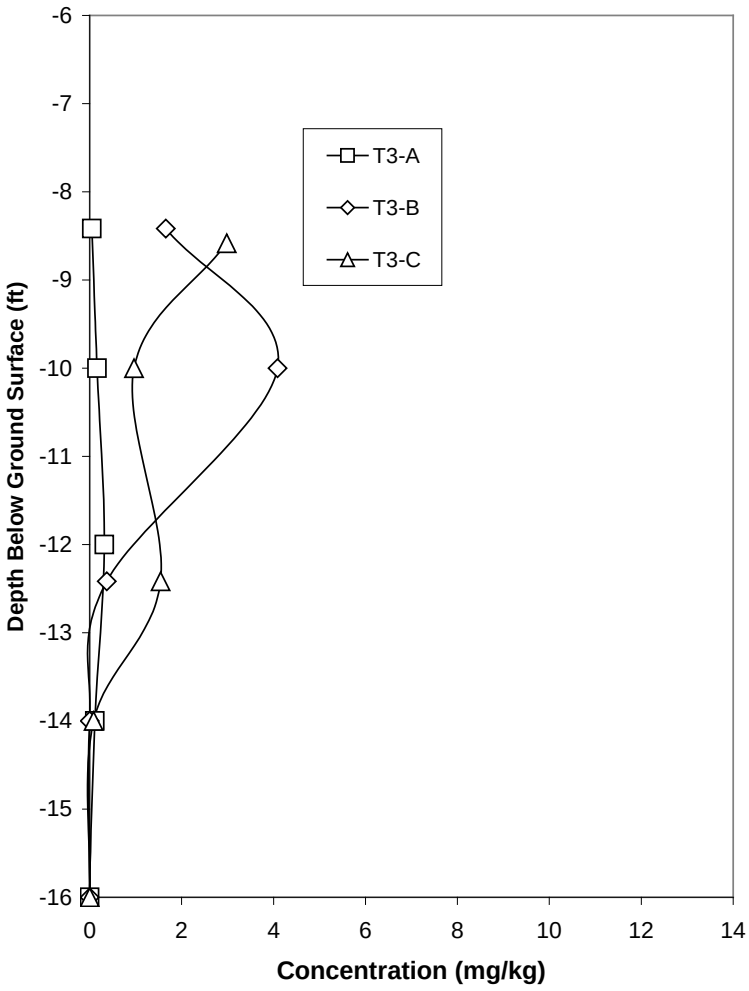
Site Characterization Results

- Cross-sectional distribution of total VOCs (PCE, TCE, DCE, VC)
- VOC contamination 8-12.5' bgs
- Upper and upper/lower surficial
- General trend also applies at T2-T6

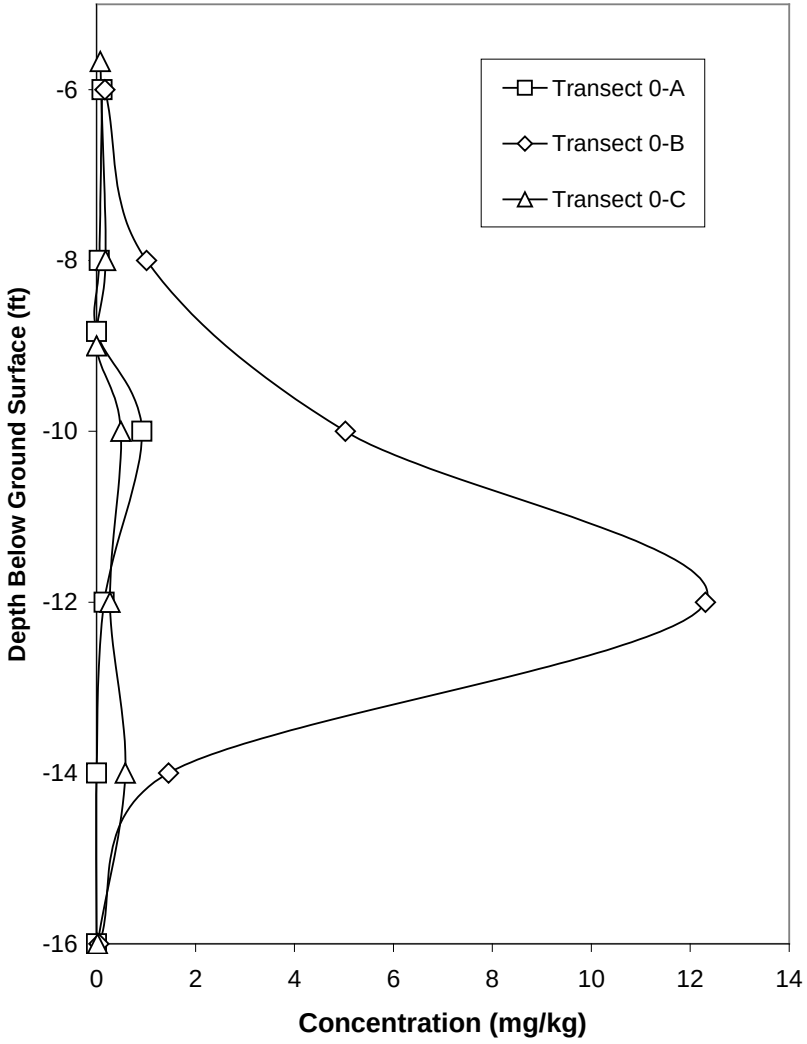


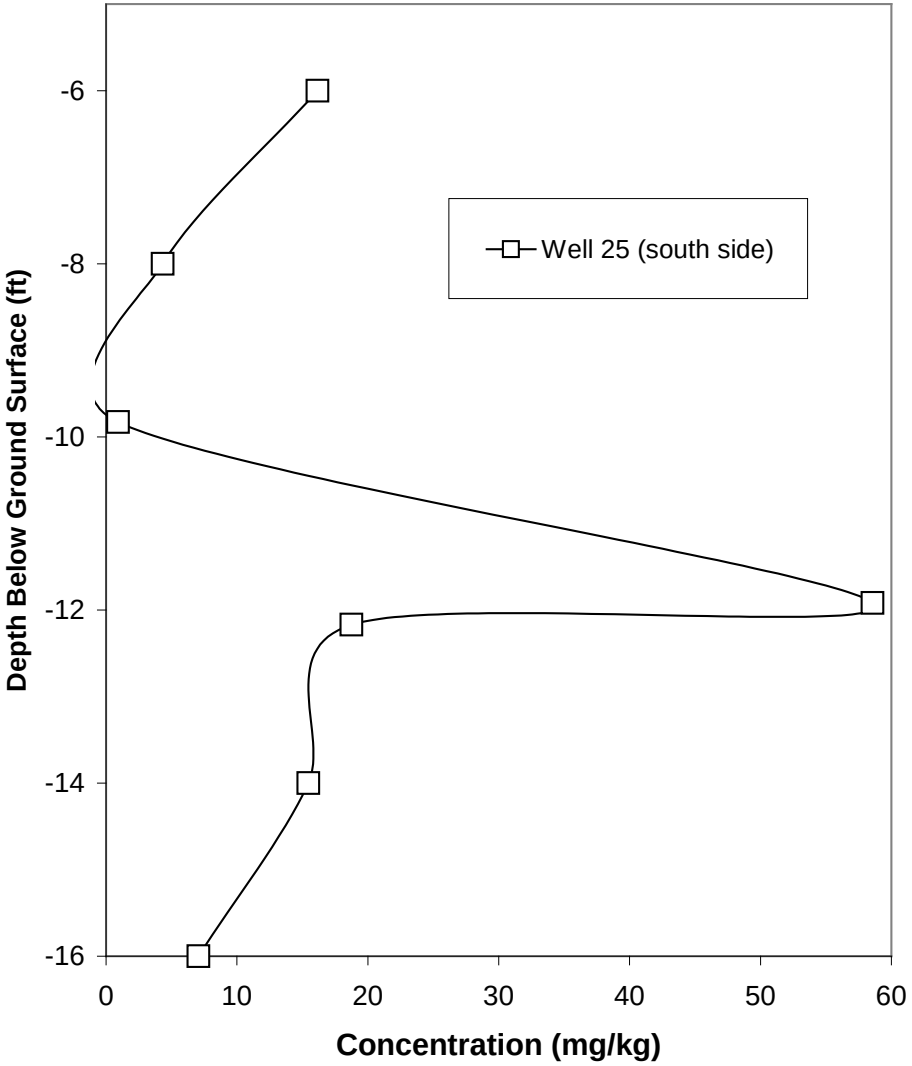
Site Characterization Results

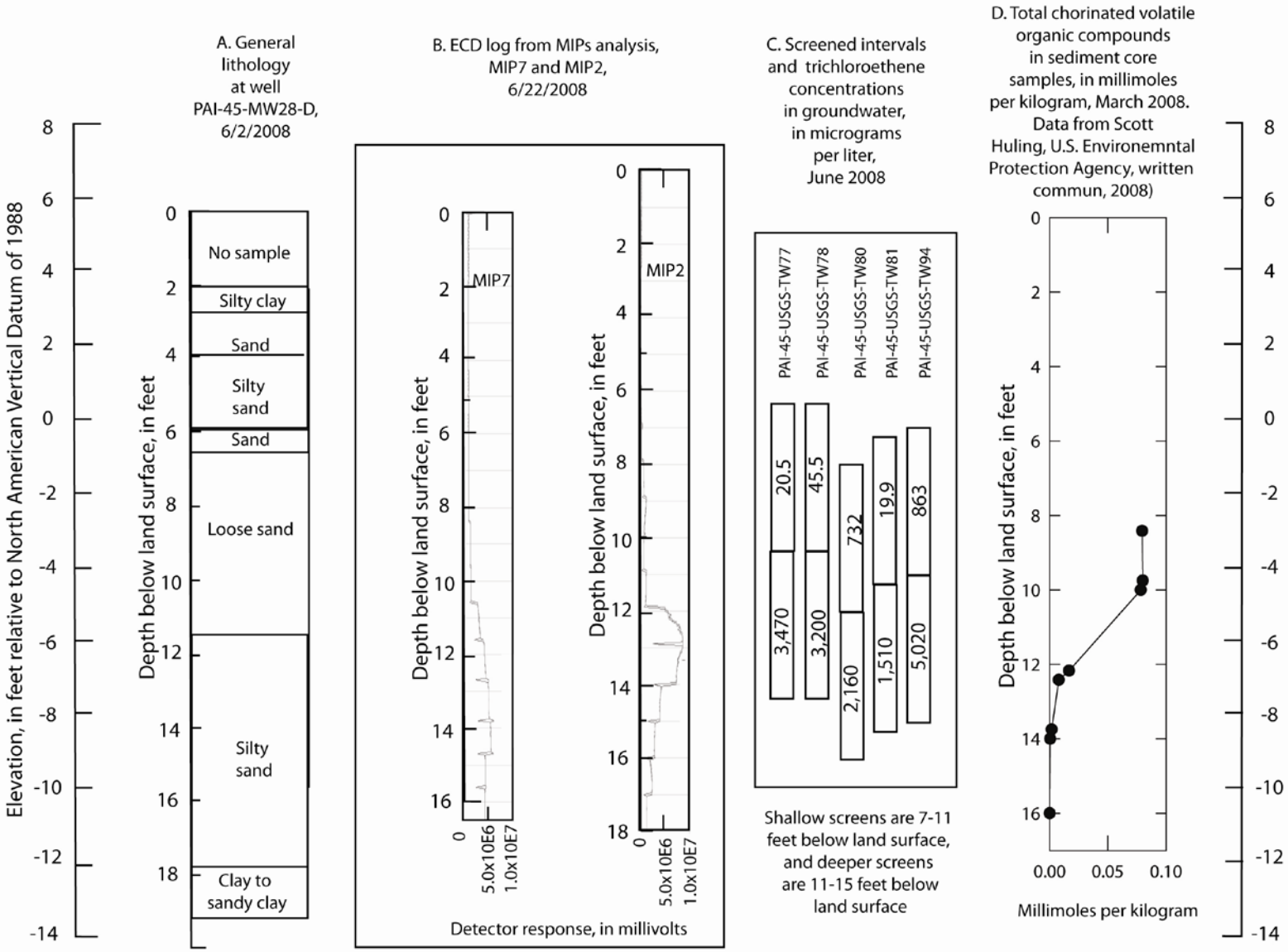




Recent Site Characterization Results





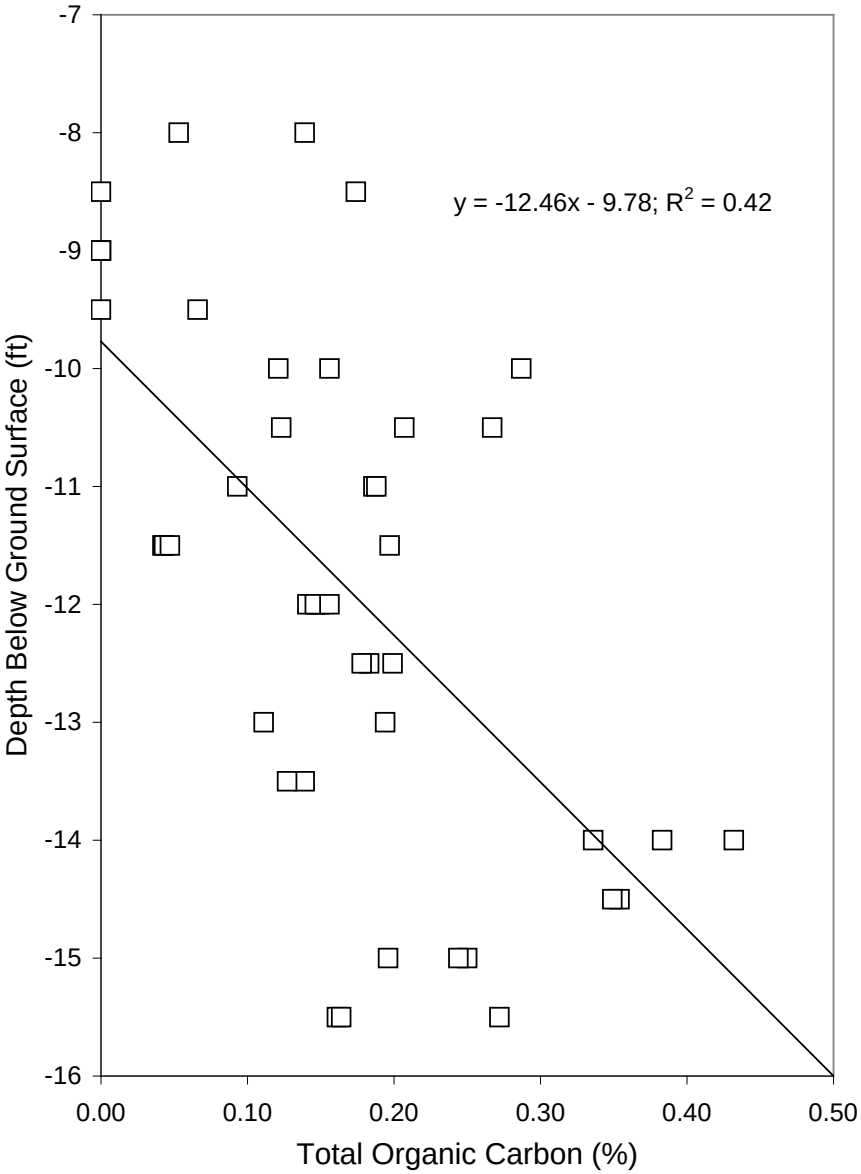


Vroblesky et al., 2009

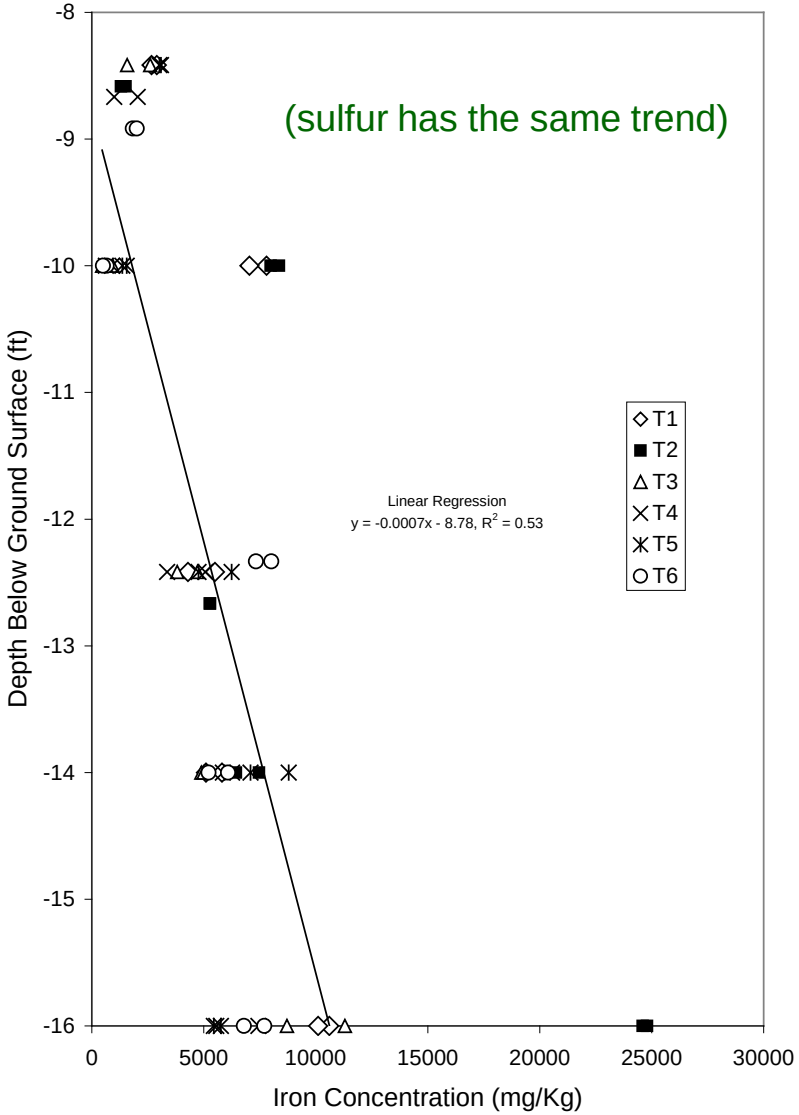
Total Organic Carbon

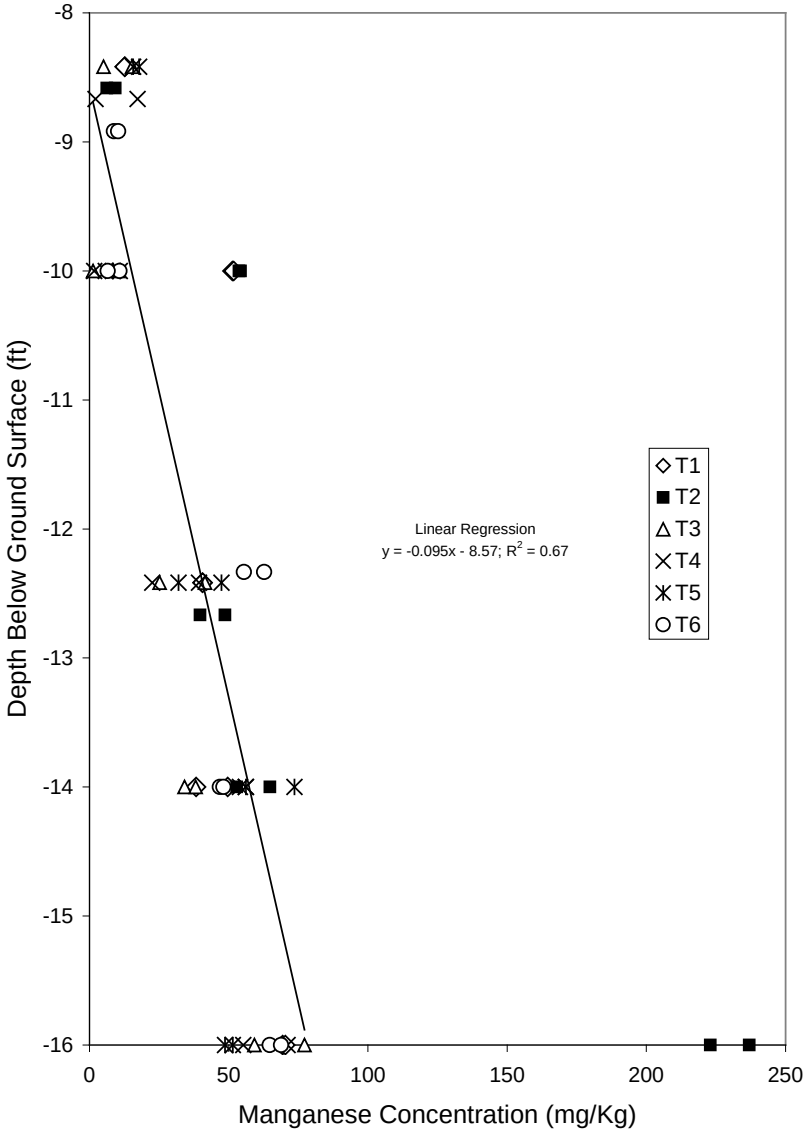
- TOC increases with depth
- Reduced conditions (imparts darker color)

Transect	Interval	TOC (%)	Samples
T1-B	8-12 ft	0.120	9
	12-16 ft	0.227	8
T3-B	8-12 ft	0.112	7
	12-16 ft	0.259	6
T5-B	8-12 ft	0.107	10
	12-16 ft	0.281	6



Iron, Manganese, Sulfur





Hydraulic Conductivity

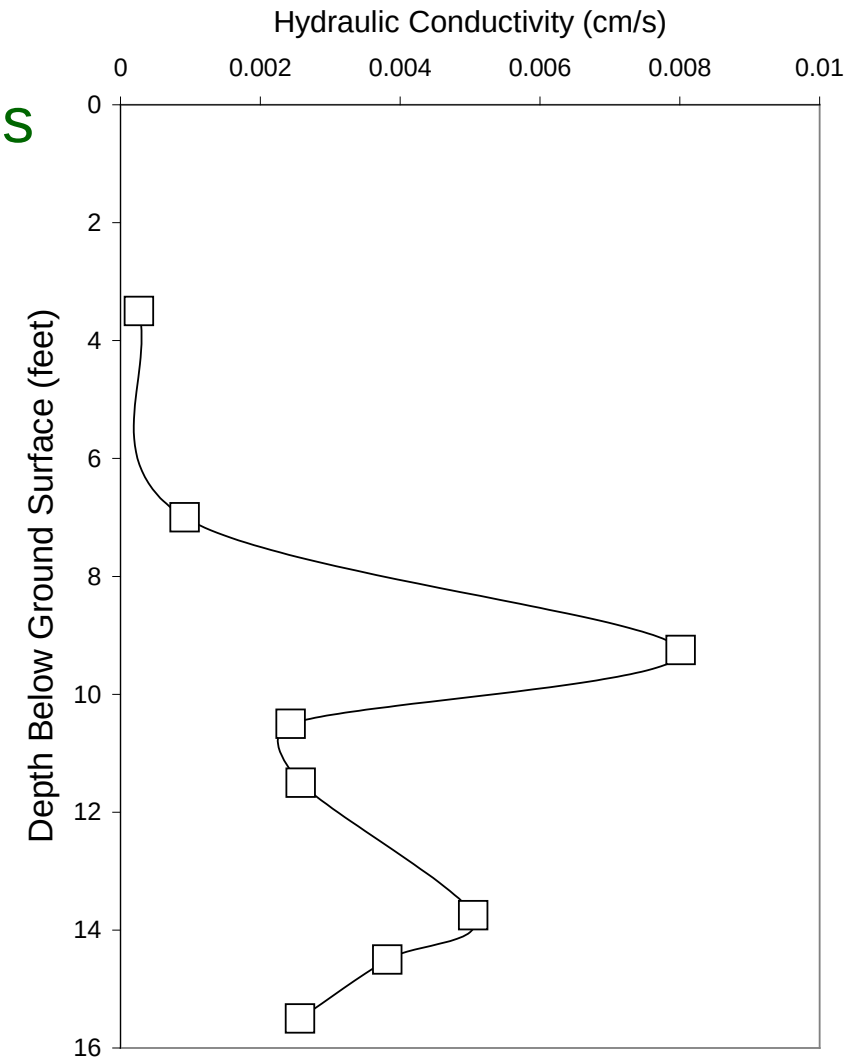
- Slug test summary (nearby wells) (TtNUS, 2004)
  - Upper- and lower surficial; 4 10^{-3} cm/s (n=8) 9 10^{-4} cm/s (n=6)
- Aquifer test summary (nearby wells, n=8)
  - 7 10^{-3} cm/s
- Clean sand, silty sand
- Unconfined surficial aquifer
  - Confined or leaky-confined
- Consistent with aquifer cores collected in 2008 and 2009
  - Thin clay layer found in the 3-6’ bgs interval

Hydraulic Conductivity

- Low conductivity limited transport of water through the column used in the treatability study
  - The column study involved a composite of aquifer material cores
  - Assuming clay was encountered in any one of these cores, water can only flow as fast as the lowest hydraulic conductivity
  - Disturbed aquifer material, composited, and compacted in a column represents a different flow regime
    - Flow direction
    - Re-orientation of soil particles
    - Lower hydraulic conductivity

Hydraulic Conductivity

- Permeameter measurements of discrete interval aquifer cores (Parris Island MCRD, Site 45)
- ASTM D2434
- Lowest K is in aquifer material above target zone



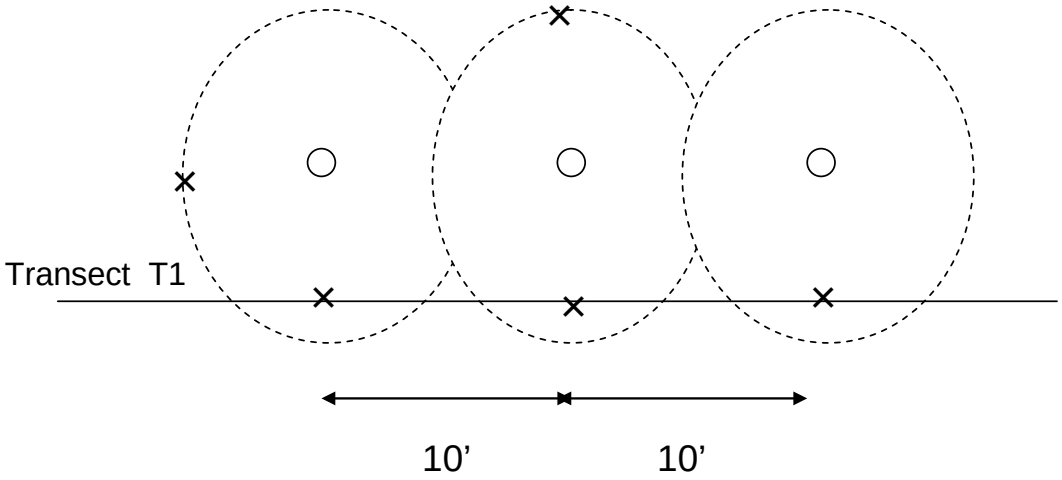
Basic ISCO Tenets for Success

- Reaction between the oxidant and target compound
  - chemistry, oxidant selection (treatability study)
- Physical contact
  - Delivery, sufficient quantity (oxidant mass)
- Contact time between oxidant and target contaminants
  - oxidant persistence (to achieve the treatment objectives)

"Bad chemistry cannot be cured by good application, but good chemistry can definitely be rendered ineffective by bad application"

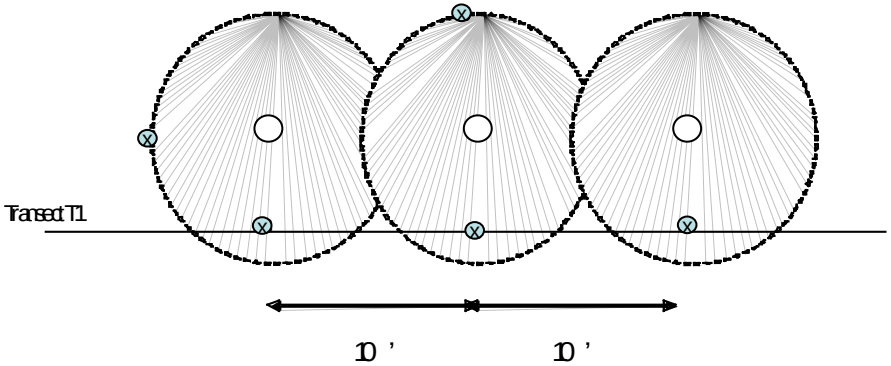
Injection System Design

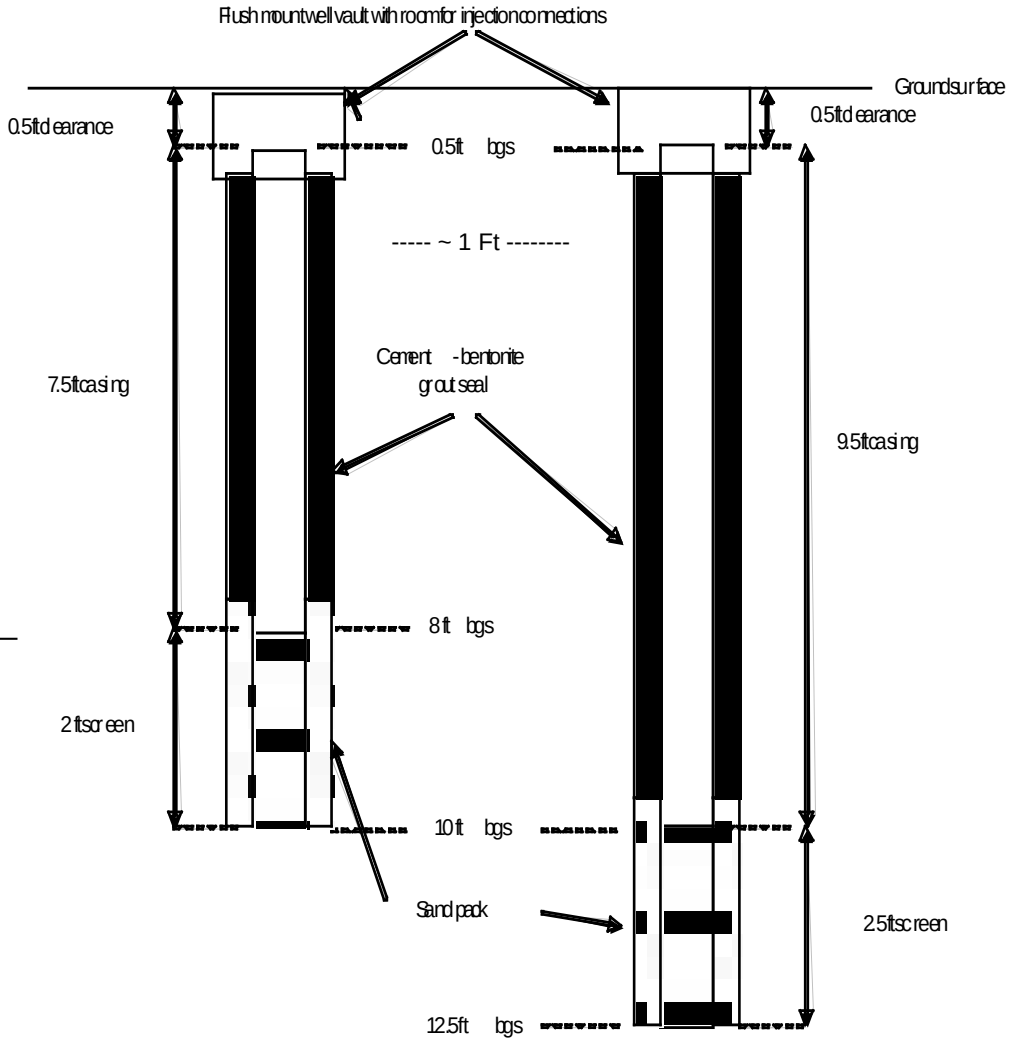
- 1 pore volume of oxidant must be achieved
- Maximize oxidant delivery
  - Close spacing of injection wells – line of 3 cluster wells on 10’ centers
  - Narrow screened intervals (8-10’, 10-12.5’ bgs)
  - Clustered wells at each location
  - Maximum contact between oxidant solution and aquifer material - large 4” (dia.) injection wells; oversized borehole (8”)



Injection Well Design

- Injection wells (4 " screened 8 - 10, 10 - 12.5 ' bgs)
- Monitoring wells (2 " screened 8 - 10, 10 - 12.5 ' bgs





Injection Volumes

Zone	Vertical interval (ft bgs)	ROI (ft)	Injected volume/well (gallons)	Total volume (gallons)
Upper	8-10	5.5	430	1290
Lower	10-12.5	5.5	530	1590
				Total 2,880

Phytate stabilized hydrogen peroxide = 4% H_2O_2 + 5 mM phytate

Base activated persulfate = 5% $Na_2S_2O_8$

Injection versus Reaction Time

Light soil (≈ < 12’ bgs)

H_2O_2 half life: 50 hrs (1st application); >> 50 hrs (2nd application)

$Na_2S_2O_8$ (unstabilized) half life: > 25 days

Dark soil (≈ > 12’ bgs)

H_2O_2 half life: 5 hrs (1st application); 20 hrs (2nd application)

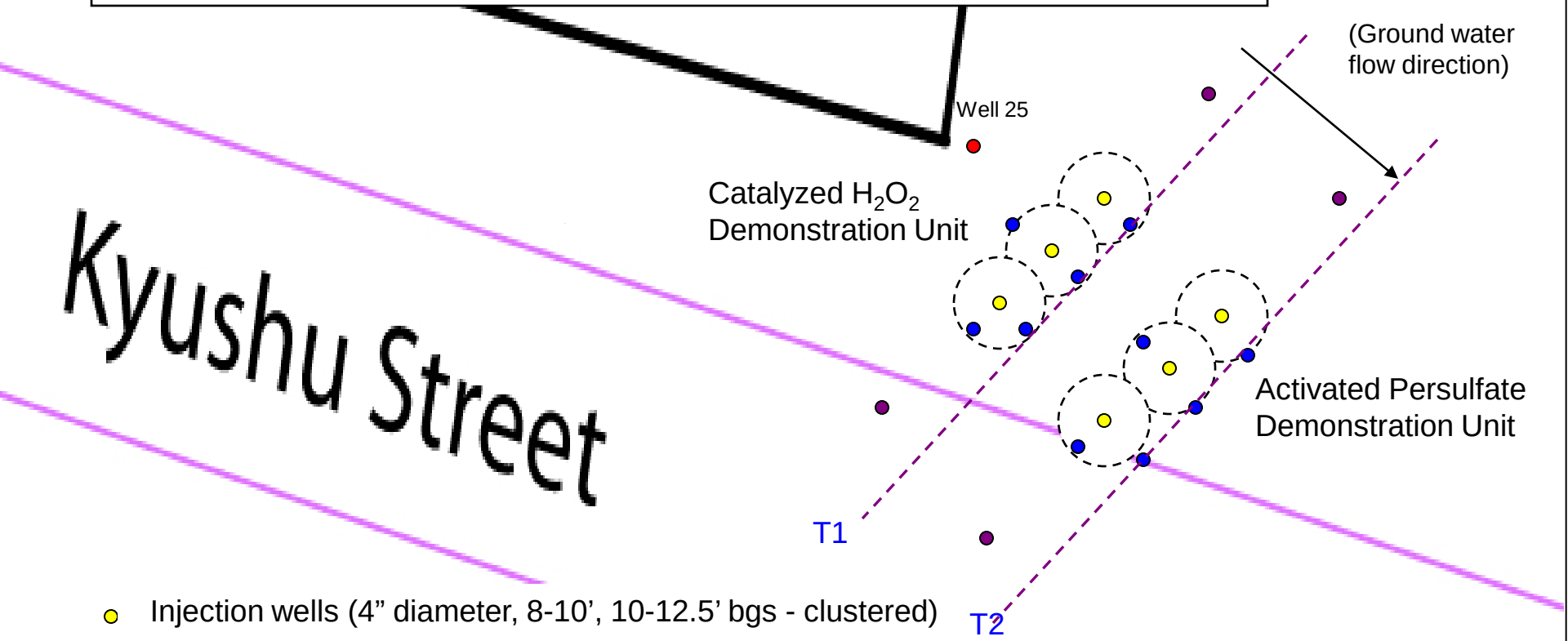
$Na_2S_2O_8$ (unstabilized) persisted 1-2 days (1st application), > 40 days (2nd application)

Injection rate 1-2 gpm (Radius of influence = 5.5’)

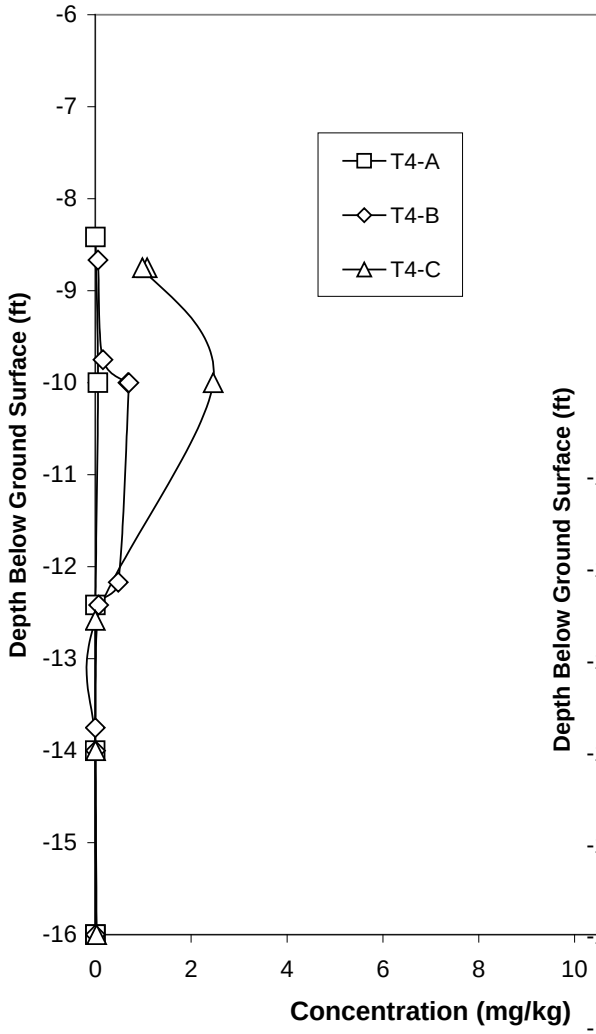
- 8-10’ bgs interval: 3.5 – 7 hrs
- 10-12.5’ bgs interval: 4.5 – 9 hrs

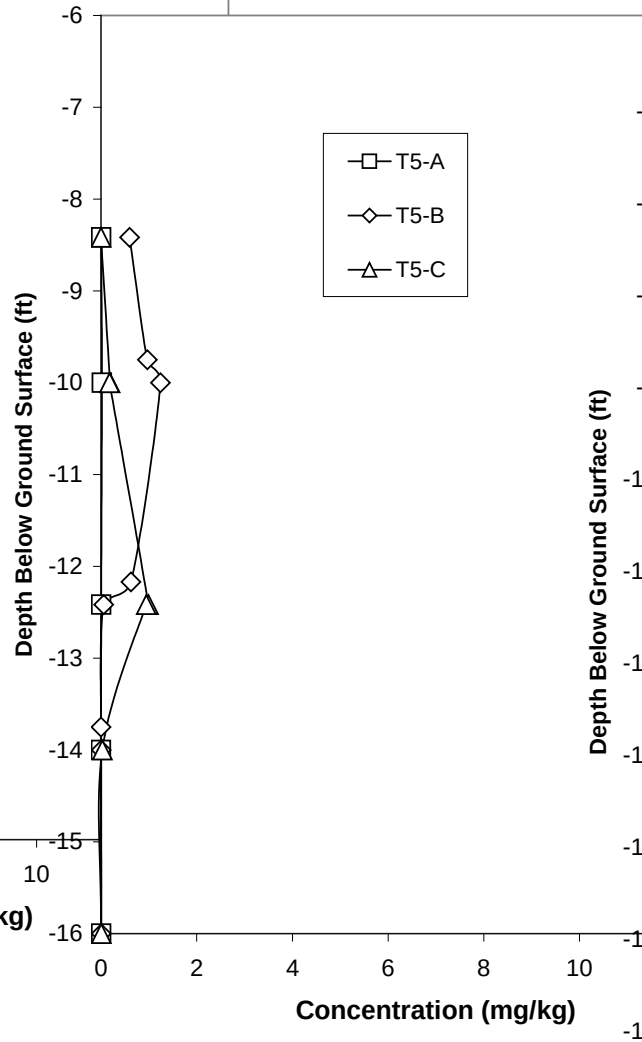
Longer half-lives of H_2O_2 can be achieved with > [Phytate]

Location of Catalyzed Hydrogen Peroxide and Base-Activated Persulfate ISCO Demonstration Units (US Marine Corp Recruit Depot, Site 45, Former Dry Cleaning Facility – South Plume, Parris Island, SC).



- Injection wells (4” diameter, 8-10’, 10-12.5’ bgs - clustered)
- Monitoring wells (2” diameter, 8-10’, 10-12.5’ bgs - clustered)
- Sentry Monitoring Points (3/8” diameter, 21” screen clustered in 8-10’ and 10-12.5’ bgs intervals)


T4-A
T4-B
T4-C
Depth Below Ground Surface (ft)
Concentration (mg/kg)
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
0
2
4
6
8
10


T5-A
T5-B
T5-C
Depth Below Ground Surface (ft)
Concentration (mg/kg)
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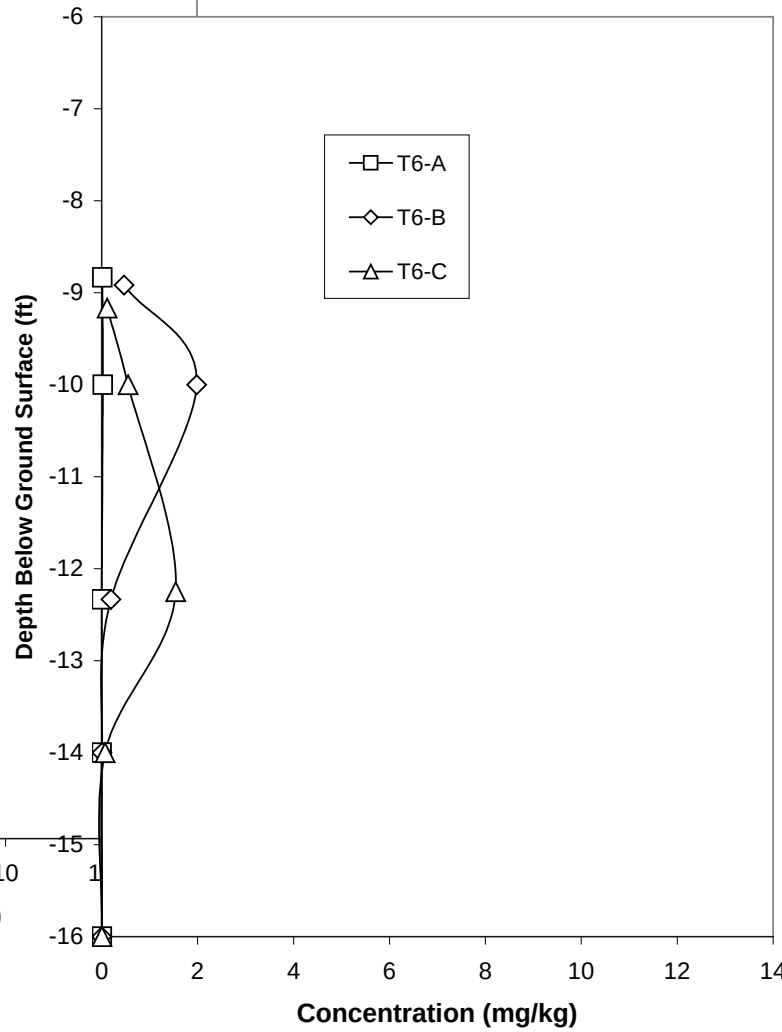
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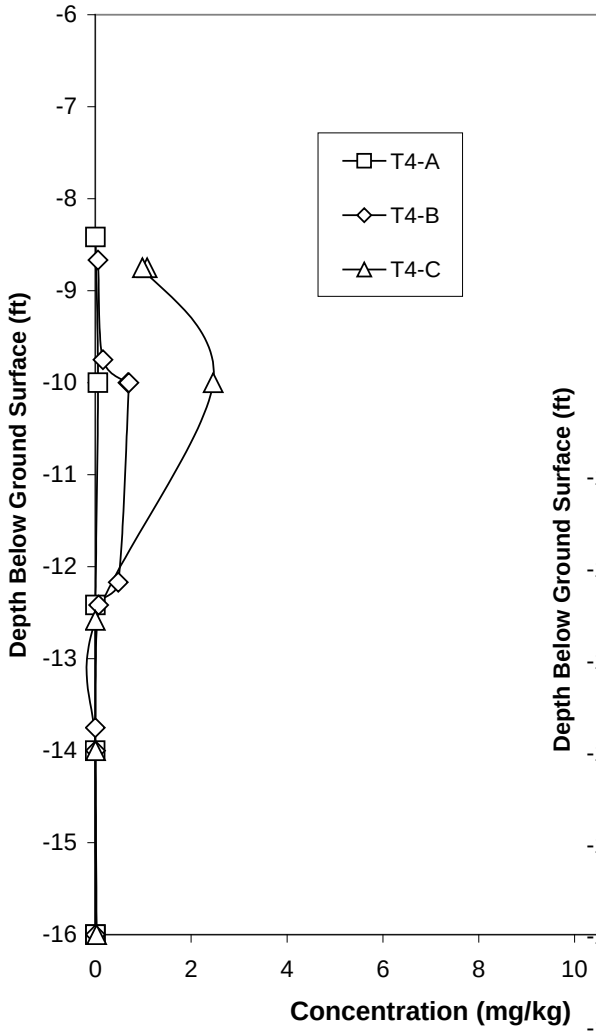
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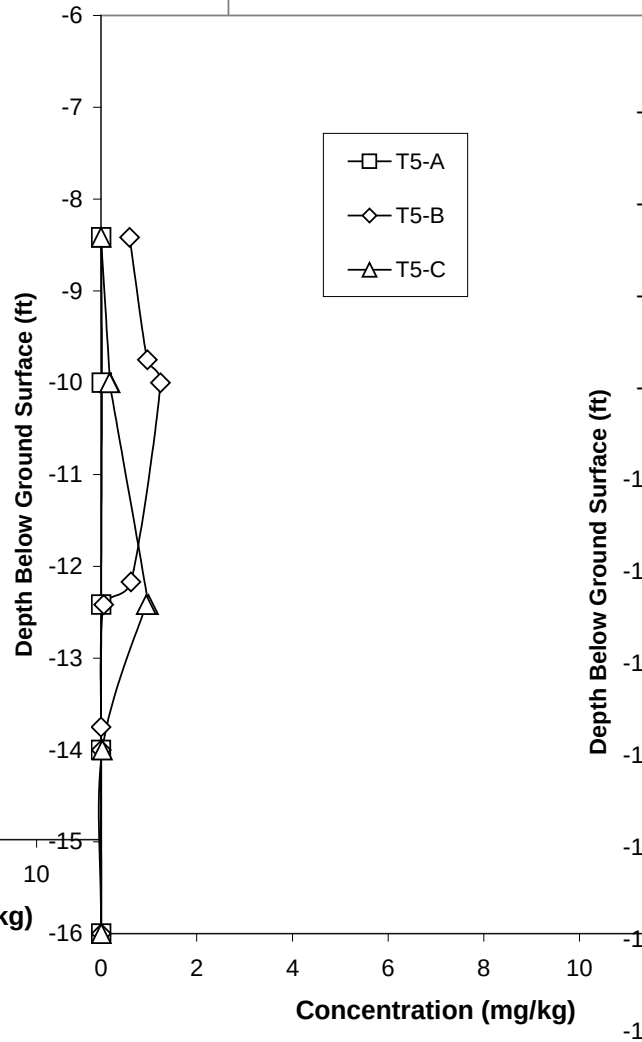
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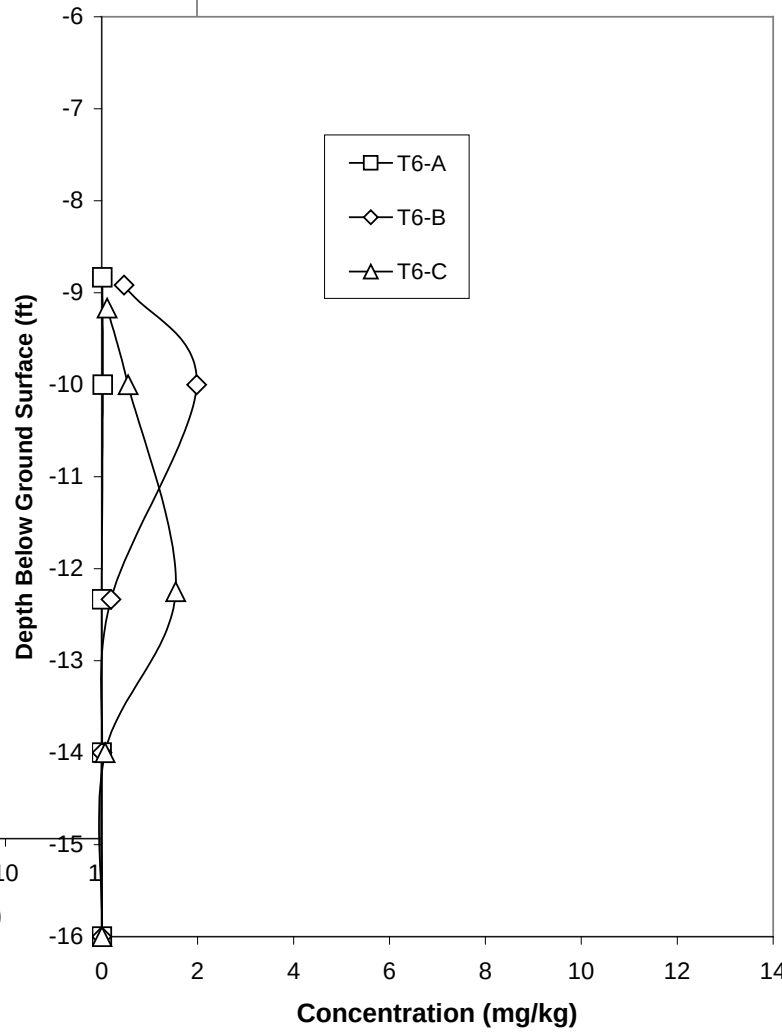
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NOTES AND ACTION ITEMS FROM ISCO CALL: July 27, 2009

Intro - Brief review: LILA

Cancelation of the ESTCP project as a reminder for the purpose of this call/web meeting

- project canceled due to unknown reasons (maybe permeability concerns, maybe change in funding, etc.)
- Site 45 FS Alternatives List (Tt paper) stated we might need a pilot study for in-situ chemical oxidation
    - previous pilot failed to produce usable results either way
- This ISCO pilot would yield information about phytate stabilized oxidants and injection mechanisms
- For use by team to move forward with FS
- Will also further research and yield useable field procedures pertaining to phytate stabilized oxidant ROI and Effectiveness.

ESTCP Transport and Fate Study: SCOTT HULING

Limited scale phytate and peroxide injections

- to be conducted with existing remaining ESTCP funds at their contractor
- to look at impact on radius of influence/transport and fate of oxidant
- performed in an area somewhat removed from secondary source zone since not looking at contaminant reduction (T-5?)
- revised limited workplan will be coming from ISCO team for ESTCP/PI Team review and approval.
- could provide some supporting data for final PI Team decision on pilot or no pilot (see below)
- will provide some data useful to make minor adjustments to original ISCO workplan, if needed, such as ROI

Navy Questions on Oxidation Studies at Site 45 in general:

- *Will pilot of Oxidants create an environment where other alternatives such as vegetable oil will no longer be effective? i.e. Will it kill the microbes needed? Navy referenced presentation by Northwind Environmental showing that the strain needed to reduce vinyl chloride does not rebound.*
    - Scott feels like things will be impacted short-term, but will rebound. Scott will call Northwind and report back.
    - Tim Harrington referenced Site 45 - specific data by Cliff Casey of Navy (data now with Mike Singletary?)
        - studied microbial rebound and was surprised how quickly it rebounded, so this should not be a concern
- *Site 45 Ph runs 5 - 6. Will Base activating the peroxide effect the Ph long-term?*
    - Injections will be targetting a Ph of 10 temporarily only. Tidal influenced areas would be difficult to maintain those Ph levels for long anyway. Scott seemed to indicate there may be some leeway in what we do with Ph.

*** Action Item = Scott to provide literature to support short-term impacts on biological activity after oxidant injections, and to include impacts from Ph manipulation if possible, and in a tidally influenced area if possible (might as well ask for it all in 1.)**

*** Action Item = Scott to otherwise provide seperate literature pertaining to Ph manipulation impacts in tidally influenced areas.**

*** Action Item = Scott to contact Northwind regarding microbes for VC breakdown and report back to the PI Team via email to Lila for distribution.**

*** Action Item = Charles to contact Mike Singletary for Cliff's data on microbial rebound following Fenton's Reagent at Site 45.**

ALL LITERATURE AND/OR DATA TO BE PROVIDED TO LILA, TO BE DISTRIBUTED TO ALL ON THE CALL LIST.

Proposal for EPA to conduct the Pilot Scale ISCO Demonstration: SCOTT HULING

Pilot scale treatability study in the secondary source area as previously designed and/or with modifications in support of the FS.
(SEE PPT PRESENTATION)

- discussed accomplishments to date
    - further site characterization, source zone id. at depth and distance, and
    Work plan already approved but may need slight modifications to adjust to PI Team desires, etc.)
- discussed new data (aquifer material from cores)
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        - Majority of contamination at 9 - 12 feet in loose sand layer
            = migrating plume zone
            (- COCs as shallow as 3 feet = not shown in slide but in original data = pertinant to VI)
    - T-0 and Well 25
        - Majority of contamination at 9 - 12 feet in loose sand layer
            = migrating plume zone
            (- COCs as shallow as 6 feet - but no data above that YET = need it for VI)
        - And even higher hits (DNAPL-ish) at 12 feet bgs in Silty Sand layer down to 16 - 18 feet at clay layer
            - highly reduced zone and peat layer appears to be containing contamination below 12 feet
            - but also permeability is somewhat decreased
            - either way, rate of transport slower than rate of transformation below 12 feet
- discussed existing data impact on current study design, proposed treatment zone, etc.
    - pilot study will now target source area more closely
    - maybe not treat below 12 feet - hydraulic conductivity drops again and TOC increases,
        so may be reducing faster than transporting
        - however, given DNAPL levels -
            weigh cost of monitoring with no treatment .vs. treating and monitoring for shorter period.

- benefits to PI Team and Navy
    - team could influence target treatment zone, oxidant choice, Ph manipulation, etc.
    - potential cost savings on analysis and field geoprobe work (EPA is not profit driven)
    - EPA provides field and technical support for testing (ensuring EPA buy-in to results)
    - yields field procedures for PI team if ISCO alternative is selected as remedy for other areas at Site 45.
    - yields field procedures for others in Env. Restoration.
    - funding EPA from Navy RPM thru IAG is supposedly an easier mechanism than through ESTCP
    - funding by Navy through Charles gives more control to team

Q&A: LILA

Are we choosing a treatment remedy in lieu of FS alternatives?
- Not necessarily. Team can decide the extent to which we want the treatment applied both horizontally and vertically.

After-the-meeting follow-up note from Lila:

I don't feel we fully answered this question during the meeting, so here are my thoughts.....

- Without this study, the site-specific data for ISCO says there is no proof of ISCO working or not at Site 45
  (= previous Fenton's Reagent Study failed to produce results.)
- Otherwise, ISCO may not be a feasible alternative to have in the FS.
- There are some areas not yet treated in the Northern Plume Area (NPA).
- We have not yet seen the final results of the EZVI to know whether or not the NPA needs further treatment.
- We do not know what the effects of the ISCO will be on Southern Pluma Area contaminant levels.
- So parts of the Northern and/or Southern Plume Areas still need treating or may need to be re-treated.
- The results of all the treatability studies at Site 45 will be used in a decision regarding:
  - what action still needs to be taken at Site 45, and
  - which alternative needs to be selected for those actions.
- Otherwise, you all know my montra has been, "It's just 9 feet down, why don't we just dig it up?" : -)

There were no more questions for now.

<u>Team Decision? :</u> LILA

- Charles indicated he had funding and was interested in an estimate
  *** Action Item - Scott to produce rough estimate.**
  Actual Cost to be identified in IAG if decision to implement is made.
- The Team would like to wait and get results from above listed action items before making a decision.
- A decision-making conference call will be held once literature and data from action items has been received and reviewed.

Thanks Folks!