## HTW BCT Meeting

February 22, 2008 at 9:00 a.m.

| Item | Action | Comment |
|---|---|---|
| OU1 Groundwater Remediation | Status Update | HGL |
| OU1 Off-Site | Status Update | |
| OU2 and 2/12 Treatment Systems | Status Update | |
| Other Groundwater Issues | Status Update | Quarterly sampling, report status, inorganic parameters for new wells, DTSC request for time vs. concentration Graphs, Agency FODIS access, Groundwater Summit Mtg, Marina Heights, University Village |
| OUCTP RI/FS, ROD and Pilot Study | Status Update | |
| Groundwater Treatment System Optimization | Status Update | |
| OU2 Landfill Gas | Status Update | |
| Basewide Range Assessment | Status Update | Seaside Risk Assessment, No further action HAs, HA161 |
| Site 39 Feasibility Study Addendum, Proposed Plan and ROD | Status Update | Work Plan schedule |
| Site 3 Post Remediation Monitoring | Status Update | Response to FOEJN letter, Work Plan prep. |
| Five Year Review | Status Update | Responses to FOEJN Comments |
| FFA Schedule | Status Update | |
| FOST/FOSET Issues | Status Update | |
| February Open House/Bus Tours | Update | |
| Calendar Update | Update | |

# SUBJECT: HTW – BCT Meeting
# February 22, 2008
# 9:00 a.m.

| Check (✓) | Name | Organization | Phone | E-mail address |
|---|---|---|---|---|
| | **Roman Racca** | DTSC | 916/255-6407 | Rracca@dtsc.ca.gov |
| | **Kate Burger** | DTSC | 916/255-6537 | kburger@dtsc.ca.gov |
| | **Stephen Pay** | DTSC | 916/255-6403 | spay@dtsc.ca.gov |
| | **John Chesnutt** | U.S. EPA | 415/972-3005 | Chesnutt.john@epa.gov |
| | **Martin Hausladen** | U.S. EPA | 415/972-3007 | Hausladen.martin@epamail.epa.gov |
| | **Grant Himebaugh** | RWQCB | 805/542-4636 | Ghimebaugh@waterboards.ca.gov |
| | **Bill Mabey** | TechLaw Inc | 415/281-8730 | bmabey@techlawinc.com |
| | **Gail Youngblood** | Fort Ord BRAC | 831/242-7918 | gail.youngblood@us.army.mil |
| | **Derek Lieberman** | Ahtna | 831/242-4873 | dlieberman@ahtnagov.com |
| | **Bill Collins** | Fort Ord BRAC | 831/242-7920 | William.K.Collins@us.army.mil |
| | **Rob Robinson** | Fort Ord BRAC | 831/242-7900 | clinton.w.robinson@us.army.mil |
| | **George Siller** | COE | 916/557-7418 | George.L.Siller@usace.army.mil |

# SUBJECT: HTW – BCT Meeting
# February 22, 2008
# 9:00 a.m.

| Check (✓) | Name | Organization | Phone | E-mail address |
|---|---|---|---|---|
| | **David Eisen** | COE | 831/393-9692 | David.Eisen@usace.army.mil |
| | **Mark Eldridge** | AEC | 410/436-6325 | Mark.h.eldridge@us.army.mil |
| | **Peter Kelsall** | Shaw E & I | 831/883-5810 ext. 810 | Peter.Kelsall@shawgrp.com |
| | **David Kelly** | Shaw E & I | 925/288-2321 | David.kelly@shawgrp.com |
| | **Jen Moser** | GEM/Shaw E & I | 831/883-5812 | Jen.moser@shawgrp.com |
| | **Eric Schmidt** | Shaw E & I | 831/883-5809 | Eric.Schmidt@shawgrp.com |
| | **Ed Ticken** | MACTEC E&C | 415/884-3176 | ejticken@mactec.com |
| | **Carlene Merey** | MACTEC E&C | 415/884-3276 | cmerey@mactec.com |
| | **Marc Edwards** | COE | | Marc.A.Edwards@usace.army.mil |
| | **Michael Taraszki** | MACTEC E&C | 415/884-3325 | mdtaraski@mactec.com |
| | **Chuck Holman** | Ahtna | 916/372-2000 | cholman@ahtnagov.com |
| | **Kelly O'Meara** | Ahtna | 916/372-2000 | komeara@ahtnagov.com |
| | **Mike Bombard** | HydroGeoLogic | 916/614-8770 | mbombard@hgl.com |

# SUBJECT: HTW – BCT Meeting
# February 22, 2008
# 9:00 a.m.

| Check (✓) | Name | Organization | Phone | E-mail address |
|---|---|---|---|---|
| | **Don Jones** | HydroGeoLogic | 916/614-8770 | djones@hgl.com |
| Phone | **Roy Evans** | HydroGeoLogic | 303-984-1167 x5 | revans@hgl.com |
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# OPERABLE UNIT 1
# OFF-SITE GROUNDWATER EXTRACTION PILOT STUDY

## STATUS – February 22, 2008

### FIELD WORK

- Well construction complete – December 21
  - 2 extraction wells
  - 3 monitoring wells
- Well development complete – January 3
- Wells surveyed – January 15
- Marina Coast Water District (MCWD) Meeting – February 13

### SCHEDULE

- OU1 Pilot Study Work Plan Agency comments due – February 6
- Equipment/material procurement – February 29
- System construction – March 28
- Baseline sampling and analysis – April 4
- System Startup – April 7

### DATA (Preliminary)

- None

### PROBLEMS/CHANGES

- Treated groundwater will be discharged to a discharge basin within the MCWD property. An injection well was not installed.
- Project schedule delayed to acquire MCWD approval for placement of treatment system and for treated groundwater discharge.

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# Former Fort Ord Groundwater Treatment Systems Operational Data and Status

## BCT Meeting February 22, 2008

| GWTP Treatment Statistics – January 2008 | | | | |
|---|---|---|---|---|
| | Volume Treated (gallons) | Average Flow Rate (gallons per minute) | % of Time Online | Mass Removed (lbs) |
| **OU2** | | | | |
| January 2008 | 35,578,510 | 735 | 92.0 | 2.85 |
| *Since October 1995* | 4.021 billion | | | 555 |
| **Sites 2/12** | | | | |
| January 2008 | 6,728,300 | 152 | 90.0 | 1.74 |
| *Since May 1999* | 1.093 billion | | | 389 |

| Key Events for OU2 and Sites 2/12 for January 2008 | | | | | | |
|---|---|---|---|---|---|---|
| S | M | T | W | T | F | S |
| *35 USA Notices in January, none of which required onsite attention* | | 1 | 2 Eastern Network restarted. New pumps installed in EW-OU2-16A and 4A. | 3 PLC program updated with new 2/12 extraction well id's. | 4 Heavy storms caused power outages to OU2 and Sites 2/12[1] | 5 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 2007 Draft O&M DTSC comments received | 19 |
| 20 | 21 | 22 | 23 OU2 and 2/12 PE sampling event conducted. | 24 | 25 | 26 |
| 27 | 28 Eastern Network PLC upgrades began. | 29 | 30 | 31 Eastern Network PLC upgrades stopped due to pullbox complications. | | |

[1] Heavy storms caused power and communication outages to both plants Friday, January 4. Both plants remained offline until damages were assessed and communications could be reestablished. Both plants were brought back online Monday, January 7 without further complications.

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| OU2 Analytical Results at TS-OU2-INJ | | | | | |
|---|---|---|---|---|---|
| | Discharge Limit (µg/L)‡ | Sample Date / Analytical Results | | | |
| COC | | 01/02/2008 | 01/16/2008** | 01/23/2008** | 01/30/2008** |
| 1,1-DCA | 5.0* | **0.78** | **0.86** | **1.1** | **0.96** |
| 1,2-DCA | 0.5 | **0.23 J** | **0.20 J** | **0.27 J** | **0.22J** |
| 1,2-DCP † | 0.5 | ND | ND | ND | ND |
| Benzene | 0.5 | ND | ND | ND | ND |
| Carbon Tetrachloride | 0.5 | ND | ND | ND | ND |
| Chloroform | 2.0* | **0.63** | **0.59** | **0.61** | **0.58** |
| Cis-1,2-DCE | 6.0* | **1.6** | **1.8** | **2.0** | **2.0** |
| Methylene Chloride | 0.5 | ND | ND | ND | ND |
| PCE | 0.5 | ND | ND | ND | ND |
| TCE | 0.5 | ND | ND | ND | ND |
| Vinyl Chloride | 0.5 | ND | ND | ND | ND |

| Sites 2/12 Analytical Results at TS-212-INJ | | | | | | |
|---|---|---|---|---|---|---|
| | Discharge Limit (µg/L)‡ | Sample Date / Analytical Results | | | | |
| COC | | 01/02/2008 | 01/10/2008 | 01/16/2008** | 01/23/2008** | 01/30/2008** |
| 1,1-DCE | 6.0 | ND | ND | ND | ND | ND |
| 1,2-DCA | 0.5 | **0.20 J** | **0.16 J** | **0.15 J** | **0.16 J** | **0.19 J** |
| 1,3-DCP † | 0.5 | ND | ND | ND | ND | ND |
| Chloroform | 2.0 | **0.42 J** | **0.34 J** | **0.37 J** | **0.37 J** | **0.42 J** |
| Cis-1,2 DCE | 6.0 | **2.1** | **2.6** | **2.5** | **2.3** | **2.4** |
| PCE | 3.0 | ND | ND | ND | ND | ND |
| TCE | 5.0 | ND | ND | ND | ND | ND |
| Vinyl Chloride | 0.1 | ND | ND | ND | ND | ND |

J The analyte was positively identified, but the associated numerical value is an approximate concentration greater than the Method Detection Limit (MDL) but less than the Practical Quantitation Limit (PQL).

ND The analyte was not detected above MDL.

* Discharge limits for low carbon affinity compounds were increased to the Aquifer Cleanup Level (ACL).

‡ Discharge limits are the ACLs for injection over the plume.

† The reported value is the sum of both cis- and trans-isomers.

** Preliminary data; validation has not been completed.

J± Data are qualified as estimated, with a high (+) or low (-) bias likely to have occurred. False positives or false negatives are unlikely to have been reported.

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| January 2008 OU2 and Sites 2/12 Extraction Well Status | | | | | |
|---|---|---|---|---|---|
| Well Identification | % On | Avg. gpm | Total Gallons | % of Total | Comments |
| **Site 12 Extraction Wells** | | | | | |
| EW-12-05-180M | 86.1 | 72.3 | 3,214,100 | 47.7 | |
| EW-12-06-180M | 89.8 | 77.2 | 3,425,000 | 50.9 | |
| EW-12-07-180M | 0 | 0 | 0 | 0 | Cycling due to air stripper flow limits. |
| EW-12-03-180U | 0.1 | 0 | 1,200 | 0 | Offline due to low concentrations. |
| EW-12-03-180M | 3.2 | 2.0 | 88,000 | 1.3 | Offline due to low concentrations. |
| EW-12-04-180U | 0.1 | 0 | 0 | 0 | Offline due to low concentrations. |
| EW-12-04-180M | 0 | 0 | 0 | 0 | Ceased operating on 11/21/2005. No power. |
| **OU2 Extraction Wells** | | | | | |
| ***Western Network*** | | | | | |
| EW-OU2-01-A | 0 | 0 | 0 | 0 | Offline due to low concentrations. |
| EW-OU2-02-A | 91.3 | 52.0 | 2,326,650 | 6.5 | |
| EW-OU2-03-A | 0 | 0 | 0 | 0 | Offline due to low concentrations. |
| EW-OU2-04-A | 88.2 | 44.9 | 2,005,320 | 5.6 | |
| EW-OU2-05-A | 85.1 | 42.5 | 1,901,160 | 5.3 | |
| EW-OU2-06-A | 91.3 | 33.7 | 1,511,020 | 4.2 | |
| EW-OU2-01-180 | 0 | 0 | 0 | 0 | Offline due to low concentrations. |
| *Total gallons extracted:* | | | *7,744,150* | *21.6* | |
| ***Eastern Network*** | | | | | |
| EW-OU2-07-A | 0 | 0 | 0 | 0 | Offline due to low concentrations. |
| EW-OU2-08-A | 86.2 | 23.2 | 1,020,750 | 2.6 | |
| EW-OU2-09-A | 86.2 | 21.5 | 960,940 | 2.7 | |
| EW-OU2-10-A | 86.2 | 20.6 | 916,800 | 2.6 | |
| EW-OU2-11-A | 0 | 0 | 0 | 0.0 | Offline due to area construction, relocation of electrical service. |
| EW-OU2-12-A | 0 | 0 | 0 | 0.0 | |
| EW-OU2-13-A | 89.6 | 25.0 | 1,123,840 | 3.2 | |
| EW-OU2-02-180 | 19.7 | 2.3 | 2,000 | 0 | |
| *Total gallons extracted:* | | | *4,024,330* | *11.1* | |
| ***Shoppette*** | | | | | |
| EW-OU2-05-180 | 91.3 | 110.0 | 4,907,489 | 13.8 | |
| EW-OU2-06-180 | 91.2 | 148.0 | 6.029,040 | 16.9 | |
| EW-OU2-16-A | 84.0 | 42.8 | 1,929,800 | 5.4 | |
| *Total gallons extracted:* | | | *12,866,329* | *36.1* | |
| ***CSUMB*** | | | | | |
| EW-OU2-14-A | 88.6 | 42.5 | 1,909,200 | 5.3 | |
| EW-OU2-15-A | 15.5 | 2.7 | 126,800 | 0.4 | |
| *Total gallons extracted:* | | | *2,036,000* | *5.7* | |
| ***Landfill*** | | | | | |
| EW-OU2-03-180 | 84.0 | 115.0 | 6,627,701 | 18.6 | |
| EW-OU2-04-180 | 0 | 0 | 0 | 0.0 | Offline due to low concentrations. |
| *Total gallons extracted:* | | | *6,627,701* | *18.6* | |
| ***Bunker Hill*** | | | | | |
| EW-OU2-08-180 | 86.2 | 50.8 | 2,280,000 | 6.4 | |
| *Total gallons extracted:* | | | *2,280,000* | *6.4* | |

The following table provides the latest[2] organic data for key COCs of interest in each of the extraction wells for OU2 and Sites 2/12, respectively. Results exceeding the ACL are in bold.

| OU2 Extraction Wells Organic Data | | | |
|---|---|---|---|
| Well Identification | Analytical Results (µg/L) | | |
| | Chloroform (2.0) | Cis-1.2-DCE (6.0) | TCE (5.0) |
| *Western Network* | | | |
| EW-OU2-01-A | 0.20 J | ND | 1.1 |
| EW-OU2-02-A | 0.22 J | ND | 1.2 |
| EW-OU2-03-A | Not sampled | | |
| EW-OU2-04-A | Not sampled | | |
| EW-OU2-05-A | 0.47 J | 1.5 | **5.2** |
| EW-OU2-06-A | 0.47 J | 1.8 | **5.0** |
| EW-OU2-01-180 | Not sampled | | |
| *Eastern Network* | | | |
| EW-OU2-07-A | ND | ND | ND |
| EW-OU2-08-A | ND | 1.1 | 2.0 |
| EW-OU2-09-A | 0.32 J | 5.3 | **5.6** |
| EW-OU2-10-A | 0.48 J | 4.3 | **5.6** |
| EW-OU2-11-A | 0.30 J | 0.71 | 2.4 |
| EW-OU2-12-A | Not sampled | | |
| EW-OU2-13-A | 1.8 | 1.6 | **18** |
| EW-OU2-02-180 | ND | 4.8 | 3.4 |
| *Shoppette* | | | |
| EW-OU2-05-180 | 0.35 J | 0.82 | **9.7** |
| EW-OU2-06-180 | 0.43 J | 1.6 | **6.6** |
| EW-OU2-16-A | 3.5 | **17** | **15** |
| *CSUMB* | | | |
| EW-OU2-14-A | 0.58 | ND | 2.2 |
| EW-OU2-15-A | 0.26 J | ND | 0.46 J |
| *Landfill* | | | |
| EW-OU2-03-180 | 0.26 J | 3.8 | **38** |
| EW-OU2-04-180 | ND | ND | ND |
| *Bunker Hill* | | | |
| EW-OU2-08-180 | 0.16 J | 0.43 J | 1.7 |

J The analyte was positively identified, but the associated numerical value is an approximate concentration greater than the Method Detection Limit (MDL) but less than the Practical Quantitation Limit (PQL).

J± Data are qualified as estimated, with a high (+) or low (-) bias likely to have occurred. False positives or false negatives are unlikely to have been reported.

ND The analyte was not detected above the reported limit of quantitation.

UJ The analyte was not detected above the reported quantitation limit. However, the reported quantitation limit value is approximate, and may or may not represent the actual limit necessary

[2] Samples were collected in December 2007.

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## Site 12 Extraction Wells Organic Data

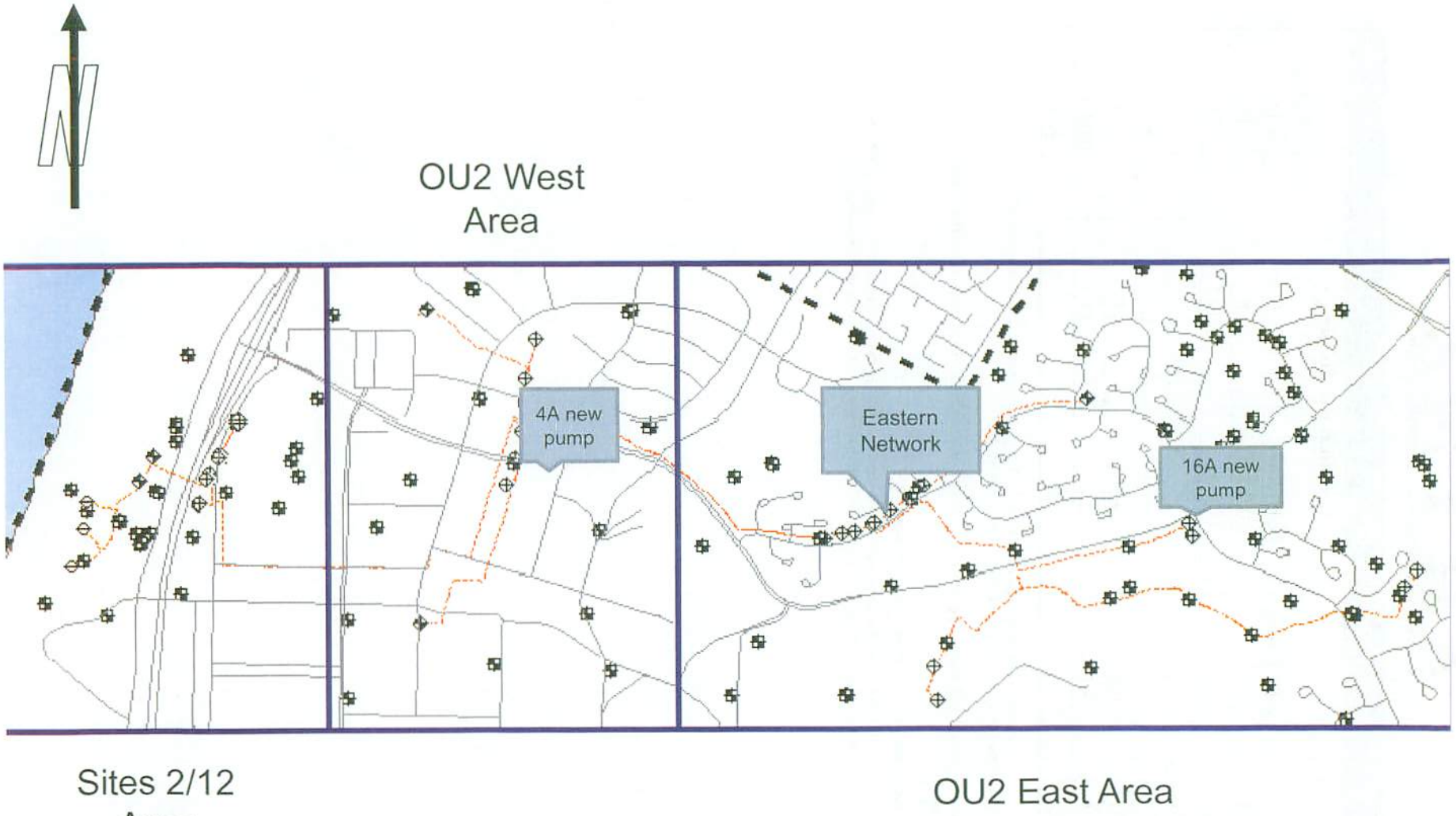
| Well Identification | Analytical Results (µg/L) | | | |
|---|---|---|---|---|
| | Cis-1.2-DCE (6.0) | PCE (3.0) | TCE (5.0) | Vinyl Chloride (0.1) |
| EW-12-03-180M | 3.9 | 0.98 | 7.8 | ND |
| EW-12-03-180U | ND | 0.23 J | 0.28 J | ND |
| EW-12-04-180M | Not Sampled | | | |
| EW-12-04-180U | ND | 0.19 J | 1.3 | ND |
| EW-12-05-180M | 8.0 | 9.5 | 17 | 0.14 |
| EW-12-06-180M | 8.1 | 2.1 | 17 | 0.08 J |
| EW-12-07-180M | 3.0 | 2.2 | 4.9 | ND |

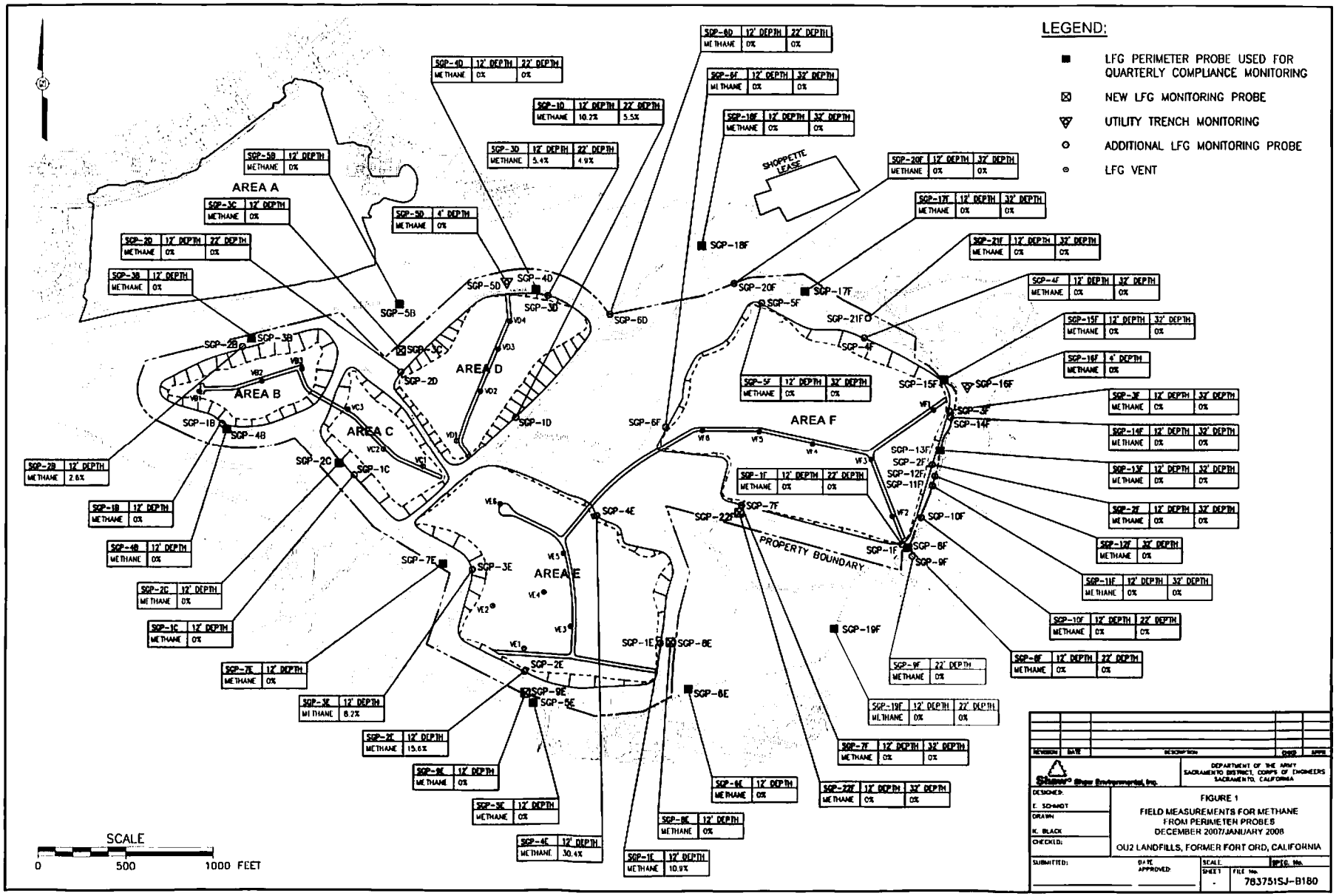
J The analyte was positively identified, but the associated numerical value is an approximate concentration greater than the Method Detection Limit (MDL) but less than the Practical Quantitation Limit (PQL).

J± Data are qualified as estimated, with a high (+) or low (-) bias likely to have occurred. False positives or false negatives are unlikely to have been reported.

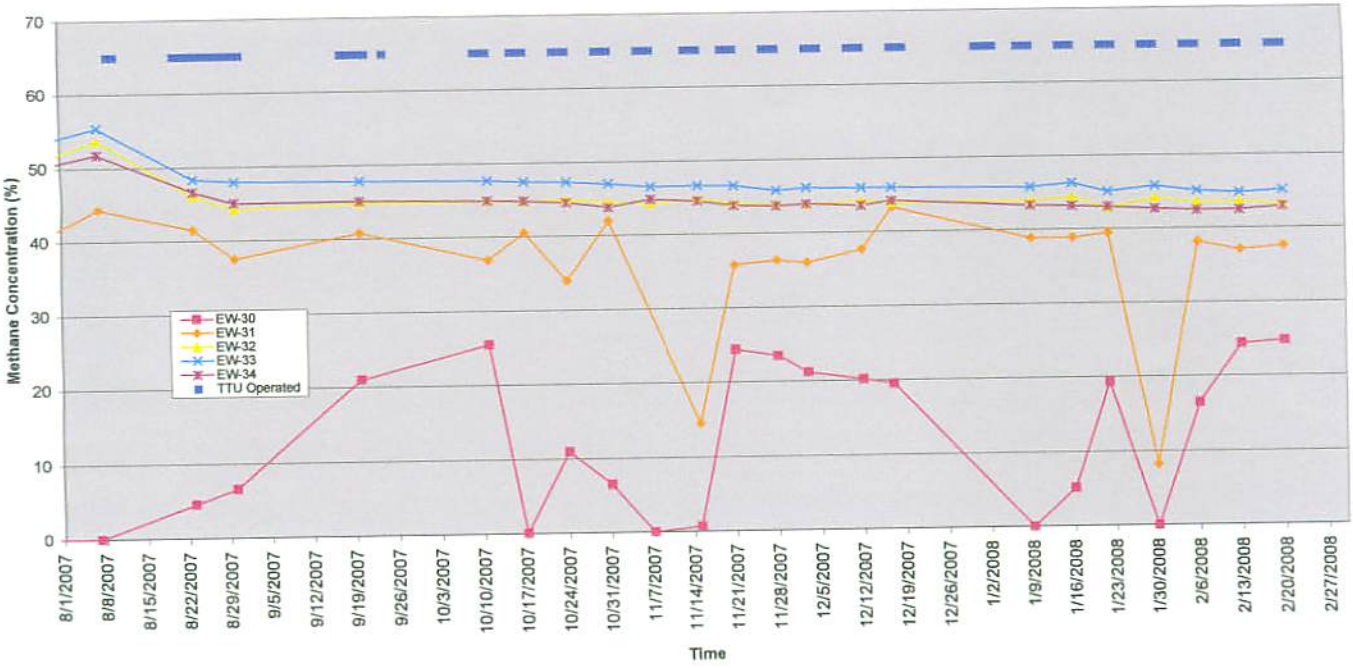
ND The analyte was not detected above the reported limit of quantitation.

UJ The analyte was not detected above the reported quantitation limit. However, the reported quantitation limit value is approximate, and may or may not represent the actual limit necessary to accurately & precisely measure the analyte in the sample matrix

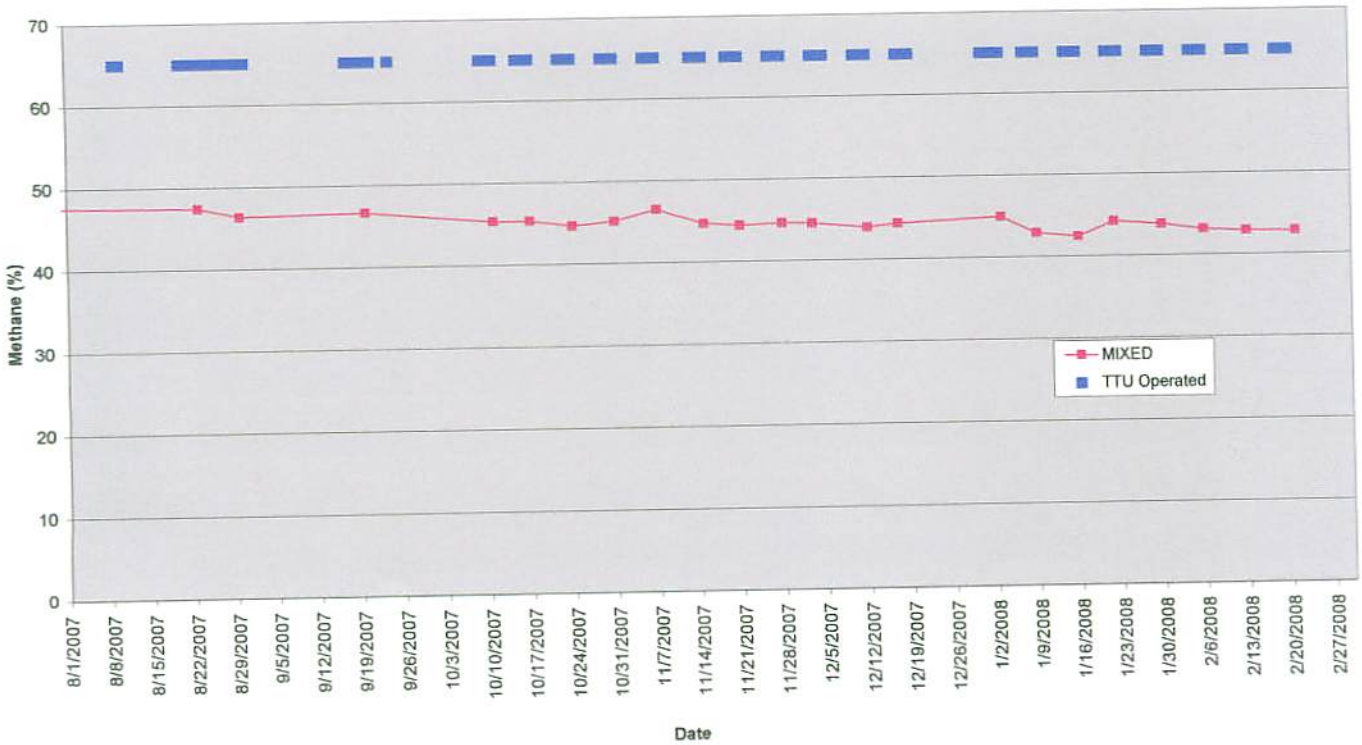

OU2 West Area
4A new pump
Eastern Network
16A new pump
Sites 2/12 Area
OU2 East Area


LEGEND:
LFG PERIMETER PROBE USED FOR QUARTERLY COMPLIANCE MONITORING
NEW LFG MONITORING PROBE
UTILITY TRENCH MONITORING
ADDITIONAL LFG MONITORING PROBE
LFG VENT
AREA A
AREA B
AREA C
AREA D
AREA E
AREA F
SHOPPETTE LEASE
PROPERTY BOUNDARY
SCALE
0
500
1000 FEET
FIGURE 1
FIELD MEASUREMENTS FOR METHANE FROM PERIMETER PROBES
DECEMBER 2007/JANUARY 2008
OU2 LANDFILLS, FORMER FORT ORD, CALIFORNIA
DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA
783751SJ-B180

**Methane Concentration vs. Time**
**(after 08-01-07)**
**Interior Extraction Wells**




**Methane Concentration vs. Time**
**(after 08-01-07)**
**Mixed Port at TTU**



# Thermal Treatment Unit
## Operation Summary
## 2007/2008

| | |
|---|---|
| Start Date/Time: | 1/1/2007 |
| Last Reading Date/Time: | 2/20/2008 15:00 |
| Total Hours (2007): | 8760 |
| Total Hours Operated (2007): | 4035.4 |
| % Operation (2007): | 48.7% |
| Total Hours (2008): | 1215 |
| Total Hours Operated (2008): | 452.2 |
| % Operation (2008): | 37.2% |
| Cumulative % Operation (since 1/1/2007): | 45.0% |

| | |
|---|---|
| Pounds of Methane Removed (2007) | 372682 |
| Pounds of Methane Removed (2008) | 37549 |

| Date TTU Started | Date TTU Shutdown | Hours Operated |
|---|---|---|
| 1/1/07 0:00 | 3/8/07 12:00 | 1561.0 |
| 3/29/07 8:30 | 3/29/07 12:30 | 4.0 |
| 4/7/07 7:30 | 5/4/07 16:00 | 656.5 |
| 5/21/07 8:00 | 6/18/07 8:00 | 672.0 |
| 7/9/07 14:00 | 7/13/07 15:00 | 97.0 |
| 8/9/07 7:30 | 8/10/07 11:00 | 27.5 |
| 8/20/07 7:30 | 8/31/07 16:00 | 272.5 |
| 9/17/07 8:00 | 9/21/07 15:00 | 103.0 |
| 9/24/07 12:00 | 9/24/07 15:00 | 3.0 |
| 10/9/07 8:00 | 10/11/07 16:30 | 56.5 |
| 10/15/07 7:15 | 10/17/07 16:45 | 57.4 |
| 10/22/07 7:40 | 10/24/07 16:45 | 57.0 |
| 10/29/07 7:15 | 10/31/07 16:45 | 57.4 |
| 11/5/07 7:20 | 11/7/07 15:30 | 56.2 |
| 11/13/07 7:15 | 11/15/07 16:00 | 56.7 |
| 11/19/07 7:30 | 11/21/07 15:30 | 56.0 |
| 11/26/07 7:00 | 11/28/07 15:15 | 56.2 |
| 12/3/07 7:00 | 12/5/07 16:00 | 57.0 |
| 12/10/07 7:00 | 12/12/07 15:30 | 56.5 |
| 12/17/07 7:30 | 12/19/07 16:30 | 57.0 |
| 12/31/07 9:00 | 1/3/08 15:00 | 78.0 |
| 1/7/08 7:30 | 1/9/08 16:30 | 57.0 |
| 1/14/08 8:00 | 1/16/08 16:00 | 56.0 |
| 1/21/08 7:45 | 1/23/08 16:00 | 56.3 |
| 1/28/08 12:00 | 1/30/08 16:00 | 51.0 |
| 2/4/08 8:00 | 2/6/08 16:00 | 56 |
| 2/11/08 7:20 | 2/13/08 16:10 | 56.9 |
| 2/18/08 7:00 | 2/20/08 15:00 | 56 |

| YEAR_Month | SumOfPOUNDS_METHANE |
|---|---|
| 2007/1 | 76359 |
| 2007/2 | 62445 |
| 2007/3 | 14078 |
| 2007/4 | 52738 |
| 2007/5 | 29140 |
| 2007/6 | 37394 |
| 2007/7 | 8491 |
| 2007/8 | 26379 |
| 2007/9 | 9733 |
| 2007/10 | 20576 |
| 2007/11 | 19753 |
| 2007/12 | 15595 |
| 2008/1 | 23914 |
| 2008/2 | 13635 |

**Figure 3**
**Vinyl Chloride Concentration vs. Date**
**Additional Monitoring Probes**
**June 2000 - January 2008**

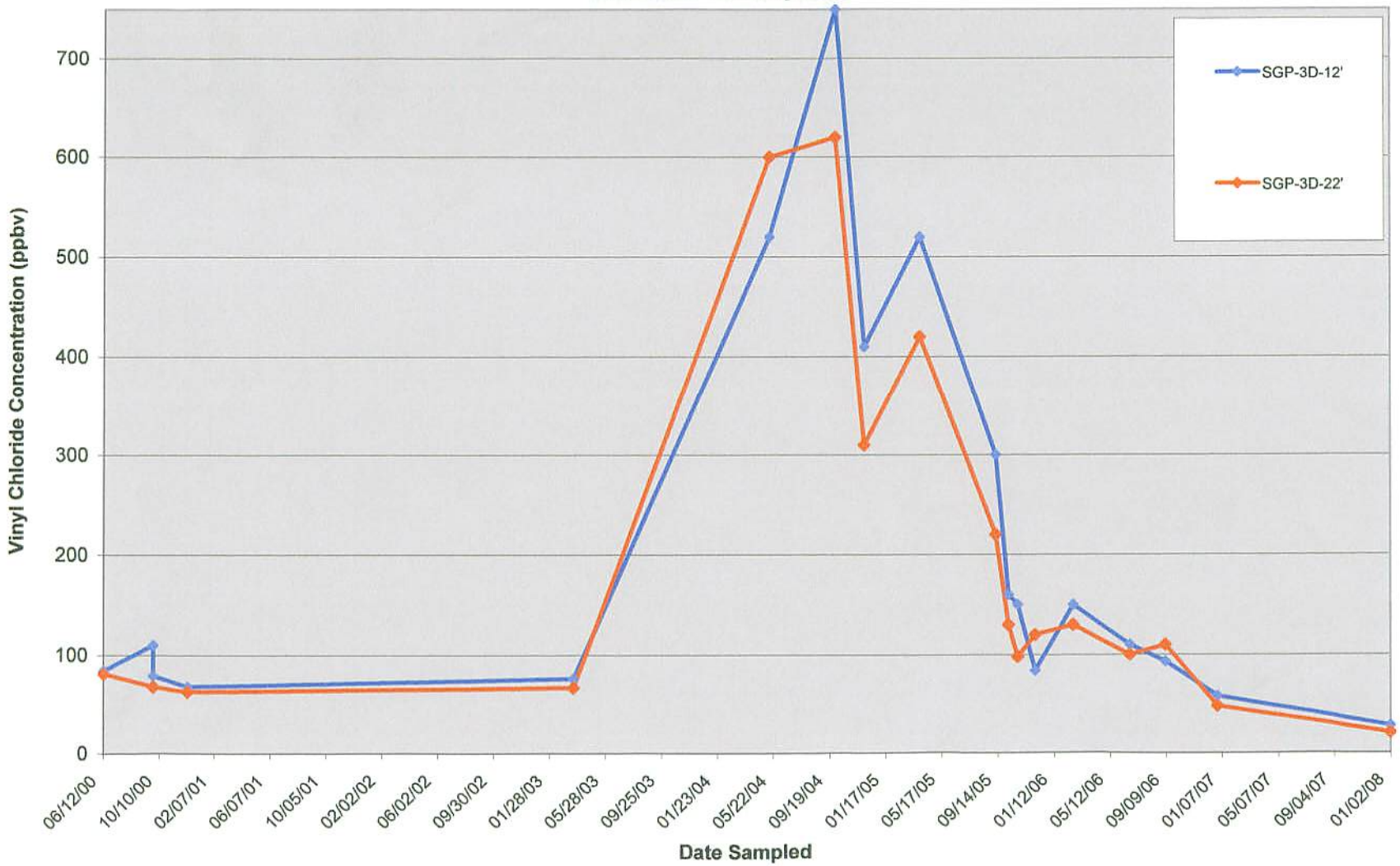
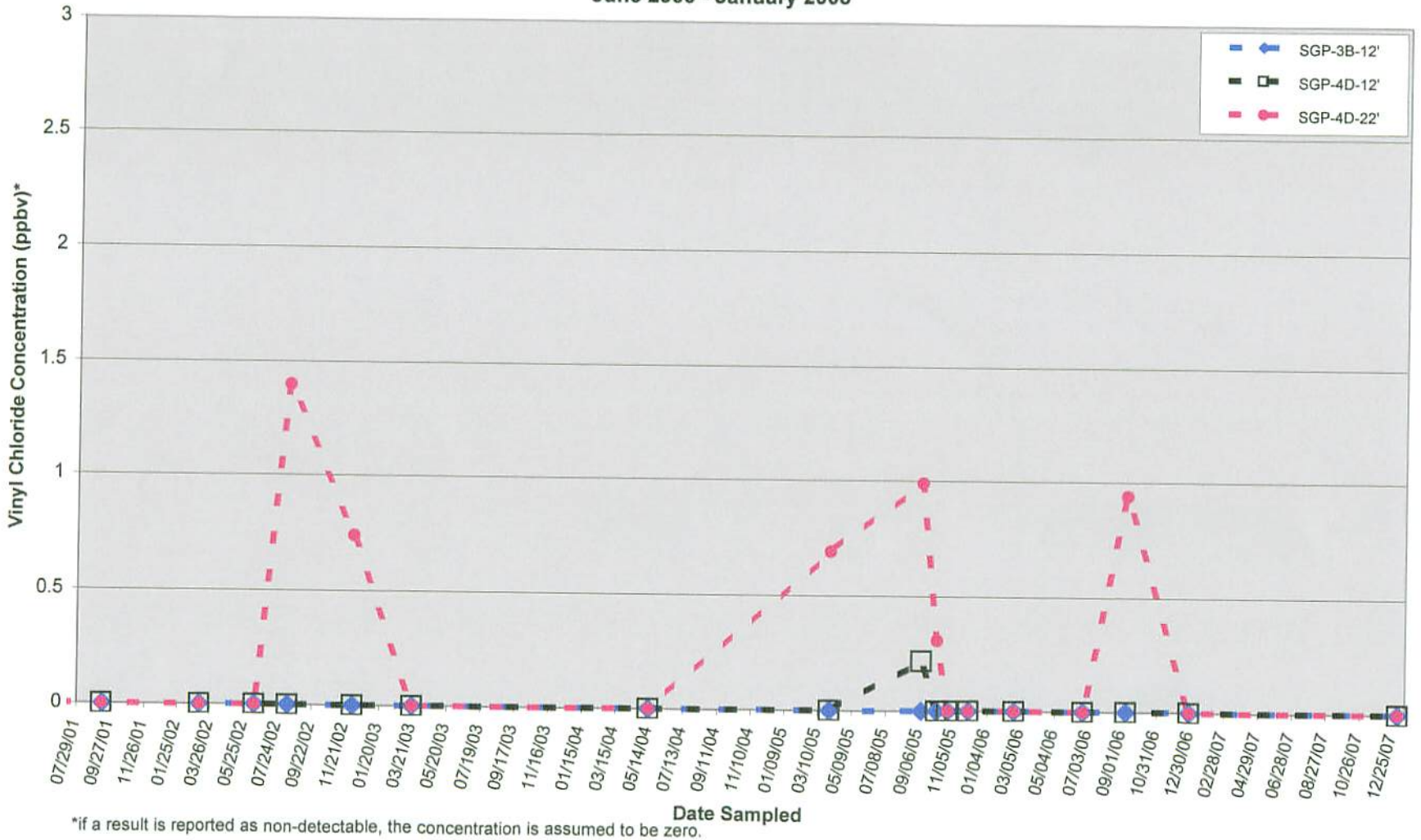
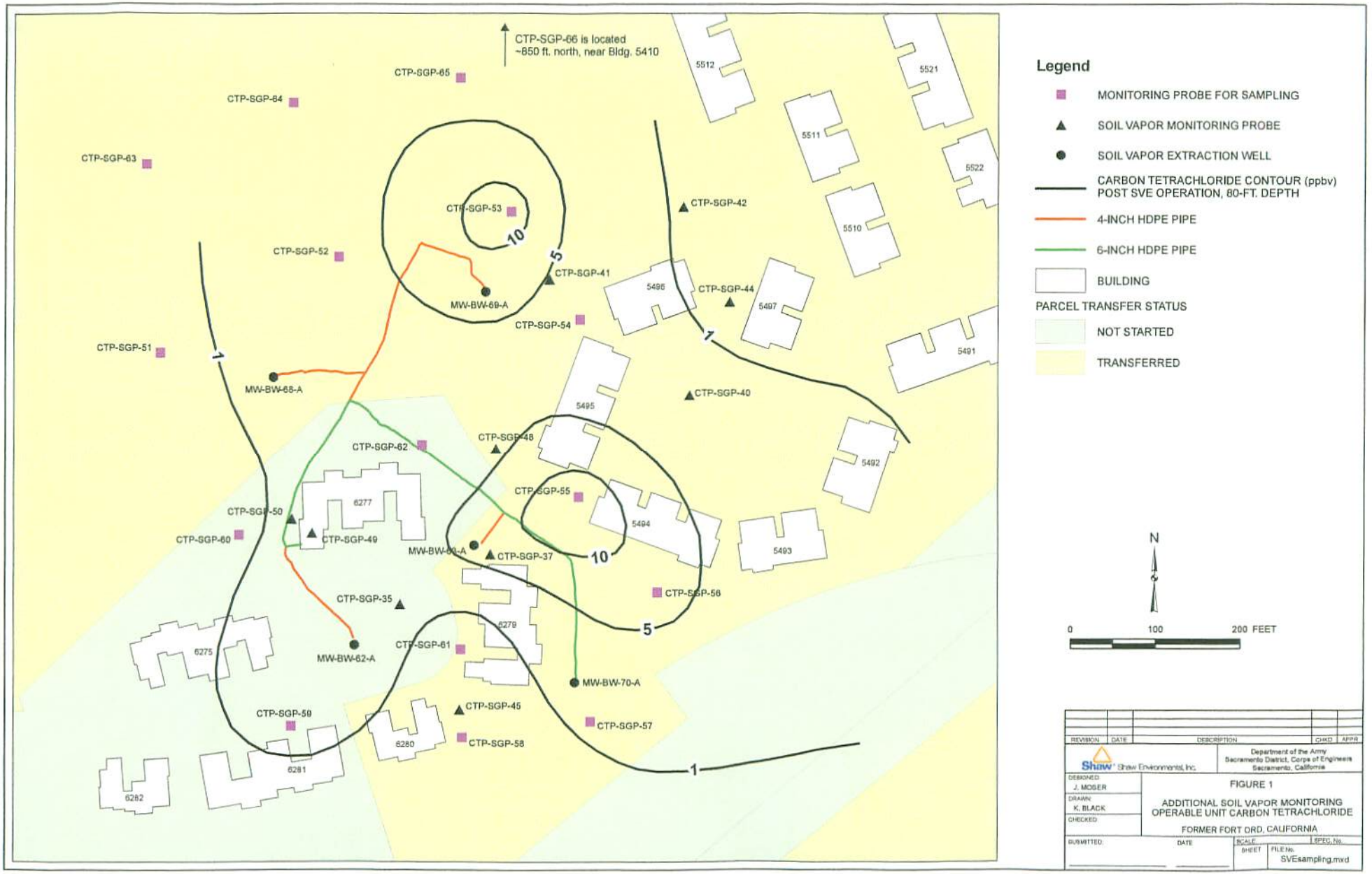


**Figure 2**
**Vinyl Chloride Concentration vs. Date**
**Select Compliance Perimeter Probes**
**June 2000 - January 2008**




*if a result is reported as non-detectable, the concentration is assumed to be zero.


CTP-SGP-66 is located
~850 ft. north, near Bldg. 5410
CTP-SGP-65
CTP-SGP-64
CTP-SGP-63
CTP-SGP-53
CTP-SGP-52
CTP-SGP-51
MW-BW-69-A
MW-BW-65-A
CTP-SGP-41
CTP-SGP-42
CTP-SGP-44
CTP-SGP-54
CTP-SGP-40
CTP-SGP-62
CTP-SGP-48
CTP-SGP-55
CTP-SGP-50
CTP-SGP-49
CTP-SGP-60
MW-BW-66-A
CTP-SGP-37
CTP-SGP-56
CTP-SGP-35
CTP-SGP-61
MW-BW-62-A
MW-BW-70-A
CTP-SGP-45
CTP-SGP-57
CTP-SGP-59
CTP-SGP-58
5512
5521
5511
5522
5510
5496
5497
5491
5495
5492
5494
5493
6277
6279
6275
6280
6281
6282
10
5
1
Legend
MONITORING PROBE FOR SAMPLING
SOIL VAPOR MONITORING PROBE
SOIL VAPOR EXTRACTION WELL
CARBON TETRACHLORIDE CONTOUR (ppbv)
POST SVE OPERATION, 80-FT. DEPTH
4-INCH HDPE PIPE
6-INCH HDPE PIPE
BUILDING
PARCEL TRANSFER STATUS
NOT STARTED
TRANSFERRED
N
0
100
200 FEET
REVISION
DATE
DESCRIPTION
CHKD
APPR
Shaw Shaw Environmental, Inc.
Department of the Army
Sacramento District, Corps of Engineers
Sacramento, California
DESIGNED: J. MOSER
DRAWN: K. BLACK
CHECKED:
FIGURE 1
ADDITIONAL SOIL VAPOR MONITORING
OPERABLE UNIT CARBON TETRACHLORIDE
FORMER FORT ORD, CALIFORNIA
SUBMITTED:
DATE
SCALE
SHEET
SPEC. No.
FILE No.
SVEsampling.mxd

## Proposed Sample Locations
## Additional CTP SVE Monitoring

| SAMPLE_AREA | SAMPLE_LOCATION | FINISH DEPTH | PROPOSED SAMPLES |
|---|---|---|---|
| CTP-SGP-51 | PERIMETER MONITORING PROBE | 85 | 1 |
| CTP-SGP-52 | PERIMETER MONITORING PROBE | 85 | 1 |
| CTP-SGP-53 | PERIMETER MONITORING PROBE | 85 | 1 |
| CTP-SGP-54 | PERIMETER MONITORING PROBE | 85 | 1 |
| CTP-SGP-55 | PERIMETER MONITORING PROBE | 85 | 1 |
| CTP-SGP-56 | PERIMETER MONITORING PROBE | 85 | 1 |
| CTP-SGP-57 | PERIMETER MONITORING PROBE | 85 | 1 |
| CTP-SGP-58 | PERIMETER MONITORING PROBE | 85 | 1 |
| CTP-SGP-59 | PERIMETER MONITORING PROBE | 85 | 1 |
| CTP-SGP-60 | PERIMETER MONITORING PROBE | 85 | 1 |
| CTP-SGP-61 | INTERIOR MONITORING PROBE | 85 | 1 |
| CTP-SGP-62 | INTERIOR MONITORING PROBE | 85 | 1 |
| CTP-SGP-63 | NEW PROBE | 85 | 1 |
| CTP-SGP-64 | NEW PROBE | 85 | 1 |
| CTP-SGP-65 | NEW PROBE | 85 | 1 |
| CTP-SGP-66 | NEW PROBE | 85 | 1 |
| | | total | 16 |
| | | QC | 2 |
| | | **grand total** | **18** |

# OPERABLE UNIT CARBON TETRACHLORIDE PLUME ENHANCED IN SITU BIOREMEDIATION PILOT STUDY

## STATUS – February 22, 2008

### FIELD WORK

- Well construction complete – July 27
  - 15 extraction wells
  - 7 injection wells
  - 5 monitoring wells
- Well development complete – August 8
- Wells surveyed – August 14
- Slug testing complete – August 17
- System construction complete – October 25
  - system checkout/testing/troubleshooting in progress
- Tracer testing completed – December 5
  - Tracer injected at 3:30 pm on November 14
  - Tracer detected in all monitoring wells and EISB-EW-10
- Baseline sampling and analysis completed – January 3
- Substrate injection initiated - January 29

### SCHEDULE

- Weekly monitoring for one month through February 29

### DATA (Preliminary)

- Baseline sampling and analysis results received.
- Revised substrate injection model to include data collected to date.
- Preliminary screening results from 16 days of system operation.

### PROBLEMS/CHANGES

- Several achievable groundwater extraction rates are lower than originally anticipated/modeled.
- Increased backpressure noted in all injection wells after 13 days of operation. Backpressure likely due to biofouling in the injection wells. Backpressure has resulted in even lower extraction/injection rates, lower substrate metering rates, and system shutdowns. Plan to clean out wells and increase substrate metering rates to optimize system operation.

OUCTP EISB Pilot Study
System Operation
Preliminary Data Summary

System Start Date: 1/29/2008

| Date: | | 2/7/2008 | | 2/21/2008 | | |
|---|---|---|---|---|---|---|
| | | 9 days | | 14 days | | |
| Extraction Well | Model Flowrate (gallons per minute) | Total Flow (gallons) | Average Flowrate (gallons per minute) | Total Flow (gallons) | Calculated Average Flowrate (gallons per minute) | Estimated Flowrate (gallons per minute) |
| EISB-EW-01 | 2 | 29,202 | 2.3 | 44,904 | 0.8 | 1.0 |
| EISB-EW-02 | 2 | 26,067 | 2.0 | 47,813 | 1.1 | 1.4 |
| EISB-EW-03 | 1 | 26,454 | 2.0 | 35,483 | 0.5 | 0.6 |
| EISB-EW-04 | 2 | 34,373 | 2.7 | 56,344 | 1.1 | 1.4 |
| EISB-EW-05 | 1 | 20,333 | 1.6 | 29,773 | 0.5 | 0.6 |
| EISB-EW-06 | 2 | 34,359 | 2.7 | 51,895 | 0.9 | 1.1 |
| EISB-EW-07 | 20 | 299,433 | 23.1 | 413,288 | 5.7 | 6.2 |
| EISB-EW-08 | 1 | 2,316 | 0.2 | 4,792 | 0.1 | 0.2 |
| EISB-EW-09 | 15 | 200,598 | 15.5 | 340,532 | 6.9 | 7.6 |
| EISB-EW-10 | 20 | 300,948 | 23.2 | 415,770 | 5.7 | 6.3 |
| EISB-EW-11 | 15 | 201,318 | 15.5 | 337,830 | 6.8 | 7.4 |
| EISB-EW-12 | 20 | 293,173 | 22.6 | 424,541 | 6.5 | 7.2 |
| EISB-EW-13 | 20 | 277,438 | 21.4 | 399,914 | 6.1 | 6.7 |
| EISB-EW-14 | 15 | 9,868 | 0.8 | 19,264 | 0.5 | 0.6 |
| EISB-EW-15 | 15 | 207,900 | 16.0 | 283,854 | 3.8 | 4.1 |
| Total | 151 | 1,963,780 | 151.6 | 2,905,997 | 46.8 | 52.4 |

| Injection Well | Model Flowrate (gallons per minute) | Total Flow (gallons) | Average Flowrate (gallons per minute) | | | |
|---|---|---|---|---|---|---|
| EISB-IW-01 | 10 | 140382 | 10.8 | 162,293 | 1.1 | 1.5 |
| EISB-IW-02 | 10 | 149783 | 12 | 182,633 | 1.6 | 2.3 |
| EISB-IW-03 | 20 | 272047 | 21 | 329,673 | 2.9 | 4.0 |
| EISB-IW-04 | 40 | 501610 | 39 | 709,625 | 10.3 | 14.4 |
| EISB-IW-05 | 35 | 402637 | 31 | 572,045 | 8.4 | 11.8 |
| EISB-IW-06 | 20 | 245754 | 19 | 354,079 | 5.4 | 7.5 |
| EISB-IW-07 | 25 | 266058 | 21 | 422,499 | 7.8 | 10.9 |
| Total | 160 | 1978271 | 153.8 | 2,732,847 | 37.5 | 52.4 |

Lactate injection concentration : 2500 mg/L
Total lactate injected (through 2/21/2008): approximately 2200 gallons

| | Method | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sample ID | | | EISB-EW-10 | | | | | |
| Well Type | | | extraction | | | | | |
| | | baseline | week 0 | week 0 | week 1 | week 1 | week 2 | week 3 |
| Date | | 12/19/2007 | 1/30/2008 | 1/31/2008 | 2/7/2008 | 2/11/2008 | 2/13/2008 | 2/21/2008 |
| alkalinity ($CaCO_3$ total) | HACH | 43 mg/L | 50 mg/L | 46 mg/L | 53 mg/L | 85 mg/L | 81 mg/L | NA mg/L |
| pH | meter | 7.12 | | | 7.1 | | 7 | 6.4 |
| dissolved oxygen | meter | 5.75 ppm | | | 7.1 ppm | | 4.55 ppm | 3.45 ppm |
| oxidation reduction potential | meter | 23 mV | | | 171 mV | | 37 mV | -91 mV |
| conductivity | meter | 44 uS/cm | | | 42.9 uS/cm | | 51.5 uS/cm | 57.9 uS/cm |
| turbidity | meter | 60.8 NTU | | | 16.4 NTU | | 72 NTU | 182 NTU |
| temperture | meter | 17.6 °C | | | 17.6 °C | | 17.7 °C | 17.6 °C |
| nitrate | 300.0 | 5730 µg/l | | | | | | |
| nitrite | 300.0 | <100 µg/l | | | | | | |
| sulfate | 300.0 | 22300 µg/l | | | | | | |
| ortho-phosphate | 300.0 | <500 µg/l | | | | | | |
| dissolved iron | 6010B | <200 µg/l | | | | | | |
| manganese | 6010B | 8.79J µg/l | | | | | | |
| arsenic | 6010B | <10 µg/l | | | | | | |
| methane | RSK 175 | | | | | | | |
| ethane | RSK 175 | | | | | | | |
| lactate | 300.0M | | | | | | | |
| propionate | 300.0M | | | | | | | |
| acetate | 300.0M | | | | | | | |
| carbon tetrachloride | 8260B | 1.2 µg/l | | | | | | |
| chloroform | 8260B | <0.5 µg/l | | | | | | |
| dichloromethane | 8260B | <5.0 µg/l | | | | | | |
| chloromethane | 8260B | 0.30J µg/l | | | | | | |
| methyl tert-butyl ether | 8260B | | | | | | | |
| isoproylbenzene | 8260B | | | | | | | |
| total organic carbon | 415.1 | | | | | | | |
| anaerobic heterotrophs | SM9215B | | | | | | | |

Detections are bolded

J qualifier indicates that the associated numeric value is an estimate.

[1] Field parameters collected by meter on January 29, 2008 when stable flow could be achieved.

[2] Samples and field parameters collected on January 30, 2008. Working pump installed on January 22 and pump tested and well purged on January 24.

| Sample ID | | | | | EISB-MW-01 monitoring | | | |
|---|---|---|---|---|---|---|---|---|
| Well Type | Method | | | | | | | |
| Date | | baseline 12/20/2007 | week 0 1/30/2008 | week 1 2/4/2008 | week 1 2/6/2008 | week 1 2/11/2008 | week 2 2/12/2008 | week 3 2/21/2008 |
| alkalinity ($CaCO_3$ total) | HACH | 39 mg/L | 48 mg/L | 46 mg/L | 73 mg/L | 102 mg/L | 96 mg/L | NA mg/L |
| pH | meter | 6.9 | | | 6.7 | | 6.9 | 6.6 |
| dissolved oxygen | meter | 8.05 ppm | | | 2.31 ppm | | 0.73 ppm | 0.78 ppm |
| oxidation reduction potential | meter | 108 mV | | | 121 mV | | 103 mV | 85 mV |
| conductivity | meter | 48 uS/cm | | | 48.1 uS/cm | | 52 uS/cm | 59.1 uS/cm |
| turbidity | meter | 2.9 NTU | | | 15.6 NTU | | 0 NTU | 15.5 NTU |
| temporture | meter | 17.3 °C | | | 16.9 °C | | 17.1 °C | 16.8 °C |
| nitrate | 300.0 | 6760(6780) µg/l | | | | | | µg/l |
| nitrite | 300.0 | <100(<100) µg/l | | | | | | µg/l |
| sulfate | 300.0 | 28900(29000) µg/l | | | | | | µg/l |
| ortho-phosphate | 300.0 | <500(<500) µg/l | | | | | | µg/l |
| dissolved iron | 6010B | <200(<200) µg/l | | | | | | µg/l |
| manganese | 6010B | <10(<10) µg/l | | | | | | µg/l |
| arsenic | 6010B | <10(<10) µg/l | | | | | | µg/l |
| methane | RSK 175 | <2.0(<2.0) µg/l | | | | | | |
| ethane | RSK 175 | <2.0(<2.0) µg/l | | | | | | |
| lactate | 300.0M | <100(<100) µg/l | | | µg/l | | µg/l | µg/l |
| propionate | 300.0M | <100(<100) µg/l | | | µg/l | | µg/l | µg/l |
| acetate | 300.0M | <100(<100) µg/l | | | µg/l | | µg/l | µg/l |
| carbon tetrachloride | 8260B | 0.99(0.96) µg/l | | | | | | µg/l |
| chloroform | 8260B | <0.50(<0.50) µg/l | | | | | | µg/l |
| dichloromethane | 8260B | <5.0(<5.0) µg/l | | | | | | µg/l |
| chloromethane | 8260B | <1.0(0.24J) µg/l | | | | | | µg/l |
| total organic carbon | 415.1 | 740J(720J) µg/l | | | | | | |
| anaerobic heterotrophs | SM9215B | $9x10^1$($5x10^1$) cfu/ml | | | | | | |

Detections are bolded
J qualifier indicates that the associated numeric value is an estimate.

| Sample ID<br>Well Type<br>Date | Method | baseline<br>12/20/2007 | week 0<br>1/30/2008 | week 0<br>2/4/2008 | EISB-MW-02<br>monitoring<br>week 1<br>2/6/2008 | week 1<br>2/11/2008 | week 2<br>2/12/2008 | week 3<br>2/19/2008 |
|---|---|---|---|---|---|---|---|---|
| alkalinity ($CaCO_3$ total) | HACH | 58 mg/L | 39 mg/L | 47 mg/L | 46 mg/L | 75 mg/L | 97 mg/L | NA mg/L |
| pH | meter | 6.91 | | | 6.9 | | 6.61 | 6.6 |
| dissolved oxygen | meter | 8.01 ppm | | | 8.98 ppm | | 6.24 ppm | 1.07 ppm |
| oxidation reduction potential | meter | 96 mV | | | 190 mV | | 156 mV | 36 mV |
| conductivity | meter | 47 uS/cm | | | 45.6 uS/cm | | 53.5 uS/cm | 59.8 uS/cm |
| turbidity | meter | 66 NTU | | | 0 NTU | | 48.8 NTU | 13.9 NTU |
| temperture | meter | 18.3 °C | | | 17.5 °C | | 18.1 °C | 159 °C |
| nitrate | 300.0 | 6410 µg/l | | | | | µg/l | µg/l |
| nitrite | 300.0 | <100 µg/l | | | | | µg/l | µg/l |
| sulfate | 300.0 | 27000 µg/l | | | | | µg/l | µg/l |
| ortho-phosphate | 300.0 | <500 µg/l | | | | | µg/l | µg/l |
| dissolved iron | 6010B | <200 µg/l | | | | | µg/l | µg/l |
| manganese | 6010B | <10 µg/l | | | | | µg/l | µg/l |
| arsenic | 6010B | 8.79J µg/l | | | | | µg/l | µg/l |
| methane | RSK 175 | | | | | | | |
| ethane | RSK 175 | | | | | | | |
| lactate | 300.0M | <100 µg/l | | | µg/l | | µg/l | µg/l |
| propionate | 300.0M | <100 µg/l | | | µg/l | | µg/l | µg/l |
| acetate | 300.0M | <100 µg/l | | | µg/l | | µg/l | µg/l |
| carbon tetrachloride | 8260B | 1.2 µg/l | | | | | µg/l | µg/l |
| chloroform | 8260B | 0.20J µg/l | | | | | µg/l | µg/l |
| dichloromethane | 8260B | <5.0 µg/l | | | | | µg/l | µg/l |
| chloromethane | 8260B | <1.0 µg/l | | | | | µg/l | µg/l |
| total organic carbon | 415.1 | 690J µg/l | | | | | | |
| anaerobic heterotrophs | SM9215B | $1x10^4$ cfu/ml | | | | | | |

Detections are bolded

J qualifier indicates that the associated numeric value is an estimate.

[1] Field parameters collected by meter on January 29, 2008 when stable flow could be achieved.

[2] Samples and field parameters collected on January 30, 2008. Working pump installed on January 22 and pump tested and well purged on January 24.

| Sample ID<br>Well Type<br>Date | Method | baseline<br>12/19/2007 | week 0<br>1/30/2008 | week 1<br>2/4/2008 | EISB-MW-03<br>monitoring<br>week 1<br>2/5/2008 | week 1<br>2/11/2008 | week 2<br>2/12/2008 | week 3<br>2/19/2008 |
|---|---|---|---|---|---|---|---|---|
| alkalinity ($CaCO_3$ total) | HACH | **41** mg/L | 77 mg/L | 115 mg/L | **131** mg/L | 152 mg/L | 145 mg/L | NA mg/L |
| pH | meter | **6.7** | | | **7** | | **7.2** | **6.7** |
| dissolved oxygen | meter | **10.07** ppm | | | **0.34** ppm | | **0.18** ppm | **0.41** ppm |
| oxidation reduction potential | meter | **116** mV | | | **54** mV | | **-38** mV | **-210** mV |
| conductivity | meter | **47.9** uS/cm | | | **87.3** uS/cm | | **83.1** uS/cm | **77.6** uS/cm |
| turbidity | meter | **7.2** NTU | | | **5.2** NTU | | **0.3** NTU | **4.5** NTU |
| temperture | meter | **17** °C | | | **17.5** °C | | **17.2** °C | **15.9** °C |
| nitrate | 300.0 | **7930(7960)** µg/l | | | µg/l | | µg/l | µg/l |
| nitrite | 300.0 | **<100(<100)** µg/l | | | µg/l | | µg/l | µg/l |
| sulfate | 300.0 | **28300(28400)** µg/l | | | µg/l | | µg/l | µg/l |
| ortho-phosphate | 300.0 | **<500(<500)** µg/l | | | µg/l | | µg/l | µg/l |
| dissolved iron | 6010B | **<200** µg/l | | | µg/l | | µg/l | µg/l |
| manganese | 6010B | **<10** µg/l | | | µg/l | | µg/l | µg/l |
| arsenic | 6010B | **<10** µg/l | | | µg/l | | µg/l | µg/l |
| methane | RSK 175 | **<2.0** µg/l | | | | | | |
| ethane | RSK 175 | **<2.0** µg/l | | | | | | |
| lactate | 300.0M | **>100(>100)** µg/l | | | µg/l | | µg/l | µg/l |
| propionate | 300.0M | **>100(>100)** µg/l | | | µg/l | | µg/l | µg/l |
| acetate | 300.0M | **>100(>100)** µg/l | | | µg/l | | µg/l | µg/l |
| carbon tetrachloride | 8260B | **1.4** µg/l | | | µg/l | | µg/l | µg/l |
| chloroform | 8260B | **<0.5** µg/l | | | µg/l | | µg/l | µg/l |
| dichloromethane | 8260B | **<5.0** µg/l | | | µg/l | | µg/l | µg/l |
| chloromethane | 8260B | **0.22J** µg/l | | | µg/l | | µg/l | µg/l |
| total organic carbon | 415.1 | | | | | | | |
| anaerobic heterotrophs | SM9215B | | | | | | | |

Detections are bolded
J qualifier indicates that the associated numeric value is an estimate.

| Sample ID<br>Well Type<br>Date | Method | baseline<br>12/18/2007 | week 0<br>1/30/2008 | week 1<br>2/4/2008 | EISB-MW-04<br>monitoring<br>week 1<br>2/6/2008 | week 1<br>2/1/2008 | week 2<br>2/12/2008 | week 3<br>2/19/2008 |
|---|---|---|---|---|---|---|---|---|
| alkalinity ($CaCO_3$ total) | HACH | 41 mg/L | 64 mg/L | 57 mg/L | 48 mg/L | 76 mg/L | 80 mg/L | NA mg/L |
| pH | meter | 7.11 | | | 7.4 | | 7 | 6.9 |
| dissolved oxygen | meter | 9.69 ppm | | | 8.09 ppm | | 4.48 ppm | 1.96 ppm |
| oxidation reduction potential | meter | 150 mV | | | 167 mV | | 142 mV | 30 mV |
| conductivity | meter | 49.1 uS/cm | | | 47.6 uS/cm | | 52.4 uS/cm | 52.1 uS/cm |
| turbidity | meter | 0 NTU | | | 0 NTU | | 7.9 NTU | 7 NTU |
| temperture | meter | 17.3 °C | | | 17.9 °C | | 17.7 °C | 16.9 °C |
| nitrate | 300.0 | 7360 µg/l | | | | | | µg/l |
| nitrite | 300.0 | <100 µg/l | | | | | | µg/l |
| sulfate | 300.0 | 26000 µg/l | | | | | | µg/l |
| ortho-phosphate | 300.0 | <500 µg/l | | | | | | µg/l |
| dissolved iron | 6010B | <200 µg/l | | | | | | µg/l |
| manganese | 6010B | <10 µg/l | | | | | | µg/l |
| arsenic | 6010B | <10 µg/l | | | | | | µg/l |
| methane | RSK 175 | <2.0 µg/l | | | | | | |
| ethane | RSK 175 | <2.0 µg/l | | | | | | |
| lactate | 300.0M | <100 µg/l | | | µg/l | | µg/l | µg/l |
| propionate | 300.0M | <100 µg/l | | | µg/l | | µg/l | µg/l |
| acetate | 300.0M | <100 µg/l | | | µg/l | | µg/l | µg/l |
| carbon tetrachloride | 8260B | 1.2 µg/l | | | | | | µg/l |
| chloroform | 8260B | <0.5 µg/l | | | | | | µg/l |
| dichloromethane | 8260B | <5.0 µg/l | | | | | | µg/l |
| chloromethane | 8260B | 0.22J µg/l | | | | | | µg/l |
| total organic carbon | 415.1 | | | | | | | |
| anaerobic heterotrophs | SM9215B | | | | | | | |

Detections are bolded

J qualifier indicates that the associated numeric value is an estimate.

[1] Field parameters collected by meter on January 29, 2008 when stable flow could be achieved.

[2] Samples and field parameters collected on January 30, 2008. Working pump installed on January 22 and pump tested and well purged on January 24.

| Sample ID<br>Well Type<br>Date | Method | baseline<br>12/18/2007 | week 0<br>1/30/2008 | week 1<br>2/4/2008 | EISB-MW-05<br>monitoring<br>week 1<br>2/6/2008 | week 1<br>2/11/08 | week 2<br>2/12/2008 | week 3<br>2/19/2008 |
|---|---|---|---|---|---|---|---|---|
| alkalinity ($CaCO_3$ total) | HACH | 47 mg/L | 48 mg/L | 59 mg/L | 51 mg/L | 136 mg/L | 150 mg/L | NA mg/L |
| pH | meter | 7.01 | | | 7.3 | | 6.9 | 6.9 |
| dissolved oxygen | meter | 10.75 ppm | | | 9.51 ppm | | 0.41 ppm | 0.38 ppm |
| oxidation reduction potential | meter | 159 mV | | | 18.5 mV | | -102 mV | -199 mV |
| conductivity | meter | 49.1 uS/cm | | | 49.9 uS/cm | | 72.2 uS/cm | 78.1 uS/cm |
| turbidity | meter | 2.9 NTU | | | 5.4 NTU | | 34.2 NTU | 2.2 NTU |
| temperture | meter | 17.8 °C | | | 17.2 °C | | 17.7 °C | 16.8 °C |
| nitrate | 300.0 | 7230 µg/l | | | | | µg/l | µg/l |
| nitrite | 300.0 | <100 µg/l | | | | | µg/l | µg/l |
| sulfate | 300.0 | 26200 µg/l | | | | | µg/l | µg/l |
| ortho-phosphate | 300.0 | 270J µg/l | | | | | µg/l | µg/l |
| dissolved iron | 6010B | <200 µg/l | | | | | µg/l | µg/l |
| manganese | 6010B | <10 µg/l | | | | | µg/l | µg/l |
| arsenic | 6010B | <10 µg/l | | | | | µg/l | µg/l |
| methane | RSK 175 | | | | | | | |
| ethane | RSK 175 | | | | | | | |
| lactate | 300.0M | <100 µg/l | | | µg/l | | µg/l | µg/l |
| propionate | 300.0M | <100 µg/l | | | µg/l | | µg/l | µg/l |
| acetate | 300.0M | <100 µg/l | | | µg/l | | µg/l | µg/l |
| carbon tetrachloride | 8260B | 1.4 µg/l | | | | | µg/l | µg/l |
| chloroform | 8260B | <0.5 µg/l | | | | | µg/l | µg/l |
| dichloromethane | 8260B | <5.0 µg/l | | | | | µg/l | µg/l |
| chloromethane | 8260B | <1.0 µg/l | | | | | µg/l | µg/l |
| total organic carbon | 415.1 | | | | | | | |
| anaerobic heterotrophs | SM9215B | | | | | | | |

Detections are bolded

J qualifier indicates that the associated numeric value is an estimate.

[1] Field parameters collected by meter on January 29, 2008 when stable flow could be achieved.

[2] Samples and field parameters collected on January 30, 2008. Working pump installed on January 22 and pump tested and well purged on January 24.

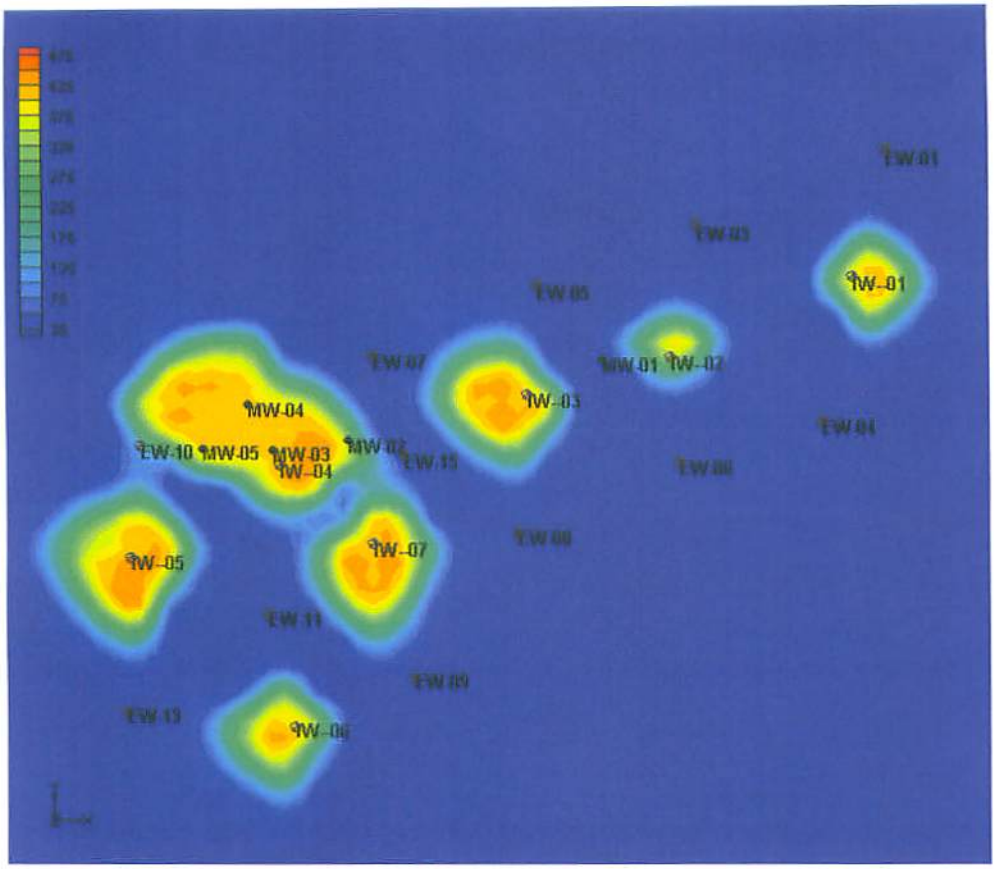



Figure 1: Sodium Lactate Injection and Extraction: 20 Days

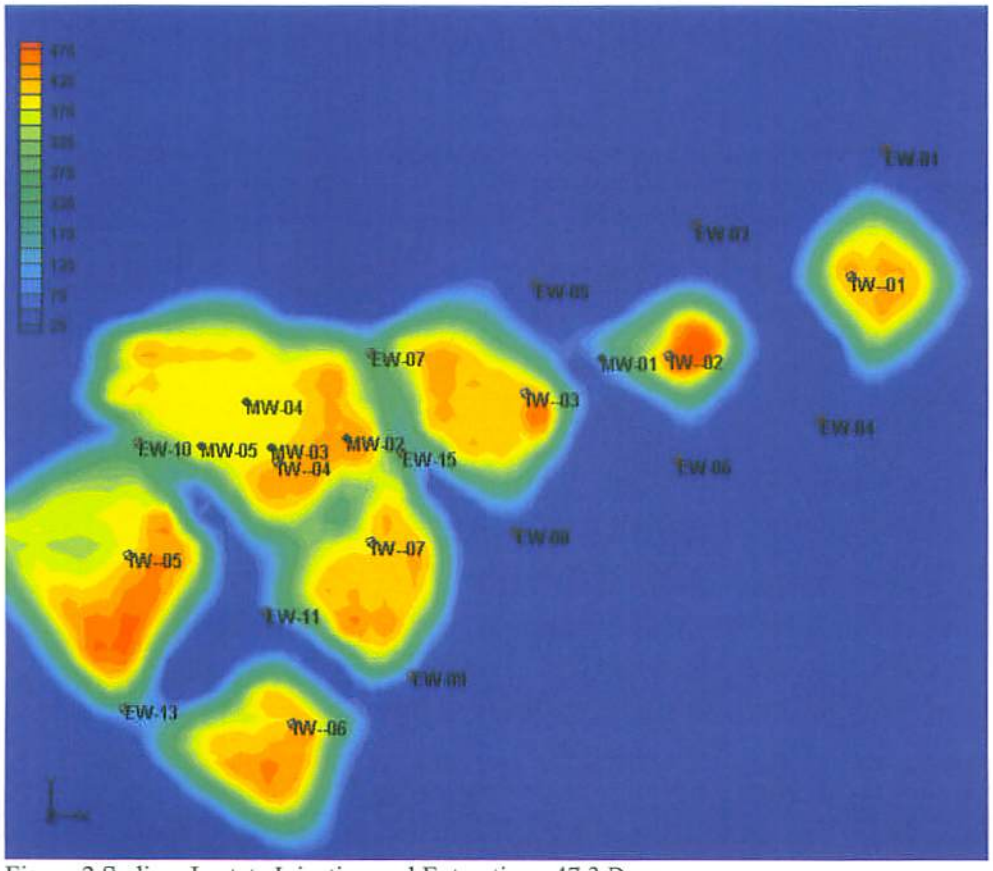



Figure 2 Sodium Lactate Injection and Extraction: 47.3 Days

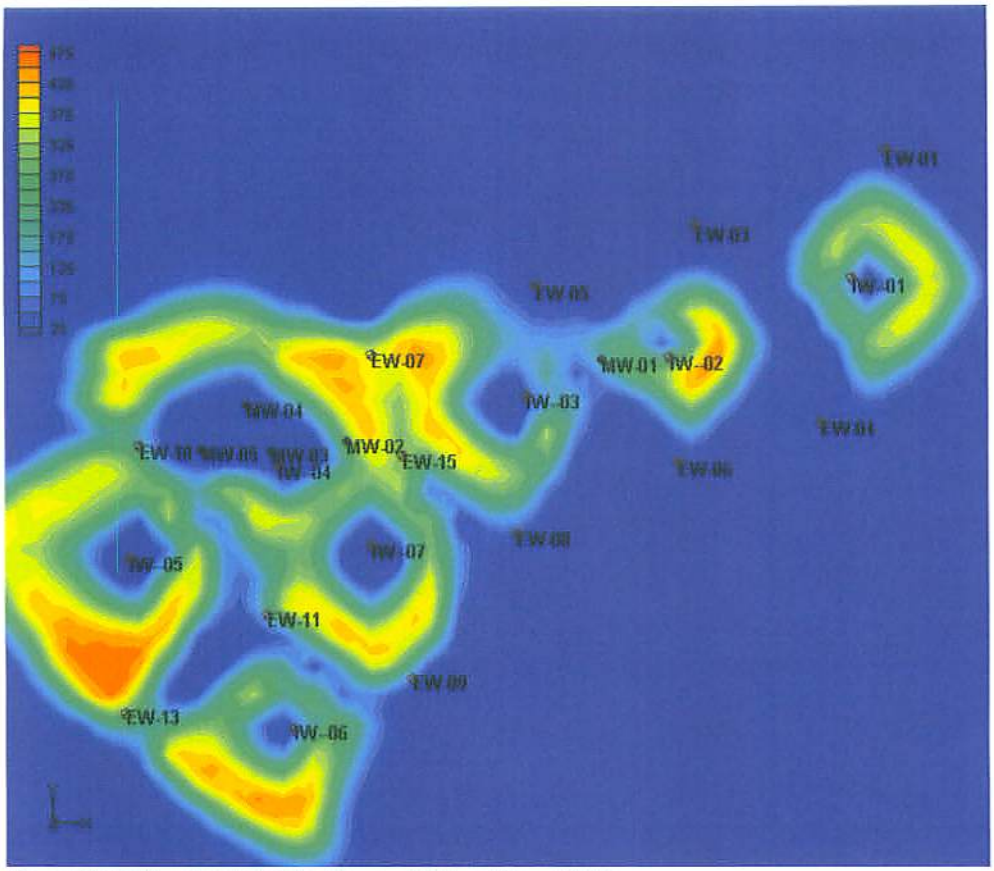



Figure 3 Sodium Lactate Injection and Extraction: 60 Days

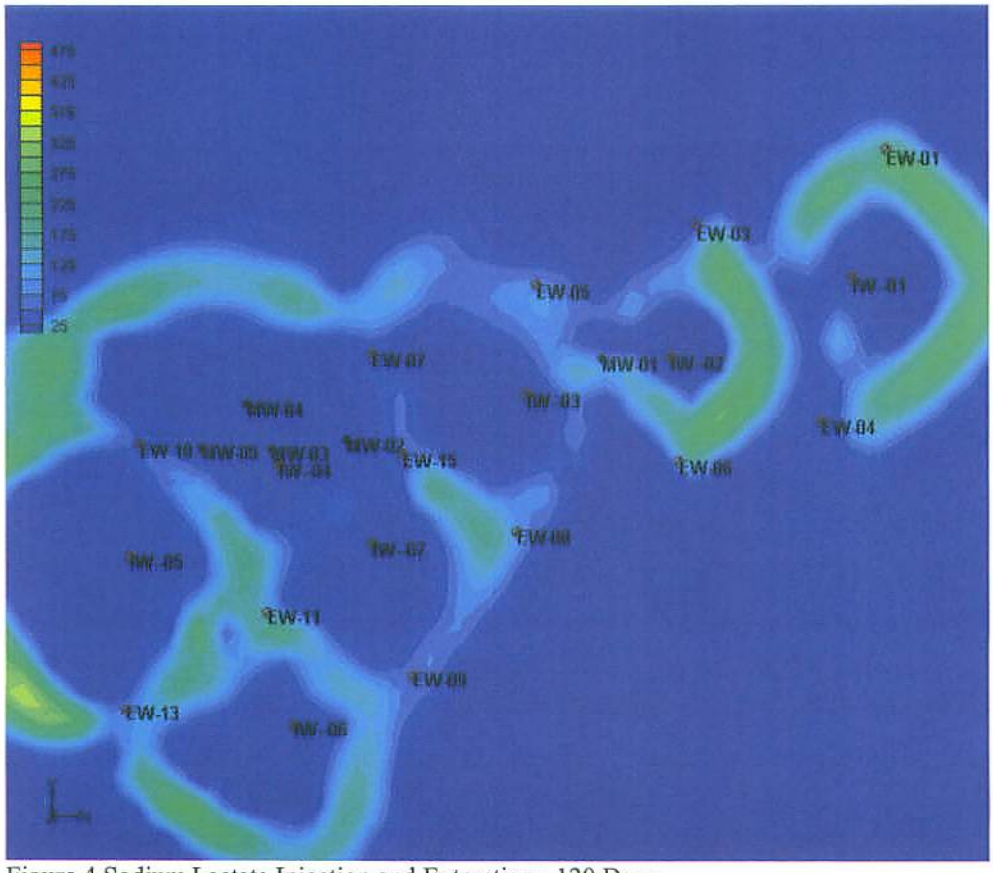



Figure 4 Sodium Lactate Injection and Extraction: 120 Days

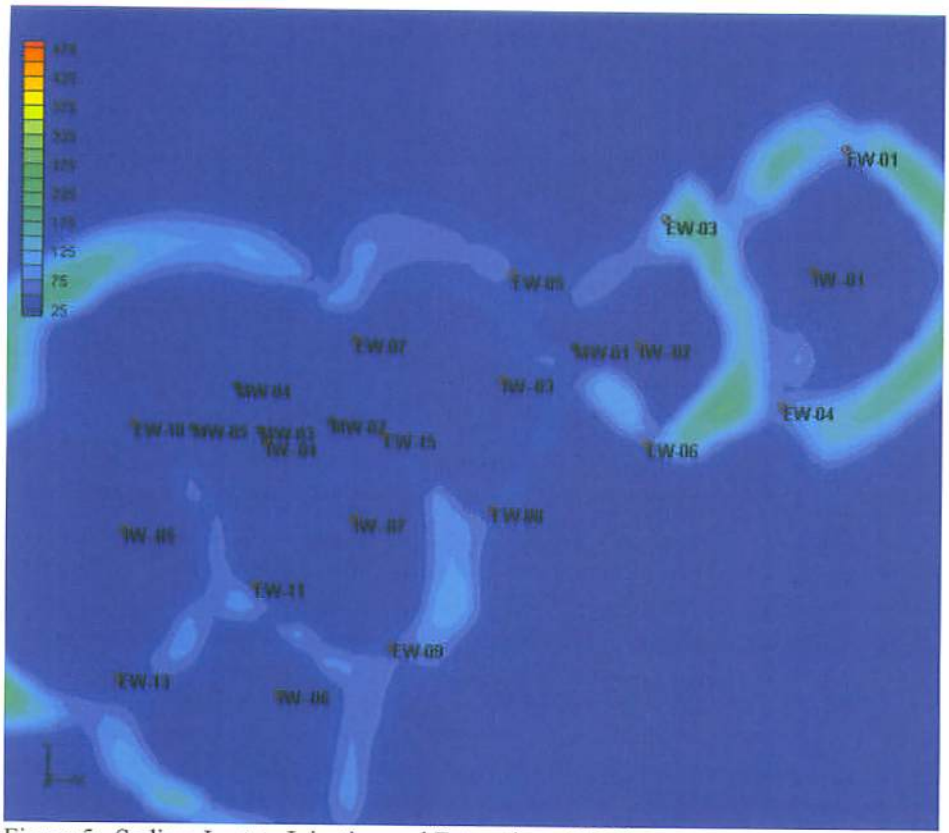



Figure 5: Sodium Lactate Injection and Extraction: 180 Days

| Well | Rate (gpm) | Duration (days) | Sodium Lactate Conc. (mg/L) |
|---|---|---|---|
| EW-01 | 2 | 47.3 | |
| EW-02 | 2 | 47.3 | |
| EW-03 | 1 | 47.3 | |
| EW-04 | 2 | 47.3 | |
| EW-05 | 1 | 47.3 | |
| EW-06 | 2 | 47.3 | |
| EW-07 | 20 | 47.3 | |
| EW-08 | 1 | 47.3 | |
| EW-09 | 15 | 47.3 | |
| EW-10 | 20 | 47.3 | |
| EW-11 | 15 | 47.3 | |
| EW-12 | 20 | 47.3 | |
| EW-13 | 20 | 47.3 | |
| EW-14 | 15 | 47.3 | |
| EW-15 | 15 | 47.3 | |
| IW-01 | 10 | 47.3 | 2,400* |
| IW-02 | 10 | 47.3 | 2,400* |
| IW-03 | 20 | 47.3 | 2,400* |
| IW-04 | 40 | 47.3 | 2,400* |
| IW-05 | 35 | 47.3 | 2,400* |
| IW-06 | 20 | 47.3 | 2,400* |
| IW-07 | 25 | 47.3 | 2,400* |

Total Out = 152 gpm
Total In = 152 gpm
* Slug Sodium Lactate in for 1 hour in every 6 hours

# OUCTP EISB Pilot Study
## Baseline Sampling and Analysis
## Data Summary

| Sample ID<br>Well Type<br>Date | Method | EISB-EW-01<br>extraction<br>1/2/2008 | EISB-EW-02<br>extraction<br>1/3/2008 | EISB-EW-03<br>extraction<br>12/20/2007 | EISB-EW-04<br>extraction<br>1/2/2008 | EISB-EW-05<br>extraction<br>1/2/2008 | EISB-EW-06<br>extraction<br>12/27/2007 | EISB-EW-07<br>extraction<br>12/19/2007 | EISB-EW-08<br>extraction<br>1/3/2008 | EISB-EW-09<br>extraction<br>12/20/2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| alkalinity ($CaCO_3$ total) | HACH | **36** mg/L | **28** mg/L | **45** mg/L | **39** mg/L | **34** mg/L | **31** mg/L | **39** mg/L | **48** mg/L | **47** mg/L |
| pH | meter | **6.55** | **7** | **6.4** | **6.47** | **6.51** | **6.04** | **6.66** | **7.1** | **6.91** |
| dissolved oxygen | meter | **6.78** ppm | **7.87** ppm | **8.17** ppm | **7.35** ppm | **7.04** ppm | **8.18** ppm | **6.03** ppm | **3.98** ppm | **6.08** ppm |
| oxidation reduction potential | meter | **51** mV | **64** mV | **119** mV | **115** mV | **40** mV | **86** mV | **58** mV | **74** mV | **43** mV |
| conductivity | meter | **45.9** uS/cm | **46.2** uS/cm | **50.9** uS/cm | **46.2** uS/cm | **47.1** uS/cm | **48.7** uS/cm | **48** uS/cm | **46.4** uS/cm | **51.5** uS/cm |
| turbidity | meter | **45.4** NTU | **219** NTU | **0.9** NTU | **18.5** NTU | **3.9** NTU | **1.4** NTU | **42.7** NTU | **40.2** NTU | **34.3** NTU |
| temperture | meter | **18.3** °C | **18.4** °C | **16.9** °C | **17** °C | **18.5** °C | **16.8** °C | **17.5** °C | **20.2** °C | **17.2** °C |
| nitrate | 300.0 | **8430** µg/l | **4950** µg/l | **9450** µg/l | **8270** µg/l | **7550(7570)** µg/l | **7010** µg/l | **8440** µg/l | **6360** µg/l | **8310** µg/l |
| nitrite | 300.0 | <100 µg/l | <100 µg/l | <100 µg/l | <100 µg/l | <100(<100) µg/l | <100 µg/l | <100 µg/l | <100 µg/l | <100 µg/l |
| sulfate | 300.0 | **37600** µg/l | **36900** µg/l | **38700** µg/l | **37900** µg/l | **31200(31200)** µg/l | **30700** µg/l | **31200** µg/l | **29800** µg/l | **27700** µg/l |
| ortho-phosphate | 300.0 | <500 µg/l | <500 µg/l | <500 µg/l | <500 µg/l | <500(<500) µg/l | <500 µg/l | <500 µg/l | <500 µg/l | <500 µg/l |
| dissolved iron | 6010B | <200 µg/l | **57.2J** µg/l | **2500** µg/l | <200 µg/l | **40.4J** µg/l | **57.1** µg/l | **45.0J** µg/l | <200 µg/l | **45.5J** µg/l |
| manganese | 6010B | **70.5** µg/l | <10 µg/l | **7.87J** µg/l | <10 µg/l | **9.18J** µg/l | <10 µg/l | **7.64J** µg/l | **149** µg/l | **8.30J** µg/l |
| arsenic | 6010B | <10 µg/l | <10 µg/l | <10 µg/l | <10 µg/l | <10 µg/l | <10 µg/l | <10 µg/l | <10 µg/l | <10 µg/l |
| methane | RSK 175 | | <2.0 µg/l | <2.0 µg/l | | | <2.0 µg/l | <2.0 µg/l | | <2.0 µg/l |
| ethane | RSK 175 | | <2.0 µg/l | <2.0 µg/l | | | <2.0 µg/l | <2.0 µg/l | | <2.0 µg/l |
| lactate | 300.0M | | | | | | | | | <100 µg/l |
| propionate | 300.0M | | | | | | | | | <100 µg/l |
| acetate | 300.0M | | | | | | | | | <100 µg/l |
| carbon tetrachloride | 8260B | **0.87** µg/l | **3.4** µg/l | **3.9** µg/l | **3.9** µg/l | **1.8** µg/l | **2.3** µg/l | **2.1** µg/l | **0.83** µg/l | **1.3** µg/l |
| chloroform | 8260B | **0.26J** µg/l | **0.23J** µg/l | **0.26J** µg/l | **0.21J** µg/l | <0.50 µg/l | <0.5 µg/l | **0.25J** µg/l | <0.50 µg/l | <0.5 µg/l |
| dichloromethane | 8260B | <5.0 µg/l | <5.0 µg/l | <5.0 µg/l | <5.0 µg/l | <5.0 µg/l | <5.0 µg/l | <5.0 µg/l | <5.0 µg/l | <5.0 µg/l |
| chloromethane | 8260B | <1.0 µg/l | <1.0 µg/l | <1.0 µg/l | <1.0 µg/l | <1.0 µg/l | <1.0 µg/l | <1.0 µg/l | <1.0 µg/l | **0.30J** µg/l |
| methyl tert-butyl ether | 8260B | | | | | | | **0.35J** µg/l | | |
| isoproylbenzene | 8260B | | | **0.21J** µg/l | | | | | | |
| total organic carbon | 415.1 | | | **770J** µg/l | | | | | | |
| anaerobic heterotrophs | SM9215B | | | **1x10$^4$** cfu/ml | | | | | | |

Detections are bolded

J qualifier indicates that the associated numeric value is an estimate.

[1] Field parameters collected by meter on January 29, 2008 when stable flow could be achieved.

[2] Samples and field parameters collected on January 30, 2008. Working pump installed on January 22 and pump tested and well purged on January 24.

OUCTP EISB Pilot Study
Baseline Sampling and Analysis
Data Summary

| Sample ID<br>Well Type<br>Date | Method | EISB-EW-10<br>extraction<br>12/19/2007 | EISB-EW-11<br>extraction<br>12/20/2007 | EISB-EW-12<br>extraction<br>12/26/2007 | EISB-EW-13<br>extraction<br>12/26/2007 | EISB-EW-14<br>extraction<br>1/30/2008 | EISB-EW-15<br>extraction<br>12/19/2007 | EISB-MW-01<br>monitoring<br>12/20/2007 | EISB-MW-02<br>monitoring<br>12/20/2007 |
|---|---|---|---|---|---|---|---|---|---|
| alkalinity ($CaCO_3$ total) | HACH | **43** mg/L | **45** mg/L | **30** mg/L | **39** mg/L | mg/L | **40** mg/L | **39** mg/L | **58** mg/L |
| pH | meter | **7.12** | **6.36** | **6.56** | **6.78** | **6.7** | **6.94** | **6.9** | **6.91** |
| dissolved oxygen | meter | **5.75** ppm | **6.5** ppm | **4.98** ppm | **6.85** ppm | **6.8** ppm | **6.82** ppm | **8.05** ppm | **8.01** ppm |
| oxidation reduction potential | meter | **23** mV | **80** mV | **54** mV | **71** mV | **40** mV | **57** mV | **108** mV | **96** mV |
| conductivity | meter | **44** uS/cm | **49.8** uS/cm | **39.8** uS/cm | **56.1** uS/cm | **69.5** uS/cm | **47.3** uS/cm | **48** uS/cm | **47** uS/cm |
| turbidity | meter | **60.8** NTU | **0** NTU | **24.6** NTU | **2.3** NTU | **113** NTU | **4.9** NTU | **2.9** NTU | **66** NTU |
| temperture | meter | **17.6** °C | **17.3** °C | **17.5** °C | **17.7** °C | **18.5** °C | **17.5** °C | **17.3** °C | **18.3** °C |
| nitrate | 300.0 | **5730** µg/l | **8070** µg/l | **6920** µg/l | **8970(9000)** µg/l | µg/l | **7620(7630)** µg/l | **6760(6780)** µg/l | **6410** µg/l |
| nitrite | 300.0 | <100 µg/l | <100 µg/l | **<100** µg/l | <100(<100) µg/l | µg/l | <100(<100) µg/l | <100(<100) µg/l | <100 µg/l |
| sulfate | 300.0 | **22300** µg/l | **24700** µg/l | **28500** µg/l | **37900(37800)** µg/l | µg/l | **26500(26400)** µg/l | **28900(29000)** µg/l | **27000** µg/l |
| ortho-phosphate | 300.0 | <500 µg/l | <500 µg/l | <500 µg/l | <500(<500) µg/l | µg/l | <500(<500) µg/l | <500(<500) µg/l | <500 µg/l |
| dissolved iron | 6010B | <200 µg/l | <200 µg/l | <200 µg/l | <200 µg/l | µg/l | <200 µg/l | <200(<200) µg/l | <200 µg/l |
| manganese | 6010B | **8.79J** µg/l | **13.3** µg/l | **13.7** µg/l | **9.25J** µg/l | µg/l | **6.21J** µg/l | <10(<10) µg/l | <10 µg/l |
| arsenic | 6010B | <10 µg/l | <10 µg/l | <10 µg/l | <10 µg/l | µg/l | <10 µg/l | <10(<10) µg/l | **8.79J** µg/l |
| methane | RSK 175 | | | <2.0 µg/l | | | | <2.0(<2.0) µg/l | |
| ethane | RSK 175 | | | **1.5J** µg/l | | | | <2.0(<2.0) µg/l | |
| lactate | 300.0M | | | | | | | <100(<100) µg/l | <100 µg/l |
| propionate | 300.0M | | | | | | | <100(<100) µg/l | <100 µg/l |
| acetate | 300.0M | | | | | | | <100(<100) µg/l | <100 µg/l |
| carbon tetrachloride | 8260B | **1.2** µg/l | **0.96** µg/l | <0.5 µg/l | <0.5 µg/l | µg/l | **2.8** µg/l | **0.99(0.96)** µg/l | **1.2** µg/l |
| chloroform | 8260B | <0.5 µg/l | <0.5 µg/l | <0.5 µg/l | <0.5 µg/l | µg/l | **0.29J** µg/l | <0.50(<0.50) µg/l | **0.20J** µg/l |
| dichloromethane | 8260B | <5.0 µg/l | <5.0 µg/l | <5.0 µg/l | <5.0 µg/l | µg/l | <5.0 µg/l | <5.0(<5.0) µg/l | <5.0 µg/l |
| chloromethane | 8260B | **0.30J** µg/l | <1.0 µg/l | <1.0 µg/l | <1.0 µg/l | µg/l | <1.0 µg/l | <1.0(**0.24J**) µg/l | <1.0 µg/l |
| methyl tert-butyl ether | 8260B | | | | | | **0.22J** µg/l | | |
| isoproylbenzene | 8260B | | | | | | | | |
| total organic carbon | 415.1 | | 580J µg/l | | | | | 740J(720J) µg/l | 690J µg/l |
| anaerobic heterotrophs | SM9215B | | **3x10**$^{2}$ cfu/ml | | | | | **9x10**$^{1}$(**5x10**$^{1}$) cfu/ml | **1x10**$^{4}$ cfu/ml |

Detections are bolded
J qualifier indicates that the associated numeric value
[1] Field parameters collected by meter on January 29,
[2] Samples and field parameters collected on January

OUCTP EISB Pilot Study
Baseline Sampling and Analysis
Data Summary

| Sample ID<br>Well Type<br>Date | Method | EISB-MW-03<br>monitoring<br>12/19/2007 | EISB-MW-04<br>monitoring<br>12/18/2007 | EISB-MW-05<br>monitoring<br>12/18/2007 | MW-BW-77-A<br>monitoring<br>12/17/2007 | MW-BW-78-A<br>monitoring<br>12/18/2007 | MW-BW-79-A<br>monitoring<br>12/18/2007 |
|---|---|---|---|---|---|---|---|
| alkalinity ($CaCO_3$ total) | HACH | **41** mg/L | **41** mg/L | **47** mg/L | **31** mg/L | **45** mg/L | **51** mg/L |
| pH | meter | **6.7** | **7.11** | **7.01** | **6.2** | **6.08** | **6.72** |
| dissolved oxygen | meter | **10.07** ppm | **9.69** ppm | **10.75** ppm | **9.17** ppm | **7.63** ppm | **7.62** ppm |
| oxidation reduction potential | meter | **116** mV | **150** mV | **159** mV | **154** mV | **131** mV | **141** mV |
| conductivity | meter | **47.9** uS/cm | **49.1** uS/cm | **49.1** uS/cm | **66.4** uS/cm | **59.6** uS/cm | **60.4** uS/cm |
| turbidity | meter | **7.2** NTU | **0** NTU | **2.9** NTU | **2.9** NTU | **6.9** NTU | **17.2** NTU |
| temperture | meter | **17** °C | **17.3** °C | **17.8** °C | **17.7** °C | **18.4** °C | **18.3** °C |
| nitrate | 300.0 | **7930(7960)** µg/l | **7360** µg/l | **7230** µg/l | **7620** µg/l | **12100** µg/l | **5600** µg/l |
| nitrite | 300.0 | <100(<100) µg/l | <100 µg/l | <100 µg/l | <100 µg/l | <100 µg/l | <100 µg/l |
| sulfate | 300.0 | **28300(28400)** µg/l | **26000** µg/l | **26200** µg/l | **49200** µg/l | **46900** µg/l | **46500** µg/l |
| ortho-phosphate | 300.0 | <500(<500) µg/l | <500 µg/l | **270J** µg/l | **618** µg/l | <500 µg/l | **1190** µg/l |
| dissolved iron | 6010B | <200 µg/l | <200 µg/l | <200 µg/l | <200 µg/l | <200 µg/l | <200 µg/l |
| manganese | 6010B | <10 µg/l | <10 µg/l | <10 µg/l | <10 µg/l | <10 µg/l | <10 µg/l |
| arsenic | 6010B | <10 µg/l | <10 µg/l | <10 µg/l | <10 µg/l | <10 µg/l | <10 µg/l |
| methane | RSK 175 | <2.0 µg/l | <2.0 µg/l | | <2.0 µg/l | <2.0 µg/l | <2.0 µg/l |
| ethane | RSK 175 | <2.0 µg/l | <2.0 µg/l | | <2.0 µg/l | <2.0 µg/l | <2.0 µg/l |
| lactate | 300.0M | >100(>100) µg/l | <100 µg/l | <100 µg/l | | | |
| propionate | 300.0M | >100(>100) µg/l | <100 µg/l | <100 µg/l | | | |
| acetate | 300.0M | >100(>100) µg/l | <100 µg/l | <100 µg/l | | | |
| carbon tetrachloride | 8260B | **1.4** µg/l | **1.2** µg/l | **1.4** µg/l | **0.22J** µg/l | **0.65** µg/l | <0.5 µg/l |
| chloroform | 8260B | <0.5 µg/l | <0.5 µg/l | <0.5 µg/l | <0.5 µg/l | <0.5 µg/l | <0.5 µg/l |
| dichloromethane | 8260B | <5.0 µg/l | <5.0 µg/l | <5.0 µg/l | <5.0 µg/l | <5.0 µg/l | <5.0 µg/l |
| chloromethane | 8260B | **0.22J** µg/l | **0.22J** µg/l | <1.0 µg/l | <1.0 µg/l | <1.0 µg/l | **0.29J** µg/l |
| methyl tert-butyl ether | 8260B | | | | | | |
| isoproylbenzene | 8260B | | | | | | |
| total organic carbon | 415.1 | | | | | | |
| anaerobic heterotrophs | SM9215B | | | | | | |

Detections are bolded
J qualifier indicates that the associated numeric value
[1] Field parameters collected by meter on January 29,
[2] Samples and field parameters collected on January