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DISCLAIMER

WSRC-TR-2005-00017
Revision 0

KEY WORDS:
Sulfate Reduction
D-Area Coal Pile Runoff Basin

D-AREA SULFATE REDUCTION STUDY
COMPREHENSIVE FINAL REPORT (U)
FEBRUARY 11, 2005

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SAVANNAH RIVER NATIONAL LABORATORY

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LIST OF ACRONYMS AND ABBREVIATIONS

ACRONYMS

ADS	Analytical Development Section
AHPC	Aerobic Heterotrophic Plate Counts
AnHPC	Anaerobic Heterotrophic Plate Counts
BHS	Bottom of Horizontial Screen
BOS	bottom of screen
DCPRB	D-Area Coal Pile Runoff Basin
DIW-1	D-Area Interceptor Well
DTT-1	D-Area Treatment Trench
DO	dissolved oxygen
EBS	Environmental Biotechnology Section
EPA	Environmental Protection Agency
ERTS	Environmental Restoration Technology Section
GC-MS	Gas Chromatography-Mass Spectrometer
GCU	Gordon Confining Unit or the “green clay”
HDPE	high density polyethylene
HRC	Hydrogen Release Compound
IC	Ion Chomotagraphy
ICP-AES	Inductively Coupled Plasma – Atomic Emission Spectroscopy
LNAPL	light non aqueous phase liquid
MDL	method detection limit
MNA	monitored natural attenuation
MMDC	Microscopic Microbial Direct Counts
MPN-SRA	Most Probable Number – Sulfate-Reducing Assay
MSDS	Material Safety Data Sheet
NA	not applicable
SC	specific conductance
SCDHEC	South Carolina Department of Health and Environmental Control
SRB	sulfate reducing bacteria
SRNL	Savannah River National Laboratory
SRS	Savannah River Site
THS	Top of Horizontial Screen
TOCg	top of casing
TOR	top of riser
TOS	top of screen
TWSP	Treatability Study Work Plan
UIC	Underground Injection Control Permit
UTRA	Upper Three Runs Aquifer
VFA	volatile fatty acid
WSRC	Westinghouse Savannah River Company

LIST OF ACRONYMS AND ABBREVIATIONS

ABBREVIATIONS

aq	aqueous
cells/ml	bacterial cells per milliliter
cm/s	centimeters per second
C:N:P	carbon:nitrogen:phosphorous
e.g.	for example
Eh	redox potential relative to the hydrogen couple
ft	feet
ft-msl	feet above mean sea level
gal	gallons
g/cm^3	grams per cubic centimeter
g/L	grams per liter
gpm/ft	specific capacity in gallons per minute per foot of drawdown
id	identification
i.e.	that is
K_h	horizontal saturated hydraulic conductivity
K_v	vertical saturated hydraulic conductivity
L	liter
m	meter
M	molar
mg/L	milligram per liter
mL	milliliter
mM	millimolar
mol/L	moles per liter
mV	millivolt
nm	nanometers
ORP	oxidation-reduction potential
pe	negative logarithm of the electron (e^-) activity (pe = 16.9 Eh at 25 ^oC)
pH	negative logarithm of the hydrogen ion (H^+) activity
ppm	part per million
redox	reduction-oxidation
s	solid
SRB/ml	sulfate reducing bacteria per milliliter
^oC	degrees Celsius
^oF	degrees Fahrenheit
%	percent
µg/L	micrograms per liter
µmhos/cm or µs/cm	microsiemens per centimeter

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D-AREA SULFATE REDUCTION STUDY

EXECUTIVE SUMMARY

An acidic/metals/sulfate, groundwater contaminant plume emanates from the D-Area Coal Pile Runoff Basin (DCPRB) at the Savannah River Site (SRS), due to the contaminated runoff the basin receives from the D-Area coal pile. A Treatability Study Work Plan (TSWP) (WSRC 2001) was implemented to evaluate the potential for the sulfate reduction remediation of the DCPRB acidic/metals/sulfate, groundwater contaminant plume. The following studies, implemented as part of the TSWP, are documented herein:

- Bacteria Population and Organic Selection Laboratory Testing,
- DTT-1 Trench Evaluation,
- DIW-1 Organic Application Field Study-Part 1, and
- DIW-1 Organic Application Field Study-Part 2.

Evaluation of sulfate reduction applicability actually began with a literature search and feasibility report in mid 2001, which fed into the TSWP. Physical completion of TSWP work occurred in late 2004 with the completion of the DIW-1 Organic Application Field Study-Part 2. The following are the primary conclusions drawn based upon this 3-year effort:

- Pure soybean oil provides a long-term, indirect, SRB carbon source that floats on top of the water table (by indirect it means that the soybean oil must be degraded by other microbes prior to utilization by SRB) for the promotion of sulfate reduction remediation. Soybean oil produces no known SRB inhibitory response and therefore large quantities can be injected infrequently.
- Sodium lactate provides a short-term, immediately available, direct, SRB carbon source that is miscible with the groundwater and therefore flows with the groundwater until it has been completely utilized for the promotion of sulfate reduction remediation. Lactate at elevated concentrations (greater than 6 g/L) does produce a SRB inhibitory response and therefore small quantities must be injected frequently.
- The use of limestone to buffer the contaminated groundwater facilitates sulfate reduction remediation through the injection of organic substrate.

Additionally conclusions and recommendations are made in Sections 8 and 9 regarding continuation of this study, the potential for an interim action, and the final remediation once discharge to the DCPRB has been discontinued.

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1.0 INTRODUCTION

An acidic/metals/sulfate, groundwater contaminant plume emanates from the D-Area Coal Pile Runoff Basin (DCPRB) at the Savannah River Site (SRS), due to the contaminated runoff the basin receives from the D-Area coal pile. Phifer et al. (2001) conducted an evaluation of the feasibility of utilizing sulfate reduction to remediate this plume. It was concluded that the plume probably could be remediated with the combination of sulfate reduction remediation and Monitored Natural Attenuation (MNA). Based upon this evaluation a Treatability Study Work Plan (TSWP) for the sulfate reduction remediation of the DCPRB (WSRC 2001) was prepared and submitted to the South Carolina Department of Health and Environmental Control (SCDHEC) and the Environmental Protection Agency (EPA). This report describes the activities conducted during implementation of this TSWP. The following are the activities conducted to implement this TSWP, which are discussed in detail within this report:

- Bacteria Population and Organic Selection Laboratory Testing: The laboratory testing evaluated the bacteria population adjacent to DCPRB and evaluated sodium lactate, Hydrogen Release Compound (HRC®), and soybean oil as carbon sources for sulfate reducing bacteria.
- DTT-1 Evaluation Field Study: This field study evaluated the longevity of limestone as a base amendment utilizing an existing limestone trench, D-Area Treatment Trench (DTT-1), located adjacent to the DCPRB.
- DIW-1 Field Organic Application Field Study Part 1: This field study involved the injection of sodium lactate and soybean oil into the DCPRB plume through the D-Area Interceptor Well (DIW-1) and the subsequent monitoring, sampling, and analysis. Sodium lactate and soybean oil were selected for application in the field study based upon the results of the Bacteria Population and Organic Selection Laboratory Testing.
- DIW-1 Field Organic Application Field Study Part 2: This field study involved the injection of soybean oil alone into the DCPRB plume through the DIW-1 and the subsequent monitoring, sampling, and analysis. Soybean oil alone was selected for application in the field study based upon the results of the DIW-1 Field Organic Application Field Study Part 1.

Additionally recommendations are made regarding continuation of this study, the potential for an interim action, and the final remediation once discharge to the DCPRB has been discontinued.

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2.0 BACKGROUND

2.1 DCRPB WATER TABLE AQUIFER HYDROGEOLOGY

The water table or unconfined aquifer (also called the lower Upper Three Runs Aquifer (UTRA)) beneath D-Area (see Figure 1 for a map of D-Area) varies in thickness from 40 to 60 feet. The aquifer consists of interbedded sand, calcareous sand, clayey sand, silt, and clay layers, which are laterally discontinuous. The average horizontal hydraulic conductivity is approximately 5.0E-4 cm/s, but the saturated hydraulic conductivities of individual layers range from 1E-3 to 1E-7 cm/s. The average ratio of horizontal hydraulic conductivity to vertical hydraulic conductivity (K_h / K_v) is approximately 10. Soils in the upper portion of the aquifer are generally at the lower end of the hydraulic conductivity range, whereas the soils in the lower portion generally contain more sand and are at the higher end of the hydraulic conductivity range. The green clay (also called the Gordon Confining Unit (GCU)) is the aquitard below the water table aquifer. The green clay consists of fine-grained glauconitic clayey sand interbedded with lenses of green and gray clay (Phifer et al. 1996; Lowry et al. 1999; Phifer et al. 2000a; Phifer et al. 2001).

Groundwater flow in the D-Area water table aquifer is predominantly east to west toward the Savannah River. The general depth of the water table below the ground surface decreases until the groundwater emerges in wetlands to the east of the Savannah River. The most shallow groundwater flow is influenced by local features such as the DCPRB, the unnamed tributary to Beaver Dam Creek (i.e., the discharge ditch), the wetlands between the DCPRB and the ash basins, the ash basins, Beaver Dam Creek, and other wetland/swamp areas. The DCPRB is located approximately 6000 feet from the Savannah River, and it is a groundwater recharge area that greatly influences local groundwater flow. The free surface of the water table ranges from grade in the basin to 15 feet below grade surrounding the basin. Groundwater flow in the DCPRB vicinity is both downward and horizontally away from the DCPRB, within the low permeability, upper portion of the water table aquifer. However, the bulk of the groundwater flow occurs in the higher permeability, lower portion of the aquifer toward the Savannah River (Phifer et al. 1996; Lowry et al. 1999; Phifer et al. 2000a; WSRC 1999; Phifer et al. 2001; Brewer and Sochor 2002).

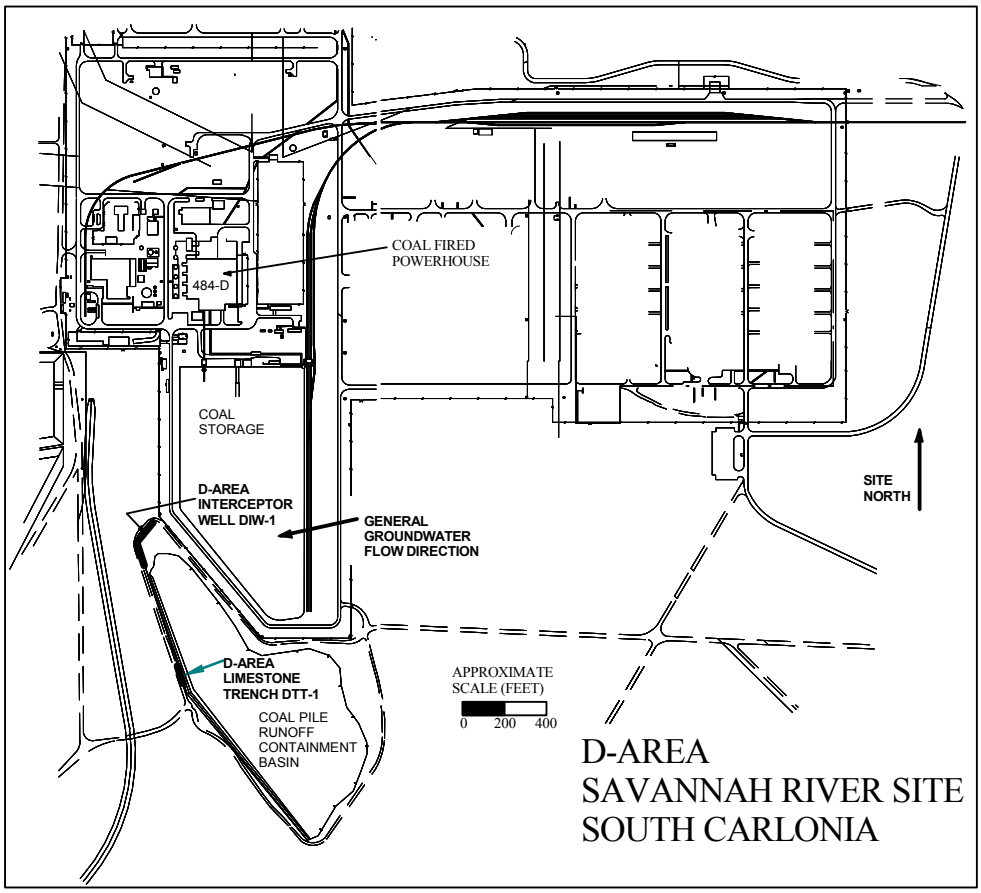

Figure 1 D-Area Map

2.2 DCPRB CONTAMINATION AND GEOCHEMISTRY

The 12.5-acre DCPRB was built in 1978 as a sedimentation basin to receive the runoff from the adjacent 8.9-acre coal pile and prevent direct discharge of the runoff to an adjacent creek. An acidic/metals/sulfate groundwater plume emanates from the basin. Shallow groundwater at the northwestern corner (SRS grid) of the DCPRB is among the most contaminated groundwater emanating from the DCPRB (see Figure 2). In 1995 a demonstration of an experimental subsurface construction technique was conducted in this northwest corner of the basin. The demonstration consisted of the construction of a groundwater extraction system, designated DIW-1, in this location.

In general, groundwater contamination decreases to the south along the western side of the basin, decreases with depth, and decreases with distance from the basin. Table 1 provides historical groundwater data from wells in the vicinity of DIW-1 (see Figure 3) and from well DCB-49, which is located adjacent to the DCPRB berm south of DIW-1 (see Figure 2). These data show that the plume consists of acidic groundwater with elevated metal and sulfate concentrations. Iron and aluminum are among the most important metals affecting groundwater geochemistry. Other metals found in lesser concentrations include cadmium, chromium, cobalt, copper, lead, manganese, nickel, and zinc (see Table 1). The contaminants from well DCB-49 are similar to those near DIW-1, but the pH is higher and the metals concentrations are lower (Phifer et al. 2001).

Table 1 DCPRB Groundwater Geochemistry (Phifer et al., 2001)

Parameter [1]	Geochemistry in the Vicinity of DIW-1 [2]			DCB-49 Geochemistry [3]
	Minimum	Maximum	Average	
Aluminum (mg/L)	8.22	1353.80	560.15	8.77
Cadmium (mg/L)	<0.002	1.570	0.306	NA
Chromium (mg/L)	<0.040	1.260	0.428	<0.1
Cobalt (mg/L)	0.565	1.960	1.124	NA
Copper (mg/L)	0.165	1.780	0.599	NA
Iron (mg/L)	1.23	9236.60	2135.85	33.40
Fe(II) / Fe(total)	NA	NA	NA	0.976
Lead (mg/L)	<0.002	0.310	0.039	NA
Manganese (mg/L)	0.480	336	38.702	0.601
Nickel (mg/L)	<0.050	14.44	4.712	0.156
Zinc (mg/L)	0.06	28.33	8.96	NA
pH	1.55	3.88	2.46	4.12
Eh (mV)	506	817	628	461.5
Total Organic Carbon (mg/L)	2	34.6	6.3	NA
Total PO_4 as P (mg/L)	0.02	0.48	0.14	NA
Phosphorus (mg/L)	NA	NA	NA	<0.64
Dissolved O_2 (mg/L)	0.4	3.2	0.81	4.6
Nitrate as N (mg/L)	<0.05	3.28	0.53	6.9
Sulfate (mg/L)	326	33400	7877	410
Dissolved CO_2 (mg/L)	NA	NA	NA	278.89 [4]
Dissolved H_2 (mg/L)	NA	NA	NA	2.07E-6 [4]

NA = not analyzed
[1] Metal values are dissolved metal concentrations.
[2] Groundwater data come from wells DCB-1A, 10, 18A, 18B, 19A, 19B, 21A, 21B, 22A, and 22B (1984-1997); for wells DCB-1A, 18A, 18B, 22A, and 22B data were collected before the D-Area Interceptor Well (DIW-1) was installed (Sources: GIMS database and unpublished data collected for the D-Area MagSep demonstration project. The MagSep project was a proposed treatment process purported to use chemical adsorption and magnetism to selectively remove trace concentrations of metals from the groundwater.).
[3] Source: Washburn, et al., 1999.
[4] One-time sample from DCB-49 using Microseeps Bubble Strip Method (Source: Washburn, et al., 1999).

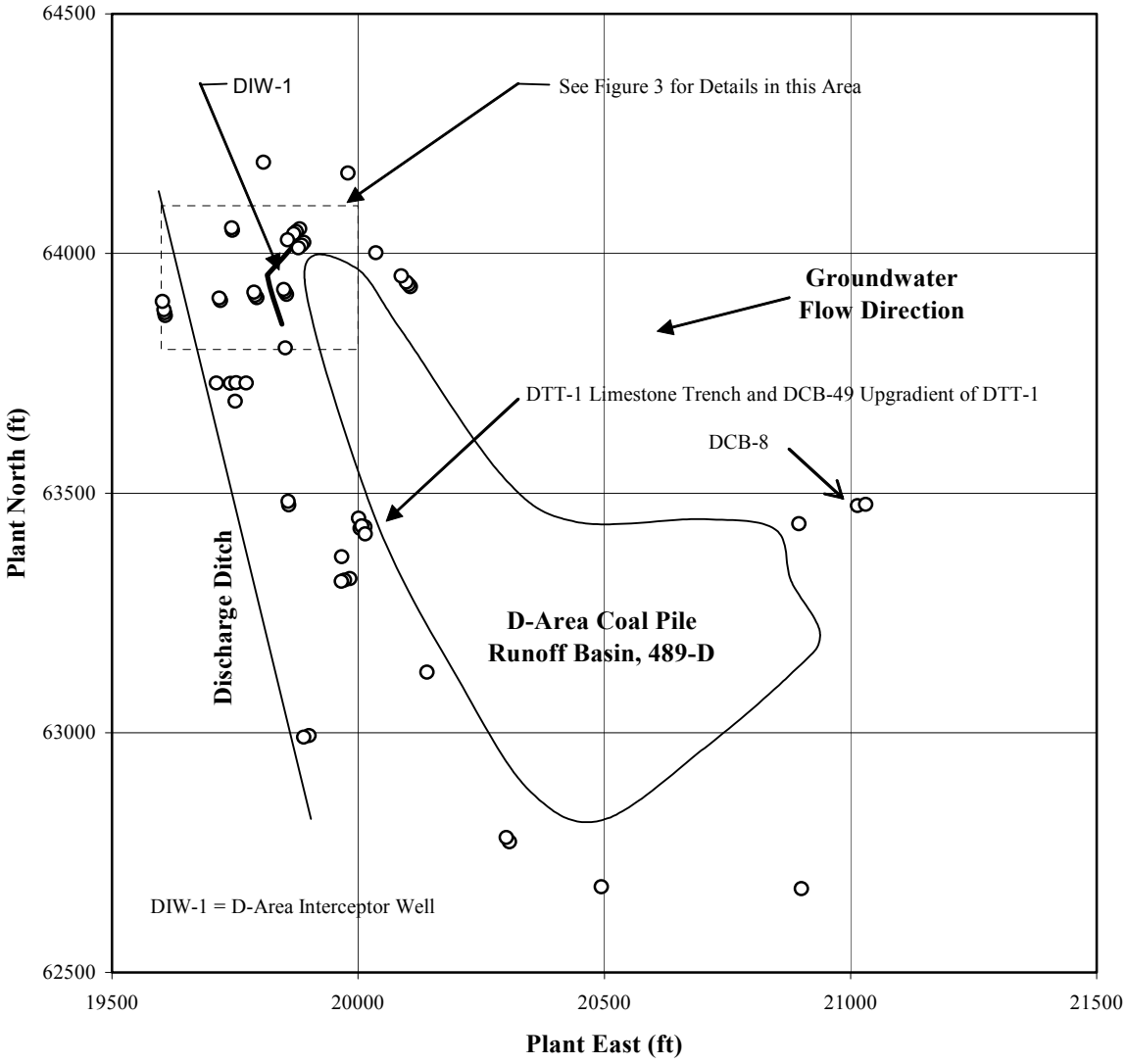

Figure 2 D-Area Coal Pile Runoff Basin Map

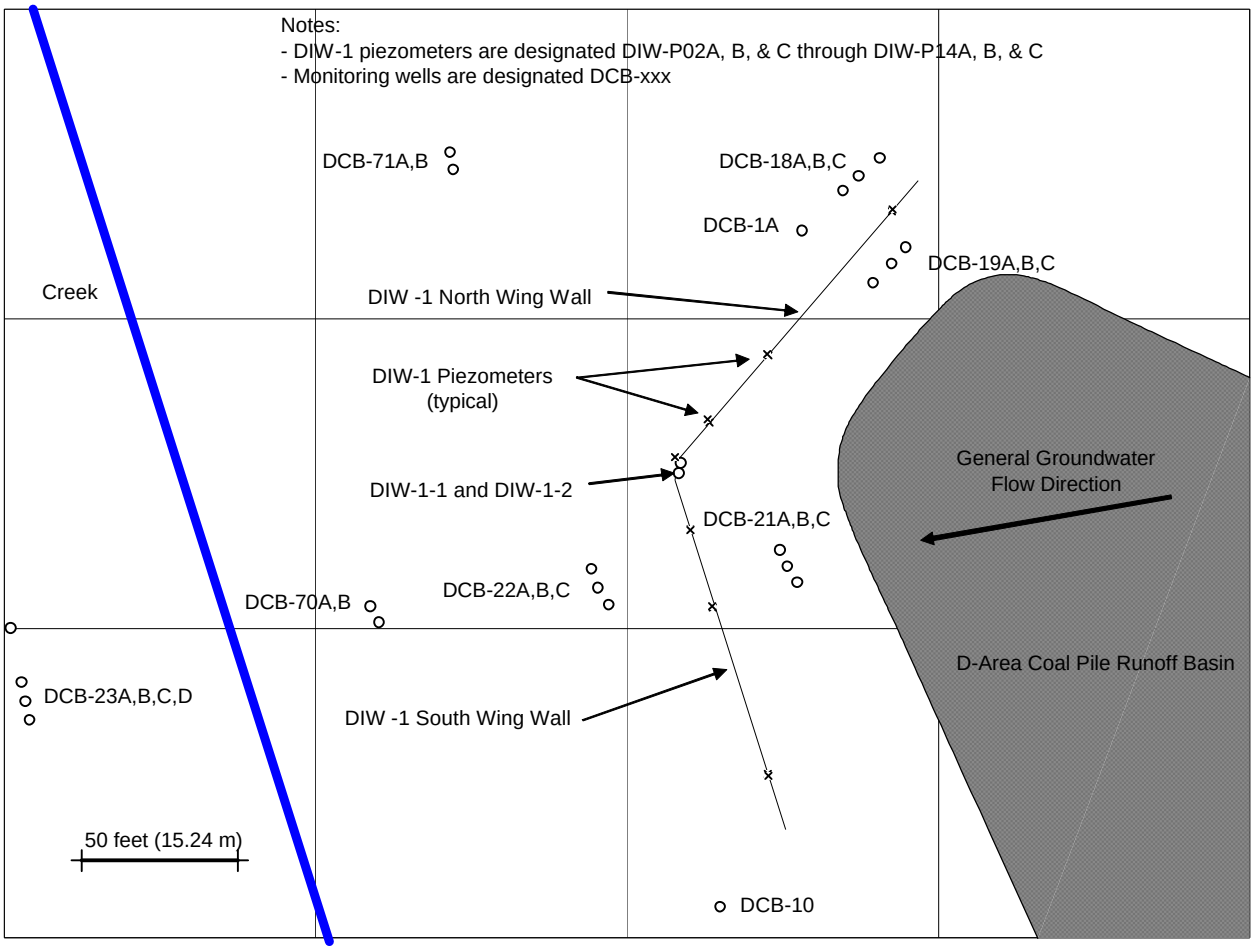

Figure 3 D-Area Interceptor Well (DIW-1) Map

2.3 SULFATE REDUCTION OVERVIEW

Microorganisms that couple the oxidation of carbon substrates to the reduction of sulfate for energy production and growth are known as sulfate reducing bacteria (SRB). In this process sulfate serves the same function as oxygen does for aerobic respiration (i.e. terminal electron acceptor). However SRB cannot use oxygen as a terminal electron acceptor. In fact oxygen is toxic to SRB above trace levels.

For sulfate to be reduced by SRB either hydrogen or a carbon substrate must be oxidized. While hydrogen oxidation provides energy, a carbon substrate provides both energy and carbon for growth. Lactate and pyruvate are almost universally used as carbon sources and electron donors by SRB (Fauque 1995; Ehrlich 1996). In addition, SRB have also been shown to use malate, formate, fatty acids and some alcohols for growth and energy production (Fauque 1995; Ehrlich 1996).

Other more complex carbon sources can ultimately be utilized by SRB. For this to occur SRB must rely on other non-sulfate reducers to partially breakdown the more complex carbon sources. For instance complex organic compounds can be degraded to short chain fatty acids by other

bacteria and then utilized by SRB. Vegetable oil has been used in the bioremediation industry as a slow release carbon source and based on results to date is viewed favorably. Vegetable oil can provide a significant amount of carbon to SRB as a result of its breakdown by fermentative bacteria. Additionally the breakdown of more complex carbon sources may also result in conditions more favorable to SRB. For instance fermenting decreases Eh values to between 0 and –150 mV (Fenchel et al. 1998; Thomas et al. 1999). This Eh range is most favorable for SRB. Also, if oxygen is present, aerobic heterotrophs scavenge the oxygen during carbon oxidation, thereby creating anaerobic conditions that are suitable for SRB growth.

The ubiquity of SRB in the environment and their ability to catalyze biogeochemical transformation of minerals has been exploited for use in bioremediation. During growth of SRB a carbon substrate such as lactate is oxidized and sulfate is reduced to H_2S. H_2S can also react with metals in the environment and result in their immobilization via the formation of reduced minerals. When SRB oxidize a carbon source the resulting HCO_3^- can serve to buffer the system and help to increase pH. The increased pH can also result in metal immobilization through metal hydroxide formation. Under certain conditions, the production of carbonate in turn can react with metals to form carbonate minerals. In a 91-day continuous-flow column study, lactate was used as a carbon source and added to synthetic river water that passed through columns consisting of fluvioglacial silica (SiO_2) and calcite sands (von Guten and Zobrist 1993). Furrer et al (1996) later modeled steady-state conditions for this experiment focusing on turnovers of carbon and sulfur in relation to calcium and iron. They determined that after the addition of 3.6 mM of lactate into a soil column, 1.1 mM of carbonate resulted from lactate oxidation. The remaining carbon was in the form of proprionate (0.8 mM) and acetate (1.5 mM). Presumably if this study were carried out longer than 91 days or if initial lactate concentrations were lower, some other strains of SRB would have oxidized the remaining acetate and proprionate. The microbially mediated sulfate reduction process can be expressed in simplified form as follows:

$$2CH_3CHOHCOO^- + 3SO_4^{-2} + 2H^+ \rightarrow 6HCO_3^- + 3H_2S \text{ (Benner et al. 1999).}$$

Though the conditions of the Furrer et al (1996) study are different from this study, it does illustrate one possibility for stabilization of metals.

In addition to a carbon substrate SRBs require nitrogen and phosphorous. These elements are important in cellular growth and energy production. The amounts needed depend on the bacterial density at a given site and the bacteria's physiological state (i.e. growing or just maintaining activity). Assuming growth conditions are being met, if 1 gram of sediment contains 10^8 bacteria, approximately 0.02 mM of phosphorus per kilogram is required for the population to double. Phosphorous is often assimilated as phosphate (PO_4^{-3}). Nitrogen requirements are usually 5 times that of phosphorous, so for 10^8 cells/kilogram of soil, about 0.1 mM of nitrogen is required. Supplemental nitrogen is usually in the form of ammonium (NH_4^+) but can also be in the form of nitrate (NO_3^-). Overall, the required ratio of carbon:nitrogen:phosphorous (C:N:P) is generally considered to be 100:5:1. So if 670 mM of lactate can result in the reduction of 1 M of SO_4^{-2} over a length of time, the cumulative amounts of nitrogen and phosphorous required are 33.5 and 6.7 mM, respectively. In an aquifer where groundwater is continuously moving past the sediment, a constant influx of nitrogen and phosphorus source is likely.

SRB grow best in a pH range from 5.5 – 9.0. However sulfate reduction has been recorded from acid mine drainage and a fresh water peat bog with pH values as low as 2.5. Similarly, SRB activity can occur under Eh conditions higher than the optimal Eh. Growth under non-optimal conditions may be due to the formation of biofilms of SRB around geologic substrates that provide a more alkaline microenvironment and therefore allow sulfate reduction to occur under otherwise harsh conditions

Competition for carbon and energy sources is also a part of the ecology of SRB. SRB compete for carbon substrates and micronutrients with both aerobic bacteria and other anaerobic bacteria that can utilize terminal electron acceptors other than sulfate. The major anaerobic competitors use the following as terminal electron acceptors; NO_3^- (nitrate reducers), Mn^{+4} (manganese reducers), Fe^{+3} (iron reducers) and CO_2 (methanogens). The thermodynamic favorability for each class of bacteria proceeds in the following order: aerobic bacteria ($O_2 \rightarrow H_2O$), nitrate reducers ($NO_3^- \rightarrow NO_2^- \rightarrow N_2O \rightarrow N_2$), manganese reducers ($MnO_2 \rightarrow Mn^{+2}$), iron reducers ($FeOOH \rightarrow Fe^{+2}$), sulfate reducers ($SO_4^{-2} \rightarrow HS^-$), and methanogens ($CO_2 \rightarrow CH_4$). While thermodynamics play a part in determining which organisms out-compete for carbon substrates, other factors also must be considered. Some SRB have been shown to assimilate nitrate as a building block for protein production and thereby decrease the available nitrate for competing anaerobes. In addition the concentration of terminal electron acceptors also plays a significant part. Oxygen is not only a terminal electron acceptor for competing aerobic bacteria, but it is toxic to many SRB even though they have been reported to tolerate small quantities of oxygen (Fauque 1995). When sulfate concentrations are high, SRB are expected to predominate. Another competitive advantage of SRB is the toxic nature of their end product, H_2S, to other bacteria. In addition, H_2S is a highly reductive compound, which has the potential of reducing terminal electron acceptors and thereby rendering them thermodynamically useless for competing microbes.

(Benner et al. 2000)

2.4 SULFATE REDUCTION VERSUS DCPRB GEOCHEMISTRY

Remediation by sulfate reduction would aid in reducing metal concentrations and raising the pH of the contaminated groundwater emanating from the DCPRB. The high sulfate concentrations relative to concentrations of other constituents needed by microbial competitors (e.g. O_2, NO_3^-, Mn^{+4}, and Fe^{+3}) favors the growth of SRB (see Table 1). However, the low organic carbon, low pH and high Eh present in the plume are not advantageous for SRB growth (see Table 1). The rate at which SRB growth occurs is largely dependent on the type and amount of organic carbon entering the system as well as the concentration of available terminal electron acceptors (i.e. sulfate). Due to the low organic carbon concentrations at this site, SRB growth is expected to be slow. In which case the rate of metal biotransformation is also expected to be slow. In order to accelerate metal transformation rates under low carbon conditions, at a minimum the addition of organic substrates is required. Based upon the literature review and feasibility evaluation (Phifer et al. 2001) Hydrogen Release Compound (HRC), sodium lactate, and soybean oil were selected for further evaluation as organic substrates through laboratory testing. The addition of organic substrates to promote microbially mediated sulfate reduction would result in an increase in pH and decrease in Eh (i.e. toward conditions more favorable to SRB growth). In addition to a carbon source, other amendments such as a base, nitrogen, and phosphate may be beneficial to SRB growth. It should also be noted that prior to any injection hydrogen sulfide had been smelled in the DIW-1-2 well indicating that SRB's were active in this location in the system.

2.5 DIW-1 CONFIGURATION AND HYDROGEOLOGY

The location, configuration, and physical condition of DIW-1 makes it one of the best possible installations for the injection of liquid organic substrates into the most highly contaminated portion of the plume (Phifer et al. 2001 and Sappington et al. 2002). The following sections provide background information on the DIW-1 configuration and the hydrology in the immediate vicinity of DIW-1.

2.5.1 DIW-1 Configuration

In 1995 an experimental subsurface construction technique was demonstrated adjacent to the northwest corner the DCPRB. The demonstration consisted of the construction of a groundwater extraction system, designated DIW-1. DIW-1 was constructed within in the water table aquifer in the most highly contaminated portion of the plume. A plan view of DIW-1 and adjacent monitoring wells is provided in Figure 3. It consists of a 2-foot wide by 30-foot deep by 240-foot long trench divided into two 120-foot long wings designated the south and north wings. A vertical high-density polyethylene (HDPE) membrane was installed down the middle of the trench with coarse gravel pack on either side of the membrane. Multiple vertical and horizontal screened zones assessable from the land surface were embedded in the gravel pack on either side of the membrane. A generalization (to scale) of the upgradient cross-section of DIW-1 is provided in Figure 4. The following provides a detailed description of the components of DIW-1:

- An approximately 30-feet deep by 240-feet long by 80 mil vertical HDPE membrane.
- Coarse gravel pack (Foster-Dixianna FX-99) on either side of the membrane with a measured saturated hydraulic conductivity of 0.45 cm/s.
- Four 6-inch diameter, stainless steel, vertical well screens connected to the central sump and located within the gravel pack on the upgradient side of the membrane. Two of the vertical well screens, which are accessible from above grade, are designated DIW-1-1 and DIW-1-2 and are shown on Figure 4. The other two vertical well screens, which are not accessible from above grade, are not shown on Figure 4. Detailed information concerning the two accessible DIW-1 well screens is provided in Table 2.
- Four 3-inch diameter, HDPE, horizontal slotted drainage pipes (laterals) connected to the central sump located within the gravel pack on the upgradient side of the membrane. Two laterals extend out along each of the two wings of the HDPE membrane from its center point. One lateral (not shown on Figure 4) is located within the gravel pack on the downgradient side of the membrane. Each lateral is accessible from above grade through its own vertical riser (not shown on Figure 4). The laterals are designated laterals 1, 2, 3, 4, and 5. Detailed information concerning these laterals is provided in Table 3.
- The vertical well screens and laterals are all attached to one central sump.
- Six piezometer clusters (three piezometers each) are located within the gravel pack on the upgradient side of the membrane, and seven piezometer clusters (three piezometers each) are located within the gravel pack on the downgradient side of the membrane. Only the upgradient piezometers are shown on Figure 4. All piezometers are vertical and accessible from above grade. The clusters are spread out along the length of the membrane, and the

piezometers in each cluster are screened at different elevations within the gravel pack. The piezometers are designated DIW-P02A, B, and C through DIW-P14A, B, and C. Detailed information concerning these DIW-1 piezometers is provided in Table 2.

(Phifer et al. 1996)

Table 4 provides detailed information concerning the monitoring wells adjacent to DIW-1.

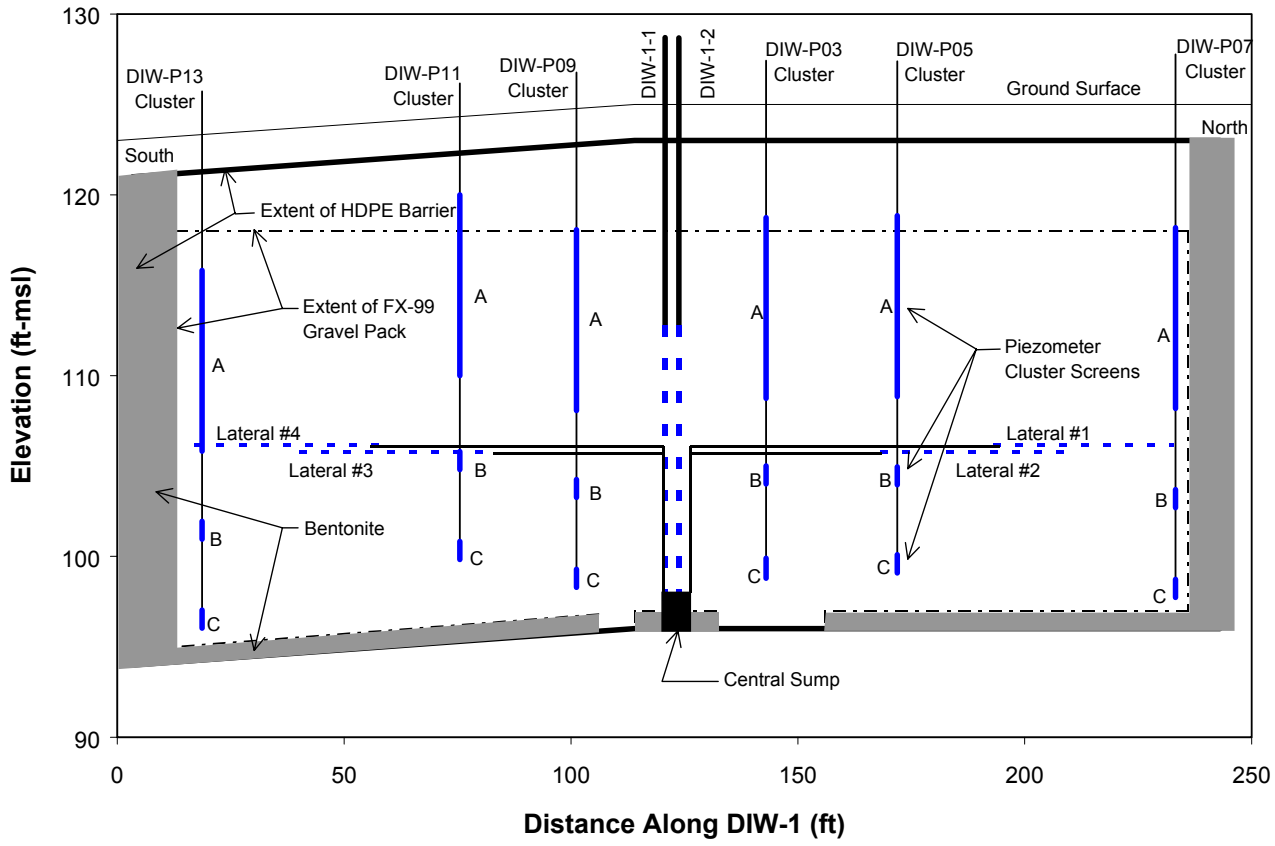

Figure 4 DIW-1 Upgradient Cross-Section

Table 2 DIW-1 Well Screens and Piezometer

Well Screen or Piezometer	Coordinates (ft)		Diameter (inches)	Elevation (ft-msl)			Location
	North	East		TOCg	TOS	BOS	
Wells Screens							
DIW-1-1	63950.06	19816.72	6	128.69	~113	~98	Up; Central
DIW-1-2	63953.41	19817.36	6	128.68	~113	~98	Up; Central
Piezometers							
DIW-P02A	63955.33	19815.47	2	128.47	119.57	109.57	Down; Central
DIW-P02B	63955.38	19815.76	1	128.47	105.66	104.66	Down; Central
DIW-P02C	63955.49	19815.38	1	128.48	100.72	99.72	Down; Central
DIW-P03A	63966.49	19826.34	2	127.42	118.74	108.74	Up; North
DIW-P03B	63966.47	19826.54	1	127.44	105.00	104.00	Up; North
DIW-P03C	63966.32	19826.48	1	127.42	99.90	98.90	Up; North
DIW-P04A	63967.54	19825.79	2	127.39	119.04	109.04	Down; North
DIW-P04B	63967.33	19825.74	1	127.43	105.14	104.14	Down; North
DIW-P04C	63967.58	19825.92	1	127.41	100.27	99.27	Down; North
DIW-P05A	63988.31	19845.14	2	127.41	118.84	108.84	Up; North
DIW-P05B	63988.12	19845.39	1	127.42	104.96	103.96	Up; North
DIW-P05C	63988.27	19845.40	1	127.39	100.09	99.09	Up; North
DIW-P06A	63988.70	19845.07	2	127.44	119.03	109.03	Down; North
DIW-P06B	63988.75	19845.23	1	127.44	105.13	104.13	Down; North
DIW-P06C	63988.38	19845.07	1	127.45	100.33	99.33	Down; North
DIW-P07A	64034.84	19885.04	2	127.77	118.18	108.18	Up; North
DIW-P07B	64034.74	19885.10	1	127.76	103.70	102.70	Up; North
DIW-P07C	64034.97	19885.09	1	127.76	98.73	97.73	Up; North
DIW-P08A	64035.44	19885.30	2	127.27	117.27	107.27	Down; North
DIW-P08B	64035.63	19885.34	1	127.78	103.53	102.53	Down; North
DIW-P08C	64035.33	19885.40	1	127.80	98.48	97.48	Down; North
DIW-P09A	63931.68	19820.54	2	126.80	118.07	108.07	Up; South
DIW-P09B	63931.85	19820.39	1	126.81	104.26	103.26	Up; South
DIW-P09C	63931.55	19820.52	1	126.76	99.29	98.29	Up; South
DIW-P10A	63931.72	19820.24	2	126.77	117.84	107.84	Down; South
DIW-P10B	63931.59	19820.25	1	126.77	104.06	103.06	Down; South
DIW-P10C	63931.77	19820.08	1	126.79	99.07	98.07	Down; South
DIW-P11A	63906.85	19827.54	2	126.19	120.00	110.00	Up; South
DIW-P11B	63906.69	19827.58	1	126.19	105.80	104.80	Up; South
DIW-P11C	63906.80	19827.52	1	126.17	100.83	99.83	Up; South
DIW-P12A	63907.06	19827.44	2	126.20	119.02	109.02	Down; South
DIW-P12B	63907.06	19827.19	1	126.19	105.17	104.17	Down; South
DIW-P12C [1]	63906.89	19827.37	1	126.17	101.33	100.33	Down; South
DIW-P13A	63852.96	19845.35	2	125.74	115.82	105.82	Up; South
DIW-P13B	63852.87	19845.22	1	125.71	101.95	100.95	Up; South
DIW-P13C	63852.87	19845.41	1	125.72	97.03	96.03	Up; South
DIW-P14A	63852.43	19845.34	2	125.52	115.52	105.52	Down; South
DIW-P14B	63852.64	19845.19	1	125.72	101.62	100.62	Down; South
DIW-P14C	63852.37	19845.51	1	125.68	96.64	95.64	Down; South

Notes to Table 2:

TOCg = top of casing; TOS = top of screen; BOS = bottom of screen; Up = upgradient side of DIW-1; Down = downgradient side of DIW-1; Central = center of DIW-1; North = north DIW-1 wing wall; South = south DIW-1 wing wall.

The odd numbered piezometer clusters are on the upgradient side of DIW-1 and the even are on the downgradient side. Piezometer clusters 9, 10, 11, 12, 13, and 14 are in the DIW-1 South wing wall, and clusters 3, 4, 5, 6, 7, and 8 are in the North DIW-1 wing wall. The DIW-P02 piezometer cluster is in the center of DIW-1 on the downgradient side. DIW-1-1 and DIW-1-2 are in the center of DIW-1 on the upgradient side of DIW-1.

[1] DIW-12C does not respond to DIW-1 pumping, therefore it is assumed that the DIW-12C screen is plugged with bentonite.

Table 3 Perforated Zones of DIW-1 Laterals

Laterals	Coordinates (ft)		Coordinates (ft)		Diameter (inches)	Elevation (ft-msl)
	North	East	North	East		
1	~64,034	~19,885	~64,005	~19859	3	~106
2	~64,018	~19,870	~63,986	~19,843	3	~106
3	~63,914	~19,826	~63,874	~19,839	3	~106
4	~63,890	~19,834	~63,852	~19,846	3	~106
5	~63,948	~19,815	~63,874	~19,839	3	~106

Note to Table 3: Laterals 1 through 4 are on the upgradient side of DIW-1 and 5 is on the downgradient side.

Table 4 Monitoring Wells

Well Id	Coordinates (ft)		Diameter (inches)	Elevation (ft-msl)			
	North	East		TOR	TOCg	TOS	BOS
DCB-8	63473.9	21014.1	4	137.2	-	130.3	110.3
DCB-1A	64028.5	19856.3	4	127.3	-	120.1	90.1
DCB-10	63803.1	19852.3	4	124.11	-	119.8	99.8
DCB-18A	64051.83	19881.29	2	-	127.03	119.79	109.79
DCB-18B	64046.05	19874.46	2	-	127.01	101.958	99.458
DCB-18C	64041.36	19869.38	2	-	126.95	89.821	87.321
DCB-19A	64023.03	19889.59	2	-	128.44	120.33	110.33
DCB-19B	64017.71	19885.02	2	-	128.19	102.28	99.78
DCB-19C	64011.57	19879.06	2	-	128.17	90.18	87.68
DCB-21A	63914.82	19854.71	2	-	128.22	119.659	109.659
DCB-21B	63920.02	19851.54	2	-	128.23	104.869	102.369
DCB-21C	63925.28	19849.19	2	-	128.44	91.012	88.512
DCB-22A	63907.57	19794.23	2	-	127.15	119.5	109.5
DCB-22B	63913.1	19790.73	2	-	126.87	103.1	100.6
DCB-22C	63919.08	19788.73	2	-	127.24	90.3	87.8
DCB-23A	19608.26	63870.38	2	-	121.13	115.489	105.5
DCB-23B	19606.95	63876.31	2	-	121.23	96.613	94.113
DCB-23C	19605.68	63882.48	2	-	120.99	90.96	88.46
DCB-23D	19602.21	63899.96	2	-	120.88	51.6	49.1
DCB-70A	19720.47	63901.87	2	119.22	118.9	115.08	105.08
DCB-70B	19717.73	63907.03	2	118.93	118.61	95.77	90.74
DCB-71A	19744.3	64048.23	2	119	118.63	114.4	104.38
DCB-71B	19743.28	64053.71	2	118.63	118.3	95.2	90.18

Notes for Table 4:
TOR = top of riser; TOCg = top of casing; TOS = top of screen; BOS = bottom of screen.
Monitoring well clusters DCB-19A, B, & C and DCB-21A, B, & C are upgradient of DIW-1; all other wells, except DCB-8, which is a DCPRB background monitoring well, are considered downgradient of DIW-1.

2.5.2 DIW-1 Hydrology

DIW-1 is a partially penetrating well screened within the upper most contaminated portion of the water table aquifer. DIW-1 extends from the ground surface at an approximate elevation of 125 ft-msl to an approximate elevation of 96-ft-msl. Within DIW-1 itself the water table elevation ranges from 110 to 117 ft-msl, therefore DIW-1 intercepts the top 14 to 21 feet of the water table aquifer. The "green clay" aquitard is at an approximate elevation of 67-ft-msl, approximately 29 feet below the bottom of DIW-1. DIW-1 is divided into two wings, the South and North wings (see Figure 3) (Phifer et al. 1996). The South wing is essentially perpendicular to the primary direction of groundwater flow, whereas the North wing is close to a forty five-degree angle to the primary direction of groundwater flow. Additionally the South wing typically is closer to the standing water in DCPRB. These factors suggest that the South wing intercepts a higher flux of groundwater than intercepted by the North wing.

Well clusters and piezometers DCB-20, DCB-21, DIW-P11A, DIW-P12A, DCB-22, and DCB-23 form a line across the northern corner of the DCPRB, which intersects DIW-1 and the discharge ditch. Piezometers DIW-P11A and DIW-P12A are installed on the upgradient and downgradient sides of the DIW-1 HDPE membrane, respectively, within the DIW-1 gravel pack. The water table surface profile along this line of wells and DIW-1 piezometers is shown in Figure 5. This profile is based upon the Table 5 water levels obtained on January 25, 1996, after DIW-1 had been installed but prior to pumping the well. When DIW-1 is not being pumped, it blocks horizontal groundwater flow from DCPRB toward the discharge ditch and directs contaminated groundwater flow from the upper, low hydraulic conductivity zone to the lower, high hydraulic conductivity, sand layers below, as shown in Figure 5. Groundwater flow on either side of DIW-1, even on the "downgradient" side for some small distance, is toward DIW-1 and then downward through DIW-1 (Phifer et al. 1996). The estimated residence time of contaminated groundwater within the system is eleven days under these conditions (Phifer et al. 2003a).

During December 2001 each DIW-1 lateral was pumped and drawdown measurements were made in order to determine if there had been any significant reduction in its hydraulic performance over its initial 1996 performance (Phifer et al. 1996). Based upon specific capacity measurements no significant degradation in hydraulic performance occurred from 1996 to 2001. The 1996 and 2001 specific capacities were essentially the same at 1.60 gpm/ft and 1.67 gpm/ft, respectively (Sappington et al. 2002).

Additionally the testing was performed to determine the efficacy of utilizing DIW-1 for the injection of an organic carbon substrate into the DCPRB acidic/metals/sulfate plume. It was determined that significant interconnection exists throughout the entire upgradient side of DIW-1, due to the coarse gravel pack and the multiple interconnected vertical and horizontal screen zones. Based upon this finding, it was concluded that injection of a liquid organic carbon substrate should be relatively easy and that even distribution of the substrate across the entire cross section of DIW-1 should occur (Sappington et al. 2002).

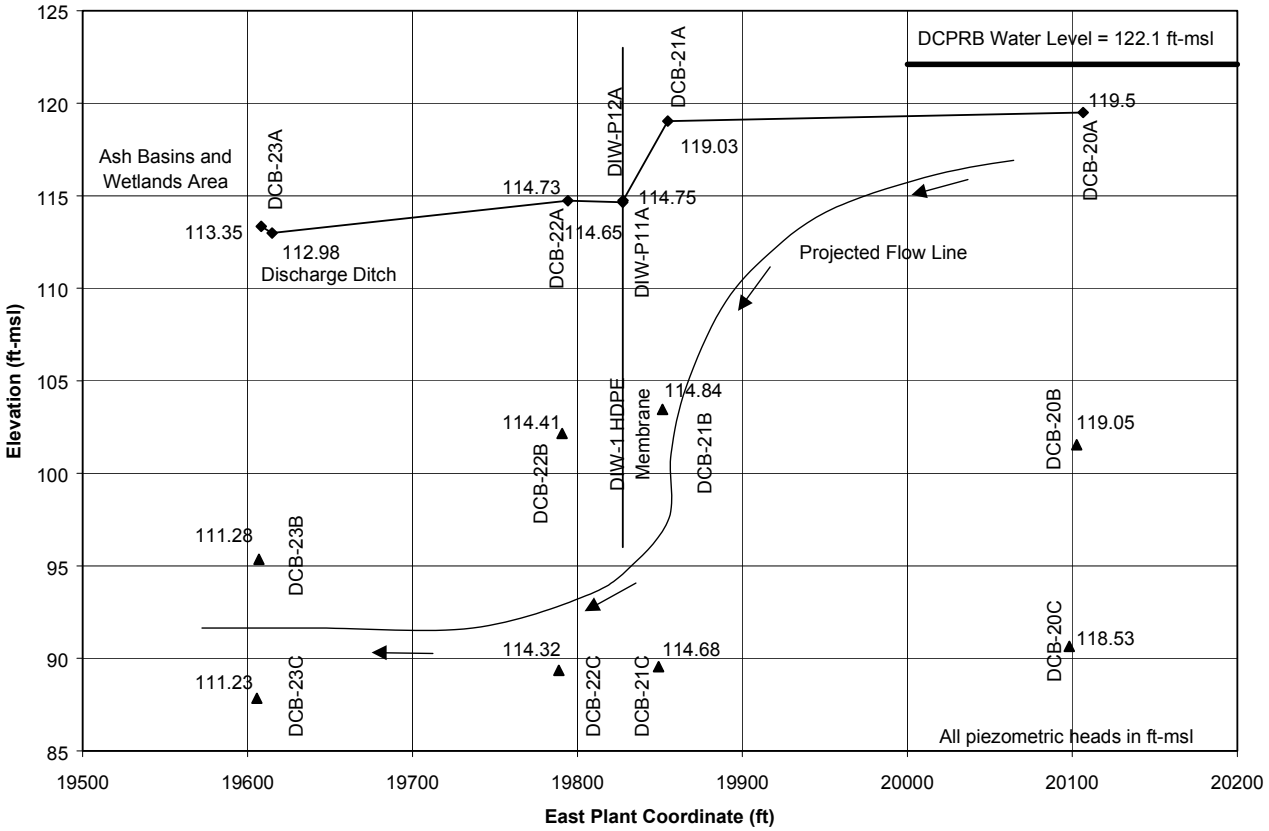

Figure 5 Water Table Profile and Projected Flow Line Across DIW-1

Table 5 Selected DCPRB Water Levels (1/25/96)

Well/Location	TOS (ft-msl)	BOS (ft-msl)	1/25/96 Water Elevation (ft-msl)
DCPRB	NA	NA	122.10
DCB-20A	120.9	110.9	119.50
DCB-20B	102.8	100.3	119.05
DCB-20C	91.9	89.4	118.53
DCB-20D	48.7	46.2	117.18
DCB-21A	120.1	110.1	119.03
DCB-21B	104.7	102.2	114.84
DCB-21C	90.8	88.3	114.68
DIW-P11A	120.0	110.0	114.75
DIW-P12A	119.02	109.02	114.65
DCB-22A	119.8	109.8	114.73
DCB-22B	103.4	100.9	114.41
DCB-22C	90.6	88.1	114.32
Discharge Ditch	NA	NA	112.98
DCB-23A	115.7	105.7	113.35
DCB-23B	96.6	94.1	111.28
DCB-23C	89.1	86.6	111.23
DCB-23D	51.6	49.1	114.31

Notes to Table 5:
TOS = Top of screen; BOS = Bottom of screen.
1) The top of the green clay is at an approximate elevation of 65 to 69 ft-msl
2) The wells highlighted in gray are screened in the Gordon aquifer (Phifer et al. 1996).

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3.0 STUDY OBJECTIVES AND FOCUS

The Treatability Study Work Plan (TSWP) for the sulfate reduction remediation of the DCPRB (WSRC 2001) was implemented based upon a strategy that included laboratory testing and pilot-scale field studies conducted in series that built upon the previous phase. Each phase was designed to address specific questions consistent with the overall treatability study objectives. The following sections provide the questions addressed during each phase conducted.

3.1 LABORATORY BACTERIA POPULATION AND ORGANIC SELECTION TESTING

The Laboratory Bacteria Population and Organic Selection Testing was designed to answer questions associated with the bacteria population near DCPRB and the effects of three carbon sources on that population in order to determine the best carbon source to utilize in field testing. The laboratory work was designed to help direct the subsequent DIW-1 Organic Application Field Study. The laboratory testing was performed in the Savannah River National Laboratory, Environmental Biotechnology Section laboratories, which include anaerobic laboratory facilities. The following are the questions that the Laboratory Bacteria Population and Organic Selection Testing was designed to answer (WSRC 2001; Turick et al. 2002):

1) Are SRB present and if so in what concentration in the vicinity of DIW-1?
2) Are SRBs associated with the groundwater in the vicinity of DIW-1? (This addresses the issue of transport of sulfate reducers within the groundwater and potentially impacts the selection of the carbon source (i.e. miscible versus immiscible))
3) Do indications exist that other bacteria populations, necessary to facilitate sulfate reduction, are present in the vicinity of DIW-1?
4) What is the best carbon source (i.e. out of lactate, HRC®, and soybean oil) to promote sulfate reduction for an extended time period in the vicinity of DIW-1?
5) Can sulfate reduction occur efficiently under the current pH conditions in the vicinity of DIW-1? Does increasing the pH of the groundwater cause sulfate reduction to occur more efficiently?
6) Is sulfate reduction prematurely terminated, while sufficient carbon source and sulfate are still present? (If so this would be an indication that some micronutrient limitation may exist)

3.2 D-AREA TREATMENT TRENCH (DTT-1) TRENCH EVALUATION

The D-Area Treatment Trench (DTT-1) Evaluation was designed to address the issue of limestone longevity within the DCPRB plume by evaluating potential limestone armoring and formation/limestone pluggage within the existing DTT-1 limestone trench, which is located adjacent to the DCPRB (WSRC 2001; Phifer et al. 2003). This evaluation was performed since limestone is considered the most likely base amendment, if required, to produce the optimal pH range for sulfate reduction in the DCPRB plume (Phifer, et al. 2001). It was performed concurrently with the DIW-1 Organic Application Field Study-Part 1, due to the importance of pH to sulfate reduction as demonstrated by the results of the laboratory testing.

3.3 DIW-1 ORGANIC SUBSTRATE FIELD APPLICATION PART 1

The DIW-1 Organic Application Field Study-Part 1 was designed to evaluate the impact of injecting sodium lactate and soybean oil into the DCPRB plume through the D-Area Interceptor Well (DIW-1) on sulfate reduction remediation. Sodium lactate and soybean oil were selected for field testing based upon the laboratory testing. The soybean oil was injected through the upper DIW-1 piezometers so that it formed a LNAPL (light non-aqueous phase liquid) layer floating on top of the water table on the upgradient side of DIW-1. The DIW-1 Organic Application Field Study-Part 1 focused upon answering the following questions (WSRC 2001; Phifer et al. 2003c):

1) Does the field application of sodium lactate and/or soybean oil (substrates) promote long-term sulfate reduction, a subsequent increase in the SRB population and pH level, and a subsequent decrease in metals concentration in the vicinity of DIW-1?
2) What is the optimal application frequency and mass of the substrates to inject into the DCPRB contaminated groundwater through DIW-1?
3) How does the SRB population change in the DCPRB contaminated groundwater with the application of the substrates?
4) How do the total bacteria population and bacteria type change in the DCPRB contaminated groundwater with the application of the substrates?
5) How do the soluble organic concentrations change in the DCPRB contaminated groundwater with the application of the substrates?
6) How do the pH and Eh change in the DCPRB contaminated groundwater with the application of the substrates?
7) How do the heavy metal and sulfate concentrations change in the DCPRB contaminated groundwater with the application of the substrates?
8) Does there appear to be a sufficient, continual influx of micronutrients (nitrogen as ammonia or nitrate and phosphate) to support SRB?

3.4 DIW-1 ORGANIC SUBSTRATE FIELD APPLICATION PART 2

The DIW-1 Organic Application Field Study-Part 2 was designed to evaluate the impact of injecting soybean oil alone into the DCPRB plume through the lower DIW-1 piezometers on sulfate reduction remediation. Soybean oil alone was selected for utilization during Part 2 based upon the Part 1 results. This allowed a more definitive determination to be made as to whether or not sodium lactate is necessary. The soybean oil injection differed from that of Part 1 in that lower ("C") piezometers were used for the injections rather than upper ("A") piezometers. This allowed for the further evaluation of the impact of soybean oil distribution on sulfate reduction. The DIW-1 Organic Application Field Study-Part 2 focused upon answering the following questions (WSRC 2001; Sappington et al. 2003):

1) Does the field application of soybean oil alone promote long-term sulfate reduction, a subsequent increase in the SRB population and pH level, and a subsequent decrease in metals concentration in DIW-1 or is sodium lactate also required?

2) Does soybean oil injection into lower portions of DIW-1 substantially increase the area impacted by sulfate reduction remediation, and what is the residence time of soybean oil within the lower portions of DIW-1?
3) What is the optimal application frequency, mass of the soybean oil to inject, and DIW-1 injection locations?
4) How does the SRB population change in the DCPRB contaminated groundwater with the application of the soybean oil alone?
5) How do the pH and Eh change in the DCPRB contaminated groundwater with the application of the soybean oil alone?
6) How do the heavy metal and sulfate concentrations change in the DCPRB contaminated groundwater with the application of the soybean oil alone?

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4.0 BACTERIA POPULATION AND ORGANIC SELECTION LABORATORY TESTING

The objectives of the bacteria population and organic selection laboratory testing are outlined in Section 3.1. In general the laboratory testing was designed to evaluate the bacteria populations adjacent to the DCPRB and the effect of organic substrate addition on microbial growth within those populations. Based upon the literature review and feasibility evaluation (Phifer et al. 2001) Hydrogen Release Compound® (HRC®), sodium lactate, and soybean oil were selected for this laboratory testing. Sodium lactate and HRC® (commercial product containing lactate) were selected because lactate is regarded as a universal carbon and energy source for SRB. Soybean oil was selected due to its low cost and its ability to provide suitable carbon sources for SRB as a result of its breakdown by fermentative bacteria. Because it is highly soluble in water, sodium lactate is readily available for microbial utilization and should elicit a rapid increase in SRB activity and growth. Because soybean oil and HRC® possess low solubility, they are regarded as "slow release" carbon sources that can be injected in high volumes into the groundwater.

The following three phases of the laboratory testing were conducted:

- Groundwater and Soil Sampling and Initial Monitoring and Analysis
- Anaerobic Microcosm Testing
- Lactate Concentration Study

The results of this laboratory testing formed the basis for the subsequent field application testing. Additional details associated with this laboratory testing can be found in Turick et al. (2002) and WSRC (2002b).

4.1 STUDY IMPLEMENTATION

4.1.1 Bacteria Population and Organic Selection Laboratory Testing

This laboratory testing was conducted utilizing groundwater samples and soil cores taken from a background location (well DCB-8) and two locations downgradient of DCPRB (wells DCB-19A and DCB-19B). The soil cores were taken from locations immediately adjacent to the monitoring wells at the same elevation as the monitor well screens. Figures 1, 2, and 3 depict the location of the DCPRB and the monitoring wells used.

Field monitoring of the groundwater was conducted for indicator parameters. Initial laboratory analyses were conducted on the groundwater for pH, selected microbial micronutrients, sulfate, hydrogen sulfide, selected potentially inhibitory metals, lactate, and selected volatile fatty acids (VFAs). Initial laboratory analyses were conducted on both the groundwater and soil for selected microbial populations (aerobic heterotrophs, anaerobic heterotrophs, and sulfate reducing bacteria).

The aerobic and anaerobic heterotrophic populations were determined utilizing Aerobic Heterotrophic Plate Counts (AHPC) and Anaerobic Heterotrophic Plate Counts (AnHPC), respectively. The spread plate method was utilized with the following growth media for each groundwater and soil sample:

- Tryptic Soy Agar (TSA) at a pH of 4.0,
- Tryptic Soy Agar (TSA) at a pH of 7.0,
- R2A at a pH of 4.0, and
- R2A at a pH of 7.0.

TSA is nutrient rich and conducive for bacteria, which require high nutrient concentrations. R2A is a minimal medium designed for growth of bacteria, which require low nutrient concentrations. Plate counts for both groundwater and soil associated with each well were performed for each type of media under both aerobic (AHPC) and anaerobic (AnHPC) conditions.

The sulfate reducing bacteria populations were determined with a 3 tube most probable number sulfate reducing assay (MPN-SRA) using media specifically designed for growth of a variety of SRB. This test was performed on both the groundwater and the soil cores. In order to perform these tests on the soil cores, the bacteria were desorbed from the soil using a phosphate buffer solution. Serial dilutions of the groundwater and phosphate buffer solutions were added to test tubes, in triplicate and incubated anaerobically for 8 weeks. The quantity of SRB was determined with the MPN-SRA based on the number of positive test tubes at each dilution. These values were then calculated statistically to determine the mean and 95% confidence limit of SRB per sample.

4.1.2 Anaerobic Microcosm Testing

Anaerobic microcosms were used to examine how microbial growth is affected by the addition of sodium lactate, HRC®, or soybean oil. Additionally the impact of the initial pH was examined. The microcosms were 200-ml gastight glass bottles into which 100 ml of the appropriate groundwater, 50 grams of the corresponding soil, and the selected organic substrate amendment were placed. Four sets of microcosms were prepared as shown in Table 6 associated with monitoring wells DCB-19A, DCB-19B, DCB-8, and DCB-19A in equilibrium with limestone. Each set consisted of four subsets, one subset for each of the following amendment treatments: sodium lactate, HRC®, soybean oil, and a control (non-amended). Each amendment treatment subset was replicated three times. This resulted in a total of 48 individual microcosms. To ensure anaerobic conditions, the microcosms were handled in an anaerobic glove box.

After two months of incubation liquid aliquots from the microcosms were obtained and analyzed for pH and selected microbial populations (total bacteria and sulfate reducing bacteria). After four months of incubation liquid aliquots from the microcosms were obtained and analyzed for pH, sulfate, hydrogen sulfide, selected volatile fatty acids (VFAs), and selected microbial populations (total bacteria and sulfate reducing bacteria). The total bacteria count was

determined through a microscopic direct bacteria count of bacteria stained with 4'6-diamidino-2-phenylindole (DAPI).

Table 6 Microcosm Testing Setup

Source	Organic Substrate Amendment per Microcosm	Number of Microcosms
DCB-19A	2.3 mL 60% lactate syrup	3
	1.93 g soybean oil	3
	4.2 g HRC®	3
	None (control)	3
DCB-19B	2.3 mL 60% lactate syrup	3
	1.93 g soybean oil	3
	4.2 g HRC®	3
	None (control)	3
DCB-8	2.3 mL 60% lactate syrup	3
	1.93 g soybean oil	3
	4.2 g HRC®	3
	None (control)	3
DCB-19A (in equilibrium with limestone)	2.3 mL 60% lactate syrup	3
	1.93 g soybean oil	3
	4.2 g HRC®	3
	None (control)	3

4.1.3 Lactate Concentration Study

Two laboratory tests were conducted to evaluate the potential inhibitory effects of lactate on SRB growth. The first laboratory test consisted of the addition of sodium lactate in concentrations ranging from 0 – 2.5% (percent as mls of 60% sodium lactate per 100 mls of solution) to test tubes containing a minimal salt solution for SRB and a SRB inocula (1% vol/vol). Growth was monitored over several weeks and positive growth was determined as production of a black color and precipitate in the media. (Turick et al. 2002)

The second laboratory test was designed to determine whether the SRB inhibition noted in the first laboratory test was due to the sodium and/or lactate. In the second test, SRB growth was monitored over time in media containing varying concentrations of sodium lactate or potassium lactate. Test tubes containing Sulfate Reducing Bacterial (SRB) growth medium (Table 7) were prepared in two sets. Set 1 contained SRB media with varied concentrations of lactate (Table 8) using sodium lactate (ACROS Organics) as the lactate source. Set 2 contained SRB media with varied concentrations of lactate (Table 8) using potassium lactate (PURAC) as the lactate source. Media were prepared under anaerobic conditions and all work was done in an anaerobic chamber (5% H_2, 5% CO_2, and 90% N_2).

Table 7 Sulfate Reducing Bacterial Growth Media

	grams/liter
Beef Extract	1.00
Peptone	2.00
Magnesium sulfate $MgSO_4 . 7H_2O$	2.00
Sodium sulfate Na_2SO_4	1.50
Dipotassium hydrogen phosphate K_2HPO_4	0.50
Calcium chloride $CaCl_2$	0.10
Ferrous ammonium sulfate $Fe(NH_4)_2(SO_4)_2.6H_2O$	0.392
Sodium Ascorbate $NaC_6H_7O_6$	0.10

Table 8 SRB Media Sets 1 and 2 –Lactate Concentrations in SRB Media

Lactate Concentrations Tested

Lactate Concentration (g/L)	Lactate Concentration % lactate	Lactate Concentration (mM)
0.88	0.14	9.88
1.75	0.28	19.65
3.50	0.56	39.30
5.25	0.83	58.95
7.00	1.11	78.60
10.50	1.67	117.90
14.00	2.22	157.20

Sulfate reducing bacteria were recovered from positive SRB media tubes (with lactate at a concentration of 35.4 mM) from a groundwater sampling event 4 months previous to this study. The positive SRB medium was spun down at 1.20E+04 Relative Centrifugal Force (RCF) for 5 mins. The supernatant was discarded and the cells were washed with SRB medium containing no lactate. The spinning and washing process was repeated twice, and the pelleted cells were resuspended in FA buffer (Difco). SRB media tubes from Sets 1 and 2 (with varying concentrations of sodium lactate and potassium lactate, respectively) were inoculated with resuspended pellet so that the bacterial concentration in each tube was 2.50E+05 bacterial cells/ml SRB media. The percent transmittance (560nm) of each tube was measured on a Bausch & Lomb Spectronic 20 over time.

Additional SRB media tubes from Sets 1 and 2 (varying concentrations of sodium lactate and potassium lactate, respectively) were inoculated with groundwater at 1/10 dilution from a field study well that had received soybean oil, but not lactate amendments, during the course of the study. The percent transmittance at 560nm of each tube was measured on a Bausch & Lomb Spectronic 20 over time.

4.2 RESULTS AND DISCUSSION

4.2.1 Initial Field Monitoring and Laboratory Analyses Results

The results of the initial groundwater field monitoring and laboratory analyses are provided in Table 9. Indicator parameters, selected microbial micronutrients, sulfate, hydrogen sulfide, selected potentially inhibitory metals, lactate, and selected volatile fatty acids (VFAs) from monitoring wells DCB-19A, DCB-19B, and DCB-8 and DCB-19A in equilibrium with limestone are provided.

Table 9 Initial Groundwater Physical, Chemical, and Biological Characteristics

Analytical Parameter	Results			
	DCB-19A	DCB-19A [1]	DCB-19B	DCB-8
Field pH	2.51	-	2.79	4.64
Field ORP (mV)	542.6	-	417.5	343.3
Field DO (mg/L)	9.16	-	9.68	4.91
Field Cond. (µS/cm)	2238	-	2217	25
Field Temp, °C	29.24	-	25.79	22.05
Lab pH	2.5	3.5	2.9	4.9
Lab Temp, °C	22	22	22	22
Phosphate, mg/L	ND	ND [2]	ND	1.4
Nitrate, mg/L	11	11 [2]	2.3	3.4
Ammonium, mg/L	ND	ND	ND	ND
Sulfate, mg/L	994	1025	2493	5.4
Hydrogen Sulfide, mg/L	0.15	0.15 [2]	0.021	0.1
Aluminum, mg/L	79.4	0.274	272	0.026
Copper, mg/L	0.216	<0.009	0.366	0.017
Lactate, mg/L	ND	ND [2]	ND	ND
Acetate, mg/L	4.4	4.4 [2]	4.5	2.6
Butyrate, mg/L	4.5	4.5 [2]	4.5	6.4
Propionate, mg/L	9.6	9.6 [2]	8.9	6.3
Valerate, mg/L	4.6	4.6 [2]	4.5	7.0

Notes to Table 9:

ORP = oxidation-reduction potential; DO = dissolved oxygen; Cond. = conductivity; Temp = temperature; ND = none detected.

DCB-19A and DCB-19B are immediately downgradient of DCPRB and upgradient of DIW-1, the D-Area Interceptor Well (Figure 3).

DCB-8 is a DCPRB background monitoring (See Figure 2).

[1] This is DCB-19A groundwater, which has been brought to equilibrium with limestone.

[2] Data obtained for DCB-19A prior to limestone treatment; limestone treatment was not anticipated to significantly affect these parameters.

Figure 6 provides the initial laboratory analyses for aerobic heterotrophs, anaerobic heterotrophs, and sulfate reducing bacteria from both the groundwater and soil samples associated with monitoring wells DCB-8, DCB-19A, and DCB-19B. Well DCB-8 is a background monitoring well and wells DCB-19A and DCB-19B are located in the plume downgradient of DCPRB. SRB counts were only determined under anaerobic conditions. While SRB were detected in groundwater and sediment at each well location under anaerobic conditions, the DCB-8 sediment, DCB-19B groundwater, and DCB-19B sediment were at the detection limit (i.e. 0.5 microbes/ml of groundwater or 0.5 microbes/g of sediment). SRB were detected at 13 microbes/ml of groundwater from DCB-8 and at 0.7 microbes/ml of groundwater and 31 microbes/g of sediment from DCB-19A. Heterotrophic populations were detected at each well location. The background well (DCB-8) had fairly consistent microbial densities under both aerobic and anaerobic conditions with both groundwater and sediment samples. In contrast microbes from DCB-19A were dominated by anaerobic bacteria from sediment samples and DCB-19B were dominated by aerobic bacteria from sediment samples.

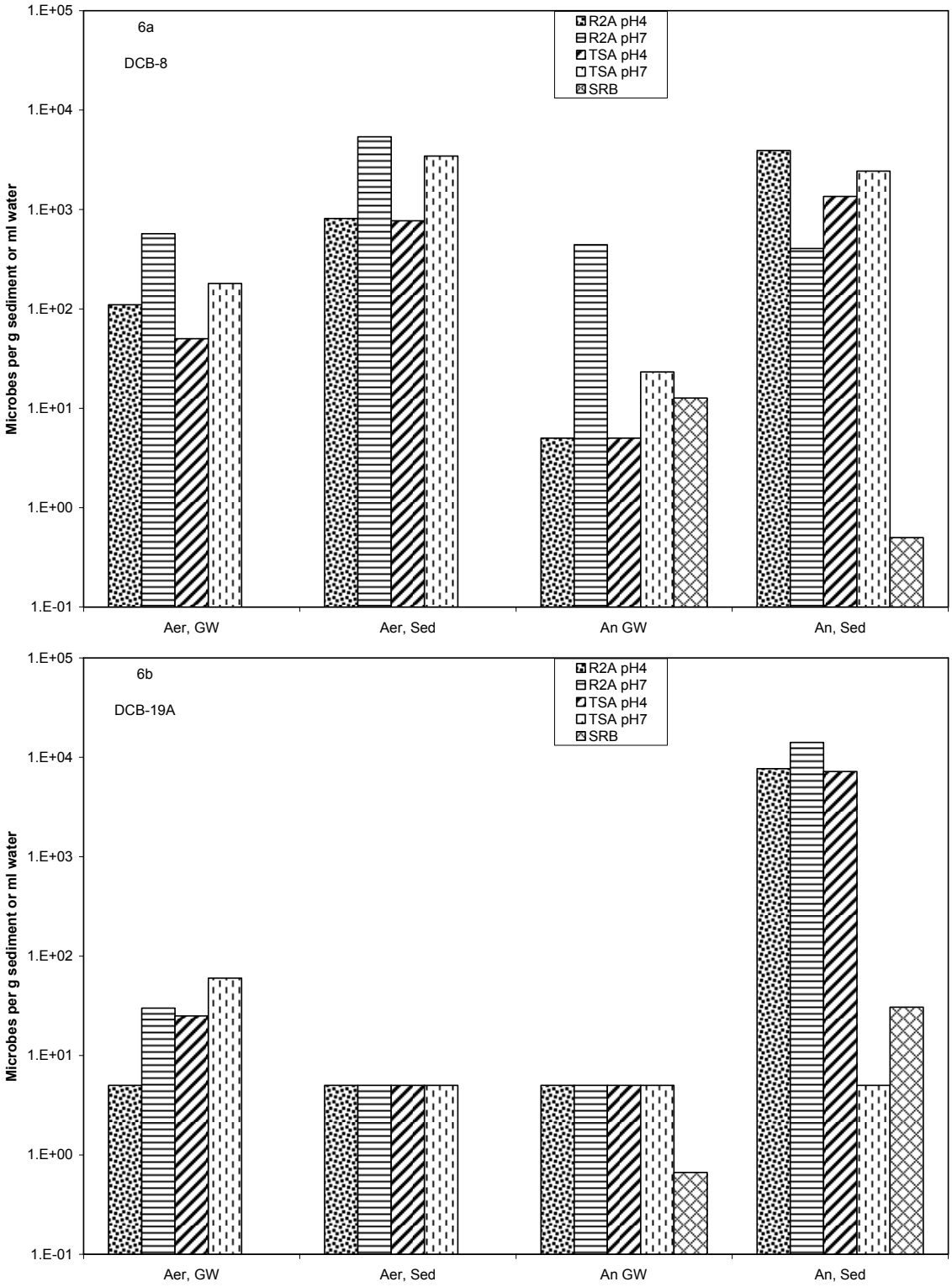
This indicates that:

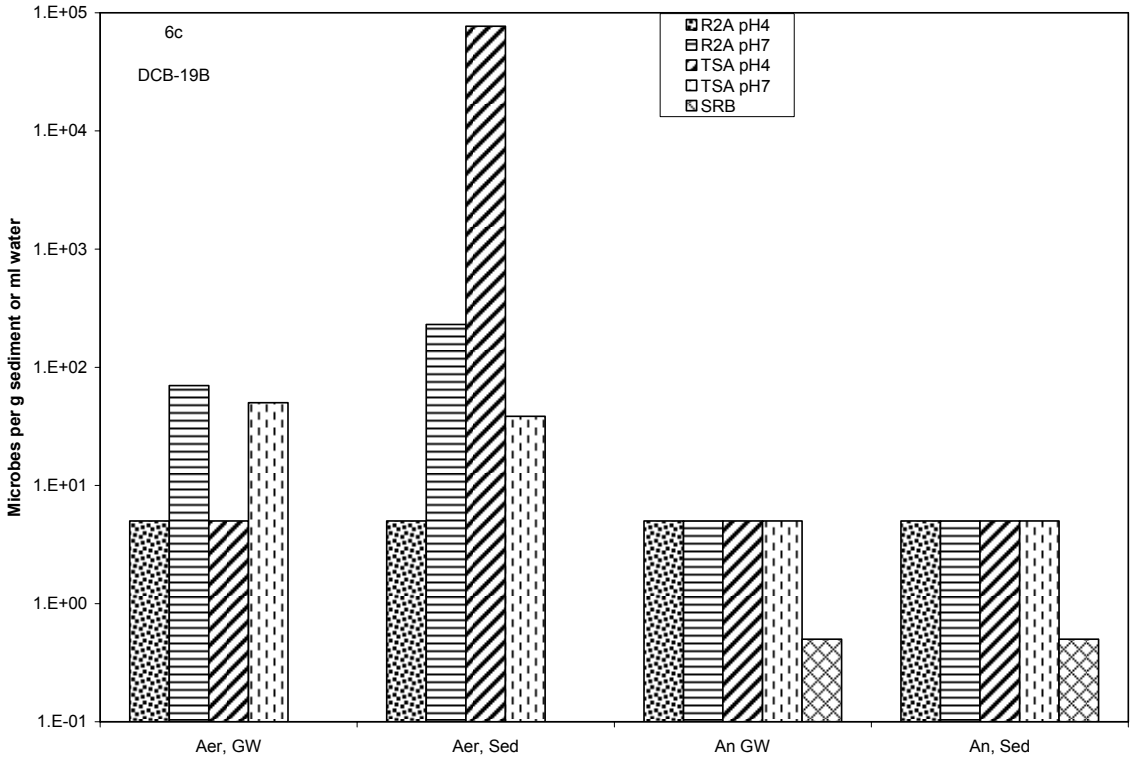
- Bacteria associated with the sediment from these highly contaminated areas may have created more favorable micro-environments within which to flourish.
- The background well DCB-8 has the greatest microbial diversity, whereas less microbial diversity exists in the more highly contaminated areas.
- There is a general trend toward decreased microbial diversity/activity as a result of contamination.
- Even in the most contaminated area (DCB-19A and DCB-19B), the microbial community is mixed and is capable of both aerobic and anaerobic growth under conditions of either rich or minimal nutrient conditions.
- A robust population capable of establishing anaerobic conditions is in the subsurface.

Since samples near DCB-19A and DCB-19B represent the worst conditions in the subsurface at the DCPRB and microbial growth was detected there; there is a high probability that microbial growth, including sulfate reduction will occur with the addition of the proper carbon and energy sources.

Figure 6 Heterotrophic Microbial Density of Water and Sediment from DCB-8 (6a), DCB-19A (6b), and DCB-19B (6c)

The abbreviations in the graphs stand for: Aer = aerobic; An = anaerobic; Gw = groundwater; Sed = sediment.




6c
DCB-19B
R2A pH4
R2A pH7
TSA pH4
TSA pH7
SRB
Microbes per g sediment or ml water
1.E+05
1.E+04
1.E+03
1.E+02
1.E+01
1.E+00
1.E-01
Aer, GW
Aer, Sed
An GW
An, Sed

4.2.2 Anaerobic Microcosm Study Results

Sulfate reduction entails the oxidation of an organic carbon substrate by sulfate-reducing bacteria (SRB) for energy and growth and the use of sulfate as an electron acceptor, which results in the production of hydrogen sulfide, an increase in pH, and the subsequent precipitation of metal sulfides. Evidence of sulfate reduction is provided by an increase in pH, an increase in the SRB population, the production of hydrogen sulfide, and the production of organic carbon substrate breakdown products (i.e. VFAs). Additionally a healthy environment for SRB is also evidenced by an increase in the total microbial population. Therefore after two months of incubation liquid aliquots from the microcosms were obtained and analyzed for pH, the sulfate reducing bacteria population, and the total microbial population. After four months of incubation liquid aliquots from the microcosms were obtained and analyzed for pH, the sulfate reducing bacteria population, hydrogen sulfide, selected volatile fatty acids (VFAs), and the total microbial population.

Microcosms amended with soybean oil and sodium lactate had higher pH values than the initial values or that within the non-amended (control) microcosms after 2 months of incubation, whereas those amended with HRC® had lower pH values (see Figure 7). Microcosms containing DCB-19A groundwater treated with limestone had higher pH values than those containing DCB-19A that had not been treated with limestone. The pH did not change significantly in the microcosms between month 2 and 4.

SRB densities (see Figure 8) increased over the concentrations found in the initial groundwater samples in the DCB-8 microcosms with no amendments and in the DCB-8 and limestone-treated DCB-19A microcosms amended with soybean oil after two and four months of incubation. The increase in SRB densities in the DCB-8 microcosms with no amendments probably occurred due to the microcosms going from aerobic conditions to anaerobic conditions with time. After the initial SRB counts no further SRB were detected in association with DCB-19B regardless of amendment or in association with microcosms amended with sodium lactate or HRC®. The lack of SRB in sodium lactate amendments indicates inhibition of SRB activity due to contaminants (pH and metals) or lactate concentrations or both. However, the increased microbial density from the direct microscopic counts and elevated VFAs from lactate amendments indicates that suppression of SRB was caused by lactate inhibition more than contaminant concentrations. The lack of SRB in HRC® amendments is probably due to the reduction in pH experienced by HRC® amended microcosms.

Hydrogen sulfide significantly greater than initial concentrations was produced in DCB-8 and limestone-treated DCB-19A microcosms amended with soybean oil after four months of incubation (Figure 9). Hydrogen sulfide concentrations from other microcosms (i.e. no amendments, sodium lactate, and HRC®) were not significantly above initial concentrations. The initial hydrogen sulfide concentrations are based on groundwater sampling performed on the source wells (Table 9). Initial hydrogen sulfide concentrations were not determined for DCB-19A pH treatments.

Volatile fatty acid (VFA) determinations were conducted on all microcosms except for the ones amended with HRC®, after 4 months of incubation to assess microbial activity in the microcosms (Figure 10). The HRC® microcosms were dropped from this analysis since positive responses

were not obtained in any of the previous analyses. As carbon sources are broken down to CO_2 by various microbial communities, the presence of various volatile fatty acids during the breakdown process indicates microbial activity. The VFAs include acetate, propionate, formate, isobutyrate, isovalerate, valerate, and isocaproate. SRB use carbon sources such as acetate, propionate, lactate, etc. VFA concentrations were determined during the initial characterization of the groundwater samples (Table 9). DCB-8 microcosms amended with soybean oil and all microcosms amended with sodium lactate produced increased VFAs.

Overall microbial density increased in soybean oil and lactate amended microcosms after 2 months incubation (Figure 11). Microbial activity was minimal in HRC® amendments after 2 months incubation. The HRC® microcosms were dropped from this analysis after 2 months, since positive responses were not obtained in any of the previous analyses. After 4 months incubation, a significant increase in microbial density was detected in lactate amended microcosms.

Overall the microcosm data suggests the following:

- It is possible to promote sulfate reduction at the DCPRB using soybean oil as the organic substrate amendment,
- It is not possible to promote sulfate reduction at the DCPRB using HRC® as the organic substrate amendment due to the reduction in pH produced by its utilization,
- While the use of sodium lactate as the organic substrate amendment stimulated overall microbial activity, its use at the concentrations utilized inhibited SRB growth, and
- Higher initial pHs appear to promote better SRB growth.

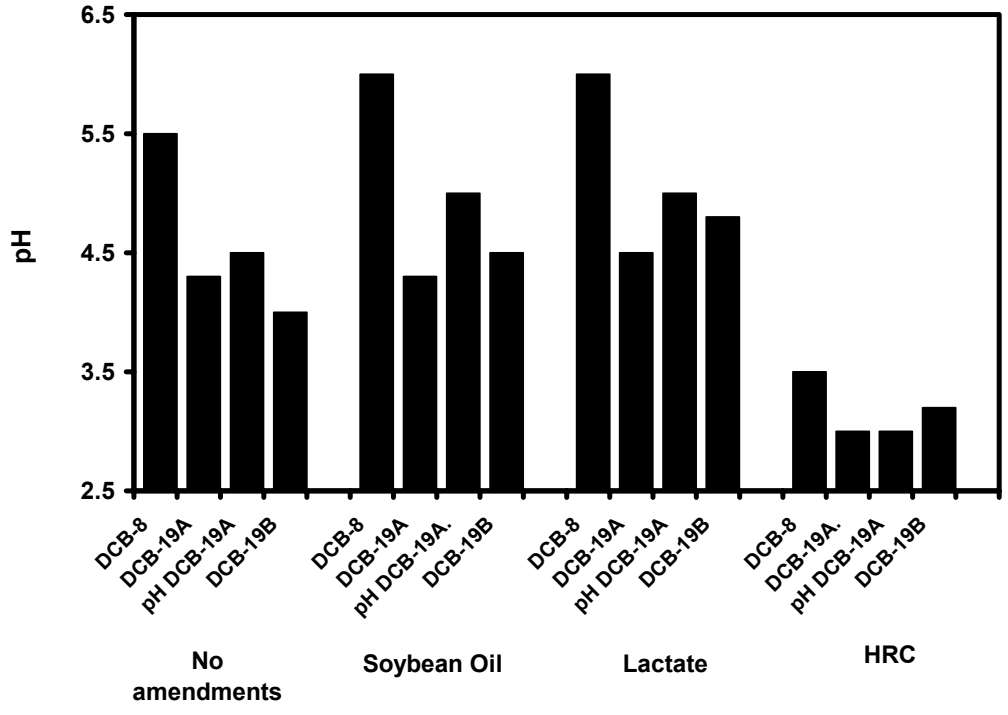


Figure 7 Microcosm pH Values after 2 Months

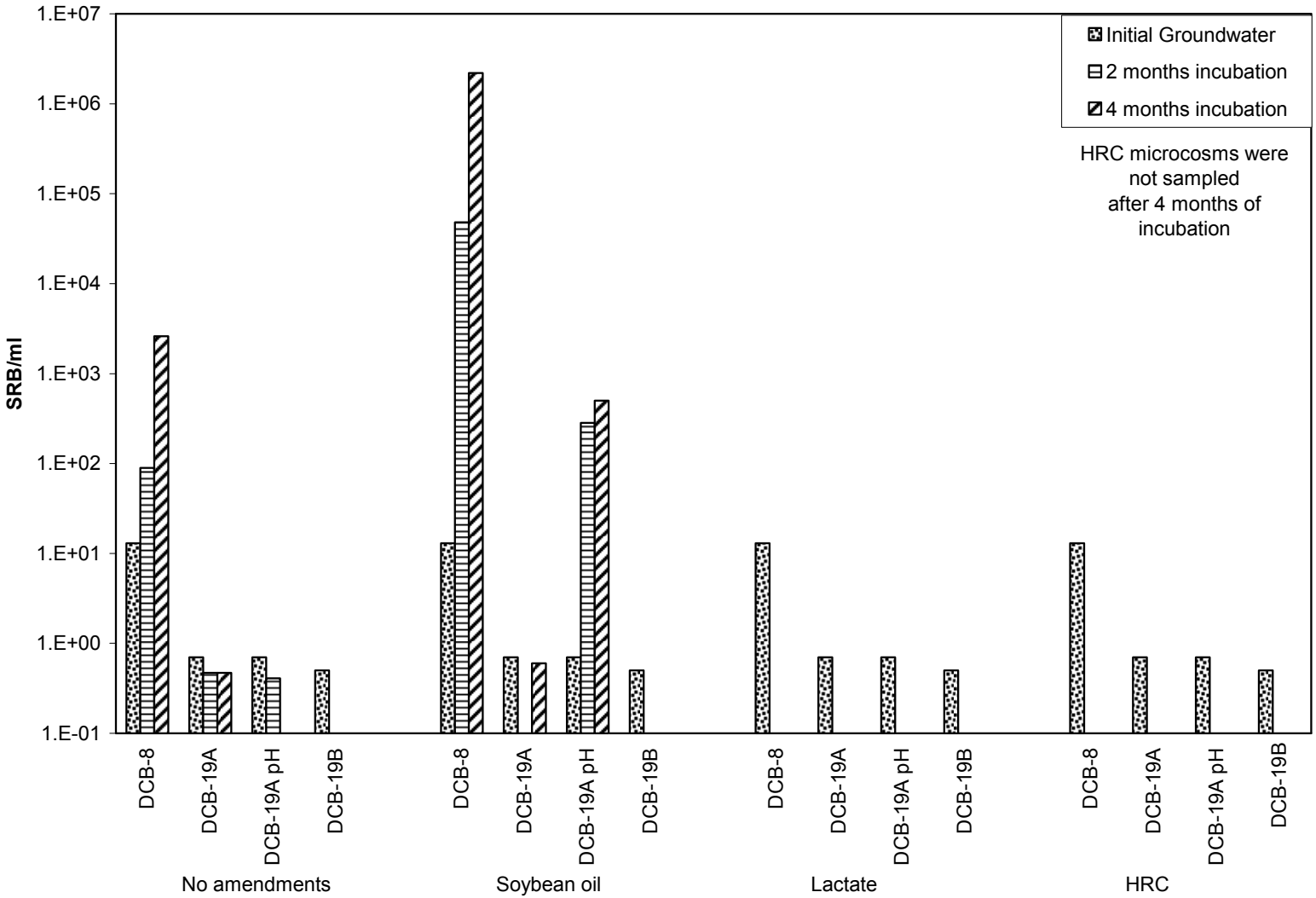


Figure 8 Microcosm Sulfate-Reducing Bacteria (SRB) Density after 2 and 4 Months

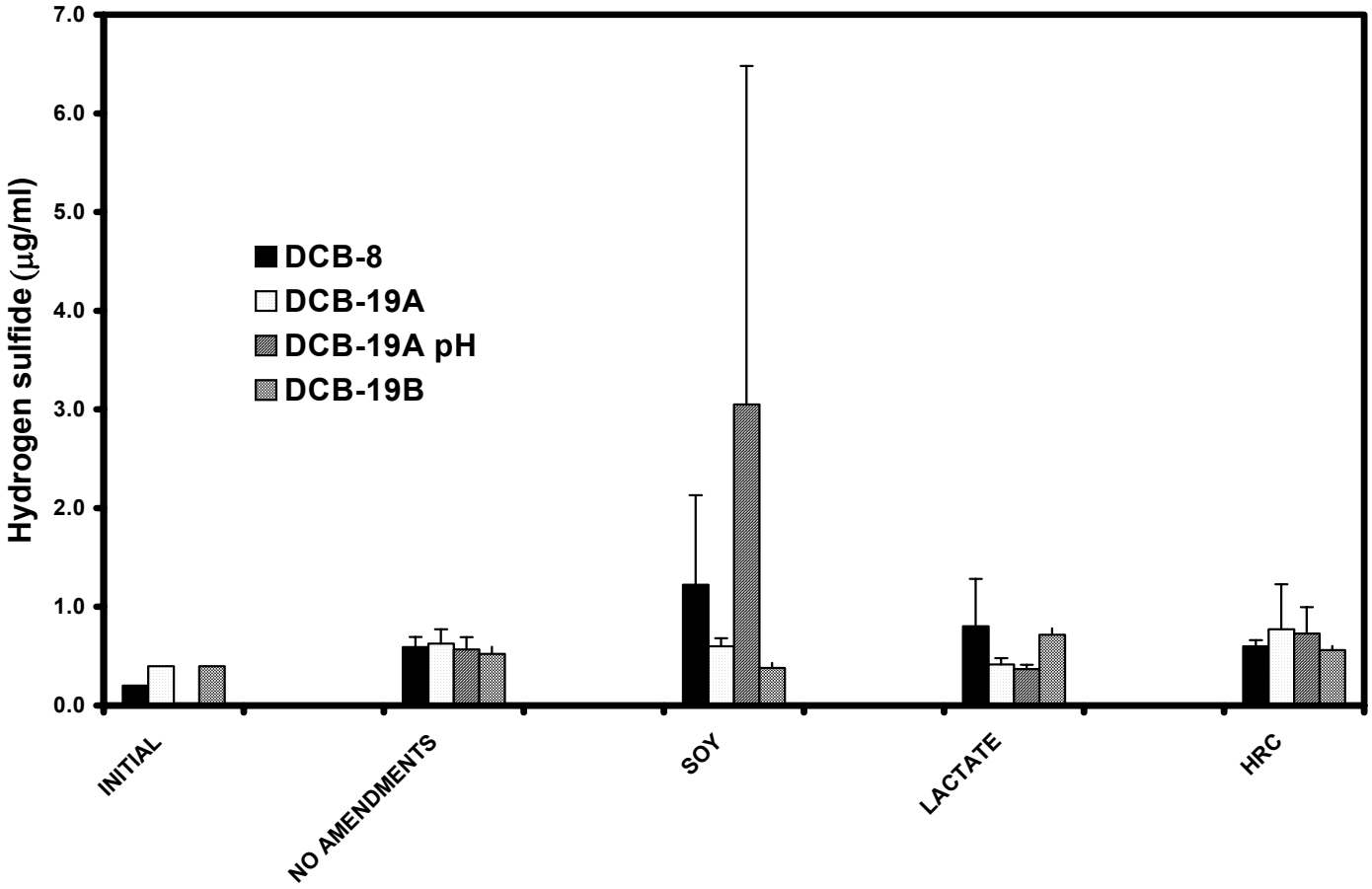


Figure 9 Microcosm Hydrogen Sulfide Concentrations after 4 Months

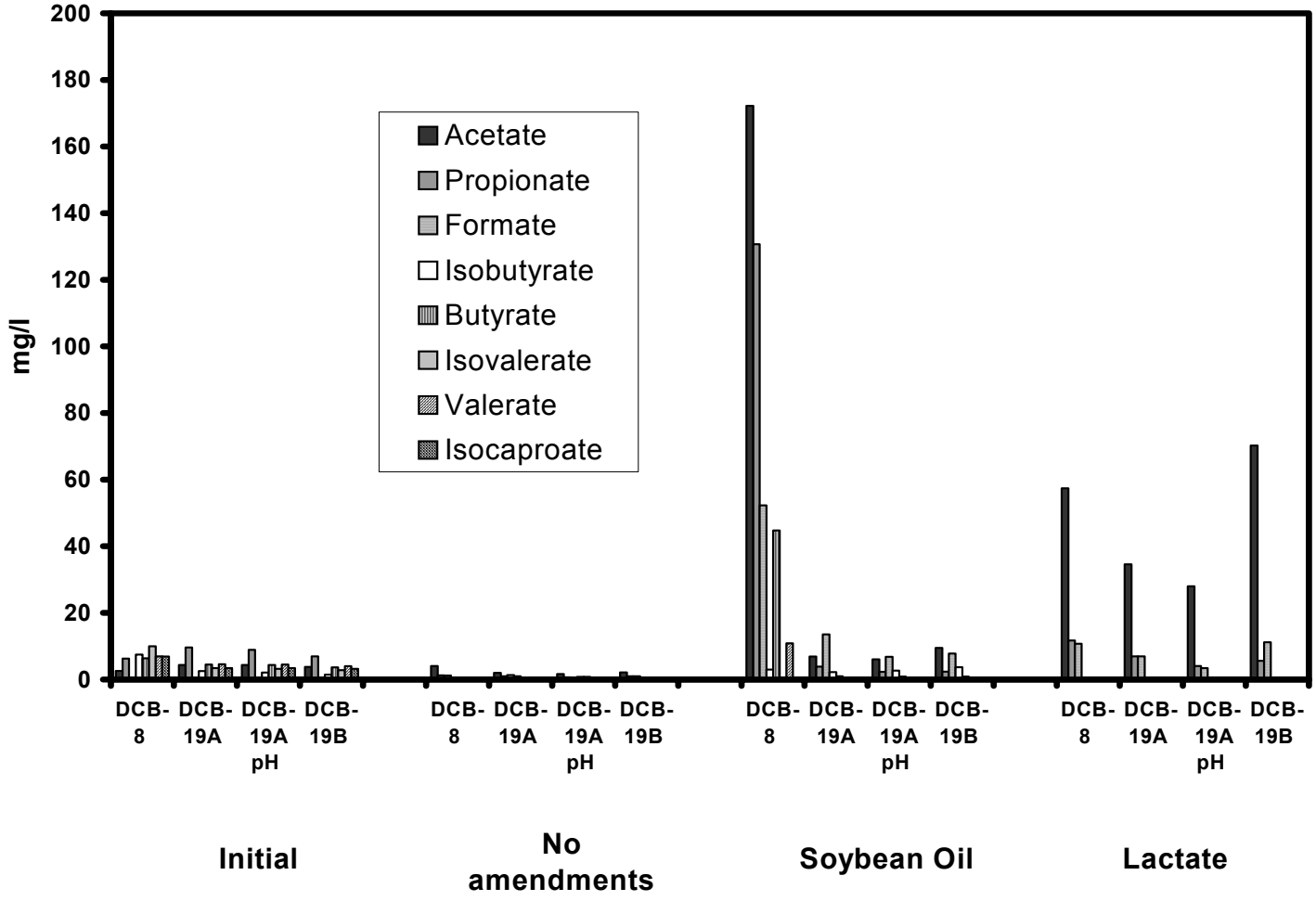


Figure 10 Microcosm Volatile Fatty Acid (VFA) Concentrations after 4 Months

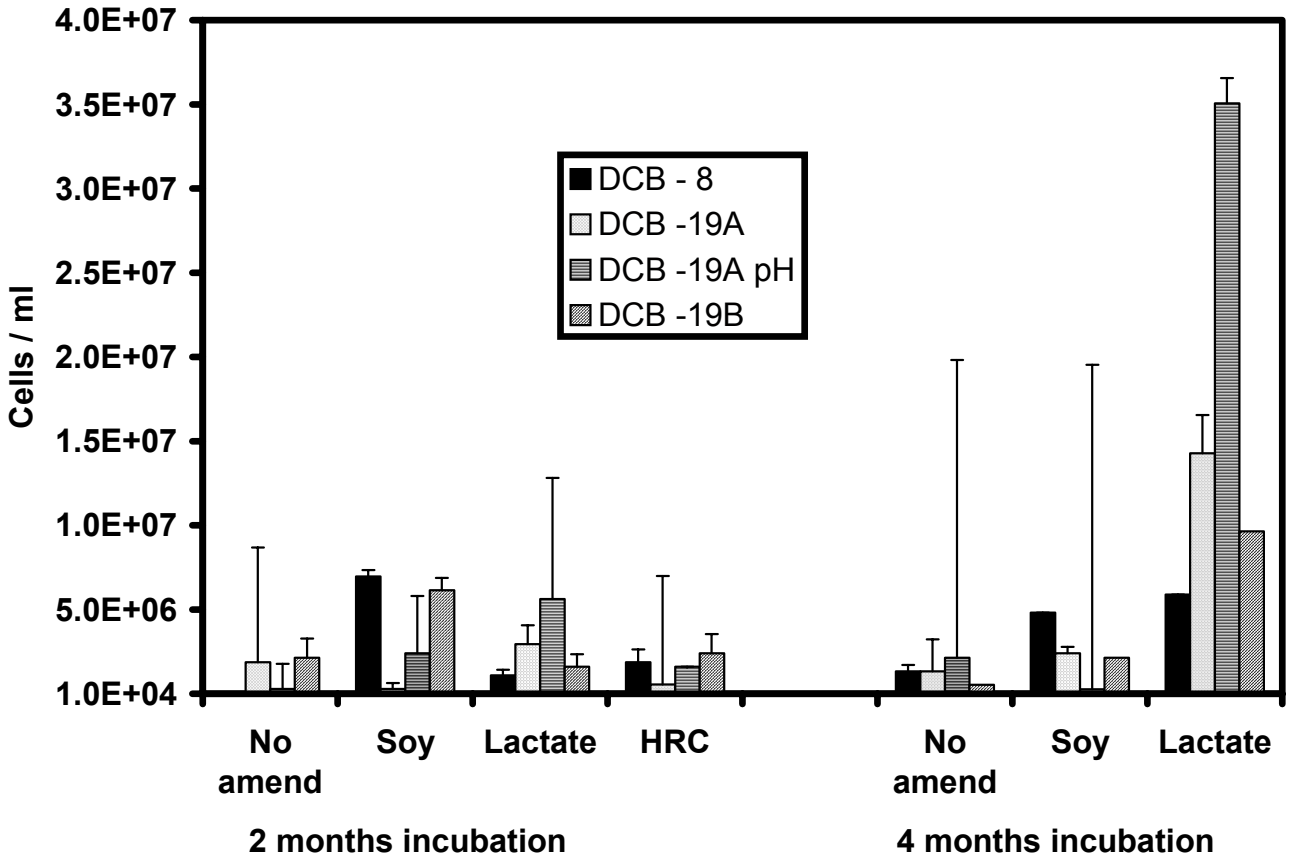


Figure 11 Microcosm Total Microbes after 2 and 4 Months

4.2.3 Lactate Concentration Study Results

SRB growth was monitored over a two month period in various sodium lactate concentrations as outlined in section 4.1.3 for the first of two laboratory tests conducted to evaluate the potential inhibitory effects of lactate on SRB growth. The results from the first laboratory test demonstrated that sodium lactate concentrations from 0.125 to 0.5% (percent as mL of 60% sodium lactate per 100 mL of water) induced sulfate reduction within 7 days. Sodium lactate concentrations of 1.0 and 1.5% additionally demonstrated sulfate reduction within two months. No sulfate reduction was detected after two months for sodium lactate concentrations ranging from 1.5 to 2.5%. Sulfate reduction indicates the presence of SRB. Thus, high concentrations of sodium lactate appear to be inhibitory to SRB growth. Based upon these results a sodium lactate concentration of 1.0% (6.3 g/L of lactate) was taken as the limit above which sodium lactate inhibition of SRB growth would occur during field application. (Turick et al. 2002)

The second laboratory test was designed to determine whether the SRB inhibition noted in the first laboratory test was due to the sodium and/or lactate. The second laboratory test incorporated sodium lactate and potassium lactate in separate assays. SRB growth was monitored over a ten day period in various lactate concentrations as outlined in Section 4.1.3. The results that incorporated a bacterial inoculum from D-area well water unexposed to lactate demonstrated that lactate concentrations from 0.28 to 0.56% (percent as mL of 60% sodium lactate per 100 mL of water) had no apparent inhibitory effect on sulfate reduction (Figure 12). While the controls which had no lactate demonstrated the highest rates of sulfate reduction, these rates were not significantly different than those of the lower lactate concentrations. Lactate concentrations of 0.83 to 1.67% additionally demonstrated sulfate reduction, however rates of sulfate reduction were decreased with these lactate concentrations. Minimal sulfate reduction was detected over ten days for lactate concentrations of 2.22 % (Figure 12). Results from sodium lactate assays were similar to those of potassium lactate when inocula, unacclimated to lactate were used (Figure 12), indicating that sodium alone had a minor effect if any at all.

Inocula were also utilized that consisted of a SRB consortium previously incubated in a 1% Na lactate medium. The results from this inoculation also demonstrated inhibitory responses at 1.67 and 2.2% for both sodium and potassium lactate (Figure 13). However, these lactate acclimated cultures demonstrated increased sulfate reduction rates relative to controls which had no lactate (Figure 13). These results differ from those above (Figure 12) with an inoculum unacclimated to lactate. In addition, sulfate reduction rates with sodium lactate were less than those with potassium lactate at lactate concentrations from 0.83-1.67% (Figure 13). Because the sulfate reduction rates of unacclimated cultures (Figure 12) were highest in the absence of lactate, it is likely that an acclimation period is required by SRB to grow optimally with lactate in any form. The acclimation period appears to be short and should not interfere with bioremediation activities.

Thus, high concentrations of sodium lactate appear to be inhibitory to SRB growth. Based upon these results a sodium lactate concentration of 1.0% (6.3 g/L of lactate) was taken as the limit above which sodium lactate inhibition of SRB growth occurs.

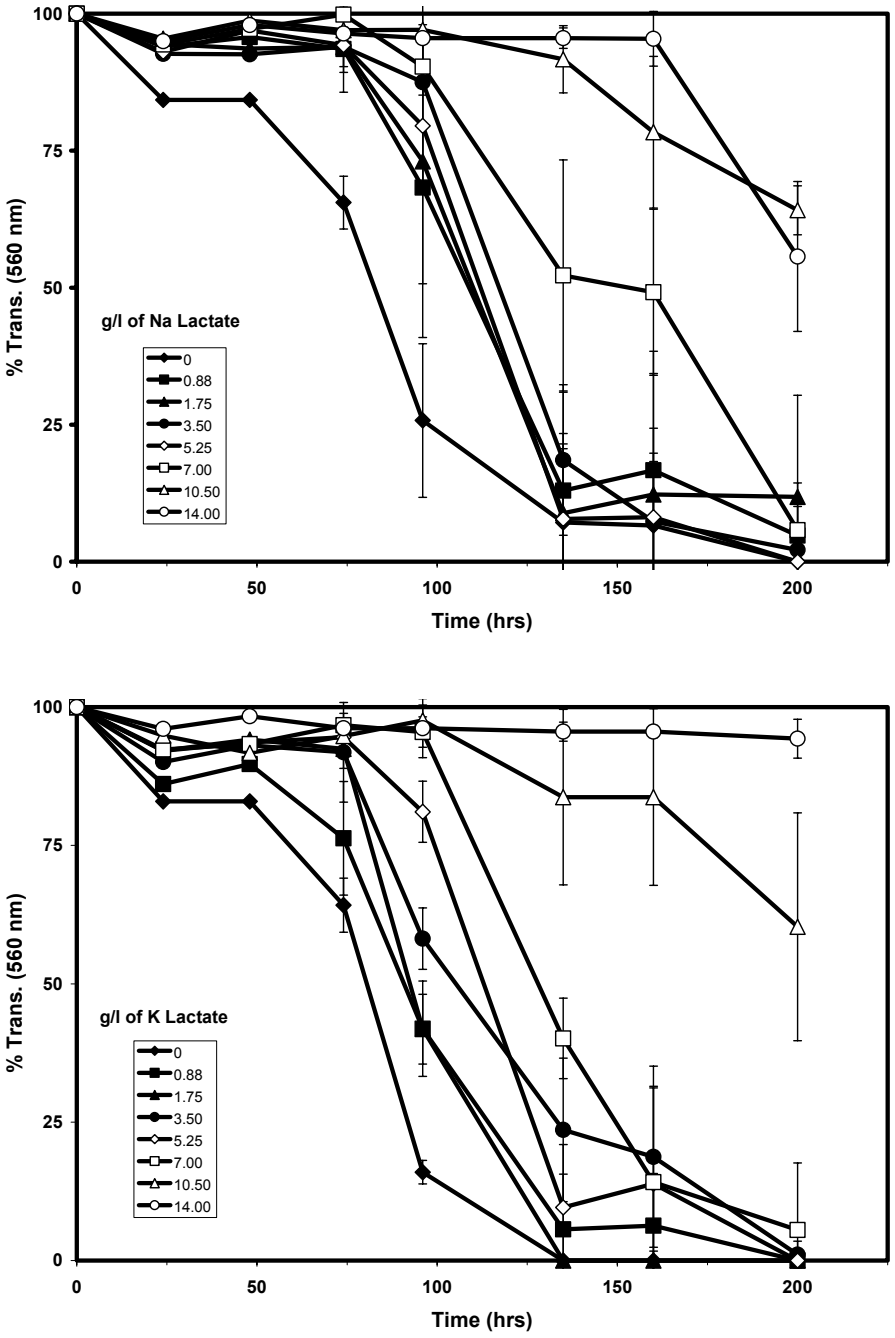


Figure 12 Growth of SRB at Various Na lactate (A) and K Lactate (B) Concentrations

Inoculum was from D-area water previously unexposed to lactate. Microbial activity was measured as a function of sulfide precipitate production over time resulting in decreased % transmittance at 560 nm.

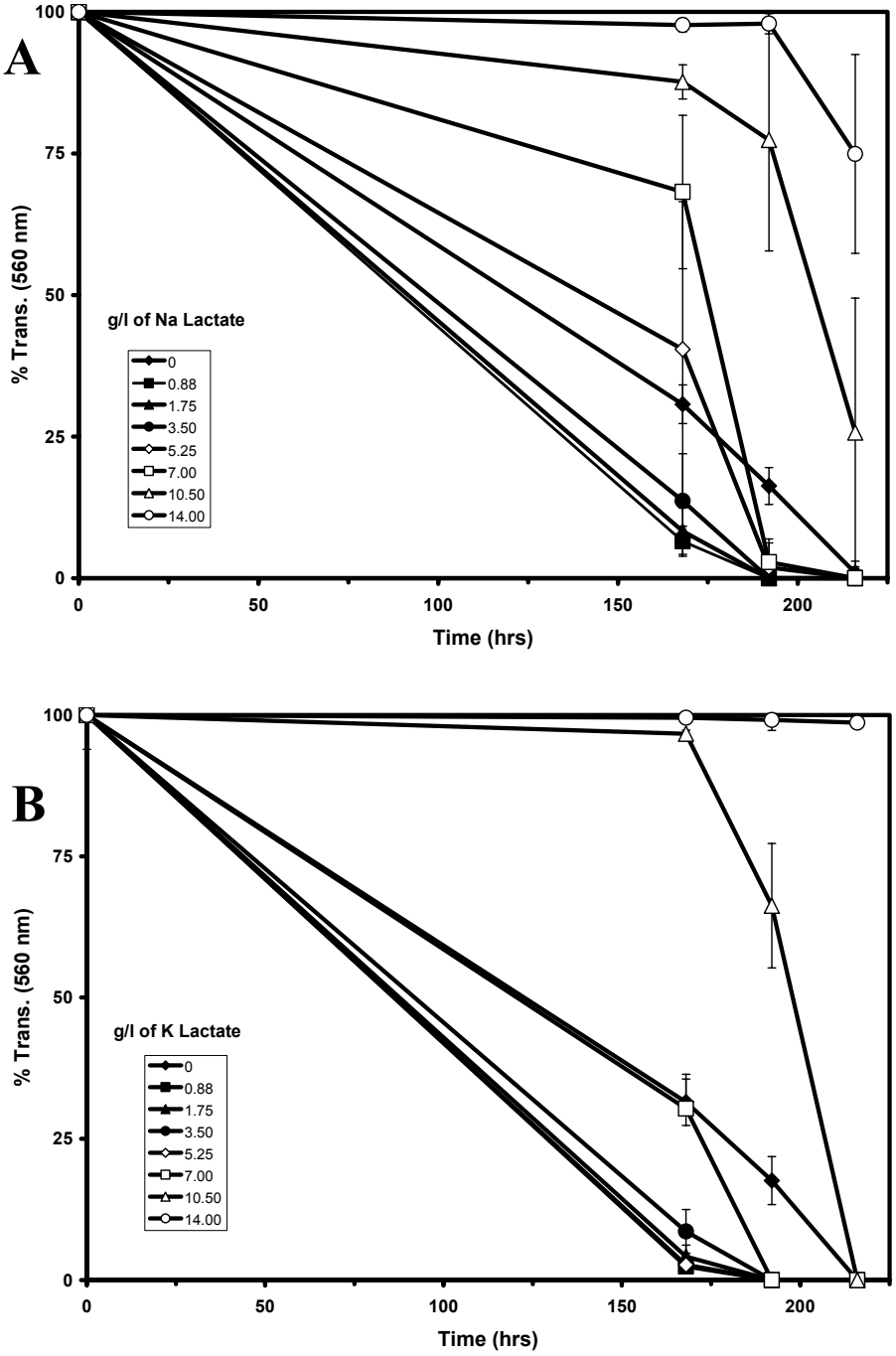


Figure 13 Growth of SRB at Various Na lactate (A) and K Lactate (B) Concentrations

Inoculum was from D-area water previously exposed to lactate concentrations of 3.5 g/l in laboratory studies. Microbial activity was measured as a function of sulfide precipitate production over time resulting in decreased % transmittance at 560 nm.

4.3 SUMMARY

Laboratory testing was conducted to assess the D-Area subsurface physical, chemical and biological parameters for bioremediation potential. The potential for microbial growth was also examined for several organic carbon substrates. This laboratory testing was documented in Turick et al. (2002) and WSRC (2002b).

The goal of bioremediation at D-Area is immobilization of soluble metals by in-situ hydrogen sulfide production. This approach requires an existing population of SRB. In addition to a carbon substrate, a mixed microbial population of sufficient size is required to support the growth and activity of SRB. Conditions that support SRB activity include anaerobic conditions and a pH near neutrality. Based on the test results the following have been determined:

1) SRB are present in the vicinity of DIW-1 ranging in population size up to 31 cells per milliliter of water or grams of sediment.
2) SRB are associated with the groundwater near DIW-1.
3) The mixed microbial community is capable of both anaerobic and aerobic growth with rich or minimal nutrient media at a pH range from 4-7. This indicates a robust population capable of establishing anaerobic conditions in the D-Area subsurface.

Aerobic bacteria decrease oxygen concentrations in the subsurface and create anaerobic conditions. The presence of anaerobic heterotrophic bacteria indicated that nutrient breakdown is possible, thus ensuring nutrient requirements of SRB will be met. Based upon this laboratory study, it was determined that microbial growth, including sulfate reduction will occur with the addition of the proper carbon and energy sources.

The potential for microbial growth was examined in this laboratory study by the addition of sodium lactate, HRC®, or soybean oil to sealed, anaerobic microcosms containing groundwater and sediment from D-Area. Sodium lactate and the lactate containing commercial compound, HRC®, were chosen because lactate is regarded as a universal carbon and energy source for SRB. The addition of lactate into the subsurface should therefore elicit a rapid increase in SRB activity and growth due to its high level of solubility in water. Soybean oil and HRC® were regarded as "slow-release" nutrients that could be injected in high volume periodically due to their low solubility in water. This laboratory study examined the feasibility of using these carbon sources for bioremediation at D-area and the following conclusions were reached:

1) Both lactate and HRC® demonstrated inhibitory effects on SRB activity. HRC® decreased the pH of the microcosms and appeared to have a negative effect on microbial growth in general. Sodium lactate inhibited SRB activity but was capable of stimulating non-SRB microbial activity. In addition, the pH increased upon addition of sodium lactate. Inhibitory conditions resulting from lactate were concentration dependent with no inhibition evident with less than 1% of a 60% sodium lactate solution (i.e. 6.3 g/L lactate). Soybean oil was capable of stimulating the microbial population as a whole including SRB. Hydrogen sulfide was detected in soybean oil amended microcosms. Lactate does serve as a carbon and energy

source to D-Area SRB but may have inhibitory effects above 1-% concentrations. In both lactate and soybean oil treated microcosms, volatile fatty acid (VFA) production was detected, indicating bacterial activity as well as carbon source breakdown. VFA production reached an apparent steady state concentration that indicates that SRBs are utilizing VFAs as carbon sources. Soybean oil will serve as an effective carbon and energy source to the mixed population, including SRB.

2) SRB were detected in microcosms under typical subsurface pH conditions. However, pH amended microcosms demonstrated increased SRB density and activity indicating that pH adjustment as a function of bacterial growth would increase the rate of SRB growth and hence hydrogen sulfide production.

In summary, it was concluded based upon this laboratory study, that the D-area acidic/metals/sulfate groundwater plume could potentially be remediated with sulfate reduction combined with Monitored Natural Attenuation (MNA). It was determined that remediation by sulfate reduction should aid in reducing metal concentrations and would raise the pH of the contaminated groundwater. The high sulfate concentrations relative to concentrations of other constituents needed by microbial competitors favors the growth of SRB. Additionally SRB are naturally present within the groundwater in the vicinity of DIW-1. However, the low organic carbon, low pH and high Eh present in the plume are not advantageous for SRB growth. At a minimum the addition of an organic substrate(s) is required to promote sulfate reduction remediation. Both sodium lactate and soybean oil are capable of stimulating the microbial population as a whole including SRB. However sodium lactate may have inhibitory effects above concentrations of 1% (i.e. 6.3 g/L of lactate). SRB activity was inhibited by lactate levels above 1% when the bacterial inoculua used were not acclimated to lactate. SRB cultures acclimated to lactate did not demonstrate the same degree of inhibition to lactate as unacclimated culture. This demonstrates that lactate addition to the subsurface will accelerate SRB activity provided that the final lactate concentrations do not exceed 1%. With time, as the indigenous SRB become acclimated to lactate, the degree of inhibition is likely to decline. Most likely this is a result of the selection of an SRB population that has become somewhat acclimated to the lactate concentrations imposed. While the laboratory data also indicate a trend towards sodium inhibition as well, lactate concentrations appear to play a major role in SRB inhibition.

Based upon this soybean oil and sodium lactate were selected as the organic substrates for injection during the subsequent pilot scale field demonstration. It was anticipated that the soybean oil will provide a long-term, slow release, carbon source for the SRB, and the sodium lactate would provide a short-term, immediately available carbon source. Due to the location, configuration, and physical condition of DIW-1, it was decided to use it as the injection system for injection of sodium lactate and soybean oil during the subsequent field demonstration.

5.0 DTT-1 TRENCH EVALUATION

The D-Area Treatment Trench (DTT-1) is a limestone filled trench that was installed adjacent to the D-Area Coal Pile Runoff Basin (DCPRB) on May 4, 1999. Since limestone is considered the most likely amendment to produce the optimal pH range for sulfate reduction in the D-Area low pH/metals/sulfate plume (Phifer, et al. 2001), the limestone trench was re-evaluated in December 2002. The re-evaluation was conducted to determine if the hydraulic and geochemical activity of the limestone trench after 3-½ years is similar to its initial conditions upon installation, to determine the potential to promote sulfate reduction at the limestone trench with the addition of an organic carbon substrate, and to determine if limestone could be a viable component of an in-situ sulfate reduction remediation system.

The limestone trench (DTT-1) is a 2 ft wide by 40 ft long by 15 to 16 ft deep trench filled with Number Four sized, limestone cobble. Embedded within the limestone are three vertical risers connected by two perforated horizontal pipes spaced 4 feet apart vertically, all made of four-inch-diameter Schedule 40 PVC piping. All three risers extended to above the ground surface for access to the trench. The bottom 10 feet of the trench is within the saturated zone. See Figures 1 and 14 for the location of DTT-1 relative to the DCPRB, and see Figure 15 for an as-built cross-section of DTT-1. Table 10 and Figure 14 provide details associated with DTT-1 and adjacent monitoring wells, DCB-49 and DCB-50.

Additional details associated with this evaluation can be found in Phifer et al. (2003b).

5.1 STUDY IMPLEMENTATION

The determination of whether or not the hydraulic and geochemical activity of the limestone trench after 3-½ years (December 2002) is similar to its initial conditions upon installation (May 1999) was primarily aimed at evaluating potential limestone armoring and formation/limestone pluggage. This in turn addresses the issue of limestone longevity within the D-Area low pH/metals/sulfate plume environment and determines if limestone is an acceptable base amendment for in situ sulfate reduction remediation. The limestone trench was evaluated hydraulically by determining its December 2002 specific capacity and comparing it to the specific capacity previously determined at the same flow rates in 1999 (Washburn et al. 1999). A decrease in specific capacity over time, determined at the same flow rates, would indicate potential formation/limestone pluggage. The limestone trench was evaluated geochemically by a comparison of 1999 and 2002 calcium-to-magnesium ratios and the downgradient changes in aluminum concentrations and pH. If limestone dissolution was still occurring in 2002 (i.e., limestone armoring had not significantly occurred), the calcium-to-magnesium ratio would fall somewhere between the ratio found in DCB-49 and the ratio of the limestone. Additionally if limestone dissolution was still occurring in 2002, it would be anticipated that the downgradient concentrations of aluminum would have decreased and the pH would have increased.

A determination of the potential to promote sulfate reduction at the limestone trench with the addition of an organic carbon substrate was evaluated by taking limited parameters from within the trench itself and comparing them to optimal sulfate reduction conditions. The determination

of whether or not limestone could be a viable component of an in-situ sulfate reduction remediation system was based upon the results of the other determinations outlined above.

Table 10 DTT-1, DCB-49, and DCB-50 Details

Trench Access	Coordinates (ft)		Diameter (inches)	Elevation (ft-msl)		
	North	South		TOC	THS	BHS
DTT-1A	63447.78	20000.97	4	124.7	112.47	108.47
DTT-1	63431.43	20007.49	4	122.64	112.47	108.47
DTT-1B	63415.08	20014.68	4	124.72	112.47	108.47
Well	Coordinates (ft)		Diameter (inches)	Elevation (ft-msl)		
	North	South		TOC	TOS	BOS
DCB-49	63429.96	20013.93	2	124.52	118.67	106.17
DCB-50	63426.58	20004.29	2	124.33	118.29	105.73

Notes to Table 10: TOC = top of casing; THS = top horizontal screen; BHS = bottom horizontal screen; TOS = top of vertical screen; BOS = bottom of vertical screen.

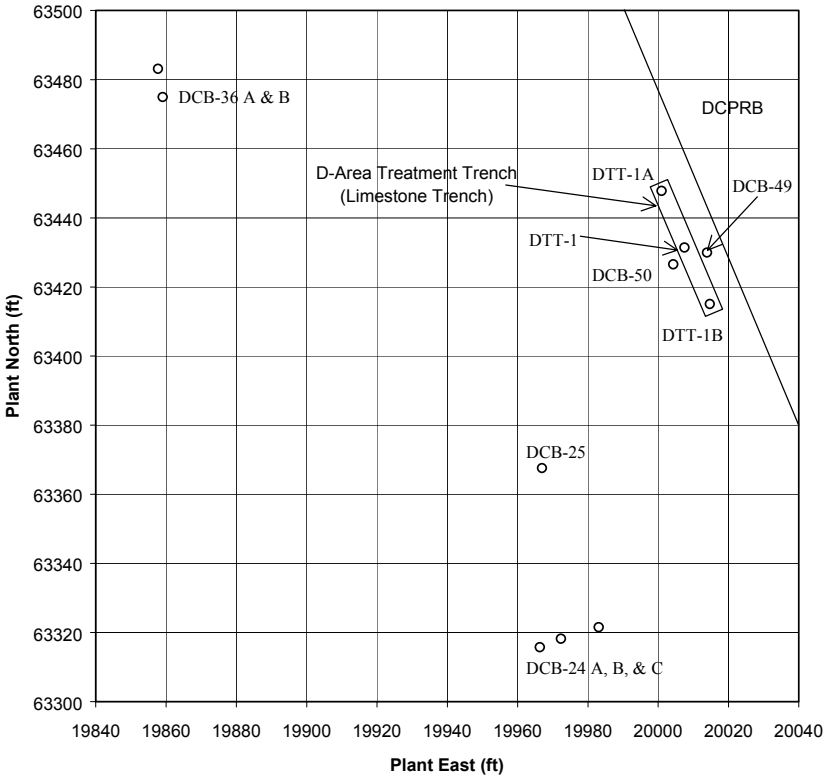


Figure 14 DTT-1 and Adjacent Monitoring Wells Location Map

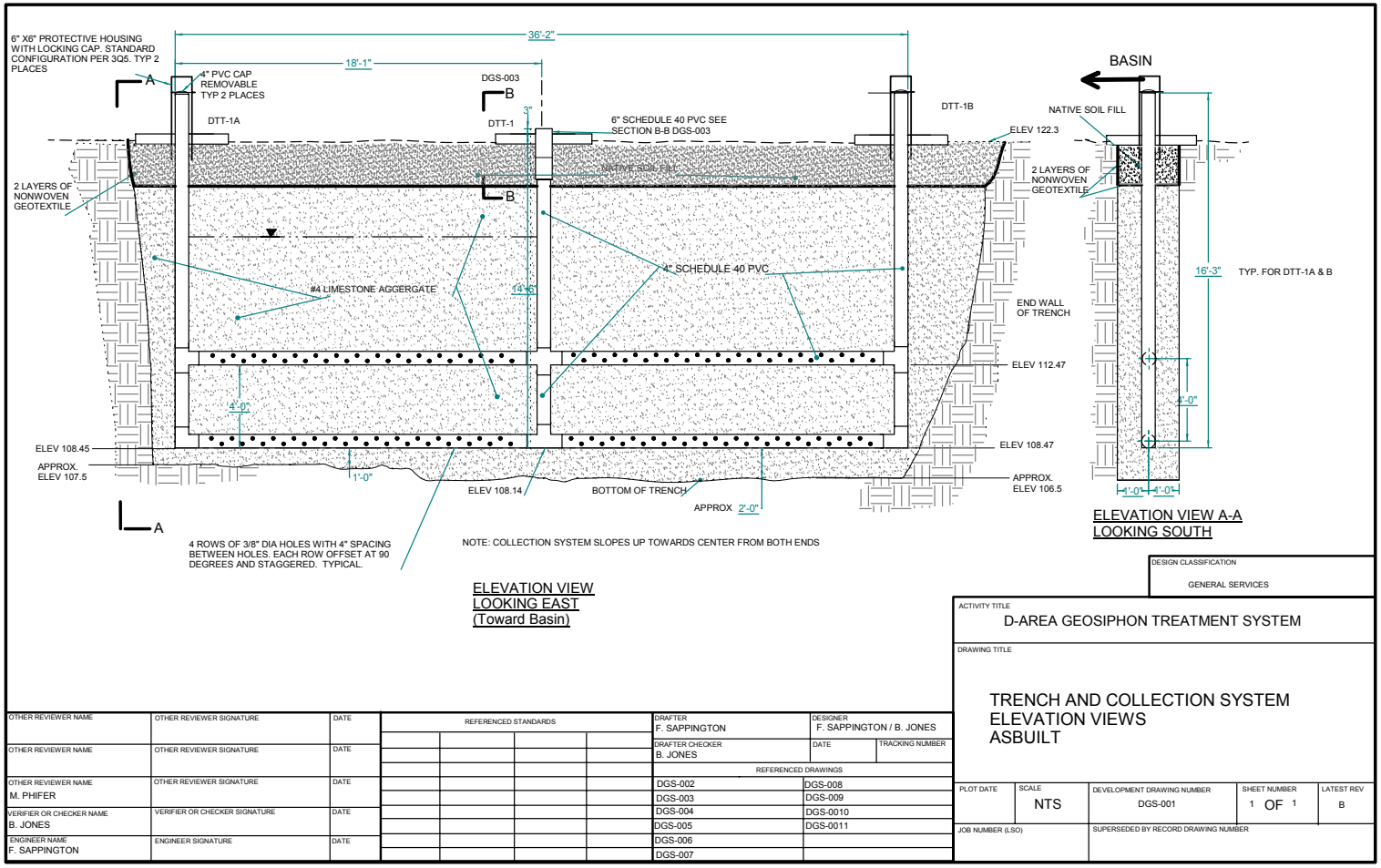


Figure 15 DTT-1 Cross-Section (Washburn et al. 1999)

5.2 RESULTS AND DISCUSSION

5.2.1 DTT-1 Hydraulic Evaluation

The hydraulic activity of the limestone trench was addressed by determining the 2002 specific capacity of the trench and comparing it to that previously determined following its installation in 1999. Table 11 provides the 1999 specific capacity estimates. The 2002 specific capacity estimates were obtained by pumping the trench, measuring drawdown and flow, and then calculating the specific capacity (flow rate divided by drawdown). The 2002 specific capacity estimates were determined at approximately the same flow rates and durations since pumping began as those determined in 1999. Table 12 presents the 2002 specific capacity estimates based upon both drawdowns determined by electric water level tape (DTT-1) and pressure transducer (DTT-1B) measurements. The December 2002 specific capacity estimates consist of three measurements ranging from 0.431 to 0.506 gpm/ft with an average of 0.459 gpm/ft for estimates based upon electric water level tape measurements. The same estimates range from 0.450 to 0.523 gpm/ft with an average of 0.481 gpm/ft for estimates based upon pressure transducer measurements. The estimates based upon pressure transducer measurements are on average 5% higher than those based upon electric water level tape measurement.

As seen in Table 11 the 1999 specific capacity estimates consist of ten measurements ranging from 0.402 to 0.562 gpm/ft with an average of 0.489 gpm/ft and a standard deviation of 0.054 gpm/ft (Washburn et al. 1999). The 1999 specific capacity estimates were based upon DTT-1 drawdown determined only by electric water level tape. While the 2002 averages are slightly less than the 1999 average (by less than 7%), the 2002 averages are based upon only three measurements versus ten in 1999. Additionally as seen in Figure 16 all of the 2002 data falls within the range of the 1999 data, and all but one of the 2002 data points lie within one standard deviation of the 1999 average. Therefore based upon this comparison it is concluded that little if any reduction in specific capacity has occurred between 1999 and 2002. That is the limestone trench appears to be essentially as hydraulically active now as it was at its installation. This indicates that precipitate accumulation has not significantly plugged the limestone or the formation.

Table 11 1999 Limestone Trench (DTT-1) Specific Capacity

Approximate Duration Since Pumping Began (hours)	Flow (gpm)	Specific Capacity (gpm/ft)	Specific Capacity (cfs/ft)
53	0.40	0.407	0.00091
47	0.41	0.466	0.00104
26	0.44	0.562	0.00125
24	0.58	0.521	0.00116
47	0.65	0.500	0.00111
25	0.69	0.552	0.00123
50	1.03	0.481	0.00107
24	1.14	0.402	0.00090
48	1.14	0.487	0.00109
25	1.17	0.515	0.00115
	Average	0.489	0.00109
	Standard Deviation	0.054	0.00012
	Average - One Standard Deviation	0.436	0.00097
	Average + One Standard Deviation	0.543	0.00121

Table 12 2002 Limestone Trench (DTT-1) Specific Capacity

Pre-pumping Water Elevation			Pumping Water Elevation			Approximate Duration Since Pumping Began (hours)	Flow			Specific Capacity (gpm/ft)	Specific Capacity (cfs/ft)
Date	Time	Water Elevation (ft-msl)	Date	Time	Water Elevation (ft-msl)		Date	Time	Flow (gpm)		
2002 Specific Capacity Estimates Based on Pressure Transducer Water Level Measurements in DTT-1B											
12/9/02	10:04	116.470	12/10/02	8:49	115.667	23	12/10/02	8:50	0.42	0.523	0.00117
12/16/02	8:49	117.095	12/17/02	8:19	115.785	24	12/17/02	8:24	0.59	0.450	0.00100
12/16/02	8:49	117.095	12/18/02	8:04	115.045	48	12/18/02	8:04	0.96	0.468	0.00104
									Average	0.481	0.00107
2002 Specific Capacity Estimates Based on Electric Water Level Tape Measurements in DTT-1											
12/9/02	10:07	116.46	12/10/02	8:44	115.63	23	12/10/02	8:50	0.42	0.506	0.00113
12/16/02	8:25	116.99	12/17/02	8:14	115.62	24	12/17/02	8:24	0.59	0.431	0.00096
12/16/02	8:25	116.99	12/18/02	7:50	114.86	48	12/18/02	8:04	0.96	0.451	0.00100
									Average	0.462	0.00103

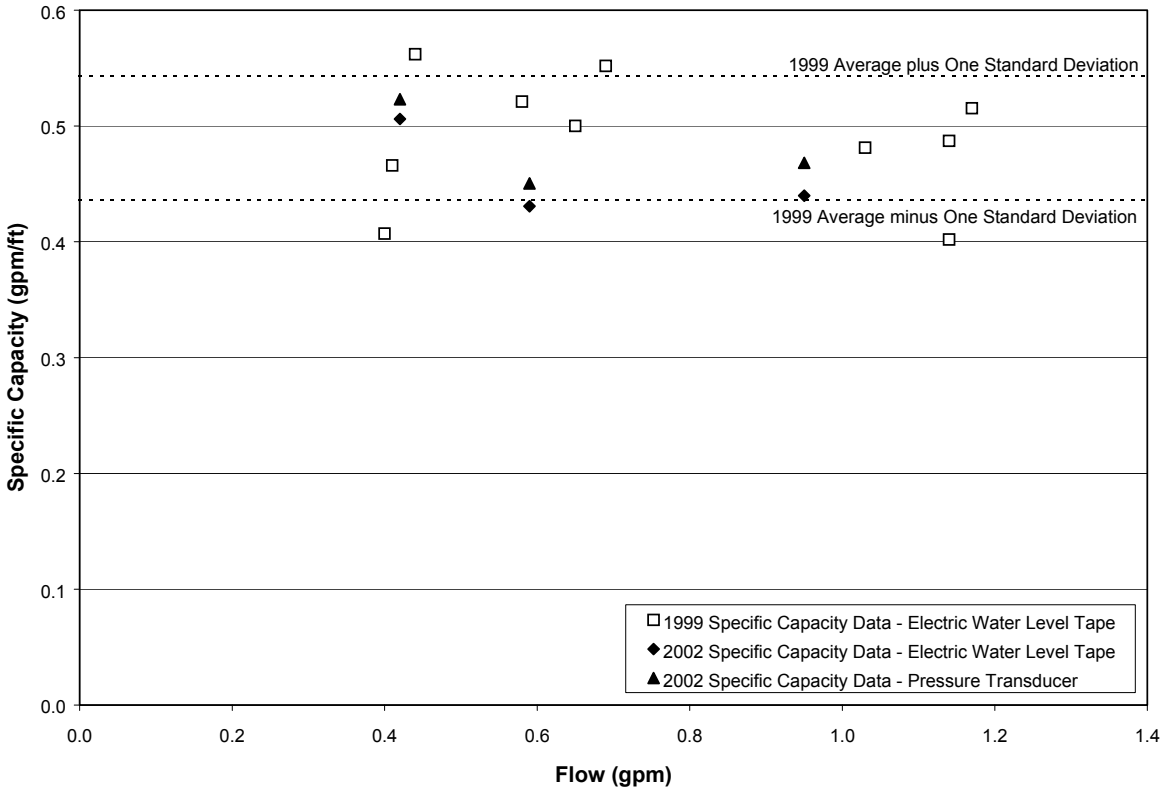


Figure 16 1999 to 2002 Specific Capacity Comparison

5.2.2 DTT-1 Geochemical Evaluation

To address the geochemical activity of the limestone trench, a comparison of 1999 and 2002 calcium-to-magnesium ratios and the downgradient changes in aluminum concentrations and pH were evaluated.

5.2.2.1 Calcium-to-Magnesium Ratios

The relationship between calcium and magnesium concentrations is useful in evaluating the dissolution of limestone in the trench. In DCB-49 the concentrations of calcium and magnesium are linearly correlated and although their 2002 concentrations are higher than they were in 1999, their ratio is consistent with the ratio found in 1999 (Figure 17). Limestone from the same batch as used in the trench was dissolved in acidic water and found to have a different ratio than that of DCB-49. More specifically, the dissolved limestone had a calcium concentration of 5.68 mg/L and a magnesium concentration of 0.69 mg/L (Washburn et al. 1999). This ratio can be used to plot the dissolution line of the limestone, which shows the calcium-to-magnesium ratio expected as limestone dissolves.

Samples collected from the trench in 1999 fall between the two lines (DCB-49 and the limestone dissolution line) indicating that their waters are a sum of the influent water concentrations and the limestone dissolution (Figure 17). Unlike the 1999 trench samples, most of the 2002 trench samples plot on the limestone dissolution line suggesting that the calcium and magnesium come from limestone dissolution with very little influence from DCB-49 water. These samples include those collected from DTT-1, DTT-1B, and the shallow sample from DTT-1A. The lower samples collected from DTT-1 and DTT-1B appear to be more representative of the upper trench chemistry and so plot on the limestone dissolution line as well. The lower DTT-1A sample is the only trench sample that does not fall on the limestone dissolution line and shows a calcium-to-magnesium ratio more similar to DCB-49 (the influent water). Samples collected from DTT-1 after the 48-hour pump tests also fall between the limestone dissolution line and DCB-49 and most likely represent the lower more contaminated influent water being pulled in to the trench (Figure 18). The plume emanating from the basin is stratified, with the lower portion of DCB-49 reflecting a more contaminated part of the plume than the upper portion (Phifer et al. 2003b). Samples collected from DCB-50 presumably reflect the mixing of waters exiting the trench (having interacted with the limestone) and waters that have not been impacted by the trench. The DCB-50 calcium and magnesium concentrations and ratio from this study are consistent with the values from the 1999 study (Figure 19).

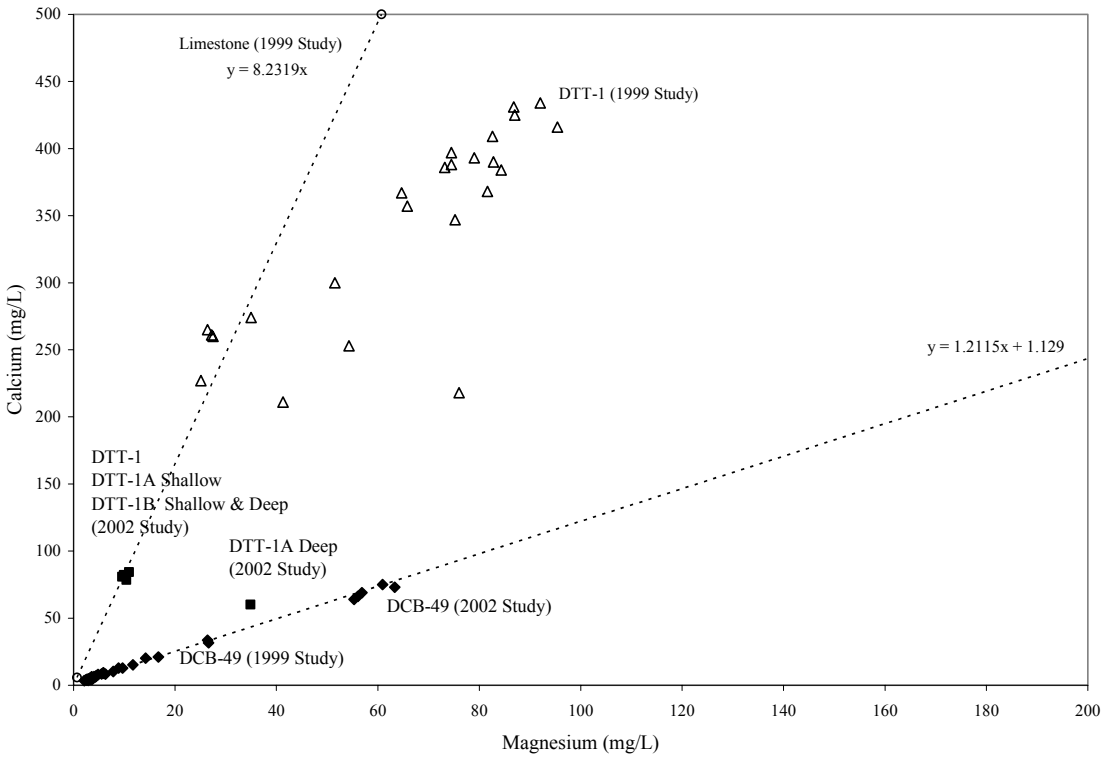


Figure 17 DCB-49 and DTT-1 Calcium Versus Magnesium Concentrations

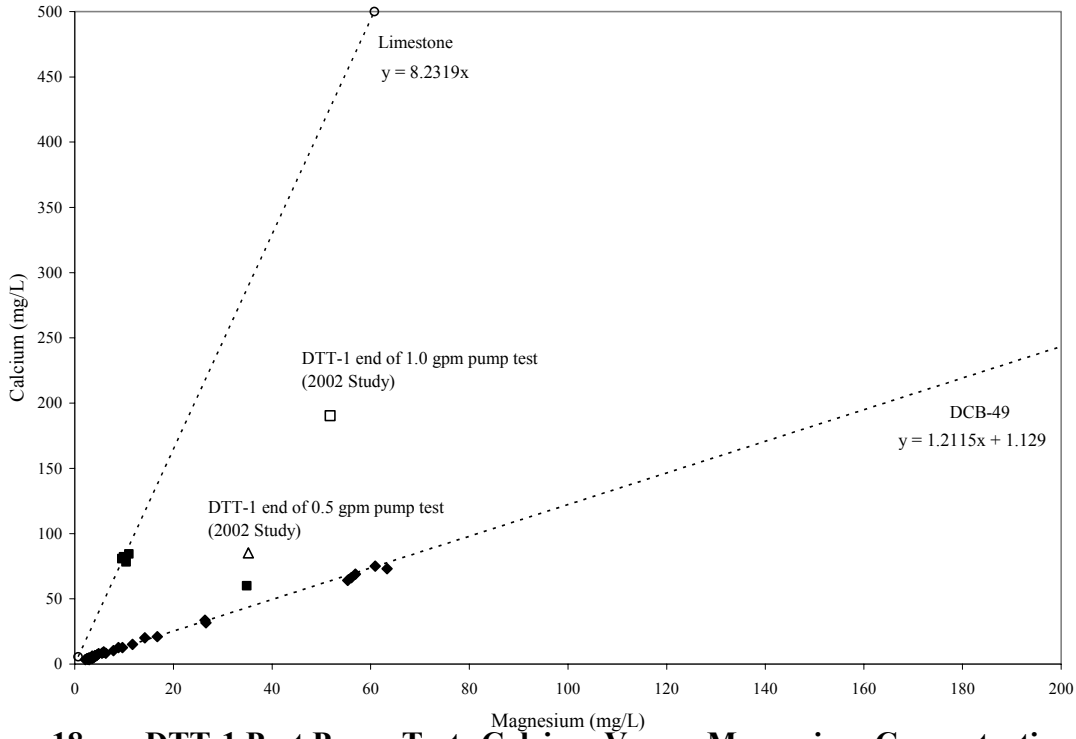


Figure 18 DTT-1 Post Pump Tests Calcium Versus Magnesium Concentrations

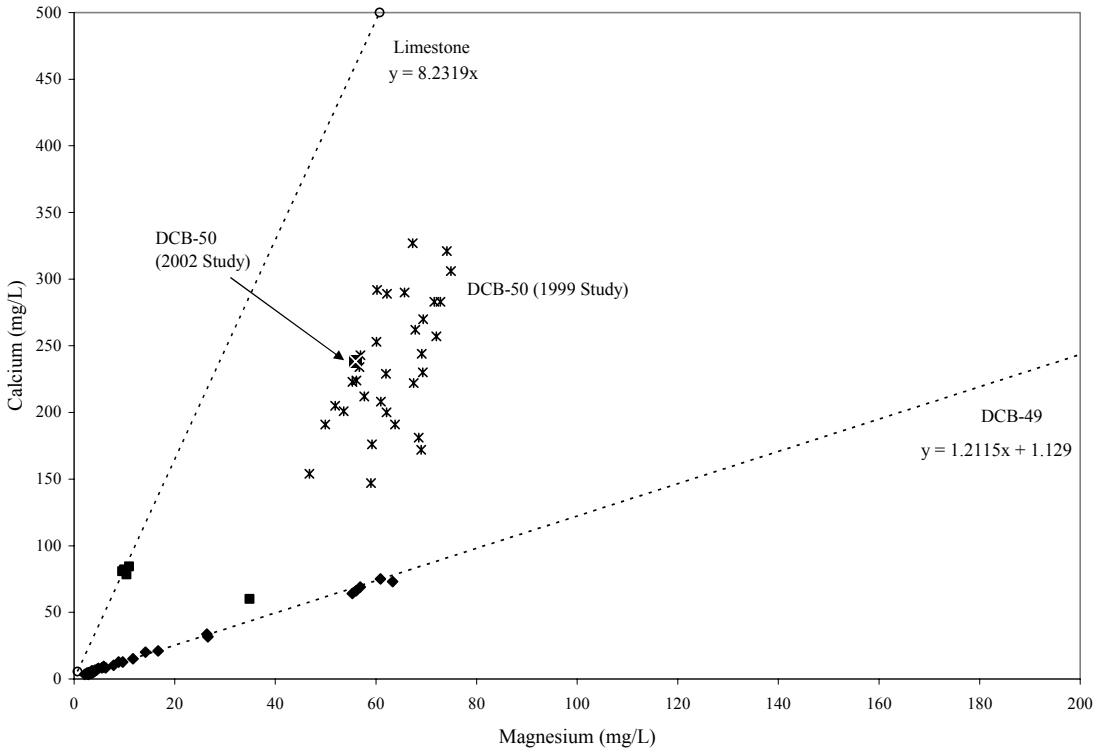


Figure 19 DCB-50 Calcium Versus Magnesium Concentrations

5.2.2.2 Downgradient Aluminum Concentrations and pH

Comparison of 1999 and 2002 samples collected from DCB-50 indicates a decrease in aluminum concentrations in the downgradient waters, which most likely reflects the impact of the limestone trench (Table 13). Results from 2002 indicate that the limestone trench remains effective at raising the pH and suggest that its impact may now be seen in the pH of DCB-50. In the downgradient well, DCB-50, pH remains constant near or above 5 throughout the screen zone. Additionally, samples collected after purging and the 48-hour pumps tests also had pH's above 5, which may reflect the extensive nature of these waters. These pH's are higher than those seen in DCB-50 in the 1999 study and are supporting evidence that the limestone trench is impacting downgradient waters (Table 13). It is likely that DCB-50 currently reflects a mixture of waters that have reacted with the trench (consequently having relatively high pH and low aluminum concentrations) and waters that have not come into contact with the limestone (having low pH and high aluminum concentrations).

Table 13 DCB-50 Aluminum and pH Concentrations

Parameter	Statistical Parameter	1999 Value	2002 Value [1]
Aluminum (mg/L)	Minimum	28.8	0.648
	Maximum	100	
	Median	51.35	
	# of samples	32	1
pH	Minimum	3.38	5.68
	Maximum	5.04	6.04
	Median	3.88	5.89
	# of samples	32	3

[1] One sample collected for Al analysis on 12/6/02; pH data from 12/6/02 during and after sample collection and 12/18/02 at the end of the 48-hour 1 gpm pump test

5.2.2.3 Geochemical Conclusions

The 2002 calcium-to-magnesium ratios within the limestone trench indicate that limestone dissolution was still occurring in 2002 within the bulk of the trench. Only one trench location (i.e. the lower DTT-1A sample location) had a calcium-to-magnesium ratio that did not plot on the limestone dissolution line and had a ratio more similar to the influent water. The downgradient aluminum concentrations and pH also indicate that limestone dissolution was still occurring. The aluminum concentrations of the downgradient well (DCB-50) were significantly less in 2002 than in 1999, and the pH was greater indicating that the limestone trench was still geochemically active. This indicates that after 3-½ years that significant limestone armoring and deactivation had not occurred and that the limestone trench remained an effective treatment for increasing the pH and removing aluminum near the DCPRB.

5.2.3 DTT-1 Sulfate Reduction Potential Evaluation

To address the existing sulfate reduction potential that exists within the trench the following evaluations were performed in 2002:

- The existing limestone trench SRB and general microbial activity have been evaluated, and
- Existing limestone trench conditions have been compared to both optimal sulfate reduction conditions and the current sulfate reduction field study (i.e. pre and post soybean oil injection conditions at the D-Area Interceptor Well (DIW-1)).

5.2.3.1 Existing Microbial Activity within and Downgradient of the Limestone Trench

Existing microbial activity including SRB within and downgradient of the limestone trench can be evaluated by comparing the upgradient values of total microbes, sulfate/hydrogen sulfide, SRBs, Eh (redox potential), and dissolved oxygen (DO) to that within and downgradient of the trench. Table 14 provides these parameters for monitoring well DCB-49 (upgradient), the trench itself (DTT-1A, DTT-1, and DTT-1B), and monitoring well DCB-50 (downgradient). The following parameters shown in Table 14 are indicative of microbial growth as discussed:

- The total number of microbes is greater by about one order of magnitude within (DTT-1A, DTT-1, and DTT-1B) and downgradient (DCB-50) of the limestone trench from that upgradient (DCB-49) indicating that the limestone trench has been conducive to overall microbial growth. Since SRB often grow as part of complex microbial consortia, increased overall bacterial populations would be conducive to SRB activity, especially in environments that are not optimum to SRB.

- The sulfate/hydrogen sulfide data, in particular, is indicative of SRB growth, since SRB decrease sulfate and increase hydrogen sulfide concentrations as a function of growth. As shown in Table 14 sulfate has decreased and hydrogen sulfide has increased within and downgradient of the limestone trench from that upgradient indicating that the limestone trench has been conducive to SRB growth. Hydrogen sulfide levels are temporal since it readily combines with many metals to form metal sulfide precipitates and it is transported as gas bubbles out of the groundwater. Therefore a direct one to one correlation between the reduction in sulfate levels and increases in hydrogen sulfide levels is not possible. Additionally it is unlikely that the low sulfate levels generally found in the trench are entirely due to SRB growth. Plume stratification could also impact the level of sulfate within the trench.

- More directly the SRB concentration has slightly increased within and downgradient of the limestone trench from that upgradient again indicating that the limestone trench has been conducive to SRB growth.

- The Eh has decreased within and downgradient of the limestone trench from that upgradient which is indicative of anaerobic activity.

- The dissolved oxygen levels within the limestone trench are higher than either the upgradient or downgradient levels. This may be due to the proximity of the limestone to the ground surface and the large void spaces of the limestone, which facilitates the transfer of atmospheric air (i.e. oxygen) into the trench water.

Overall the data indicate that the limestone trench has resulted in increased microbial activity including SRB activity.

Table 14 Microbial Parameters

Sample Location	Sample Depth (ft)	Total Microbes (cells/ml)	SO_4 (mg/L)	H_2S (mg/L)	SRB (cells/ml)	Eh (mV)	DO (mg/L)
DCB-49	11.7	3.95E+04	2556	< 0.05	1.84E+01	432	0.541
DTT-1A	11.9	3.29E+05	67.91	0.1	4.60E+01	304	2.012
DTT-1A	15.9	4.00E+05	1465	0.05	3.00E+01	449	0.490
DTT-1	9.8	2.72E+05	72.54	0.1	8.60E+01	255	2.114
DTT-1	13.8	3.29E+05	67.89	0.05	8.60E+01	292	2.277
DTT-1B	11.9	1.79E+05	78.62	0.08	4.60E+01	267	1.920
DTT-1B	15.9	1.14E+05	75.76	0.08	8.60E+01	284	1.822
DCB-50	11.5	2.37E+05	1262	0.14	8.60E+01	224	0.654

Note to Table 14:
SRB = sulfate reducing bacteria; DO = dissolved oxygen

5.2.3.2 Limestone Trench Comparison to Optimal Sulfate Reduction Conditions

Optimal sulfate reduction conditions are provided in Table 15 for comparison to the conditions upgradient (DCB-49), within (DTT-1A, DTT-1, and DTT-1B), and downgradient (DCB-50) of the limestone trench. The optimal conditions in this table are somewhat conservative because SRB activity can occur in microbial biofilms where conditions approach optimum for SRB even though the environment outside the biofilm is less than optimal. The ability to isolate SRB from environments as harsh as DCB-49 indicates that bacterial biofilms are present. As shown in the table the presence of the limestone trench has had the following beneficial impacts relative to approaching optimal sulfate reduction conditions from upgradient conditions (DCB-49):

- The pH has increased to within the optimal range within and downgradient of the trench.
- The Eh has decreased toward optimal conditions.
- The total SRB numbers have increased.
- The manganese, iron, and aluminum concentrations have all decreased.

This indicates that the use of limestone upgradient of organic substrate injection locations will move conditions toward optimal sulfate reduction conditions and hence facilitate sulfate reduction remediation.

Table 15 Limestone Trench Conditions Versus Optimal Sulfate Reduction Conditions

Parameter	Optimal Condition[1]	DCB-49	DTT-1A, DTT-1, and DTT-1B	DCB-50
pH	5.5 to 9	3.29	3.89 – 7.28 (6.67 average)	5.89
Eh	0 to –150 mV	432	255 – 449 (308 average)	224
Total SRBs	1.0E+5 – 1.0E+7 cells/ml	1.84E+01 cells/ml	3.0E+01–8.6E+01 cells/ml (6.3E+01 average)	8.6E+01 cells/ml
Organic Carbon Substrate	1000 – 3000 mg/L as Lactate (>6000 mg/L Lactate could be inhibitory) [2]	TOC = 3.1 mg/L	TOC = 2.3 – 10.2 (7.68 average)	TOC = 7.6 mg/L
Nitrogen: NO_3^-	mg/L range of soluble organic or inorganic nitrogen	<0.5 mg/L	<0.5 – 3.82 mg/L (2.68 average)	<0.5 mg/L
NO_2^-		10.13 mg/L	<0.5 - 6 mg/L (1.58 average)	<0.5 mg/L
NH_4^+		<0.5 mg/L	<0.5 mg/L	<0.5 mg/L
Phosphate (PO_4^{-3})	mg/L range of soluble organic or inorganic phosphate	<0.5 mg/L	<0.5 mg/L	<0.5 mg/L
Dissolved Oxygen (O_2)	<1 mg/L (toxic to SRB)	0.542 mg/L	0.49 – 2.28 mg/L (1.77 average)	0.654 mg/L
Nitrate (NO_3^-)	Small fraction of SO_4 concentration	<0.5 mg/L	<0.5 – 3.82 mg/L (2.68 average)	<0.5 mg/L
Manganese (Mn^{+4}) [3]	Small fraction of SO_4 concentration	Mn_{total} = 4.8 mg/L	Mn_{total} <0.001 – 3.277 mg/L (0.546 average)	Mn_{total} = 2.418 mg/L
Ferric Iron (Fe^{+3})	Small fraction of SO_4 concentration	Fe_{total} = 672.87 mg/L All Fe^{+2}	Fe_{total} <0.004 – 374.3 mg/L (62.4 average) All Fe^{+2}	Fe_{total} = 252.05 mg/L All Fe^{+2}
Sulfate (SO_4^{-2})	Significant SO_4 concentrations; <170 mg/L H_2S (higher concentrations may inhibit SRB)	SO_4^{-2} = 2556 mg/L H_2S <0.05 mg/L	SO_4^{-2} = 67.89 - 1465 mg/L (305 average) H_2S = 0.05 – 0.1 mg/L (0.08 average)	SO_4^{-2} = 1262 mg/L H_2S = 0.14 mg/L
Acetate CO_2 H_2	Eh > -150 mV; presence of significant sulfate	Eh = 432 mV SO_4^{-2} = 2556 mg/L	Eh = 255 – 449 mV (308 average) SO_4^{-2} = 67.89 - 1465 mg/L (305 average)	Eh = 224 mV SO_4^{-2} = 1262 mg/L
Aluminum	Low concentrations (toxic to SRB)	128.55 mg/L	0.024 – 79.31 mg/L (13.4 mg/L)	0.648 mg/L

Notes to Table 15:

[1] Sources for optimal sulfate reduction conditions: Benner et al. 1999; Chapelle 1993; EPA 1999; Fauque 1995; Fenchel et al. 1998; Thomas et al. 1999

[2] Turick et al. 2002

[3] Dissolved Mn data may include both $^{+2}$ and $^{+4}$ species; at the pH and Eh ranges given above, Mn^{+2} should be the dominant species present.

5.2.3.3 DTT-1 Sulfate Reduction Potential Conclusions

Microbial activity, including SRBs, is greater within and downgradient of the trench than upgradient, primarily due to the increased pH produced by the limestone trench. Additionally the limestone trench has in general improved conditions both within and downgradient of the trench relative to optimal sulfate reduction conditions from that upgradient. This indicates that the use of limestone upgradient of organic substrate injection locations will move conditions toward optimal sulfate reduction conditions and hence facilitate sulfate reduction remediation.

5.3 SUMMARY

A re-evaluation of the DTT-1 limestone trench has been conducted to determine if the hydraulic and geochemical activity of the trench is similar to its initial conditions upon installation 3-½ years ago. Additionally the potential to promote sulfate reduction at the limestone trench with the addition of an organic carbon substrate has been evaluated.

Based upon a comparison of specific capacity measurements the limestone trench appears to be essentially as hydraulically active now as it was at its installation. This indicates that precipitate accumulation has not significantly plugged the limestone or the formation. Additionally based upon analytical results it has been determined that the limestone trench remains an effective treatment for increasing the pH and removing aluminum both within and downgradient of the trench as at installation. Finally based upon the microbial results it has been determined that the limestone trench has increased microbial activity, including SRBs, both within and downgradient of the trench and has in general improved conditions relative to optimal sulfate reduction conditions from upgradient conditions. This indicates that limestone installed within the DCPRB plume can be utilized to move conditions toward optimal sulfate reduction conditions over at least a 3-½ year period without significant limestone or formation pluggage and without significant limestone armoring and deactivation. Additionally such use of limestone would facilitate sulfate reduction remediation through the injection of organic substrate.

6.0 DIW-1 ORGANIC APPLICATION FIELD STUDY-PART 1

Based upon the previous laboratory study (see Section 4.3), it was concluded that the D-area acidic/metals/sulfate groundwater plume could potentially be remediated with sulfate reduction combined with Monitored Natural Attenuation (MNA). It was also determined that at a minimum the addition of an organic substrate(s) is required to promote sulfate reduction remediation, and that both sodium lactate and soybean oil are capable of stimulating the microbial population as a whole including SRB. However sodium lactate may have inhibitory effects above concentrations of 1% (i.e. 6.3 g/L of lactate). Based upon this soybean oil and sodium lactate were selected as the organic substrates for injection during the DIW-1 Organic Application Field Study-Part 1.

It was also previously determined that due to its location, configuration, and physical condition, the D-Area Interceptor Well (DIW-1) would be one of the best possible installations for the injection of liquid organic substrates into the most highly contaminated portion of the plume (Phifer et al. 2001 and Sappington et al. 2002). DIW-1 was constructed within in the water table aquifer in the most highly contaminated portion of the plume. It consists of a 2-foot wide by 30-foot deep by 240-foot long trench divided into two 120-foot long wings designated the south and north wings. A vertical high-density polyethylene (HDPE) membrane was installed down the middle of the trench with coarse gravel pack on either side of the membrane. Multiple vertical and horizontal screened zones assessable from the land surface were embedded in the gravel pack on either side of the membrane.

The DIW-1 Organic Application Field Study-Part 1 was designed to evaluate the impact of injecting sodium lactate and soybean oil into the DCPRB plume through the D-Area Interceptor Well (DIW-1) on sulfate reduction remediation consistent with the objectives listed in Section 3.3. Additional details associated with the DIW-1 Organic Application Field Study-Part 1 can be found in Phifer et al. (2003c) and WSRC (2003).

6.1 Application Overview

To address the questions outlined in Section 3.3, the DIW-1 Organic Application Field Study Part 1 was conducted as follows:

- A total of approximately 825 gallons of soybean oil (see Table 16 for pertinent soybean oil material properties) was injected during two events (July 15, 2002 and November 19-21, 2002) into both the south and north wings of DIW-1 (see Figures 3 and 4).
- A total of approximately 227.5 gallons of 60% sodium lactate (see Table 16 for pertinent sodium lactate material properties) and 1169 gallons of groundwater from background well DCB-8 were injected during fifteen events (July 16, 2002 through January 7, 2003) into the south wing only (see Figures 3 and 4). Approximately 15 gallons of 60% sodium lactate was injected during each event. Frequent, low volume, sodium lactate injections were performed due to the SRB inhibitory response to high lactate concentrations. The groundwater was used to reduce the viscosity of the sodium lactate for injection, to flush the sodium lactate out of the injection point screen zones, and to provide bioaugmentation (i.e. the addition of SRB).
- Both pre-injection and post-injection monitoring and sampling and analysis were conducted in order to evaluate the impact of organic substrate injection on soluble organic, sulfate,

nutrient, microbe, hydrogen sulfide, pH, Eh, and metal concentrations (i.e. the ability to promote sulfate reduction remediation of the plume).

Table 16 Organic Substrate Properties

Property	Refined Soybean Oil [1]	Sodium Lactate [2]
Composition	>99 Triglycerides: ~14.8% Saturated ~84.2% Unsaturated ~0.003-0.045% Phosphatides ~0.3% Unsaponifiable matter ~0.05% Free Fatty acids	~60% $C_3H_5O_3Na$ ~40% H_2O
Density, g/cm^3	0.920 – 0.925	1.323 at 20 ^oC
Physical Phase at 25 ^oC	Liquid	Aqueous solution
Viscosity, centipoises [3]	50.9 at 25 ^oC	80 – 160 at 20 ^oC
Water Solubility	Negligible, less than 5%	Completely soluble

Notes to Table 16:
[1] Data taken from Cargill, Inc. MSDS for alkali refined soybean oil (Manufacturer Identity Code 452), and Hui, 1996
[2] Data taken from Pfanstiehl Laboratories, Inc. MSDS for Sodium DL-Lactate Solution 60%, U.S.P. (Product Code or Stock Item S-110). The viscosity was taken from PURAC MSDS for Sodium-L-Lactate, PURASAL® S.
[3] Water viscosity at 25 ^oC is 0.894 centipoises

6.2 Results and Discussion

The information presented below addresses the questions asked in Section 3.3. Many of the figures presented within this section include data over time from background, upgradient, and injection zone locations (i.e. DIW-1 piezometers). The upgradient influent data is presented both as an average (i.e. average from wells DCB-19A, DCB-19B, DCB-21A, and DCB-21B) and as the worse case (i.e. data from well DCB-21A, which typically has the highest contaminant levels). The data associated with the DIW-1 piezometers are further segregated by wing (i.e. South and North wings) and by depth (i.e. the "A" piezometers are screened across the water table, the "B" piezometers between the "A" and "C" piezometers, and the "C" piezometers are at the bottom of DIW-1). Representation by wing is important since as noted previously the South wing received both sodium lactate and soybean oil, whereas only soybean oil was injected into the North wing. Depth determinations are important since the soybean oil formed a layer floating on top of the water table.

In the immediate vicinity of DIW-1 groundwater flow is toward DIW-1 from either side, then downward through DIW-1 to the higher permeability, lower portion of the aquifer, and finally toward the Savannah River. The soybean oil was injected into both DIW-1 wings and formed a floating layer on top of and slightly depressing the water table surface within the coarse gravel pack of DIW-1 over its entire upgradient side (see Figure 20). Soybean oil was present throughout the duration of the field study (i.e. from July 2002 through July 2003). The sodium lactate, on the other hand, was only injected into the DIW-1 South wing. The sodium lactate mixed with and was transported by the groundwater downward through DIW-1 toward the

higher permeability, lower portion of the aquifer. Lactate concentrations in the lowest portion of the DIW-1 South wing were at or above the laboratory determined inhibitory concentration (i.e. 6.3 g/L) during the period of sodium lactate injections. Lactate concentrations quickly returned to below detection after the last lactate injection in January 2003 (see Figure 21).

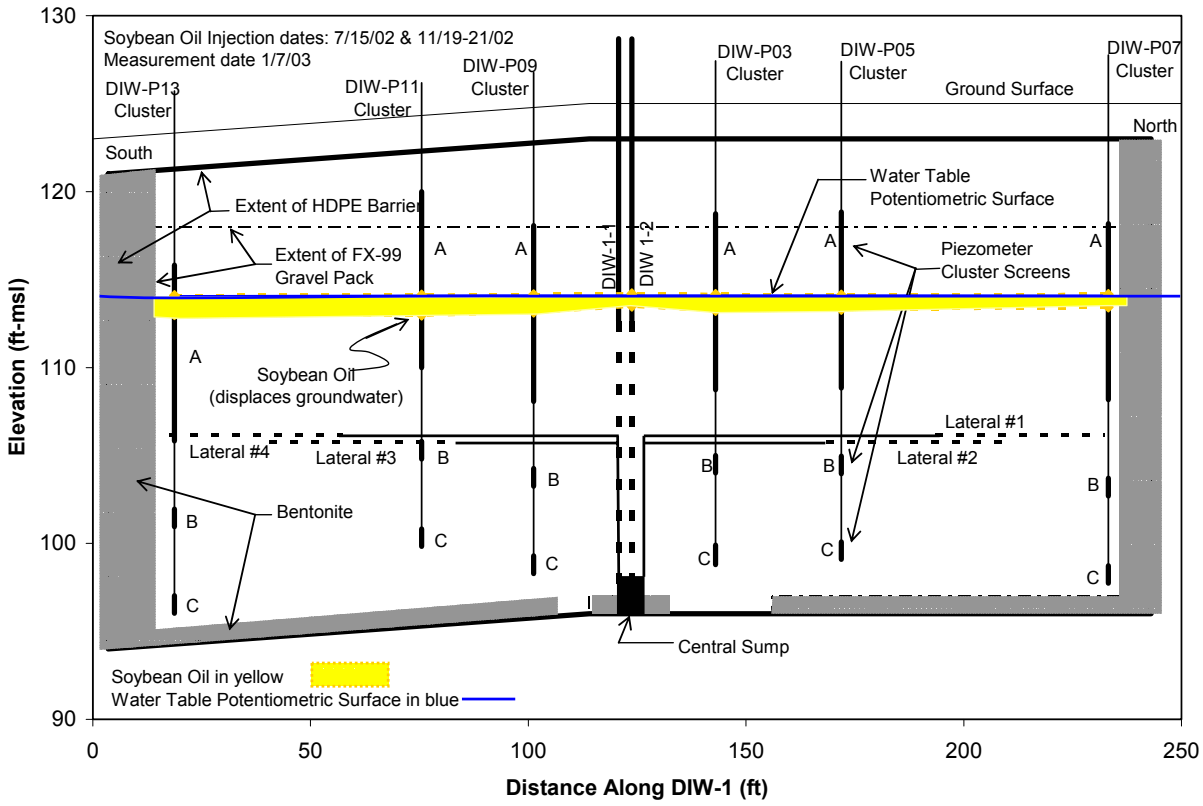


Figure 20 Soybean Oil within DIW-1

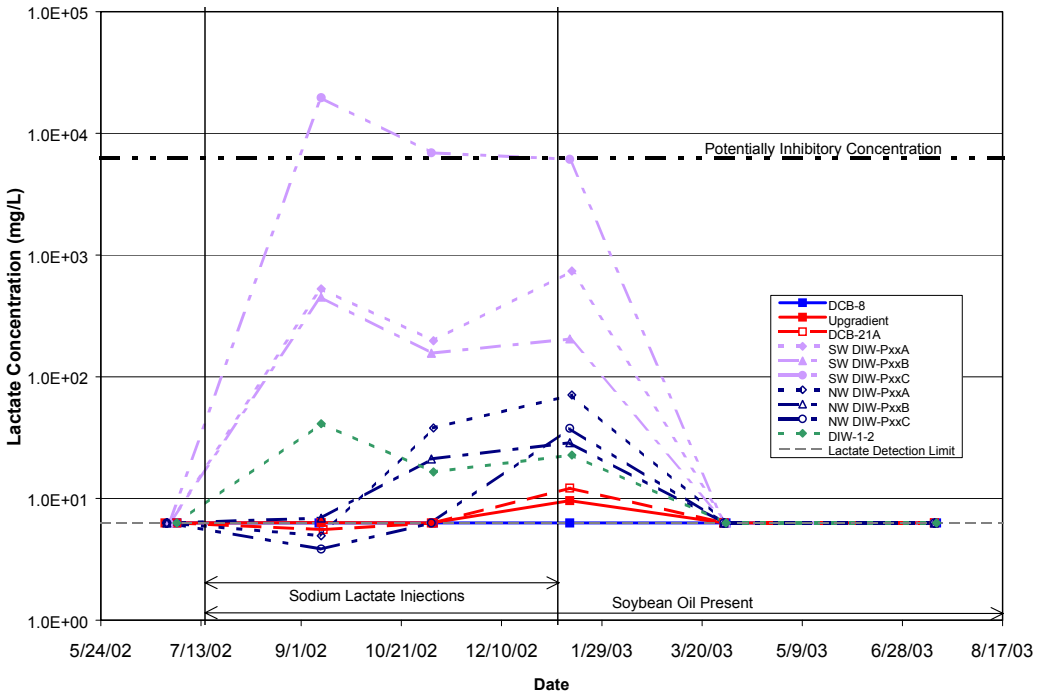


Figure 21 Lactate Concentrations

During the course of the study the quantity of rainfall changed from that of drought conditions to greater than average conditions. This caused water elevations to dramatically increase particularly from November 2002 to April 2003. This resulted in an increased flux of groundwater and contaminants through DIW-1 particularly within the South wing. The South wing is essentially perpendicular to the primary direction of groundwater flow, whereas the North wing is approximately at a forty-five-degree angle. Additionally the South wing typically is closer to the standing water in DCPRB. These factors indicate that the South wing intercepts a higher flux of groundwater and therefore contaminants than the North wing.

Both soybean oil and sodium lactate provided a suitable carbon source to promote SRB growth either directly or indirectly through degradation and the subsequent production of short chain, volatile fatty acids (VFAs). The SRB growth promoted by both soybean oil and sodium lactate has resulted in sulfate reduction remediation as evidenced by the decrease in sulfate and increase in hydrogen sulfide concentrations, the subsequent increase in pH and decrease in Eh, and finally the subsequent decrease in metal concentrations. In general the level of sulfate reduction, as evidenced by the above changes, was seen to be greatest within the upper portion of DIW-1 closest to the floating soybean oil. A delayed but increasing response over time was seen within the lower portions of the North wing. Finally an initial positive response was seen for many parameters within the lower portions of the South wing followed by a decreasing response, after sodium lactate injections were discontinued and water levels increased dramatically.

Prior to injection the SRB population was a minor component of the total bacterial population, however after injection, SRB became the major component of the total bacteria population. The SRB population increased dramatically by five to six orders of magnitude (see Figure 22) after organic injections within the water of the upper portion of DIW-1 closest to the floating soybean oil. SRB within the lower portion of the North wing have also increased by five to six orders of magnitude over a longer period of time, indicating that the soybean oil zone of influence has increased with time in this wing. SRB within the lower portion of the South wing have increased one to two orders of magnitude. The calculated SRB doubling times (i.e. length of time it took the bacterial population to double in number) ranged from 11 to 32 days. In addition to the SRB, it is assumed that a significant fermentative bacteria population also exists due to the degradation and breakdown of the lactate and soybean oil to VFAs (see Figure 23).

Significant soluble organic substrates were available after the injections began. Lactate was immediately available upon injection in the South wing, but it was only available while the injections were on going (see Figure 21). VFAs, on the other hand, were immediately available in the South wing where the sodium lactate was injected and then available after 4 months in the North wing (see Figure 21). VFAs continued to be available throughout the duration of this field study due to soybean oil degradation, with the greatest concentrations in the upper portion of DIW-1 closest to the floating soybean oil after sodium lactate injections ceased. After sodium lactate injections ceased, VFA levels in the remainder of DIW-1 were consistent with the general pattern of sulfate reduction noted above.

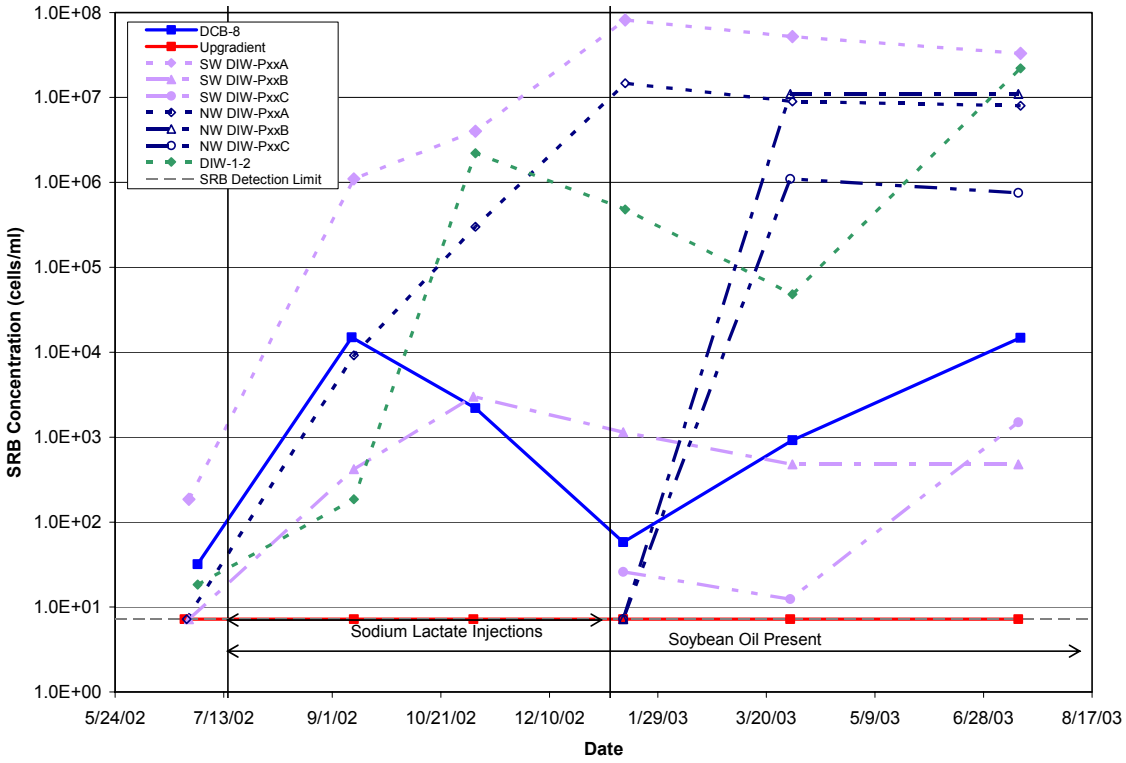


Figure 22 SRB Concentration Trends

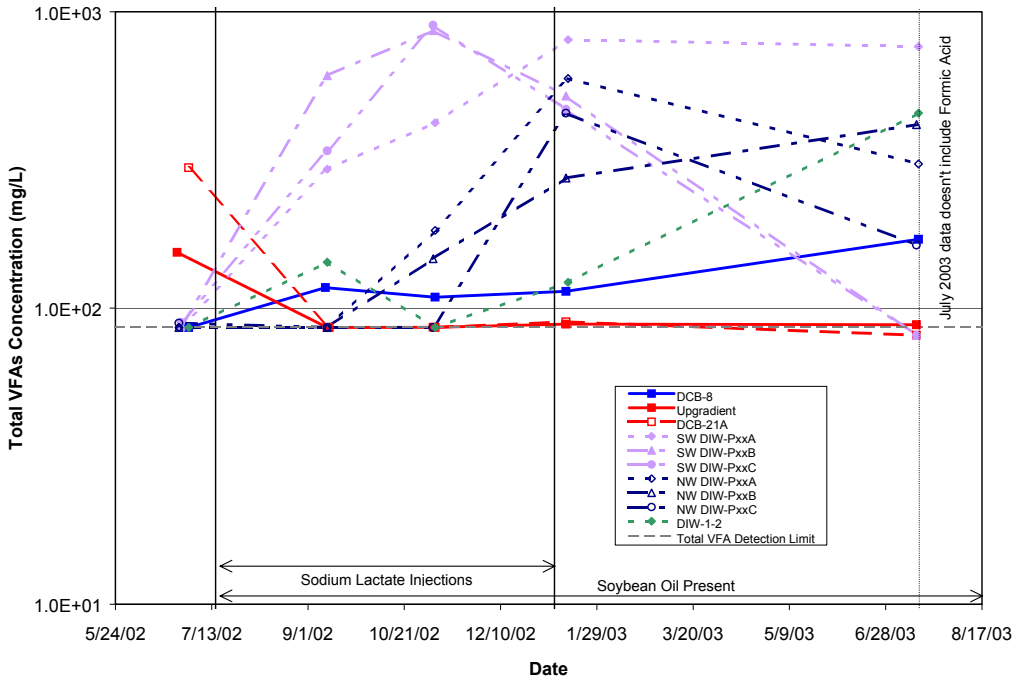


Figure 23 Total VFA Concentration Trends

The decrease in sulfate concentrations (see Figure 24) and hydrogen sulfide at concentrations greater than background and upgradient (see Figure 25) indicate that sulfate reduction has been occurring within DIW-1 during this field study. Sulfate concentrations declined from the thousands of ppm to the tens within the upper portion of the North wing closest to the floating soybean oil and to the hundreds within the upper portion of the South wing. A delayed but decreasing level of sulfate over time was seen within the lower portions of the North wing, whereas very little or no decrease was seen within the lower portions of the South wing. The lesser response seen within the South wing is thought to be primarily due to the greater contaminant flux it receives than that of the North wing. It is also possible that inhibitory lactate concentrations contributed to the lack of a sulfate decrease within the lower portions of the South wing. Hydrogen sulfide concentrations did not correspond inversely with decreases in sulfate concentrations (i.e. hydrogen sulfide did not increase proportionally to sulfate decreases), since hydrogen sulfide is transient (i.e. it can volatilize or precipitate as a metal sulfide). However hydrogen sulfide levels within DIW-1 in general remained above both background and upgradient levels after injections began, indicating that an increased level of sulfate reduction was occurring within DIW-1. For clarity Figure 25 provides the normalized hydrogen sulfide levels relative to the average background/upgradient concentration.

Sulfate reduction through the oxidation of a carbon source consumes hydrogen ions (H^+) through the reduction of sulfate and formation of hydrogen sulfide, which may then degas (as H_2S (gas)) or form metal sulfides. This generally resulted in an increase in pH to between 5 and 6 (i.e. background levels or higher (see Figure 26) within the upper portion of DIW-1 closest to the

floating soybean oil. The least increase in pH was noted within the bottom portion of the South wing. This is probably due to the greater contaminant flux received by the South wing and the potentially inhibitory lactate concentrations received by this portion of the South wing. Patterns of pH changes within the remainder of DIW-1 were consistent with the general pattern of sulfate reduction noted above. Sulfate reduction also results in a decrease in Eh. In general the Eh within the upper portion of DIW-1 closest to the floating soybean oil decreased to between 100 and 200 mV. Again patterns of Eh changes within the remainder of DIW-1 were consistent with the general pattern of sulfate reduction noted above.

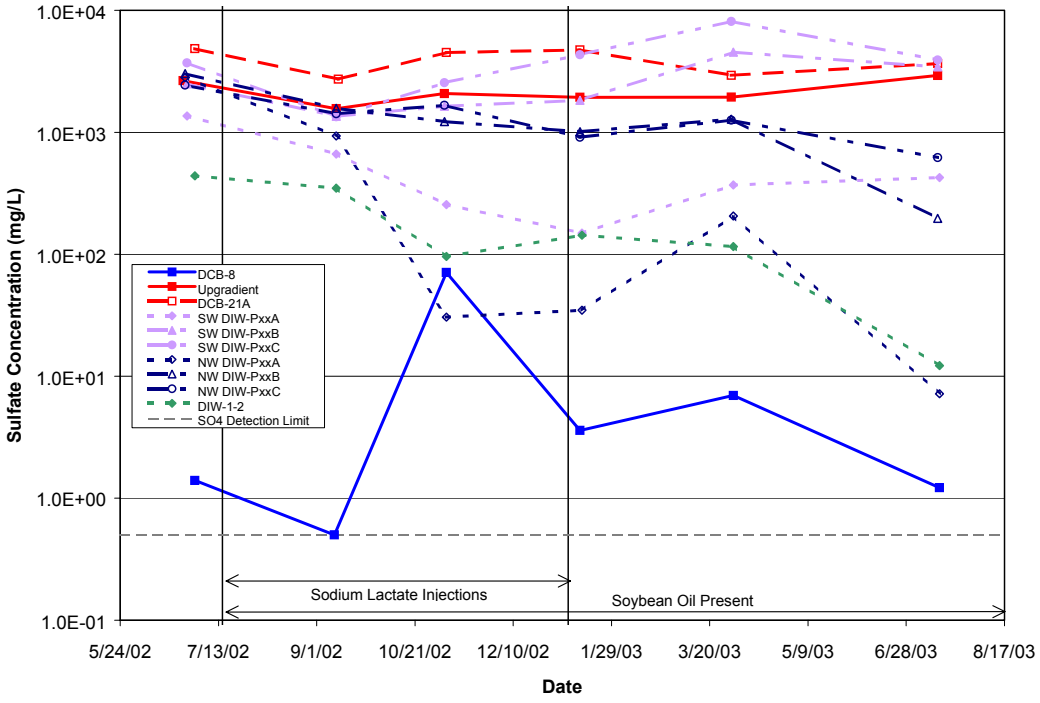


Figure 24 Sulfate Concentration Trends

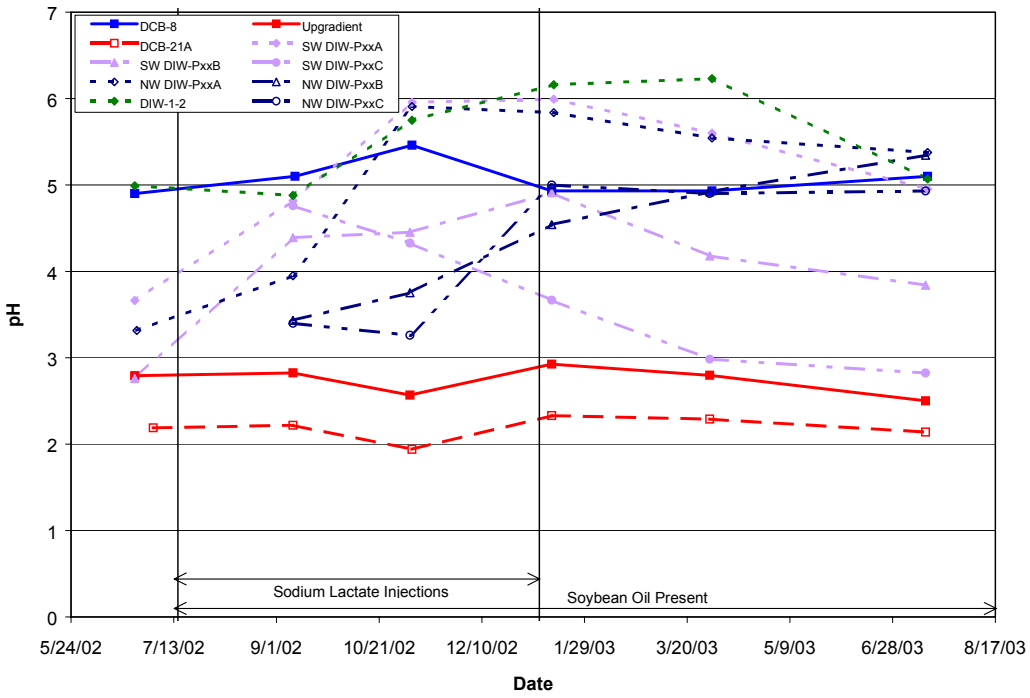


Figure 25 Normalized Hydrogen Sulfide Trends

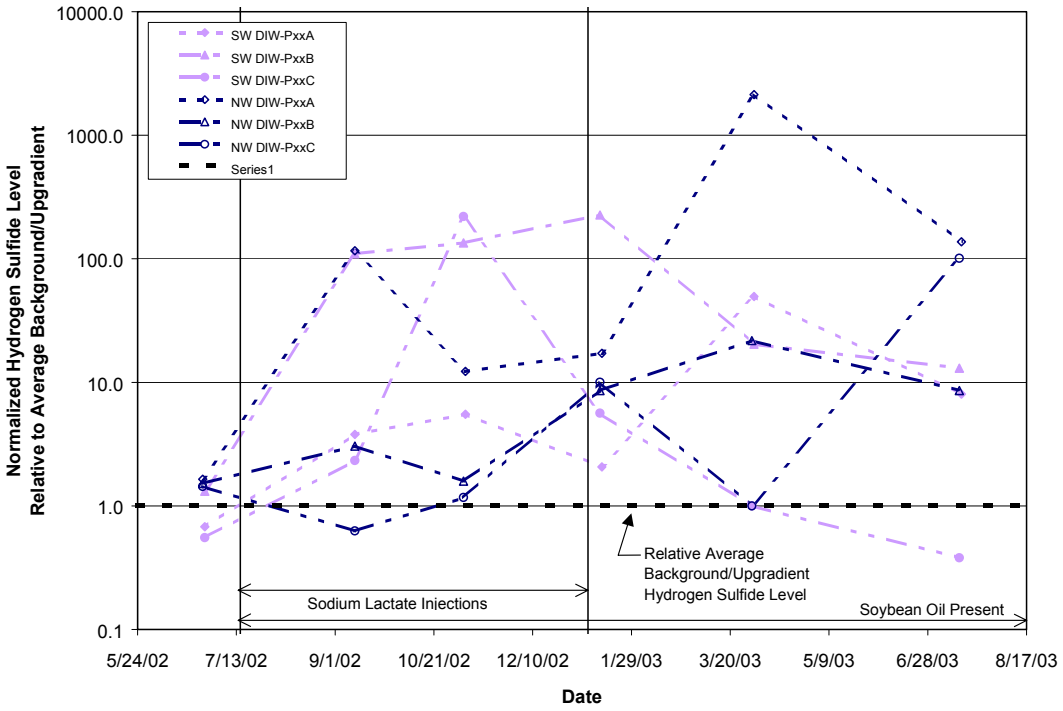


Figure 26 pH Trends

The greatest reductions in metals concentrations occurred within the upper portion of DIW-1 closest to the floating soybean oil (see Table 17). Near 90 percent reductions in aluminum, chromium, copper, nickel, and zinc concentrations and greater than 50 percent reductions in calcium, magnesium, and manganese concentrations occurred. Significant reductions in iron and silica concentrations also occurred. Patterns of metal concentration changes within the remainder of DIW-1 were consistent with the general pattern of sulfate reduction noted above. It is anticipated that the metals concentrations reduction was due to the following:

- The precipitation of iron, copper, and zinc sulfides,
- The precipitation of aluminum and chromium hydroxides, and
- The adsorption of calcium, copper, magnesium, manganese, nickel, and zinc onto kaolinite and aluminum and iron oxides and (oxy)hydroxides.

The only metal that demonstrated a consistent but slight increase was barium (see Table 17). This increase may be a function of the dissolution of barite ($BaSO_4$). As sulfate is removed from the system, the solubility of barite increases and barium and sulfate are released into solution.

Based on the data available nitrogen concentrations should be sufficient to maintain SRB growth. While phosphate concentrations were below detectable limits in a majority of the wells receiving nutrients, these wells were capable of supporting increases of SRB by 5 orders of magnitude. The capacity to support bacterial densities of that magnitude indicates sufficient micronutrients. It is likely that sufficient nitrogen and phosphate concentrations will be maintained due to a continual groundwater influent and biological cycling.

Table 17 Average Metal Concentration Trends from Selected DIW-1 Locations

Sample Date	Aluminum (mg/L)	Barium (mg/L)	Calcium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)
6/26/02	87.814	0.002	65.367	0.039	0.072	102.380
7/15/03	0.446	0.014	19.967	0.002	0.009	62.167
Percent Reduction	99.5	NA	69.5	94.8	87.6	39.3
Percent Increase	NA	592.5	NA	NA	NA	NA
Sample Date	Magnesium (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silicon (mg/L)	Zinc (mg/L)	
6/26/02	37.212	12.380	0.467	30.467	0.849	
7/15/03	14.967	4.571	0.010	16.639	0.001	
Percent Reduction	59.8	63.1	97.9	45.4	99.9	
Percent Increase	NA	NA	NA	NA	NA	

Notes to Table 17:

1) Average concentrations from DIW-1 locations DIW-P11A, DIW-1-2, and DIW-P07A (i.e. upper portion of DIW-1 closest to the floating soybean oil).
2) NA = not applicable.

6.3 SUMMARY

Based upon promotion of sulfate reduction by soybean oil injection and the anticipated 18 month longevity of the 825 gallons of injected soybean oil (see Figure 27), it has been demonstrated that soybean oil does provide a relatively long-term, slow release, carbon source for the SRB. Based upon promotion of sulfate reduction by sodium lactate, the quick sulfate reduction response to sodium lactate injection, and the quick depletion of the lactate, it has been demonstrated that sodium lactate does provide a short-term, immediately available carbon source for SRB. Injection of sodium lactate, however, must take into consideration the inhibitory SRB response to elevated sodium lactate concentrations and the quick lactate depletion. These facts mean that sodium lactate, if utilized, must be injected frequently in low quantities, which results in increased costs over that of soybean oil injection, which can be performed infrequently in high quantities as noted above. Therefore the best use of sodium lactate appears to be to quickly initiate sulfate reduction and facilitate the subsequent utilization of soybean oil for continuation of sulfate reduction.

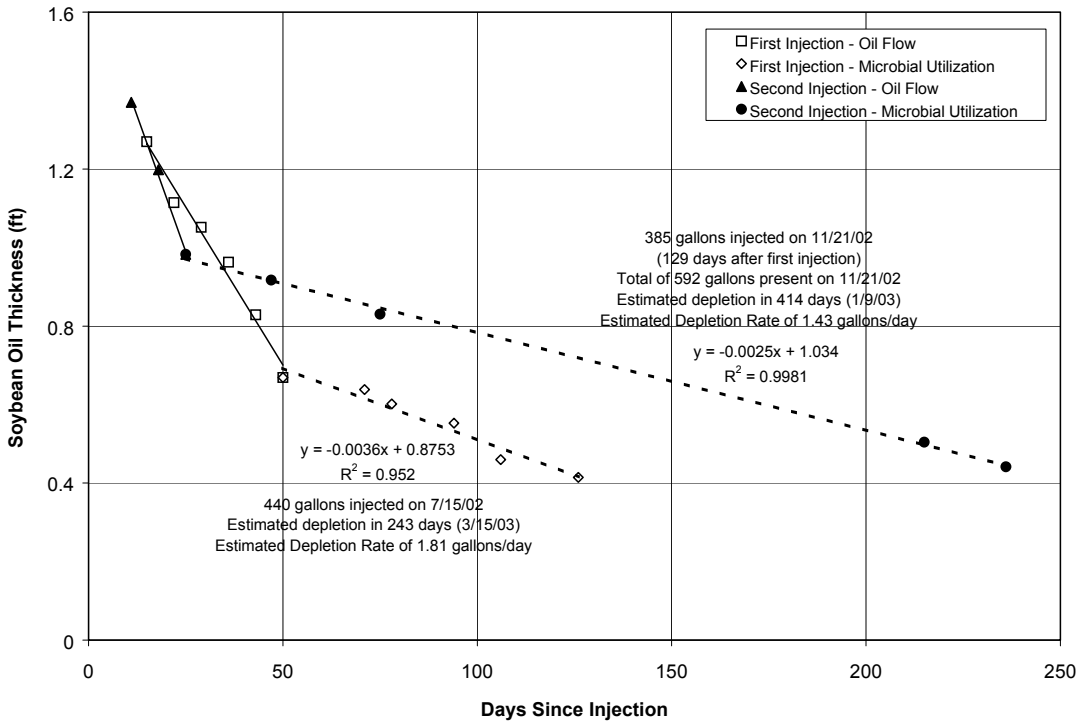


Figure 27 Soybean Oil Flow and Depletion

From the field study, however, it is not clear whether or not the sodium lactate played a significant role in initiating sulfate reduction and facilitating the utilization of the soybean oil for sulfate reduction. Essentially concurrent with cessation of sodium lactate injections in the South wing, a significant rise in water levels occurred. The water level rise resulted in both an increased flux of contaminated groundwater, particularly to the South wing, and an increased distance of the DIW-1 lower zone from the soybean oil. This resulted in decreased levels of sulfate reduction within the South wing over that initially experienced. Additionally although sodium lactate was not injected directly into the North wing, slightly elevated lactate concentrations were detected within the North wing for a brief period of time (see Figure 21). The North wing, which was assumed to have received a lesser flux of contaminated groundwater than the South wing, demonstrated an increased depth of sulfate reduction influence with time. These occurrences make the role of sodium lactate relative to initiating sulfate reduction and facilitating the utilization of soybean oil for sulfate reduction somewhat unclear.

Finally the following are apparent from this field study relative to the use of soybean oil to promote sulfate reduction remediation within the DCPRB acidic/metals/sulfate groundwater plume:

- Soybean oil alone has promoted sulfate reduction remediation. Sodium lactate may not be necessary for the initiation of sulfate reduction and to facilitate soybean oil utilization.
- Soybean oil does provide a long-term, slow release, carbon source for SRB, and it is significantly cheaper than sodium lactate in terms of both material costs and injection costs. The soybean oil for this field study cost approximately $175 per 55-gallon drum versus $770 per 55-gallon drum for 60% sodium lactate. During this field study only two soybean oil injections were conducted for the injection of 825 gallons, whereas fifteen sodium lactate injections were required for the injection of 227.5 gallons.
- The distribution and proximity of soybean oil are the primary factors that influence the overall effectiveness of sulfate reduction remediation promoted by soybean oil injection.

7.0 ORGANIC SUBSTRATE FIELD APPLICATION PART 2

7.1 STUDY IMPLEMENTATION

7.1.1 Application Overview

During Part 2 of the field application, soybean oil alone was injected into the contaminated aquifer through selected Table 2 "C" piezometers (i.e. the deepest screen zones in DIW-1) and the DIW-1-2 well screen. Section 2.5 provides a detailed description of DIW-1, and Figure 4 provides an upgradient cross-sectional view of DIW-1. Groundwater from existing monitoring well DCB-8 (see Figure 2) was used in conjunction with the injection of soybean oil to flush oil from the C piezometers and as a head/seal during the actual injection. Finally sampling purge water from the piezometers and downgradient wells, which could contain the injected organics, was reinjected into DIW-1 through DIW 1-2. Table 18 provides a summary of the injected volumes during this phase of the project by date. The use of potable water in lieu of DCB-8 groundwater was authorized in the permitting documents however no potable water was utilized.

Table 16 provides pertinent properties of the soybean oil. Table 19 provides the maximum quantities of organic substrates, DCB-8 groundwater and/or potable water, and purge water that could be injected during this field study phase (Part 2) per the approved Underground Injection Control Permit (UIC) (WRRS 2002a). Table 18 also includes the actual injected volumes. As seen in the table the maximum quantities were not exceeded. Injection details including information on the injection points, total quantity injected per injection event, the method of injection, and the injection event frequency/schedule are provided in Table 20 and discussed below.

Soybean oil was injected by pumping into the upgradient side of both the North and South DIW-1 wing walls. Soybean oil was injected through DIW-1-2 and the upgradient DIW-1 "C" piezometers (see Table 20). As stated in the Study Focus and Objectives Section 3.4, a goal of Part 2 was to evaluate the distribution of soybean oil injected at greater depths. A total of 825 gallons of soybean oil was injected during two separate injections events, to the maximum amount of soybean oil allowed by the UIC permit. No Sodium Lactate was injected during Part 2.

The Soybean oil was flushed from the "C' piezometers with from 6 to 24 gallons of DCB-8 groundwater. The injection and flushing from the "C" piezometers was performed as shown in Figure 28 with the friction packer shown in Figure 29. In addition to the DCB-8 groundwater used for flushing, DCB-8 groundwater was also injected/gravity fed into the annular space between the friction packer tubing and the piezometer casing (Figure 29) in order to minimize soybean oil accumulation within the casing. For the two soybean oil injection events a total of 161.75 gallons of DCB-8 groundwater was injected. The UIC permit allowed the injection of a maximum 10,000 gallons of DCB-8 groundwater or potable water (see Table 19).

Downgradient monitoring well purge water including DIW-1 piezometer sampling, which could contain the injected organics or their degradation products, was recycled back into the system by injection into DIW-1 through DIW-1-2. All DIW-1 piezometers (see Table 2) and all monitoring wells (see Figure 3 and Table 3) located immediately downgradient of DIW-1 were assumed to contain the injected organics or their degradation products.

Table 18 Field Application Part 2 Task and Injection Summary

Field Task	Actual Dates	Purge Water [4]		Soy Bean Oil Injections	
		Tier 1 (gal)	Tier 2/3 (gal)	Soy Bean Oil (gal)	DCB- 8 Ground Water[5] (gal)
Pre-Injection Tier 2 and 3 Monitoring and Sampling	Nov 3/4, 2003	----	23.3	----	----
First Soybean Oil Injection and Oil/Water Level Measurements	Nov 10/11, 2003	----	----	440	91.25
Oil/Water Level Measurements	Nov 13, 2003	----	----	----	----
Oil/Water Level Measurements	Nov 18, 2003	----	----	----	----
Post Injection B & C Piezometer Oil Removal [1]	Nov 21, 2003	9.3	----	----	----
Oil/Water Level Measurements	Nov 25, 2003	----	----	----	----
Tier 1 Indicator Parameters/Monitoring	Dec 2, 2003	10.8	----	----	----
Oil/Water Level Measurements	Dec 15, 2003	----	----	----	----
Tier 1 Indicator Parameters/Monitoring [2]	Jan 5, 2003	41.0	----	----	----
First post-injection Tier 2 and 3 Monitoring and Sampling		----	----	----	----
Oil/Water Level Measurements	Jan 30, 2004	----	----	----	----
Sampling	Feb 3, 2004	----	36.0	----	----
Tier 1 Indicator Parameters/Monitoring	Mar 9, 2004	12.2	----	----	----
Second Soybean Oil Injection	Mar 22/23, 2004	----	----	385	70.5
Post Injection B & C Piezometer Oil Removal [1]	Mar 31, 2004	48.3	----	----	----
Oil/Water Level Measurements	Mar 31, 2004	----	----	----	----
Oil/Water Level Measurements	Apr 7, 2004	----	----	----	----
Tier 1 Indicator Parameters/Monitoring [1]	Apr 19, 2004	18.0	----	----	----
Second post-injection Tier 2 and 3 Monitoring and Sampling		----	----	----	----
Oil/Water Level Measurements	May 3, 2004	----	----	----	----
Sampling	May 3, 2004	----	32.0	----	----
Tier 1 Indicator Parameters/Monitoring (Expanded)	May 24/25, 2004	32.5	----	----	----
Tier 1 Indicator Parameters/Monitoring	Jun 14, 2004	9.8	----	----	----
Third post-injection Tier 2 and 3 Monitoring and Sampling		----	----	----	----
Oil/Water Level Measurements	Jul 12, 2004	----	----	----	----
Sampling [3]	Jul 12/13, 2004	----	49.1	----	----
Oil/Water Level Measurements	Nov 11, 2004	----	----	----	----
	Totals	181.9	140.4	825.0	161.75

Notes to Table 18:
[1]Oil/Water removed from B & C Piezometers following Injection.
[2] Includes 11 gallons from Tier 1 event and 30 gallons of unused samples from the laboratory.
[3] Includes 46.1 gallons from Tier 2/3 event and 6 gallons returned of unused samples from the laboratory.
[4] Purge water and other as noted above produced from DIW-1 piezometer and downgradient monitoring well sampling, which could contain the injected organics, was reinjected into DIW-1 through DIW 1-2.
[5] DCB- 8 groundwater used in the annular space during injection and flushing of the "C" piezometers at time of injection.

Table 19 Maximum UIC Permit Versus Actual Part 2 Injection Volumes

Material	Maximum UIC Permit Injection Volume Per Part/Phase (gallons)	Actual Part 2 Injection Volumes (gallons)
Soybean Oil	825	825
60% Sodium Lactate	2,200	0
DCB-8 Groundwater [1]	10,000	161.8 [3]
Purge Water [2]	1,200	322.3

Notes to Table 19:
[1] Groundwater from monitoring well DCB-8 and/or potable water
[2] Purge water produced from DIW-1 piezometer and downgradient monitoring well sampling, which is likely to contain the injected organics, was reinjected into DIW-1 through DIW 1-2.
[3] Only DCB-8 groundwater was injected. No Potable water was injected.

Table 20 Soybean Oil Injection Details

		Part 2 Soybean Oil Injection 1 Nov 10/11, 2003			Part 2 Soybean Oil Injection 2 Mar 22/23, 2004			Total per well Injections 1and 2		
Injection Well ID	Injection Method	Soy-bean Oil (gal)	DCB- 8 Ground Water Flush (gal)	DCB-8 Annulus Ground Water (gal)	Soy-bean Oil (gal)	DCB- 8 Ground Water Flush (gal)	DCB-8 Annulus Ground Water (gal)	Soy-bean Oil (gal)	DCB- 8 Ground Water Flush (gal)	DCB-8 Annulus Ground Water (gal)
DIW-P13C	Pump	55	6.5	6	55	8.5	1	110	15	7
DIW-P11C	Pump	82.5	6.5	6	55	9	1	137.5	15.5	7
DIW-P09C	Pump	55	6.5	0.25	55	9	1	110	15.5	1.25
DIW-1-2	Pump	55	0	0	55	0	0	110	0	0
DIW-P03C	Pump	55	6	10	80	10	1	135	16	11
DIW-P05C	Pump	82.5	6.5	25	57.5	17	2	140	23.5	27
DIW-P07C	Pump	55	6.5	5.5	27.5	10	1	82.5	16.5	6.5
Totals		440	42.5	48.75	385	63.5	7	825	102	59.75

7.1.2 Application Technique

Because of the configuration and hydraulic properties of the existing DIW-1 (see Section 2.5) the two soybean oil injections required minimal equipment and could be conducted with relative ease. Section 7.1.2.1 provides a list of the primary equipment needed, Sections 7.1.2.2 and 7.1.2.3 describe the soybean oil and purge water injections, respectively.

7.1.2.1 Materials and Equipment

The primary materials and equipment required included the following:

- Soybean oil supplied in 55 gallon drums
- 25 liter (6.6 gallon) HDPE carboys
- 200 gallon polyethylene tank
- Industrial process peristaltic pumps
- Tygon tubing
- Polyethylene tubing
- Injection tubing and friction packer
- Portable generators
- Water-oil interface meter
- All required safety equipment and supplies

7.1.2.2 Soybean Oil Injection

Soybean oil was injected into the upgradient side of both the North and South DIW-1 wing walls during two injection events. The soybean oil was pumped directly from the vendor's 55-gallon drums with a peristaltic pump through the injection tubing and friction packer into the "C" piezometers (see Figure 28 and 29). During the injection DCB-8 groundwater was poured into the annular space between the injection tubing and the piezometer casing to provide a "head" to reduce any oil bypass flow during injection. Following the soybean oil injection, the piezometer was flushed with DCB-8 groundwater prior to moving to the next injection point. The injection method, injection start, injection completion, and actual injection volumes were recorded. The depth to oil and water and subsequent changes in the soybean oil layer over time were periodically measured and recorded. The two soybean oil injection events were conducted approximately 4-½ months apart. Table 18 provides a summary of the total volumes of soybean oil injected over the two injection events.

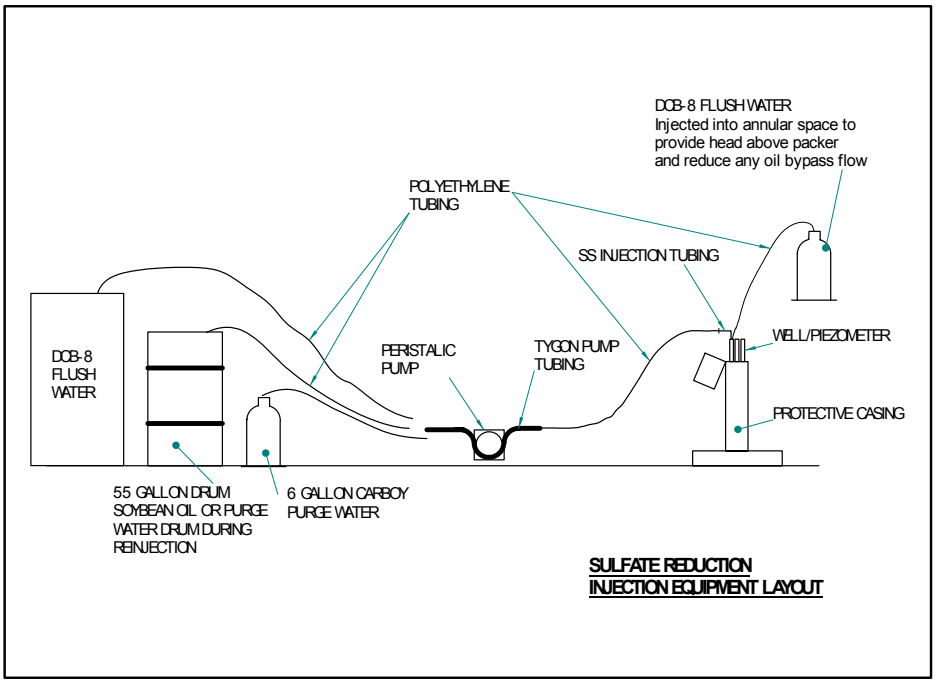


Figure 28 Injection Equipment Layout

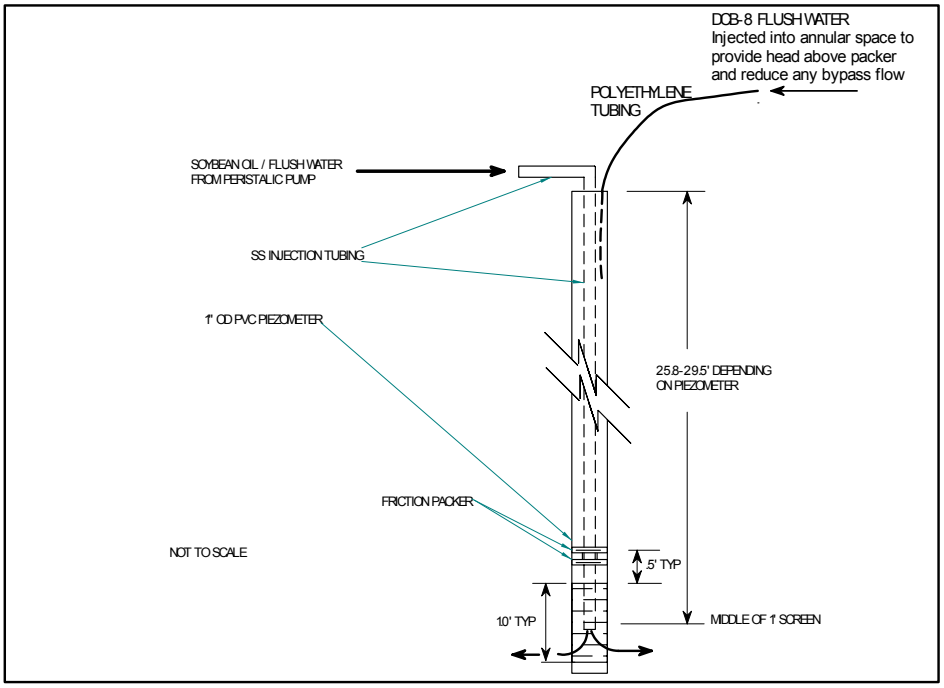


Figure 29 Friction Packer and Injection Tubing

7.1.2.3 Purge Water Injections

After completion of each Tier 1, 2, and/or 3 sampling event, any purge water collected from any DIW-1 well or piezometer or any down gradient well, which could potentially contain injected organic material, was reinjected into the DIW-1-2 well screen. The purge water was pumped with a peristaltic pump directly from the 6.6-gallon carboys or 55 gallon drum used to collect it (see Figure 28). Table 18 provides the injection volumes of purge water after each sampling event.

7.1.3 Sampling and Analysis

Baseline (pre-injection) and post-injection groundwater monitoring was conducted in a tiered structure utilizing monitoring wells upgradient and downgradient of DIW-1 and piezometers within DIW-1 (see Tables 2 and 4). Sampling and analysis was performed to evaluate the impact of organic substrate (soybean oil) injection on microbial populations, pH, Eh, and concentrations of metals, sulfate/sulfide and nutrients.

The tiered sampling structure included three tiers:

- Tier 1 sampling consisted of field measurements from specific wells and piezometers to monitor the occurrence of bulk geochemical changes. Tier 1 sampling was conducted approximately on a one to two month frequency. Additional oil/water measurements were obtained as needed to monitor oil distribution within DIW-1. Table 18 provides specific dates for Tier 1 events and individual water/oil level measurements. Table 21 shows the field parameters measured.
- Tier 2 sampling consisted of more extensive field measurements to evaluate trends in bulk chemistry. These field measurements were conducted at the same time as the Tier 3 sampling but included more wells than those sampled for Tier 3 parameters. Tier 2 parameters were collected for the baseline sampling and three post-injection sampling events (approximately every two and one half to three months after the initial injection). Table 18 provides specific dates for Tier 2 events. Table 21 shows the field parameters measured.
- Tier 3 sampling consisted of comprehensive analyses on key wells or piezometers to evaluate the impact of organic substrate injection on microbial populations and concentrations of metals, sulfate/sulfide, and nutrients. Like the Tier 2 events, sampling was conducted for a baseline and approximately every two and one half to three months after the initial injection. Table 18 provides specific dates for Tier 3 events. Table 21 shows the field parameters measured.

Prior to Tier 1 and Tier 2 sampling and periodically as needed, depth to water was measured using a water level meter tape. For piezometers containing soybean oil, the oil/water interface was also measured using an oil/water interface meter. Multiparameter and single parameter probes/meters were used to collect indicator parameters.

Samples were collected using peristaltic pumps except for well DCB-8 cluster which has a dedicated pump. Prior to sampling, a minimum of 5 gallons was purged from the monitoring wells (DCB) and 2 gallons from the middle (B) and lower (C) piezometers (DIW). For the “A” piezometers in DIW-1 that would likely contain soybean oil, one liter was purged at a low flow

rate prior to sampling in order to minimize the amount of oil collected in the samples. Purge water was appropriately dispositioned according to the approved Waste Management Plan and UIC permit by discharging onto the ground, containment, or injection into DIW-1, as required.

Samples collected for indicator parameters and microbial parameters were not filtered, whereas samples collected for analyses of metals, anions, and organics were filtered. Anion and metals duplicate samples were also collected from DIW-P11B for comparison. In addition, one replicate sample (DIW-P11B) and a blank were collected during each Tier 3 sampling event to be analyzed by an EPA certified laboratory for metals and anions. Anions were analyzed using ion chromotagraphy (IC); elemental (metal) analyses by inductively coupled plasma atomic emission spectroscopy (ICP-AES); and iron speciation and hydrogen sulfide by spectrometry methods. SRB analysis was performed using Most Probable Number – Sulfate Reducing Assay (MPN – SRA). Table 21 provides a more complete list of analytical parameters, methods, and approximate detection limits for samples collected in this study. A further description of Tier 1, 2, and 3 sampling can be found in the *D-Area Sulfate Reduction Study Field Scoping Plan (U)* (Sappington et al. 2003).

Table 21 Field Study Analytical Parameters and Methods

Analytical Suite; Primary Laboratory	Sample Volume, Bottle, and Preservative	Analytical Parameter	Analytical Method	Typical Detection Limit
Tier 1 and 2 Monitoring: Field Indicator Parameter Monitoring				
Field Indicator Parameters; ERTS	Not Applicable	Field pH	Field probe/meter	-
		Field Eh	Field probe/meter	-
		Field Dissolved Oxygen (DO)	Field probe/meter	0.1 mg/L
		Field Specific Conductance (SC)	Field probe/meter	15 μmhos/cm
		Field Temperature	Field probe/meter	-
Tier 3 Sampling and Analysis: Comprehensive Parameter Sampling and Analysis				
Hydrogen Sulfide; EBS	125 ml HDPE bottle; Eliminate headspace	Hydrogen Sulfide	UV-vis Spectrophotometer	0.001 mg/L
MPN - SRA; EBS	1 L polypropylene bottle and eliminate headspace	SRB Counts	Most Probable Number – Sulfate Reducing Assay (MPN – SRA)	7.2 cells/ml
Metals (ICP Parameters); SRTC Mobile Lab	30 ml HDPE bottle; 1 ml HCl and eliminate headspace	Aluminum	ICP-AES	0.009 mg/L
		Barium	ICP-AES	0.002 mg/L
		Beryllium	ICP-AES	0.001 to 0.1 mg/L
		Calcium	ICP-AES	0.006 mg/L
		Cadmium	ICP-AES	0.003 mg/L
		Chromium	ICP-AES	0.002 mg/L
		Copper	ICP-AES	0.010 mg/L
		Iron	ICP-AES	0.040 mg/L
		Magnesium	ICP-AES	0.004 mg/L
		Manganese	ICP-AES	0.001 mg/L
		Sodium	ICP-AES	0.010 mg/L
		Nickel	ICP-AES	0.010 mg/L
		Potassium	ICP-AES	0.010 mg/L
		Lead	ICP-AES	0.017 mg/L
		Silicon	ICP-AES	0.079 mg/L
		Zinc	ICP-AES	0.001 mg/L
Iron Speciation; SRTC Mobile Lab	30 ml Amber HDPE bottle; Eliminate headspace	Iron Speciation (Fe(II) / Fe(total))	Spectrometer	-
Anions; SRTC Mobile Lab	30 ml HDPE bottle; Eliminate headspace	Chloride	IC	1 mg/L
		Nitrate	IC	1 mg/L
		Nitrite	IC	1 mg/L
		Phosphate	IC	1 mg/L
		Sulfate	IC	1 mg/L

Notes to Table 21:

ERTS = Environmental Restoration Technology Section; EBS = Environmental Biotechnology Section; SRTC Mobile Lab = Savannah River Technology Center Mobile Laboratory; MPN-SRA = Most Probable Number – Sulfate-Reducing Assay; μmhos/cm = microsiemens per centimeter, ICP-AES = Inductively Coupled Plasma – Atomic Emission Spectroscopy; IC = Ion Chromatography.

7.2 Results and Discussion

7.2.1 DIW-1 Hydrology Trends

During the course of the Part 1 study the quantity of rainfall changed from that of drought conditions to greater than average conditions. This caused water elevations to dramatically increase particularly from November 2002 to April 2003 as seen in Figure 30. This resulted in an increased flux of groundwater and contaminants through DIW-1 particularly within the South wing. During the end of the Part 1 study to the beginning of the Part 2 study the quantity of rainfall/water elevations changed fell back to more average conditions. They began at more normal conditions prior to the first Part 2 injection and remained stable (near normal) until February 2004 at which time they began to increase. As noted in Section 2.5.2 the South wing is essentially perpendicular to the primary direction of groundwater flow, whereas the North wing is close to a forty five degree angle to the primary direction of groundwater flow. Additionally the South wing typically is closer to the standing water in DCPRB. These factors indicate that the South wing intercepts a higher flux of groundwater than the North wing.

Figure 30 confirms the DCPRB hydrology and DIW-1 hydrology, respectively, presented in Sections 2.1 and 2.5.2. As can be seen water elevations decrease with depth and distance from the DCPRB (i.e. groundwater flow is downward and horizontally away from the DCPRB). Water elevations in all DIW-1 piezometers are always essentially the same regardless of depth and typically lower than those in adjacent wells screened across the water table (i.e. upgradient "A" wells, DCB-19A, and DCB-21A) regardless of whether the wells are upgradient or "downgradient" of DIW-1. Water elevations in wells DCB-22C and DCB-18C, which are located downgradient of DIW-1 and screened within the higher permeability, lower portion of the aquifer, are typically lower than that in DIW-1. These two facts confirm that groundwater flow is toward DIW-1 from its immediate vicinity on either side, downward through DIW-1 to the higher permeability, lower portion of the aquifer, and then toward the Savannah River.

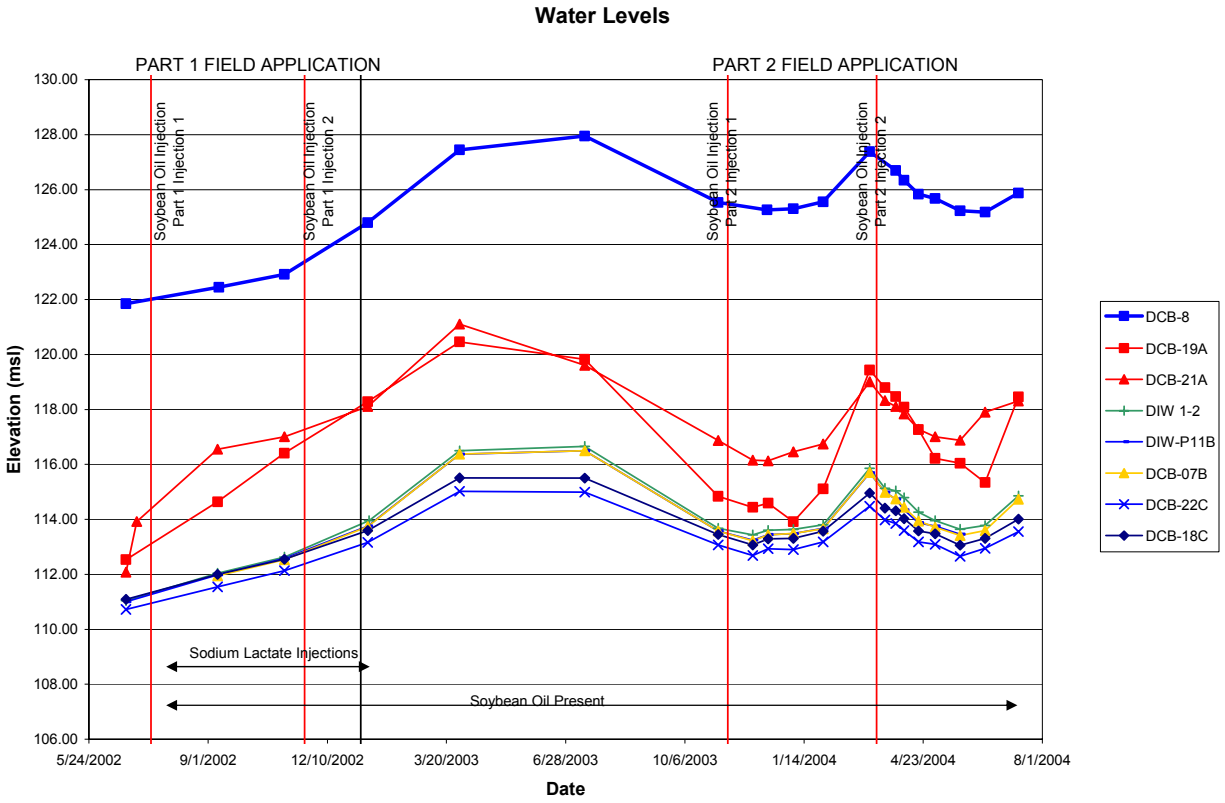


Figure 30 Water Elevation Trends (Part 1 and Part 2)

7.2.2 Organic Substrate Trends

Soybean oil alone was injected into DIW-1 as outlined in Section 7.1.1. The soybean oil was intended to provide a long-term, slow release, carbon source for the SRB, since it is essentially insoluble and lighter than water. As anticipated the soybean oil initially injected into the "C" piezometers migrated through the coarse gravel pack of DIW-1 and floated on and depressed the top of the water table surface within DIW-1 (see Figure 31). As can be seen in Figure 31 following the second Part 2 injection within 9 days much of the oil had floated to the top of the water table.

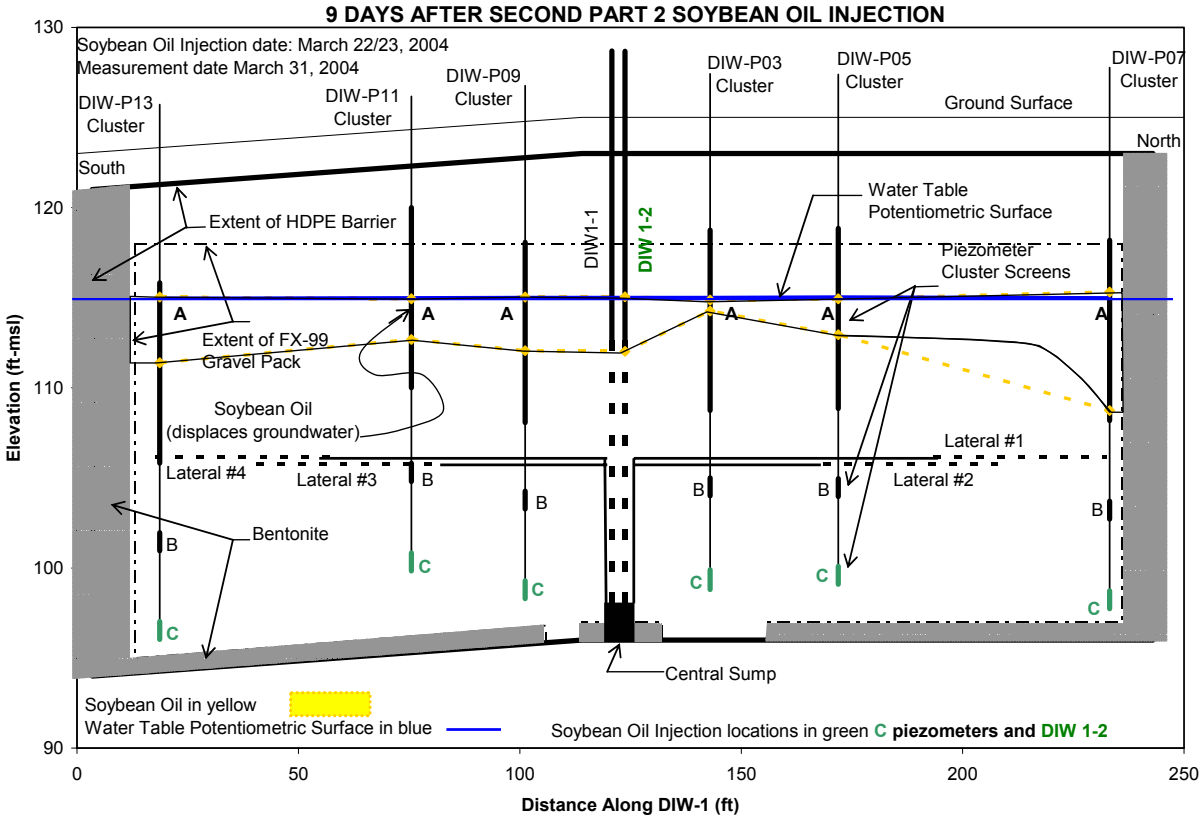


Figure 31 Soybean Oil within DIW-1

Figure 32, Piezometer Oil Column Depths, shows a chronological view of the oil depth at each of the "A" (water table) piezometers and DIW-1-2, as such it provides a chorological/pictorial view of the oil leveling/oil utilization in the DIW-1 gravel pack. As seen, oil leveling occurred fairly rapidly during the two Part 1 soybean oil injections. During the first Part 2 soybean oil injection, oil leveling occurred fairly rapidly except in DIW-P07A and DIW-P03A. The oil level in DIW-P07A remained relatively elevated during the entire 132 days and DIW-P03A remained relatively depressed for about 80 days. Considering the volume of oil injected into each of the piezometers it appears that soybean oil injected into piezometers DIW- P03C and DIW-P05C, which are located below Laterals #1 and #2 (see Figure 31) may have migrated toward piezometer DIW-P07A and resulted the relatively greater height of oil in DIW-P07A. A preferential path through and around the laterals may exist toward DIW-P07A, and as soybean oil rose within the gravel pack it may have intercepted this assumed preferential path. During the second Part 2 soybean oil injection, the time to reach what could be considered leveling was much greater than for any of the other injection events. Additionally the apparent preferential flow of oil from piezometers DIW- P03C and DIW-P05C toward DIW-P07A appeared to have occurred again. The extended duration required for oil leveling after the last soybean oil injection indicates that there may be some plugging of the DIW-1 gravel pack and a subsequent reduction in hydraulic conductivity. This plugging of the pore space in the FX-99 gravel pack could be from both biofouling and precipitation. The most likely cause is biofouling due to the large increase in microbial activity. Addition evaluation of soybean oil leveling/depletion is continued below with the discussion of Figure 33.

Figures 33 shows the soybean oil flow and estimated depletion rates. In Figure 33 the first portion of each curve is interpreted to be reductions in thickness due to soybean oil flow from the injection points and subsequent leveling within DIW-1. The second portion of each curve is interpreted to be reductions in thickness due to initial microbial utilization of the soybean oil. And the third portion of the curve shown, for the second Part 1 injection and second portion of the curve for the second Part 2 injection, are interpreted to be the long-term microbial utilization. It is not anticipated that the soybean oil migrated from the DIW-1 gravel pack into the adjacent formation for the following reasons:

- The soybean oil is essentially insoluble and lighter than water. Therefore as it migrates through the gravel pack, it either coats the granules or rises to the water table surface and then floats on top of and depresses the water table and little is lost through dissolution.
- The DIW-1 HDPE membrane prevents migration of the soybean oil in the direction away from the DCPRB.
- The water elevation is greater on the DCPRB side of DIW-1 than within DIW-1 itself, therefore there is no driving force for the soybean oil to migrate toward the DCPRB.
- The soybean oil has a viscosity greater than water (see Table 16), it is located within the coarse DIW-1 gravel pack surrounded by low permeability, saturated, fine grained sediment, and it slightly depresses the water table over which it floats. Therefore there is no suction force to pull the soybean oil out of the gravel pack.

Soybean oil was injected into the "A" (water table) piezometers for the two Part 1 injections. For the first Part 1 injection there was a variation of soybean oil depths which became level by 50

days (Figure 33). Based on observations from the first injection the injection volume scheme was revised and leveling occurred in 25 days for the second injection. The first injection of the Part 2 study was performed using the deeper "C" piezometers. It was anticipated that soybean oil injection into lower portions of DIW-1 would increase the area impacted by sulfate reduction remediation by being retained on the FX-99 gravel pack as it migrated up through the water. For the Part 2 first injection overall leveling occurred in approximately 34 days with the exception of piezometers DIW-P07A and DIW-P03A. The Part 2 second injection never seemed to reach a point of leveling up to the point that field activities were completed at 112 days. One additional set of oil/water level data was collected on day 234 beyond the final field injection and it does not appear that oil leveling had occurred at that point.

Initially, following the Part 1 injections soybean oil microbial utilization rates (i.e. estimated soybean oil depletion rates) were determined. Rates of 1.81 gallons/day and 1.54 gallons/day were estimated respectively based upon the data associated with the first and second injections for Part 1 of the study (Figure 27). Having additional time to monitor depletion rates for the Part 1 study new depletion rates were calculated. Monitoring was limited to approximately 130 days for the first injection of each Part of the study. At that time the second injection was initiated. Looking at the short term depletion rate (i.e. approximately 130 days) following the first 3 injections the calculated depletion rates are 1.81, 2.68 and 2.73 gallons per day respectively with a combined average of 2.41 gallons per day. Based on 825 gallons of soybean oil injected this would mean the soybean oil would last approximately 11.4 months. Between Part 1 Injection 2 and the start of Part 2 activities six months elapsed and long term monitoring (355 days) occurred for this injection. After approximately 130 days a second inflection is noted (Figure 33). The data indicate a significant decrease in the depletion rate at that time from an average of 2.41 to 0.24 gallons per day. This is likely due to a shift from exponential growth phase to stationary growth phase of the microbial population. This decrease in growth rate could be a result of decreased availability of carbon and/or sulfate. Additionally a build up of microbial by-products could also contribute to decreased growth rates. Based upon this information, depletion of 825 gallons of soybean oil injected into DIW-1 would be anticipated to occur within six years.

Field activities were completed after approximately 112 days following the final Part 2 Injection 2, however one additional oil/water level measurement was conducted on day 234. Based on a review of the data, the slope of the initial curve when compared to the 3 previous injections appears to indicate a combination of both leveling and microbial utilization. The additional oil/water level measurements taken on day 234 for the Part 2 Injection 2 also provided additional evidence that a significant decrease in utilization occurred sometime after approximately 115 days. However for the data shown an apparent error in the field data must be explained. The oil depth measurement recorded for DIW-13A on 6/24/04, 7/12/04 and 11/11/04 is 3.05, 1.5, and 3.03 feet respectively. With the data from 7/12/04 (day 84) eliminated a lower boundary of "0" oil utilization is assumed and the upper boundary is assumed to be an inflection point on 6/24/04. The initial curve then extended past day 115. This provides the complete boundary conditions of where the inflection had to occur. A line with the same slope as the third curve from Part 1 Injection 2 was transposed through the final data point at day 234 and provides a reasonable estimate to an inflection point. Additionally if the oil depth measurement recorded for DIW-13A on 7/12/04 is revised to 3.04 feet based on the before and after readings the slope of the line as

determined graphically is -.0006x identical to Part 1 Injection 2 curve 3 with a long-term oil depletion rate of 0.24 gallons per day.

The microbial data (see Section 7.2.3) also suggest that microbial growth rates have decreased and that the decrease appears to be reflected in the decrease in the rate of soybean oil utilization. Although the bacterial numbers are expected to stay high after their initial increase in growth, bacterial metabolism is expected to be slower due to the higher population density.

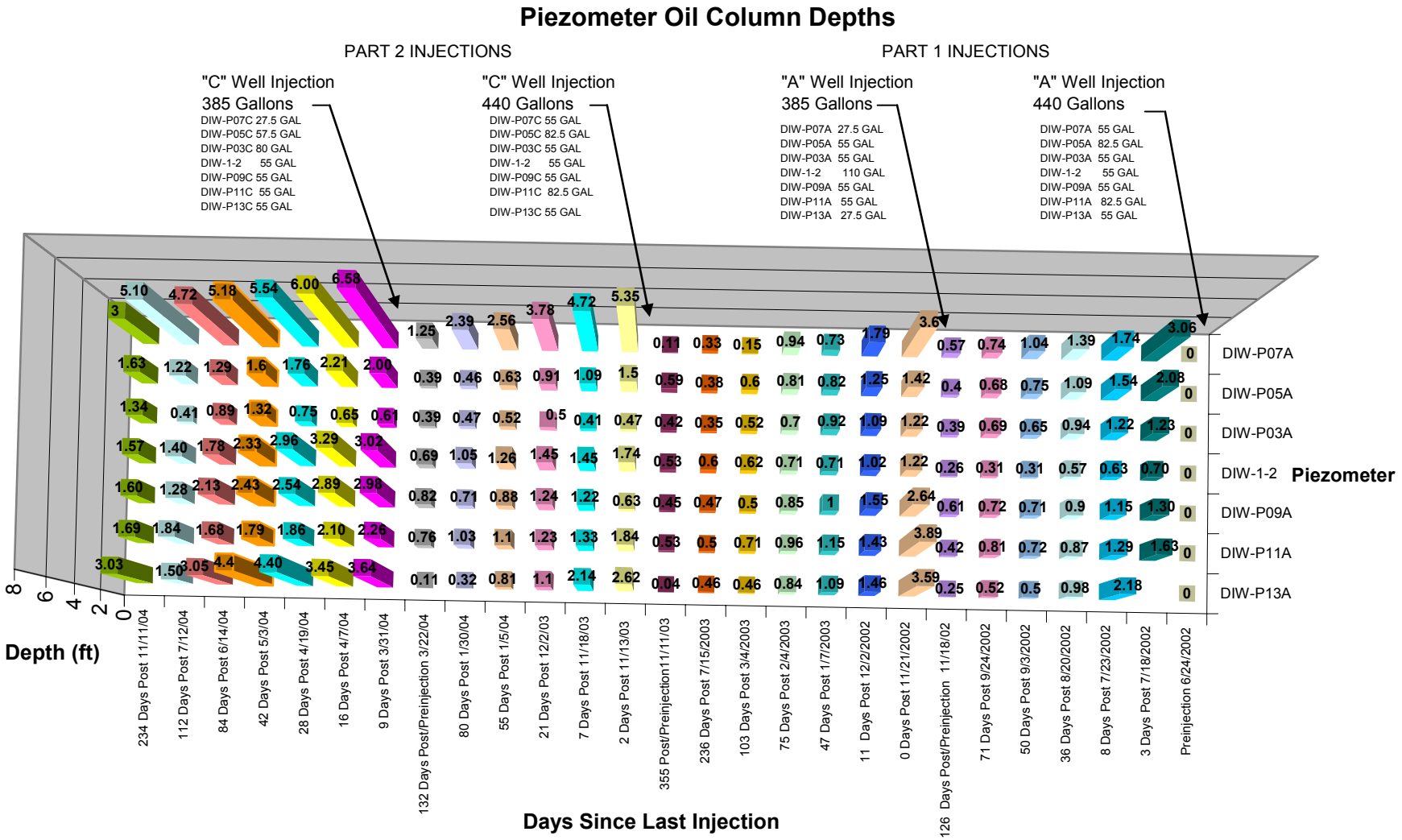


Figure 32 Piezometer Oil Column Depths

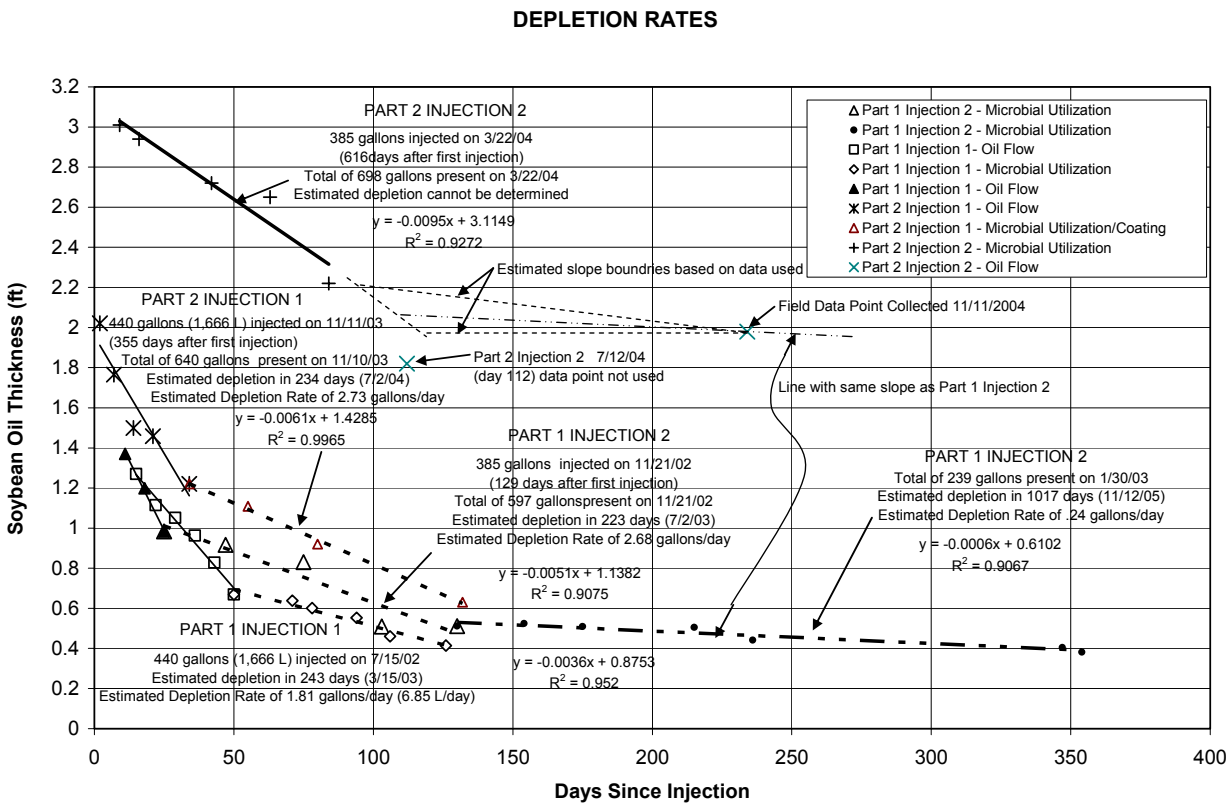


Figure 33 Soybean Oil Flow and Depletion (Part 1 and Part 2)

7.2.3 SRB

Overall, SRB activity increased substantially in all wells that received organic amendments immediately after the first Part 1 injection and remained elevated throughout the remainder of Part 1 and throughout Part 2 (Figure 34). The general trend was a greater increase in the SRB activity at the higher well elevations followed by increased SRB activity in the lower portions of the wells, albeit to a somewhat lesser degree. As outlined in Section 6.3 it is not clear whether or not the sodium lactate played a significant role in initiating sulfate reduction and facilitating the utilization of the soybean oil for sulfate reduction immediately after the first Part 1 injection which included sodium lactate injection. Also as outlined in Section 6.2, sodium lactate concentrations may have exceeded inhibitory levels in a portion of the South Wing for a limited time during Part 1. However it is known that soybean oil alone served as a carbon and energy source for the overall bacterial population, including SRB, and that the population density remained relatively constant for approximately 2-½ years without the presence of lactate.

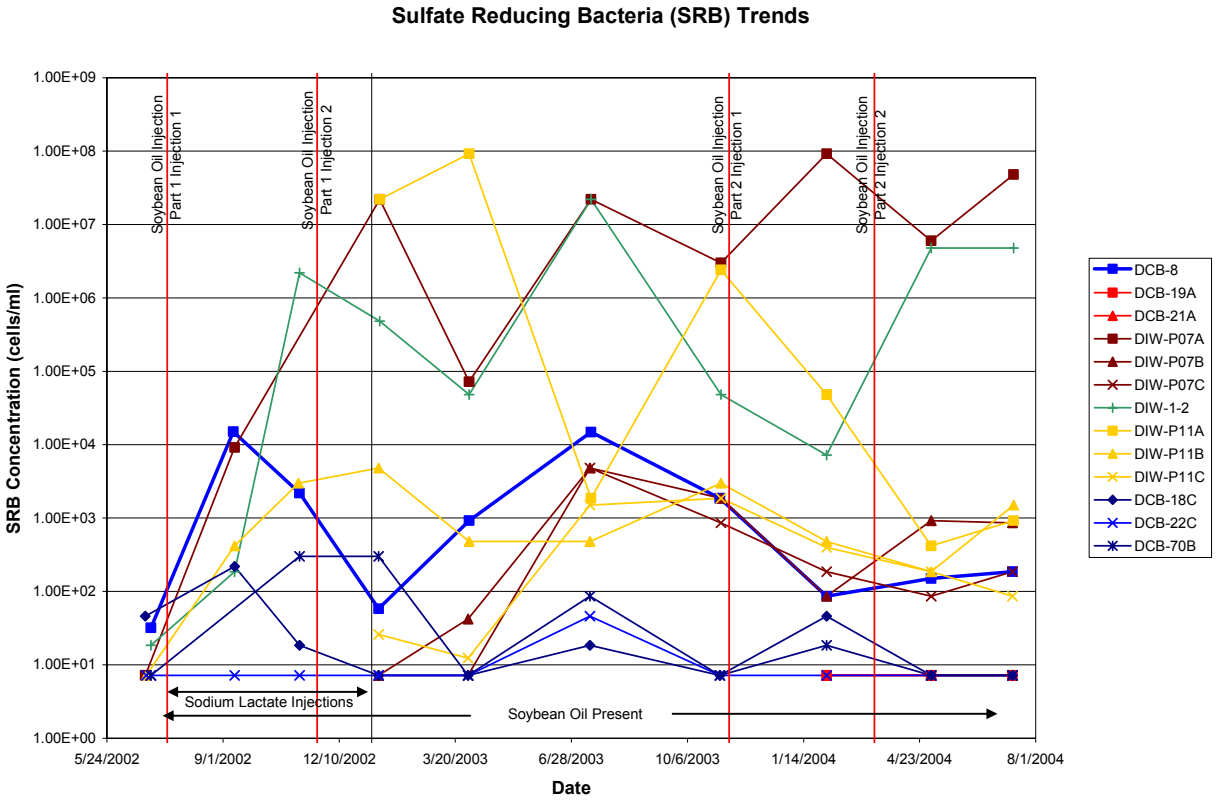


Figure 34 SRB Concentration Trends

7.2.4 Sulfate / Hydrogen Sulfide

Decreases in sulfate concentrations and intermittent increases in hydrogen sulfide concentrations observed throughout this study suggest that sulfate reduction is occurring within DIW-1. Evidence of sulfate reduction in DIW-1 was also observed prior to this study. Figure 35 and analytical data suggest that redox and pH conditions within DIW-1 became more favorable during this study for the stability of a reduced sulfate species (S^{-2}) such as H_2S or HS^-. Post-injection measurements show that the north wing piezometers (e.g. DIW-P03, P05, and P07), and DIW-P11A were more reducing and less acidic than upgradient and baseline (or pre-injection) conditions. These results are consistent with organic substrate injection (lactate and/or soybean oil) and processes associated with sulfate reducing bacteria. Conditions within other south wing piezometers (e.g. DIW-P09 and DIW-P11B&C) fluctuated throughout this study most likely reflecting changes in water chemistries and flow associated with rising water levels in the basin.

The partial pressure of H_2S has a significant influence on the quantity of H_2S that is soluble in the groundwater. Figure 36 provides solubility curves for H_2S using various partial pressures for H_2S. During this study H_2S concentrations in background (DCB-8) and upgradient wells ranged from < 0.001 (minimum detection limit) to 1 mg/L. Detected H_2S concentrations in these wells were far above the solubility of H_2S for a system open to the atmosphere (partial pressure = 5 X 10^{-11} atm) suggesting that the partial pressure of H_2S in the system is probably near 1 X 10^{-5} atm. Intermittent increases in H_2S concentrations above background and upgradient concentrations were observed in piezometers within the wall (e.g. DIW-P07, DIW-P09, and DIW-1-2) and approached the maximum H_2S solubility (assuming a closed system). The highest H_2S concentrations were observed in piezometers with pH less than 5. The precipitation of metal sulfides such as iron monosulfide (FeS) may have contributed to keeping H_2S near or at saturation within the wall at locations with a pH above 5.

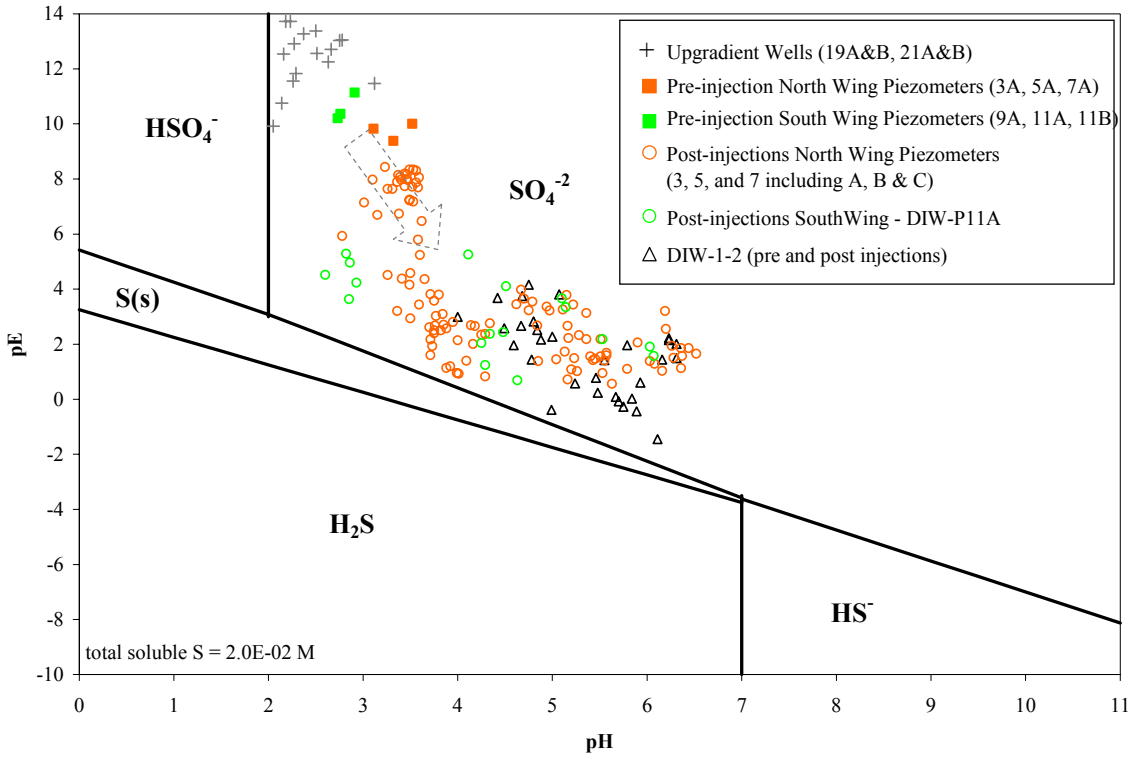


Figure 35 pe-pH for Sulfur Species

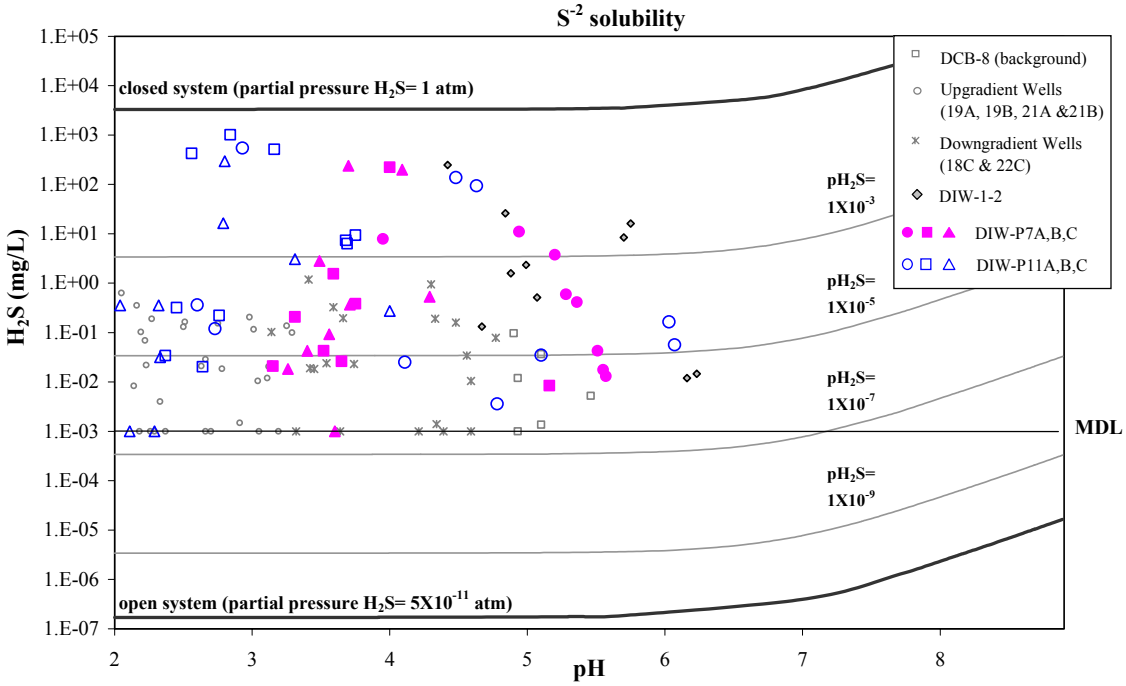


Figure 36 Sulfide Solubility

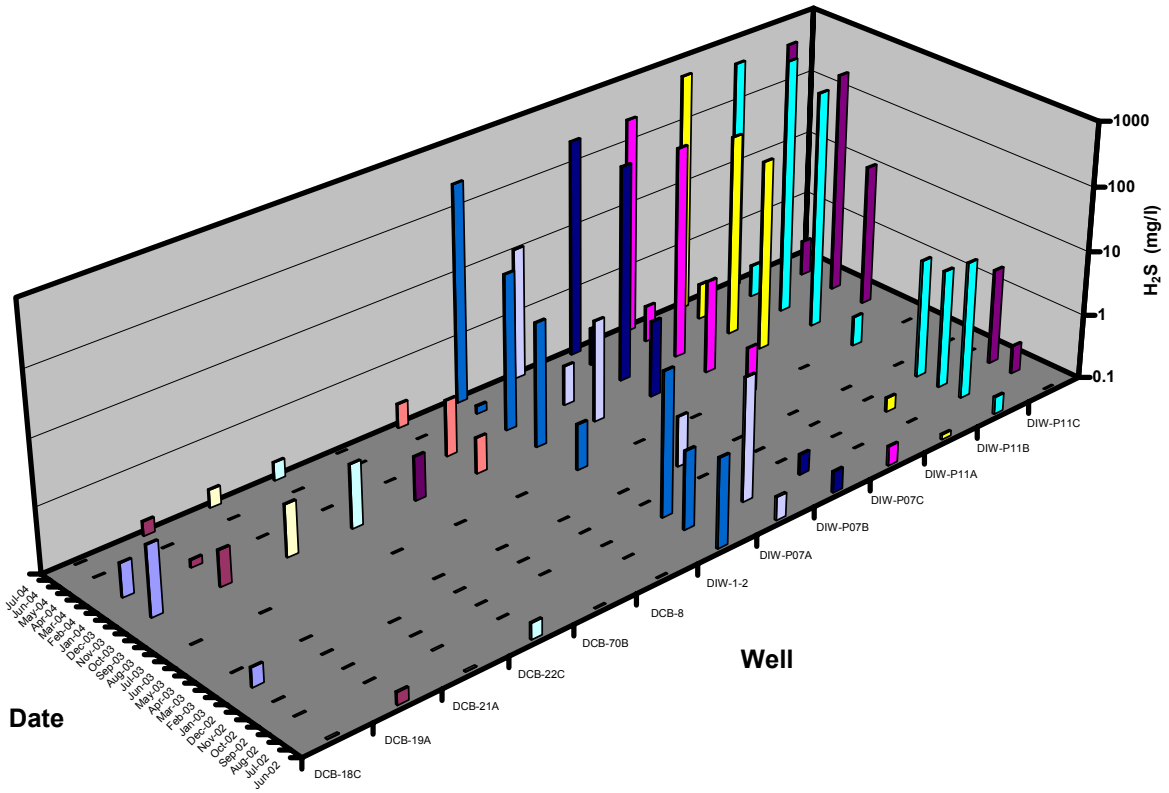


Figure 37 Hydrogen Sulfide Concentration Trends

Figure 37 provides an alternate view of the hydrogen sulfide concentration trends over time. The pre-injection hydrogen sulfide concentrations were essentially the same for all locations except for DIW-1-2. It was previously known that some level of sulfate reduction was occurring in the vicinity of DIW-1-2, probably due to an organic coating on some steel components installed near DIW-1-2 during DIW-1 construction. Hydrogen sulfide concentrations throughout DIW-1 quickly increased over those in background and up gradient locations, and they continued to remain above background and up gradient concentrations even though the background and up gradient locations showed a decreasing trend with time, probably due to the increased flux of water as the water level rose. The hydrogen sulfide trends within the lower zone of the South wing seem to be impacted similarly to those of the VFAs with the concurrent cessation of sodium lactate injection and water level rise. That is they appear to have increased and then subsequently decreased. On the other hand hydrogen sulfide concentrations have seemed to increase over time in the deeper portions of the North wing relative to background and up gradient concentrations. This indicates that the zone of influence of the soybean oil has increased with time in this wing.

It is clear that both the soybean oil and sodium lactate have resulted in the promotion of sulfate reduction as evidenced by the decrease in sulfate concentration and increase in hydrogen sulfide concentrations.

7.2.5 Indicator Parameters (pH; Eh; conductivity)

Figures 38-40 provide cross-sectional views of the upgradient side of the wall (DIW-1) with contoured indicator (field) parameters that were measured throughout the study. These values are based on samples collected using a peristaltic pump and measured at the surface. The two wings of the wall (north wing, P03-P07, and south wing, P09-P13) are evident in the contouring and are divided in the middle by DIW-1-2.

Some adjustments were made for contouring the indicator parameters because the data were limited. These adjustments are discussed below.

1. Each sample collected from a piezometer provides a combined measurement of water quality for the water pulled through the screen zone during pumping. Values presented in the cross-sections may not accurately reflect heterogeneity within the contaminant plume. In particular, DIW-1-2 in the center of the wall is a fully screened well. For the contouring, this "average" pH measurement was assumed to be the pH for the entire well screen.
2. The baseline cross-section (June 2002) does not reflect values measured throughout the wall. Measurements were made primarily in the "A" piezometers (with the exception of DIW-P11B and DIW-1-2) and these values were then assumed to be the same for all elevations.
3. Values near the edges of the wall may not accurately represent the contaminant plume concentrations but may be artifacts of the contouring.

Although the diagrams may not allow for quantitative analysis, the diagrams are useful for depicting the overall conditions in the wall and the changes that occurred during the study.

Based on the contours and measured data, the south wing has been more acidic and has had higher specific conductivities than the north wing. This same trend was observed in the upgradient wells with DCB21A (on the south side) having lower pH and higher specific conductivities than DCB19A (on the north side). During the latter part of the study (July 2003-July 2004), an increase in acidity and specific conductivity was observed in several of the south wing piezometers and in the upgradient well DCB19A. The increase in acidity (H^+) and specific conductivity observed in the latter part of the study likely reflects changes in water chemistries and flow associated with rising water levels in the basin and aquifer. Figure 41 provides average water elevation in DIW-1, rainfall and the sample dates for the cross-sectional data. This graph shows an increase in rainfall and water levels in DIW-1 from March to June 2003. An increase in water levels in the basin would lead to more water in contact with a wider area of coal tailings (more reactive surfaces), which may produce greater oxidation of minerals (e.g. elemental sulfur and pyrite). This oxidation would create more acidity and increase sulfate concentrations. The greater surface area in contact with the basin water and increase in acidity could also cause more metals (e.g. Al, Cu, Fe, Ni, Zn) to leach from minerals present within the coal and aquifer

formation, which along with the sulfate would increase the ionic activity of the water and its electrical conductance (specific conductivity). In addition to the increase in acidity and dissolved ions, the increase in water levels may also have created greater flow (more water with less residence time) at the south wing of the wall (DIW-1) thereby consuming (or overwhelming) the sulfate reduction processes that may have been established.

In contrast to the south wing, the north wing showed a decrease in acidity (increase in pH) throughout the study (particularly from July 2003-July 2004) despite an increase in acidity in the upgradient well (DCB-19A). However, the position and angle of the north wing influences the influent water the north wing receives from the basin and so it may not be a direct comparison with the south wing. Unlike the south wing wall, specific conductivity in the north wing remained approximately the same throughout the study suggesting that the ionic activity (concentration of dissolved ions) did not drastically change despite the increasing water levels and increase in specific conductivity in the upgradient well (DCB-19A).

From June 2002 to November 2002, Eh decreased in all of the "A" piezometers and in DIW-P11B likely from the reducing conditions generated from the injection of organics. An increase in Eh was observed in both the north and south wings for January through July 2003. This increase in oxidizing conditions corresponds to the increase in rainfall and water levels and may reflect the initial influx of fresh water from the basin and aquifer. The subsequent decrease in Eh in May and July 2004 may show a return to more reducing conditions in the basin water or the influence of soybean oil and sulfate reduction processes within the wall.

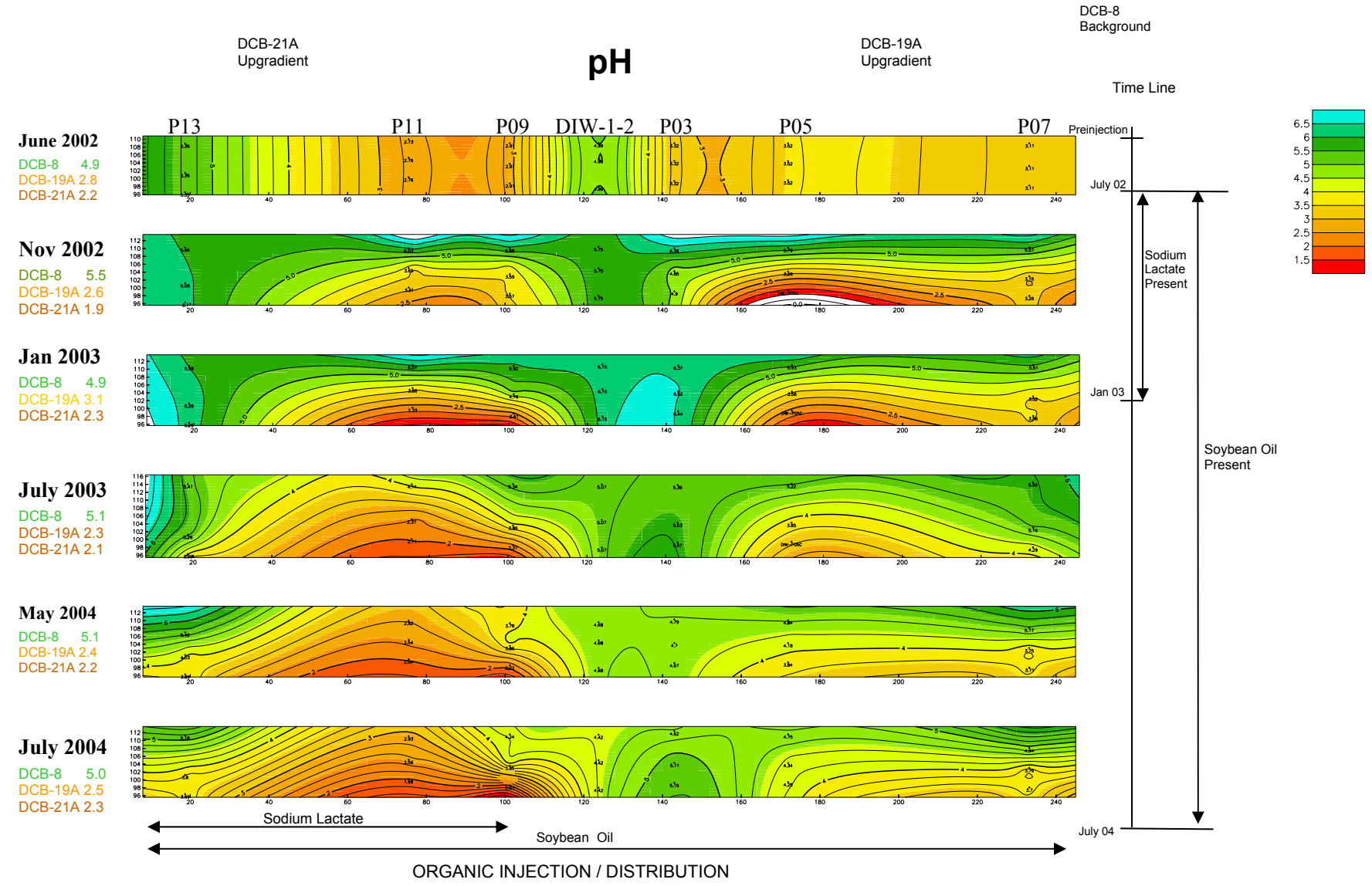

pH
DCB-21A
Upgradient
DCB-19A
Upgradient
DCB-8
Background
Time Line
P13
P11
P09
DIW-1-2
P03
P05
P07
Preinjection
July 02
Jan 03
July 04
Sodium
Lactate
Present
Soybean Oil
Present
June 2002
DCB-8 4.9
DCB-19A 2.8
DCB-21A 2.2
Nov 2002
DCB-8 5.5
DCB-19A 2.6
DCB-21A 1.9
Jan 2003
DCB-8 4.9
DCB-19A 3.1
DCB-21A 2.3
July 2003
DCB-8 5.1
DCB-19A 2.3
DCB-21A 2.1
May 2004
DCB-8 5.1
DCB-19A 2.4
DCB-21A 2.2
July 2004
DCB-8 5.0
DCB-19A 2.5
DCB-21A 2.3
Sodium Lactate
Soybean Oil
ORGANIC INJECTION / DISTRIBUTION

Figure 38 pH

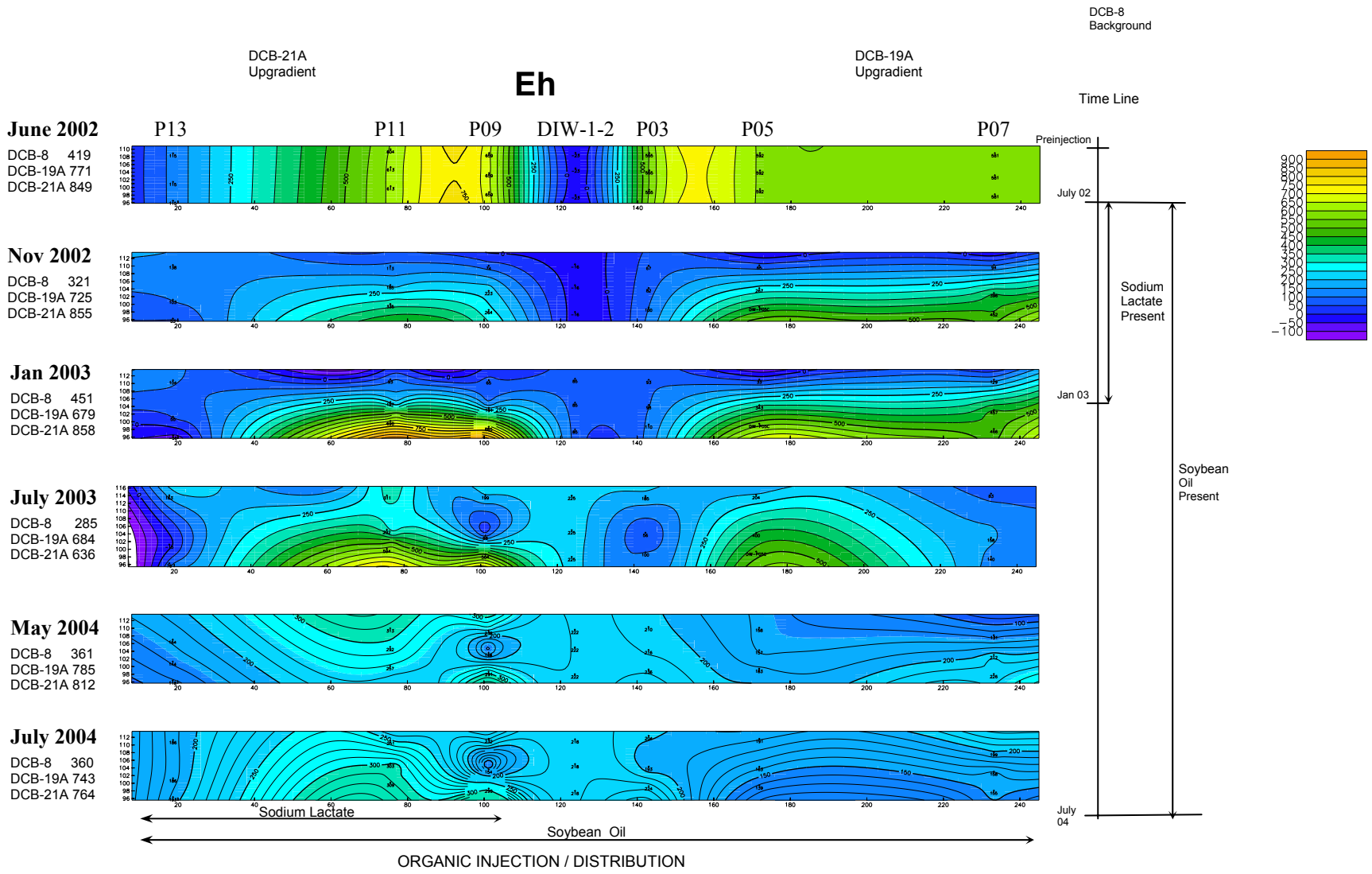

Eh
DCB-21A Upgradient
DCB-19A Upgradient
DCB-8 Background
Time Line
P13
P11
P09
DIW-1-2
P03
P05
P07
June 2002
DCB-8 419
DCB-19A 771
DCB-21A 849
Nov 2002
DCB-8 321
DCB-19A 725
DCB-21A 855
Jan 2003
DCB-8 451
DCB-19A 679
DCB-21A 858
July 2003
DCB-8 285
DCB-19A 684
DCB-21A 636
May 2004
DCB-8 361
DCB-19A 785
DCB-21A 812
July 2004
DCB-8 360
DCB-19A 743
DCB-21A 764
Preinjection
July 02
Jan 03
July 04
Sodium Lactate Present
Soybean Oil Present
Sodium Lactate
Soybean Oil
ORGANIC INJECTION / DISTRIBUTION

Figure 39 Eh

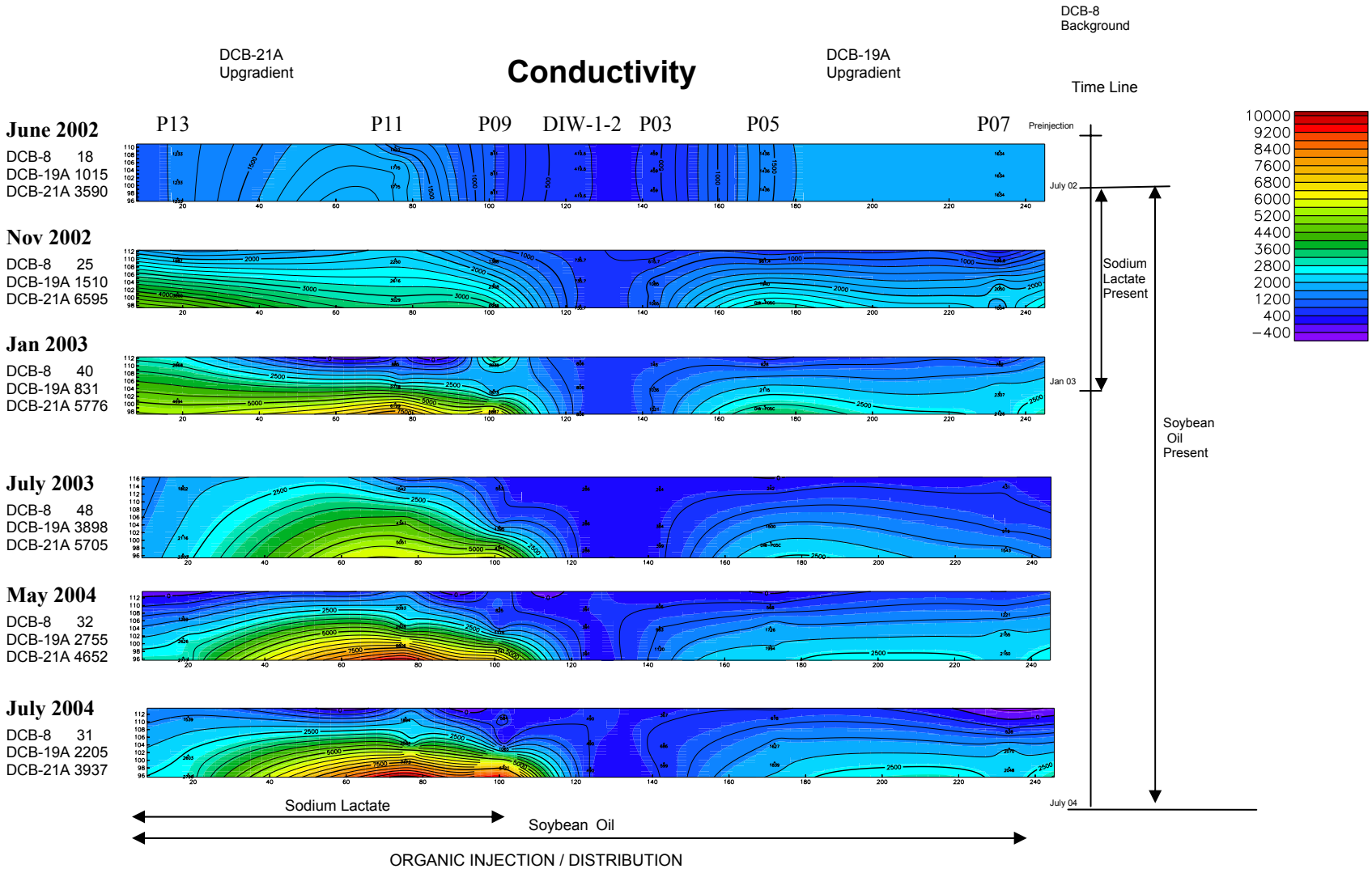


Figure 40 Conductivity

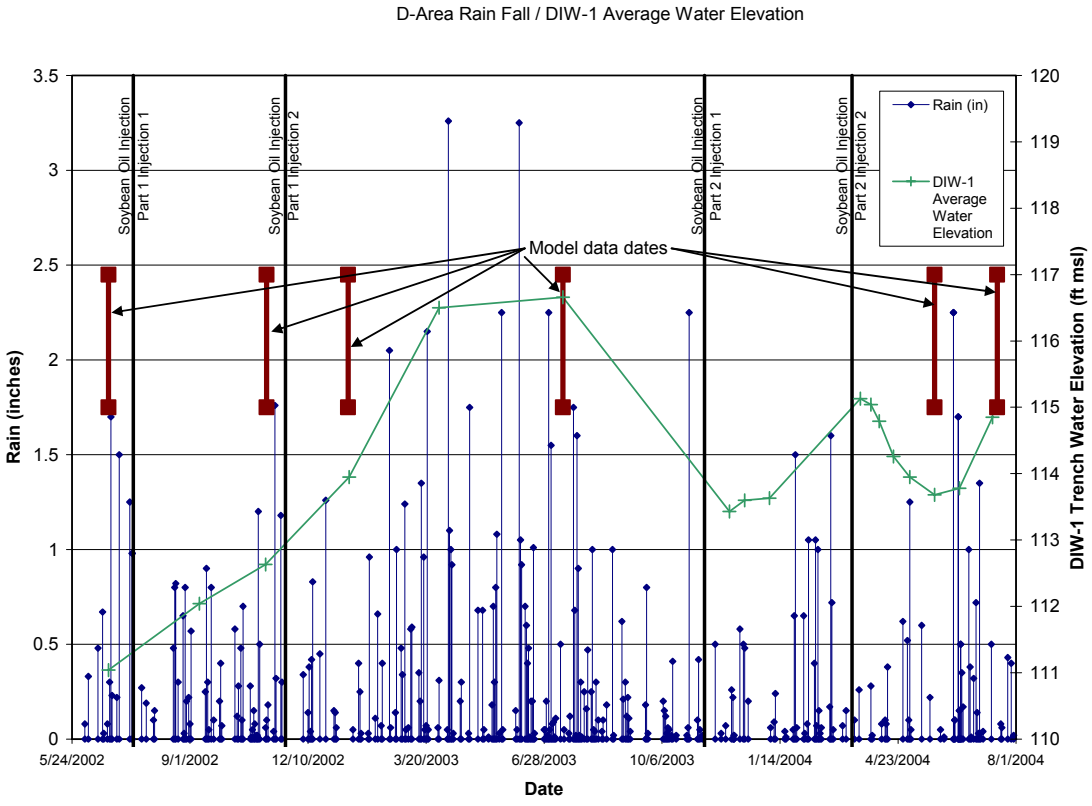


Figure 41 Average Rainfall/DIW-1 Water Elevation

7.2.6 Metals (Al, Fe, Cr, Cu, Ni, Zn)

Precipitation or coprecipitation of metals along with adsorption (surface complexation) may account in part for the decrease in concentrations observed during this study. With the formation of sulfide species produced from sulfate reduction, metals can precipitate as sulfide minerals such as monosulfide (FeS), mackinawite ($FeS_{(1-x)}$), pyrite (FeS_2), chalcopyrite ($CuFeS_2$), covellite (CuS), chalcocite (Cu_2S), millerite (NiS) and sphalerite (ZnS) thereby decreasing metal concentrations in the groundwater. Increases in pH from the sulfate reduction will also favor the precipitation of aluminum and chromium hydroxides decreasing aluminum and chromium concentrations in the groundwater.

Figure 42 and analytical data suggest that redox and pH conditions were favorable in the wall during this study for the precipitation of iron sulfides. In upgradient locations and baseline wall data, ferric iron (Fe^{+3}) was likely the predominant species in the groundwater. Under these conditions, the precipitation of a solid ferric oxide or oxyhydroxide would be favored. With the initiation of the study, pe decreased and pH increased in the piezometers within DIW-1 favoring the predominance of ferrous iron (Fe^{+2}) and the precipitation of iron sulfides.

Figure 43 shows the results from a simplistic reaction model to demonstrate the effect of likely precipitation reactions on groundwater contaminant concentrations. The initial groundwater chemistry was based on DCB-19A, an upgradient well on the north side of DIW-1. To simulate the processes associated with sulfate reduction, carbon was gradually reacted with the groundwater while allowing sulfide and hydroxide minerals to precipitate. With the consumption of acid and production of bicarbonate, pH increases and some sulfide minerals become oversaturated. The precipitation of these minerals decreases the Fe, Zn and Cu concentrations in the groundwater. If enough carbon is reacted, pH significantly increases and the groundwater becomes oversaturated with respect to sulfide and hydroxide minerals causing these minerals to precipitate. For this simplistic model (assuming equilibrium and steady-state, i.e. no flow in or out), low concentrations of carbon are needed to affect pH and metal concentrations. However, the model does not reflect the fluctuations in iron concentrations observed during this study. Reductive dissolution of existing iron oxides and oxyhydroxides would generate increases in iron concentrations, which would presumably precipitate as iron sulfides.

Although sulfate reduction processes promote mineral precipitation, this precipitation would replace a small percentage of the porosity in the wall (DIW-1). Basic calculations were performed and showed that iron sulfide precipitation from a single pore volume would fill a maximum of 0.008% of the porosity and aluminum hydroxide would fill a maximum of 0.04% of the porosity. These calculations were based on worst case groundwater concentrations with the following assumptions:

- All of the mineral precipitation would occur in the wall (in the FX-99 sand in DIW-1)
- Iron sulfide and aluminum hydroxides would be the primary minerals precipitating

- Porosity of the FX-99 sand = 30%
- All iron would precipitate as FeS_2 with density of ~5 g/cm^3
- Maximum concentration of iron in DCB-19A (217 mg/L) of which 197 mg/L would precipitate (based on minimum iron concentration of ~20 mg/L observed in north wing of the wall)
- All aluminum would precipitate as $Al(OH)_3$ with density of ~2 g/cm^3
- Maximum concentration of aluminum in DCB-19A (324 mg/L) of which 323.97 mg/L would precipitate (based on minimum aluminum concentration of ~0.03 mg/L observed in north wing of the wall)

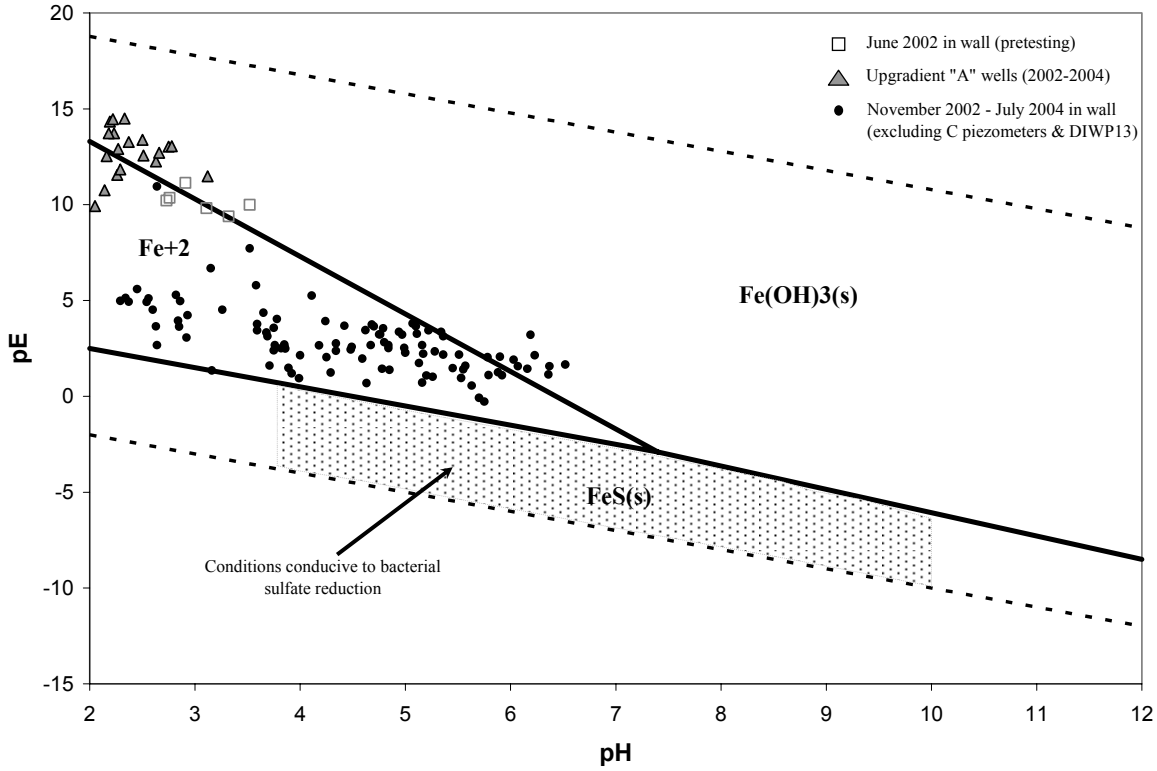


Figure 42 pe-pH Diagram for Iron and Trends in Iron Concentrations

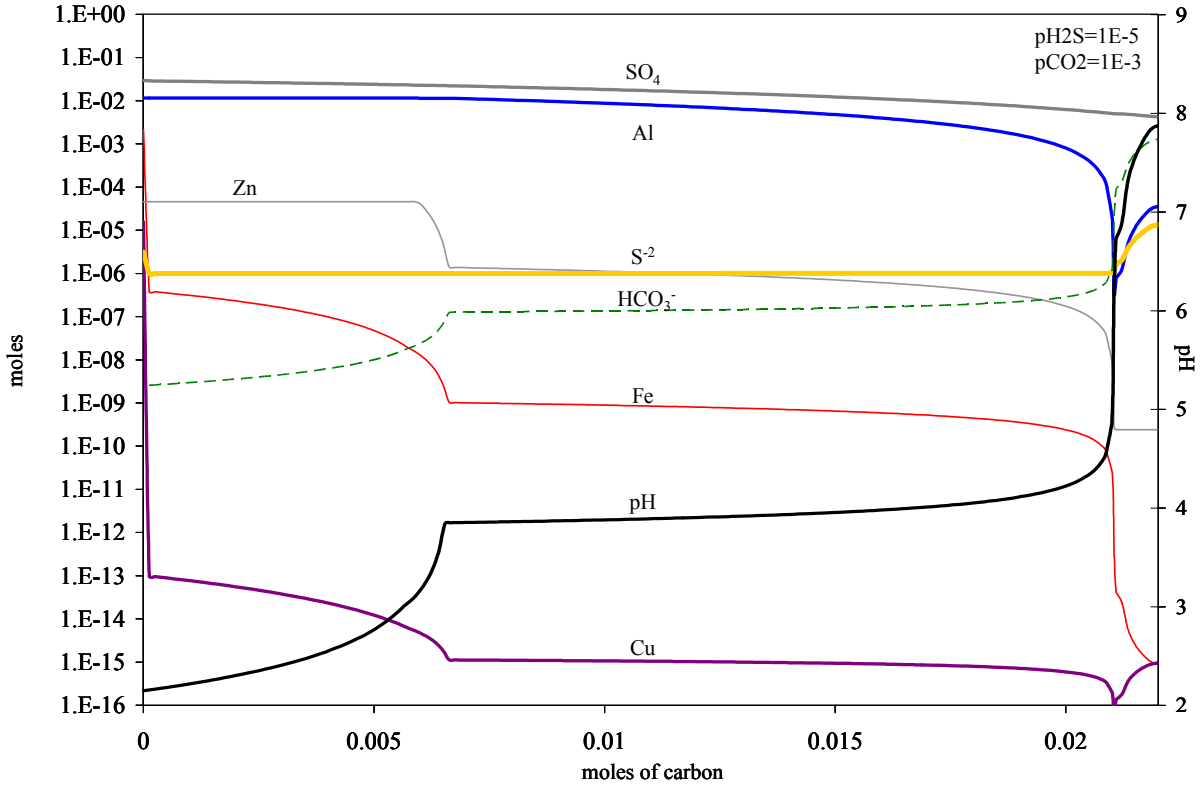


Figure 43 Reaction Model

7.2.7 Nitrate / Nitrite

Nitrate and nitrite serve as sources of nitrogen, a required nutrient for almost all bacteria (section 2.3). Our previous calculations determined that nitrogen would not be a limiting nutrient in this aquifer and based on the growth of SRB as well as VFA production, nitrogen was not limiting in this system. In addition, nitrate and nitrite reducing bacteria use these compounds as terminal electron acceptors and compete against SRB for carbon sources (section 2.3). Based on our data the nitrate and nitrite concentrations were not in high enough concentration to establish a significant nitrate/nitrite reducing microbial population, thus SRB were the dominant anaerobic respiratory population.

7.3 SUMMARY

The DIW-1 South wing is essentially perpendicular to the primary direction of D-Area groundwater flow and is closer to the standing water in DCPRB, whereas the DIW-1 North wing is at close to a forty five degree angle to the primary direction of D-Area groundwater flow and is further from the standing water in DCPRB. However groundwater flow in the immediate vicinity of DIW-1 is toward DIW-1 from either side, downward through DIW-1 to the higher permeability, lower portion of the aquifer, and then toward the Savannah River, regardless of wing. In general the South wing intercepts a higher flux of groundwater and contaminants than the North wing, since it is perpendicular to the primary groundwater flow direction and is closer to standing water in DCPRB.

Over the course of the Part 1 and 2 studies water table levels within DIW-1 varied from approximately 122 ft-msl at the initiation of Part 1 to a maximum of 128 ft-msl prior to the initiation of Part 2 due to increased rainfall. Water table levels remained elevated at between 125 and 127 ft-msl during the Part 2 study. Corresponding variations in water levels were also seen within the DCPRB. An increase in water levels in the basin would lead to more water in contact with a wider area of coal tailings closer to DIW-1 and would create more acidity and increase the sulfate and metals (e.g. Al, Cu, Fe, Ni, Zn) concentrations. In addition to the increase in acidity and dissolved ions, the increase in water levels may also have created greater flow (more water with less residence time) through DIW-1 particularly within the South wing.

It is in this context that a total of 825 gallons of soybean oil was injected during two separate injections events into the upgradient side of both the North and South wings through the deepest screen zones, during Part 2 of the field application. Over less than a two week period after injection into the deepest screen zones of DIW-1, the bulk of the soybean oil migrated through the coarse gravel pack and came to float on and depress the water table surface within DIW-1. However an extended duration was required for soybean oil to level out within DIW-1 particularly after the last injection. This indicates that there may have been some plugging of the DIW-1 gravel pack and a subsequent reduction in hydraulic conductivity due to biofouling.

Phase 2 baseline (pre-injection) and post-injection groundwater monitoring was conducted to determine if soybean oil alone could maintain sulfate reduction and to evaluate its impact on microbial populations, pH, Eh, and concentrations of metals, sulfate/sulfide, and nutrients. Based upon this Phase 2 monitoring, it was determined that soybean oil alone could serve as a SRB carbon and energy source in order to maintain sulfate reduction. Over 2-½ years, without the presence of lactate the following have in general been observed which support the conclusion that soybean oil alone can be utilized to maintain sulfate reduction:

- The overall bacterial population, including SRB, within DIW-1 has remained elevated relative to background and upgradient locations.
- In general the pH has increased and the Eh has decreased within DIW-1.
- In general metal concentrations (Al, Fe, Cr, Cu, Ni, Zn) have decreased due to precipitation or coprecipitation along with adsorption (surface complexation).
- Sulfate concentrations have decreased and intermittent increases in hydrogen sulfide concentrations have been observed throughout DIW-1.
- Based upon the response of SRB, it was determined that nitrogen was neither limiting to SRB in DIW-1 nor was it so great as to result in significant nitrate and nitrite reducing bacteria populations, which could compete against SRB for carbon sources.

In general the observations noted above were most prominent in the upper portions of DIW-1 closest to the soybean oil. Additionally these observations, in general, became more prominent over time within the lower portions of the North wing. Finally these observations, in general, were least prominent within the lower portions of the South wing. This is attributed to the South wing receiving a greater flow of more acidic and contaminated water, due to its orientation relative to groundwater flow and its proximity to standing water within the DCPRB.

The data also indicate that a short-term microbial utilization rate of 2.41 gallons per day occurs during the initial exponential microbial growth phase (i.e. approximately 130 days) followed by a long-term microbial utilization rate of 0.24 gallons per day after the microbial population has stabilized at an elevated population density. Based upon this information, depletion of 825 gallons of soybean oil injected into DIW-1 would be anticipated to occur within six years.

In summary the use of soybean oil alone has promoted and maintained sulfate reduction remediation within DIW-1 over a 2-½ year period. Soybean oil injection into lower portions of DIW-1, however, does not appear to substantially increase the area impacted due to its relatively quick migration through the coarse gravel pack to the water table surface. The soybean oil does provide a long-term carbon and energy source for SRB, with an estimated long-term DIW-1 utilization rate of approximately 100 gallons per year.

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8.0 STUDY SUMMARY AND CONCLUSIONS

8.1 Study Summary

The studies implemented, as part of the Treatability Study Work Plan (TSWP) (WSRC 2001) to evaluate the potential for the sulfate reduction remediation of the D-Area Coal Pile Runoff Basin (DCPRB) acidic/metals/sulfate, groundwater contaminant plume, included:

- Bacteria Population and Organic Selection Laboratory Testing,
- DTT-1 Trench Evaluation,
- DIW-1 Organic Application Field Study-Part 1, and
- DIW-1 Organic Application Field Study-Part 2.

The Bacteria Population and Organic Selection Laboratory Testing was conducted to assess the D-Area subsurface physical, chemical and biological parameters for bioremediation potential. The potential for microbial growth was also examined for several organic carbon substrates. In summary, it was concluded based upon this laboratory study, that the D-area acidic/metals/sulfate groundwater plume could potentially be remediated with sulfate reduction combined with Monitored Natural Attenuation (MNA). It was determined that remediation by sulfate reduction should aid in reducing metal concentrations and would raise the pH of the contaminated groundwater. The high sulfate concentrations relative to concentrations of other constituents needed by microbial competitors favors the growth of SRB. Additionally SRB are naturally present within the groundwater in the vicinity of DIW-1. However, the low organic carbon, low pH and high Eh present in the plume are not advantageous for SRB growth. During testing microcosms treated with limestone, which increased the pH of those microcosms, had greater SRB densities than microcosms without limestone treatment. At a minimum the addition of an organic substrate(s) is required to promote sulfate reduction remediation. Both sodium lactate and soybean oil are capable of stimulating the microbial population as a whole including SRB. HRC® decreased the pH of the microcosms and appeared to have a negative effect on microbial growth in general. Although sodium lactate is capable of stimulating the SRB population, it may have inhibitory effects above concentrations of 1% (i.e. 6.3 g/L of lactate). SRB activity was inhibited by lactate levels above 1% when the bacterial inoculua used were not acclimated to lactate. SRB cultures acclimated to lactate did not demonstrate the same degree of inhibition to lactate as unacclimated culture. This demonstrates that lactate addition to the subsurface will accelerate SRB activity provided that the final lactate concentrations do not exceed 1%. With time, as the indigenous SRB become acclimated to lactate, the degree of inhibition is likely to decline. Most likely this is a result of the selection of an SRB population that has become somewhat acclimated to the lactate concentrations imposed. While the laboratory data also indicate a trend towards sodium inhibition as well, lactate concentrations appear to play a major role in SRB inhibition.

Based upon the laboratory testing results, soybean oil and sodium lactate were selected as the organic substrates for injection during the subsequent pilot scale field demonstration. It was anticipated that the soybean oil would provide a long-term, slow release, carbon source for the SRB, and the sodium lactate would provide a short-term, immediately available carbon source. Due to the location, configuration, and physical condition of DIW-1, it was decided to use it as the injection system for injection of sodium lactate and soybean oil during the subsequent field demonstration. It was also decided that the existing DTT-1 limestone trench should be re-evaluated to determine current hydraulic and geochemical activity, since limestone was shown to improve SRB response in the laboratory testing.

The re-evaluation of the DTT-1 limestone trench was conducted to determine if the hydraulic and geochemical activity of the trench was similar to its initial conditions upon installation 3-½ years previously. Additionally the potential to promote sulfate reduction at the limestone trench with the addition of an organic carbon substrate was evaluated. Based upon a comparison of specific capacity measurements, the limestone trench appeared to be essentially as hydraulically active after 3-½ years, as it was at its installation. This indicates that precipitate accumulation had not significantly plugged the limestone or the formation. Additionally based upon analytical results it was determined that the limestone trench remained an effective treatment for increasing the pH and removing aluminum both within and downgradient of the trench as at installation. Finally based upon the microbial results it was determined that the limestone trench had increased microbial activity, including SRBs, both within and downgradient of the trench and had in general improved conditions relative to optimal sulfate reduction conditions from upgradient conditions. This indicates that limestone installed within the DCPRB plume can be utilized to move conditions toward optimal sulfate reduction conditions over at least a 3-½ year period without significant limestone or formation pluggage and without significant limestone armoring and deactivation. Such use of limestone would facilitate sulfate reduction remediation through the injection of organic substrate.

As a result of the laboratory testing the DIW-1 Organic Application Field Study-Part 1 was conducted. The Part 1 field study demonstrated that soybean oil does provide a relatively long-term, slow release, carbon source for the SRB. Based upon the results it was anticipated that the 825 gallons of soybean oil injected would promote of sulfate reduction of approximately 18 months. It was also demonstrated that sodium lactate does provide a short-term, immediately available carbon source for SRB. The sodium lactate promoted a quick sulfate reduction response and was quickly depleted. Injection of sodium lactate, however, must take into consideration the inhibitory SRB response to elevated sodium lactate concentrations and the quick lactate depletion. These facts mean that sodium lactate, if utilized, must be injected frequently in low quantities, which results in increased costs over that of soybean oil injection, which can be performed infrequently in high quantities as noted above. Therefore the best use of sodium lactate appears to be to quickly initiate sulfate reduction and facilitate the subsequent utilization of soybean oil for continuation of sulfate reduction.

From Part 1 of the field study, however, it was not clear whether or not the sodium lactate played a significant role in initiating sulfate reduction and facilitating the utilization of the soybean oil for sulfate reduction. Essentially concurrent with cessation of sodium lactate injections in the South wing, a significant rise in water levels occurred. The water level rise resulted in both an increased flux of contaminated groundwater, particularly to the South wing, and an increased distance of the DIW-1 lower zone from the soybean oil. This resulted in decreased levels of sulfate reduction within the South wing over that initially experienced. Additionally although sodium lactate was not injected directly into the North wing, slightly elevated lactate concentrations were detected within the North wing for a brief period of time. The North wing, which was assumed to have received a lesser flux of contaminated groundwater than the South wing, demonstrated an increased depth of sulfate reduction influence with time. These occurrences make the role of sodium lactate relative to initiating sulfate reduction and facilitating the utilization of soybean oil for sulfate reduction somewhat unclear.

Finally the following are apparent from Part 1 of the field study relative to the use of soybean oil to promote sulfate reduction remediation within the DCPRB acidic/metals/sulfate groundwater plume:

- Soybean oil alone has promoted sulfate reduction remediation. Sodium lactate may not be necessary for the initiation of sulfate reduction and to facilitate soybean oil utilization.
- Soybean oil does provide a long-term, slow release, carbon source for SRB, and it is significantly cheaper than sodium lactate in terms of both material costs and injection costs. The soybean oil for this field study cost approximately $175 per 55-gallon drum versus $770 per 55-gallon drum for 60% sodium lactate. During this field study only two soybean oil injections were conducted for the injection of 825 gallons, whereas fifteen sodium lactate injection were required for the injection of 227.5 gallons.
- The distribution and proximity of soybean oil are the primary factors that influence the overall effectiveness of sulfate reduction remediation promoted by soybean oil injection.

Based on the findings in Part 1 of the field study, the DIW-1 Organic Application Field Study-Part 2 was conducted to determine if soybean oil alone could maintain sulfate reduction and to evaluate its impact on microbial populations, pH, Eh, and concentrations of metals, sulfate/sulfide, and nutrients. A total of 825 gallons of soybean oil was injected during two separate injections events into the upgradient side of both the North and South wings through the deepest screen zones, during Part 2 of the field application. Over less than a two week period after injection into the deepest screen zones of DIW-1, the bulk of the soybean oil migrated through the coarse gravel pack and came to float on and depress the water table surface within DIW-1. This indicates that soybean oil injection into lower portions of DIW-1 does not substantially increase the area impacted due to its relatively quick migration through the coarse gravel pack to the water table surface.

However over 2-½ years, without the presence of lactate the following have in general been observed which support the conclusion that soybean oil alone can be utilized to maintain sulfate reduction:

- The overall bacterial population, including SRB, within DIW-1 has remained elevated relative to background and upgradient locations.
- In general the pH has increased and the Eh has decreased within DIW-1.
- In general metal concentrations (Al, Fe, Cr, Cu, Ni, Zn) have decreased due to precipitation or coprecipitation along with adsorption (surface complexation).
- Sulfate concentrations have decreased and intermittent increases in hydrogen sulfide concentrations have been observed throughout DIW-1.
- Based upon the response of SRB, it was determined that nitrogen was neither limiting to SRB in DIW-1 nor was it so great as to result in significant nitrate and nitrite reducing bacteria populations, which could compete against SRB for carbon sources.

In general the observations noted above where most prominent in the upper portions of DIW-1 closest to the soybean oil. Additionally these observations, in general, became more prominent over time within the lower portions of the North wing. Finally these observations, in general, were least prominent within the lower portions of the South wing. This is attributed to the South wing receiving a greater flow of more acidic and contaminated water, due to its orientation relative to groundwater flow and its proximity to standing water within the DCPRB.

The data also indicate that a short-term microbial utilization rate of 2.41 gallons per day occurs during the initial exponential microbial growth phase (i.e. approximately 130 days) followed by a long-term microbial utilization rate of 0.24 gallons per day after the microbial population has stabilized at an elevated population density. Based upon this information, depletion of 825 gallons of soybean oil injected into DIW-1 would be anticipated to occur within six years.

In summary Part 2 of the field study demonstrated that the use of soybean oil alone promoted and maintained sulfate reduction remediation within DIW-1 over a 2-½ year period. The soybean oil does provide a long-term carbon and energy source for SRB, with an estimated long-term DIW-1 utilization rate of approximately 100 gallons per year.

8.2 Study Conclusions

The conclusions presented herein address in summary the questions outlined in Section 3.0, which are listed as the objectives and focus of this study.

- Sulfate reduction has been promoted and maintained within DIW-1 by the injection of sodium lactate and/or soybean oil as evidenced by the increased SRB populations, increased H_2S concentrations, increased pH, and decreased Eh. Soybean oil alone has promoted and maintained sulfate reduction.
- Promotion of sulfate reduction by the injection of sodium lactate and/or soybean oil does in general produce an increase in pH. The pH increase is produced by metabolic processes of both SRB and other microbes. Other microbes capable of growth under these acidic conditions increase the pH and thereby provide more suitable conditions for SRB and the SRB further increase the pH.
- When and where the sulfate reduction has been accompanied by an increase in pH, aluminum, iron, chromium, copper, nickel, and zinc concentrations have decreased. Mineral precipitation, co-precipitation, and adsorption are likely processes controlling these metal concentrations (from a geochemical stand point). However whether or not sulfate reduction increases the pH to within the range necessary to promote significant metals precipitation is dependent upon which organic substrate is utilized, the initial pre-injection conditions, and the available residence time. The chemical species present, their concentrations, and the associated geochemical reactions also impact the extent of the pH increase. Since sodium lactate is an immediately available, direct SRB carbon source, its use should tend to increase the pH more quickly and to a greater extent than the use of soybean oil alone. The closer the initial pH conditions are to optimal for SRB (i.e. 5.5 to 9.0), the more likely that sulfate reduction can produce a pH within the range necessary for significant metals precipitation. The residence time required to promote the necessary pH conditions is dependent upon the characteristics of the influent groundwater. The more acidity present in the groundwater, the more residence time that is required.
- Pure soybean oil within DIW-1 provides a long-term, indirect, SRB carbon source that floats on top of the water table (by indirect it means that the soybean oil must be degraded by other microbes prior to utilization by SRB). Soybean oil produces no known SRB inhibitory response and therefore large quantities can be injected infrequently.
- Sodium lactate within DIW-1 provides a short-term, immediately available, direct, SRB carbon source that is miscible with the groundwater and therefore flows with the groundwater until it has been completely utilized. Lactate at elevated concentrations (greater than 7g/L) does produce a SRB inhibitory response and therefore small quantities must be injected frequently.
- Sodium lactate and emulsified soybean oil can be easily diluted to increase their subsurface injectability, whereas pure soybean oil can not.
- Indications are that limestone installed within the DCPRB plume can be utilized to move conditions toward optimal sulfate reduction conditions without significant limestone or formation pluggage and without significant limestone armoring and deactivation.

- The use of limestone would facilitate sulfate reduction remediation through the injection of organic substrate.

8.3 Considerations and Issues

The following are issues drawn from the completion of the D-Area Sulfate Reduction Study that should be considered relative to the use of sulfate reduction combined with Monitored Natural Attenuation (MNA) for the remediation of the DCPRB acidic/metals/sulfate, groundwater contaminant plume:

- If the pH is not increased to within the range that promotes significant metals precipitation, two conditions could occur which could adversely impact SRB activity. Soluble metals, such as aluminum, which are not precipitated out can be toxic to SRB, and hydrogen sulfide could potentially build up to concentrations toxic to SRB. However microbial community development as biofilms on subsurface particles can provide micro-environments suitable for sustained SRB activity even when the bulk conditions are less favorable.
- Metal precipitate stability (i.e. longevity) is dependent upon the geochemical and biological conditions present after the precipitates have formed as well as the nature of the mineral phase that has precipitated. In general from a geochemical perspective metal precipitates produced due to sulfate reduction are more stable in near neutral pH, low Eh, conditions. From a biological perspective metal precipitates produced due to sulfate reduction are more stable in environments which contain low levels of biological oxidizing agents such as oxygen and nitrate/nitite. Uncontaminated groundwater in D-Area is near neutral (5.0 to 5.5 pH), has a moderate Eh (300 to 500 mV Eh), has a moderate oxygen concentration (2 to 4 mg/L), and a low nitrate/nitrite concentration (< 5 mg/L combined). The DCPRB contaminant plume is acidic (less than 3 pH), has a high Eh (greater than 500 mV Eh), has a moderate oxygen concentration (1 to 4.5 mg/L), and a fairly low nitrate/nitrite concentration (<20 mg/L combined). Also in general the vadose zone is more oxidizing (i.e. greater Eh) and the saturated zone is more reducing (i.e. lower Eh). Of these conditions, metal precipitates produced through sulfate reduction will be more stable in the saturated zone in contact with uncontaminated groundwater.
- It is anticipated that the DCPRB will remain operational until the D-Area powerhouse has been shut down and the coal pile has been removed. Until that time the DCPRB will be a continual source of contaminated acidic groundwater. Additionally the DCPRB, which receives the runoff from the 8.9 acre coal pile and generally does not discharge, causes the elevation of the water table adjacent to it to be higher than natural and causes the elevation to vary substantially more than is typical of D-area. Also the continual flux of contaminated water out of the DCPRB varies with precipitation and depth of water within the basin.

9.0 STUDY RECOMMENDATIONS

The following are recommendations made based upon the conclusion of the over 3 year D-Area Sulfate Reduction Study beginning with a literature search and feasibility report in mid 2001 and ending with the completion of Part 2 of the field study in late 2004.

- Sulfate reduction remediation of the DCPRB groundwater through the injection of soybean oil and/or sodium lactate is considered feasible.
- Sulfate reduction remediation of the DCPRB groundwater will be most effectively and efficiently performed after the DCPRB has been decommissioned. At that time the continual source of acidic contaminated groundwater would have been eliminated, the large swings in water table elevations would have decreased, and if the DCPRB is decommissioned with a layer of limestone in its bottom, water infiltrating through the decommissioned basin would buffer the groundwater. This would create conditions much more suitable to metal precipitation and stability. It could also result in the need for only a limited number of organic substrate injections, if not a single injection.
- It is recommended that no additional soybean oil be injected into the DCPRB groundwater plume through DIW-1 prior to decommissioning of the powerhouse, coal pile, and DCPRB. Continued injection will be inefficient, produce less than optimal results, and result in a metal precipitate mass located within the vadose zone, once the DCPRB has been decommissioned and the water table elevation has returned to its natural lower elevation. Such a metal precipitate mass within the future vadose zone will not be as stable as one located within the saturated zone due to the greater oxidation potential within the vadose zone.
- It is recommended that prior to implementation of sulfate reduction remediation of the DCPRB groundwater through the injection of soybean oil and/or sodium lactate that laboratory studies be conducted to address the stability of the metal precipitates versus the anticipated conditions at DCPRB decommissioning.

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APPENDICES

APPENDIX A LABORATORY STUDIES

APPENDIX B DTT-1 TRENCH EVALUATION

APPENDIX C ORGANIC SUBSTRATE FIELD APPLICATION PART 1

APPENDIX D ORGANIC SUBSTRATE FIELD APPLICATION PART 2

APPENDIX A
LABORATORY STUDIES

APPENDIX A-1

Heterotrophic Microbial Density

Well	Growth Medium	Growth Conditions / Sample Medium			
		Aerobic / Groundwater (microbes/ml)	Aerobic / Sediment (microbes/g)	Anaerobic / Groundwater (microbes/ml)	Anaerobic / Sediment (microbes/g)
DCB 8	R2A pH4	110	811	5	3920
	R2A pH7	570	5390	443	405
	TSA pH4	50	770	5	1350
	TSA pH7	180	3450	23.3	2430
	SRB	---	---	12.67	0.5
DCB 19A	R2A pH4	5	5	5	7660
	R2A pH7	30	5	5	14100
	TSA pH4	25	5	5	7180
	TSA pH7	60	5	5	5
	SRB	----	----	0.6667	30.65
DCB 19B	R2A pH4	5	5	5	5
	R2A pH7	70	231	5	5
	TSA pH4	5	76900	5	5
	TSA pH7	50	38.4	5	5
	SRB	----	----	0.5	0.5

Appendix A-2

pH Values of Microcosms as a Function of Amendments

Medium	Well	Initial pH	pH after 2 months of incubation (February 2002)	pH after 4 months of incubation (April 2002)
Groundwater	DCB-8	4.9	-	-
	DCB-19A	2.5	-	-
	pH DCB-19A	3.5	-	-
	DCB-19B	2.9	-	-
Microcosm with no Amendments	DCB-8	-	5.5	5.5
	DCB-19A	-	4.3	4.3
	pH DCB-19A	-	4.5	4.5
	DCB-19B	-	4	4
Microcosm with Soybean Oil	DCB-8	-	6	6
	DCB-19A	-	4.3	4.3
	pH DCB-19A.	-	5	5
	DCB-19B	-	4.5	4.5
Microcosm with Sodium Lactate	DCB-8	-	6	6
	DCB-19A	-	4.5	4.5
	pH DCB-19A	-	5	5
	DCB-19B	-	4.8	4.8
Microcosm with HRC	DCB-8	-	3.5	Not analyzed
	DCB-19A.	-	3	Not analyzed
	pH DCB-19A	-	3	Not analyzed
	DCB-19B	-	3.2	Not analyzed

Appendix A-3

Direct Microbial Counts

Medium	Well	Average Direct Microbial Count after 2 months of incubation (February 2002) (microbes/ml)	Average Direct Microbial Count after 4 months of incubation (April 2002) (microbes/ml)
Microcosm with no Amendments	DCB-8	53,560	1,339,250
	DCB-19A	187,4600	1,339,250
	pH DCB-19A	294,585	2,142,800
	DCB-19B	2,142,400	535,700
Microcosm with Soybean Oil	DCB-8	6,962,800	4,821,300
	DCB-19A	294,580	2,410,650
	pH DCB-19A	2,410,200	267,850
	DCB-19B	6,159,400	2,142,800
Microcosm with Sodium Lactate	DCB-8	1,097,980	5,890,000
	DCB-19A	2,945,800	14,300,000
	pH DCB-19A	5,623,800	35,100,000
	DCB-19B	1,606,800	9,640,000
Microcosm with HRC	DCB-8	1,874,600	Not analyzed
	DCB-19A.	562,380	Not analyzed
	pH DCB-19A	1,606,800	Not analyzed
	DCB-19B	2,410,200	Not analyzed

Appendix A-4

Volatile Fatty Acid (VFA) Analysis Used as a Measure of Microbial Activity in Microcosms after 4 Months of Incubation (April 2002)

Medium	Well	Acetic Acid (mg/L)	Propanoic Acid (mg/L)	Formic Acid (mg/L)	Isobutyric Acid (mg/L)
Groundwater	DCB-8	2.60	6.30	ND	7.50
	DCB-19A	4.40	9.60	ND	2.50
	pH DCB-19A	4.40	8.90	ND	2.10
	DCB-19B	3.80	7.00	ND	1.50
Microcosm with no Amendments	DCB-8	4.10	1.25	1.21	0.63
	DCB-19A	2.00	1.00	1.33	1.00
	pH DCB-19A	1.67	0.67	0.33	0.83
	DCB-19B	2.13	1.00	1.00	0.60
Microcosm with Soybean Oil	DCB-8	172.20	130.67	52.31	2.93
	DCB-19A	6.90	3.86	13.55	2.20
	pH DCB-19A	6.05	2.31	6.82	2.66
	DCB-19B	9.47	2.40	7.79	3.69
Microcosm with Sodium Lactate	DCB-8	57.41	11.72	10.73	0.00
	DCB-19A.	34.61	6.99	6.99	0.45
	pH DCB-19A	28.01	4.10	3.42	ND
	DCB-19B	70.20	5.62	11.20	0.15
Medium	Well	Butyric Acid (mg/L)	Isovaleric Acid (mg/L)	Valeric Acid (mg/L)	Isocaproic Acid (mg/L)
Groundwater	DCB-8	6.40	10.00	7.00	6.90
	DCB-19A	4.50	3.40	4.60	3.40
	pH DCB-19A	4.40	3.20	4.50	3.40
	DCB-19B	3.60	2.80	4.00	3.20
Microcosm with no Amendments	DCB-8	0.08	ND	ND	ND
	DCB-19A	0.33	ND	ND	ND
	pH DCB-19A	0.83	ND	ND	ND
	DCB-19B	ND	ND	ND	ND
Microcosm with Soybean Oil	DCB-8	44.78	0.60	10.90	0.30
	DCB-19A	0.96	0.15	0.30	ND
	pH DCB-19A	0.90	ND	ND	ND
	DCB-19B	0.90	ND	ND	ND
Microcosm with Sodium Lactate	DCB-8	0.54	0.15	0.15	ND
	DCB-19A.	0.45	0.15	0.15	0.15
	pH DCB-19A	0.30	ND	ND	ND
	DCB-19B	0.60	ND	ND	ND

ND = Not detected

Appendix A-5

Sulfate Reducing Bacteria (SRB) Density from Microcosms after 2 and 4 Months of Incubation

Medium	Well	Initial SRB Density (microbes/ml)	SRB Density after 2 months of incubation (February 2002) (microbes/ml)	SRB Density after 4 months of incubation (April 2002) (microbes/ml)
Groundwater	DCB-8	13	-	-
	DCB-19A	0.7	-	-
	pH DCB-19A	0.7	-	-
	DCB-19B	0.5	-	-
Microcosm with no Amendments	DCB-8	-	89.33	2,600
	DCB-19A	-	0.47	0.47
	pH DCB-19A	-	0.41	None detected
	DCB-19B	-	None detected	None detected
Microcosm with Soybean Oil	DCB-8	-	48,000	2,200,000
	DCB-19A	-	None detected	0.6
	pH DCB-19A.	-	283.4	500
	DCB-19B	-	None detected	None detected
Microcosm with Sodium Lactate	DCB-8	-	None detected	None detected
	DCB-19A	-	None detected	None detected
	pH DCB-19A	-	None detected	None detected
	DCB-19B	-	None detected	None detected
Microcosm with HRC	DCB-8	-	None detected	Not analyzed
	DCB-19A.	-	None detected	Not analyzed
	pH DCB-19A	-	None detected	Not analyzed
	DCB-19B	-	None detected	Not analyzed

Appendix A-6

Hydrogen Sulfide Concentrations from Initial Groundwater and Microcosms after 4 Months of Incubation (April 2002)

Medium	Hydrogen Sulfide (mg/L)			
	DCB-8	DCB-19A	DCB-19A pH	DCB-19B
Initial Groundwater	0.2	0.4	Not applicable	0.4
Microcosm with no Amendments	0.59	0.62	0.56	0.52
Microcosm with Soybean Oil	1.22	0.59	3.05	0.38
Microcosm with Sodium Lactate	0.80	0.41	0.36	0.72
Microcosm with HRC	0.60	0.77	0.73	0.56

Appendix A-7

Sulfate Concentrations from Initial Groundwater and Microcosms after 4 Months of Incubation (April 2002)

Medium	Sulfate (mg/L)			
	DCB-8	DCB-19A	DCB-19A pH	DCB-19B
Initial Groundwater	5.5	994.0	1,025.4	2,493.6
Microcosm with no Amendments	15.2	1,126.7	1,263.3	2,242.6
Microcosm with Soybean Oil	22.7	1,163.3	1,153.3	2,072.7
Microcosm with Sodium Lactate	23.0	1,547.3	1,534.0	2,243.6

Appendix A-8

Lactate Utilization in Microcosms

Microcosm	DCB-8	DCB-19A	DCB-19A pH	DCB-19B
Lactate (% used)	3.10	2.72	2.91	1.27

Appendix A-9

Lactate inhibition study with Na Lactate

SRB inoculm from groundwater

Groundwater (24 hours) (Spec 20 560 wavelength)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	84.4	85.6	86.6	78	86.6	84.24	3.22
0.88	94.6	95	94.2	92	94	93.96	1.04
1.75	93.8	95	96.2	94.8	92.4	94.44	1.27
3.50	96	90.8	92.2	90.8	93.4	92.64	1.94
5.25	93.2	94.8	94.4	94.6	88	93	2.56
7.00	93.6	94.2	94.4	96.2	93.4	94.36	0.99
10.50	96.4	95.2	96.2	93.8	95.6	95.44	0.92
14.00	94.4	96.4	95.8	92.6	95.6	94.96	1.35

Groundwater (48 hours) (Spec 20 560 wavelength)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	85.8	82	91	87.6	86.2	86.52	2.91
0.88	94	96	96.2	96.4	96	95.72	0.87
1.75	90.2	97.6	92.4	90	98	93.64	3.50
3.50	94.6	91.8	94.6	93.8	88.2	92.6	2.43
5.25	97.8	98.6	94.8	96.6	96.8	96.92	1.28
7.00	95.8	97.8	97.2	97.6	97.6	97.2	0.73
10.50	97.8	99.2	99	99.6	98	98.72	0.70
14.00	97.4	95.6	99.2	98.2	99.2	97.92	1.34

Groundwater (72 hours) (Spec 20 560 wavelength)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	68.4	66.6	69.8	66.6	56.2	65.52	4.81
0.88	88.8	100	98.9	80.2	99.8	93.54	7.87
1.75	90.4	88.8	96.2	96.6	97.6	93.92	3.59
3.50	85.4	98	94.8	93.4	98.2	93.96	4.66
5.25	96.2	91.8	93.8	94.6	94.8	94.24	1.44
7.00	97.8	100	98.8	98	98	98.52	0.82
10.50	97.2	97.4	96.6	96.6	97.2	97	0.33
14.00	95.6	96.4	97.8	96.8	95.2	96.36	0.92

Appendix A-9 (Continued)

Lactate inhibition study with Na Lactate

SRB inoculm from groundwater

Groundwater (96 hours) (Spec 20 560 wavelength)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	53	24	14.2	20.4	17.2	25.76	14.01
0.88	91.2	45.8	88.8	89.9	25.6	68.26	27.35
1.75	44.2	91	90.6	47.2	92.2	73.04	22.35
3.50	98.6	95.4	96.4	97.2	49.8	87.48	18.87
5.25	88.8	62.6	87	68.8	90.4	79.52	11.50
7.00	86.4	90	98	93.8	83.4	90.32	5.19
10.50	98	97.2	97.8	95.4	96.8	97.04	0.92
14.00	98.2	98.4	86.6	95.4	97.4	95.2	4.43

Groundwater (135 hours) (Spec 20 560 wavelength)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	35.8	0	0	0	0	7.16	14.32
0.88	0	0	0	19	45.8	12.96	17.99
1.75	0.0	0.0	0.0	29.4	14.8	8.84	11.77
3.50	0	3.8	28.8	32.4	27.8	18.56	13.74
5.25	39	0	0	0	0	7.8	15.60
7.00	40.4	46.2	94	37.8	42.8	52.24	21.06
10.50	94.6	95.2	79.4	94.6	94.6	91.68	6.14
14.00	94.8	96.8	96.4	97.4	92.2	95.52	1.87

Appendix A-9 (Continued)

Lactate inhibition study with Na Lactate

SRB inoculm from groundwater

Groundwater (160 hours) (Spec 20 560 wavelength)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	33	0	0	0	0	6.6	13.20
0.88	26.4	0	0	55.2	1.8	16.68	21.71
1.75	0.0	0.0	0.0	56.2	5.2	12.28	22.05
3.50	28.2	8.6	0	0	0	7.36	10.94
5.25	40.6	0	0	0	0	8.12	16.24
7.00	43.8	44.8	45	78.4	34	49.2	15.16
10.50	88	98.6	61.6	65.2	78.4	78.36	13.83
14.00	87.2	92.0	98.8	99.4	99.6	95.4	4.98

Groundwater (200 hours) (Spec 20 560 wavelength)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	0	0	0	0	0	0	0.00
0.88	3.4	0	0	6	14.4	4.76	5.32
1.75	6.2	48.6	4.4	0.0	0.0	11.84	18.54
3.50	9.6	1.2	0	0	0	2.16	3.75
5.25	0	0	0	0	0	0	0.00
7.00	6.6	22.2	0	0	0	5.76	8.61
10.50	63.6	56.8	70.8	65.2	78.4	66.96	7.26
14.00	53.0	66.6	68.4	59.8	30.6	55.68	13.67

Appendix A-10

Lactate inhibition study with Na Lactate
SRB inoculm from groundwater and acclimated to SRB medium (1g/l lactate)
Cells were concentrated from media via centrufigation

Spun Cell Tube (Day 7) (Spec 20 560 wavelength)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	St Dev
0.00	33.6	27.2	33.2	32.8	26.8	30.72	3.41
0.88	2.8	8.4	6.4	9.6	5.4	6.52	2.65
1.75	11.4	2.4	6.8	8.0	12.8	8.3	4.09
3.50	5	10.6	23	22	7.6	13.64	8.33
5.25	26.4	30.2	29.2	29.4	87	40.44	26.07
7.00	50	76.8	58.2	82.2	73.8	68.2	13.53
10.50	83.8	87.4	86.8	88	92.2	87.64	3.02
14.00	99.2	97.0	96.2	97.6	98.4	97.68	1.17

Spun Cell Tube (Day 8) (Spec 20 560 wavelength)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st Dev
0.00	17.80	13.40	18.80	19.20	12.20	16.28	3.25
0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.25	9.60	0.00	0.00	0.00	0.00	1.92	4.29
7.00	0.00	0.00	9.60	0.80	3.80	2.84	4.09
10.50	46.40	92.20	91.20	87.60	69.60	77.40	19.59
14.00	99.20	98.40	97.60	99.40	95.00	97.92	1.78

Spun Cell Tube (Day 9) (Spec 20 560 wavelength)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	4.6	0	0	0	0	0.92	2.06
0.88	0	0	0	0	0	0	0.00
1.75	0	0	0	0	0	0	0.00
3.50	0	0	0	0	0	0	0.00
5.25	0	0	0	0	0	0	0.00
7.00	0	0	0	0	0	0	0.00
10.50	0	44.4	46.8	37.4	0	25.72	23.73
14.00	48.8	88.8	64.8	84.6	87.6	74.92	17.55

Appendix A-11

Lactate inhibition study with K Lactate

SRB inoculm from groundwater

Groundwater (24 hours)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	84.8	78.0	79.6	84.4	88.0	82.96	4.09
0.88	83.0	87.2	89.8	87.8	82.6	86.08	3.15
1.75	88.4	93.8	92.8	93.8	91.8	92.12	2.24
3.50	92.4	90.6	89.6	89.8	88.0	90.08	1.60
5.25	92.8	94.0	94.8	87.0	91.8	92.08	3.06
7.00	93.8	91.4	92.8	95.4	88.2	92.32	2.73
10.50	95.2	94.2	94.0	95.6	95.2	94.84	0.70
14.00	96.0	96.2	95.6	95.6	96.8	96.04	0.50

Groundwater (48 hours)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	87.4	84.8	87.8	83.8	83.6	85.48	1.99
0.88	88.2	84.2	91.8	91.6	92.6	89.68	3.50
1.75	95	96.4	91.4	95.4	92.4	94.12	2.12
3.50	95.4	94.0	94.4	92.0	89.6	93.08	2.30
5.25	92.6	94.2	95.6	91.0	94.6	93.6	1.81
7.00	95	95.2	91.8	92.4	92.2	93.32	1.64
10.50	87.8	91.4	92.4	93.8	93.2	91.72	2.37
14.00	100.0	97.6	97.9	98.8	97.4	98.34	1.07

Groundwater (72 hours)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	66.2	69.0	66.2	56.2	63.4	64.2	4.89
0.88	85.4	82.4	69.8	61.4	82.4	76.28	10.27
1.75	86.8	91.2	95.4	94	94.8	92.44	3.54
3.50	99.6	97.8	96.8	86.4	78.6	91.84	9.02
5.25	94.2	96.8	91.0	95.6	95.2	94.56	2.20
7.00	98.8	96.6	96.4	98.4	93.4	96.72	2.14
10.50	95.6	94.8	91.4	96.6	95.4	94.76	1.99
14.00	96.6	96.9	96.6	96.8	94.0	96.18	1.23

Appendix A-11 (Continued)

Lactate inhibition study with K Lactate

SRB inoculm from groundwater

Groundwater (96 hours)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	17.4	13.0	18.2	16.6	14.6	15.96	2.13
0.88	46.0	33.4	54.8	39.2	36.0	41.88	8.63
1.75	47.6	32.2	44.4	46	38.8	41.8	6.31
3.50	54.8	58.2	51.2	61.0	65.6	58.16	5.55
5.25	87.8	77.0	77.6	76.6	86.4	81.08	5.53
7.00	91	98.2	95.2	96	97	95.48	2.74
10.50	99.6	98.8	99.8	96.6	93.2	97.6	2.77
14.00	87.0	98.0	98.6	98.6	100.0	96.44	5.33

Groundwater (135 hours)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	0.0	0.0	0.0	0.0	0.0	0	0.00
0.88	0.0	0.0	0.0	23.0	5.2	5.64	9.96
1.75	0	0	0	0	0	0	0.00
3.50	7.4	17.4	32.6	36.2	36.2	25.96	12.96
5.25	25.2	0.0	17.8	0.0	4.9	9.58	11.37
7.00	47.8	31.6	46.6	34	40.6	40.12	7.27
10.50	92.0	83.6	94.8	91.9	56.4	83.74	15.85
14.00	97.8	94.6	93.6	96.8	95.0	95.56	1.71

Appendix A-11 (Continued)

Lactate inhibition study with K Lactate

SRB inoculm from groundwater

Groundwater (160 hours)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	3.8	0.0	0.0	0.0	0.0	0.76	1.70
0.88	0.0	0.0	0.0	21.2	10.2	6.28	9.44
1.75	0	0	0	0	0	0	0.00
3.50	15.6	33.9	0.0	7.0	37.2	18.74	16.35
5.25	28.8	36.2	0.0	0.0	4.4	13.88	17.29
7.00	15	5.6	43.6	0	6.6	14.16	17.31
10.50	91.0	96.4	84.8	95.6	57.8	85.12	15.95
14.00	98.4	99.8	99.6	99.6	97.2	98.92	1.11

Groundwater (200 hours)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	0.0	0.0	0.0	0.0	0.0	0	0.00
0.88	0.0	0.0	0.0	0.0	0.0	0.00	0.00
1.75	0	0	0	0	0	0	0.00
3.50	5.4	0.0	0.0	0.0	0.0	1.08	2.41
5.25	0.0	0.0	0.0	0.0	0.0	0	0.00
7.00	27.2	0	0	0	0.4	5.52	12.12
10.50	35.2	60.4	53.4	60.2	92.2	60.28	20.59
14.00	88.2	96.8	96.6	94.8	95.0	94.28	3.52

Appendix A-12

Lactate inhibition study with K Lactate
SRB inoculm from groundwater and acclimated to SRB medium (1g/l lactate)
Cells were concentrated from media via centrufigation

Spun Cell Tube (Day 7)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	St Dev
0.00	32.8	25.2	31.0	31.8	36.6	31.48	4.11
0.88	2.6	2.0	3.4	2.2	1.8	2.40	0.63
1.75	4.6	1.8	5.6	2.4	6.4	4.16	2.00
3.50	10.8	3.4	8.2	13.6	7.0	8.60	3.86
5.25	2.0	2.8	2.2	2.0	4.4	2.68	1.02
7.00	30.4	21.6	27.8	36.4	35.6	30.36	6.07
10.50	97.0	97.6	96.0	96.2	96.6	96.68	0.64
14.00	98.8	98.0	98.8	98.8	98.8	98.64	0.36

Spun Cell Tube (Day 8)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	st dev
0.00	23.80	17.40	15.80	12.20	18.80	17.60	4.25
0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.50	52.80	68.80	57.20	73.20	79.20	66.24	11.01
14.00	99.80	100.00	100.00	95.80	100.00	99.12	1.86

Spun Cell Tube (Day 9)

	% Transmittance						
Lactate mg/l	Tube # 1	Tube # 2	Tube # 3	Tube # 4	Tube # 5	Avg % Trans	stdev
0.00	0.0	0.0	0.0	0.0	0.0	0	0.00
0.88	0.0	0.0	0.0	0.0	0.0	0	0.00
1.75	0.0	0.0	0.0	0.0	0.0	0	0.00
3.50	0.0	0.0	0.0	0.0	0.0	0	0.00
5.25	0.0	0.0	0.0	0.0	0.0	0	0.00
7.00	0.0	0.0	0.0	0.0	0.0	0	0.00
10.50	0.0	0.0	0.0	0.0	0.0	0	0.00
14.00	100.0	98.0	99.6	100.0	100.0	99.52	0.87

APPENDIX B
DTT-1 TRENCH EVALUATION

Appendix B-1, Flow Measurements

Date/Time	Cumulative Duration since Pumping Began (min)	Volume Collected (L)	Collection Duration (sec)	Flow (gpm)
12/9/02 10:14	0	0	0	0
12/9/02 10:15	1	1.00	29.5	0.54
12/9/02 10:30	16	1.00	29.5	0.54
12/9/02 10:35	21	1.00	29.8	0.53
12/9/02 10:45	31	1.00	29.3	0.54
12/9/02 13:05	171	0.95	29.0	0.52
12/9/02 15:04	290	0.98	30.6	0.51
12/9/02 15:15	301	16.80	600	0.44
12/9/02 15:40	326	16.80	505	0.53
12/10/02 8:50	1356	16.80	632	0.42
12/10/02 9:10	1376	16.80	550	0.48
12/10/02 10:24	1450	16.80	523	0.51
12/11/02 9:45	2851	16.80	809	0.33
12/11/02 10:15	2881	16.80	830	0.32
12/11/02 10:20	2886	16.80	830	0.32
12/11/02 10:21	2887	0	0	0
12/16/02 8:50	0	0	0	0
12/16/02 8:51	1	16.80	232	1.15
12/16/02 9:03	13	16.80	232	1.15
12/16/02 9:24	34	16.80	225	1.19
12/16/02 11:30	160	16.80	232	1.15
12/16/02 14:41	351	16.80	239	1.12
12/17/02 8:24	1414	16.80	452	0.59
12/17/02 8:40	1430	16.80	237	1.13
12/17/02 8:45	1435	16.80	238	1.12
12/17/02 15:43	1853	16.80	276	0.97
12/17/02 15:55	1865	16.80	228	1.17
12/18/02 8:04	2834	16.80	277	0.96
12/18/02 8:48	2878	16.80	280	0.95
12/18/02 9:01	2891	16.80	280	0.95
12/18/02 9:02	2892	16.80	0	0

Appendix B-2, Water Elevations (Determined from Electric Water Level Tape Measurement)

Sample Location	Date/Time	Top of Casing (ft-msl)	Depth to Water (ft)	Water Elevation (ft-msl)	Phase
DCB-49	12/2/02 14:18	124.52	7.97	116.55	1
DCB-49	12/5/02 15:09	124.52	7.78	116.74	1
DCB-49	12/6/02 12:11	124.52	8.05	116.47	1
DCB-49	12/8/02 9:17	124.52	7.99	116.53	1
DCB-49	12/9/02 10:06	124.52	7.98	116.54	1
DCB-49	12/9/02 11:07	124.52	8.11	116.41	2
DCB-49	12/9/02 15:09	124.52	8.37	116.15	2
DCB-49	12/10/02 8:43	124.52	8.68	115.84	2
DCB-49	12/10/02 10:17	124.52	8.72	115.80	2
DCB-49	12/11/02 9:19	124.52	8.4	116.12	2
DCB-49	12/11/02 10:11	124.52	8.43	116.09	2
DCB-49	12/16/02 8:26	124.52	7.46	117.06	1
DCB-49	12/16/02 11:22	124.52	7.93	116.59	3
DCB-49	12/16/02 14:28	124.52	8.31	116.21	3
DCB-49	12/17/02 8:12	124.52	8.64	115.88	3
DCB-49	12/17/02 15:33	124.52	9.01	115.51	3
DCB-49	12/18/02 7:50	124.52	9.31	115.21	3
DCB-49	12/18/02 8:58	124.52	9.36	115.16	3
DTT-1A	12/2/02 14:17	124.70	8.21	116.49	1
DTT-1A	12/5/02 15:05	124.70	8.03	116.67	1
DTT-1A	12/6/02 12:14	124.70	8.28	116.42	1
DTT-1A	12/8/02 9:21	124.70	8.23	116.47	1
DTT-1A	12/9/02 10:06	124.70	8.23	116.47	1
DTT-1A	12/9/02 11:10	124.70	8.37	116.33	2
DTT-1A	12/9/02 15:10	124.70	8.68	116.02	2
DTT-1A	12/10/02 8:44	124.70	9.06	115.64	2
DTT-1A	12/10/02 10:19	124.70	9.09	115.61	2
DTT-1A	12/11/02 9:20	124.70	8.73	115.97	2
DTT-1A	12/11/02 10:09	124.70	8.75	115.95	2
DTT-1A	12/16/02 8:29	124.70	7.71	116.99	1
DTT-1A	12/16/02 11:24	124.70	8.25	116.45	3
DTT-1A	12/16/02 14:29	124.70	8.71	115.99	3
DTT-1A	12/17/02 8:15	124.70	9.08	115.62	3
DTT-1A	12/17/02 15:34	124.70	9.49	115.21	3
DTT-1A	12/18/02 7:51	124.70	9.84	114.86	3
DTT-1A	12/18/02 8:56	124.70	9.87	114.83	3

Appendix B-2 (continued)

Sample Location	Date/Time	Top of Casing (ft-msl)	Depth to Water (ft)	Water Elevation (ft-msl)	Phase
DTT-1	12/2/02 14:16	122.64	6.16	116.48	1
DTT-1	12/5/02 15:07	122.64	5.97	116.67	1
DTT-1	12/6/02 12:13	122.64	6.22	116.42	1
DTT-1	12/8/02 9:19	122.64	6.18	116.46	1
DTT-1	12/9/02 10:07	122.64	6.18	116.46	1
DTT-1	12/9/02 11:08	122.64	6.31	116.33	2
DTT-1	12/9/02 15:09	122.64	6.61	116.03	2
DTT-1	12/10/02 8:44	122.64	7.01	115.63	2
DTT-1	12/10/02 10:18	122.64	7.03	115.61	2
DTT-1	12/11/02 9:18	122.64	6.68	115.96	2
DTT-1	12/11/02 10:09	122.64	6.69	115.95	2
DTT-1	12/16/02 8:25	122.64	5.65	116.99	1
DTT-1	12/16/02 11:23	122.64	6.2	116.44	3
DTT-1	12/16/02 14:29	122.64	6.64	116.00	3
DTT-1	12/17/02 8:14	122.64	7.02	115.62	3
DTT-1	12/17/02 15:32	122.64	7.42	115.22	3
DTT-1	12/18/02 7:50	122.64	7.78	114.86	3
DTT-1	12/18/02 8:54	122.64	7.81	114.83	3
DTT-1B	12/2/02 14:20	124.72	8.23	116.49	1
DTT-1B	12/5/02 15:10	124.72	8.03	116.69	1
DTT-1B	12/6/02 12:14	124.72	8.29	116.43	1
DTT-1B	12/8/02 9:16	124.72	8.24	116.48	1
DTT-1B	12/9/02 10:05	124.72	8.25	116.47	1
DTT-1B	12/9/02 11:04	124.72	8.37	116.35	2
DTT-1B	12/9/02 15:07	124.72	8.68	116.04	2
DTT-1B	12/10/02 8:42	124.72	9.07	115.65	2
DTT-1B	12/10/02 10:15	124.72	9.1	115.62	2
DTT-1B	12/11/02 9:15	124.72	8.74	115.98	2
DTT-1B	12/11/02 10:07	124.72	8.76	115.96	2
DTT-1B	12/16/02 8:23	124.72	7.72	117.00	1
DTT-1B	12/16/02 11:21	124.72	8.26	116.46	3
DTT-1B	12/16/02 14:27	124.72	8.7	116.02	3
DTT-1B	12/17/02 8:11	124.72	9.09	115.63	3
DTT-1B	12/17/02 15:31	124.72	9.49	115.23	3
DTT-1B	12/18/02 7:48	124.72	9.85	114.87	3
DTT-1B	12/18/02 8:53	124.72	9.88	114.84	3

Appendix B-2 (continued)

Sample Location	Date/Time	Top of Casing (ft-msl)	Depth to Water (ft)	Water Elevation (ft-msl)	Phase
DCB-50	12/2/02 14:10	124.33	8.04	116.29	1
DCB-50	12/5/02 15:08	124.33	7.86	116.47	1
DCB-50	12/6/02 12:12	124.33	8.1	116.23	1
DCB-50	12/8/02 9:18	124.33	8.07	116.26	1
DCB-50	12/9/02 10:05	124.33	8.06	116.27	1
DCB-50	12/9/02 11:06	124.33	8.16	116.17	2
DCB-50	12/9/02 15:08	124.33	8.4	115.93	2
DCB-50	12/10/02 8:43	124.33	8.71	115.62	2
DCB-50	12/10/02 10:16	124.33	8.74	115.59	2
DCB-50	12/11/02 9:17	124.33	8.45	115.88	2
DCB-50	12/11/02 10:08	124.33	8.45	115.88	2
DCB-50	12/16/02 8:24	124.33	7.55	116.78	1
DCB-50	12/16/02 11:22	124.33	7.95	116.38	3
DCB-50	12/16/02 14:28	124.33	8.30	116.03	3
DCB-50	12/17/02 8:13	124.33	8.65	115.68	3
DCB-50	12/17/02 15:32	124.33	8.97	115.36	3
DCB-50	12/18/02 7:49	124.33	9.26	115.07	3
DCB-50	12/18/02 8:59	124.33	9.33	115.00	3
DCB-21A	12/9/02 13:15	128.22	10.45	117.77	
DCB-21A	12/10/02 10:31	128.22	10.44	117.78	
DCB-21A	12/11/02 10:30	128.22	10.47	117.75	
DCB-21A	12/16/02 11:16	128.22	9.95	118.27	
DCB-21A	12/17/02 7:58	128.22	9.99	118.23	
DCB-21A	12/17/02 16:03	128.22	9.95	118.27	
DCB-21A	12/18/02 7:42	128.22	10.00	118.22	
DCB-24A	12/9/02 11:13	124.17	7.91	116.26	
DCB-24A	12/10/02 9:03	124.17	7.92	116.25	
DCB-24A	12/10/02 10:34	124.17	7.91	116.26	
DCB-24A	12/11/02 10:24	124.17	7.68	116.49	
DCB-24A	12/16/02 11:33	124.17	7.22	116.95	
DCB-24A	12/17/02 8:10	124.17	7.35	116.82	
DCB-24A	12/17/02 15:36	124.17	7.39	116.78	
DCB-24A	12/18/02 7:47	124.17	7.45	116.72	

Phase 1 = Pre-pumping; Phase 2 = First pumping episode (~0.5 gpm); Phase 3 = second pumping episode (~1 gpm)

Appendix B-3, Pre-Pump Field Parameter Profile

Sample Location	Sample Date/Time	Top of Casing (ft-msl)	Probe Depth (ft)	Probe Elevation (ft-msl)	Temperature (^{o}F)	Temperature (^{o}C)	pH	Conducivity (µS/cm)	DO (µg/L)	ORP (mV)	Calculated Eh (mV)
DCB-49	12/2/02 15:07	124.52	9	115.52	68.03	20.02	4.18	72	3150	389	588.10
DCB-49	12/2/02 15:12	124.52	10	114.52	68.19	20.11	4.11	67	2825	410	609.03
DCB-49	12/2/02 15:15	124.52	11	113.52	69.97	21.09	4.07	67	2770	425	623.18
DCB-49	12/2/02 15:18	124.52	12	112.52	70.38	21.32	4.03	68	2645	431	628.98
DCB-49	12/2/02 15:22	124.52	13	111.52	70.79	21.55	4	69	2510	428	625.79
DCB-49	12/2/02 15:26	124.52	14	110.52	71.1	21.72	3.96	73	2530	412	609.64
DCB-49	12/2/02 15:31	124.52	15	109.52	71.25	21.81	3.84	84	2670	394	591.56
DCB-49	12/2/02 15:34	124.52	16	108.52	72.22	22.34	3.34	2613	420	288	485.10
DCB-49	12/2/02 15:36	124.52	17	107.52	72.47	22.48	3.26	3080	210	237	433.98
DTT-1A	12/3/02 10:26	124.7	9	115.7	68.15	20.08	7.18	446	1602	13	212.05
DTT-1A	12/3/02 10:32	124.7	10	114.7	68.24	20.13	7.19	447	1361	12	211.00
DTT-1A	12/3/02 10:37	124.7	11	113.7	68.29	20.16	7.19	447	1309	12	210.98
DTT-1A	12/3/02 10:42	124.7	12	112.7	68.31	20.17	7.19	446	1329	6	204.97
DTT-1A	12/3/02 10:47	124.7	13	111.7	69.17	20.65	5.15	894	360	121	319.56
DTT-1A	12/3/02 10:51	124.7	14	110.7	70.7	21.50	4.09	1534	137	232	429.83
DTT-1A	12/3/02 10:56	124.7	15	109.7	71.22	21.79	4.03	1630	129	234	431.58
DTT-1A	12/3/02 11:00	124.7	16	108.7	71.53	21.96	3.92	1604	226	225	422.43
DTT-1	12/3/02 8:45	122.64	7	115.64	68.4	20.22	7.35	440	3500	150	348.93
DTT-1	12/3/02 8:50	122.64	8	114.64	68.33	20.18	7.32	437	3300	142	340.96
DTT-1	12/3/02 8:55	122.64	9	113.64	68.6	20.33	7.28	438	2990	100	298.83
DTT-1	12/3/02 8:59	122.64	10	112.64	68.72	20.40	7.23	449	2468	50	248.77
DTT-1	12/3/02 9:05	122.64	11	111.64	69.15	20.64	6	812	528	24	222.57
DTT-1	12/3/02 9:10	122.64	12	110.64	69.52	20.84	4.27	1303	212	221	419.39
DTT-1	12/3/02 9:15	122.64	13	109.64	70.93	21.63	3.58	1844	202	264	461.72
DTT-1	12/3/02 9:20	122.64	14	108.64	71.26	21.81	3.6	1892	163	261	458.56

Appendix B-3 (continued)

Sample Location	Sample Date/Time	Top of Casing (ft-msl)	Probe Depth (ft)	Probe Elevation (ft-msl)	Temperature (^{o}F)	Temperature (^{o}C)	pH	Conducivity (µS/cm)	DO (µg/L)	ORP (mV)	Calculated Eh (mV)
DTT-1B	12/3/02 9:39	124.72	9	115.72	68.69	20.38	7.13	420	4379	106	304.79
DTT-1B	12/3/02 9:45	124.72	10	114.72	68.72	20.40	7.15	421	3872	114	312.77
DTT-1B	12/3/02 9:49	124.72	11	113.72	68.75	20.42	7.16	421	4002	116	314.76
DTT-1B	12/3/02 9:54	124.72	12	112.72	68.73	20.41	7.12	439	2660	32	230.77
DTT-1B	12/3/02 9:58	124.72	13	111.72	68.68	20.38	6.06	736	487	11	209.79
DTT-1B	12/3/02 10:03	124.72	14	110.72	68.69	20.38	4.56	1089	163	185	383.79
DTT-1B	12/3/02 10:08	124.72	15	109.72	69.36	20.76	3.86	1585	137	248	446.47
DTT-1B	12/3/02 10:14	124.72	16	108.72	70.1	21.17	3.92	1700	234	195	393.12
DCB-50	12/2/02 14:24	124.33	9	115.33	68.05	20.03	4.97	118	4950	356	555.09
DCB-50	12/2/02 14:29	124.33	10	114.33	68.33	20.18	4.95	117	4167	348	546.96
DCB-50	12/2/02 14:32	124.33	11	113.33	68.79	20.44	4.92	117	5454	344	542.74
DCB-50	12/2/02 14:36	124.33	12	112.33	69.25	20.69	4.91	118	4400	340	538.52
DCB-50	12/2/02 14:39	124.33	13	111.33	69.62	20.90	4.89	120	4200	336	534.35
DCB-50	12/2/02 14:42	124.33	14	110.33	69.92	21.07	4.88	122	4340	336	534.20
DCB-50	12/2/02 14:44	124.33	15	109.33	70.73	21.52	4.95	132	3490	334	531.81
DCB-50	12/2/02 14:49	124.33	16	108.33	71.46	21.92	5.24	157	750	164	361.46
DCB-50	12/2/02 14:52	124.33	17	107.33	71.81	22.12	5.36	338	480	114	311.30

Appendix B-4, Field Parameters

Phase	Sample ID	Sample Location	Sample Date	Sample Depth (ft)	Temperature (^{o}F)	Temperature (^{o}C)	pH	Conductivity (µS/cm)	DO (µg/L)	ORP (mV)	Calculated Eh (mv)	Turbidity (NTU)
1	DTT-00001	DCB-49	12/6/02	11.7	69.60	20.89	3.29	2540	541	234	432	4.0
1	DTT-00002	DTT-1A	12/6/02	11.9	66.28	19.04	7.23	432	2012	104	304	4.7
1	DTT-00014	DTT-1A	12/6/02	15.9	69.74	20.97	3.89	1655	490	251	449	37.0
1	DTT-00003	DTT-1	12/6/02	9.8	65.90	18.83	7.18	434	2114	55	255	15.2
1	DTT-00016	DTT-1	12/6/02	13.8	66.31	19.06	7.20	428	2277	92	292	41.9
1	DTT-00004	DTT-1B	12/6/02	11.9	66.96	19.42	7.23	460	1920	67	267	4.3
1	DTT-00015	DTT-1B	12/6/02	15.9	67.33	19.63	7.28	460	1822	85	284	4.6
1	DTT-00005	DCB-50	12/6/02	11.5	66.78	19.32	5.89	1325	654	24	224	Off scale
2a	DTT-00006	DCB-49	12/9/02	11.7	66.48	19.16	3.39	2615	418	256	456	0.6
2a	DTT-00007	DTT-1	12/9/02		63.64	17.58	6.64	540	1677	-24	177	6.4
2b	DTT-00008	DCB-49	12/11/02	11.7	66.36	19.09	3.39	2721	292	237	437	5.6
2b	DTT-00009	DTT-1	12/11/02		64.02	17.79	4.51	1373	1550	199	400	2.8
3a	DTT-00010	DCB-49	12/16/02	11.7	65.57	18.65	3.47	2590	535	249	449	0.4
3a	DTT-00011	DTT-1	12/16/02		62.51	16.95	7.25	439	2555	100	302	1.7
3b	DTT-00012	DCB-49	12/18/02	11.7	67.46	19.70	3.36	2761	636	237	436	0.2
3b	DTT-00013	DTT-1	12/18/02		65.90	18.83	4.88	1742	637	161	361	70.5

1 = Pre-pump tests
2a = Sample collected after first 30 min of pumping during 48-hour 0.5 gpm pump test
2b = Sample collected after last 30 min of pumping during 48-hour 0.5 gpm pump test
3a = Sample collected after first 30 min of pumping during 48-hour 1.0 gpm pump test
3b = Sample collected after last 30 min of pumping during 48-hour 1.0 gpm pump test

Appendix B-5, Anions and Cations (EBS Laboratory IC Results)

Sample ID	Sample Location	Sample Depth (ft)	Cl^- (mg/L)	NO_2^- (mg/L)	NO_3^- (mg/L)	NH_4^+ (mg/L)	SO_4^{-2} (mg/L)	PO_4^{-2} (mg/L)	K^+ (mg/L)	Na^+ (mg/L)	Mg^{+2} (mg/L)	Ca^{+2} (mg/L)
DTT-00001	DCB-49	11.7	1.64	10.13	<0.5	<0.5	2556	<0.5	5.34	15.22	77.36	83.5
DTT-00002	DTT-1A	11.9	1.47	<0.5	3.73	<0.5	67.91	<0.5	5.73	2.59	13.96	94.26
DTT-00014	DTT-1A	15.9	1.09	6	<0.5	<0.5	1465	<0.5	4.3	8.22	45.85	68.71
DTT-00003	DTT-1	9.8	1.46	<0.5	<0.5	<0.5	72.54	<0.5	5.82	3.18	13.42	92.12
DTT-00016	DTT-1	13.8	1.35	1.5	3.73	<0.5	67.89	<0.5	5.63	2.95	13.51	92.93
DTT-00004	DTT-1B	11.9	1.32	<0.5	3.82	<0.5	78.62	<0.5	5.77	3.03	15.37	98.38
DTT-00015	DTT-1B	15.9	1.41	<0.5	3.77	<0.5	75.76	<0.5	5.91	2.06	15.23	99.68
DTT-00005	DCB-50	11.5	0.65	<0.5	<0.5	<0.5	1262	<0.5	6.31	8.2	63.33	267.72

See Appendix B-1 for phase and date information for corresponding sample ID.

Appendix B-6, Metals (SRTC Mobile Laboratory ICP-AES Results)

Phase	Sample ID	Sample Location	Sample Date	Sample Depth (ft)	Al (mg/L)	Ba (mg/L)	Be (mg/L)	Ca (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	Fe (mg/L)
1	DTT-00001	DCB-49	12/6/02	11.7	128.550	<0.001	<0.005	73.070	<0.003	<0.002	0.070	672.870
1	DTT-00002	DTT-1A	12/6/02	11.9	0.259	<0.001	<0.005	80.893	<0.003	<0.002	<0.009	0.094
1	DTT-00014	DTT-1A	12/6/02	15.9	79.310	<0.001	<0.005	60.116	<0.003	<0.002	0.105	374.300
1	DTT-00003	DTT-1	12/6/02	9.8	0.024	<0.001	<0.005	81.260	<0.003	<0.002	<0.009	<0.004
1	DTT-00016	DTT-1	12/6/02	13.8	0.071	<0.001	<0.005	82.209	<0.003	<0.002	<0.009	0.025
1	DTT-00004	DTT-1B	12/6/02	11.9	0.716	<0.001	<0.005	78.479	<0.003	<0.002	<0.009	0.096
1	DTT-00015	DTT-1B	12/6/02	15.9	0.048	<0.001	<0.005	84.422	<0.003	<0.002	<0.009	<0.004
1	DTT-00005	DCB-50	12/6/02	11.5	0.648	<0.001	<0.005	238.190	<0.003	<0.002	<0.009	252.050
2a	DTT-00006	DCB-49	12/9/02	11.7	159.160	<0.001	<0.005	68.944	<0.003	<0.002	0.060	640.860
2a	DTT-00007	DTT-1	12/9/02		4.844	<0.001	<0.005	82.329	<0.003	<0.002	<0.009	21.360
2b	DTT-00008	DCB-49	12/11/02	11.7	127.360	<0.001	<0.005	66.318	<0.003	<0.002	0.091	733.380
2b	DTT-00009	DTT-1	12/11/02		51.661	<0.001	<0.005	85.263	<0.003	<0.002	0.035	284.380
3a	DTT-00010	DCB-49	12/16/02	11.7	125.800	<0.001	<0.005	75.087	<0.003	<0.002	0.068	644.640
3a	DTT-00011	DTT-1	12/16/02		0.397	<0.001	<0.005	86.850	<0.003	<0.002	<0.009	0.153
3b	DTT-00012	DCB-49	12/18/02	11.7	125.940	<0.001	<0.005	64.099	<0.003	<0.002	0.075	750.460
3b	DTT-00013	DTT-1	12/18/02		39.771	<0.001	<0.005	190.380	<0.003	<0.002	0.042	330.360

Appendix B-6 (continued)

Phase	Sample ID	Sample Location	Sample Date	Sample Depth (ft)	Mg (mg/L)	Mn (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Si (mg/L)	Zn (mg/L)
1	DTT-00001	DCB-49	12/6/02	11.7	63.319	4.800	14.484	0.828	<0.017	30.516	2.060
1	DTT-00002	DTT-1A	12/6/02	11.9	9.577	<0.001	2.256	<0.010	<0.017	1.771	<0.001
1	DTT-00014	DTT-1A	12/6/02	15.9	34.886	3.277	7.664	0.626	<0.017	43.578	1.418
1	DTT-00003	DTT-1	12/6/02	9.8	10.049	<0.001	2.267	<0.010	<0.017	1.720	<0.001
1	DTT-00016	DTT-1	12/6/02	13.8	9.923	<0.001	1.971	<0.010	<0.017	1.747	<0.001
1	DTT-00004	DTT-1B	12/6/02	11.9	10.404	<0.001	2.117	<0.010	<0.017	1.865	<0.001
1	DTT-00015	DTT-1B	12/6/02	15.9	10.951	<0.001	2.038	<0.010	<0.017	1.789	<0.001
1	DTT-00005	DCB-50	12/6/02	11.5	55.947	2.418	8.194	0.244	<0.017	5.371	0.469
2a	DTT-00006	DCB-49	12/9/02	11.7	56.878	4.758	13.765	0.814	<0.017	29.396	1.962
2a	DTT-00007	DTT-1	12/9/02		11.631	0.087	2.159	<0.010	<0.017	4.271	<0.001
2b	DTT-00008	DCB-49	12/11/02	11.7	56.083	4.935	16.362	0.877	<0.017	34.797	2.142
2b	DTT-00009	DTT-1	12/11/02		35.185	2.540	8.609	0.447	<0.017	24.472	0.947
3a	DTT-00010	DCB-49	12/16/02	11.7	60.915	4.983	14.213	0.823	<0.017	29.502	2.082
3a	DTT-00011	DTT-1	12/16/02		10.564	<0.001	2.262	<0.010	<0.017	1.841	<0.001
3b	DTT-00012	DCB-49	12/18/02	11.7	55.308	4.882	16.073	0.858	<0.017	35.690	2.066
3b	DTT-00013	DTT-1	12/18/02		51.782	3.572	9.622	0.484	<0.017	25.363	1.066

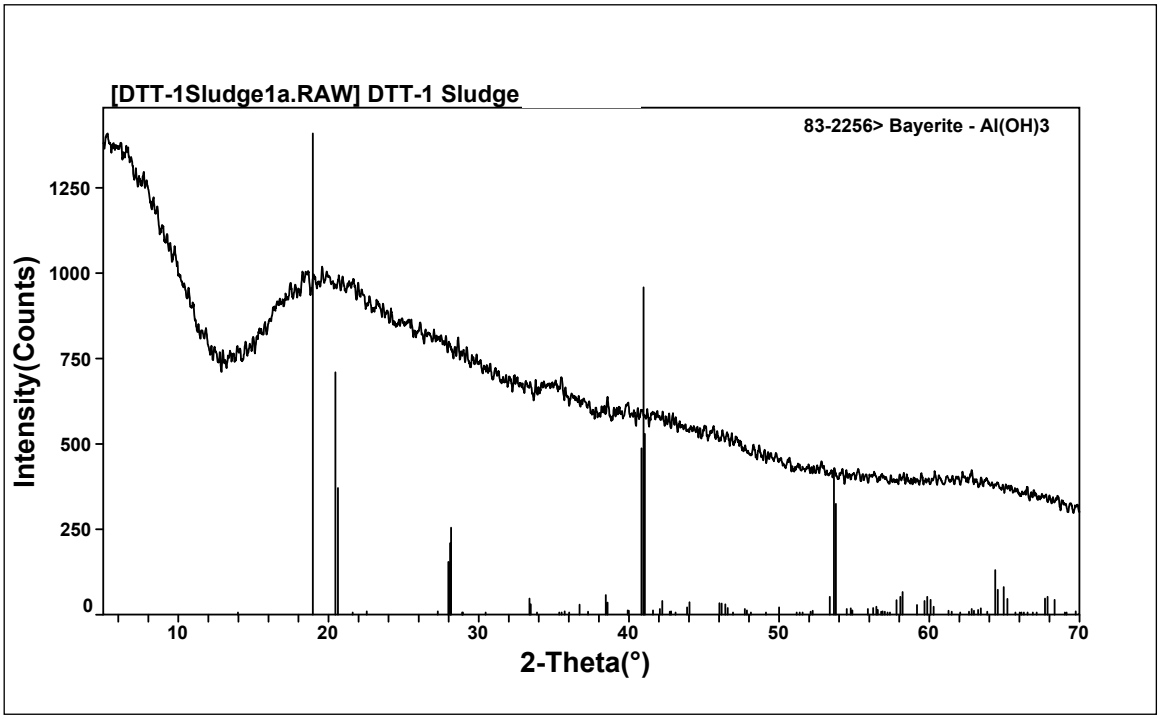
1 = Pre-pump tests
2a = Sample collected after first 30 min of pumping during 48-hour 0.5 gpm pump test
2b = Sample collected after last 30 min of pumping during 48-hour 0.5 gpm pump test
3a = Sample collected after first 30 min of pumping during 48-hour 1.0 gpm pump test
3b = Sample collected after last 30 min of pumping during 48-hour 1.0 gpm pump test

Appendix B-7, Iron Speciation (SRTC Mobile Laboratory)

Sample ID	Well	Fe^{+2}	Fe^{+3}	Fe_{total}	Fe^{+2}/Fe_{total}
DTT-00001	DCB-49	1.515	<0.010	1.523	all Fe^{+2}
		1.515	<0.010	1.521	
DTT-00002	DTT-1A	<0.010	<0.010	<0.010	no iron detected
		<0.010	<0.010	<0.010	
DTT-00014	DTT-1A	0.873	<0.010	0.877	all Fe^{+2}
		0.876	<0.010	0.875	
DTT-00003	DTT-1	<0.010	<0.010	<0.010	no iron detected
		<0.010	<0.010	<0.010	
DTT-00016	DTT-1	<0.010	<0.010	<0.010	no iron detected
		<0.010	<0.010	<0.010	
DTT-00004	DTT-1B	<0.010	<0.010	<0.010	no iron detected
		<0.010	<0.010	<0.010	
DTT-00015	DTT-1B	<0.010	<0.010	<0.010	no iron detected
		<0.010	<0.010	<0.010	
DTT-00005	DCB-50	0.544	<0.010	0.545	all Fe^{+2}
		0.545	<0.010	0.545	
DTT-00006	DCB-49	1.572	<0.010	1.572	all Fe^{+2}
		1.579	<0.010	1.582	
DTT-00007	DTT-1	0.016	<0.010	0.023	all Fe^{+2}
		0.017	<0.010	0.024	
DTT-00008	DCB-49	1.593	<0.010	1.59	all Fe^{+2}
		1.622	<0.010	1.624	
DTT-00009	DTT-1	0.629	<0.010	0.631	all Fe^{+2}
		0.643	<0.010	0.639	
DTT-00010	DCB-49	1.365	<0.010	1.377	all Fe^{+2}
		1.397	<0.010	1.389	
DTT-00011	DTT-1	<0.010	<0.010	<0.010	no iron detected
		<0.010	<0.010	<0.010	
DTT-00012	DCB-49	1.622	<0.010	1.626	all Fe^{+2}
		1.653	<0.010	1.660	
DTT-00013	DTT-1	0.718	<0.010	0.710	all Fe^{+2}
		0.712	<0.010	0.713	

See Appendix B-3 for phase and date information for corresponding sample ID.

Appendix B-8, XRD and XRF Results



XRD Results: Peaks in the x-ray diffraction spectrum suggest that the sludge is composed of an amorphous aluminum hydroxide mineral (similar to bayerite).

XRF Results:

SiO_2 wt%	Al_2O_3 wt%	Fe_2O_3 wt%	MgO wt%	CaO wt%	Na_2O wt%	K_2O wt%	P_2O_5 wt%	LOI wt%
8.47	53.15	4.89	0.47	3.32	0.01	0.09	0.38	29.15

LOI = loss on ignition (reflecting loss of water or other volatile componenets)

X-ray fluorescence on another similar sludge sample also indicates that the sludge consists predominantly of aluminum.

Appendix B-9, Microbial Parameters

Phase	Sample ID	Sample Location	Sample Depth (ft)	Date	TOC (mg/L)	Total Microbes (cells/ml)	SO_4 (mg/L)	H_2S (mg/L)	SRB (cells/ml)	pH	Eh (mV)	DO (mg/L)
1	DTT-00001	DCB-49	11.7	12/6/02	3.1	3.95E+04	2556	< 0.05	1.84E+01	3.29	432	0.541
1	DTT-00002	DTT-1A	11.9	12/6/02	8.3	3.29E+05	67.91	0.1	4.60E+01	7.23	304	2.012
1	DTT-00014	DTT-1A	15.9	12/6/02	2.3	4.00E+05	1465	0.05	3.00E+01	3.89	449	0.490
1	DTT-00003	DTT-1	9.8	12/6/02	9.4	2.72E+05	72.54	0.1	8.60E+01	7.18	255	2.114
1	DTT-00016	DTT-1	13.8	12/6/02	8.5	3.29E+05	67.89	0.05	8.60E+01	7.2	292	2.277
1	DTT-00004	DTT-1B	11.9	12/6/02	10.2	1.79E+05	78.62	0.08	4.60E+01	7.23	267	1.920
1	DTT-00015	DTT-1B	15.9	12/6/02	7.4	1.14E+05	75.76	0.08	8.60E+01	7.28	284	1.822
1	DTT-00005	DCB-50	11.5	12/6/02	7.6	2.37E+05	1262	0.14	8.60E+01	5.89	224	0.654

1 = Pre-pump tests

12/6/02 DTT-1 Sludge Sample	SRB (cells/ml)	Total Microbes (cells/ml)
Mixed Supernate and Precipitate	4.20E+02	3.59E+05
Supernate	-	1.63E+05
Precipitate	-	6.84E+07

APPENDIX C
ORGANIC SUBSTRATE FIELD APPLICATION
PART 1

Pre-Injection Field Parameter Results

Well/ Piezometer	Sample Number	Sample Type	Date	Time	Temperature (oF)	Temperature (oC)	pH	Conductivity (uS/cm)	Dissolved Oxygen (ug/L)	ORP (mV)	Eh Calculated (mV)	Comments
DCB-8	DSR-00001	Field	6/24/2002	9:35	67.5	19.72	4.9	17.69	38.25	220	419	
DCB-21A	DSR-00002	Field	7/3/2002	9:10	73.43	23.02	2.19	3590	4200	652	849	
DCB-21B	DSR-00003	Field	6/24/2002	11:32	68.01	20.01	3.25	1121	207	364	563	
DCB-21C	DSR-00004	Field	6/24/2002	11:39	68.78	20.43	4.22	703.4	198	303	502	
DCB-22A	DSR-00005	Field	7/3/2002	9:30	67.18	19.54	2.85	1594	1824	599	799	
DCB-22B	DSR-00006	Field	6/24/2002	11:57	66.52	19.18	3.44	1633	224	302	502	
DCB-22C	DSR-00007	Field	6/24/2002	12:07	67.56	19.76	4.48	367.3	206	293	492	
DCB-70A	DSR-00008	Field	6/25/2002	14:32	66.35	19.08	3.39	1186	2527	443	643	
DCB-70B	DSR-00009	Field	6/25/2002	13:51	64.95	18.31	4.29	223.1	294	114	315	
DCB-19A	DSR-00010	Field	6/24/2002	12:19	70.33	21.29	2.75	1015	3280	573	771	
DCB-19B	DSR-00011	Field	6/24/2002	12:27	67.87	19.93	2.98	1430	490	414	613	
DCB-19C	DSR-00012	Field	6/24/2002	13:06	77.38	25.21	3.17	1343	1289	394	589	
DCB-18A	DSR-00013	Field	6/24/2002	12:46	71.48	21.93	2.64	2149	3768	595	792	
DCB-18B	DSR-00014	Field	6/24/2002	12:56	68.62	20.34	2.66	2127	388	603	802	
DCB-18C	DSR-00015	Field	6/24/2002	13:12	69.53	20.85	3.14	1310	192	388	586	
DCB-71A	DSR-00016	Field	6/25/2002	13:32	66.12	18.96	4.1	485.3	3680	410	610	
DCB-71B	DSR-00017	Field	6/25/2002	12:55	66.34	19.08	3.62	1555	151	289	489	
DIW-P13A	DSR-00018	Field	6/24/2002	10:36	67.4	19.67	5.35	1233	598	-84	115	
DIW-P14A	DSR-00019	Field	6/24/2002	10:45	67.09	19.49	3.76	1295	407	54	254	
DIW-P11A	DSR-00020	Field	6/24/2002	10:22	69.7	20.94	2.73	1422	670	406	604	
DIW-P11B	DSR-00021	Field	6/24/2002	10:08	73.14	22.86	2.76	1775	1510	416	613	
DIW-P12A	DSR-00022	Field	6/24/2002	10:30	69.3	20.72	2.96	1148	560	370	568	
DIW-P09A	DSR-00023	Field	6/24/2002	10:58	70.02	21.12	2.91	811	438	461	659	
DIW-P10A	DSR-00024	Field	6/24/2002	10:54	68.83	20.46	2.95	625.4	502	397	596	
DIW-1-2	DSR-00025	Field	6/24/2002	11:09	68.62	20.34	4.99	419.6	241	-222	-23	
DIW-P02A	DSR-00026	Field	6/24/2002	11:18	69.81	21.01	6.28	147.1	322	-19	179	
DIW-P03A	DSR-00027	Field	6/25/2002	12:06	69.55	20.86	3.32	459.2	527	357	555	
DIW-P04A	DSR-00028	Field	6/25/2002		69.24	20.69	3.72	227.5	1008	346	545	
DIW-P05A	DSR-00029	Field	6/25/2002	11:53	69.19	20.66	3.52	1436	260	393	592	
DIW-P06A	DSR-00030	Field	6/25/2002	11:44	69.93	21.07	3.17	1011	299	374	572	
DIW-P07A	DSR-00031	Field	6/25/2002	13:22	70.1	21.17	3.11	1634	255	383	581	
DIW-P08A	DSR-00032	Field	6/25/2002	13:05	75.24	24.02	3.71	1660	500	272	468	
		Gray highlight means that there is no data										

First Post-Injection Field Parameter Results

Well/ Piezometer	Sample Number	Sample Type	Date	Time	Temperature (oF)	Temperature (oC)	pH	Conductivity (uS/cm)	Dissolved Oxygen (ug/L)	ORP (mV)	Eh Calculated (mV)	Comments
DCB-8	DSR-00050	Field	9/10/2002	8:40	75.39	24.11	5.1	31.6	2765	344	540	
DCB-21A	DSR-00051	Field	9/9/2002	10:54	77.77	25.43	2.22	6529	3017	661	855	
DCB-21B	DSR-00052	Field	9/9/2002	10:42	71.49	21.94	3.29	1704	161	359	556	
DCB-21C	DSR-00053	Field	9/9/2002	10:33	69.24	20.69	4.33	1042	190	268	467	
DCB-22A	DSR-00054	Field	9/9/2002	10:12	70.67	21.48	2.9	2525	834	568	766	
DCB-22B	DSR-00055	Field	9/9/2002	10:19	68.39	20.22	3.56	2381	186	276	475	
DCB-22C	DSR-00056	Field	9/9/2002	10:25	67.85	19.92	4.77	485.5	189	232	431	
DCB-70A	DSR-00057	Field	9/10/2002	11:45	72.85	22.69	3.04	1851	738	479	676	
DCB-70B	DSR-00058	Field	9/10/2002	12:07	70.63	21.46	5.65	222	1060	182	380	
DCB-19A	DSR-00059	Field	9/9/2002	9:34	77.86	25.48	2.78	1789	3662	578	772	
DCB-19B	DSR-00060	Field	9/9/2002	9:21	71.22	21.79	3.01	2044	476	419	617	
DCB-19C	DSR-00061	Field	9/9/2002	13:57	74.93	23.85	2.84	1434	762	457	653	
DCB-18A	DSR-00062	Field	9/9/2002	9:47	75.65	24.25	2.65	3646	2716	607	802	
DCB-18B	DSR-00063	Field	9/9/2002	9:54	71.99	22.22	2.78	2121	3290	619	816	
DCB-18C	DSR-00064	Field	9/9/2002	10:04	69.1	20.61	3.74	1884	208	272	471	
DCB-71A	DSR-00065	Field	9/10/2002	9:40	68.58	20.32	4.02	983	515	257	456	
DCB-71B	DSR-00066	Field	9/10/2002	10:00	71.6	22.00	3.65	910	1282	438	635	
DIW-P14C	DSR-00067	Field	9/9/2002	12:23	74.53	23.63	6.01	14600	1173	-165	31	
DIW-P13B	DSR-00068	Field	9/9/2002	12:29	74.42	23.57	5.49	4672	509	-133	63	
DIW-P13C	DSR-00069	Field	9/9/2002	12:35	73.03	22.79	5.75	31530	355	-94	103	
DIW-P12B	DSR-00070	Field	9/9/2002	12:40	75.51	24.17	4.03	2851	526	-69	127	
DIW-P11B	DSR-00071	Field	9/9/2002	12:44	75.12	23.96	3.75	2800	534	34	230	
DIW-P11C	DSR-00072	Field	9/9/2002	12:48	74.75	23.75	4	4586	270	74	270	
DIW-P10C	DSR-00073	Field	9/9/2002	12:52	75	23.89	3.52	3281	320	157	353	
DIW-P09B	DSR-00074	Field	9/9/2002	12:56	75.9	24.39	3.93	2650	489	42	237	
DIW-P09C	DSR-00075	Field	9/9/2002	13:00	75.78	24.32	4.53	5777	247	13	208	
DIW-P02C	DSR-00076	Field	9/9/2002	13:05	75.74	24.30	4.23	2720	396	-51	144	
DIW-P03B	DSR-00077	Field	9/9/2002	13:10	76.1	24.50	3.53	1638	469	230	425	
DIW-P04C	DSR-00078	Field	9/9/2002	13:14	75.11	23.95	3.31	1968	353	270	466	
DIW-P05B	DSR-00079	Field	9/9/2002	13:20	77.07	25.04	3.46	2290	490	278	473	
DIW-P06C	DSR-00080	Field	9/9/2002	13:24	76.14	24.52	3.45	2608	327	279	474	
DIW-P07B	DSR-00081	Field	9/9/2002	13:43	76.97	24.98	3.31	2391	458	257	452	
DIW-P07C	DSR-00082	Field	9/9/2002	13:47	75.85	24.36	3.4	2146	556	277	472	
DIW-P08C	DSR-00083	Field	9/9/2002	13:51	73.76	23.20	3.41	2154	346	271	467	May have been DIW-P08B instead
DIW-P14A	DSR-00084	Field	9/9/2002	11:02	71.52	21.96	6.18	2076	259	-252	-55	
DIW-P10A	DSR-00085	Field	9/9/2002	14:05	77.55	25.31	3.09	1045	560	345	540	
DIW-P08A	DSR-00086	Field	9/9/2002	11:11	73.85	23.25	4.1	1601	220	-112	84	
DIW-P13A	DSR-00087	Field	9/9/2002	14:31	78.96	26.09	5.9	3284	369	-64	130	
DIW-P11A	DSR-00088	Field	9/9/2002	14:22	81.29	27.38	4.78	2876	260	53	246	
DIW-P12A	DSR-00089	Field	9/9/2002	14:16	80.22	26.79	4.51	2127	500	50	243	
DIW-P09A	DSR-00090	Field	9/9/2002	14:09	80.44	26.91	3.78	1357	241	165	358	
DIW-1-2	DSR-00091	Field	9/9/2002	14:39	76.95	24.97	4.88	774.3	493	-67	128	
DIW-P07A	DSR-00092	Field	9/9/2002	14:50	79.69	26.49	3.95	1713	371	-27	166	

Second Post-Injection Field Parameter Results												
Well/ Piezometer	Sample Number	Sample Type	Date	Time	Temperature (oF)	Temperature (oC)	pH	Conductivity (uS/cm)	Dissolved Oxygen (ug/L)	ORP (mV)	Eh Calculated (mV)	Comments
DCB-8	DSR-00101	Field	11/6/2002	11:55	71.02	21.68	5.46	24.75	3830	123	321	
DCB-21A	DSR-00102	Field	11/6/2002	9:55	73.46	23.03	1.94	6595	3630	658	855	
DCB-21B	DSR-00103	Field	11/6/2002	10:16	72.59	22.55	3.04	1514	457	401	598	
DCB-21C	DSR-00104	Field	11/6/2002	10:43	70.11	21.17	4.16	938.9	485	298	496	
DCB-22A	DSR-00105	Field	11/6/2002	9:25	69.87	21.04	2.66	2281	1359	560	758	
DCB-22B	DSR-00106	Field	11/6/2002	9:07	69.36	20.76	3.32	1970	755	294	492	
DCB-22C	DSR-00107	Field	11/6/2002	8:37	67.87	19.93	4.59	513	885	212	411	
DCB-70B	DSR-00108	Field	11/6/2002	10:54	67.41	19.67	5.21	94.94	644	225	424	
DCB-19A	DSR-00109	Field	11/5/2002	10:22	71.82	22.12	2.63	1510	4114	528	725	
DCB-19B	DSR-00110	Field	11/5/2002	10:51	71.31	21.84	2.66	1696	1756	454	652	
DCB-19C	DSR-00111	Field	11/5/2002	10:08	68.13	20.07	2.92	1684	700	381	580	
DCB-18A	DSR-00112	Field	11/6/2002	9:46	73.93	23.29	2.22	5252	2562	614	810	
DCB-18B	DSR-00113	Field	11/6/2002	9:20	72.59	22.55	2.51	2607	2400	575	772	
DCB-18C	DSR-00114	Field	11/6/2002	8:43	69.36	20.76	3.45	1957	308	264	462	
DCB-71B	DSR-00115	Field	11/6/2002	10:34	67.66	19.81	3.44	1697	674	327	526	
DIW-P14C	DSR-00116	Field	11/5/2002	8:47	68.73	20.41	6.01	4957	415	-105	94	
DIW-P13B	DSR-00117	Field	11/5/2002	9:15	69.31	20.73	6.08	3860	394	-95	103	
DIW-P13C	DSR-00118	Field	11/5/2002	9:00	67.73	19.85	6.1	29510	225	-146	53	
DIW-P12B	DSR-00119	Field	11/5/2002	9:23	70.34	21.30	3.53	2715	570	158	356	
DIW-P11B	DSR-00120	Field	11/5/2002	9:38	70.28	21.27	3.69	2616	645	-13	185	
DIW-P11C	DSR-00121	Field	11/5/2002	10:14	69.01	20.56	3.31	3029	570	136	335	
DIW-P10C	DSR-00122	Field	11/5/2002	10:40	70.33	21.29	3.58	2797	439	19	217	
DIW-P09B	DSR-00123	Field	11/5/2002	10:47	70.67	21.48	3.59	2308	634	25	223	
DIW-P09C	DSR-00124	Field	11/5/2002	11:02	68.75	20.42	3.57	2938	495	65	264	
DIW-P02C	DSR-00125	Field	11/5/2002	11:07	70.1	21.17	3.97	2547	1008	-2	196	
DIW-P03B	DSR-00126	Field	11/5/2002	8:38	69.15	20.64	4.85	1085	400	-117	82	
DIW-P04C	DSR-00127	Field	11/5/2002	8:56	70.12	21.18	4.7	1026	616	17	215	
DIW-P05B	DSR-00128	Field	11/5/2002	9:03	70.05	21.14	3.26	1940	625	69	267	
DIW-P06C	DSR-00129	Field	11/5/2002	9:08	69.31	20.73	3.21	2080	421	104	302	
DIW-P07B	DSR-00130	Field	11/5/2002	9:15	70.94	21.63	3.15	2050	486	198	396	
DIW-P07C	DSR-00131	Field	11/5/2002	9:28	69.61	20.89	3.26	1864	409	254	452	
DIW-P08C	DSR-00132	Field	11/5/2002	9:45	70.81	21.56	3.33	2062	272	195	393	May have been DIW-P08B instead
DIW-P14A	DSR-00133	Field	11/6/2002	11:05	70.45	21.36	5.93	1833	742	-116	82	
DIW-P10A	DSR-00134	Field	11/6/2002	11:13	72.34	22.41	3.21	1139	480	264	461	
DIW-P08A	DSR-00135	Field	11/6/2002	11:19	73.22	22.90	3.59	2043	449	233	430	
DIW-P13A	DSR-00136	Field	11/6/2002	12:56	72.15	22.31	5.96	1987	236	-59	138	
DIW-P12A	DSR-00137	Field	11/6/2002	12:27	72.85	22.69	6.22	1861	163	-119	78	
DIW-P11A	DSR-00138	Field	11/6/2002	12:59	72.49	22.49	6.03	2250	135	-84	113	
DIW-P09A	DSR-00139	Field	11/6/2002	11:33	73.72	23.18	5.88	1388	280	-122	74	
DIW-1-2	DSR-00140	Field	11/6/2002	12:16	73.24	22.91	5.75	735.7	247	-213	-16	
DIW-P03A	DSR-00141	Field	11/6/2002	11:52	71.43	21.91	6.36	615.7	210	-130	67	
DIW-P05A	DSR-10001	Field	11/6/2002	12:03	73.67	23.15	5.79	961.4	144	-131	65	Additional unschedule sample taken for field parameters
DIW-P07A	DSR-00142	Field	11/6/2002	11:24	74.17	23.43	5.57	636.8	290	-102	94	

Third Post-Injection Field Parameter Results

Well/ Piezometer	Sample Number	Sample Type	Date	Time	Temperature (oF)	Temperature (oC)	pH	Conductivity (uS/cm)	Dissolved Oxygen (ug/L)	ORP (mV)	Eh Calculated (mV)	Comments
DCB-8	DSR-00151	Field	1/13/2003	12:58	67.17	19.54	4.93	40.16	3223	251	451	
DCB-21A	DSR-00152	Field	1/13/2003	8:40	60.26	15.70	2.33	5776	3500	655	858	
DCB-21B	DSR-00153	Field	1/13/2003	8:54	65.29	18.49	3.14	1887	792	409	609	
DCB-22A	DSR-00154	Field	1/13/2003	9:17	59.89	15.49	2.96	2013	2423	481	684	
DCB-22B	DSR-00155	Field	1/13/2003	9:35	63.5	17.50	3.46	2152	793	318	519	
DCB-22C	DSR-00156	Field	1/13/2003	10:08	64.39	17.99	4.56	621.6	750	99	300	
DCB-70B	DSR-00157	Field	1/13/2003	11:56	62.49	16.94	5.54	119.8	3310	154	356	
DCB-19A	DSR-00158	Field	1/13/2003	10:10	58.9	14.94	3.12	830.5	4330	476	679	
DCB-19B	DSR-00159	Field	1/13/2003	10:27	67.37	19.65	3.11	1418	2264	431	630	
DCB-18A	DSR-00160	Field	1/13/2003	10:42	62.28	16.82	2.24	6440	4263	618	820	
DCB-18B	DSR-00161	Field	1/13/2003	10:55	68.14	20.08	2.28	6672	2625	622	821	
DCB-18C	DSR-00162	Field	1/13/2003	11:15	68.7	20.39	3.66	1717	658	290	489	
DCB-71B	DSR-00163	Field	1/13/2003	12:30	65.63	18.68	3.65	2085	823	287	487	
DIW-P14C	DSR-00164	Field	1/13/2003	8:56	64.33	17.96	5	3090	760	-176	25	
DIW-P13B	DSR-00165	Field	1/13/2003	9:24	65.11	18.39	6.29	4694	595	-145	55	
DIW-P13C	DSR-00166	Field	1/13/2003	9:11	65.83	18.79	6.26	30520	563	-256	-56	
DIW-P12B	DSR-00167	Field	1/13/2003	9:38	63.97	17.76	2.41	5077	980	471	672	
DIW-P11B	DSR-00168	Field	1/13/2003	9:59	63.34	17.41	3.68	2718	633	-4	197	
DIW-P11C	DSR-00169	Field	1/13/2003	10:14	66.16	18.98	2.33	6199	1135	490	690	
DIW-P10C	DSR-00170	Field	1/13/2003	10:30	66.96	19.42	2.39	5729	1049	480	680	
DIW-P09B	DSR-00171	Field	1/13/2003	10:44	66.13	18.96	4.76	1873	868	-9	191	
DIW-P09C	DSR-00172	Field	1/13/2003	10:58	66.14	18.97	2.41	5887	1157	465	665	
DIW-P02C	DSR-00173	Field	1/13/2003	11:46	65.85	18.81	4.13	2223	574	-17	183	
DIW-P03B	DSR-00174	Field	1/13/2003	11:11	66.27	19.04	6.52	1036	1053	-102	98	
DIW-P03C	DSR-00175	Field	1/13/2003	11:23	66.09	18.94	6.44	1021	1107	-90	110	
DIW-P04C	DSR-00176	Field	1/13/2003	11:36	67.38	19.66	5.98	1033	1012	-51	148	
DIW-P05B	DSR-00177	Field	1/13/2003	11:54	66.95	19.42	3.58	2115	1180	143	343	
DIW-P06C	DSR-00178	Field	1/13/2003	12:02	68.76	20.42	3.62	2277	1098	174	373	
DIW-P07B	DSR-00179	Field	1/13/2003	12:13	69.23	20.68	3.52	2307	1115	258	457	
DIW-P07C	DSR-00180	Field	1/13/2003	12:25	69.19	20.66	3.56	2126	935	267	466	
DIW-P08C	DSR-00181	Field	1/13/2003	12:30	69.73	20.96	3.56	2198	931	263	461	
DIW-P14A	DSR-00182	Field	1/14/2003	9:06	60.39	15.77	5.89	1544	880	-26	177	
DIW-P10A	DSR-00183	Field	1/14/2003	8:45	62.95	17.19	3.77	453.3	820	288	490	
DIW-P08A	DSR-00184	Field	1/14/2003	8:54	64.44	18.02	3.87	2039	600	203	404	
DIW-P13A	DSR-00185	Field	1/14/2003	9:20	58.48	14.71	5.99	2868	908	-100	104	
DIW-P11A	DSR-00186	Field	1/14/2003	9:45	61.5	16.39	6.07	884.6	559	-109	93	
DIW-P12A	DSR-00187	Field	1/14/2003	10:00	62.93	17.18	5.95	615	448	-108	94	
DIW-P09A	DSR-00188	Field	1/14/2003	10:22	62.41	16.89	5.92	3038	523	-137	65	
DIW-1-2	DSR-00189	Field	1/14/2003	10:13	65.58	18.66	6.16	805.5	474	-115	85	
DIW-P03A	DSR-00190	Field	1/14/2003	9:52	64.6	18.11	6.37	747.9	625	-108	93	
DIW-P05A	DSR-00191	Field	1/14/2003	9:30	64.29	17.94	5.63	628.1	692	-168	33	
DIW-P07A	DSR-00192	Field	1/14/2003	9:15	62.12	16.73	5.51	781.6	664	-73	129	

Forth Post-Injection Field Parameter Results

Well / Piezometer	Sample Number	Sample Type	Date	Time	Temperature (F)	Temperature (C)	pH	Conductivity (uS/cm)	DO (ug/L)	ORP (mV)	Eh Calculated (mV)	Comments
DCB-8	DSR-00201	Field	4/1/2003	9:19	62.59	16.99	4.93	47		98	300	
DCB-21A	DSR-00202	Field	3/31/2003	11:51	63.1	17.28	2.29	4760		499	700	
DCB-21B	DSR-00203	Field	3/31/2003	11:55	65.75	18.75	3.05	2133		422	622	
DCB-22C	DSR-00204	Field	3/31/2003	13:13	68.83	20.46	4.59	752		298	497	
DCB-70B	DSR-00205	Field	3/31/2003	13:32	65.2	18.44	5.24	146		140	340	
DCB-19A	DSR-00206	Field	3/31/2003	13:43	62.03	16.68	2.66	3279		550	752	
DCB-19B	DSR-00207	Field	3/31/2003	13:18	66.59	19.22	3.19	1321		416	616	
DCB-18C	DSR-00208	Field	3/31/2003	14:00	69.97	21.09	3.64	1959		314	512	
DCB-71B	DSR-00209	Field	3/31/2003	13:57	66.8	19.33	3.65	2308		306	506	
DIW-P14C	DSR-00210	Field	3/31/2003	14:29	66.53	19.18	4.31	1855		-148	52	
DIW-P13B	DSR-00211	Field	3/31/2003	14:13	66.16	18.98	4.91	5633		-112	88	
DIW-P13C	DSR-00212	Field	3/31/2003	14:21	67.58	19.77	4.45	8168		-143	56	
DIW-P12B	DSR-00213	Field	4/1/2003	8:24	59.5	15.28	2.43	4489		478	681	
DIW-P11B	DSR-00214	Field	4/1/2003	8:33	59.89	15.49	2.64	3805		445	648	
DIW-P11C	DSR-00215	Field	3/31/2003	14:42	64.73	18.18	2.29	7443		483	684	
DIW-P10C	DSR-00216	Field	4/1/2003	8:58	64.03	17.79	2.48	4703		461	662	
DIW-P09B	DSR-00217	Field	4/1/2003	9:03	62.48	16.93	4.99	1265		-52	150	
DIW-P09C	DSR-00218	Field	4/1/2003	9:07	63.8	17.67	2.21	6603		494	695	
DIW-P02C	DSR-00219	Field	4/1/2003	9:11	63.52	17.51	5.96	736		-97	104	
DIW-P03B	DSR-00220	Field	4/1/2003	8:29	61.97	16.65	6.19	933		-12	190	
DIW-P03C	DSR-00221	Field	4/1/2003	8:47	63.15	17.31	6.2	966		-50	151	
DIW-P04C	DSR-00222	Field	4/1/2003	8:38	63.24	17.36	5.47	1054		-62	139	
DIW-P07B	DSR-00223	Field	3/31/2003	13:17	67.79	19.88	3.65	2391		59	258	
DIW-P07C	DSR-00224	Field	3/31/2003	14:26	69.21	20.67	3.6	2371		111	310	
DIW-P08C	DSR-00225	Field	3/31/2003	14:32	69.72	20.96	3.63	2430		75	273	
DIW-P13A	DSR-00226	Field	4/1/2003	9:20	60.44	15.80	5.92	1608		-79	124	
DIW-P11A	DSR-00227	Field	4/1/2003	9:43	60.61	15.89	5.1	952		14	217	
DIW-P09A	DSR-00228	Field	4/1/2003	10:03	62.33	16.85	5.78	427		-81	121	
DIW-1-2	DSR-00229	Field	4/1/2003	10:11	64.62	18.12	6.23	763		-74	127	
DIW-P03A	DSR-00230	Field	4/1/2003	10:07	63.89	17.72	5.9	432		-79	122	
DIW-P05A	DSR-00231	Field	4/1/2003	9:50	63.22	17.34	5.45	408		-114	87	
DIW-P07A	DSR-00232	Field	4/1/2003	9:38	63.16	17.31	5.28	540		-63	138	
		Gray highlight means that there is no data										

Fifth Post-Injection Field Parameter Results

Well / Piezometer	Sample Number	Sample Type	Date	Time	Temperature (F)	Temperature (C)	pH	Conductivity (uS/cm)	DO (ug/L)	ORP (mV)	Eh Calculated (mV)	Comments
DCB-8	DSR-00250	Field	7/15/2003	8:15	71.26	21.81	5.1	48.05	1540	87	285	
DCB-21A	DSR-00251	Field	7/14/2003	10:25	79.72	26.51	2.14	5705	900	443	636	
DCB-21B	DSR-00252	Field	7/14/2003	10:43	72.64	22.58	2.91	2799	790	395	592	
DCB-22C	DSR-00253	Field	7/14/2003	10:05	70.59	21.44	4.34	773.4	1940	253	451	
DCB-70B	DSR-00254	Field	7/14/2003	9:56	68.77	20.43	4.59	247.03	1050	101	300	
DCB-23C	DSR-00255	Field	7/14/2003	12:54	69.87	21.04	4.6	1988	1130	86	284	
DCB-19A	DSR-00256	Field	7/14/2003	11:11	77.04	25.02	2.26	3898	1040	489	684	
DCB-19B	DSR-00257	Field	7/14/2003	11:34	73.56	23.09	2.7	2491	1450	458	654	
DCB-18C	DSR-00258	Field	7/14/2003	11:46	72.36	22.42	3.42	2039	870	181	378	
DCB-71B	DSR-00259	Field	7/14/2003	9:33	69.28	20.71	3.87	949.8	1300	113	312	
DIW-P14C	DSR-00260	Field	7/14/2003	11:18	71.39	21.88	4.35	2485	890	-60	137	
DIW-P13B	DSR-00261	Field	7/14/2003	11:07	71.76	22.09	5.26	2116	890	-212	-15	
DIW-P13C	DSR-00262	Field	7/14/2003	11:14	72.76	22.64	3.99	2300	950	-121	76	
DIW-P12B	DSR-00263	Field	7/14/2003	12:11	73.62	23.12	2.07	5270	920	418	614	
DIW-P11B	DSR-00264	Field	7/14/2003	11:38	74.86	23.81	2.37	4341	670	96	292	
DIW-P11C	DSR-00265	Field	7/14/2003	11:57	72.93	22.74	2.11	5051	860	397	594	
DIW-P10C	DSR-00266	Field	7/14/2003	12:34	70.84	21.58	2.68	3383	1150	122	320	
DIW-P09B	DSR-00267	Field	7/14/2003	12:25	72.45	22.47	3.89	1395	950	-109	88	
DIW-P09C	DSR-00268	Field	7/14/2003	12:27	70.63	21.46	2.37	4341	1000	306	504	
DIW-P02C	DSR-00269	Field	7/14/2003	12:44	70.04	21.13	5.91	566.2	980	-88	110	
DIW-P03B	DSR-00270	Field	7/14/2003	12:13	71.7	22.06	5.53	383.8	830	-141	56	
DIW-P03C	DSR-00271	Field	7/14/2003	12:31	70.71	21.51	5.57	399.4	880	-98	100	
DIW-P04C	DSR-00272	Field	7/14/2003	12:02	70.28	21.27	4.46	756.6	1000	-95	103	
DIW-P07B	DSR-00273	Field	7/14/2003	10:39	70.91	21.62	5.16	918.8	1010	-40	158	
DIW-P07C	DSR-00274	Field	7/14/2003	10:53	72.02	22.23	4.29	1543	1000	-57	140	
DIW-P08C	DSR-00275	Field	7/14/2003	10:24	70.67	21.48	4.27	1738	1850	42	240	
DIW-P13A	DSR-00276	Field	7/15/2003	8:28	71.53	21.96	5.41	1802	470	-34	163	
DIW-P11A	DSR-00277	Field	7/15/2003	8:48	74.78	23.77	4.11	1542	590	115	311	
DIW-P09A	DSR-00278	Field	7/15/2003	9:00	72.88	22.71	5.34	552.9	480	2	199	
DIW-1-2	DSR-00279	Field	7/15/2003	9:17	74.34	23.52	5.07	286.2	610	29	225	
DIW-P03A	DSR-00280	Field	7/15/2003	9:13	73.64	23.13	5.36	264.4	410	-11	185	
DIW-P05A	DSR-00281	Field	7/15/2003	8:52	73.46	23.03	5.22	242	710	7	204	
DIW-P07A	DSR-00282	Field	7/15/2003	8:09	72.44	22.47	5.55	430.6	740	-114	83	

dissolved oxygen measurements taken with a YSI 95 DO meter

Pre-Injection EBS Analytical Results

Well / Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Lab pH	Analysis Date	Chloride (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)
DCB-8	DSR-00001	7/1/2002	Sample	7/3/2002	4.54	7/15/2002	5.2	<0.5	3.4	1.4	1.4
DCB-21A	DSR-00002	7/1/2002	Sample	7/3/2002	2.42	7/15/2002	4.7	<0.5	3.6	2.4	4864.56
DCB-21B	DSR-00003	6/27/2002	Sample	7/3/2002	3.05	7/15/2002	7.7	<0.5	<0.5	1.3	2121.94
DCB-21C	DSR-00004	6/27/2002	Sample	7/3/2002	3.92	7/15/2002	6.0	<0.5	<0.5	<0.5	590
DCB-22A	DSR-00005	6/27/2002	Sample	7/3/2002	2.95	7/15/2002	6.6	<0.5	10	<0.5	2654.61
DCB-22B	DSR-00006	6/27/2002	Sample	7/3/2002	2.97	7/15/2002	2.9	<0.5	0.7	<0.5	3067.87
DCB-22C	DSR-00007	6/27/2002	Sample	7/3/2002	4.04	7/15/2002	5.5	<0.5	<0.5	<0.5	390
DCB-70A	DSR-00008	7/1/2002	Sample	7/3/2002	3.23	7/15/2002	7.0	<0.5	2.1	<0.5	2383.19
DCB-70B	DSR-00009	7/1/2002	Sample	7/3/2002	4.15	7/15/2002	4.8	<0.5	3.2	1.4	250
DCB-19A	DSR-00010	6/26/2002	Sample	7/3/2002	2.87	7/15/2002	4.4	<0.5	11	<0.5	994.18
DCB-19B	DSR-00011	6/25/2002	Sample	7/3/2002	3.1	7/15/2002	4.3	<0.5	2.3	<0.5	2617
DCB-19C	DSR-00012	6/26/2002	Sample	7/3/2002	3.01	7/15/2002	4.1	<0.5	<0.5	<0.5	2493.55
DCB-18A	DSR-00013	6/27/2002	Sample	7/3/2002	2.74	7/15/2002	2.5	<0.5	5.9	<0.5	3226.71
DCB-18B	DSR-00014	6/26/2002	Sample	7/3/2002	2.75	7/15/2002	3.2	<0.5	4.3	<0.5	4038.62
DCB-18C	DSR-00015	6/26/2002	Sample	7/3/2002	3.01	7/15/2002	7.3	<0.5	<0.5	1.3	1807.67
DCB-71A	DSR-00016	7/1/2002	Sample	7/3/2002	3.88	7/15/2002	5.5	<0.5	2.0	1.3	760
DCB-71B	DSR-00017	7/1/2002	Sample	7/3/2002	3.09	7/15/2002	4.2	<0.5	<0.5	<0.5	2989.31
DIW-P11A	DSR-00020	6/27/2002	Sample	7/3/2002	3.01	7/15/2002	2.7	<0.5	<0.5	<0.5	2033.48
DIW-P11B	DSR-00021	6/27/2002	Sample	7/3/2002	3.03	7/15/2002	2.8	<0.5	1.8	<0.5	2489.65
DIW-1-2	DSR-00025	7/1/2002	Sample	7/3/2002	2.72	7/15/2002	3.1	<0.5	<0.5	<0.5	440
DIW-P07A	DSR-00031	6/26/2002	Sample	7/3/2002	3.89	7/15/2002	3.9	<0.5	1.8	<0.5	2817.64
DCB-21B	DSR-00033	6/27/2002	Duplicate			7/15/2002	8.4	<0.5	<0.5	1.3	2083.28
DCB-21B	DSR-00034	6/27/2002	Unfiltered								
DCB-22C	DSR-00035	6/27/2002	Duplicate			7/15/2002	5.6	<0.5	<0.5	<0.5	380
DCB-22C	DSR-00036	6/27/2002	Unfiltered								
DIW-P11B	DSR-00037	6/27/2002	Duplicate			7/15/2002	2.7	<0.5	1.7	<0.5	2474.66
DIW-P11B	DSR-00039	6/27/2002	Unfiltered								
DIW-P11C	DSR-00040	6/27/2002	Sample	7/3/2002	2.73	7/15/2002	3.1	<0.5	<0.5	<0.5	3827.21
DIW-P12B	DSR-00041	6/27/2002	Sample	7/3/2002	3.03	7/15/2002	2.8	<0.5	<0.5	<0.5	2375.6
DIW-P09A	DSR-00042	6/27/2002	Sample	7/3/2002	3.04	7/15/2002	4.1	<0.5	4.1	<0.5	690
DIW-P09B	DSR-00043	6/27/2002	Sample	7/3/2002	2.95	7/15/2002	2.7	<0.5	<0.5	1.3	2504.2
DIW-P09C	DSR-00044	6/27/2002	Sample	7/3/2002	2.73	7/15/2002	2.5	<0.5	1.9	<0.5	3615.71
DIW-P10C	DSR-00045	6/27/2002	Sample			7/15/2002	2.5	<0.5	1.8	1.5	2863.38
DIW-P07B	DSR-00046	6/26/2002	Sample	7/3/2002	2.93	7/15/2002	3.5	<0.5	<0.5	1.4	3034.17
DIW-P07C	DSR-00047	6/26/2002	Sample	7/3/2002	3.05	7/15/2002	3.9	<0.5	1.8	1.3	2432.24
DIW-P08C	DSR-00048	6/26/2002	Sample	7/3/2002	3.03	7/15/2002	3.5	<0.5	<0.5	1.3	2596.6

Gray highlight means that there is no data

Pre-Injection EBS Analytical Results

Well / Piezometer	Analysis Date	Lithium (mg/L)	Sodium (mg/L)	Ammonium (mg/L)	Potassium (mg/L)	Magnesium (mg/L)	Calcium (mg/L)	Analysis Date	Hydrogen Sulfide (mg/L)	Analysis Date	Lactate (%)	Lactate (mg/L)
DCB-8	7/18/2002	<0.5	3.6	<0.5	<0.5	2.2	0.7	7/9/2002	0.096921323	7/15/2002	<0.001	<6.3
DCB-21A	7/18/2002	0.6	7.4	2.4	65	<0.5	> 100	7/9/2002	0.102622577	7/15/2002	<0.001	<6.3
DCB-21B	7/18/2002	<0.5	7.5	<0.5	61	<0.5	> 100	7/9/2002	0.136830103	7/15/2002	<0.001	<6.3
DCB-21C	7/18/2002	<0.5	4.4	<0.5	39	<0.5	> 100	7/9/2002	0.074116306	7/15/2002	<0.001	<6.3
DCB-22A	7/18/2002	<0.5	16	<0.5	46	<0.5	78	7/9/2002	0.131128848	7/15/2002	<0.001	<6.3
DCB-22B	7/18/2002	<0.5	27	<0.5	53	<0.5	> 100	7/9/2002	0.165336374	7/15/2002	<0.001	<6.3
DCB-22C	7/18/2002	<0.5	3.8	<0.5	21	<0.5	91	7/9/2002	0.15963512	7/15/2002	<0.001	<6.3
DCB-70A	7/18/2002	<0.5	20	2.0	40	<0.5	65	7/9/2002	0.399087799	7/15/2002	<0.001	<6.3
DCB-70B	7/18/2002	<0.5	60	<0.5	11	<0.5	19	7/9/2002	0.096921323	7/15/2002	<0.001	<6.3
DCB-19A	7/18/2002	<0.5	4.5	<0.5	17	<0.5	39	7/9/2002	0.153933865	7/15/2002	<0.001	<6.3
DCB-19B	7/18/2002	<0.5	17	<0.5	38	<0.5	90	7/9/2002	0.205245154	7/15/2002	<0.001	<6.3
DCB-19C	7/18/2002	<0.5	13	<0.5	39	<0.5	> 100	7/9/2002	0.205245154	7/15/2002	<0.001	<6.3
DCB-18A	7/18/2002	<0.5	3.9	0.8	43	<0.5	87	7/9/2002	0.091220068	7/15/2002	<0.001	<6.3
DCB-18B	7/18/2002	<0.5	6.3	1.1	54	<0.5	> 100	7/9/2002	0.148232611	7/15/2002	<0.001	<6.3
DCB-18C	7/18/2002	<0.5	5.3	<0.5	40	<0.5	> 100	7/9/2002	0.102622577	7/15/2002	<0.001	<6.3
DCB-71A	7/18/2002	<0.5	7.1	<0.5	21	<0.5	34	7/9/2002	0.091220068	7/15/2002	<0.001	<6.3
DCB-71B	7/18/2002	<0.5	7.8	<0.5	57	<0.5	> 100	7/9/2002	0.028506271	7/15/2002	<0.001	<6.3
DIW-P11A	7/18/2002	<0.5	16	1.3	38	<0.5	> 100	7/9/2002	0.11972634	7/15/2002	<0.001	<6.3
DIW-P11B	7/18/2002	<0.5	16	1.3	44	<0.5	> 100	7/9/2002	0.222348917	7/15/2002	<0.001	<6.3
DIW-1-2	7/18/2002	<0.5	10	<0.5	13	<0.5	23	7/9/2002	2.337514253	7/15/2002	<0.001	<6.3
DIW-P07A	7/18/2002	<0.5	22	1.5	42	<0.5	> 100	7/9/2002	0.228050171	7/15/2002	<0.001	<6.3
DCB-21B	7/18/2002	<0.5	6.2	<0.5	54	<0.5	> 100			7/15/2002	<0.001	<6.3
DCB-21B								7/9/2002	0.182440137			
DCB-22C	7/18/2002	<0.5	3.8	<0.5	20	<0.5	90			7/15/2002	<0.001	<6.3
DCB-22C								7/9/2002	0.193842645			
DIW-P11B	7/18/2002	<0.5	16	1.3	42	<0.5	> 100			7/15/2002	<0.001	<6.3
DIW-P11B								7/9/2002	0.148232611			
DIW-P11C	7/18/2002	<0.5	16	2.7	46	<0.5	> 100	7/9/2002	0.062713797	7/15/2002	<0.001	<6.3
DIW-P12B	7/18/2002	<0.5	56	3.8	37	<0.5	98	7/9/2002	0.005701254	7/15/2002	<0.001	<6.3
DIW-P09A	7/18/2002	<0.5	12	<0.5	14	<0.5	29	7/9/2002	0.068415051	7/15/2002	<0.001	<6.3
DIW-P09B	7/18/2002	<0.5	14	1.7	40	<0.5	> 100	7/9/2002	0.142531357	7/15/2002	<0.001	<6.3
DIW-P09C	7/18/2002	<0.5	15	2.9	43	<0.5	> 100	7/9/2002	0.091220068	7/15/2002	<0.001	<6.3
DIW-P10C	7/18/2002	<0.5	24	2.4	38	<0.5	82	7/9/2002	<0.005	7/15/2002	<0.001	<6.3
DIW-P07B	7/18/2002	<0.5	16	<0.5	37	<0.5	> 100	7/9/2002	0.210946408	7/15/2002	<0.001	<6.3
DIW-P07C	7/18/2002	<0.5	9.7	0.6	34	<0.5	93	7/9/2002	0.1995439	7/15/2002	<0.001	<6.3
DIW-P08C	7/18/2002	<0.5	13	<0.5	36	<0.5	95	7/9/2002	0.193842645	7/15/2002	<0.001	<6.3

Gray highlight means that there is no data

Pre-Injection EBS Analytical Results

Well / Piezometer	Analysis Date	Acetic Acid (mg/L)	Propanoic Acid (mg/L)	Formic Acid (mg/L)	Isobutyric Acid (mg/L)	Butyric Acid (mg/L)	Isovaleric Acid (mg/L)	Valeric Acid (mg/L)	Isocaproic Acid (mg/L)	Hexanoic Acid (mg/L)	Heptanoic Acid (mg/L)	Analysis Date	TBCD (cells/ml)	Analysis Date	SRB (cells/ml)
DCB-8	7/25/2002	2.6	6.3	<1.0	7.5	6.4	10.0	7.0	6.9	7.4	8.0	7/2/2002	9.29E+04	9/23/2002	3.20E+01
DCB-21A	7/25/2002	7.8	32.2	11.6	36.8	28.0	44.9	36.1	36.7	33.3	30.1				
DCB-21B	7/25/2002	6.0	18.3	7.1	15.2	14.1	18.6	16.7	15.9	15.5	15.2	7/3/2002	1.20E+05	9/23/2002	7.20E+00
DCB-21C	7/25/2002	4.2	11.3	4.9	8.3	8.4	10.1	9.3	8.4	9.0	9.4				
DCB-22A	7/25/2002	9.0	35.8	12.7	20.6	21.1	22.0	23.3	18.2	18.0	14.8				
DCB-22B	7/25/2002	8.1	26.9	9.6	11.2	13.8	12.2	14.6	10.6	11.4	10.0				
DCB-22C	7/25/2002	5.7	16.4	6.6	6.5	8.9	7.4	9.2	6.7	7.9	<5.0	7/3/2002	3.33E+04	9/23/2002	7.20E+00
DCB-70A	7/25/2002	7.0	16.7	6.7	5.2	8.0	6.2	8.0	5.7	6.9	<5.0				
DCB-70B	7/25/2002	4.1	8.7	<1.0	2.5	4.8	3.7	5.0	3.8	5.1	<5.0	7/2/2002	4.39E+04	9/23/2002	<7.20E+00
DCB-19A	7/25/2002	4.4	9.6	<1.0	2.5	4.5	3.4	4.6	3.4	4.7	<5.0				
DCB-19B	7/25/2002	4.4	8.9	<1.0	2.1	4.4	3.2	4.5	3.4	4.6	<5.0	7/2/2002	3.27E+04	9/23/2002	<7.20E+00
DCB-19C	7/25/2002	3.8	7.0	<1.0	1.5	3.6	2.8	4.0	3.2	4.4	<5.0				
DCB-18A	7/25/2002	3.3	5.8	<1.0	<1.5	3.1	2.4	3.5	<2.0	<2.0	<5.0				
DCB-18B	7/25/2002	2.8	4.5	<1.0	<1.5	2.8	<2.0	3.1	<2.0	<2.0	<5.0				
DCB-18C	7/25/2002	2.5	4.1	<1.0	<1.5	2.6	<2.0	<2.0	<2.0	<2.0	<5.0	7/3/2002	1.17E+04	9/23/2002	4.60E+01
DCB-71A	7/25/2002	2.2	3.8	<1.0	<1.5	2.5	<2.0	<2.0	<2.0	<2.0	<5.0				
DCB-71B	7/25/2002	2.1	3.8	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0	7/2/2002	7.84E+04	9/23/2002	8.60E+01
DIW-P11A	7/25/2002	2.5	4.8	<1.0	1.2	3.1	2.4	3.1	<2.0	<2.0	<5.0				
DIW-P11B	7/25/2002	4.1	8.4	<1.0	3.2	5.2	4.3	5.4	4.3	5.2	<5.0	7/3/2002	5.86E+04	9/23/2002	7.20E+00
DIW-1-2	7/25/2002	<1.0	2.2	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0	7/2/2002	1.33E+05	9/23/2002	1.84E+01
DIW-P07A	7/25/2002	<1.0	1.8	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0			9/23/2002	<7.20E+00
DCB-21B	7/25/2002	<1.0	<1.0	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0	7/3/2002	1.10E+05		
DCB-21B															
DCB-22C	7/25/2002	<1.0	<1.0	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0				
DCB-22C															
DIW-P11B	7/25/2002	<1.0	<1.0	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0				
DIW-P11B															
DIW-P11C	7/25/2002	2.4	13.3	5.6	3.1	3.7	3.1	4.4	<2.0	<2.0	<5.0				
DIW-P12B	7/25/2002	<1.0	4.4	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0				
DIW-P09A	7/25/2002	<1.0	2.0	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0	7/3/2002	1.93E+04	9/23/2002	1.86E+02
DIW-P09B	7/25/2002	<1.0	<1.0	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0				
DIW-P09C	7/25/2002	<1.0	1.4	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0				
DIW-P10C	7/25/2002	<1.0	<1.0	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0				
DIW-P07B	7/25/2002	<1.0	<1.0	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0				
DIW-P07C	7/25/2002	2.8	10.0	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0				
DIW-P08C	7/25/2002	<1.0	2.3	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0				

Gray highlight means that there is no data

SRB = Sulfate Reducing Bacteria

TBCD = Total Bacterial Cell Density

Pre-Injection EBS Analytical Results	
Well / Piezometer	Comments
DCB-8	
DCB-21A	
DCB-21B	
DCB-21C	
DCB-22A	
DCB-22B	
DCB-22C	
DCB-70A	
DCB-70B	
DCB-19A	
DCB-19B	
DCB-19C	
DCB-18A	
DCB-18B	
DCB-18C	
DCB-71A	
DCB-71B	
DIW-P11A	
DIW-P11B	
DIW-1-2	
DIW-P07A	
DCB-21B	The TBCD was suppost to be for DIW-P07A; may be mis-labeled
DCB-21B	
DCB-22C	
DCB-22C	
DIW-P11B	
DIW-P11B	
DIW-P11C	
DIW-P12B	
DIW-P09A	
DIW-P09B	
DIW-P09C	
DIW-P10C	
DIW-P07B	
DIW-P07C	
DIW-P08C	May have been DIW-P08B insteac

First Post-Injection EBS Analytical Results

Well / Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Lab pH	Analysis Date	Chloride (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)
DCB-8	DSR-00050	9/10/2002	Sample	9/10/2002	4.52	9/18/2002	3.35	3.77	< 0.5	< 0.5	< 0.5
DCB-21A	DSR-00051	9/12/2002	Sample	9/12/2002	2.33	9/18/2002	4.73	2.25	16.47	< 0.5	2728.62
DCB-21B	DSR-00052	9/11/2002	Sample	9/11/2002	2.82	9/18/2002	2.61	< 0.5	5.70	< 0.5	1301.23
DCB-21C	DSR-00053	9/11/2002	Sample	9/11/2002	4.06	9/18/2002	4.14	< 0.5	< 0.5	< 0.5	534.45
DCB-22A	DSR-00054	9/11/2002	Sample	9/11/2002	3.31	9/18/2002	2.66	< 0.5	9.41	< 0.5	1598.26
DCB-22B	DSR-00055	9/12/2002	Sample	9/12/2002	2.6	9/18/2002	5.46	8.48	11.64	< 0.5	1539.71
DCB-22C	DSR-00056	9/11/2002	Sample	9/12/2002	4.47	9/18/2002	4.41	< 0.5	< 0.5	< 0.5	340.66
DCB-70A	DSR-00057	9/10/2002	Sample	9/10/2002	2.92	9/19/2002	5.41	0.73	8.17	< 0.5	1204.01
DCB-70B	DSR-00058	9/10/2002	Sample	9/10/2002	4.84	9/19/2002	3.15	< 0.5	< 0.5	< 0.5	97.91
DCB-19A	DSR-00059	9/12/2002	Sample	9/12/2002	2.75	9/18/2002	0.87	12.43	5.18	< 0.5	808.67
DCB-19B	DSR-00060	9/11/2002	Sample	9/11/2002	2.91	9/18/2002	3.20	1.53	9.79	< 0.5	1402.10
DCB-19C	DSR-00061	9/11/2002	Sample	9/11/2002	3.2	9/18/2002	3.32	0.00	8.96	< 0.5	1403.57
DCB-18A	DSR-00062	9/12/2002	Sample	9/12/2002	2.49	9/18/2002	2.43	3.71	16.07	< 0.5	2111.57
DCB-18B	DSR-00063	9/11/2002	Sample	9/11/2002	2.68	9/18/2002	1.83	3.54	13.38	< 0.5	1557.13
DCB-18C	DSR-00064	9/11/2002	Sample	9/11/2002	3.53	9/18/2002	2.40	0.00	5.06	< 0.5	1128.16
DCB-71A	DSR-00065	9/10/2002	Sample	9/10/2002	3.29	9/19/2002	1.63	< 0.5	3.62	< 0.5	658.29
DCB-71B	DSR-00066	9/10/2002	Sample	9/10/2002	3.52	9/19/2002	3.10	< 0.5	8.51	< 0.5	1513.43
DIW-P14C	DSR-00067	9/11/2002	Sample	9/11/2002	6.31	9/19/2002	< 0.5	< 0.5	48.63	11.23	227.92
DIW-P13B	DSR-00068	9/11/2002	Sample	9/11/2002	5.5	9/19/2002	10.12	< 0.5	18.33	< 0.5	961.42
DIW-P13C	DSR-00069	9/11/2002	Sample	9/11/2002	6.02	9/19/2002	< 0.5	< 0.5	< 0.5	< 0.5	465.53
DIW-P12B	DSR-00070	9/11/2002	Sample	9/11/2002	3.88	9/19/2002	2.95	< 0.5	10.51	< 0.5	1582.23
DIW-P11B	DSR-00071	9/11/2002	Sample	9/11/2002	3.76	9/19/2002	2.57	< 0.5	9.75	< 0.5	1623.21
DIW-P11C	DSR-00072	9/11/2002	Sample	9/11/2002	3.87	9/19/2002	3.55	< 0.5	12.54	< 0.5	1888.21
DIW-P10C	DSR-00073	9/11/2002	Sample	9/11/2002	3.47	9/19/2002	3.08	0.92	9.96	< 0.5	1595.32
DIW-P09B	DSR-00074	9/11/2002	Sample	9/11/2002	3.91	9/19/2002	2.18	< 0.5	8.29	< 0.5	1476.91
DIW-P09C	DSR-00075	9/11/2002	Sample	9/11/2002	4.33	9/19/2002	3.49	< 0.5	10.99	< 0.5	1670.11
DIW-P07B	DSR-00081	9/11/2002	Sample	9/11/2002	3.34	9/19/2002	2.89	< 0.5	10.65	< 0.5	1575.03
DIW-P07C	DSR-00082	9/11/2002	Sample	9/11/2002	3.4	9/19/2002	3.08	< 0.5	9.22	< 0.5	1420.39
DIW-P08C	DSR-00083	9/11/2002	Sample	9/11/2002	3.46	9/19/2002	3.45	< 0.5	9.96	< 0.5	1518.85
DIW-P13A	DSR-00087	9/11/2002	Sample	9/11/2002	6.1	9/19/2002	5.94	2.79	15.75	< 0.5	183.75
DIW-P11A	DSR-00088	9/11/2002	Sample	9/11/2002	4.88	9/19/2002	4.84	< 0.5	1.92	< 0.5	1053.84
DIW-P09A	DSR-00090	9/11/2002	Sample	9/11/2002	3.81	9/19/2002	0.77	0.55	4.35	< 0.5	753.48
DIW-1-2	DSR-00091	9/11/2002	Sample	9/11/2002	5.24	9/19/2002	0.77	< 0.5	5.08	< 0.5	348.46
DIW-P07A	DSR-00092	9/11/2002	Sample	9/11/2002	4.08	9/19/2002	1.40	< 0.5	4.52	< 0.5	933.92
DCB-21B	DSR-00093	9/11/2002	Duplicate	9/11/2002	2.82						
DCB-21B	DSR-00094	9/11/2002	Unfiltered	9/11/2002	2.82						
DCB-22C	DSR-00095	9/11/2002	Duplicate								
DCB-22C	DSR-00096	9/11/2002	Unfiltered	9/11/2002	4.47						
DIW-P11B	DSR-00097	9/11/2002	Duplicate								
DIW-P11B	DSR-00099	9/11/2002	Unfiltered	9/11/2002	3.76						

na* - sodium interferrent; na^ - lactate interferrent

Gray highlight means that there is no data

First Post-Injection EBS Analytical Results

Well / Piezometer	Analysis Date	Lithium (mg/L)	Sodium (mg/L)	Ammonium (mg/L)	Potassium (mg/L)	Magnesium (mg/L)	Calcium (mg/L)	Analysis Date	Hydrogen Sulfide (mg/L)	Analysis Date	Lactate (%)	Lactate (mg/L)
DCB-8	9/18/2002	< 0.5	1.45	< 0.5	0.55	0.54686469	0.70	9/13/2002	0.036461447	9/18/2002	<0.001	<6.3
DCB-21A	9/18/2002	0.83	11.51	< 0.5	27.40	27.4028302	113.80	9/13/2002	0.069336521	9/18/2002	0.000882	5.5545
DCB-21B	9/18/2002	< 0.5	7.58	< 0.5	36.16	36.1630363	83.89	9/13/2002	0.099222953	9/18/2002	0.001966	12.3879
DCB-21C	9/18/2002	< 0.5	3.88	< 0.5	26.82	26.8158416	78.03	9/13/2002	0.031978482	9/18/2002	0.000595	3.7480891
DCB-22A	9/18/2002	< 0.5	31.66	< 0.5	26.49	26.4886792	88.54	9/13/2002	0.121637776	9/18/2002	0.001993	12.554713
DCB-22B	9/18/2002	< 0.5	18.26	< 0.5	37.53	37.5280528	54.88	9/13/2002	0.021518231	9/18/2002	0.000868	5.4654326
DCB-22C	9/18/2002	< 0.5	3.36	< 0.5	21.50	21.4993399	56.09	9/13/2002	0.078302451	9/18/2002	<0.001	<6.3
DCB-70A	9/19/2002	< 0.5	18.02	< 0.5	35.55	35.5491749	36.69	9/13/2002	0.048416019	9/19/2002	0.000638	4.0203587
DCB-70B	9/19/2002	< 0.5	45.49	< 0.5	1.81	1.80957096	2.21	9/13/2002	0.026001195	9/19/2002	<0.001	<6.3
DCB-19A	9/18/2002	< 0.5	4.44	< 0.5	17.01	17.0085809	32.57	9/13/2002	0.018529588	9/18/2002	0.000596	3.7536587
DCB-19B	9/18/2002	< 0.5	16.56	< 0.5	27.65	27.6537954	55.55	9/13/2002	0.11566049	9/18/2002	0.000585	3.6834913
DCB-19C	9/18/2002	< 0.5	14.94	< 0.5	27.34	27.3432343	81.71	9/13/2002	0.03945009	9/18/2002	0.000799	5.0355261
DCB-18A	9/18/2002	0.73	7.51	< 0.5	5.74	5.74488449	81.30	9/13/2002	0.018529588	9/18/2002	0.000684	4.3086522
DCB-18B	9/18/2002	0.44	4.77	< 0.5	29.31	29.3125413	46.66	9/13/2002	0.021518231	9/18/2002	0.000843	5.3105804
DCB-18C	9/18/2002	< 0.5	6.09	< 0.5	31.97	31.9719472	95.20	9/13/2002	0.023012552	9/18/2002	0.001545	9.7339109
DCB-71A	9/19/2002	< 0.5	4.79	< 0.5	26.36	26.3643564	26.99	9/13/2002	0.026001195	9/19/2002	0.000664	4.1829717
DCB-71B	9/19/2002	< 0.5	9.22	< 0.5	61.44	61.4443396	94.52	9/13/2002	0.085774059	9/19/2002	0.002688	16.932391
DIW-P14C	9/19/2002	< 0.5	1876.85	< 0.5	< 0.5	62.0154242	59.93	9/13/2002	0.442916916	9/19/2002	0.691181	4354.4389
DIW-P13B	9/19/2002	< 0.5	772.39	na*	25.65	62.0482424	38.24	9/13/2002	0.179916318	9/19/2002	0.189444	1193.5001
DIW-P13C	9/19/2002	na*	na*	na*	na*	65.015553	na*	9/13/2002	0.043933054	9/19/2002	8.781929	55326.15
DIW-P12B	9/19/2002	< 0.5	96.04	na*	45.96	70.4196136	58.91	9/13/2002	18.16377764	9/19/2002	0.025414	160.10528
DIW-P11B	9/19/2002	< 0.5	79.41	na*	47.68	75.9877652	60.61	9/13/2002	9.389121339	9/19/2002	0.009997	62.981794
DIW-P11C	9/19/2002	< 0.5	301.36	na*	67.96	98.2795152	73.44	9/13/2002	0.274058577	9/19/2002	0.20918	1317.8351
DIW-P10C	9/19/2002	< 0.5	245.91	na*	49.27	68.5763258	62.54	9/13/2002	0.226240287	9/19/2002	0.164169	1034.2616
DIW-P09B	9/19/2002	< 0.5	76.93	< 0.5	45.31	45.3146226	53.60	9/13/2002	12.78421996	9/19/2002	0.01549	97.585094
DIW-P09C	9/19/2002	< 0.5	557.74	na*	79.85	83.7574697	78.30	9/13/2002	0.156007173	9/19/2002	0.367363	2314.3867
DIW-P07B	9/19/2002	< 0.5	15.44	< 0.5	37.32	37.3193396	77.21	9/13/2002	0.206814106	9/19/2002	0.001095	6.8960348
DIW-P07C	9/19/2002	< 0.5	10.38	< 0.5	32.66	32.6641509	76.90	9/13/2002	0.042438733	9/19/2002	0.000609	3.837887
DIW-P08C	9/19/2002	< 0.5	33.83	< 0.5	40.84	40.8419811	82.20	9/13/2002	0.075313808	9/19/2002	0.000821	5.1720717
DIW-P13A	9/19/2002	< 0.5	517.63	na*	14.50	44.9691136	21.14	9/13/2002	0.18141064	9/19/2002	0.048644	306.4555
DIW-P11A	9/19/2002	< 0.5	254.58	na*	28.25	46.5252424	42.77	9/13/2002	0.003586372	9/19/2002	0.200738	1264.6474
DIW-P09A	9/19/2002	< 0.5	37.51	< 0.5	23.90	23.9029703	26.37	9/13/2002	0.584877466	9/19/2002	0.001901	11.978857
DIW-1-2	9/19/2002	< 0.5	86.44	< 0.5	21.18	21.1762376	22.49	9/13/2002	1.575612672	9/19/2002	0.00654	41.205104
DIW-P07A	9/19/2002	< 0.5	21.70	< 0.5	24.85	24.8462264	53.57	9/13/2002	7.88643156	9/19/2002	0.000785	4.945637
DCB-21B								9/13/2002	0.024506874			
DCB-21B								9/13/2002	0.082785415			
DCB-22C												
DCB-22C								9/13/2002	0.072325164			
DIW-P11B												
DIW-P11B								9/13/2002	17.04004782			

na* - sodium interferrent; na^ - lactate interferrent

Gray highlight means that there is no data

First Post-Injection EBS Analytical Results

Well / Piezometer	Analysis Date	Acetic Acid (mg/L)	Propanoic Acid (mg/L)	Formic Acid (mg/L)	Isobutyric Acid (mg/L)	Butyric Acid (mg/L)	Isovaleric Acid (mg/L)	Valeric Acid (mg/L)	Isocaproic Acid (mg/L)	Hexanoic Acid (mg/L)	Heptanoic Acid (mg/L)	Analysis Date	TBCD (cells/ml)	Analysis Date	SRB (cells/ml)
DCB-8	9/18/2002	< 6.0	< 7.0	36.22	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	#######	2.35E+04	12/10/2002	1.50E+04
DCB-21A	9/18/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-21B	9/18/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	#######	1.03E+05	12/10/2002	<7.20E+00
DCB-21C	9/18/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-22A	9/18/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-22B	9/18/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-22C	9/18/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	#######	1.05E+06	12/10/2002	<7.20E+00
DCB-70A	9/19/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-70B	9/19/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	#######	4.91E+04	12/10/2002	1.84E+01
DCB-19A	9/18/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-19B	9/18/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	#######	9.95E+04	12/10/2002	<7.20E+00
DCB-19C	9/18/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-18A	9/18/2002	< 6.0	< 7.0	7.61	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-18B	9/18/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-18C	9/18/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	#######	4.42E+03	12/10/2002	2.20E+02
DCB-71A	9/19/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-71B	9/19/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	#######	7.11E+04	12/10/2002	1.48E+01
DIW-P14C	9/19/2002	1274.08	730.10	48.66	62.71	1298.92	< 10.0	62.39	< 10.0	123.78	< 10.0				
DIW-P13B	9/19/2002	655.57	476.97	8.81	< 9.0	256.46	< 10.0	12.27	< 10.0	< 10.0	< 10.0				
DIW-P13C	9/19/2002	347.95	69.29	5.61	57.24	172.79	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P12B	9/19/2002	137.60	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P11B	9/19/2002	104.64	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	#######	4.73E+05	12/10/2002	4.20E+02
DIW-P11C	9/19/2002	58.04	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P10C	9/19/2002	59.35	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P09B	9/19/2002	102.34	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P09C	9/19/2002	97.39	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P07B	9/19/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P07C	9/19/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P08C	9/19/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P13A	9/19/2002	437.83	165.53	21.42	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			12/10/2002	2.20E+06
DIW-P11A	9/19/2002	11.98	< 7.0	11.61	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P09A	9/19/2002	11.33	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	#######	1.65E+05	12/10/2002	4.20E+01
DIW-1-2	9/19/2002	57.65	12.16	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	#######	5.36E+04	12/10/2002	1.86E+02
DIW-P07A	9/19/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			12/10/2002	9.20E+03
DCB-21B	9/19/2002	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-21B															
DCB-22C	9/19/2002	8.03	< 7.0	6.33	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-22C															
DIW-P11B	9/19/2002	81.08	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P11B															

na* - sodium interferrent; na^ - lactate interferrent

Gray highlight means that there is no data

SRB = Sulfate Reducing Bacteria

TBCD = Total Bacterial Cell Density

First Post-Injection EBS Analytical Results

Well / Piezometer	Comments
DCB-8	
DCB-21A	
DCB-21B	
DCB-21C	
DCB-22A	
DCB-22B	
DCB-22C	
DCB-70A	
DCB-70B	
DCB-19A	
DCB-19B	
DCB-19C	
DCB-18A	
DCB-18B	
DCB-18C	
DCB-71A	
DCB-71B	
DIW-P14C	
DIW-P13B	
DIW-P13C	
DIW-P12B	
DIW-P11B	
DIW-P11C	
DIW-P10C	
DIW-P09B	
DIW-P09C	
DIW-P07B	
DIW-P07C	
DIW-P08C	May have been DIW-P08B instead
DIW-P13A	
DIW-P11A	
DIW-P09A	
DIW-1-2	
DIW-P07A	
DCB-21B	
DCB-21B	
DCB-22C	
DCB-22C	
DIW-P11B	
DIW-P11B	

Second Post-Injection EBS Analytical Results

Well / Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Lab pH	Analysis Date	Chloride (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)
DCB-8 *	DSR-00101	11/6/2002	Sample	11/6/02	5	11/21/2002	3.72	< 0.5	2.61	< 0.5	70.88
DCB-21A	DSR-00102	11/6/2002	Sample	11/6/02	2.19	11/22/2002	3.03	14.50	< 0.5	< 0.5	4514.00
DCB-21B	DSR-00103	11/6/2002	Sample	11/6/02	3.02	11/23/2002	2.42	10.37	< 0.5	< 0.5	1486.97
DCB-21C	DSR-00104	11/6/2002	Sample	11/6/02	4.44	11/24/2002	< 0.5	< 0.5	< 0.5	< 0.5	532.52
DCB-22A	DSR-00105	11/6/2002	Sample	11/6/02	2.92	11/25/2002	< 0.5	12.93	6.77	< 0.5	1902.34
DCB-22B	DSR-00106	11/6/2002	Sample	11/6/02	3.46	11/26/2002	2.00	10.10	< 0.5	< 0.5	1845.97
DCB-22C	DSR-00107	11/6/2002	Sample	11/6/02	4.51	11/27/2002	4.54	< 0.5	< 0.5	< 0.5	336.67
DCB-70B	DSR-00108	11/6/2002	Sample	11/6/02	5.04	11/28/2002	2.82	< 0.5	< 0.5	< 0.5	53.26
DCB-19A	DSR-00109	11/5/2002	Sample	11/5/2002	2.96	11/29/2002	1.51	7.66	10.52	< 0.5	890.53
DCB-19B	DSR-00110	11/5/2002	Sample	11/5/2002	3.1	11/30/2002	1.75	12.71	4.15	< 0.5	1432.62
DCB-19C	DSR-00111	11/5/2002	Sample	11/5/2002	3.47	12/1/2002	2.30	8.80	< 0.5	< 0.5	1609.96
DCB-18A	DSR-00112	11/6/2002	Sample	11/6/02	2.47	12/2/2002	1.48	17.11	< 0.5	< 0.5	3643.28
DCB-18B	DSR-00113	11/6/2002	Sample	11/6/02	2.7	12/3/2002	1.81	14.72	< 0.5	< 0.5	2806.49
DCB-18C	DSR-00114	11/6/2002	Sample	11/6/02	3.73	12/4/2002	< 0.5	6.28	< 0.5	< 0.5	1265.47
DCB-71B	DSR-00115	11/6/2002	Sample	11/6/02	3.47	12/5/2002	2.11	9.90	< 0.5	< 0.5	1856.20
DIW-P14C	DSR-00116	11/5/2002	Sample	11/5/2002	6.23	12/6/2002	6.31	11.14	< 0.5	< 0.5	133.01
DIW-P13B	DSR-00117	11/5/2002	Sample	11/5/2002	6.39	12/7/2002	4.99	10.84	< 0.5	< 0.5	8.60
DIW-P13C	DSR-00118	11/5/2002	Sample	11/5/2002	6.46	12/8/2002	< 0.5	354.37	< 0.5	< 0.5	82.75
DIW-P12B	DSR-00119	11/5/2002	Sample	11/5/2002	3.79	12/9/2002	9.31	< 0.5	< 0.5	< 0.5	3356.52
DIW-P11B	DSR-00120	11/5/2002	Sample	11/5/2002	3.94	12/10/2002	2.57	< 0.5	< 0.5	< 0.5	2871.69
DIW-P11C	DSR-00121	11/5/2002	Sample	11/5/02	3.59	12/11/2002	20.17	< 0.5	< 0.5	< 0.5	3947.55
DIW-P10C	DSR-00122	11/5/2002	Sample	11/5/2002	3.9	12/12/2002	3.56	< 0.5	< 0.5	< 0.5	3282.49
DIW-P09B	DSR-00123	11/5/2002	Sample	11/5/2002	3.99	12/13/2002	1.98	10.96	< 0.5	< 0.5	2030.19
DIW-P09C	DSR-00124	11/5/2002	Sample	11/5/2002	3.85	12/14/2002	5.11	< 0.5	< 0.5	< 0.5	3622.36
DIW-P03B	DSR-00126	11/5/2002	Sample	11/5/2002	5.28	12/15/2002	1.00	4.92	< 0.5	< 0.5	626.81
DIW-P07B	DSR-00130	11/5/2002	Sample	11/5/02	3.52	12/16/2002	< 0.5	10.92	< 0.5	< 0.5	1819.83
DIW-P07C	DSR-00131	11/5/2002	Sample	11/5/2002	3.45	12/17/2002	2.04	10.16	< 0.5	< 0.5	1662.59
DIW-P08C	DSR-00132	11/5/2002	Sample	11/5/2002	3.63	12/18/2002	2.28	8.73	< 0.5	< 0.5	1784.34
DIW-P13A	DSR-00136	11/6/2002	Sample	11/6/02	6.13	12/19/2002	5.20	< 0.5	< 0.5	< 0.5	7.48
DIW-P11A	DSR-00138	11/6/2002	Sample	11/6/02	6.15	12/20/2002	0.70	< 0.5	< 0.5	< 0.5	421.99
DIW-P09A	DSR-00139	11/6/2002	Sample	11/6/02	6.09	12/21/2002	1.25	5.64	< 0.5	< 0.5	338.16
DIW-1-2	DSR-00140	11/6/2002	Sample	11/6/02	6.13	12/22/2002	0.81	< 0.5	< 0.5	< 0.5	95.97
DIW-P03A	DSR-00141	11/6/2002	Sample	11/6/02	6.49	12/23/2002	1.87	< 0.5	< 0.5	< 0.5	< 0.5
DIW-P07A	DSR-00142	11/6/2002	Sample	11/6/02	5.68	12/24/2002	1.46	6.28	< 0.5	< 0.5	60.52
DCB-21B	DSR-00143	11/6/2002	Dulicate			12/25/2002	2.47	10.37	< 0.5	< 0.5	1400.80
DCB-21B	DSR-00144	11/6/2002	Unfiltered								
DCB-22C	DSR-00145	11/6/2002	Dulicate			12/27/2002	4.31	< 0.5	< 0.5	< 0.5	291.53
DCB-22C	DSR-00146	11/6/2002	Unfiltered								
DIW-P11B	DSR-00147	11/5/2002	Dulicate			12/29/2002	2.08	< 0.5	< 0.5	< 0.5	2637.72
DIW-P11B	DSR-00149	11/5/2002	Unfiltered								

Gray highlight means that there is no data

Second Post-Injection EBS Analytical Results

Well / Piezometer	Analysis Date	Lithium (mg/L)	Sodium (mg/L)	Ammonium (mg/L)	Potassium (mg/L)	Magnesium (mg/L)	Calcium (mg/L)	Analysis Date	Hydrogen Sulfide (mg/L)	Analysis Date	Lactate (%)	Lactate (mg/L)
DCB-8 *	11/12/2002	< 0.5	2.09	< 0.5	< 0.5	< 0.5	0.61	11/12/2002	0.0052	11/21/2002	<0.001	<6.3
DCB-21A	11/12/2002	< 0.5	14.25	4.13	< 0.5	163.81	240.91	11/12/2002	0.0131	11/22/2002	<0.001	<6.3
DCB-21B	11/12/2002	< 0.5	9.23	< 0.5	1.28	88.06	132.06	11/12/2002	0.0105	11/23/2002	<0.001	<6.3
DCB-21C	11/12/2002	< 0.5	4.50	< 0.5	1.76	63.88	144.29	11/12/2002	0.0079	11/24/2002	0.0018	11.334465
DCB-22A	11/12/2002	< 0.5	14.95	< 0.5	1.03	67.08	83.15	11/12/2002	0.0079	11/25/2002	0.0028	17.662479
DCB-22B	11/12/2002	< 0.5	27.04	1.61	2.28	105.01	149.42	11/12/2002	0.0733	11/26/2002	<0.001	<6.3
DCB-22C	11/12/2002	< 0.5	4.35	< 0.5	1.47	26.06	100.09	11/12/2002	0.0105	11/27/2002	<0.001	<6.3
DCB-70B	11/12/2002	< 0.5	29.72	< 0.5	0.82	< 0.5	1.02	11/12/2002	0.0052	11/28/2002	<0.001	<6.3
DCB-19A	11/12/2002	< 0.5	4.92	< 0.5	1.37	27.19	52.29	11/12/2002	0.0209	11/29/2002	<0.001	<6.3
DCB-19B	11/12/2002	< 0.5	12.61	< 0.5	1.66	53.07	87.09	11/12/2002	0.0288	11/30/2002	<0.001	<6.3
DCB-19C	11/12/2002	< 0.5	751.73	< 0.5	2.02	66.75	148.57	11/12/2002	0.0183	12/1/2002	<0.001	<6.3
DCB-18A	11/12/2002	< 0.5	12.39	2.66	0.89	119.34	166.66	11/12/2002	0.0131	12/2/2002	<0.001	<6.3
DCB-18B	11/12/2002	< 0.5	9.27	1.89	1.05	91.36	133.85	11/12/2002	0.0183	12/3/2002	<0.001	<6.3
DCB-18C	11/12/2002	< 0.5	6.70	0.58	3.24	73.65	178.80	11/12/2002	0.0183	12/4/2002	0.0029	18.435689
DCB-71B	11/12/2002	< 0.5	10.33	< 0.5	4.64	113.07	164.43	11/12/2002	0.0131	12/5/2002	<0.001	<6.3
DIW-P14C	11/12/2002	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	11/12/2002	0.0864	12/6/2002	0.1087	685.07808
DIW-P13B	11/12/2002	< 0.5	1292.02	112.75	33.12	33.34	51.78	11/12/2002	0.0236	12/7/2002	0.0723	455.53409
DIW-P13C	11/12/2002	< 0.5	17102.25	790.72	< 0.5	49.12	92.29	11/12/2002	0.0131	12/8/2002	3.2429	20430.456
DIW-P12B	11/12/2002	< 0.5	98.15	15.24	2.08	99.36	177.48	11/12/2002	0.2069	12/9/2002	<0.001	<6.3
DIW-P11B	11/12/2002	< 0.5	165.27	12.47	8.57	92.36	174.23	11/12/2002	6.3106	12/10/2002	<0.001	<6.3
DIW-P11C	11/12/2002	< 0.5	78.08	8.56	1.74	107.21	194.37	11/12/2002	3.0610	12/11/2002	<0.001	<6.3
DIW-P10C	11/12/2002	< 0.5	116.74	8.86	3.98	97.87	178.16	11/12/2002	2.6839	12/12/2002	<0.001	<6.3
DIW-P09B	11/12/2002	< 0.5	104.29	< 0.5	6.88	85.41	120.36	11/12/2002	0.0001	12/13/2002	<0.001	<6.3
DIW-P09C	11/12/2002	< 0.5	160.01	12.31	3.55	107.81	191.25	11/12/2002	7.2794	12/14/2002	0.0477	300.65618
DIW-P03B	11/12/2002	< 0.5	68.34	< 0.5	3.09	37.40	56.52	11/12/2002	0.0288	12/15/2002	0.0057	35.899736
DIW-P07B	11/12/2002	< 0.5	15.78	< 0.5	2.08	71.28	134.22	11/12/2002	0.0209	12/16/2002	<0.001	<6.3
DIW-P07C	11/12/2002	< 0.5	12.63	< 0.5	2.35	70.75	142.59	11/12/2002	0.0183	12/17/2002	<0.001	<6.3
DIW-P08C	11/12/2002	< 0.5	34.22	< 0.5	3.05	80.60	160.62	11/12/2002	0.0314	12/18/2002	<0.001	<6.3
DIW-P13A	11/12/2002	< 0.5	480.39	30.79	8.98	41.43	71.91	11/12/2002	0.0288	12/19/2002	0.0424	266.88307
DIW-P11A	11/12/2002	< 0.5	470.23	38.72	5.90	72.01	127.07	11/12/2002	0.1650	12/20/2002	0.0428	269.57482
DIW-P09A	11/12/2002	< 0.5	201.28	< 0.5	6.67	41.35	58.49	11/12/2002	0.0655	12/21/2002	0.0090	56.402617
DIW-1-2	11/12/2002	< 0.5	167.85	< 0.5	3.82	22.84	31.09	11/12/2002	16.1561	12/22/2002	0.0026	16.524214
DIW-P03A	11/12/2002	< 0.5	17.23	0.64	1.78	9.16	23.11	11/12/2002	0.3718	12/23/2002	0.0026	16.381404
DIW-P07A	11/12/2002	< 0.5	27.85	< 0.5	2.34	34.83	63.79	11/12/2002	0.0131	12/24/2002	0.0094	59.425524
DCB-21B	11/12/2002	< 0.5	8.23	0.73	1.42	98.23	141.96			12/25/2002	<0.001	<6.3
DCB-21B								11/12/2002	0.0236			
DCB-22C	11/12/2002	< 0.5	3.89	< 0.5	1.54	24.05	103.54			12/27/2002	<0.001	<6.3
DCB-22C								11/12/2002	0.0052			
DIW-P11B	11/12/2002	< 0.5	170.58	10.60	7.58	95.21	166.32			12/29/2002	<0.001	<6.3
DIW-P11B								11/12/2002	7.3318			

Gray highlight means that there is no data

Second Post-Injection EBS Analytical Results

Well / Piezometer	Analysis Date	Acetic Acid (mg/L)	Propanoic Acid (mg/L)	Formic Acid (mg/L)	Isobutyric Acid (mg/L)	Butyric Acid (mg/L)	Isovaleric Acid (mg/L)	Valeric Acid (mg/L)	Isocaproic Acid (mg/L)	Hexanoic Acid (mg/L)	Heptanoic Acid (mg/L)	Analysis Date	TBCD (cells/ml)	Analysis Date	SRB (cells/ml)
DCB-8	12/6/2002	4.70	8.54	26.24	<9	<9	<10	<10	<10	<10	<10	#######	4.04E+04	2/10/2003	2.20E+03
DCB-21A	12/6/2002	<6	<7	3.96	<9	<9	<10	<10	<10	<10	<10				
DCB-21B	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10	#######	7.96E+04	2/10/2003	<7.20E+00
DCB-21C	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DCB-22A	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DCB-22B	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DCB-22C	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10	#######	1.74E+04	2/10/2003	<7.20E+00
DCB-70B	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10	#######	2.17E+04	2/10/2003	3.00E+02
DCB-19A	12/6/2002	<6	<7	5.51	<9	<9	<10	<10	<10	<10	<10				
DCB-19B	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10	#######	1.10E+05	2/10/2003	<7.20E+00
DCB-19C	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DCB-18A	12/6/2002	<6	<7	23.63	<9	<9	<10	<10	<10	<10	<10				
DCB-18B	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DCB-18C	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10	#######	1.59E+04	2/10/2003	1.84E+01
DCB-71B	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10	#######	3.42E+04	2/10/2003	4.60E+01
DIW-P14C	12/6/2002	1320.92	701.98	25.70	42.83	268.92	0.00	17.60	<10	37.64	<10				
DIW-P13B	12/6/2002	800.08	831.97	28.07	648.44	62.88	0.00	12.19	<10	<10	<10				
DIW-P13C	12/6/2002	579.88	635.33	42.24	557.78	635.71	0.00	33.91	<10	16.98	<10				
DIW-P12B	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DIW-P11B	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10	#######	4.04E+05	2/10/2003	3.00E+03
DIW-P11C	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DIW-P10C	12/6/2002	7.02	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DIW-P09B	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DIW-P09C	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DIW-P03B	12/6/2002	32.08	<7	31.63	<9	<9	<10	<10	19.65	25.07	54.13				
DIW-P07B	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DIW-P07C	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DIW-P08C	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DIW-P13A	12/6/2002	301.40	281.62	20.42	119.75	17.29	0.00	22.20	<10	<10	<10	#######	3.31E+06	2/10/2003	5.80E+06
DIW-P11A	12/6/2002	68.13	53.94	<5	57.30	<9	<10	<10	<10	<10	<10				
DIW-P09A	12/6/2002	79.14	41.46	<5	35.61	<9	<10	<10	<10	<10	<10	#######	3.21E+06	2/10/2003	>2.20E+06
DIW-1-2	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10	#######	1.47E+06	2/10/2003	>2.20E+06
DIW-P03A	12/6/2002	27.97	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DIW-P07A	12/6/2002	97.87	55.36	<5	38.85	10.77	<10	<10	<10	<10	<10	#######	5.25E+06	2/10/2003	3.00E+05
DCB-21B	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DCB-21B															
DCB-22C	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DCB-22C															
DIW-P11B	12/6/2002	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10				
DIW-P11B															

Gray highlight means that there is no data

SRB = Sulfate Reducing Bacteria TBCD = Total Bacterial Cell Density

Second Post-Injection EBS Analytical Results	
Well / Piezometer	Comments
DCB-8	
DCB-21A	
DCB-21B	
DCB-21C	
DCB-22A	
DCB-22B	
DCB-22C	
DCB-70B	SRB count was previously listed as 8.60E+01; this was preliminary data
DCB-19A	
DCB-19B	
DCB-19C	
DCB-18A	
DCB-18B	
DCB-18C	SRB count was previously listed as <7.20E+00; this was preliminary data
DCB-71B	SRB count was previously listed as 1.84E+01; this was preliminary data
DIW-P14C	
DIW-P13B	
DIW-P13C	
DIW-P12B	
DIW-P11B	
DIW-P11C	
DIW-P10C	
DIW-P09B	
DIW-P09C	
DIW-P03B	
DIW-P07B	
DIW-P07C	
DIW-P08C	May have been DIW-P08B instead
DIW-P13A	
DIW-P11A	
DIW-P09A	SRB count was previously listed as 2.20E+06; this was preliminary data
DIW-1-2	SRB count was previously listed as 4.80E+05; this was preliminary data
DIW-P03A	
DIW-P07A	SRB count was previously listed as >2.20E+07; this was preliminary data
DCB-21B	
DCB-21B	
DCB-22C	
DCB-22C	
DIW-P11B	
DIW-P11B	

Third Post-Injection EBS Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Lab pH	Analysis Date	Chloride (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)
DCB-8	DSR-00151	1/13/2003	Sample	1/16/2003	4.48	1/23/2002	7.38	1.58	< 0.5	< 0.5	3.60
DCB-21A	DSR-00152	1/13/2003	Sample	1/16/2003	2.38	1/23/2002	3.87	< 0.5	< 0.5	< 0.5	4733
DCB-21B	DSR-00153	1/13/2003	Sample	1/16/2003	3.03	1/23/2002	3.49	< 0.5	7.03	< 0.5	1466
DCB-22A	DSR-00154	1/13/2003	Sample	1/16/2003	2.94	1/23/2002	3.72	8.35	8.40	< 0.5	1852
DCB-22B	DSR-00155	1/13/2003	Sample	1/16/2003	3.42	1/23/2002	2.84	< 0.5	8.36	< 0.5	1889
DCB-22C	DSR-00156	1/13/2003	Sample	1/16/2003	4.25	1/23/2002	4.82	< 0.5	< 0.5	< 0.5	381.7
DCB-70B	DSR-00157	1/13/2003	Sample	1/16/2003	5.23	1/23/2002	3.13	< 0.5	< 0.5	< 0.5	50.65
DCB-19A	DSR-00158	1/13/2003	Sample	1/16/2003	3.18	1/23/2002	6.60	6.20	< 0.5	< 0.5	472.6
DCB-19B	DSR-00159	1/13/2003	Sample	1/16/2003	3.13	1/23/2002	2.12	6.28	6.38	< 0.5	1081
DCB-18A	DSR-00160	1/13/2003	Sample	1/16/2003	2.23	1/23/2002	3.77	< 0.5	< 0.5	< 0.5	5313
DCB-18B	DSR-00161	1/13/2003	Sample	1/16/2003	2.25	1/23/2002	4.14	< 0.5	< 0.5	< 0.5	5609
DCB-18C	DSR-00162	1/13/2003	Sample	1/16/2003	3.41	1/23/2002	2.85	< 0.5	< 0.5	< 0.5	1285
DCB-71B	DSR-00163	1/13/2003	Sample	1/16/2003	3.43	1/23/2002	3.04	< 0.5	8.11	< 0.5	1899
DIW-P14C	DSR-00164	1/13/2003	Sample	1/16/2003	4.8	1/23/2002	2.10	< 0.5	< 0.5	< 0.5	2017
DIW-P13B	DSR-00165	1/13/2003	Sample	1/16/2003	6.71	1/23/2002	23.15	< 0.5	< 0.5	< 0.5	835.4
DIW-P13C	DSR-00166	1/13/2003	Sample	1/16/2003	6.4	1/23/2002	141.35	< 0.5	< 0.5	< 0.5	242.8
DIW-P12B	DSR-00167	1/13/2003	Sample	1/16/2003	2.23	1/23/2002	2.45	2.80	< 0.5	< 0.5	4965
DIW-P11B	DSR-00168	1/13/2003	Sample	1/16/2003	3.47	1/23/2002	3.05	< 0.5	< 0.5	< 0.5	3135
DIW-P11C	DSR-00169	1/13/2003	Sample	1/16/2003	2.19	1/23/2002	20.05	3.85	< 0.5	< 0.5	6493
DIW-P10C	DSR-00170	1/13/2003	Sample	1/16/2003	2.39	1/23/2002	18.60	3.25	< 0.5	< 0.5	5791
DIW-P09B	DSR-00171	1/13/2003	Sample	1/16/2003	4.48	1/23/2002	2.12	< 0.5	3.26	< 0.5	1260
DIW-P09C	DSR-00172	1/13/2003	Sample	1/16/2003	2.43	1/23/2002	2.70	< 0.5	< 0.5	< 0.5	6245
DIW-P03B	DSR-00174	1/13/2003	Sample	1/16/2003	6.36	1/23/2002	3.22	< 0.5	< 0.5	< 0.5	< 0.5
DIW-P03C	DSR-00175	1/13/2003	Sample	1/16/2003	6.31	1/23/2002	3.99	< 0.5	< 0.5	< 0.5	0.00
DIW-P07B	DSR-00179	1/13/2003	Sample	1/16/2003	3.39	1/23/2002	2.96	< 0.5	8.58	< 0.5	2025
DIW-P07C	DSR-00180	1/13/2003	Sample	1/16/2003	3.42	1/23/2002	3.33	< 0.5	7.81	< 0.5	1825
DIW-P08C	DSR-00181	1/13/2003	Sample	1/16/2003	3.24	1/23/2002	3.35	< 0.5	7.83	< 0.5	1861
DIW-P13A	DSR-00185	1/14/2003	Sample	1/16/2003	5.95	1/23/2002	41.20	< 0.5	< 0.5	< 0.5	252.8
DIW-P11A	DSR-00186	1/14/2003	Sample	1/16/2003	5.88	1/23/2002	4.80	< 0.5	< 0.5	< 0.5	139.2
DIW-P09A	DSR-00188	1/14/2003	Sample	1/16/2003	5.83	1/23/2002	13.40	< 0.5	16.73	< 0.5	55.14
DIW-1-2	DSR-00189	1/14/2003	Sample	1/16/2003	6.07	1/23/2002	2.46	< 0.5	< 0.5	< 0.5	143.2
DIW-P03A	DSR-00190	1/14/2003	Sample	1/16/2003	6.24	1/23/2002	< 0.5	< 0.5	< 0.5	< 0.5	20.28
DIW-P05A	DSR-00191	1/14/2003	Sample	1/16/2003	5.47	1/23/2002	4.84	< 0.5	< 0.5	< 0.5	68.23
DIW-P07A	DSR-00192	1/14/2003	Sample	1/16/2003	5.25	1/23/2002	3.39	< 0.5	< 0.5	< 0.5	15.80
DCB-21B	DSR-00193	1/13/2003	Duplicate			1/23/2002	3.63	< 0.5	7.25	< 0.5	1441
DCB-21B	DSR-00194	1/13/2003	Unfiltered								
DCB-22C	DSR-00195	1/13/2003	Duplicate			1/23/2002	5.00	< 0.5	7.97	< 0.5	435.3
DCB-22C	DSR-00196	1/13/2003	Unfiltered								
DIW-P11B	DSR-00197	1/13/2003	Duplicate			1/23/2002	< 0.5	< 0.5	< 0.5	< 0.5	369.7
DIW-P11B	DSR-00199	1/13/2003	Unfiltered								

Gray highlight means that there is no data

Third Post-Injection EBS Analytical Results

Well / Piezometer	Analysis Date	Lithium (mg/L)	Sodium (mg/L)	Ammonium (mg/L)	Potassium (mg/L)	Magnesium (mg/L)	Calcium (mg/L)	Analysis Date	Hydrogen Sulfide (mg/L)	Analysis Date	Lactate (%)	Lactate (mg/L)
DCB-8	1/22/2003	< 0.5	3.95	< 0.5	< 0.5	< 0.5	< 0.5	1/16/2003	0.0120	1/23/2002	<0.001	<6.3
DCB-21A	1/22/2003	< 0.5	10.81	< 0.5	0.85	116.17	162.96	1/16/2003	0.0040	1/23/2002	0.0019	12.172664
DCB-21B	1/22/2003	< 0.5	7.73	0.53	1.72	72.62	121.27	1/16/2003	0.0233	1/23/2002	0.0016	9.8946952
DCB-22A	1/22/2003	< 0.5	17.62	< 0.5	1.38	56.72	71.31	1/16/2003	0.0014	1/23/2002	0.0016	9.854176
DCB-22B	1/22/2003	< 0.5	26.84	1.27	2.88	74.80	132.43	1/16/2003	0.0973	1/23/2002	<0.001	<6.3
DCB-22C	1/22/2003	< 0.5	4.10	< 0.5	1.95	28.64	109.71	1/16/2003	0.0233	1/23/2002	<0.001	<6.3
DCB-70B	1/22/2003	< 0.5	28.74	0.63	1.88	< 0.5	< 0.5	1/16/2003	0.0040	1/23/2002	<0.001	<6.3
DCB-19A	1/22/2003	< 0.5	3.28	< 0.5	1.82	13.59	28.45	1/16/2003	0.0206	1/23/2002	<0.001	<6.3
DCB-19B	1/22/2003	< 0.5	6.25	< 0.5	1.84	35.89	61.38	1/16/2003	0.0120	1/23/2002	0.0016	10.029853
DCB-18A	1/22/2003	< 0.5	11.86	0.92	< 0.5	137.22	180.07	1/16/2003	0.0315	1/23/2002	0.0024	14.994636
DCB-18B	1/22/2003	< 0.5	12.90	0.70	< 0.5	136.40	198.25	1/16/2003	0.0315	1/23/2002	0.0025	15.872833
DCB-18C	1/22/2003	< 0.5	6.17	< 0.5	3.33	57.13	157.65	1/16/2003	0.1960	1/23/2002	0.0033	20.48612
DCB-71B	1/22/2003	< 0.5	11.19	0.60	4.74	81.63	147.85	1/16/2003	0.0671	1/23/2002	0.0016	10.260388
DIW-P14C	1/22/2003	< 0.5	621.40	7.70	43.15	63.60	88.50	1/16/2003	0.2452	1/23/2002	0.0462	291.29477
DIW-P13B	1/22/2003	< 0.5	1536.35	< 0.5	12.85	53.15	72.20	1/16/2003	0.0014	1/23/2002	0.1553	978.69524
DIW-P13C	1/22/2003	< 0.5	15259.75	< 0.5	NA	44.30	62.35	1/16/2003	0.1356	1/23/2002	2.8795	18140.663
DIW-P12B	1/22/2003	< 0.5	29.30	1.40	< 0.5	119.20	119.85	1/16/2003	0.0507	1/23/2002	<0.001	<6.3
DIW-P11B	1/22/2003	< 0.5	52.65	< 0.5	< 0.5	82.75	96.15	1/16/2003	7.3562	1/23/2002	0.0154	97.230111
DIW-P11C	1/22/2003	< 0.5	27.15	0.55	< 0.5	153.20	147.80	1/16/2003	0.0315	1/23/2002	0.0158	99.595594
DIW-P10C	1/22/2003	< 0.5	28.50	1.40	< 0.5	137.55	142.45	1/16/2003	0.0781	1/23/2002	<0.001	<6.3
DIW-P09B	1/22/2003	< 0.5	150.67	2.35	7.26	47.66	65.84	1/16/2003	0.9904	1/23/2002	0.0041	25.789202
DIW-P09C	1/22/2003	< 0.5	38.25	1.50	< 0.5	148.40	148.50	1/16/2003	0.0753	1/23/2002	0.0166	104.75202
DIW-P03B	1/22/2003	< 0.5	118.27	< 0.5	1.79	16.05	23.86	1/16/2003	0.2041	1/23/2002	0.0081	51.150933
DIW-P03C	1/22/2003	< 0.5	113.46	0.75	4.54	17.85	26.84	1/16/2003	0.1960	1/23/2002	0.0110	69.022945
DIW-P07B	1/22/2003	< 0.5	18.24	< 0.5	2.33	61.63	131.51	1/16/2003	0.0425	1/23/2002	<0.001	<6.3
DIW-P07C	1/22/2003	< 0.5	14.12	< 0.5	3.71	59.00	130.25	1/16/2003	0.0918	1/23/2002	<0.001	<6.3
DIW-P08C	1/22/2003	< 0.5	17.81	< 0.5	4.48	60.22	134.38	1/16/2003	0.0918	1/23/2002	<0.001	<6.3
DIW-P13A	1/22/2003	< 0.5	1132.95	3.90	< 0.5	22.00	30.15	1/16/2003	0.0014	1/23/2002	0.2447	1541.7157
DIW-P11A	1/22/2003	< 0.5	104.80	< 0.5	< 0.5	7.75	15.15	1/16/2003	0.0562	1/23/2002	0.0384	242.17
DIW-P09A	1/22/2003	< 0.5	328.83	< 0.5	0.63	25.12	26.73	1/16/2003	0.0315	1/23/2002	0.0686	431.94
DIW-1-2	1/22/2003	< 0.5	99.93	2.10	5.33	20.90	33.73	1/16/2003	0.0120	1/23/2002	0.0036	22.77
DIW-P03A	1/22/2003	< 0.5	44.39	22.07	2.68	6.41	16.16	1/16/2003	0.0014	1/23/2002	0.0103	64.85
DIW-P05A	1/22/2003	< 0.5	24.71	< 0.5	2.81	25.19	34.74	1/16/2003	0.6973	1/23/2002	0.0084	53.09
DIW-P07A	1/22/2003	< 0.5	22.60	< 0.5	3.84	27.91	50.48	1/16/2003	0.0425	1/23/2002	0.0151	94.84
DCB-21B	1/22/2003	< 0.5	8.32	0.63	1.29	76.06	125.25			1/23/2002	0.0016	9.95
DCB-21B								1/16/2003	0.0808			
DCB-22C	1/22/2003	< 0.5	4.71	< 0.5	1.35	24.29	106.35			1/23/2002	<0.001	<6.3
DCB-22C								1/16/2003	0.0343			
DIW-P11B	1/22/2003	< 0.5	5.55	< 0.5	< 0.5	8.42	9.75			1/23/2002	0.0016	9.8165769
DIW-P11B								1/16/2003	6.5069			

Gray highlight means that there is no data

Third Post-Injection EBS Analytical Results

Well / Piezometer	Analysis Date	Acetic Acid (mg/L)	Propanoic Acid (mg/L)	Formic Acid (mg/L)	Isobutyric Acid (mg/L)	Butyric Acid (mg/L)	Isovaleric Acid (mg/L)	Valeric Acid (mg/L)	Isocaproic Acid (mg/L)	Hexanoic Acid (mg/L)	Heptanoic Acid (mg/L)	Analysis Date	TBCD (cells/ml)	Analysis Date	SRB (cells/ml)
DCB-8	1/22/2003	9.88	8.07	27.91	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			4/15/2003	5.80E+01
DCB-21A	1/22/2003	< 6.0	< 7.0	8.85	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-21B	1/22/2003	< 6.0	< 7.0	5.67	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			4/15/2003	<7.20E+00
DCB-22A	1/22/2003	< 6.0	< 7.0	< 5.0	10.43	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-22B	1/22/2003	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-22C	1/22/2003	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			4/15/2003	<7.20E+00
DCB-70B	1/22/2003	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			4/15/2003	3.00E+02
DCB-19A	1/22/2003	< 6.0	< 7.0	6.64	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-19B	1/22/2003	< 6.0	< 7.0	7.52	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			4/15/2003	<7.20E+00
DCB-18A	1/22/2003	< 6.0	< 7.0	32.02	< 9.0	7.44	< 10.0	14.88	19.08	25.08	49.57				
DCB-18B	1/22/2003	< 6.0	< 7.0	18.11	< 9.0	< 9.0	< 10.0	< 10.0	12.98	12.22	24.14				
DCB-18C	1/22/2003	< 6.0	< 7.0	20.32	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	16.46			4/15/2003	<7.20E+00
DCB-71B	1/22/2003	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			4/15/2003	1.84E+01
DIW-P14C	1/22/2003	102.95	< 7.0	30.10	50.32	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P13B	1/22/2003	521.76	809.25	71.34	850.79	40.17	11.81	99.15	< 10.0	25.34	< 10.0				
DIW-P13C	1/22/2003	399.44	< 7.0	59.18	< 9.0	572.33	10.53	94.05	< 10.0	51.45	13.80				
DIW-P12B	1/22/2003	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P11B	1/22/2003	< 6.0	< 7.0	5.62	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			4/15/2003	4.80E+03
DIW-P11C	1/22/2003	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			4/15/2003	2.60E+01
DIW-P10C	1/22/2003	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P09B	1/22/2003	90.59	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P09C	1/22/2003	11.19	< 7.0	7.11	8.00	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P03B	1/22/2003	160.25	128.35	7.40	101.39	< 9.0	< 10.0	12.84	< 10.0	< 10.0	< 10.0				
DIW-P03C	1/22/2003	297.92	237.39	7.32	215.22	8.89	< 10.0	17.41	< 10.0	< 10.0	< 10.0				
DIW-P07B	1/22/2003	< 6.0	< 7.0	< 5.0	11.49	< 9.0	< 10.0	11.57	< 10.0	< 10.0	< 10.0			4/15/2003	<7.20E+00
DIW-P07C	1/22/2003	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			4/15/2003	<7.20E+00
DIW-P08C	1/22/2003	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P13A	1/22/2003	443.91	< 7.0	56.01	295.39	79.07	< 10.0	123.63	< 10.0	38.68	16.83			4/15/2003	2.20E+08
DIW-P11A	1/22/2003	120.28	184.78	21.12	160.11	< 9.0	< 10.0	< 10.0	< 10.0	15.49	< 10.0			4/15/2003	2.20E+07
DIW-P09A	1/22/2003	312.68	127.72	18.42	242.11	18.12	< 10.0	19.64	< 10.0	14.03	< 10.0			4/15/2003	3.00E+06
DIW-1-2	1/22/2003	35.82	7.72	< 5.0	14.61	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			4/15/2003	4.80E+05
DIW-P03A	1/22/2003	164.14	< 7.0	< 5.0	85.59	11.76	< 10.0	16.45	< 10.0	11.51	< 10.0			4/15/2003	4.80E+03
DIW-P05A	1/22/2003	126.79	156.90	6.18	106.70	16.42	< 10.0	13.74	< 10.0	< 10.0	< 10.0			4/15/2003	>2.20E+07
DIW-P07A	1/22/2003	267.16	331.60	19.49	222.18	60.23	< 10.0	43.59	< 10.0	14.29	< 10.0			4/15/2003	>2.20E+07
DCB-21B	1/22/2003	< 6.0	< 7.0	6.17	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-21B															
DCB-22C	1/22/2003	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-22C															
DIW-P11B	1/22/2003	< 6.0	< 7.0	6.81	9.34	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P11B															

Gray highlight means that there is no data

SRB = Sulfate Reducing Bacteria TBCD = Total Bacterial Cell Density

Third Post-Injection EBS Analytical Results

Well / Piezometer	Comments
DCB-8	
DCB-21A	
DCB-21B	
DCB-22A	
DCB-22B	
DCB-22C	
DCB-70B	
DCB-19A	
DCB-19B	
DCB-18A	
DCB-18B	
DCB-18C	
DCB-71B	
DIW-P14C	
DIW-P13B	
DIW-P13C	
DIW-P12B	
DIW-P11B	
DIW-P11C	
DIW-P10C	
DIW-P09B	
DIW-P09C	
DIW-P03B	
DIW-P03C	
DIW-P07B	
DIW-P07C	
DIW-P08C	
DIW-P13A	
DIW-P11A	
DIW-P09A	
DIW-1-2	
DIW-P03A	
DIW-P05A	
DIW-P07A	SRB count was previously listed as >2.20E+08; this was preliminary data
DCB-21B	
DCB-21B	
DCB-22C	
DCB-22C	
DIW-P11B	
DIW-P11B	

Fourth Post-Injection EBS Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Lab pH	Analysis Date	Chloride (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)
DCB-8	DSR-00201	4/1/2003	Sample	4/01/03	5.01	4/11/2003	12.52	0.56	0.22	< 0.5	6.94
DCB-21A	DSR-00202	3/31/2003	Sample	3/31/03	2.37	4/11/2003	24.43	< 0.5	0.00	< 0.5	2936.28
DCB-21B	DSR-00203	3/31/2003	Sample	3/31/03	2.98	4/11/2003	15.85	< 0.5	7.68	< 0.5	1470.59
DCB-22C	DSR-00204	3/31/2003	Sample	3/31/03	4.46	4/11/2003	0.87	< 0.5	0.55	< 0.5	413.16
DCB-70B	DSR-00205	3/31/2003	Sample	3/31/03	4.98	4/11/2003	3.52	0.46	0.24	< 0.5	65.70
DCB-19A	DSR-00206	3/31/2003	Sample	3/31/03	2.36	4/11/2003	17.99	5.35	15.85	< 0.5	2484.03
DCB-19B	DSR-00207	3/31/2003	Sample	3/31/03	3.14	4/11/2003	12.15	5.61	7.01	< 0.5	887.87
DCB-18C	DSR-00208	3/31/2003	Sample	3/31/03	3.52	4/11/2003	13.95	0.24	6.01	< 0.5	1337.39
DCB-71B	DSR-00209	3/31/2003	Sample								
DIW-P14C	DSR-00210	3/31/2003	Sample								
DIW-P13B	DSR-00211	3/31/2003	Sample								
DIW-P13C	DSR-00212	3/31/2003	Sample								
DIW-P12B	DSR-00213	4/1/2003	Sample	4/01/03	2.53	4/11/2003	30.64	7.96	50.22	< 0.5	4907.71
DIW-P11B	DSR-00214	4/1/2003	Sample	4/01/03	2.74	4/11/2003	26.60	4.57	48.39	< 0.5	4539.62
DIW-P11C	DSR-00215	3/31/2003	Sample	3/31/03	1.96	4/11/2003	100.89	5.09	84.20	< 0.5	8137.55
DIW-P10C	DSR-00216	4/1/2003	Sample								
DIW-P09B	DSR-00217	4/1/2003	Sample								
DIW-P09C	DSR-00218	4/1/2003	Sample								
DIW-P02C	DSR-00219	4/1/2003	Sample								
DIW-P03B	DSR-00220	4/1/2003	Sample	4/01/03	5.99	4/11/2003	4.35	0.47	0.63	< 0.5	542.33
DIW-P03C	DSR-00221	4/1/2003	Sample	4/01/03	6.22	4/11/2003	4.24	0.24	0.56	< 0.5	552.11
DIW-P04C	DSR-00222	4/1/2003	Sample	4/01/03	5.48	4/11/2003	2.67	0.32	7.44	< 0.5	743.79
DIW-P07B	DSR-00223	3/31/2003	Sample	3/31/03	3.23	4/11/2003	15.23	0.21	10.31	< 0.5	2025.50
DIW-P07C	DSR-00224	3/31/2003	Sample	3/31/03	3.38	4/11/2003	16.05	0.48	10.98	< 0.5	1967.98
DIW-P08C	DSR-00225	3/31/2003	Sample	3/31/03	3.25	4/11/2003	16.11	< 0.5	10.82	< 0.5	1972.64
DIW-P13A	DSR-00226	4/1/2003	Sample	4/01/03	5.88	4/11/2003	8.22	2.49	4.69	< 0.5	375.33
DIW-P11A	DSR-00227	4/1/2003	Sample	4/01/03	5.14	4/11/2003	0.00	2.29	5.09	< 0.5	598.02
DIW-P09A	DSR-00228	4/1/2003	Sample	4/01/03	5.57	4/11/2003	0.00	2.48	2.54	< 0.5	135.99
DIW-1-2	DSR-00229	4/1/2003	Sample	4/01/03	6.32	4/11/2003	5.25	0.00	4.47	< 0.5	115.80
DIW-P03A	DSR-00230	4/1/2003	Sample	4/01/03	6.06	4/11/2003	0.00	4.61	2.58	< 0.5	126.99
DIW-P05A	DSR-00231	4/1/2003	Sample	4/01/03	5.49	4/11/2003	< 0.5	5.05	6.70	< 0.5	163.28
DIW-P07A	DSR-00232	4/1/2003	Sample	4/01/03	5.34	4/11/2003	< 0.5	< 0.5	2.45	< 0.5	326.85
DCB-21B	DSR-00233	3/31/2003	Duplicate			4/11/2003	15.12	0.53	8.35	< 0.5	1432.48
DCB-21B	DSR-00234	3/31/2003	Unfiltered								
DCB-22C	DSR-00235	3/31/2003	Duplicate			4/11/2003	0.88	0.52	0.26	< 0.5	422.77
DCB-22C	DSR-00236	3/31/2003	Unfiltered								
DIW-P11B	DSR-00237	4/1/2003	Duplicate			4/11/2003	24.57	6.63	22.85	< 0.5	4563.63
DIW-P11B	DSR-00239	4/1/2003	Unfiltered								

Gray highlight means that there is no data

Fourth Post-Injection EBS Analytical Results

Well / Piezometer	Analysis Date	Lithium (mg/L)	Sodium (mg/L)	Ammonium (mg/L)	Potassium (mg/L)	Magnesium (mg/L)	Calcium (mg/L)	Analysis Date	Hydrogen Sulfide (mg/L)	Analysis Date	Lactate (%)	Lactate (mg/L)
DCB-8	4/12/2003	< 0.5	6.86	< 0.5	< 0.5	1.23	3.19	4/4/2003	<0.001	4/11/2003	<0.001	<6.3
DCB-21A	4/12/2003	< 0.5	6.07	< 0.5	0.00	98.96	83.64	4/4/2003	<0.001	4/11/2003	<0.001	<6.3
DCB-21B	4/12/2003	< 0.5	7.61	< 0.5	1.15	73.71	111.58	4/4/2003	<0.001	4/11/2003	<0.001	<6.3
DCB-22C	4/12/2003	< 0.5	3.91	< 0.5	1.27	21.31	111.55	4/4/2003	<0.001	4/11/2003	<0.001	<6.3
DCB-70B	4/12/2003	< 0.5	23.06	< 0.5	0.81	1.92	4.36	4/4/2003	<0.001	4/11/2003	<0.001	<6.3
DCB-19A	4/12/2003	< 0.5	4.96	< 0.5	1.04	78.44	88.21	4/4/2003	<0.001	4/11/2003	<0.001	<6.3
DCB-19B	4/12/2003	< 0.5	4.81	< 0.5	0.80	22.81	48.20	4/4/2003	<0.001	4/11/2003	<0.001	<6.3
DCB-18C	4/12/2003	< 0.5	6.85	< 0.5	2.56	48.33	139.17	4/4/2003	<0.001	4/11/2003	<0.001	<6.3
DCB-71B												
DIW-P14C												
DIW-P13B												
DIW-P13C												
DIW-P12B	4/12/2003	< 0.5	7.16	< 0.5	< 0.5	116.95	83.37	4/4/2003	<0.001	4/11/2003	<0.001	<6.3
DIW-P11B	4/12/2003	< 0.5	11.56	< 0.5	< 0.5	104.06	78.42	4/4/2003	0.020	4/11/2003	<0.001	<6.3
DIW-P11C	4/12/2003	< 0.5	17.83	< 0.5	< 0.5	190.80	139.52	4/4/2003	<0.001	4/11/2003	<0.001	<6.3
DIW-P10C												
DIW-P09B												
DIW-P09C												
DIW-P02C												
DIW-P03B	4/12/2003	< 0.5	30.13	< 0.5	2.16	32.48	93.79	4/4/2003	0.017	4/11/2003	<0.001	<6.3
DIW-P03C	4/12/2003	< 0.5	30.97	< 0.5	2.20	33.10	90.08	4/4/2003	<0.001	4/11/2003	<0.001	<6.3
DIW-P04C	4/12/2003	< 0.5	13.74	< 0.5	1.85	37.38	74.81	4/4/2003	0.121	4/11/2003	<0.001	<6.3
DIW-P07B	4/12/2003	< 0.5	16.94	< 0.5	1.77	68.10	117.32	4/4/2003	0.026	4/11/2003	<0.001	<6.3
DIW-P07C	4/12/2003	< 0.5	14.64	< 0.5	1.68	65.36	117.29	4/4/2003	<0.001	4/11/2003	<0.001	<6.3
DIW-P08C	4/12/2003	< 0.5	19.10	< 0.5	1.85	70.02	126.51	4/4/2003	0.009	4/11/2003	<0.001	<6.3
DIW-P13A	4/12/2003	< 0.5	238.92	< 0.5	< 0.5	18.06	19.18	4/4/2003	<0.001	4/11/2003	<0.001	<6.3
DIW-P11A	4/12/2003	< 0.5	35.50	< 0.5	< 0.5	31.42	40.09	4/4/2003	0.035	4/11/2003	<0.001	<6.3
DIW-P09A	4/12/2003	< 0.5	30.82	< 0.5	< 0.5	6.14	12.23	4/4/2003	0.113	4/11/2003	<0.001	<6.3
DIW-1-2	4/12/2003	< 0.5	58.96	< 0.5	0.00	23.64	31.91	4/4/2003	0.015	4/11/2003	<0.001	<6.3
DIW-P03A	4/12/2003	< 0.5	21.22	< 0.5	0.00	23.83	50.31	4/4/2003	0.058	4/11/2003	<0.001	<6.3
DIW-P05A	4/12/2003	< 0.5	20.75	< 0.5	0.00	21.56	42.70	4/4/2003	5.755	4/11/2003	<0.001	<6.3
DIW-P07A	4/12/2003	< 0.5	12.82	< 0.5	0.00	15.17	37.12	4/4/2003	0.598	4/11/2003	<0.001	<6.3
DCB-21B	4/12/2003	< 0.5	7.48	< 0.5	0.95	72.75	109.77			4/11/2003	<0.001	<6.3
DCB-21B								4/4/2003	<0.001			
DCB-22C	4/12/2003	< 0.5	4.73	< 0.5	1.24	23.57	112.49			4/11/2003	<0.001	<6.3
DCB-22C								4/4/2003	<0.001			
DIW-P11B	4/12/2003	< 0.5	7.98	< 0.5	< 0.5	103.56	79.84			4/11/2003	<0.001	<6.3
DIW-P11B								4/4/2003	0.075			

Gray highlight means that there is no data

Fourth Post-Injection EBS Analytical Results

Well / Piezometer	Analysis Date	Acetic Acid (mg/L)	Propanoic Acid (mg/L)	Formic Acid (mg/L)	Isobutyric Acid (mg/L)	Butyric Acid (mg/L)	Isovaleric Acid (mg/L)	Valeric Acid (mg/L)	Isocaproic Acid (mg/L)	Hexanoic Acid (mg/L)	Heptanoic Acid (mg/L)	Analysis Date	TBCD (cells/ml)	Analysis Date	SRB (cells/ml)
DCB-8	4/12/2003													7/3/2003	9.20E+02
DCB-21A	4/12/2003														
DCB-21B	4/12/2003													7/3/2003	<7.20E+00
DCB-22C	4/12/2003													7/3/2003	<7.20E+00
DCB-70B	4/12/2003													7/3/2003	7.20E+00
DCB-19A	4/12/2003														
DCB-19B	4/12/2003													7/3/2003	<7.20E+00
DCB-18C	4/12/2003													7/3/2003	7.20E+00
DCB-71B															
DIW-P14C															
DIW-P13B															
DIW-P13C															
DIW-P12B	4/12/2003														
DIW-P11B	4/12/2003													7/3/2003	4.80E+02
DIW-P11C	4/12/2003													7/3/2003	1.24E+01
DIW-P10C															
DIW-P09B															
DIW-P09C															
DIW-P02C															
DIW-P03B	4/12/2003													7/3/2003	>2.20E+07
DIW-P03C	4/12/2003													7/3/2003	2.20E+06
DIW-P04C	4/12/2003														
DIW-P07B	4/12/2003													7/3/2003	4.20E+01
DIW-P07C	4/12/2003													7/3/2003	<7.20E+00
DIW-P08C	4/12/2003														
DIW-P13A	4/12/2003													7/3/2003	4.20E+07
DIW-P11A	4/12/2003													7/3/2003	9.20E+07
DIW-P09A	4/12/2003													7/3/2003	2.20E+07
DIW-1-2	4/12/2003													7/3/2003	4.80E+04
DIW-P03A	4/12/2003													7/3/2003	2.20E+07
DIW-P05A	4/12/2003													7/3/2003	4.80E+06
DIW-P07A	4/12/2003													7/3/2003	7.20E+04
DCB-21B	4/12/2003														
DCB-21B															
DCB-22C	4/12/2003														
DCB-22C															
DIW-P11B	4/12/2003														
DIW-P11B															

Gray highlight means that there is no data

SRB = Sulfate Reducing Bacteria TBCD = Total Bacterial Cell Density

Fourth Post-Injection EBS Analytical Results

Well / Piezometer	Comments
DCB-8	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DCB-21A	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DCB-21B	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DCB-22C	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DCB-70B	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DCB-19A	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DCB-19B	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DCB-18C	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DCB-71B	
DIW-P14C	
DIW-P13B	
DIW-P13C	
DIW-P12B	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P11B	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P11C	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P10C	
DIW-P09B	
DIW-P09C	
DIW-P02C	
DIW-P03B	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P03C	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P04C	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P07B	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P07C	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P08C	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P13A	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P11A	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P09A	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-1-2	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P03A	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P05A	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P07A	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DCB-21B	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DCB-21B	
DCB-22C	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DCB-22C	
DIW-P11B	VFA (Acetic Acid through Heptanoic Acid) data invalid due to an analytical error
DIW-P11B	

Fifth Post-Injection EBS Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Lab pH	Analysis Date	Chloride (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)
DCB-8	DSR-00250	7/15/2003	Sample	7/15/2003	4.34	8/13/2003	7.75	< 0.5	0.56	< 0.5	1.22
DCB-21A	DSR-00251	7/14/2003	Sample	7/14/2003	2.05	8/13/2003	< 0.5	10.84	< 0.5	< 0.5	3668.56
DCB-21B	DSR-00252	7/14/2003	Sample	7/14/2003	3.06	8/13/2003	< 0.5	< 0.5	< 0.5	< 0.5	2799.44
DCB-22C	DSR-00253	7/14/2003	Sample	7/14/2003	4.49	8/13/2003	4.15	< 0.5	< 0.5	< 0.5	975.68
DCB-70B	DSR-00254	7/14/2003	Sample	7/14/2003	4.12	8/13/2003	3.59	< 0.5	< 0.5	< 0.5	115.42
DCB-23C	DSR-00255	7/14/2003	Sample	7/14/2003	4.73	8/13/2003	1.20	< 0.5	< 0.5	< 0.5	2181.57
DCB-19A	DSR-00256	7/14/2003	Sample	7/14/2003	2.21	8/13/2003	3.80	8.92	< 0.5	< 0.5	2934.61
DCB-19B	DSR-00257	7/14/2003	Sample	7/14/2003	2.7	8/13/2003	4.82	< 0.5	< 0.5	< 0.5	2313.44
DCB-18C	DSR-00258	7/14/2003	Sample	7/14/2003	3.14	8/13/2003	3.90	< 0.5	< 0.5	< 0.5	1901.46
DCB-71B	DSR-00259										
DIW-P14C	DSR-00260										
DIW-P13B	DSR-00261										
DIW-P13C	DSR-00262										
DIW-P12B	DSR-00263	7/14/2003	Sample	7/14/2003	2.04	8/13/2003	< 0.5	< 0.5	< 0.5	< 0.5	3885.55
DIW-P11B	DSR-00264	7/14/2003	Sample	7/14/2003	2.52	8/13/2003	< 0.5	< 0.5	< 0.5	< 0.5	3440.81
DIW-P11C	DSR-00265	7/14/2003	Sample	7/14/2003	2.42	8/13/2003	< 0.5	< 0.5	< 0.5	< 0.5	3919.53
DIW-P10C	DSR-00266										
DIW-P09B	DSR-00267										
DIW-P09C	DSR-00268										
DIW-P02C	DSR-00269										
DIW-P03B	DSR-00270	7/14/2003	Sample	7/14/2003	5.08	8/13/2003	2.29	< 0.5	< 0.5	< 0.5	< 0.5
DIW-P03C	DSR-00271	7/14/2003	Sample	7/14/2003	5.55	8/13/2003	2.69	< 0.5	< 0.5	< 0.5	< 0.5
DIW-P04C	DSR-00272	7/14/2003	Sample	7/14/2003	4.02	8/13/2003	0.82	< 0.5	< 0.5	< 0.5	510.68
DIW-P07B	DSR-00273	7/14/2003	Sample	7/14/2003	5.1	8/13/2003	< 0.5	< 0.5	< 0.5	< 0.5	393.35
DIW-P07C	DSR-00274	7/14/2003	Sample	7/14/2003	4.25	8/13/2003	1.51	< 0.5	< 0.5	< 0.5	1238.99
DIW-P08C	DSR-00275	7/14/2003	Sample	7/14/2003	3.94	8/13/2003	1.98	< 0.5	< 0.5	< 0.5	1509.18
DIW-P13A	DSR-00276	7/15/2003	Sample	7/15/2003	5.08	8/13/2003	< 0.5	< 0.5	< 0.5	< 0.5	13.56
DIW-P11A	DSR-00277	7/15/2003	Sample	7/15/2003	3.77	8/13/2003	< 0.5	< 0.5	< 0.5	< 0.5	1192.16
DIW-P09A	DSR-00278	7/15/2003	Sample	7/15/2003	4.73	8/13/2003	< 0.5	< 0.5	< 0.5	< 0.5	72.38
DIW-1-2	DSR-00279	7/15/2003	Sample	7/15/2003	4.51	8/13/2003	0.75	< 0.5	< 0.5	< 0.5	12.21
DIW-P03A	DSR-00280	7/15/2003	Sample	7/15/2003	4.83	8/13/2003	< 0.5	< 0.5	< 0.5	< 0.5	3.61
DIW-P05A	DSR-00281	7/15/2003	Sample	7/15/2003	4.76	8/13/2003	< 0.5	< 0.5	< 0.5	< 0.5	8.55
DIW-P07A	DSR-00282	7/15/2003	Sample	7/15/2003	4.97	8/13/2003	< 0.5	< 0.5	< 0.5	< 0.5	9.37
DCB-21B	DSR-00283	7/14/2003	Duplicate								
DCB-21B	DSR-00284	7/14/2003	Unfiltered								
DCB-22C	DSR-00285	7/14/2003	Duplicate								
DCB-22C	DSR-00286	7/14/2003	Unfiltered								
DIW-P11B	DSR-00287	7/14/2003	Duplicate								
DIW-P11B	DSR-00289	7/14/2003	Unfiltered								

Gray highlight means that there is no data

Fifth Post-Injection EBS Analytical Results

Well / Piezometer	Analysis Date	Lithium (mg/L)	Sodium (mg/L)	Ammonium (mg/L)	Potassium (mg/L)	Magnesium (mg/L)	Calcium (mg/L)	Analysis Date	Hydrogen Sulfide (mg/L)	Analysis Date	Lactate (%)	Lactate (mg/L)
DCB-8	7/23/2003	<0.5	2.96	<0.5	1.07	<0.5	<0.5	7/17/2003	0.0014	8/13/2003	<0.001	<6.3
DCB-21A	7/23/2003	<0.5	1.31	<0.5	<0.5	<0.5	60.60	7/17/2003	0.0083	8/13/2003	<0.001	<6.3
DCB-21B	7/23/2003	<0.5	5.17	<0.5	<0.5	<0.5	<0.5	7/17/2003	0.0015	8/13/2003	<0.001	<6.3
DCB-22C	7/23/2003	<0.5	10.47	<0.5	54.90	<0.5	122.27	7/17/2003	<0.001	8/13/2003	<0.001	<6.3
DCB-70B	7/23/2003	<0.5	15.22	<0.5	8.94	<0.5	5.94	7/17/2003	<0.001	8/13/2003	<0.001	<6.3
DCB-23C	7/23/2003	<0.5	8.13	<0.5	<0.5	<0.5	<0.5	7/17/2003	0.0013	8/13/2003	<0.001	<6.3
DCB-19A	7/23/2003	<0.5	1.81	<0.5	<0.5	<0.5	63.99	7/17/2003	<0.001	8/13/2003	<0.001	<6.3
DCB-19B	7/23/2003	<0.5	5.14	<0.5	<0.5	<0.5	53.09	7/17/2003	<0.001	8/13/2003	<0.001	<6.3
DCB-18C	7/23/2003	<0.5	4.92	<0.5	<0.5	<0.5	<0.5	7/17/2003	0.0190	8/13/2003	<0.001	<6.3
DCB-71B												
DIW-P14C												
DIW-P13B												
DIW-P13C												
DIW-P12B	7/23/2003	<0.5	<0.5	<0.5	11.21	<0.5	5.23	7/17/2003	<0.001	8/13/2003	<0.001	<6.3
DIW-P11B	7/23/2003	<0.5	<0.5	<0.5	9.31	<0.5	4.52	7/17/2003	0.0343	8/13/2003	<0.001	<6.3
DIW-P11C	7/23/2003	<0.5	<0.5	<0.5	12.99	<0.5	6.78	7/17/2003	<0.001	8/13/2003	<0.001	<6.3
DIW-P10C												
DIW-P09B												
DIW-P09C												
DIW-P02C												
DIW-P03B	7/23/2003	<0.5	6.94	<0.5	27.98	<0.5	21.86	7/17/2003	0.0368	8/13/2003	<0.001	<6.3
DIW-P03C	7/23/2003	<0.5	7.27	<0.5	25.14	<0.5	17.74	7/17/2003	0.0015	8/13/2003	<0.001	<6.3
DIW-P04C	7/23/2003	<0.5	3.41	<0.5	36.43	<0.5	30.01	7/17/2003	0.5702	8/13/2003	<0.001	<6.3
DIW-P07B	7/23/2003	<0.5	10.16	<0.5	19.30	<0.5	17.97	7/17/2003	0.0083	8/13/2003	<0.001	<6.3
DIW-P07C	7/23/2003	<0.5	9.21	<0.5	<0.5	<0.5	40.30	7/17/2003	0.5292	8/13/2003	<0.001	<6.3
DIW-P08C	7/23/2003	<0.5	18.16	<0.5	<0.5	<0.5	50.94	7/17/2003	0.0037	8/13/2003	<0.001	<6.3
DIW-P13A	7/23/2003	<0.5	12.56	<0.5	0.83	<0.5	0.77	7/17/2003	0.0014	8/13/2003	<0.001	<6.3
DIW-P11A	7/23/2003	<0.5	<0.5	<0.5	0.98	<0.5	<0.5	7/17/2003	0.0252	8/13/2003	<0.001	<6.3
DIW-P09A	7/23/2003	<0.5	0.54	<0.5	1.14	<0.5	<0.5	7/17/2003	0.0367	8/13/2003	<0.001	<6.3
DIW-1-2	7/23/2003	<0.5	0.54	<0.5	0.75	<0.5	<0.5	7/17/2003	0.5113	8/13/2003	<0.001	<6.3
DIW-P03A	7/23/2003	<0.5	0.65	<0.5	<0.5	<0.5	1.80	7/17/2003	0.5218	8/13/2003	<0.001	<6.3
DIW-P05A	7/23/2003	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	7/17/2003	0.5446	8/13/2003	<0.001	<6.3
DIW-P07A	7/23/2003	<0.5	1.29	<0.5	<0.5	<0.5	<0.5	7/17/2003	0.0176	8/13/2003	<0.001	<6.3
DCB-21B												
DCB-21B								7/17/2003	<0.001			
DCB-22C												
DCB-22C								7/17/2003	0.0014			
DIW-P11B												
DIW-P11B								7/17/2003	0.5450			

Gray highlight means that there is no data

Fifth Post-Injection EBS Analytical Results

Well / Piezometer	Analysis Date	Acetic Acid (mg/L)	Propanoic Acid (mg/L)	Formic Acid (mg/L)	Isobutyric Acid (mg/L)	Butyric Acid (mg/L)	Isovaleric Acid (mg/L)	Valeric Acid (mg/L)	Isocaproic Acid (mg/L)	Hexanoic Acid (mg/L)	Heptanoic Acid (mg/L)	Analysis Date	TBCD (cells/ml)	Analysis Date	SRB (cells/ml)
DCB-8	8/1/2003	71	23		< 9.0	14	< 10.0	12	< 10.0	13	< 10.0			10/16/2003	1.48E+04
DCB-21A	8/1/2003	< 6.0	< 7.0		< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DCB-21B	8/1/2003	< 6.0	< 7.0		< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			10/16/2003	7.20E+00
DCB-22C	8/1/2003	< 6.0	< 7.0		< 9.0	< 9.0	< 10.0	< 10.0	12	< 10.0	< 10.0			10/16/2003	4.60E+01
DCB-70B	8/1/2003	< 6.0	< 7.0		< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			10/16/2003	8.60E+01
DCB-23C	8/1/2003	< 6.0	< 7.0		< 9.0	< 9.0	< 10.0	< 10.0	10	< 10.0	< 10.0			10/16/2003	1.86E+02
DCB-19A	8/1/2003	< 6.0	17		< 9.0	< 9.0	11	< 10.0	23	< 10.0	13				
DCB-19B	8/1/2003	< 6.0	< 7.0		< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			10/16/2003	<7.20E+00
DCB-18C	8/1/2003	18	17		< 9.0	< 9.0	11	< 10.0	19	< 10.0	14			10/16/2003	1.84E+01
DCB-71B															
DIW-P14C															
DIW-P13B															
DIW-P13C															
DIW-P12B	8/1/2003	17	< 7.0		< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P11B	8/1/2003	< 6.0	< 7.0		< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			10/16/2003	4.80E+02
DIW-P11C	8/1/2003	< 6.0	< 7.0		< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			10/16/2003	1.50E+03
DIW-P10C															
DIW-P09B															
DIW-P09C															
DIW-P02C															
DIW-P03B	8/1/2003	214	164		< 9.0	28	< 10.0	17	17	< 10.0	< 10.0			10/16/2003	2.20E+07
DIW-P03C	8/1/2003	114	51		< 9.0	16	< 10.0	11	12	< 10.0	< 10.0			10/16/2003	1.50E+06
DIW-P04C	8/1/2003	< 6.0	< 7.0		< 9.0	< 9.0	< 10.0	< 10.0	15	< 10.0	< 10.0				
DIW-P07B	8/1/2003	66	189		11	22	< 10.0	25	< 10.0	< 10.0	< 10.0			10/16/2003	4.80E+03
DIW-P07C	8/1/2003	< 6.0	9		< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0			10/16/2003	4.80E+03
DIW-P08C	8/1/2003	< 6.0	< 7.0		< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0				
DIW-P13A	8/1/2003	586	690		13	123	< 10.0	81	< 10.0	18	< 10.0			10/16/2003	7.00E+06
DIW-P11A	8/1/2003	69	90		< 9.0	< 9.0	< 10.0	10	< 10.0	< 10.0	< 10.0			10/16/2003	1.86E+03
DIW-P09A	8/1/2003	181	245		< 9.0	25	< 10.0	17	< 10.0	11	< 10.0			10/16/2003	9.20E+07
DIW-1-2	8/1/2003	199	134		< 9.0	55	< 10.0	15	< 10.0	13	< 10.0			10/16/2003	2.20E+07
DIW-P03A	8/1/2003	132	131		< 9.0	21	< 10.0	15	< 10.0	< 10.0	< 10.0			10/16/2003	>2.20E+07
DIW-P05A	8/1/2003	69	76		< 9.0	23	< 10.0	15	< 10.0	< 10.0	< 10.0			10/16/2003	2.20E+06
DIW-P07A	8/1/2003	143	103		< 9.0	25	< 10.0	18	< 10.0	12	< 10.0			10/16/2003	>2.20E+07
DCB-21B															
DCB-21B															
DCB-22C															
DCB-22C															
DIW-P11B															
DIW-P11B															

Gray highlight means that there is no data

Fifth Post-Injection EBS Analytical Results

Well / Piezometer	Comments
DCB-8	Formic acid results invalid due to standard and method problems & ambiguous peaks
DCB-21A	Formic acid results invalid due to standard and method problems & ambiguous peaks
DCB-21B	Formic acid results invalid due to standard and method problems & ambiguous peaks
DCB-22C	Formic acid results invalid due to standard and method problems & ambiguous peaks
DCB-70B	Formic acid results invalid due to standard and method problems & ambiguous peaks
DCB-23C	Formic acid results invalid due to standard and method problems & ambiguous peaks
DCB-19A	Formic acid results invalid due to standard and method problems & ambiguous peaks
DCB-19B	Formic acid results invalid due to standard and method problems & ambiguous peaks
DCB-18C	Formic acid results invalid due to standard and method problems & ambiguous peaks
DCB-71B	
DIW-P14C	
DIW-P13B	
DIW-P13C	
DIW-P12B	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-P11B	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-P11C	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-P10C	
DIW-P09B	
DIW-P09C	
DIW-P02C	
DIW-P03B	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-P03C	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-P04C	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-P07B	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-P07C	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-P08C	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-P13A	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-P11A	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-P09A	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-1-2	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-P03A	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-P05A	Formic acid results invalid due to standard and method problems & ambiguous peaks
DIW-P07A	Formic acid results invalid due to standard and method problems & ambiguous peaks
DCB-21B	Duplicates were not run by the laboratory
DCB-21B	
DCB-22C	Duplicates were not run by the laboratory
DCB-22C	
DIW-P11B	Duplicates were not run by the laboratory
DIW-P11B	

Pre-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)
DCB-8	DSR-00001	7/1/2002	Sample	7/1/2002	0.088	<0.002		0.556	<0.003	<0.002	0.068	1.01	0.406	<0.001
DCB-21A	DSR-00002	7/1/2002	Sample	7/1/2002	351	<0.002		114.0	0.010	0.199	0.994	183	94.2	9.03
DCB-21B	DSR-00003	6/27/2002	Sample	6/27/2002	120	<0.002		116	<0.003	<0.002	0.161	94.2	98.9	12.4
DCB-21C	DSR-00004	6/27/2002	Sample	6/27/2002	1.99	<0.002		111	<0.003	<0.002	0.024	1.94	57.5	6.47
DCB-22A	DSR-00005	6/27/2002	Sample	6/27/2002	269	<0.002		71.4	<0.003	0.019	0.190	3.80	68.2	7.24
DCB-22B	DSR-00006	6/27/2002	Sample	6/27/2002	200	<0.002		128	<0.003	<0.002	0.158	248	96.4	13.4
DCB-22C	DSR-00007	6/27/2002	Sample	6/27/2002	2.12	<0.002		84.9	<0.003	<0.002	0.027	2.32	23.4	1.48
DCB-70A	DSR-00008	7/1/2002	Sample	7/1/2002	240	<0.002		59.9	<0.003	0.127	0.147	8.24	60.9	7.47
DCB-70B	DSR-00009	7/1/2002	Sample	7/1/2002	2.21	0.018		19.0	<0.003	<0.002	0.026	1.87	12.1	0.352
DCB-19A	DSR-00010	6/26/2002	Sample	6/26/2002	82.8	<0.002		38.5	<0.003	<0.002	0.133	2.27	23.6	2.13
DCB-19B	DSR-00011	6/25/2002	Sample	6/26/2002	232	<0.002		90.2	<0.003	<0.002	0.295	218	58.4	5.48
DCB-19C	DSR-00012	6/26/2002	Sample	6/26/2002	199	<0.002		122	<0.003	<0.002	0.264	168	63.1	15.6
DCB-18A	DSR-00013	6/27/2002	Sample	6/27/2002	298	<0.002		78.4	<0.003	0.046	0.468	8.47	67.8	6.88
DCB-18B	DSR-00014	6/26/2002	Sample	6/26/2002	413	<0.002		121	<0.003	0.066	0.506	26.4	102	10.10
DCB-18C	DSR-00015	6/26/2002	Sample	6/26/2002	103	<0.002		139	<0.003	0.014	0.175	117	69.8	19.0
DCB-71A	DSR-00016	7/1/2002	Sample	7/1/2002	84.9	0.036		32.4	<0.003	<0.002	0.189	1.07	31.0	4.23
DCB-71B	DSR-00017	7/1/2002	Sample	7/1/2002	222	<0.002		130	<0.003	<0.002	0.085	106	106	21.7
DIW-P11A	DSR-00020	6/27/2002	Sample	6/27/2002	122	<0.002		98.6	<0.003	<0.002	0.069	119	64.9	11.3
DIW-P11B	DSR-00021	6/27/2002	Sample	6/27/2002	155	<0.002		118	<0.003	0.009	0.110	154	78.2	13.3
DIW-1-2	DSR-00025	7/1/2002	Sample	7/1/2002	4.08	<0.002		28.9	<0.003	0.112	0.023	123	16.6	3.63
DIW-P07A	DSR-00031	6/26/2002	Sample	6/26/2002	196	<0.002		136	<0.003	<0.002	0.092	181	73.5	28.2
DCB-21B	DSR-00033	6/27/2002	Duplicate	6/27/2002	126	<0.002		117	<0.003	<0.002	0.171	95.3	100	12.6
DCB-21B	DSR-00034	6/27/2002	Unfiltered	6/27/2002	129	<0.002		116	<0.003	<0.002	0.182	92.8	99.5	21.5
DCB-22C	DSR-00035	6/27/2002	Duplicate	6/27/2002	2.40	<0.002		86.0	<0.003	<0.002	0.028	2.50	28.9	1.57
DCB-22C	DSR-00036	6/27/2002	Unfiltered	6/27/2002	2.88	<0.002		87.4	<0.003	<0.002	0.029	2.64	31.2	1.87
DIW-P11B	DSR-00037	6/27/2002	Duplicate	6/27/2002	157	<0.002		119	<0.003	0.007	0.110	154	77.6	13.5
DIW-P11B	DSR-00039	6/27/2002	Unfiltered	6/27/2002	156	<0.002		118	<0.003	0.009	0.111	152	77.6	13.3
DIW-P11C	DSR-00040	6/27/2002	Sample	6/27/2002	263	<0.002		126	0.007	0.060	0.353	255	93.5	13.1
DIW-P12B	DSR-00041	6/27/2002	Sample	6/27/2002	120	<0.002		108	<0.003	<0.002	0.084	240	70.5	15.5
DIW-P09A	DSR-00042	6/27/2002	Sample	6/27/2002	63.4	<0.002		31.2	<0.003	<0.002	0.102	3.14	21.5	5.31
DIW-P09B	DSR-00043	6/27/2002	Sample	6/27/2002	165	<0.002		108	<0.003	0.009	0.129	139	74.2	21.4
DIW-P09C	DSR-00044	6/27/2002	Sample	6/27/2002	264	<0.002		118	<0.003	0.074	0.395	194	85.2	12.9
DIW-P10C	DSR-00045	6/27/2002	Sample	6/27/2002	193	<0.002		106	<0.003	0.053	0.269	158	71.2	11.7
DIW-P07B	DSR-00046	6/26/2002	Sample	6/26/2002	243	<0.002		118	<0.003	<0.002	0.123	195	69.2	16.4
DIW-P07C	DSR-00047	6/26/2002	Sample	6/26/2002	190	<0.002		115	<0.003	<0.002	0.096	155	62.7	17.6
DIW-P08C	DSR-00048	6/26/2002	Sample	6/26/2002	199	<0.002		117	<0.003	<0.002	0.157	169	65.4	16.8

Gray highlight means that there is no data

Pre-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Nickel (mg/L)	Lead (mg/L)	Silicon (mg/L)	Zinc (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Sulfur (mg/L)	Analysis Date	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)	Analysis Date	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)
DCB-8	<0.010	<0.017	5.28	<0.001												
DCB-21A	1.52	<0.017	113	6.49												
DCB-21B	0.625	<0.017	27.8	1.75												
DCB-21C	0.139	<0.017	16.4	<0.001												
DCB-22A	1.12	<0.017	81.1	2.63												
DCB-22B	1.05	<0.017	29.1	2.61												
DCB-22C	0.010	<0.017	11.8	<0.001												
DCB-70A	1.02	<0.017	74.4	2.31												
DCB-70B	<0.010	<0.017	8.53	<0.001												
DCB-19A	0.344	<0.017	77.7	0.822												
DCB-19B	0.941	<0.017	41.8	1.99												
DCB-19C	0.903	<0.017	33.0	2.16												
DCB-18A	1.08	<0.017	94.9	2.78												
DCB-18B	1.35	<0.017	87.8	3.48												
DCB-18C	0.698	<0.017	18.4	1.66												
DCB-71A	0.459	<0.017	31.2	1.52												
DCB-71B	1.18	<0.017	14.4	2.91												
DIW-P11A	0.609	<0.017	37.9	1.56												
DIW-P11B	0.736	<0.017	39.4	2.02												
DIW-1-2	0.239	<0.017	17.2	<0.001												
DIW-P07A	0.863	<0.017	35.5	1.86												
DCB-21B	0.646	<0.017	29.2	1.79												
DCB-21B	0.649	<0.017	30.0	1.80												
DCB-22C	0.013	<0.017	11.9	<0.001												
DCB-22C	0.019	<0.017	12.1	<0.001												
DIW-P11B	0.735	<0.017	39.4	2.01												
DIW-P11B	0.737	<0.017	39.2	2.00												
DIW-P11C	1.17	<0.017	68.3	3.48												
DIW-P12B	0.626	<0.017	36.7	1.56												
DIW-P09A	0.298	<0.017	38.7	0.685												
DIW-P09B	0.769	<0.017	47.3	2.10												
DIW-P09C	1.11	<0.017	73.6	3.43												
DIW-P10C	0.856	<0.017	62.0	2.61												
DIW-P07B	1.05	<0.017	36.4	2.24												
DIW-P07C	0.888	<0.017	28.5	1.86												
DIW-P08C	0.946	<0.017	25.4	2.07												

Gray highlight means that there is no data

Pre-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Comments
DCB-8	
DCB-21A	
DCB-21B	
DCB-21C	
DCB-22A	
DCB-22B	
DCB-22C	
DCB-70A	
DCB-70B	
DCB-19A	
DCB-19B	
DCB-19C	
DCB-18A	
DCB-18B	
DCB-18C	
DCB-71A	
DCB-71B	
DIW-P11A	
DIW-P11B	
DIW-1-2	
DIW-P07A	
DCB-21B	
DCB-21B	
DCB-22C	
DCB-22C	
DIW-P11B	
DIW-P11B	
DIW-P11C	
DIW-P12B	
DIW-P09A	
DIW-P09B	
DIW-P09C	
DIW-P10C	
DIW-P07B	
DIW-P07C	
DIW-P08C	May have been DIW-P08B instead

First Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)
DCB-8 *	DSR-00050	9/10/2002	Sample	9/16/2002	0.052	<0.002		0.215	<0.003	<0.002	<0.009	0.239	0.383	<0.001
DCB-21A	DSR-00051	9/12/2002	Sample	9/16/2002	465	<0.002		147	<0.003	0.160	1.07	219	114	9.6
DCB-21B	DSR-00052	9/11/2002	Sample	9/16/2002	131	<0.002		106	<0.003	<0.002	0.149	78.2	87.9	9.2
DCB-21C	DSR-00053	9/11/2002	Sample	9/16/2002	2.12	<0.002		111	<0.003	<0.002	<0.009	2.65	54.3	5.93
DCB-22A	DSR-00054	9/11/2002	Sample	9/16/2002	253	<0.002		68.6	<0.003	<0.002	0.102	3.15	66.0	6.63
DCB-22B	DSR-00055	9/12/2002	Sample	9/16/2002	182	<0.002		122	<0.003	<0.002	0.075	244	90.2	10.1
DCB-22C	DSR-00056	9/11/2002	Sample	9/16/2002	1.54	<0.002		84.8	<0.003	<0.002	<0.009	1.96	23.9	1.130
DCB-70A	DSR-00057	9/10/2002	Sample	9/16/2002	181	<0.002		49.7	<0.003	<0.002	0.064	31.2	42.7	5.53
DCB-70B	DSR-00058	9/10/2002	Sample	9/16/2002	0.132	<0.002		1.86	<0.003	<0.002	<0.009	0.382	1.08	<0.001
DCB-19A	DSR-00059	9/12/2002	Sample	9/16/2002	90.2	<0.002		38.5	<0.003	<0.002	0.058	1.94	22.5	2.35
DCB-19B	DSR-00060	9/11/2002	Sample	9/16/2002	185	<0.002		76.3	<0.003	<0.002	0.187	131	49.2	4.79
DCB-19C	DSR-00061	9/11/2002	Sample	9/16/2002	176	<0.002		116	<0.003	<0.002	0.171	146	56.8	10.2
DCB-18A	DSR-00062	9/12/2002	Sample	9/16/2002	432	<0.002		274	<0.003	0.025	0.725	10.9	76.7	7.67
DCB-18B	DSR-00063	9/11/2002	Sample	9/16/2002	267	<0.002		65.9	<0.003	<0.002	0.391	6.93	53.6	5.24
DCB-18C	DSR-00064	9/11/2002	Sample	9/16/2002	92.2	<0.002		131	<0.003	<0.002	0.079	106	62.3	13.2
DCB-71A	DSR-00065	9/10/2002	Sample	9/16/2002	83.2	<0.002		27.5	<0.003	<0.002	0.239	7.60	24.3	3.98
DCB-71B	DSR-00066	9/10/2002	Sample	9/16/2002	196	<0.002		125	<0.003	<0.002	<0.009	92.2	99.7	15.2
DIW-P14C	DSR-00067	9/11/2002	Sample	9/16/2002	56.3	<0.002		85.2	<0.003	0.021	<0.009	146	50.9	8.1
DIW-P13B	DSR-00068	9/11/2002	Sample	9/16/2002	30.7	<0.002		75.0	<0.003	<0.002	<0.009	149	49.5	7.06
DIW-P13C	DSR-00069	9/11/2002	Sample	9/16/2002	53.5	0.071		63.1	<0.003	<0.002	<0.009	334	39.7	5.37
DIW-P12B	DSR-00070	9/11/2002	Sample	9/16/2002	125	<0.002		104	<0.003	<0.002	<0.009	387	69.1	7.72
DIW-P11B	DSR-00071	9/11/2002	Sample	9/16/2002	117	<0.002		261	<0.003	<0.002	<0.009	426	69.2	7.65
DIW-P11C	DSR-00072	9/11/2002	Sample	9/16/2002	153	<0.002		141	<0.003	<0.002	<0.009	544	90.2	9.56
DIW-P10C	DSR-00073	9/11/2002	Sample	9/16/2002	130	<0.002		104	<0.003	<0.002	<0.009	297	61.8	7.91
DIW-P09B	DSR-00074	9/11/2002	Sample	9/16/2002	65.8	<0.002		88.3	<0.003	<0.002	<0.009	518	61.0	7.79
DIW-P09C	DSR-00075	9/11/2002	Sample	9/16/2002	111	<0.002		127	<0.003	<0.002	<0.009	606	79.8	9.3
DIW-P07B	DSR-00081	9/11/2002	Sample	9/16/2002	223	<0.002		111	<0.003	<0.002	<0.009	186	63.7	11.5
DIW-P07C	DSR-00082	9/11/2002	Sample	9/16/2002	182	<0.002		113	<0.003	<0.002	0.025	148	59.7	13.5
DIW-P08C	DSR-00083	9/11/2002	Sample	9/16/2002	175	<0.002		126	<0.003	<0.002	0.010	219	66.8	15.6
DIW-P13A	DSR-00087	9/11/2002	Sample	9/16/2002	0.038	0.022		43.6	<0.003	<0.002	<0.009	120	34.0	5.57
DIW-P11A	DSR-00088	9/11/2002	Sample	9/16/2002	4.85	<0.002		199	<0.003	<0.002	<0.009	344	47.7	7.17
DIW-P09A	DSR-00090	9/11/2002	Sample	9/16/2002	48.0	<0.002		27.0	<0.003	<0.002	<0.009	128	11.3	2.54
DIW-1-2	DSR-00091	9/11/2002	Sample	9/16/2002	0.347	<0.002		25.1	<0.003	0.052	<0.009	18.6	16.7	2.48
DIW-P07A	DSR-00092	9/11/2002	Sample	9/16/2002	32.6	<0.002		83.1	<0.003	<0.002	<0.009	248	42.8	15.0
DCB-21B	DSR-00093	9/11/2002	Duplicate	9/16/2002	133	<0.002		107	<0.003	<0.002	0.156	78.5	88.5	9.42
DCB-21B	DSR-00094	9/11/2002	Unfiltered	9/16/2002	134	<0.002		108	<0.003	<0.002	0.152	79.7	89.8	9.41
DCB-22C	DSR-00095	9/11/2002	Duplicate	9/16/2002	1.54	<0.002		83.2	<0.003	<0.002	<0.009	2.03	23.1	1.11
DCB-22C	DSR-00096	9/11/2002	Unfiltered	9/16/2002	1.58	<0.002		84.6	<0.003	<0.002	<0.009	1.97	24.2	1.22
DIW-P11B	DSR-00097	9/11/2002	Duplicate	9/16/2002	123	<0.002		106	<0.003	<0.002	<0.009	432	69.7	7.92
DIW-P11B	DSR-00099	9/11/2002	Unfiltered	9/16/2002	124	<0.002		105	<0.003	<0.002	<0.009	430	71.2	7.98

Gray highlight means that there is no data

First Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Nickel (mg/L)	Lead (mg/L)	Silicon (mg/L)	Zinc (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Sulfur (mg/L)	Analysis Date	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)	Analysis Date	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)
DCB-8 *	<0.010	<0.017	5.05	<0.001		0.981		9/16/2002	< detect	< detect						
DCB-21A	1.49	<0.017	122	5.82		11.0		9/16/2002	0	0						
DCB-21B	0.519	<0.017	36.2	1.58		6.97		9/16/2002	0.907	70.98						
DCB-21C	0.059	<0.017	15.5	<0.001		3.44		9/16/2002	0.974	2.58						
DCB-22A	0.919	<0.017	78.2	2.12		16.3		9/16/2002	0	0						
DCB-22B	0.806	<0.017	27.9	1.96		27.1		9/16/2002	0.996	242.93						
DCB-22C	<0.010	<0.017	10.8	<0.001		3.02		9/16/2002	0.893	1.75						
DCB-70A	0.627	<0.017	77.7	1.49		16.7		9/16/2002	0.846	26.36						
DCB-70B	<0.010	<0.017	7.48	<0.001		41.1		9/16/2002	< detect	< detect						
DCB-19A	0.269	<0.017	83.0	0.732		4.27		9/16/2002	< detect	< detect						
DCB-19B	0.691	<0.017	36.9	1.46		13.4		9/16/2002	0.963	125.75						
DCB-19C	0.691	<0.017	32.9	1.62		12.7		9/16/2002	0.991	144.90						
DCB-18A	1.12	<0.017	101	3.21		7.26		9/16/2002	0	0						
DCB-18B	0.728	<0.017	84.2	2.05		5.16		9/16/2002	0	0						
DCB-18C	0.504	<0.017	16.6	1.21		5.55		9/16/2002	0.991	105.17						
DCB-71A	0.314	<0.017	35.4	1.76		4.52		9/16/2002	0.836	6.35						
DCB-71B	0.877	<0.017	12.7	2.06		9.09		9/16/2002	0.987	91.00						
DIW-P14C	<0.010	<0.017	6.63	<0.001		2690		9/16/2002	0.976	142.39						
DIW-P13B	0.092	<0.017	7.25	<0.001		1020		9/16/2002	0.958	142.67						
DIW-P13C	<0.010	<0.017	13.5	<0.001		8840		9/16/2002	0.646	215.41						
DIW-P12B	0.57	<0.017	48.5	0.263		135		9/16/2002	1.000	387.19						
DIW-P11B	0.476	<0.017	52.7	0.077		11.5		9/16/2002	1.000	426.00						
DIW-P11C	0.765	<0.017	52.6	0.934		39.6		9/16/2002	1.000	544.00						
DIW-P10C	0.536	<0.017	43.5	0.825		291		9/16/2002	1.001	297.44						
DIW-P09B	0.495	<0.017	46.9	0.005		110		9/16/2002	1.000	517.79						
DIW-P09C	0.619	<0.017	47.6	0.271		534		9/16/2002	1.000	606.00						
DIW-P07B	0.840	<0.017	35.6	1.58		15.2		9/16/2002	1.001	186.23						
DIW-P07C	0.735	<0.017	28.0	1.51		10.4		9/16/2002	0.997	147.51						
DIW-P08C	0.742	<0.017	21.6	1.47		34.2		9/16/2002	0.996	218.13						
DIW-P13A	<0.010	<0.017	3.80	<0.001		524		9/16/2002	0.991	118.60						
DIW-P11A	<0.010	<0.017	18.4	<0.001		307		9/16/2002	0.950	326.88						
DIW-P09A	0.138	<0.017	54.5	0.363		2460		9/16/2002	0.827	106.04						
DIW-1-2	<0.010	<0.017	7.89	<0.001		129		9/16/2002	0.893	16.58						
DIW-P07A	0.199	<0.017	16.1	<0.001		20.9		9/16/2002	0.999	247.78						
DCB-21B	0.523	<0.017	36.7	1.57		7.09		9/16/2002	0.898	70.51						
DCB-21B	0.521	<0.017	36.9	1.56		7.03										
DCB-22C	0.072	<0.017	10.7	<0.001		3.03		9/16/2002	0.816	1.66						
DCB-22C	0.069	<0.017	10.9	<0.001		3.11										
DIW-P11B	0.498	<0.017	53.0	0.101		121		9/16/2002	0.998	431.13						
DIW-P11B	0.509	<0.017	54.3	0.071		121										

Gray highlight means that there is no data

First Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Comments
DCB-8 *	
DCB-21A	
DCB-21B	
DCB-21C	
DCB-22A	Bottles used for the collection of DCB-22A were marked as 22B. Data corrected in this table
DCB-22B	Bottles used for the collection of DCB-22B were marked as 22A. Data corrected in this table
DCB-22C	
DCB-70A	
DCB-70B	
DCB-19A	
DCB-19B	
DCB-19C	
DCB-18A	
DCB-18B	
DCB-18C	
DCB-71A	
DCB-71B	
DIW-P14C	
DIW-P13B	
DIW-P13C	
DIW-P12B	
DIW-P11B	
DIW-P11C	
DIW-P10C	
DIW-P09B	
DIW-P09C	
DIW-P07B	
DIW-P07C	
DIW-P08C	May have been DIW-P08B instead
DIW-P13A	
DIW-P11A	
DIW-P09A	
DIW-1-2	
DIW-P07A	
DCB-21B	
DCB-21B	
DCB-22C	
DCB-22C	
DIW-P11B	
DIW-P11B	

Second Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)
DCB-8 *	DSR-00101	11/6/2002	Sample	11/18/2002	0.033	<0.002	<0.100	0.034	<0.003	<0.002	<0.010	0.930	0.280	<0.001
DCB-21A	DSR-00102	11/6/2002	Sample	11/18/2002	563	<0.002	4.28	164	<0.003	0.240	1.50	456	138	15.0
DCB-21B	DSR-00103	11/6/2002	Sample	11/18/2002	144	<0.002	2.39	105	<0.003	<0.002	0.161	91.3	87.8	8.75
DCB-21C	DSR-00104	11/6/2002	Sample	11/18/2002	2.75	<0.002	0.128	105	<0.003	<0.002	<0.010	3.73	54.8	5.86
DCB-22A	DSR-00105	11/6/2002	Sample	11/18/2002	273	<0.002	2.62	78.6	<0.003	<0.002	0.099	3.28	73.8	7.29
DCB-22B	DSR-00106	11/6/2002	Sample	11/18/2002	172	<0.002	3.38	110	<0.003	<0.002	0.067	226	85.5	9.67
DCB-22C	DSR-00107	11/6/2002	Sample	11/18/2002	1.66	<0.002	0.260	80.3	<0.003	<0.002	<0.010	1.99	27.6	1.45
DCB-70B	DSR-00108	11/6/2002	Sample	11/18/2002	0.088	<0.002	<0.100	<0.006	<0.003	<0.002	<0.010	0.050	0.160	<0.001
DCB-19A	DSR-00109	11/5/2002	Sample	11/18/2002	100	<0.002	0.987	40.0	<0.003	<0.002	0.086	1.02	26.6	2.83
DCB-19B	DSR-00110	11/5/2002	Sample	11/18/2002	181	<0.002	4.86	67.5	<0.003	<0.002	0.187	94.1	48.6	4.42
DCB-19C	DSR-00111	11/5/2002	Sample	11/18/2002	171	<0.002	7.28	110	<0.003	<0.002	0.166	171	57.0	12.1
DCB-18A	DSR-00112	11/6/2002	Sample	11/18/2002	578	<0.002	4.35	122	<0.003	0.217	1.21	50.6	99.5	12.0
DCB-18B	DSR-00113	11/6/2002	Sample	11/18/2002	456	<0.002	3.46	97.0	<0.003	0.110	0.828	25.3	78.4	8.16
DCB-18C	DSR-00114	11/6/2002	Sample	11/18/2002	95.1	<0.002	5.54	129	<0.003	<0.002	0.079	111	62.9	16.6
DCB-71B	DSR-00115	11/6/2002	Sample	11/18/2002	212	<0.002	3.76	126	<0.003	<0.002	0.032	103	99.2	19.0
DIW-P14C	DSR-00116	11/5/2002	Sample	11/18/2002	0.516	0.154	<0.100	63.2	<0.003	<0.002	<0.010	74.6	34.7	6.56
DIW-P13B	DSR-00117	11/5/2002	Sample	11/18/2002	0.049	0.120	<0.100	39.5	<0.003	<0.002	<0.010	170	29.2	4.69
DIW-P13C	DSR-00118	11/5/2002	Sample	11/18/2002	43.2	0.547	<0.100	80.4	<0.003	<0.002	<0.010	418	34.7	4.22
DIW-P12B	DSR-00119	11/5/2002	Sample	11/18/2002	360	<0.002	2.48	128	<0.003	0.052	<0.010	170	90.2	9.23
DIW-P11B	DSR-00120	11/5/2002	Sample	11/18/2002	214	<0.002	1.62	117	<0.003	<0.002	<0.010	262	84.0	9.12
DIW-P11C	DSR-00121	11/5/2002	Sample	11/18/2002	477	<0.002	3.26	143	<0.003	0.151	<0.010	170	98.5	9.90
DIW-P10C	DSR-00122	11/5/2002	Sample	11/18/2002	355	<0.002	2.62	125	<0.003	0.023	<0.010	256	85.6	9.14
DIW-P09B	DSR-00123	11/5/2002	Sample	11/18/2002	202	<0.002	1.95	91.7	<0.003	<0.002	<0.010	260	69.6	7.86
DIW-P09C	DSR-00124	11/5/2002	Sample	11/18/2002	367	<0.002	3.09	138	<0.003	0.035	<0.010	286	95.6	9.53
DIW-P03B	DSR-00126	11/5/2002	Sample	11/18/2002	0.555	<0.002	<0.100	45.3	<0.003	<0.002	<0.010	194	32.9	4.41
DIW-P07B	DSR-00130	11/5/2002	Sample	11/18/2002	208	<0.002	4.60	104	<0.003	<0.002	<0.010	164	60.5	11.9
DIW-P07C	DSR-00131	11/5/2002	Sample	11/18/2002	178	<0.002	4.99	104	<0.003	<0.002	0.016	151	58.3	15.5
DIW-P08C	DSR-00132	11/5/2002	Sample	11/18/2002	169	<0.002	4.59	115	<0.003	<0.002	0.023	194	65.2	18.3
DIW-P13A	DSR-00136	11/6/2002	Sample	11/18/2002	0.117	0.171	<0.100	51.0	<0.003	<0.002	<0.010	253	35.1	4.89
DIW-P11A	DSR-00138	11/6/2002	Sample	11/18/2002	0.392	<0.002	<0.100	92.8	<0.003	<0.002	<0.010	134	65.1	6.99
DIW-P09A	DSR-00139	11/6/2002	Sample	11/18/2002	0.134	<0.002	<0.100	49.8	<0.003	<0.002	<0.010	206	37.0	4.44
DIW-1-2	DSR-00140	11/6/2002	Sample	11/18/2002	0.079	<0.002	<0.100	24.9	<0.003	<0.002	<0.010	2.32	20.6	2.49
DIW-P03A	DSR-00141	11/6/2002	Sample	11/18/2002	0.109	0.242	<0.100	18.5	<0.003	<0.002	<0.010	153	7.45	4.08
DIW-P07A	DSR-00142	11/6/2002	Sample	11/18/2002	0.170	0.094	<0.100	54.9	<0.003	<0.002	<0.010	106	32.5	14.9
DCB-21B	DSR-00143	11/6/2002	Dulicate	11/18/2002	136	<0.002	2.34	100	<0.003	<0.002	0.138	93.6	85.8	8.60
DCB-21B	DSR-00144	11/6/2002	Unfiltered	11/18/2002	141	<0.002	2.21	102	<0.003	<0.002	0.153	89.9	88.6	8.77
DCB-22C	DSR-00145	11/6/2002	Dulicate	11/18/2002	1.40	<0.002	0.228	77.4	<0.003	<0.002	<0.010	1.81	26.3	1.29
DCB-22C	DSR-00146	11/6/2002	Unfiltered	11/18/2002	1.26	<0.002	0.217	77.6	<0.003	<0.002	<0.010	1.84	25.2	1.13
DIW-P11B	DSR-00147	11/5/2002	Dulicate	11/18/2002	211	<0.002	1.66	113	<0.003	<0.002	<0.010	252	83.1	10.5
DIW-P11B	DSR-00149	11/5/2002	Unfiltered	11/18/2002	211	<0.002	1.47	126	<0.003	<0.002	<0.010	260	83.2	10.5

Gray highlight means that there is no data

Second Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Nickel (mg/L)	Lead (mg/L)	Silicon (mg/L)	Zinc (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Sulfur (mg/L)	Analysis Date	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)	Analysis Date	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)
DCB-8 *	<0.010	<0.017	5.45	<0.001	<0.001	0.704		11/18/2002	< detect	< detect						
DCB-21A	1.93	<0.017	121	6.60	7.44	17.3		11/18/2002	0	0						
DCB-21B	0.572	<0.017	37.8	1.80	1.96	8.27		11/18/2002	0.8743688	79.83						
DCB-21C	0.066	<0.017	16.0	<0.001	<0.001	3.29		11/18/2002	0	0						
DCB-22A	1.01	<0.017	81.5	2.42	2.65	19.7		11/18/2002	< detect	< detect						
DCB-22B	0.784	<0.017	27.3	1.95	2.19	27.4		11/18/2002	1	226.00						
DCB-22C	<0.010	<0.017	11.1	<0.001	<0.001	2.67		11/18/2002	< detect	< detect						
DCB-70B	<0.010	<0.017	7.80	<0.001	<0.001	32.3		11/18/2002	< detect	< detect						
DCB-19A	0.307	<0.017	71.4	0.909	0.941	3.15		11/18/2002	< detect	< detect						
DCB-19B	0.680	<0.017	39.5	1.48	1.62	14.1		11/18/2002	0.9684685	91.13						
DCB-19C	0.724	<0.017	29.3	1.76	1.93	14.6		11/18/2002	1	171.00						
DCB-18A	1.48	<0.017	102	4.41	4.85	12.8		11/18/2002	0	0						
DCB-18B	1.17	<0.017	90.7	3.52	3.87	9.67		11/18/2002	0	0						
DCB-18C	0.531	<0.017	16.4	1.36	1.49	6.42		11/18/2002	1	111.00						
DCB-71B	1.06	<0.017	12.7	2.41	2.70	10.3		11/18/2002	1	103.00						
DIW-P14C	<0.010	<0.017	2.79	<0.001	<0.001	1330		11/18/2002	1	74.60						
DIW-P13B	<0.010	<0.017	2.84	<0.001	<0.001	1080		11/18/2002	1	170.00						
DIW-P13C	<0.010	<0.017	11.1	<0.001	<0.001	18200		11/18/2002	0.7561663	316.08						
DIW-P12B	0.823	<0.017	71.0	5.44	5.92	84.7		11/18/2002	1	170.00						
DIW-P11B	0.538	<0.017	41.8	<0.001	<0.001	136		11/18/2002	1	262.00						
DIW-P11C	1.13	<0.017	94.5	4.98	5.51	80.0		11/18/2002	1	170.00						
DIW-P10C	0.890	<0.017	65.9	2.91	3.29	101		11/18/2002	1	256.00						
DIW-P09B	0.536	<0.017	55.5	0.342	0.371	93.1		11/18/2002	1	260.00						
DIW-P09C	0.988	<0.017	73.8	0.110	0.122	139		11/18/2002	1	286.00						
DIW-P03B	<0.010	<0.017	23.8	<0.001	<0.001	64.2		11/18/2002	1	194.00						
DIW-P07B	0.792	<0.017	32.0	1.60	1.80	16.6		11/18/2002	1	164.00						
DIW-P07C	0.722	<0.017	24.4	1.52	1.68	11.7		11/18/2002	1	151.00						
DIW-P08C	0.730	<0.017	18.7	1.54	1.72	31.4		11/18/2002	1	194.00						
DIW-P13A	<0.010	<0.017	4.46	<0.001	<0.001	423		11/18/2002	1	253.00						
DIW-P11A	<0.010	<0.017	8.03	<0.001	<0.001	421		11/18/2002	1	134.00						
DIW-P09A	<0.010	<0.017	12.7	<0.001	<0.001	167		11/18/2002	1	206.00						
DIW-1-2	<0.010	<0.017	5.39	<0.001	<0.001	137		11/18/2002	< detect	< detect						
DIW-P03A	<0.010	<0.017	4.52	<0.001	<0.001	18.9		11/18/2002	1	153.00						
DIW-P07A	<0.010	<0.017	7.00	<0.001	<0.001	26.8		11/18/2002	1	106.00						
DCB-21B	0.518	<0.017	33.6	1.66	1.84	7.91		11/18/2002	0.9035423	84.57						
DCB-21B	0.530	<0.017	37.1	1.72	1.90	7.84										
DCB-22C	<0.010	<0.017	10.4	<0.001	<0.001	3.06		11/18/2002	1	1.81						
DCB-22C	<0.010	<0.017	10.4	<0.001	<0.001	2.46										
DIW-P11B	0.553	<0.017	39.9	<0.001	<0.001	135		11/18/2002	1	252						
DIW-P11B	0.476	<0.017	40.7	<0.001	<0.001	690										

Gray highlight means that there is no data

Second Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Comments
DCB-8 *	
DCB-21A	
DCB-21B	
DCB-21C	
DCB-22A	
DCB-22B	
DCB-22C	
DCB-70B	
DCB-19A	
DCB-19B	
DCB-19C	
DCB-18A	
DCB-18B	
DCB-18C	
DCB-71B	
DIW-P14C	
DIW-P13B	
DIW-P13C	
DIW-P12B	
DIW-P11B	
DIW-P11C	
DIW-P10C	
DIW-P09B	
DIW-P09C	
DIW-P03B	
DIW-P07B	
DIW-P07C	
DIW-P08C	May have been DIW-P08B instead
DIW-P13A	
DIW-P11A	
DIW-P09A	
DIW-1-2	
DIW-P03A	
DIW-P07A	
DCB-21B	
DCB-21B	
DCB-22C	
DCB-22C	
DIW-P11B	
DIW-P11B	

Third Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)
DCB-8	DSR-00151	1/13/2003	Sample	1/28/2003	1.06	<0.002	<0.100	<0.006	<0.003	<0.002	0.043	<0.040	<0.004	<0.001
DCB-21A	DSR-00152	1/13/2003	Sample	1/28/2003	494	<0.002	<0.100	117	<0.003	0.254	1.34	559	137	10.0
DCB-21B	DSR-00153	1/13/2003	Sample	1/28/2003	127	<0.002	<0.100	96.1	<0.003	0.025	0.180	88	83.5	7.38
DCB-22A	DSR-00154	1/13/2003	Sample	1/28/2003	243	<0.002	<0.100	72.2	<0.003	0.041	0.129	2.78	64.5	6.06
DCB-22B	DSR-00155	1/13/2003	Sample	1/28/2003	167	<0.002	<0.100	105	<0.003	<0.002	0.117	236	84.9	9.05
DCB-22C	DSR-00156	1/13/2003	Sample	1/28/2003	2.31	<0.002	<0.100	94.8	<0.003	<0.002	0.007	1.68	30.8	1.69
DCB-70B	DSR-00157	1/13/2003	Sample	1/28/2003	1.24	<0.002	<0.100	<0.006	<0.003	<0.002	0.003	<0.040	<0.004	<0.001
DCB-19A	DSR-00158	1/13/2003	Sample	1/28/2003	47.2	<0.002	<0.100	28.2	<0.003	<0.002	0.053	<0.040	13.8	1.52
DCB-19B	DSR-00159	1/13/2003	Sample	1/28/2003	130	<0.002	<0.100	56.6	<0.003	<0.002	0.173	17.2	37.9	3.21
DCB-18A	DSR-00160	1/13/2003	Sample	1/28/2003	570	<0.002	<0.100	127	<0.003	0.372	1.72	587	139	12.1
DCB-18B	DSR-00161	1/13/2003	Sample	1/28/2003	645	<0.002	<0.100	133	<0.003	0.381	1.83	651	149	12.8
DCB-18C	DSR-00162	1/13/2003	Sample	1/28/2003	90.5	<0.002	<0.100	120	<0.003	<0.002	0.116	113	62.0	12.7
DCB-71B	DSR-00163	1/13/2003	Sample	1/28/2003	208	<0.002	<0.100	117	<0.003	<0.002	0.075	97.9	99.4	15.0
DIW-P14C	DSR-00164	1/13/2003	Sample	1/28/2003	12.1	<0.002	<0.100	102	<0.003	<0.002	<0.009	472	73.7	9.79
DIW-P13B	DSR-00165	1/13/2003	Sample	1/28/2003	22.0	0.059	<0.100	85.9	<0.003	<0.002	<0.009	365	60.6	6.95
DIW-P13C	DSR-00166	1/13/2003	Sample	1/28/2003	40.5	0.389	<0.100	57.3	<0.003	0.085	0.013	462	33.2	3.89
DIW-P12B	DSR-00167	1/13/2003	Sample	1/28/2003	407	<0.002	<0.100	121	<0.003	0.229	0.994	454	117	10.0
DIW-P11B	DSR-00168	1/13/2003	Sample	1/28/2003	270	<0.002	<0.100	104	<0.003	0.109	<0.009	316	88.2	9.27
DIW-P11C	DSR-00169	1/13/2003	Sample	1/28/2003	537	<0.002	<0.100	137	<0.003	0.305	1.50	693	141	11.0
DIW-P10C	DSR-00170	1/13/2003	Sample	1/28/2003	489	<0.002	<0.100	132	<0.003	0.300	1.32	525	132	11.1
DIW-P09B	DSR-00171	1/13/2003	Sample	1/28/2003	51.6	<0.002	<0.100	67.7	<0.003	<0.002	<0.009	413	49.4	5.37
DIW-P09C	DSR-00172	1/13/2003	Sample	1/28/2003	536	<0.002	<0.100	135	<0.003	0.303	1.67	631	138	11.1
DIW-P03B	DSR-00174	1/13/2003	Sample	1/28/2003	1.12	0.984	<0.100	24.8	<0.003	<0.002	<0.009	223	15.2	2.92
DIW-P03C	DSR-00175	1/13/2003	Sample	1/28/2003	6.56	0.624	<0.100	29.0	<0.003	<0.002	<0.009	213	18.6	3.12
DIW-P07B	DSR-00179	1/13/2003	Sample	1/28/2003	226	<0.002	<0.100	109	<0.003	0.010	<0.009	170	66.0	9.06
DIW-P07C	DSR-00180	1/13/2003	Sample	1/28/2003	187	<0.002	<0.100	108	<0.003	<0.002	0.062	160	62.9	11.3
DIW-P08C	DSR-00181	1/13/2003	Sample	1/28/2003	181	<0.002	<0.100	107	<0.003	<0.002	0.122	167	60.6	11.2
DIW-P13A	DSR-00185	1/14/2003	Sample	1/28/2003	1.57	0.254	<0.100	49.5	<0.003	<0.002	<0.009	235	33.9	4.48
DIW-P11A	DSR-00186	1/14/2003	Sample	1/28/2003	1.79	0.231	<0.100	30.2	<0.003	<0.002	<0.009	188	22.7	3.79
DIW-P09A	DSR-00188	1/14/2003	Sample	1/28/2003	1.25	0.039	<0.100	29.2	<0.003	<0.002	<0.009	224	24.7	2.12
DIW-1-2	DSR-00189	1/14/2003	Sample	1/28/2003	1.20	0.016	<0.100	33.4	<0.003	<0.002	<0.009	100	21.0	3.11
DIW-P03A	DSR-00190	1/14/2003	Sample	1/28/2003	1.34	0.163	<0.100	21.2	<0.003	<0.002	<0.009	226	9.85	2.14
DIW-P05A	DSR-00191	1/14/2003	Sample	1/28/2003	2.12	0.026	<0.100	34.8	<0.003	<0.002	<0.009	117	23.5	5.32
DIW-P07A	DSR-00192	1/14/2003	Sample	1/28/2003	1.20	0.141	<0.100	53.6	<0.003	<0.002	<0.009	182	27.0	9.58
DCB-21B	DSR-00193	1/13/2003	Duplicate	1/28/2003	112	<0.002	<0.100	94.6	<0.003	0.019	0.181	87.1	81.1	7.34
DCB-21B	DSR-00194	1/13/2003	Unfiltered	1/28/2003	116	<0.002	<0.100	96.3	<0.003	<0.002	0.157	87.5	82.1	7.55
DCB-22C	DSR-00195	1/13/2003	Duplicate	1/28/2003	2.32	<0.002	<0.100	91.7	<0.003	<0.002	0.010	1.68	29.6	1.71
DCB-22C	DSR-00196	1/13/2003	Unfiltered	1/28/2003	2.45	<0.002	<0.100	92.2	<0.003	<0.002	0.009	1.76	29.8	1.81
DIW-P11B	DSR-00197	1/13/2003	Duplicate	1/28/2003	284	<0.002	<0.100	102	<0.003	0.098	<0.009	322	85.7	9.08
DIW-P11B	DSR-00199	1/13/2003	Unfiltered	1/28/2003	272	<0.002	<0.100	103	<0.003	0.103	<0.009	312	88.4	9.22

Gray highlight means that there is no data

Third Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Nickel (mg/L)	Lead (mg/L)	Silicon (mg/L)	Zinc (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Sulfur (mg/L)	Analysis Date	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)	Analysis Date	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)
DCB-8	<0.010	<0.017	4.30	<0.001		3.81	<0.100	1/28/2003	<detect	<detect	2/11/2003	7.43	<1.00	1.52	<1.00	2.67
DCB-21A	1.76	<0.017	93.2	6.48		11.6	1940	1/28/2003	0.0104884	5.86	2/11/2003	4.46	<1.00	6.87	<1.00	5550
DCB-21B	0.501	<0.017	32.8	1.69		7.47	523	1/28/2003	0.8526784	75.04						
DCB-22A	0.879	<0.017	75.7	2.27		15.0	665	1/28/2003	0	0						
DCB-22B	0.747	<0.017	29.8	2.08		24.8	673	1/28/2003	1	236.00						
DCB-22C	<0.010	<0.017	12.4	<0.001		3.80	112	1/28/2003	1	1.68	2/11/2003	5.08	<1.00	<1.00	<1.00	377
DCB-70B	<0.010	<0.017	7.80	<0.001		24.2	16.4	1/28/2003	<detect	<detect	2/11/2003	3.19	<1.00	<1.00	<1.00	52.4
DCB-19A	0.107	<0.017	45.5	0.279		2.64	142	1/28/2003	<detect	<detect						
DCB-19B	0.507	<0.017	54.7	1.11		5.90	356	1/28/2003	0.8	13.76						
DCB-18A	1.83	<0.017	102.0	6.56		12.9	2140	1/28/2003	0	0						
DCB-18B	1.92	<0.017	104.0	6.90		14.0	2350	1/28/2003	0	0						
DCB-18C	0.504	<0.017	16.5	1.36		6.77	428	1/28/2003	1	113.00						
DCB-71B	0.900	<0.017	13.3	2.53		9.61	676	1/28/2003	1	97.90						
DIW-P14C	<0.010	<0.017	2.49	<0.001		402	691	1/28/2003	1	472.00						
DIW-P13B	<0.010	<0.017	50.3	<0.001		1170	283	1/28/2003	0.9144525	333.78						
DIW-P13C	<0.010	<0.017	12.4	0.009		9310	55.3	1/28/2003	0.7406	342.16						
DIW-P12B	1.32	<0.017	80.2	5.14		28.9	1550	1/28/2003	0.3880813	176.19						
DIW-P11B	0.679	<0.017	59.5	1.07		49.6	1200	1/28/2003	1	316.00	2/11/2003	<1.00	<1.00	<1.00	<1.00	2910
DIW-P11C	1.65	<0.017	91.2	6.96		28.3	2120	1/28/2003	0.2475583	171.56	2/11/2003	5.47	<1.00	2.41	<1.00	6390
DIW-P10C	1.54	<0.017	92.3	6.24		28.5	1850	1/28/2003	0.3062082	160.76						
DIW-P09B	0.098	<0.017	28.5	<0.001		122	499	1/28/2003	1	413.00						
DIW-P09C	1.58	<0.017	96.8	8.22		39.4	2010	1/28/2003	0.4189131	264.33						
DIW-P03B	<0.010	<0.017	6.58	<0.001		104	2.69	1/28/2003	0.8347701	186.15						
DIW-P03C	<0.010	<0.017	22.8	<0.001		102.0	3.23	1/28/2003	0.8157895	173.76						
DIW-P07B	0.828	<0.017	39.6	1.82		17.1	732	1/28/2003	1	170.00						
DIW-P07C	0.750	<0.017	32.7	1.76		12.8	648	1/28/2003	1	160.00						
DIW-P08C	0.747	<0.017	27.5	1.77		15.8	628	1/28/2003	1	167.00						
DIW-P13A	<0.010	<0.017	6.74	<0.001		901	75.9	1/28/2003	0.7790686	183.08	2/11/2003	3.43	<1.00	<1.00	<1.00	212
DIW-P11A	<0.010	<0.017	12.2	<0.001		128	26.6	1/28/2003	0.9093893	170.97	2/11/2003	2.31	<1.00	<1.00	<1.00	49.8
DIW-P09A	<0.010	<0.017	17.2	<0.001		267	39.7	1/28/2003	0.9507598	212.97						
DIW-1-2	<0.010	<0.017	8.35	<0.001		246	66.2	1/28/2003	0.8294853	82.95	2/11/2003	2.96	<1.00	<1.00	<1.00	139
DIW-P03A	<0.010	<0.017	6.38	<0.001		42.2	8.26	1/28/2003	1	226.00	2/11/2003	2.26	<1.00	<1.00	<1.00	23.9
DIW-P05A	<0.010	<0.017	12.2	<0.001		23.8	102	1/28/2003	1	117.00						
DIW-P07A	<0.010	<0.017	9.25	<0.001		21.4	83.8	1/28/2003	1	182.00						
DCB-21B	0.501	<0.017	32.7	1.69		7.64	461	1/28/2003	0.9031119	78.66						
DCB-21B	0.446	<0.017	30.7	1.55		7.33	505									
DCB-22C	<0.010	<0.017	12.1	<0.001		3.57	113	1/28/2003	1	1.68						
DCB-22C	<0.010	<0.017	12.1	<0.001		3.74	116									
DIW-P11B	0.669	<0.017	58.8	1.00		52.3	1190	1/28/2003	1	322.00						
DIW-P11B	0.688	<0.017	68.9	1.14		64.6	1160									

Gray highlight means that there is no data

Third Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Comments
DCB-8	
DCB-21A	
DCB-21B	
DCB-22A	
DCB-22B	
DCB-22C	
DCB-70B	
DCB-19A	
DCB-19B	
DCB-18A	
DCB-18B	
DCB-18C	
DCB-71B	
DIW-P14C	
DIW-P13B	
DIW-P13C	
DIW-P12B	
DIW-P11B	
DIW-P11C	
DIW-P10C	
DIW-P09B	
DIW-P09C	
DIW-P03B	
DIW-P03C	
DIW-P07B	
DIW-P07C	
DIW-P08C	
DIW-P13A	
DIW-P11A	
DIW-P09A	
DIW-1-2	
DIW-P03A	
DIW-P05A	
DIW-P07A	
DCB-21B	
DCB-21B	
DCB-22C	
DCB-22C	
DIW-P11B	
DIW-P11B	

Fourth Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)
DCB-8	DSR-00201	4/1/2003	Sample	4/8/2003	0.177	<0.002	<0.001	2.12	<0.003	0.007	0.051	0.226	1.50	<0.001
DCB-21A	DSR-00202	3/31/2003	Sample	4/9/2003	239	<0.002	<0.001	74.7	<0.003	0.140	0.678	468	97.7	7.04
DCB-21B	DSR-00203	3/31/2003	Sample	4/10/2003	131	<0.002	<0.001	96.2	<0.003	0.049	0.141	106	83.5	7.20
DCB-22C	DSR-00204	3/31/2003	Sample	4/11/2003	0.937	<0.002	<0.001	101	<0.003	0.011	<0.009	2.06	29.5	1.51
DCB-70B	DSR-00205	3/31/2003	Sample	4/12/2003	0.339	<0.002	<0.001	4.41	<0.003	0.008	<0.009	0.102	2.50	<0.001
DCB-19A	DSR-00206	3/31/2003	Sample	4/13/2003	324	<0.002	<0.001	79.9	<0.003	0.140	0.559	118	84.0	6.13
DCB-19B	DSR-00207	3/31/2003	Sample	4/14/2003	124	<0.002	<0.001	49.4	<0.003	0.037	0.131	5.63	33.9	2.99
DCB-18C	DSR-00208	3/31/2003	Sample	4/15/2003	102	<0.002	<0.001	123	<0.003	0.029	0.119	110	62.4	12.7
DCB-71B	DSR-00209													
DIW-P14C	DSR-00210													
DIW-P13B	DSR-00211													
DIW-P13C	DSR-00212													
DIW-P12B	DSR-00213	4/1/2003	Sample	4/20/2003	374	<0.002	<0.001	95.3	<0.003	0.223	0.924	516	123	9.72
DIW-P11B	DSR-00214	4/1/2003	Sample	4/21/2003	417	<0.002	<0.001	93.9	<0.003	0.231	0.827	380	134	9.89
DIW-P11C	DSR-00215	3/31/2003	Sample	4/22/2003	494	<0.002	<0.001	172	<0.003	0.291	1.65	1280	121	12.6
DIW-P10C	DSR-00216													
DIW-P09B	DSR-00217													
DIW-P09C	DSR-00218													
DIW-P02C	DSR-00219													
DIW-P03B	DSR-00220	4/1/2003	Sample	4/27/2003	0.274	0.097	<0.001	86.3	<0.003	0.014	<0.009	115	237	14.1
DIW-P03C	DSR-00221	4/1/2003	Sample	4/28/2003	0.139	0.187	<0.001	87.3	<0.003	0.011	<0.009	114	46.4	14.1
DIW-P04C	DSR-00222	4/1/2003	Sample	4/29/2003	2.09	<0.002	<0.001	75.2	<0.003	0.009	<0.009	207	47.7	11.0
DIW-P07B	DSR-00223	3/31/2003	Sample	4/30/2003	249	<0.002	<0.001	106	<0.003	0.042	<0.009	166	46.5	9.53
DIW-P07C	DSR-00224	3/31/2003	Sample	5/1/2003	236	<0.002	<0.001	105	<0.003	0.036	0.032	164	63.9	10.1
DIW-P08C	DSR-00225	3/31/2003	Sample	5/2/2003	221	<0.002	<0.001	114	<0.003	0.033	0.082	188	62.0	11.0
DIW-P13A	DSR-00226	4/1/2003	Sample	5/3/2003	0.173	0.074	<0.001	37.7	<0.003	0.007	<0.009	214	66.2	7.85
DIW-P11A	DSR-00227	4/1/2003	Sample	5/4/2003	6.70	0.013	<0.001	51.0	<0.003	0.014	<0.009	214	22.0	9.21
DIW-P09A	DSR-00228	4/1/2003	Sample	5/5/2003	0.579	<0.002	<0.001	20.4	<0.003	0.014	<0.009	110	39.3	2.14
DIW-1-2	DSR-00229	4/1/2003	Sample	5/6/2003	0.140	0.041	<0.001	34.4	<0.003	0.016	<0.009	162	15.3	2.96
DIW-P03A	DSR-00230	4/1/2003	Sample	5/7/2003	0.871	<0.002	<0.001	40.2	<0.003	0.014	<0.009	52.7	23.8	6.21
DIW-P05A	DSR-00231	4/1/2003	Sample	5/8/2003	0.424	0.043	<0.001	41.2	<0.003	0.008	<0.009	18.9	24.0	7.35
DIW-P07A	DSR-00232	4/1/2003	Sample	5/9/2003	0.590	<0.002	<0.001	40.1	<0.003	0.007	<0.009	105	17.7	7.34
DCB-21B	DSR-00233	3/31/2003	Duplicate	5/10/2003	127	<0.002	<0.001	99.4	<0.003	0.055	0.147	96.4	87.4	7.14
DCB-21B	DSR-00234	3/31/2003	Unfiltered	5/11/2003	131	<0.002	<0.001	101	<0.003	0.054	0.138	104	90.2	7.30
DCB-22C	DSR-00235	3/31/2003	Duplicate	5/12/2003	0.929	<0.002	<0.001	104	<0.003	0.009	<0.009	2.07	31.6	1.47
DCB-22C	DSR-00236	3/31/2003	Unfiltered	5/13/2003	1.27	<0.002	<0.001	105	<0.003	0.010	<0.009	1.98	33.8	1.83
DIW-P11B	DSR-00237	4/1/2003	Duplicate	5/14/2003	401	<0.002	<0.001	94.1	<0.003	0.231	0.833	361	118	9.82
DIW-P11B	DSR-00239	4/1/2003	Unfiltered	5/15/2003	408	<0.002	<0.001	91.9	<0.003	0.228	0.810	364	116	9.75

Gray highlight means that there is no data

Fourth Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Nickel (mg/L)	Lead (mg/L)	Silicon (mg/L)	Zinc (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Sulfur (mg/L)	Analysis Date	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)	Analysis Date	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)
DCB-8	<0.010	<0.017	4.33	<0.001		6.19		4/2/2003	<detect	<detect						
DCB-21A	1.30	<0.017	71.4	4.18		5.44		4/2/2003	0.2151453	100.69						
DCB-21B	0.518	<0.017	26.7	1.62		6.74		4/2/2003	0.9111831	96.59						
DCB-22C	0.031	<0.017	11.8	<0.001		3.45		4/2/2003	1	2.06						
DCB-70B	<0.010	<0.017	6.56	<0.001		22.4		4/2/2003	<detect	<detect						
DCB-19A	1.10	<0.017	60.2	3.50		3.74		4/2/2003	0	0						
DCB-19B	0.489	<0.017	49.4	1.04		4.22		4/2/2003	0.6833333	3.85						
DCB-18C	0.578	<0.017	17.1	1.47		6.2		4/2/2003	1	110.00						
DCB-71B																
DIW-P14C																
DIW-P13B																
DIW-P13C																
DIW-P12B	1.58	<0.017	92.8	5.32		8.17		4/2/2003	0.3377018	174.25						
DIW-P11B	1.65	<0.017	107	7.90		8.36		4/2/2003	0.6342134	241.00						
DIW-P11C	2.23	0.045	84.2	8.54		10.6		4/2/2003	0.2220866	284.27						
DIW-P10C																
DIW-P09B																
DIW-P09C																
DIW-P02C																
DIW-P03B	<0.010	<0.017	8.64	<0.001		31.4		4/2/2003	1	115.00						
DIW-P03C	<0.010	<0.017	8.51	<0.001		34.0		4/2/2003	1	114.00						
DIW-P04C	<0.010	<0.017	6.60	<0.001		18.9		4/2/2003	1	207.00						
DIW-P07B	0.861	<0.017	38.8	1.63		16.6		4/2/2003	1	166.00						
DIW-P07C	0.851	<0.017	34.9	1.98		14.3		4/2/2003	1	164.00						
DIW-P08C	0.835	<0.017	30.2	1.91		18.8		4/2/2003	1	188.00						
DIW-P13A	<0.010	<0.017	6.84	<0.001		295		4/2/2003	1	214.00						
DIW-P11A	0.054	<0.017	16.1	0.07		50.9		4/2/2003	1	214.00						
DIW-P09A	<0.010	<0.017	13.0	<0.001		43.2		4/2/2003	1	110.00						
DIW-1-2	<0.010	<0.017	9.28	<0.001		53.8		4/2/2003	1	162.00						
DIW-P03A	<0.010	<0.017	6.16	<0.001		13.9		4/2/2003	1	52.70						
DIW-P05A	<0.010	<0.017	9.34	<0.001		16.5		4/2/2003	1	18.90						
DIW-P07A	<0.010	<0.017	8.20	<0.001		18.1		4/2/2003	1	105.00						
DCB-21B	0.520	<0.017	28.3	1.63		6.84		4/2/2003	0.8959664	86.37						
DCB-21B	0.520	<0.017	27.5	1.60		6.60										
DCB-22C	0.031	<0.017	12.4	<0.001		3.38		4/2/2003	1	2.07						
DCB-22C	0.040	<0.017	12.8	<0.001		3.51										
DIW-P11B	1.62	<0.017	108	7.82		8.59		4/2/2003	0.6142286	221.74						
DIW-P11B	1.64	<0.017	107	7.81		8.31										

Gray highlight means that there is no data

Fourth Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Comments
DCB-8	Chromium and copper were rerun on 4/8/03 due to standards problems
DCB-21A	Chromium and copper were rerun on 4/8/03 due to standards problems
DCB-21B	Chromium and copper were rerun on 4/8/03 due to standards problems
DCB-22C	Chromium and copper were rerun on 4/8/03 due to standards problems
DCB-70B	Chromium and copper were rerun on 4/8/03 due to standards problems
DCB-19A	Chromium and copper were rerun on 4/8/03 due to standards problems
DCB-19B	Chromium and copper were rerun on 4/8/03 due to standards problems
DCB-18C	Chromium and copper were rerun on 4/8/03 due to standards problems
DCB-71B	
DIW-P14C	
DIW-P13B	
DIW-P13C	
DIW-P12B	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P11B	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P11C	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P10C	
DIW-P09B	
DIW-P09C	
DIW-P02C	
DIW-P03B	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P03C	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P04C	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P07B	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P07C	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P08C	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P13A	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P11A	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P09A	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-1-2	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P03A	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P05A	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P07A	Chromium and copper were rerun on 4/8/03 due to standards problems
DCB-21B	Chromium and copper were rerun on 4/8/03 due to standards problems
DCB-21B	Chromium and copper were rerun on 4/8/03 due to standards problems
DCB-22C	Chromium and copper were rerun on 4/8/03 due to standards problems
DCB-22C	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P11B	Chromium and copper were rerun on 4/8/03 due to standards problems
DIW-P11B	Chromium and copper were rerun on 4/8/03 due to standards problems

Fifth Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)
DCB-8	DSR-00250	7/15/2003	Sample	7/22/2003	0.032	<0.002	<0.010	0.771	<0.003	<0.002	<0.009	2.36	0.817	<0.004
DCB-21A	DSR-00251	7/14/2003	Sample	7/22/2003	171	<0.002	<0.010	74.7	<0.003	0.044	0.822	553	71.9	6.36
DCB-21B	DSR-00252	7/14/2003	Sample	7/22/2003	170	<0.002	<0.010	128	<0.003	<0.002	0.171	179	219	14.4
DCB-22C	DSR-00253	7/14/2003	Sample	7/22/2003	5.25	<0.002	<0.010	144	<0.003	<0.002	<0.009	60.7	59.1	4.01
DCB-70B	DSR-00254	7/14/2003	Sample	7/22/2003	1.07	0.049	<0.010	11.5	<0.003	<0.002	<0.009	1.35	8.60	0.116
DCB-23C	DSR-00255	7/14/2003	Sample	7/22/2003	1.76	<0.002	<0.010	300	<0.003	<0.002	<0.009	161	152	9.20
DCB-19A	DSR-00256	7/14/2003	Sample	7/22/2003	190	<0.002	<0.010	71.2	<0.003	0.026	0.552	217	71.4	8.92
DCB-19B	DSR-00257	7/14/2003	Sample	7/22/2003	212	<0.002	<0.010	57.5	<0.003	<0.002	0.352	23.1	60.8	5.35
DCB-18C	DSR-00258	7/14/2003	Sample	7/22/2003	115	<0.002	<0.010	121	<0.003	<0.002	0.113	126	72.4	18.4
DCB-71B	DSR-00259													
DIW-P14C	DSR-00260													
DIW-P13B	DSR-00261													
DIW-P13C	DSR-00262													
DIW-P12B	DSR-00263	7/14/2003	Sample	7/22/2003	204	<0.002	<0.010	75.3	<0.003	0.069	0.782	572	76.5	7.50
DIW-P11B	DSR-00264	7/14/2003	Sample	7/22/2003	214	<0.002	<0.010	74.4	<0.003	0.064	<0.009	526	74.5	8.59
DIW-P11C	DSR-00265	7/14/2003	Sample	7/22/2003	229	<0.002	<0.010	78.5	<0.003	0.078	0.306	582	79.8	8.20
DIW-P10C	DSR-00266													
DIW-P09B	DSR-00267													
DIW-P09C	DSR-00268													
DIW-P02C	DSR-00269													
DIW-P03B	DSR-00270	7/14/2003	Sample	7/22/2003	0.668	<0.002	<0.010	25.3	<0.003	<0.002	<0.009	22.4	25.0	6.79
DIW-P03C	DSR-00271	7/14/2003	Sample	7/22/2003	0.288	0.129	<0.010	21.6	<0.003	<0.002	<0.009	48.0	19.4	5.51
DIW-P04C	DSR-00272	7/14/2003	Sample	7/22/2003	10.0	<0.002	<0.010	37.3	<0.003	<0.002	<0.009	84.5	34.3	8.28
DIW-P07B	DSR-00273	7/14/2003	Sample	7/22/2003	0.157	0.09	<0.010	34.2	<0.003	<0.002	<0.009	204	30.5	7.17
DIW-P07C	DSR-00274	7/14/2003	Sample	7/22/2003	15.8	<0.002	<0.010	52.3	<0.003	<0.002	<0.009	351	47.3	8.51
DIW-P08C	DSR-00275	7/14/2003	Sample	7/22/2003	37.5	<0.002	<0.010	63.5	<0.003	<0.002	<0.009	360	51.4	11.7
DIW-P13A	DSR-00276	7/15/2003	Sample	7/22/2003	0.10	0.466	<0.010	35.8	<0.003	<0.002	<0.009	440	26.2	5.03
DIW-P11A	DSR-00277	7/15/2003	Sample	7/22/2003	77.6	0.025	<0.010	41.0	<0.003	<0.002	<0.009	305	39.5	10.9
DIW-P09A	DSR-00278	7/15/2003	Sample	7/22/2003	1.06	0.038	<0.010	18.4	<0.003	<0.002	<0.009	103	17.7	4.53
DIW-1-2	DSR-00279	7/15/2003	Sample	7/22/2003	0.254	<0.002	<0.010	19.8	<0.003	<0.002	<0.009	40.5	10.9	2.43
DIW-P03A	DSR-00280	7/15/2003	Sample	7/22/2003	0.308	0.108	<0.010	23.6	<0.003	<0.002	<0.009	17.1	12.5	5.61
DIW-P05A	DSR-00281	7/15/2003	Sample	7/22/2003	0.047	0.008	<0.010	20.7	<0.003	<0.002	<0.009	20.6	11.4	4.49
DIW-P07A	DSR-00282	7/15/2003	Sample	7/22/2003	0.029	<0.002	<0.010	21.7	<0.003	<0.002	<0.009	43.0	16.3	6.75
DCB-21B	DSR-00283	7/14/2003	Duplicate	7/22/2003	180	<0.002	<0.010	134	<0.003	<0.002	0.179	183	133	14.2
DCB-21B	DSR-00284	7/14/2003	Unfiltered	7/22/2003	173	<0.002	<0.010	135	<0.003	<0.002	0.157	188	135	14.4
DCB-22C	DSR-00285	7/14/2003	Duplicate	7/22/2003	5.14	<0.002	<0.010	143	<0.003	<0.002	<0.009	59.7	59.1	4.10
DCB-22C	DSR-00286	7/14/2003	Unfiltered	7/22/2003	5.76	<0.002	<0.010	144	<0.003	<0.002	<0.009	64.1	60.9	4.36
DIW-P11B	DSR-00287	7/14/2003	Duplicate	7/22/2003	208	<0.002	<0.010	74.1	<0.003	0.070	<0.009	516	74.6	8.91
DIW-P11B	DSR-00289	7/14/2003	Unfiltered	7/22/2003	213	<0.002	<0.010	76.5	<0.003	0.066	<0.009	524	75.0	8.71

Gray highlight means that there is no data

Fifth Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Nickel (mg/L)	Lead (mg/L)	Silicon (mg/L)	Zinc (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Sulfur (mg/L)	Analysis Date	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)	Analysis Date	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)
DCB-8	<0.010	<0.017	5.44	<0.001		4.45		7/21/2003	<detect	<detect						
DCB-21A	1.06	<0.017	87.0	3.50		3.35		7/21/2003	0.9623436	532.18						
DCB-21B	0.866	<0.017	32.9	2.59		8.61		7/21/2003	1	179.00						
DCB-22C	0.051	<0.017	14.0	0.068		14.1		7/21/2003	1	60.70						
DCB-70B	<0.010	<0.017	7.11	<0.001		24.6		7/21/2003	<detect	<detect						
DCB-23C	0.443	<0.017	17.7	1.52		12.4		7/21/2003	1	161.00						
DCB-19A	0.948	<0.017	79.4	2.97		3.88		7/21/2003	0.2555405	55.45						
DCB-19B	0.895	<0.017	75.9	2.30		8.50		7/21/2003	0.3989575	9.22						
DCB-18C	0.715	<0.017	19.2	1.80		8.61		7/21/2003	1	126.00						
DCB-71B																
DIW-P14C																
DIW-P13B																
DIW-P13C																
DIW-P12B	1.18	<0.017	94.7	3.78		3.79		7/21/2003	1	572.00						
DIW-P11B	1.08	<0.017	95.8	2.81		3.30		7/21/2003	1	526.00						
DIW-P11C	1.19	<0.017	100	3.68		3.30		7/21/2003	1	582.00						
DIW-P10C																
DIW-P09B																
DIW-P09C																
DIW-P02C																
DIW-P03B	<0.010	<0.017	6.63	<0.001		10.4		7/21/2003	<detect	<detect						
DIW-P03C	<0.010	<0.017	7.76	<0.001		11.4		7/21/2003	1	48.00						
DIW-P04C	<0.010	<0.017	11.5	<0.001		5.86		7/21/2003	1	84.50						
DIW-P07B	<0.010	<0.017	4.67	<0.001		16.3		7/21/2003	1	204.00						
DIW-P07C	0.012	<0.017	10.2	<0.001		14.9		7/21/2003	1	351.00						
DIW-P08C	0.286	<0.017	12.5	0.077		26.7		7/21/2003	1	360.00						
DIW-P13A	<0.010	<0.017	11.4	<0.001		185		7/21/2003	1	440.00						
DIW-P11A	0.406	<0.017	44.9	1.04		10.1		7/21/2003	1	305.00						
DIW-P09A	<0.010	<0.017	19.3	<0.001		11.0		7/21/2003	1	103.00						
DIW-1-2	<0.010	<0.017	22.2	<0.001		3.78		7/21/2003	<detect	<detect						
DIW-P03A	<0.010	<0.017	7.74	<0.001		9.83		7/21/2003	1	17.10						
DIW-P05A	<0.010	<0.017	11.6	<0.001		5.68		7/21/2003	<detect	<detect						
DIW-P07A	<0.010	<0.017	8.42	<0.001		18.1		7/21/2003	<detect	<detect						
DCB-21B	0.898	<0.017	33.5	2.71		9.54		7/21/2003	1	183.00						
DCB-21B	0.880	<0.017	30.7	2.64		9.70										
DCB-22C	0.050	<0.017	13.9	0.079		15.3		7/21/2003	<detect	<detect						
DCB-22C	0.061	<0.017	14.2	0.092		15.0										
DIW-P11B	1.13	<0.017	95.2	2.90		3.36		7/21/2003	1	516.00						
DIW-P11B	1.10	<0.017	96.7	2.87		3.56										

Gray highlight means that there is no data

Fifth Post-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Comments
DCB-8	
DCB-21A	
DCB-21B	
DCB-22C	
DCB-70B	
DCB-23C	
DCB-19A	
DCB-19B	
DCB-18C	
DCB-71B	
DIW-P14C	
DIW-P13B	
DIW-P13C	
DIW-P12B	
DIW-P11B	
DIW-P11C	
DIW-P10C	
DIW-P09B	
DIW-P09C	
DIW-P02C	
DIW-P03B	
DIW-P03C	
DIW-P04C	
DIW-P07B	
DIW-P07C	
DIW-P08C	
DIW-P13A	
DIW-P11A	
DIW-P09A	
DIW-1-2	
DIW-P03A	
DIW-P05A	
DIW-P07A	
DCB-21B	
DCB-21B	
DCB-22C	
DCB-22C	
DIW-P11B	
DIW-P11B	

Pre-Injection SRTC ADS Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Total Inorganic Carbon (ug/ml)	Total Organic Carbon (ug/ml)
DCB-8	DSR-00001	7/1/2002	Sample	8/8/2002	1.23	31.40
DCB-21B	DSR-00003	6/27/2002	Sample	8/13/2002	15.40	49.60
DCB-22C	DSR-00007	6/27/2002	Sample	8/21/2002	2.08	1.44
DCB-70B	DSR-00009	7/1/2002	Sample	8/8/2002	0.82	20.80
DCB-19B	DSR-00011	6/25/2002	Sample	7/2/2002	9.58	4.13
DCB-18C	DSR-00015	6/26/2002	Sample	7/2/2002	7.89	2.41
DCB-71B	DSR-00017	7/1/2002	Sample	8/8/2002	0.86	83.60
DIW-P11B	DSR-00021	6/27/2002	Sample	8/21/2002	17.00	7.50
DIW-1-2	DSR-00025	7/1/2002	Sample	8/8/2002	0.68	17.90
DIW-P07A	DSR-00031	6/26/2002	Sample	7/2/2002	14.20	8.22
DIW-P09A	DSR-00042	6/27/2002	Sample	8/13/2002	2.08	1.44

First Post-Injection SRTC ADS Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Total Inorganic Carbon (ug/ml)	Total Organic Carbon (ug/ml)
DCB-8	DSR-00050	9/10/2002	Sample	9/30/2002	7.11	5.29
DCB-21B	DSR-00052	9/11/2002	Sample	10/29/2002	0.962	1.36
DCB-22C	DSR-00056	9/11/2002	Sample	9/30/2002	<1	<1
DCB-70B	DSR-00058	9/10/2002	Sample	9/30/2002	17.4	6.3
DCB-19B	DSR-00060	9/11/2002	Sample	9/23/2002	12.8	4.1
DCB-18C	DSR-00064	9/11/2002	Sample	10/11/2002	10.7	2.3
DCB-71B	DSR-00066	9/10/2002	Sample	9/30/2002	11.8	7.7
DIW-P11B	DSR-00071	9/11/2002	Sample	9/23/2002	74	67
DIW-P13A	DSR-00087	9/11/2002	Sample	9/23/2002	380	514
DIW-P09A	DSR-00090	9/11/2002	Sample	9/30/2002	61.4	5090
DIW-1-2	DSR-00091	9/11/2002	Sample	9/30/2002	38.1	33.5
DIW-P07A	DSR-00092	9/11/2002	Sample	10/22/2002	48.1	3.5

Second Post-Injection SRTC ADS Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Total Inorganic Carbon (ug/ml)	Total Organic Carbon (ug/ml)
DCB-8	DSR-00101	11/6/2002	Sample	11/13/2002	9.02	<1
DCB-21B	DSR-00103	11/6/2002	Sample	11/13/2002	6.92	1.66
DCB-22C	DSR-00107	11/6/2002	Sample	11/13/2002	8.52	<1
DCB-70B	DSR-00108	11/6/2002	Sample	11/13/2002	13.10	1
DCB-19B	DSR-00110	11/5/2002	Sample	11/13/2002	14.20	6.4
DCB-18C	DSR-00114	11/6/2002	Sample	11/13/2002	9.44	0.76
DCB-71B	DSR-00115	11/6/2002	Sample	11/13/2002	8.80	3.5
DIW-P11B	DSR-00120	11/5/2002	Sample	11/13/2002	36.00	62.8
DIW-P13A	DSR-00136	11/6/2002	Sample	11/13/2002	316.00	602
DIW-P09A	DSR-00139	11/6/2002	Sample	11/13/2002	195.00	135
DIW-1-2	DSR-00140	11/6/2002	Sample	11/13/2002	95.20	30.8
DIW-P07A	DSR-00142	11/6/2002	Sample	11/13/2002	115.00	177

Third Post-Injection SRTC ADS Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Total Inorganic Carbon (ug/ml)	Total Organic Carbon (ug/ml)
DCB-8	DSR-00151	1/13/2003	Sample	1/21/2003	8.25	3.05
DCB-21B	DSR-00153	1/13/2003	Sample	1/21/2003	7.53	3.87
DCB-22C	DSR-00156	1/13/2003	Sample	1/21/2003	7.36	1.57
DCB-70B	DSR-00157	1/13/2003	Sample	1/21/2003	10.7	2.9
DCB-19B	DSR-00159	1/13/2003	Sample	1/21/2003	6.68	2.76
DCB-18C	DSR-00162	1/13/2003	Sample	1/21/2003	6.95	2.3
DCB-71B	DSR-00163	1/13/2003	Sample	1/21/2003	7.42	5.58
DIW-P11B	DSR-00168	1/13/2003	Sample	1/21/2003	44.6	43.5
DIW-P13A	DSR-00185	1/14/2003	Sample	1/21/2003	380	1760
DIW-P09A	DSR-00188	1/14/2003	Sample	1/21/2003	202	742
DIW-1-2	DSR-00189	1/14/2003	Sample	1/21/2003	134	70
DIW-P07A	DSR-00192	1/14/2003	Sample	1/21/2003	148	542

Fourth Post-Injection SRTC ADS Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Total Inorganic Carbon (ug/ml)	Total Organic Carbon (ug/ml)

No TIC or TOC were performed for this sampling event

Fifrth Post-Injection SRTC ADS Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Total Inorganic Carbon (ug/ml)	Total Organic Carbon (ug/ml)

No TIC or TOC were performed for this sampling event

Pre-Injection Field Turbidity Results					
Well/ Piezometer	Sample #	Type Sample	Date	Time	Turbidity (NTU)
DCB-21B	DSR-00003	Sample	6/27/2002	9:47	0.03
DCB-22C	DSR-00007	Sample	6/27/2002	10:30	0.08
DIW-P11B	DSR-00021	Sample	6/27/2002	9:55	0.6
DCB-21B	DSR-00034	Unfiltered	6/27/2002	9:30	0.02
DCB-22C	DSR-00036	Unfiltered	6/27/2002	10:15	0.6
DIW-P11B	DSR-00039	Unfiltered	6/27/2002	9:55	2.8

First Post-Injection Field Turbidity Results					
Well/ Piezometer	Sample #	Type Sample	Date	Time	Turbidity (NTU)
DCB-8	DSR-00050	Unfiltered	9/10/2002	9:50	1.14
DCB-21B	DSR-00052	Filtered	9/11/2002	10:00	9.35
DCB-21B	DSR-00094	Unfiltered	9/11/2002	10:05	0.07
DCB-22C	DSR-00056	Filtered	9/11/2002	10:25	0.05
DCB-22C	DSR-00096	Unfiltered	9/11/2002	10:21	7.78
DCB-70B	DSR-00058	Unfiltered	9/10/2002	12:15	15.6
DCB-19B	DSR-00060	Unfiltered	9/11/2002	11:21	0.52
DCB-18C	DSR-00064	Unfiltered	9/11/2002	12:03	0.52
DCB-71B	DSR-00066	Unfiltered	9/10/2002	11:00	53.5
DIW-P11B	DSR-00071	Filtered	9/11/2002	10:00	0.1
DIW-P11B	DSR-00099	Unfiltered	9/11/2002	9:50	3.71
DIW-P13A	DSR-00087	Unfiltered	9/11/2002	13:52	3.34
DIW-P09A	DSR-00090	Unfiltered	9/11/2002	13:10	6.44
DIW-1-2	DSR-00091	Unfiltered	9/11/2002	13:00	2.99
DIW-P07A	DSR-00092	Unfiltered	9/11/2002	12:31	2.16

Second Post-Injection Field Turbidity Results					
Well/ Piezometer	Sample #	Type Sample	Date	Time	Turbidity (NTU)
DCB-8	DSR-00101	Unfiltered	11/6/2002	11:58	13
DCB-21B	DSR-00103	Filtered	11/6/2002	10:28	0.16
DCB-21B	DSR-00144	Unfiltered	11/6/2002	10:13	0.29
DCB-22C	DSR-00107	Filtered	11/6/2002	8:46	0.11
DCB-22C	DSR-00146	Unfiltered	11/6/2002	8:35	0.16
DCB-70B	DSR-00108	Unfiltered	11/6/2002	10:53	22.6
DCB-19B	DSR-00110	Unfiltered	11/5/2002	10:57	0.25
DCB-18C	DSR-00114	Unfiltered	11/6/2002	8:55	0.16
DCB-71B	DSR-00115	Unfiltered	11/6/2002	10:32	7.45
DIW-P11B	DSR-00120	Filtered	11/5/2002	9:44	0.16
DIW-P11B	DSR-00149	Unfiltered	11/5/2002	9:51	2.68
DIW-P13A	DSR-00136	Unfiltered	11/6/2002	12:52	2.79
DIW-P09A	DSR-00139	Unfiltered	11/6/2002	12:30	5.69
DIW-1-2	DSR-00140	Unfiltered	11/6/2002	12:19	2.73
DIW-P07A	DSR-00142	Unfiltered	11/6/2002	11:32	2.76

Third Post-Injection Field Turbidity Results					
Well/ Piezometer	Sample Number	Sample Type	Date	Time	Turbidity (NTU)
DCB-8	DSR-00151	Unfiltered	1/13/2003	12:58	1.73
DCB-21B	DSR-00153	Filtered	1/13/2003	9:03	0.21
DCB-21B	DSR-00194	Unfiltered	1/13/2003	8:54	0.88
DCB-22C	DSR-00156	Filtered	1/13/2003	9:53	0.24
DCB-22C	DSR-00196	Unfiltered	1/13/2003	9:58	0.16
DCB-70B	DSR-00157	Unfiltered	1/13/2003	11:56	82
DCB-19B	DSR-00159	Unfiltered	1/13/2003	10:27	0.36
DCB-18C	DSR-00162	Unfiltered	1/13/2003	11:13	0.41
DCB-71B	DSR-00163	Unfiltered	1/13/2003	12:15	18.7
DIW-P11B	DSR-00168	Filtered	1/13/2003	9:58	0.12
DIW-P11B	DSR-00199	Unfiltered	1/13/2003	9:59	6.38
DIW-P13A	DSR-00185	Unfiltered	1/14/2003	10:45	23.8
DIW-P09A	DSR-00188	Unfiltered	1/14/2003	10:50	28.9
DIW-1-2	DSR-00189	Unfiltered	1/14/2003		
DIW-P07A	DSR-00192	Unfiltered	1/14/2003	11:02	13.4
Gray highlight means that there is no dat					

Forth Post-Injection Field Turbidity Results					
Well/ Piezometer	Sample Number	Sample Type	Date	Time	Turbidity (NTU)
DCB-8	DSR-00201	Unfiltered	4/1/2003	9:00	3.46
DCB-21B	DSR-00203	Filtered	3/31/2003	12:57	0.09
DCB-21B	DSR-00234	Unfiltered	3/31/2003	12:55	0.12
DCB-22C	DSR-00204	Filtered	3/31/2003	13:15	0.08
DCB-22C	DSR-00236	Unfiltered	3/31/2003	13:12	0.15
DCB-70B	DSR-00205	Unfiltered	3/31/2003	13:32	13.1
DCB-19B	DSR-00207	Unfiltered	3/31/2003	13:10	0.68
DCB-18C	DSR-00208	Unfiltered	3/31/2003	13:56	0.54
DIW-P11B	DSR-00214	Filtered	4/1/2003	8:43	0.16
DIW-P11B	DSR-00239	Unfiltered	4/1/2003	8:34	0.63
DIW-P13A	DSR-00226	Unfiltered	4/1/2003	9:20	12
DIW-P11A	DSR-00227	Unfiltered	4/1/2003	9:45	3.92
DIW-P09A	DSR-00228	Unfiltered	4/1/2003	10:03	8.66
DIW-1-2	DSR-00229	Unfiltered	4/1/2003	10:09	2.18
DIW-P07A	DSR-00232	Unfiltered	4/1/2003	10:15	4.15

Fifth Post-Injection Field Turbidity Results					
Well/ Piezometer	Sample Number	Sample Type	Date	Time	Turbidity (NTU)
DCB-8	DSR-00250	Unfiltered	7/15/2003	8:15	7.28
DCB-21B	DSR-00252	Filtered	7/14/2003	10:49	0.21
DCB-21B	DSR-00284	Unfiltered	7/14/2003	10:46	0.25
DCB-22C	DSR-00253	Filtered	7/14/2003	10:12	0.08
DCB-22C	DSR-00286	Unfiltered	7/14/2003	10:05	1.86
DCB-70B	DSR-00254	Unfiltered	7/14/2003	9:56	8.76
DCB-19B	DSR-00257	Unfiltered	7/14/2003	11:43	0.2
DCB-18C	DSR-00258	Unfiltered	7/14/2003	11:46	0.11
DIW-P11B	DSR-00264	Filtered	7/14/2003	11:48	0.2
DIW-P11B	DSR-00289	Unfiltered	7/14/2003	11:48	1.42
DIW-P13A	DSR-00276	Unfiltered	7/15/2003	8:28	21.4
DIW-P09A	DSR-00278	Unfiltered	7/15/2003	9:00	6.95
DIW-1-2	DSR-00279	Unfiltered	7/15/2003	9:17	3.86
DIW-P07A	DSR-00282	Unfiltered	7/15/2003	8:09	5.45

Pre-Injection Field Oil and Water Levels							
Well/ Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	DSR-00001	Field	6/24/2002	7:37	no oil	15.35	
DCB-21A	DSR-00002	Field	6/24/2002	7:42	no oil	16.14	
DCB-21A	DSR-00002	Field	7/3/2002	9:04	no oil	14.30	Rain 7/2-7/3
DCB-21B	DSR-00003	Field	6/24/2002	7:44	no oil	16.89	
DCB-21C	DSR-00004	Field	6/24/2002	7:45	no oil	17.23	
DCB-22A	DSR-00005	Field	6/24/2002	7:47	no oil	16.24	
DCB-22A	DSR-00005	Field	7/3/2002	9:06	no oil	15.58	Rain 7/2-7/3
DCB-22B	DSR-00006	Field	6/24/2002	7:48	no oil	16.04	
DCB-22C	DSR-00007	Field	6/24/2002	7:49	no oil	16.52	
DCB-70A	DSR-00008	Field	7/3/2002	9:40	no oil	7.37	3.42' Approx. stick up. Rain 7/2-7/3
DCB-70B	DSR-00009	Field	7/3/2002	9:42	no oil	11.22	4.56' Approx. stick up. Rain 7/2-7/3
DCB-19A	DSR-00010	Field	6/24/2002	7:53	no oil	15.91	
DCB-19B	DSR-00011	Field	6/24/2002	7:55	no oil	15.73	
DCB-19C	DSR-00012	Field	6/24/2002	7:56	no oil	16.78	
DCB-18A	DSR-00013	Field	6/24/2002	7:57	no oil	13.53	
DCB-18B	DSR-00014	Field	6/24/2002	7:58	no oil	15.17	
DCB-18C	DSR-00015	Field	6/24/2002	7:59	no oil	15.86	
DCB-71A	DSR-00016	Field	7/3/2002	9:45	no oil	4.75	3.00' Approx. stick up. Rain 7/2-7/3
DCB-71B	DSR-00017	Field	7/3/2002	9:47	no oil	11.30	4.1' Approx. stick up. Rain 7/2-7/3
DIW-P13A	DSR-00018	Field	6/24/2002	8:25	no oil	14.82	
DIW-P14A	DSR-00019	Field	6/24/2002	8:26	no oil	14.54	
DIW-P11A	DSR-00020	Field	6/24/2002	8:20	no oil	15.23	
DIW-P11B	DSR-00021	Field	6/24/2002	8:21	no oil	15.19	
DIW-P12A	DSR-00022	Field	6/24/2002	8:22	no oil	15.20	
DIW-P09A	DSR-00023	Field	6/24/2002	8:18	no oil	15.79	
DIW-P10A	DSR-00024	Field	6/24/2002	8:19	no oil	15.76	
DIW-1-2	DSR-00025	Field	6/24/2002	8:14	no oil	17.21	
DIW-P02A	DSR-00026	Field	6/24/2002	8:13	no oil	17.45	
DIW-P03A	DSR-00027	Field	6/24/2002	8:09	no oil	16.40	
DIW-P04A	DSR-00028	Field	6/24/2002	8:10	no oil	16.38	
DIW-P05A	DSR-00029	Field	6/24/2002	8:06	no oil	16.40	
DIW-P06A	DSR-00030	Field	6/24/2002	8:07	no oil	16.49	
DIW-P07A	DSR-00031	Field	6/24/2002	8:02	no oil	16.78	
DIW-P08A	DSR-00032	Field	6/24/2002	8:03	no oil	16.38	

First Post-Injection Field Oil and Water Levels

Well/ Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	DSR-00050	Field	9/10/2002	8:38	no oil	14.75	
DCB-21A	DSR-00051	Field	9/9/2002	9:30	no oil	11.67	
DCB-21B	DSR-00052	Field	9/9/2002	9:25	no oil	15.95	
DCB-21C	DSR-00053	Field	9/9/2002	9:23	no oil	16.34	
DCB-22A	DSR-00054	Field	9/9/2002	9:08	no oil	15.38	
DCB-22B	DSR-00055	Field	9/9/2002	9:09	no oil	15.16	
DCB-22C	DSR-00056	Field	9/9/2002	9:10	no oil	15.70	
DCB-70A	DSR-00057	Field	9/9/2002	10:04	no oil	7.21	
DCB-70B	DSR-00058	Field	9/9/2002	10:03	no oil	7.86	
DCB-19A	DSR-00059	Field	9/9/2002	8:57	no oil	13.80	
DCB-19B	DSR-00060	Field	9/9/2002	8:58	no oil	14.70	
DCB-19C	DSR-00061	Field	9/9/2002	8:59	no oil	15.85	
DCB-18A	DSR-00062	Field	9/9/2002	9:01	no oil	9.85	
DCB-18B	DSR-00063	Field	9/9/2002	9:03	no oil	14.10	
DCB-18C	DSR-00064	Field	9/9/2002	9:04	no oil	14.95	
DCB-71A	DSR-00065	Field	9/9/2002	10:01	no oil	7.08	
DCB-71B	DSR-00066	Field	9/9/2002	10:02	no oil	9.41	
DIW-P14C	DSR-00067	Field	9/9/2002	9:32	no oil	13.78	
DIW-P13B	DSR-00068	Field	9/9/2002	9:33	no oil	13.81	
DIW-P13C	DSR-00069	Field	9/9/2002	9:35	no oil	13.82	
DIW-P12B	DSR-00070	Field	9/9/2002	9:37	no oil	14.24	
DIW-P11B	DSR-00071	Field	9/9/2002	9:38	no oil	14.21	
DIW-P11C	DSR-00072	Field	9/9/2002	9:39	no oil	14.21	
DIW-P10C	DSR-00073	Field	9/9/2002	9:40	no oil	14.82	
DIW-P09B	DSR-00074	Field	9/9/2002	9:42	no oil	14.82	
DIW-P09C	DSR-00075	Field	9/9/2002	9:43	no oil	14.80	
DIW-P02C	DSR-00076	Field	9/9/2002	9:45	no oil	16.48	
DIW-P03B	DSR-00077	Field	9/9/2002	9:47	no oil	15.46	
DIW-P04C	DSR-00078	Field	9/9/2002	9:48	no oil	15.41	
DIW-P05B	DSR-00079	Field	9/9/2002	9:50	no oil	15.44	
DIW-P06C	DSR-00080	Field	9/9/2002	9:52	no oil	15.47	
DIW-P07B	DSR-00081	Field	9/9/2002	9:55	no oil	15.82	
DIW-P07C	DSR-00082	Field	9/9/2002	9:56	no oil	15.77	
DIW-P08C	DSR-00083	Field	9/9/2002	9:57	no oil	15.87	May have been DIW-P08B instead
DIW-P14A	DSR-00084	Field	9/9/2002	10:35	no oil	13.55	
DIW-P10A	DSR-00085	Field	9/9/2002	10:14	*	14.79	* May have thin oil film
DIW-P08A	DSR-00086	Field	9/9/2002	10:18	no oil	15.31	
DIW-P13A	DSR-00087	Field	9/9/2002	10:31	13.81	14.43	
DIW-P11A	DSR-00088	Field	9/9/2002	10:27	14.17	15.00	
DIW-P12A	DSR-00089	Field	9/9/2002	10:29	14.18	14.72	
DIW-P09A	DSR-00090	Field	9/9/2002	10:25	14.76	15.58	
DIW-1-2	DSR-00091	Field	9/9/2002	10:23	16.21	16.58	
DIW-P07A	DSR-00092	Field	9/9/2002	10:20	15.72	16.70	

Second Post-Injection Field Oil and Water Levels							
Well/ Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	DSR-00101	Field	11/4/2002	12:02	no oil	14.28	
DCB-21A	DSR-00102	Field	11/4/2002	11:38	no oil	11.21	
DCB-21B	DSR-00103	Field	11/4/2002	11:39	no oil	15.40	
DCB-21C	DSR-00104	Field	11/4/2002	11:40	no oil	15.88	
DCB-22A	DSR-00105	Field	11/4/2002	11:41	no oil	14.90	
DCB-22B	DSR-00106	Field	11/4/2002	11:42	no oil	14.68	
DCB-22C	DSR-00107	Field	11/4/2002	11:43	no oil	15.11	
DCB-70B	DSR-00108	Field	11/4/2002	11:48	no oil	7.17	
DCB-19A	DSR-00109	Field	11/4/2002	11:31	no oil	12.03	
DCB-19B	DSR-00110	Field	11/4/2002	11:32	no oil	14.04	
DCB-19C	DSR-00111	Field	11/4/2002	11:33	no oil	15.37	
DCB-18A	DSR-00112	Field	11/4/2002	11:34	no oil	9.55	
DCB-18B	DSR-00113	Field	11/4/2002	11:35	no oil	13.55	
DCB-18C	DSR-00114	Field	11/4/2002	11:36	no oil	14.40	
DCB-71B	DSR-00115	Field	11/4/2002	11:52	no oil	8.85	
DIW-P14C	DSR-00116	Field	11/4/2002	12:00	no oil	13.21	
DIW-P13B	DSR-00117	Field	11/4/2002	12:01	no oil	13.20	
DIW-P13C	DSR-00118	Field	11/4/2002	12:02	no oil	13.28	
DIW-P12B	DSR-00119	Field	11/4/2002	12:05	no oil	13.63	
DIW-P11B	DSR-00120	Field	11/4/2002	12:06	no oil	13.61	
DIW-P11C	DSR-00121	Field	11/4/2002	12:06	no oil	13.59	
DIW-P10C	DSR-00122	Field	11/4/2002	12:08	no oil	14.21	
DIW-P09B	DSR-00123	Field	11/4/2002	12:08	no oil	14.22	
DIW-P09C	DSR-00124	Field	11/4/2002	12:09	no oil	14.18	
DIW-P02C	DSR-00125	Field	11/4/2002	12:11	no oil	15.87	
DIW-P03B	DSR-00126	Field	11/4/2002	12:12	no oil	14.88	
DIW-P04C	DSR-00127	Field	11/4/2002	12:13	no oil	14.81	
DIW-P05B	DSR-00128	Field	11/4/2002	12:10	no oil	14.87	
DIW-P06C	DSR-00129	Field	11/4/2002	12:11	no oil	14.89	
DIW-P07B	DSR-00130	Field	11/4/2002	12:09	no oil	15.23	
DIW-P07C	DSR-00131	Field	11/4/2002	12:10	no oil	15.17	
DIW-P08C	DSR-00132	Field	11/4/2002	12:08	no oil	15.22	May have been DIW-P08B instead
DIW-P14A	DSR-00133	Field	11/4/2002	11:59	no oil	12.97	
DIW-P10A	DSR-00134	Field	11/4/2002	12:07	no oil	14.17	
DIW-P08A	DSR-00135	Field	11/4/2002	12:14	no oil	14.68	
DIW-P13A	DSR-00136	Field	11/4/2002	11:41	13.18	13.47	
DIW-P12A	DSR-00137	Field	11/4/2002	11:44	13.59	13.74	
DIW-P11A	DSR-00138	Field	11/4/2002	11:42	13.57	14.18	
DIW-P09A	DSR-00139	Field	11/4/2002	11:46	14.16	14.73	
DIW-1-2	DSR-00140	Field	11/4/2002	11:48	15.62	15.81	
DIW-P03A	DSR-00141	Field	11/4/2002	11:38	14.8	15.35	
DIW-P05A	DSR-10001	Field	11/4/2002	11:50	14.79	15.23	
DIW-P07A	DSR-00142	Field	11/4/2002	11:52	15.14	15.48	

Third Post-Injection Field Oil and Water Levels							
Well/ Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	DSR-00151	Field	1/13/2003	8:33	no oil	12.4	
DCB-21A	DSR-00152	Field	1/13/2003	8:11	no oil	10.11	
DCB-21B	DSR-00153	Field	1/13/2003	8:12	no oil	14.38	
DCB-22A	DSR-00154	Field	1/13/2003	8:18	no oil	13.07	
DCB-22B	DSR-00155	Field	1/13/2003	8:18	no oil	13.58	
DCB-22C	DSR-00156	Field	1/13/2003	8:19	no oil	14.08	
DCB-70B	DSR-00157	Field	1/13/2003	11:56	no oil	6.2	
DCB-19A	DSR-00158	Field	1/13/2003	8:23	no oil	10.16	
DCB-19B	DSR-00159	Field	1/13/2003	8:23	no oil	13.13	
DCB-18A	DSR-00160	Field	1/13/2003	8:26	no oil	9.05	
DCB-18B	DSR-00161	Field	1/13/2003	8:27	no oil	12.46	
DCB-18C	DSR-00162	Field	1/13/2003	8:27	no oil	13.36	
DCB-71B	DSR-00163	Field	1/13/2003	12:15	no oil	7.76	
DIW-P14C	DSR-00164	Field	1/13/2003	8:13	no oil	11.92	
DIW-P13B	DSR-00165	Field	1/13/2003	8:14	no oil	11.95	
DIW-P13C	DSR-00166	Field	1/13/2003	8:14	no oil	12.12	
DIW-P12B	DSR-00167	Field	1/13/2003	8:15	no oil	12.38	
DIW-P11B	DSR-00168	Field	1/13/2003	8:15	no oil	12.44	
DIW-P11C	DSR-00169	Field	1/13/2003	8:16	no oil	12.36	
DIW-P10C	DSR-00170	Field	1/13/2003	8:16	no oil	12.98	
DIW-P09B	DSR-00171	Field	1/13/2003	8:17	no oil	12.97	
DIW-P09C	DSR-00172	Field	1/13/2003	8:17	no oil	13.01	
DIW-P02C	DSR-00173	Field	1/13/2003	8:19	no oil	14.66	
DIW-P03B	DSR-00174	Field	1/13/2003	8:20	no oil	13.69	
DIW-P03C	DSR-00175	Field	1/13/2003	8:21	no oil	13.62	
DIW-P04C	DSR-00176	Field	1/13/2003	8:22	no oil	13.6	
DIW-P05B	DSR-00177	Field	1/13/2003	8:22	no oil	13.63	
DIW-P06C	DSR-00178	Field	1/13/2003	8:22	no oil	13.66	
DIW-P07B	DSR-00179	Field	1/13/2003	8:24	no oil	14.02	
DIW-P07C	DSR-00180	Field	1/13/2003	8:25	no oil	13.98	
DIW-P08C	DSR-00181	Field	1/13/2003	8:26	no oil	13.98	
DIW-P14A	DSR-00182	Field	1/14/2003	8:06	no oil	11.71	
DIW-P10A	DSR-00183	Field	1/14/2003	8:07	no oil	12.92	
DIW-P08A	DSR-00184	Field	1/14/2003	8:08	no oil	13.43	
DIW-P13A	DSR-00185	Field	1/14/2003	8:26	11.9	12.88	
DIW-P11A	DSR-00186	Field	1/14/2003	8:19	12.3	13.1	
DIW-P12A	DSR-00187	Field	1/14/2003	8:22	12.4	12.45	
DIW-P09A	DSR-00188	Field	1/14/2003	8:18	12.9	13.95	
DIW-1-2	DSR-00189	Field	1/14/2003	8:16	14.3	15	
DIW-P03A	DSR-00190	Field	1/14/2003	8:13	13.4	14.44	
DIW-P05A	DSR-00191	Field	1/14/2003	8:11	13.51	14.35	
DIW-P07A	DSR-00192	Field	1/14/2003	8:09	13.85	14.73	

Forth Post-Injection Field Oil and Water Levels							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	DSR-00201	Field	3/31/2003	10:40	no oil	9.75	
DCB-21A	DSR-00202	Field	3/31/2003	10:45	no oil	7.11	
DCB-21B	DSR-00203	Field	3/31/2003	10:50	no oil	12.5	
DCB-22C	DSR-00204	Field	3/31/2003	10:55	no oil	12.22	
DCB-70B	DSR-00205	Field	3/31/2003	11:00	no oil	4.4	
DCB-19A	DSR-00206	Field	3/31/2003	11:03	no oil	7.98	
DCB-19B	DSR-00207	Field	3/31/2003	11:04	no oil	11.21	
DCB-18C	DSR-00208	Field	3/31/2003	11:05	no oil	11.44	
DCB-71B	DSR-00209	Field	3/31/2003	11:02	no oil	5.98	
DIW-P14C	DSR-00210	Field	3/31/2003	11:38	no oil	9.33	
DIW-P13B	DSR-00211	Field	3/31/2003	10:45	no oil	9.35	
DIW-P13C	DSR-00212	Field	3/31/2003	11:38	no oil	9.48	
DIW-P12B	DSR-00213	Field	3/31/2003	11:39	no oil	9.85	
DIW-P11B	DSR-00214	Field	3/31/2003	10:48	no oil	9.82	
DIW-P11C	DSR-00215	Field	3/31/2003	11:39	no oil	9.84	
DIW-P10C	DSR-00216	Field	3/31/2003	11:41	no oil	10.43	
DIW-P09B	DSR-00217	Field	3/31/2003	10:49	no oil	10.41	
DIW-P09C	DSR-00218	Field	3/31/2003	11:40	no oil	10.43	
DIW-P02C	DSR-00219	Field	3/31/2003	11:42	no oil	12.09	
DIW-P03B	DSR-00220	Field	3/31/2003	10:50	no oil	11.05	
DIW-P03C	DSR-00221	Field	3/31/2003	11:43	no oil	11.05	
DIW-P04C	DSR-00222	Field	3/31/2003	11:43	no oil	11.04	
DIW-P07B	DSR-00223	Field	3/31/2003	10:52	no oil	11.38	
DIW-P07C	DSR-00224	Field	3/31/2003	11:44	no oil	11.35	
DIW-P08C	DSR-00225	Field	3/31/2003	11:45	no oil	11.4	
DIW-P13A	DSR-00226	Field	3/31/2003	11:02	9.31	9.8	
DIW-P11A	DSR-00227	Field	3/31/2003	11:55	9.75	10.43	
DIW-P09A	DSR-00228	Field	3/31/2003	11:07	10.35	10.91	Estimated based upon measurement on 4/2/03
DIW-1-2	DSR-00229	Field	3/31/2003	11:10	11.75	12.37	
DIW-P03A	DSR-00230	Field	3/31/2003	11:13	10.97	11.58	
DIW-P05A	DSR-00231	Field	3/31/2003	11:15	10.96	11.47	
DIW-P07A	DSR-00232	Field	3/31/2003	11:27	11.3	11.41	

Fifth Post-Injection Field Oil and Water Levels							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	DSR-00250	Field	7/14/2003	9:38	no oil	9.25	
DCB-21A	DSR-00251	Field	7/14/2003	8:30	no oil	8.61	
DCB-21B	DSR-00252	Field	7/14/2003	8:31	no oil	12.51	
DCB-22C	DSR-00253	Field	7/14/2003	8:35	no oil	12.25	
DCB-70B	DSR-00254	Field	7/14/2003	8:37	no oil	4.42	
DCB-23C	DSR-00255	Field	7/14/2003	9:31	no oil	9.25	
DCB-19A	DSR-00256	Field	7/14/2003	8:43	no oil	8.62	
DCB-19B	DSR-00257	Field	7/14/2003	8:45	no oil	11.21	
DCB-18C	DSR-00258	Field	7/14/2003	8:47	no oil	11.45	
DCB-71B	DSR-00259	Field	7/14/2003	8:40	no oil	5.94	
DIW-P14C	DSR-00260	Field	7/14/2003	9:11	no oil	9.27	
DIW-P13B	DSR-00261	Field	7/14/2003	9:11	no oil	9.19	
DIW-P13C	DSR-00262	Field	7/14/2003	9:12	no oil	9.22	
DIW-P12B	DSR-00263	Field	7/14/2003	9:13	no oil	9.71	
DIW-P11B	DSR-00264	Field	7/14/2003	9:14	no oil	9.69	
DIW-P11C	DSR-00265	Field	7/14/2003	9:15	no oil	9.68	
DIW-P10C	DSR-00266	Field	7/14/2003	9:16	no oil	10.28	
DIW-P09B	DSR-00267	Field	7/14/2003	9:17	no oil	10.28	
DIW-P09C	DSR-00268	Field	7/14/2003	9:18	no oil	10.26	
DIW-P02C	DSR-00269	Field	7/14/2003	9:19	no oil	11.95	
DIW-P03B	DSR-00270	Field	7/14/2003	9:21	no oil	10.92	
DIW-P03C	DSR-00271	Field	7/14/2003	9:22	no oil	10.91	
DIW-P04C	DSR-00272	Field	7/14/2003	9:20	no oil	10.88	
DIW-P07B	DSR-00273	Field	7/14/2003	9:26	no oil	11.26	
DIW-P07C	DSR-00274	Field	7/14/2003	9:26	no oil	11.23	
DIW-P08C	DSR-00275	Field	7/14/2003	9:25	no oil	11.26	
DIW-P13A	DSR-00276	Field	7/14/2003	9:44	9.2	9.66	
DIW-P11A	DSR-00277	Field	7/14/2003	9:47	9.65	10.15	
DIW-P09A	DSR-00278	Field	7/14/2003	9:49	10.23	10.7	
DIW-1-2	DSR-00279	Field	7/14/2003	9:51	11.59	12.19	
DIW-P03A	DSR-00280	Field	7/14/2003	9:54	10.88	11.23	
DIW-P05A	DSR-00281	Field	7/14/2003	9:56	10.85	11.23	
DIW-P07A	DSR-00282	Field	7/14/2003	9:59	11.2	11.53	

Sampling Event	Well/ Piezometer	Sample Number	Sample Date	Sample Type	Lab	Aluminum (mg/L)	Barium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)
Pre-Injection	DIW-P11B	DSR-00038	6/27/2002	Replicate	Subcontractor	139.5	0.01095	113	0.00425	0.0274	0.082
Pre-Injection	DEXOU-FB	DSR-00049	6/27/2002	Field Blank	Subcontractor	<0.322	0.0025	<0.0471	<0.0041	<0.011	0.00094
First Post-Injection	DIW-P11B	DSR-00098	9/11/2002	Replicate	Subcontractor	128	0.05215	102.5	0.0024	0.03925	0.0012
First Post-Injection	DEXOU-FB	DSR-00100	9/12/2002	Field Blank	Subcontractor	<0.322	<0.0083	<0.0676	<0.0041	0.0012	0.00082
Second Post-Injection	DIW-P11B	DSR-00148	11/5/2002	Replicate	Subcontractor	217.5	0.0479	118.5	0.0041	0.0764	0.0055
Second Post-Injection	DEXOU-FB	DSR-00150	11/5/2002	Field Blank	Subcontractor	<0.322	<0.0083	<0.296	<0.0041	<0.011	0.00074
Third Post-Injection	DIW-P11B	DSR-00198	1/14/2003	Replicate	Subcontractor	289	0.0278	107.5	0.0019	0.1405	0.0055
Third Post-Injection	DEXOU-FB	DSR-00200	1/14/2003	Field Blank	Subcontractor	<0.322	<0.0083	<0.0368	<0.0041	<0.011	<0.0055
Fourth Post-Injection	DIW-P11B	DSR-00238	4/1/2003	Replicate	Subcontractor	399.5	0.00915	94.3	0.0363	0.209	0.9675
Fourth Post-Injection	DEXOU-FB	DSR-00240	4/1/2003	Field Blank	Subcontractor	<0.322	<0.0083	0.0553	<0.0041	<0.011	<0.0055
Fifth Post-Injection	DIW-P11B	DSR-00288	7/14/2003	Replicate	Subcontractor	223	0.0329	82.5	0.0051	0.139	0.00056
Fifth Post-Injection	DEXOU-FB	DSR-00290	7/14/2003	Field Blank	Subcontractor	0.0501	<0.0083	<0.296	<0.0041	<0.011	<0.0055

Sampling Event	Well/ Piezometer	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Lead (mg/L)	Silica (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)	Ammonium (mg/L)
Pre-Injection	DIW-P11B	141.5	70.95	12.1	0.7505	0.015	72.85	1.995		0.057	0.0374	1960	1.23
Pre-Injection	DEXOU-FB	0.0908	<0.019	<0.00088	<0.0041	<0.015	<0.0508	<0.058		<0.057	<0.101	<0.32	0.09
First Post-Injection	DIW-P11B	410.5	69.75	9.82	0.7515	0.015	109.5	0.234	119.5	0.33	0.101	2240	0.108
First Post-Injection	DEXOU-FB	<0.192	0.0184	0.00036	0.0013	<0.015	<0.0705	<0.058	<0.134	<0.057	<0.101	0.097	0.055
Second Post-Injection	DIW-P11B	252	88.4	11.55	0.8	0.0084	102.5	0.08555	145	0.057	0.0511	4540	0.826
Second Post-Injection	DEXOU-FB	0.0377	<0.17	0.0013	0.00079	<0.003	12.3	<0.058	19.1	<0.057	<0.101	0.056	0.5195
Third Post-Injection	DIW-P11B	294.5	90.6	12.55	1.01	0.00905	120.5	1.315	49.35	0.114	1.15	5700	1.25
Third Post-Injection	DEXOU-FB	<0.192	<0.0186	0.00072	<0.0041	<0.015	0.0522	<0.0103	<0.214	<0.057	<0.101	0.25	0.05
Fourth Post-Injection	DIW-P11B	346.5	111.5	12.35	2.28	0.0035	226.5	8.25	10.3	0.242	0.56	6450	1.02
Fourth Post-Injection	DEXOU-FB	0.0204	0.0376	<0.0015	<0.0041	<0.015	<0.132	<0.0088	<0.214	<0.057	0.0189	<0.32	<1
Fifth Post-Injection	DIW-P11B	470	64.7	9.04	1.23	0.0075	176	2.83	3.32	<0.285	0.791	3120	0.425
Fifth Post-Injection	DEXOU-FB	<0.192	<0.17	<0.0015	0.00055	<0.015	0.0241	<0.058	0.0272	0.048	0.00364	<0.32	0.067

Gray highlight means that there is no data

SRTC ML, SRTC EBS, and Subcontractor Intra-Laboratory Comparison

Sampling Event	Well/ Piezometer	Sample Number	Sample Date	Sample Type	Lab	Aluminum (mg/L)	Barium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Magnesium (mg/L)
Pre-Injection	DIW-P11B	DSR-00021	6/27/2002	Sample	SRTC ML	155	<0.002	118	<0.003	0.009	0.110	154	78.2
Pre-Injection	DIW-P11B	DSR-00021	6/27/2002	Sample	SRTC EBS			> 100					<0.5
Pre-Injection	DIW-P11B	DSR-00037	6/27/2002	Duplicate	SRTC ML	157	<0.002	119	<0.003	0.007	0.110	154	77.6
Pre-Injection	DIW-P11B	DSR-00037	6/27/2002	Duplicate	SRTC EBS			> 100					<0.5
Pre-Injection	DIW-P11B	DSR-00038	6/27/2002	Replicate	Subcontractor	139.5	0.01095	113	0.00425	0.0274	0.082	141.5	70.95
Pre-Injection	DIW-P11B	DSR-00039	6/27/2002	Unfiltered	SRTC ML	156	<0.002	118	<0.003	0.009	0.111	152	77.6
First Post-Injection	DIW-P11B	DSR-00071	9/11/2002	Sample	SRTC ML	117	<0.002	261	<0.003	<0.002	<0.009	426	69.2
First Post-Injection	DIW-P11B	DSR-00071	9/12/2002	Sample	SRTC EBS			60.61					75.99
First Post-Injection	DIW-P11B	DSR-00097	9/11/2002	Duplicate	SRTC ML	123	<0.002	106	<0.003	<0.002	<0.009	432	69.7
First Post-Injection	DIW-P11B	DSR-00098	9/11/2002	Replicate	Subcontractor	128	0.05215	102.5	0.0024	0.03925	0.0012	410.5	69.75
First Post-Injection	DIW-P11B	DSR-00099	9/11/2002	Unfiltered	SRTC ML	124	<0.002	105	<0.003	<0.002	<0.009	430	71.2
Second Post-Injection	DIW-P11B	DSR-00120	11/5/2002	Sample	SRTC ML	214	<0.002	117	<0.003	<0.002	<0.010	262	84.0
Second Post-Injection	DIW-P11B	DSR-00120	11/5/2002	Sample	SRTC EBS			174.23					92.36
Second Post-Injection	DIW-P11B	DSR-00147	11/5/2002	Dulicate	SRTC ML	211	<0.002	113	<0.003	<0.002	<0.010	252	83.1
Second Post-Injection	DIW-P11B	DSR-00147	11/5/2002	Dulicate	SRTC EBS			166.32					95.21
Second Post-Injection	DIW-P11B	DSR-00148	11/5/2002	Replicate	Subcontractor	217.5	0.0479	118.5	0.0041	0.0764	0.0055	252	88.4
Second Post-Injection	DIW-P11B	DSR-00149	11/5/2002	Unfiltered	SRTC ML	211	<0.002	126	<0.003	<0.002	<0.010	260	83.2
Third Post-Injection	DIW-P11B	DSR-00168	1/13/2003	Sample	SRTC ML	270	<0.002	104	<0.003	0.109	<0.009	316	88.2
Third Post-Injection	DIW-P11B	DSR-00168	1/13/2003	Sample	SRTC EBS			96.15					82.75
Third Post-Injection	DIW-P11B	DSR-00197	1/13/2003	Duplicate	SRTC ML	284	<0.002	102	<0.003	0.098	<0.009	322	85.7
Third Post-Injection	DIW-P11B	DSR-00197	1/13/2003	Duplicate	SRTC EBS			9.75					8.42
Third Post-Injection	DIW-P11B	DSR-00198	1/14/2003	Replicate	Subcontractor	289	0.0278	107.5	0.0019	0.1405	0.0055	294.5	90.6
Third Post-Injection	DIW-P11B	DSR-00199	1/13/2003	Unfiltered	SRTC ML	272	<0.002	103	<0.003	0.103	<0.009	312	88.4
Fourth Post-Injection	DIW-P11B	DSR-00214	4/1/2003	Sample	SRTC ML	417	<0.002	93.9	<0.003	0.231	0.827	380	134
Fourth Post-Injection	DIW-P11B	DSR-00214	4/1/2003	Sample	SRTC EBS			78.42					104.06
Fourth Post-Injection	DIW-P11B	DSR-00237	4/1/2003	Duplicate	SRTC ML	401	<0.002	94.1	<0.003	0.231	0.833	361	118
Fourth Post-Injection	DIW-P11B	DSR-00237	4/1/2003	Duplicate	SRTC EBS			79.84					103.56
Fourth Post-Injection	DIW-P11B	DSR-00238	4/1/2003	Replicate	Subcontractor	399.5	0.00915	94.3	0.0363	0.209	0.9675	346.5	111.5
Fourth Post-Injection	DIW-P11B	DSR-00239	4/1/2003	Unfiltered	SRTC ML	408	<0.002	91.9	<0.003	0.228	0.810	364	116
Fifth Post-Injection	DIW-P11B	DSR-00264	7/14/2003	Sample	SRTC ML	214	<0.002	74.4	<0.003	0.064	<0.009	526	74.5
Fifth Post-Injection	DIW-P11B	DSR-00264	7/14/2003	Sample	SRTC EBS			4.52					<0.5
Fifth Post-Injection	DIW-P11B	DSR-00287	7/14/2003	Duplicate	SRTC ML	208	<0.002	74.1	<0.003	0.070	<0.009	516	74.6
Fifth Post-Injection	DIW-P11B	DSR-00287	7/14/2003	Duplicate	SRTC EBS								
Fifth Post-Injection	DIW-P11B	DSR-00288	7/14/2003	Replicate	Subcontractor	223	0.0329	82.5	0.0051	0.139	0.00056	470	64.7
Fifth Post-Injection	DIW-P11B	DSR-00289	7/14/2003	Unfiltered	SRTC ML	213	<0.002	76.5	<0.003	0.066	<0.009	524	75.0

Gray highlight means that there is no data

d Subcontractor Intra-Laboratory

Well/ Piezometer	Sample Number	Manganese (mg/L)	Nickel (mg/L)	Lead (mg/L)	Silica (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Nitrate (mg/L)	Phosphate or Phosphorus (mg/L)	Sulfate (mg/L)	Ammonium (mg/L)	Chloride (mg/L)	Nitrite (mg/L)
DIW-P11B	DSR-00021	13.3	0.736	<0.017	39.4	2.02							
DIW-P11B	DSR-00021						16	<0.5	<0.5	2489.65	1.3		
DIW-P11B	DSR-00037	13.5	0.735	<0.017	39.4	2.01							
DIW-P11B	DSR-00037						16	<0.5	<0.5	2474.66	1.3		
DIW-P11B	DSR-00038	12.1	0.7505	0.015	72.85	1.995		0.057	0.0374	1960	1.23		
DIW-P11B	DSR-00039	13.3	0.737	<0.017	39.2	2.00							
DIW-P11B	DSR-00071	7.65	0.476	<0.017	52.7	0.077							
DIW-P11B	DSR-00071						79.41	< 0.5	< 0.5	1623.21	na*		
DIW-P11B	DSR-00097	7.92	0.498	<0.017	53.0	0.101							
DIW-P11B	DSR-00098	9.82	0.7515	0.015	109.5	0.234	119.5	0.33	0.101	2240	0.108		
DIW-P11B	DSR-00099	7.98	0.509	<0.017	54.3	0.071							
DIW-P11B	DSR-00120	9.12	0.538	<0.017	41.8	<0.001							
DIW-P11B	DSR-00120						165.27	< 0.5	< 0.5	2871.69	12.47		
DIW-P11B	DSR-00147	10.5	0.553	<0.017	39.9	<0.001							
DIW-P11B	DSR-00147						170.58	< 0.5	< 0.5	2637.72	10.60		
DIW-P11B	DSR-00148	11.55	0.8	0.0084	102.5	0.08555	145	0.057	0.0511	4540	0.826		
DIW-P11B	DSR-00149	10.5	0.476	<0.017	40.7	<0.001							
DIW-P11B	DSR-00168	9.27	0.679	<0.017	59.5	1.07	49.6	<1.00	<1.00	2910		<1.00	<1.00
DIW-P11B	DSR-00168						52.65	< 0.5	< 0.5	3135	< 0.5	3.05	< 0.5
DIW-P11B	DSR-00197	9.08	0.669	<0.017	58.8	1.00							
DIW-P11B	DSR-00197						5.55	< 0.5	< 0.5	369.7	< 0.5		
DIW-P11B	DSR-00198	12.55	1.01	0.00905	120.5	1.315	49.35	0.114	1.15	5700	1.25		
DIW-P11B	DSR-00199	9.22	0.688	<0.017	68.9	1.14							
DIW-P11B	DSR-00214	9.89	1.65	<0.017	107	7.90							
DIW-P11B	DSR-00214						11.56	4.57	< 0.5	4539.62	< 0.5		
DIW-P11B	DSR-00237	9.82	1.62	<0.017	108	7.82							
DIW-P11B	DSR-00237						7.98	6.63	< 0.5	4563.63	< 0.5		
DIW-P11B	DSR-00238	12.35	2.28	0.0035	226.5	8.25	10.3	0.242	0.56	6450	1.02		
DIW-P11B	DSR-00239	9.75	1.64	<0.017	107	7.81							
DIW-P11B	DSR-00264	8.59	1.08	<0.017	95.8	2.81							
DIW-P11B	DSR-00264						<0.5	< 0.5	< 0.5	3440.81	<0.5		
DIW-P11B	DSR-00287	8.91	1.13	<0.017	95.2	2.90							
DIW-P11B	DSR-00287												
DIW-P11B	DSR-00288	9.04	1.23	0.0075	176	2.83	3.32	<0.285	0.791	3120	0.425		
DIW-P11B	DSR-00289	8.71	1.10	<0.017	96.7	2.87							

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SRTC EBS Inter-Laboratory Comparison

Sampling Event	Well / Piezometer	Sample Number	Sample Date	Sample Type	Lab	Chloride (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)	Lithium (mg/L)	Sodium (mg/L)	Ammonium (mg/L)
Pre-Injection	DCB-21B	DSR-00003	6/27/2002	Sample	SRTC EBS	7.7	<0.5	<0.5	1.3	2121.94	<0.5	7.5	<0.5
Pre-Injection	DCB-21B	DSR-00033	6/27/2002	Duplicate	SRTC EBS	8.4	<0.5	<0.5	1.3	2083.28	<0.5	6.2	<0.5
Pre-Injection	DCB-21B	DSR-00034	6/27/2002	Unfiltered	SRTC EBS								
Pre-Injection	DCB-22C	DSR-00007	6/27/2002	Sample	SRTC EBS	5.5	<0.5	<0.5	<0.5	390	<0.5	3.8	<0.5
Pre-Injection	DCB-22C	DSR-00035	6/27/2002	Duplicate	SRTC EBS	5.6	<0.5	<0.5	<0.5	380	<0.5	3.8	<0.5
Pre-Injection	DCB-22C	DSR-00036	6/27/2002	Unfiltered	SRTC EBS								
First Post-Injection	DCB-21B	DSR-00052	9/11/2002	Sample	SRTC EBS	2.61	< 0.5	5.70	< 0.5	1301.23	< 0.5	7.58	< 0.5
First Post-Injection	DCB-21B	DSR-00093	9/11/2002	Duplicate	SRTC EBS								
First Post-Injection	DCB-21B	DSR-00094	9/11/2002	Unfiltered	SRTC EBS								
First Post-Injection	DCB-22C	DSR-00056	9/11/2002	Sample	SRTC EBS	4.41	< 0.5	< 0.5	< 0.5	340.66	< 0.5	3.36	< 0.5
First Post-Injection	DCB-22C	DSR-00095	9/11/2002	Duplicate	SRTC EBS								
First Post-Injection	DCB-22C	DSR-00096	9/11/2002	Unfiltered	SRTC EBS								
Second Post-Injection	DCB-21B	DSR-00103	11/6/2002	Sample	SRTC EBS	2.42	10.37	< 0.5	< 0.5	1486.97	< 0.5	9.23	< 0.5
Second Post-Injection	DCB-21B	DSR-00143	11/6/2002	Dulicate	SRTC EBS	2.47	10.37	< 0.5	< 0.5	1400.80	< 0.5	8.23	0.73
Second Post-Injection	DCB-21B	DSR-00144	11/6/2002	Unfiltered	SRTC EBS								
Second Post-Injection	DCB-22C	DSR-00107	11/6/2002	Sample	SRTC EBS	4.54	< 0.5	< 0.5	< 0.5	336.67	< 0.5	4.35	< 0.5
Second Post-Injection	DCB-22C	DSR-00145	11/6/2002	Dulicate	SRTC EBS	4.31	< 0.5	< 0.5	< 0.5	291.53	< 0.5	3.89	< 0.5
Second Post-Injection	DCB-22C	DSR-00146	11/6/2002	Unfiltered	SRTC EBS								
Third Post-Injection	DCB-21B	DSR-00153	1/13/2003	Sample	SRTC EBS	3.49	< 0.5	7.03	< 0.5	1466	< 0.5	7.73	0.53
Third Post-Injection	DCB-21B	DSR-00193	1/13/2003	Duplicate	SRTC EBS	3.63	< 0.5	7.25	< 0.5	1441	< 0.5	8.32	0.63
Third Post-Injection	DCB-21B	DSR-00194	1/13/2003	Unfiltered	SRTC EBS								
Third Post-Injection	DCB-22C	DSR-00156	1/13/2003	Sample	SRTC EBS	4.82	< 0.5	< 0.5	< 0.5	381.7	< 0.5	4.10	< 0.5
Third Post-Injection	DCB-22C	DSR-00195	1/13/2003	Duplicate	SRTC EBS	5.00	< 0.5	7.97	< 0.5	435.3	< 0.5	4.71	< 0.5
Third Post-Injection	DCB-22C	DSR-00196	1/13/2003	Unfiltered	SRTC EBS								
Fourth Post-Injection	DCB-21B	DSR-00203	3/31/2003	Sample	SRTC EBS	15.85	< 0.5	7.68	< 0.5	1470.59	< 0.5	7.61	< 0.5
Fourth Post-Injection	DCB-21B	DSR-00233	3/31/2003	Duplicate	SRTC EBS	15.12	0.53	8.35	< 0.5	1432.48	< 0.5	7.48	< 0.5
Fourth Post-Injection	DCB-21B	DSR-00234	3/31/2003	Unfiltered	SRTC EBS								
Fourth Post-Injection	DCB-22C	DSR-00204	3/31/2003	Sample	SRTC EBS	0.87	< 0.5	0.55	< 0.5	413.16	< 0.5	3.91	< 0.5
Fourth Post-Injection	DCB-22C	DSR-00235	3/31/2003	Duplicate	SRTC EBS	0.88	0.52	0.26	< 0.5	422.77	< 0.5	4.73	< 0.5
Fourth Post-Injection	DCB-22C	DSR-00236	3/31/2003	Unfiltered	SRTC EBS								
Fifth Post-Injection	DCB-21B	DSR-00252	7/14/2003	Sample	SRTC EBS	< 0.5	< 0.5	< 0.5	< 0.5	2799.44	<0.5	5.17	<0.5
Fifth Post-Injection	DCB-21B	DSR-00283	7/14/2003	Duplicate	SRTC EBS								
Fifth Post-Injection	DCB-21B	DSR-00284	7/14/2003	Unfiltered	SRTC EBS								
Fifth Post-Injection	DCB-22C	DSR-00253	7/14/2003	Sample	SRTC EBS	4.15	< 0.5	< 0.5	< 0.5	975.68	<0.5	10.47	<0.5
Fifth Post-Injection	DCB-22C	DSR-00285	7/14/2003	Duplicate	SRTC EBS								
Fifth Post-Injection	DCB-22C	DSR-00286	7/14/2003	Unfiltered	SRTC EBS								
	Gray highlight means that there is no data												

ry Comparison

Well / Piezometer	Sample Number	Potassium (mg/L)	Magnesium (mg/L)	Calcium (mg/L)	Hydrogen Sulfide (mg/L)	Lactate (mg/L)	Acetic Acid (mg/L)	Propanoic Acid (mg/L)	Formic Acid (mg/L)	Isobutyric Acid (mg/L)	Butyric Acid (mg/L)	Isovaleric Acid (mg/L)	Valeric Acid (mg/L)	Isocaproic Acid (mg/L)	Hexanoic Acid (mg/L)	Heptanoic Acid (mg/L)
DCB-21B	DSR-00003	61	<0.5	> 100	0.13683	<6.3	6.0	18.3	7.1	15.2	14.1	18.6	16.7	15.9	15.5	15.2
DCB-21B	DSR-00033	54	<0.5	> 100		<6.3	<1.0	<1.0	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0
DCB-21B	DSR-00034				0.18244											
DCB-22C	DSR-00007	21	<0.5	91	0.159635	<6.3	5.7	16.4	6.6	6.5	8.9	7.4	9.2	6.7	7.9	<5.0
DCB-22C	DSR-00035	20	<0.5	90		<6.3	<1.0	<1.0	<1.0	<1.5	<2.0	<2.0	<2.0	<2.0	<2.0	<5.0
DCB-22C	DSR-00036				0.193843											
DCB-21B	DSR-00052	36.16	36.16304	83.89	0.099223	12.3879	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
DCB-21B	DSR-00093				0.024507		< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
DCB-21B	DSR-00094				0.082785											
DCB-22C	DSR-00056	21.50	21.49934	56.09	0.078302	<6.3	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
DCB-22C	DSR-00095						8.03	< 7.0	6.33	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
DCB-22C	DSR-00096				0.072325											
DCB-21B	DSR-00103	1.28	88.06	132.06	0.0105	<6.3	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10
DCB-21B	DSR-00143	1.42	98.23	141.96		<6.3	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10
DCB-21B	DSR-00144				0.0236											
DCB-22C	DSR-00107	1.47	26.06	100.09	0.0105	<6.3	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10
DCB-22C	DSR-00145	1.54	24.05	103.54		<6.3	<6	<7	<5	<9	<9	<10	<10	<10	<10	<10
DCB-22C	DSR-00146				0.0052											
DCB-21B	DSR-00153	1.72	72.62	121.27	0.0233	9.894695	< 6.0	< 7.0	5.67	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
DCB-21B	DSR-00193	1.29	76.06	125.25		9.95	< 6.0	< 7.0	6.17	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
DCB-21B	DSR-00194				0.0808											
DCB-22C	DSR-00156	1.95	28.64	109.71	0.0233	<6.3	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
DCB-22C	DSR-00195	1.35	24.29	106.35		<6.3	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
DCB-22C	DSR-00196				0.0343											
DCB-21B	DSR-00203	1.15	73.71	111.58	<0.001	<6.3	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
DCB-21B	DSR-00233	0.95	72.75	109.77		<6.3	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
DCB-21B	DSR-00234				<0.001											
DCB-22C	DSR-00204	1.27	21.31	111.55	<0.001	<6.3	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
DCB-22C	DSR-00235	1.24	23.57	112.49		<6.3	< 6.0	< 7.0	< 5.0	< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
DCB-22C	DSR-00236				<0.001											
DCB-21B	DSR-00252	<0.5	<0.5	<0.5	0.0015	<6.3	< 6.0	< 7.0		< 9.0	< 9.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
DCB-21B	DSR-00283															
DCB-21B	DSR-00284				<0.001											
DCB-22C	DSR-00253	54.90	<0.5	122.27	<0.001	<6.3	< 6.0	< 7.0		< 9.0	< 9.0	< 10.0	< 10.0	12	< 10.0	< 10.0
DCB-22C	DSR-00285															
DCB-22C	DSR-00286				0.0014											

Gray highlight means that there Gray highlight means that there is no data

SRTC ML Inter-Laboratory Comparison

Sampling Event	Well/ Piezometer	Sample Number	Sample Date	Sample Type	Lab	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)
Pre-Injection	DCB-21B	DSR-00003	6/27/2002	Sample	SRTC ML	120	<0.002		116	<0.003	<0.002	0.161	94.2
Pre-Injection	DCB-21B	DSR-00033	6/27/2002	Duplicate	SRTC ML	126	<0.002		117	<0.003	<0.002	0.171	95.3
Pre-Injection	DCB-21B	DSR-00034	6/27/2002	Unfiltered	SRTC ML	129	<0.002		116	<0.003	<0.002	0.182	92.8
Pre-Injection	DCB-22C	DSR-00007	6/27/2002	Sample	SRTC ML	2.12	<0.002		84.9	<0.003	<0.002	0.027	2.32
Pre-Injection	DCB-22C	DSR-00035	6/27/2002	Duplicate	SRTC ML	2.40	<0.002		86.0	<0.003	<0.002	0.028	2.50
Pre-Injection	DCB-22C	DSR-00036	6/27/2002	Unfiltered	SRTC ML	2.88	<0.002		87.4	<0.003	<0.002	0.029	2.64
First Post-Injection	DCB-21B	DSR-00052	9/11/2002	Sample	SRTC ML	131	<0.002		106	<0.003	<0.002	0.149	78.2
First Post-Injection	DCB-21B	DSR-00093	9/11/2002	Duplicate	SRTC ML	133	<0.002		107	<0.003	<0.002	0.156	78.5
First Post-Injection	DCB-21B	DSR-00094	9/11/2002	Unfiltered	SRTC ML	134	<0.002		108	<0.003	<0.002	0.152	79.7
First Post-Injection	DCB-22C	DSR-00056	9/11/2002	Sample	SRTC ML	1.54	<0.002		84.8	<0.003	<0.002	<0.009	1.96
First Post-Injection	DCB-22C	DSR-00095	9/11/2002	Duplicate	SRTC ML	1.54	<0.002		83.2	<0.003	<0.002	<0.009	2.03
First Post-Injection	DCB-22C	DSR-00096	9/11/2002	Unfiltered	SRTC ML	1.58	<0.002		84.6	<0.003	<0.002	<0.009	1.97
Second Post-Injection	DCB-21B	DSR-00103	11/6/2002	Sample	SRTC ML	144	<0.002	2.39	105	<0.003	<0.002	0.161	91.3
Second Post-Injection	DCB-21B	DSR-00143	11/6/2002	Dulicate	SRTC ML	136	<0.002	2.34	100	<0.003	<0.002	0.138	93.6
Second Post-Injection	DCB-21B	DSR-00144	11/6/2002	Unfiltered	SRTC ML	141	<0.002	2.21	102	<0.003	<0.002	0.153	89.9
Second Post-Injection	DCB-22C	DSR-00107	11/6/2002	Sample	SRTC ML	1.66	<0.002	0.260	80.3	<0.003	<0.002	<0.010	1.99
Second Post-Injection	DCB-22C	DSR-00145	11/6/2002	Dulicate	SRTC ML	1.40	<0.002	0.228	77.4	<0.003	<0.002	<0.010	1.81
Second Post-Injection	DCB-22C	DSR-00146	11/6/2002	Unfiltered	SRTC ML	1.26	<0.002	0.217	77.6	<0.003	<0.002	<0.010	1.84
Third Post-Injection	DCB-21B	DSR-00153	1/13/2003	Sample	SRTC ML	127	<0.002	<0.100	96.1	<0.003	0.025	0.180	88
Third Post-Injection	DCB-21B	DSR-00193	1/13/2003	Duplicate	SRTC ML	112	<0.002	<0.100	94.6	<0.003	0.019	0.181	87.1
Third Post-Injection	DCB-21B	DSR-00194	1/13/2003	Unfiltered	SRTC ML	116	<0.002	<0.100	96.3	<0.003	<0.002	0.157	87.5
Third Post-Injection	DCB-22C	DSR-00156	1/13/2003	Sample	SRTC ML	2.31	<0.002	<0.100	94.8	<0.003	<0.002	0.007	1.68
Third Post-Injection	DCB-22C	DSR-00195	1/13/2003	Duplicate	SRTC ML	2.32	<0.002	<0.100	91.7	<0.003	<0.002	0.010	1.68
Third Post-Injection	DCB-22C	DSR-00196	1/13/2003	Unfiltered	SRTC ML	2.45	<0.002	<0.100	92.2	<0.003	<0.002	0.009	1.76
Fourth Post-Injection	DCB-21B	DSR-00203	3/31/2003	Sample	SRTC ML	131	<0.002	<0.001	96.2	<0.003	0.049	0.141	106
Fourth Post-Injection	DCB-21B	DSR-00233	3/31/2003	Duplicate	SRTC ML	127	<0.002	<0.001	99.4	<0.003	0.055	0.147	96.4
Fourth Post-Injection	DCB-21B	DSR-00234	3/31/2003	Unfiltered	SRTC ML	131	<0.002	<0.001	101	<0.003	0.054	0.138	104
Fourth Post-Injection	DCB-22C	DSR-00204	3/31/2003	Sample	SRTC ML	0.937	<0.002	<0.001	101	<0.003	0.011	<0.009	2.06
Fourth Post-Injection	DCB-22C	DSR-00235	3/31/2003	Duplicate	SRTC ML	0.929	<0.002	<0.001	104	<0.003	0.009	<0.009	2.07
Fourth Post-Injection	DCB-22C	DSR-00236	3/31/2003	Unfiltered	SRTC ML	1.27	<0.002	<0.001	105	<0.003	0.010	<0.009	1.98
Fifth Post-Injection	DCB-21B	DSR-00252	7/14/2003	Sample	SRTC ML	170	<0.002	<0.010	128	<0.003	<0.002	0.171	179
Fifth Post-Injection	DCB-21B	DSR-00283	7/14/2003	Duplicate	SRTC ML	180	<0.002	<0.010	134	<0.003	<0.002	0.179	183
Fifth Post-Injection	DCB-21B	DSR-00284	7/14/2003	Unfiltered	SRTC ML	173	<0.002	<0.010	135	<0.003	<0.002	0.157	188
Fifth Post-Injection	DCB-22C	DSR-00253	7/14/2003	Sample	SRTC ML	5.25	<0.002	<0.010	144	<0.003	<0.002	<0.009	60.7
Fifth Post-Injection	DCB-22C	DSR-00285	7/14/2003	Duplicate	SRTC ML	5.14	<0.002	<0.010	143	<0.003	<0.002	<0.009	59.7
Fifth Post-Injection	DCB-22C	DSR-00286	7/14/2003	Unfiltered	SRTC ML	5.76	<0.002	<0.010	144	<0.003	<0.002	<0.009	64.1
	Gray highlight means that there is no data												

Comparison

Well/ Piezometer	Sample Number	Magnesium (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Lead (mg/L)	Silica (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)
DCB-21B	DSR-00003	98.9	12.4	0.625	<0.017	27.8	1.75			
DCB-21B	DSR-00033	100	12.6	0.646	<0.017	29.2	1.79			
DCB-21B	DSR-00034	99.5	21.5	0.649	<0.017	30.0	1.80			
DCB-22C	DSR-00007	23.4	1.48	0.010	<0.017	11.8	<0.001			
DCB-22C	DSR-00035	28.9	1.57	0.013	<0.017	11.9	<0.001			
DCB-22C	DSR-00036	31.2	1.87	0.019	<0.017	12.1	<0.001			
DCB-21B	DSR-00052	87.9	9.2	0.519	<0.017	36.2	1.58	6.97	0.907	70.98
DCB-21B	DSR-00093	88.5	9.42	0.523	<0.017	36.7	1.57	7.09	0.898	70.51
DCB-21B	DSR-00094	89.8	9.41	0.521	<0.017	36.9	1.56	7.03		
DCB-22C	DSR-00056	23.9	1.130	<0.010	<0.017	10.8	<0.001	3.02	0.893	1.75
DCB-22C	DSR-00095	23.1	1.11	0.072	<0.017	10.7	<0.001	3.03	0.816	1.66
DCB-22C	DSR-00096	24.2	1.22	0.069	<0.017	10.9	<0.001	3.11		
DCB-21B	DSR-00103	87.8	8.75	0.572	<0.017	37.8	1.80	8.27	0.87436882	79.83
DCB-21B	DSR-00143	85.8	8.60	0.518	<0.017	33.6	1.66	7.91	0.903542251	84.57
DCB-21B	DSR-00144	88.6	8.77	0.530	<0.017	37.1	1.72	7.84		
DCB-22C	DSR-00107	27.6	1.45	<0.010	<0.017	11.1	<0.001	2.67	< detect	< detect
DCB-22C	DSR-00145	26.3	1.29	<0.010	<0.017	10.4	<0.001	3.06	1	1.81
DCB-22C	DSR-00146	25.2	1.13	<0.010	<0.017	10.4	<0.001	2.46		
DCB-21B	DSR-00153	83.5	7.38	0.501	<0.017	32.8	1.69	7.47	0.852678356	75.04
DCB-21B	DSR-00193	81.1	7.34	0.501	<0.017	32.7	1.69	7.64	0.903111866	78.66
DCB-21B	DSR-00194	82.1	7.55	0.446	<0.017	30.7	1.55	7.33		
DCB-22C	DSR-00156	30.8	1.69	<0.010	<0.017	12.4	<0.001	3.80	1	1.68
DCB-22C	DSR-00195	29.6	1.71	<0.010	<0.017	12.1	<0.001	3.57	1	1.68
DCB-22C	DSR-00196	29.8	1.81	<0.010	<0.017	12.1	<0.001	3.74		
DCB-21B	DSR-00203	83.5	7.20	0.518	<0.017	26.7	1.62	6.74	0.911183106	96.59
DCB-21B	DSR-00233	87.4	7.14	0.520	<0.017	28.3	1.63	6.84	0.895966421	86.37
DCB-21B	DSR-00234	90.2	7.30	0.520	<0.017	27.5	1.60	6.60		
DCB-22C	DSR-00204	29.5	1.51	0.031	<0.017	11.8	<0.001	3.45	1	2.06
DCB-22C	DSR-00235	31.6	1.47	0.031	<0.017	12.4	<0.001	3.38	1	2.07
DCB-22C	DSR-00236	33.8	1.83	0.040	<0.017	12.8	<0.001	3.51		
DCB-21B	DSR-00252	219	14.4	0.866	<0.017	32.9	2.59	8.61	1	179.00
DCB-21B	DSR-00283	133	14.2	0.898	<0.017	33.5	2.71	9.54	1	183.00
DCB-21B	DSR-00284	135	14.4	0.880	<0.017	30.7	2.64	9.70		
DCB-22C	DSR-00253	59.1	4.01	0.051	<0.017	14.0	0.068	14.1	1	60.70
DCB-22C	DSR-00285	59.1	4.10	0.050	<0.017	13.9	0.079	15.3	<detect	<detect
DCB-22C	DSR-00286	60.9	4.36	0.061	<0.017	14.2	0.092	15.0		

Gray highlight means that there Gray highlight means that there is no data

Field Blanks

Sampling Event	Well/ Piezometer	Sample Number	Sample Date	Sample Type	Lab	Aluminum (mg/L)	Barium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Magnesium (mg/L)
Pre-Injection	DEXOU-FB	DSR-00049	6/27/2002	Field Blank	Subcontractor	<0.322	0.0025	<0.0471	<0.0041	<0.011	0.00094	0.0908	<0.019
First Post-Injection	DEXOU-FB	DSR-00100	9/12/2002	Field Blank	Subcontractor	<0.322	<0.0083	<0.0676	<0.0041	0.0012	0.00082	<0.192	0.0184
Second Post-Injection	DEXOU-FB	DSR-00150	11/5/2002	Field Blank	Subcontractor	<0.322	<0.0083	<0.296	<0.0041	<0.011	0.00074	0.0377	<0.17
Third Post-Injection	DEXOU-FB	DSR-00200	1/14/2003	Field Blank	Subcontractor	<0.322	<0.0083	<0.0368	<0.0041	<0.011	<0.0055	<0.192	<0.0186
Fourth Post-Injection	DEXOU-FB	DSR-00240	4/1/2003	Field Blank	Subcontractor	<0.322	<0.0083	0.0553	<0.0041	<0.011	<0.0055	0.0204	0.0376
Fifth Post-Injection	DEXOU-FB	DSR-00290	7/14/2003	Field Blank	Subcontractor	0.0501	<0.0083	<0.296	<0.0041	<0.011	<0.0055	<0.192	<0.17
	Gray highlight means that there is no data												

Well/ Piezometer	Sample Number	Manganese (mg/L)	Nickel (mg/L)	Lead (mg/L)	Silica (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)	Ammonium (mg/L)
DEXOU-FB	DSR-00049	<0.00088	<0.0041	<0.015	<0.0508	<0.058		<0.057	<0.101	<0.32	0.09
DEXOU-FB	DSR-00100	0.00036	0.0013	<0.015	<0.0705	<0.058	<0.134	<0.057	<0.101	0.097	0.055
DEXOU-FB	DSR-00150	0.0013	0.00079	<0.003	12.3	<0.058	19.1	<0.057	<0.101	0.056	0.5195
DEXOU-FB	DSR-00200	0.00072	<0.0041	<0.015	0.0522	<0.0103	<0.214	<0.057	<0.101	0.25	0.05
DEXOU-FB	DSR-00240	<0.0015	<0.0041	<0.015	<0.132	<0.0088	<0.214	<0.057	0.0189	<0.32	<1
DEXOU-FB	DSR-00290	<0.0015	0.00055	<0.015	0.0241	<0.058	0.0272	0.048	0.00364	<0.32	0.067
Gray highlight means that there Gray highlight means that there is no data											

APPENDIX D
ORGANIC SUBSTRATE FIELD APPLICATION
PART 2

Pre Injection Field Parameters Tier 2 & 3											
Well / Piezometer	Sample Number	Sample Type	Date	Time	Temp (F)	Temp (C)	pH	Conductivity (uS/cm)	DO (ug/L)	ORP (mV)	Eh Calculated (mV)
DCB-8	DSR-00300	Sample	11/3/2003	9:20	70.57	21.43	5.46	48	4490	132	330
DCB-21A	DSR-00301	Sample	11/3/2003	11:48	74.23	23.46	2.05	6054	2620	391	587
DCB-22C	DSR-00302	Sample	11/3/2003	11:20	71.10	21.72	4.3	947	2190	262	460
DCB-70B	DSR-00303	Sample	11/3/2003	10:53	70.34	21.3	4.2	376	5020	258	456
DCB-19A	DSR-00304	Sample	11/3/2003	12:12	79.09	26.16	2.16	5241	4470	548	742
DCB-18C	DSR-00305	Sample	11/3/2003	12:29	74.80	23.78	3.41	2109	2270	324	520
DIW-P11A	DSR-00306	Sample	11/4/2003	10:46	75.02	23.9	4.63	964	1990	-155	41
DIW-P11B	DSR-00307	Sample	11/4/2003	10:33	74.12	23.4	3.16	2423	1980	-116	80
DIW-P11C	DSR-00308	Sample	11/4/2003	10:30	74.61	23.67	2.79	5049	2350	-1	195
DIW-1-2	DSR-00309	Sample	11/4/2003	11:01	75.49	24.16	5.7	680	1620	-200	-4
DIW-P07A	DSR-00310	Sample	11/4/2003	11:20	75.85	24.36	5.2	1129	2410	-131	64
DIW-P07B	DSR-00311	Sample	11/3/2003	12:37	77.90	25.5	3.59	2647	1600	9	203
DIW-P07C	DSR-00312	Sample	11/3/2003	12:49	76.10	24.5	3.49	2487	1480	51	246

TIER 1 Field Parameters 12/2/03											
Well / Piezometer			Date	Time	Temp (F)	Temp (C)	pH	Conductivity (uS/cm)	DO (ug/L)	ORP (mV)	Eh Calculated (mV)
First Post-Injection Tier 2:											
DIW-P11A	NA	Sample	12/2/2003	11:14	66.33	19.07	4.25	1074	1670	-79.1	121
DIW-P11B	NA	Sample	12/2/2003	10:56	67.33	19.63	2.92	2761	2900	-18.1	181
DIW-P11C	NA	Sample	12/2/2003	11:05	66.60	19.22	2.20	6259	1510	74.3	274
DIW-1-2	NA	Sample	12/2/2003	11:28	67.78	19.88	5.00	694	2390	-64.8	134
DIW-P07A	NA	Sample	12/2/2003	11:46	71.06	21.7	5.26	1402	1750	-137.5	60
DIW-P07B	NA	Sample	12/2/2003	10:34	68.99	20.55	3.85	2278	2230	-38.5	160
DIW-P07C	NA	Sample	12/2/2003	10:43	67.50	19.72	3.77	2105	1820	-20.4	179

TIER 1 Field Parameters 1/5/04											
Well / Piezometer			Date	Time	Temp (F)	Temp (C)	pH	Conductivity (uS/cm)	DO (ug/L)	ORP (mV)	Eh Calculated (mV)
First Post-Injection Tier 2:											
DIW-P11A	NA	Sample	1/5/2004	10:54	67.89	19.94	4.29	1224	2800	-125.7	73
DIW-P11B	NA	Sample	1/5/2004	10:40	69.71	20.95	2.64	4081	3920	-40.3	158
DIW-P11C	NA	Sample	1/5/2004	10:45	70.70	21.5	2.40	6344	4560	-18.5	179
DIW-1-2	NA	Sample	1/5/2004	11:09	68.70	20.39	4.78	801	2970	-113.9	85
DIW-P07A	NA	Sample	1/5/2004	11:25	70.03	21.13	5.16	1345	3050	-155.8	42
DIW-P07B	NA	Sample	1/5/2004	10:25	70.38	21.32	3.99	2159	1490	-141.9	56
DIW-P07C	NA	Sample	1/5/2004	10:30	71.17	21.76	4.01	2057	1680	-142.6	55

Pre Injection Field Parameters Tier 2 & 3											
Well / Piezometer	Sample Number	Sample Type	Date	Time	Temp (F)	Temp (C)	pH	Conductivity (uS/cm)	DO (ug/L)	ORP (mV)	Eh Calculated (mV)
DCB-8	DSR-00320	Sample	2/3/2004	10:30	63.79	17.66	5.2	34	4700	202	403
DCB-21A	DSR-00321	Sample	2/3/2004	8:49	59.70	15.39	2.23	6196	8900	609	812
DCB-22C	DSR-00322	Sample	2/3/2004	9:07	64.83	18.24	4.39	789	2620	318	519
DCB-70B	DSR-00323	Sample	2/3/2004	9:31	60.82	16.01	4.77	188	4400	317	520
DCB-19A	DSR-00324	Sample	2/3/2004	9:50	60.75	15.97	2.5	3766	9880	589	792
DCB-18C	DSR-00325	Sample	2/3/2004	10:08	65.80	18.78	3.59	2222	3030	301	501
DIW-P11A	DSR-00326	Sample	2/3/2004	11:51	61.79	16.55	4.48	1138	5120	-58	144
DIW-P11B	DSR-00327	Sample	2/3/2004	11:30	63.43	17.46	2.84	3551	3330	32	233
DIW-P11C	DSR-00328	Sample	2/3/2004	11:40	65.68	18.71	2.8	5152	2200	22	222
DIW-1-2	DSR-00329	Sample	2/3/2004	12:05	63.88	17.71	4.84	861	2940	-52	149
DIW-P07A	DSR-00330	Sample	2/3/2004	12:18	64.47	18.04	5.36	775	4040	-72	129
DIW-P07B	DSR-00331	Sample	2/3/2004	10:52	66.99	19.44	4	2275	2070	-73	127
DIW-P07C	DSR-00332	Sample	2/3/2004	11:03	66.20	19	4.09	2081		-117	83
	Denotes no data availiable										

TIER 1 Field Parameters 3/9/04											
Well / Piezometer			Date	Time	Temp (F)	Temp (C)	pH	Conductivity (uS/cm)	DO (ug/L)	ORP (mV)	Eh Calculated (mV)
DIW-P11A	NA	Sample	3/9/2004	11:38	59.25	15.14	4.34	1402	2990	-62.5	141
DIW-P11B	NA	Sample	3/9/2004	10:50	64.22	17.9	2.34	3572	1460	103.1	304
DIW-P11C	NA	Sample	3/9/2004	11:20	64.63	18.13	2.29	4556	3000	23.1	224
DIW-1-2	NA	Sample	3/9/2004	12:04	62.24	16.8	4.80	799	2040	-34.9	167
DIW-P07A	NA	Sample	3/9/2004	12:25	61.21	16.23	5.13	809	1740	-99.8	103
DIW-P07B	NA	Sample	3/9/2004	10:35	64.38	17.99	3.92	1851	2740	-130	71
DIW-P07C	NA	Sample	3/9/2004	10:52	66.00	18.89	3.88	1932	4300	-132.7	67

TIER 1 Field Parameters 3/9/04											
Well / Piezometer			Date	Time	Temp (F)	Temp (C)	pH	Conductivity (uS/cm)	DO (ug/L)	ORP (mV)	Eh Calculated (mV)
DIW-P11A	NA	Sample	4/19/2004	12:22	67.66	19.81	2.86	1896	8007	94.5	294
DIW-P11B	NA	Sample	4/19/2004	12:13	66.27	19.04	2.29	3265	5950	94.8	295
DIW-P11C	NA	Sample	4/19/2004	12:05	68.13	20.07	2.34	3589	6680	25.5	225
DIW-1-2	NA	Sample	4/19/2004	12:39	71.67	22.04	4.59	558	7440	-81.3	116
DIW-P07A	NA	Sample	4/19/2004								
DIW-P07B	NA	Sample	4/19/2004	11:50	71.89	22.16	3.71	1935	5600	-102.6	95
DIW-P07C	NA	Sample	4/19/2004	11:42	70.70	21.5	3.73	1970	2570	-83.5	114

Field Parameters Tier 2 & 3											
Well / Piezometer	Sample Number	Sample Type	Date	Time	Temp (F)	Temp (C)	pH	Conductivity (uS/cm)	DO (ug/L)	ORP (mV)	Eh Calculated (mV)
DCB-8	DSR-00340	Sample	5/3/2004	9:05	64.13	17.85	5.08	32	4580	159.8	361
DCB-21A	DSR-00341	Sample	5/3/2004	10:35	65.19	18.44	2.18	4652	6480	611.5	812
DCB-22C	DSR-00342	Sample	5/3/2004	10:49	68.27	20.15	4.21	756	1360	332.5	531
DCB-70B	DSR-00343	Sample	5/3/2004	11:03	64.69	18.16	4.84	154	2030	312.5	513
DCB-19A	DSR-00344	Sample	5/3/2004	10:08	64.00	17.78	2.37	2755	7830	584.4	785
DCB-18C	DSR-00345	Sample	5/3/2004	10:19	69.44	20.8	3.32	2023	1560	360.5	559
DIW-P11A	DSR-00346	Sample	5/3/2004	12:15	65.17	18.43	2.6	2474	6070	67	267
DIW-P11B	DSR-00347	Sample	5/3/2004	11:13	65.12	18.4	2.45	3030	1890	130.6	331
DIW-P11C	DSR-00348	Sample	5/3/2004	11:34	66.27	19.04	2.32	4207	1220	66.4	266
DIW-1-2	DSR-00349	Sample	5/3/2004	12:30	68.54	20.3	4.67	532	5510	-41	158
DIW-P07A	DSR-00350	Sample	5/3/2004								
DIW-P07B	DSR-00351	Sample	5/3/2004	11:44	67.98	19.99	3.75	2185	3330	-57.4	142
DIW-P07C	DSR-00352	Sample	5/3/2004	11:56	69.33	20.74	3.71	2153	5400	-70	128
	Denotes no data availiable										

TIER 1 Field Parameters 5/25/2004 (Expanded)											
Well / Piezometer	Sample Number	Sample Type	Date	Time	Temp (F)	Temp (C)	pH	Conductivity (uS/cm)	DO (ug/L)	ORP (mV)	Eh Calculated (mV)
DIW-P11A	NA	Sample	5/25/2004	9:29	70.59	21.44	2.82	2093	4250	114.8	313
DIW-P11B	NA	Sample	5/24/2004	11:48	68.54	20.3	2.54	2928	1220	92.8	292
DIW-P11C	NA	Sample	5/24/2004	11:12	71.44	21.91	2.04	6606	1420	59.4	257
DIW-1-2	NA	Sample	5/25/2004	10:12	71.78	22.1	4.68	391	2060	24.5	222
DIW-P07A	NA	Sample	5/25/2004	12:04	83.80	28.78	5.17	1221	3180	-60	131
DIW-P07B[1]	NA	Sample	5/24/2004	14:06	70.16	21.2	3.75	2155	4330	13.5	212
DIW-P07C	NA	Sample	5/24/2004	14:14	72.57	22.54	3.71	2160	2600	29	226
DIW-P13A	NA	Sample	5/25/2004	10:30	72.97	22.76	5.42	1259	2730	-32.4	164
DIW-P13B	NA	Sample	5/24/2004	11:38	70.41	21.34	4.03	2626	2240	-53.9	144
DIW-P13C	NA	Sample	5/24/2004	11:25	71.06	21.7	3.89	2777	1940	-79.7	118
DIW-P09A	NA	Sample	5/25/2004	9:56	71.64	22.02	3.78	825	2180	41.1	238
DIW-P09B	NA	Sample	5/24/2004	12:12	71.24	21.8	3.86	1175	2330	-49.9	148
DIW-P09C	NA	Sample	5/24/2004	12:18	72.52	22.51	2.22	5141	4050	94.2	291
DIW-P03A	NA	Sample	5/25/2004	8:48	70.95	21.64	4.79	406	1340	12.2	210
DIW-P03B	NA	Sample	5/24/2004	14:27	70.00	21.11	4.7	983	4600	18	216
DIW-P03C	NA	Sample	5/24/2004	14:36	72.70	22.61	4.67	1120	7360	38.7	236
DIW-P05A	NA	Sample	5/25/2004	9:10	70.34	21.3	4.84	568	1110	-39.9	158
DIW-P05B	NA	Sample	5/24/2004	12:48	72.28	22.38	4.18	1726	3410	-39.7	157
DIW-P05C	NA	Sample	5/24/2004	12:59	70.27	21.26	3.84	1994	2840	-14.9	183

TIER 1 Field Parameters 6/14/2004											
Well / Piezometer	Sample Number	Sample Type	Date	Time	Temp (F)	Temp (C)	pH	Conductivity (uS/cm)	DO (ug/L)	ORP (mV)	Eh Calculated (mV)
DIW-P11A	NA	Sample	6/14/2004	11:15	70.88	21.6	2.85	2080	1400	17.3	215
DIW-P11B	NA	Sample	6/14/2004	10:38	69.26	20.7	2.63	3021	700	17.7	216
DIW-P11C	NA	Sample	6/14/2004	10:45	69.17	20.65	2.05	7077	150	41.3	240
DIW-1-2	NA	Sample	6/14/2004	11:24	70.79	21.55	4.49	448	1250	-45.3	152
DIW-P07A	NA	Sample	6/14/2004	11:54	75.87	24.37	4.97	772	1930	-4.6	191
DIW-P07B	NA	Sample	6/14/2004	10:56	70.81	21.56	3.82	2126	1580	-49.8	148
DIW-P07C	NA	Sample	6/14/2004	11:04	72.00	22.22	3.75	2090	1650	-49.1	148

TIER 2/3 Field Parameters 7/12/2004 (Expanded)											
Well / Piezometer	Sample Number	Sample Type	Date	Time	Temp (F)	Temp (C)	pH	Conductivity (uS/cm)	DO (ug/L)	ORP (mV)	Eh Calculated (mV)
DCB-8	DSR-00360	Sample	7/12/2004	9:00	69.51	20.84	4.96	31	3710	161.4	360
DCB-21A	DSR-00361	Sample	7/12/2004	9:44	78.58	25.88	2.27	3937	7380	570	764
DCB-22C	DSR-00362	Sample	7/12/2004	11:07	70.93	21.63	4.33	669	2010	286	484
DCB-70B	DSR-00363	Sample	7/12/2004	11:22	70.05	21.14	4.51	292	1550	276	474
DCB-19A	DSR-00364	Sample	7/12/2004	10:12	78.01	25.56	2.51	2205	8050	549	743
DCB-18C	DSR-00365	Sample	7/12/2004	10:49	72.32	22.4	3.54	1734	3470	328	525
DIW-P11A	DSR-00366	Sample	7/13/2004	9:15	75.16	23.98	2.93	1894	4370	55	251
DIW-P11B	DSR-00367	Sample	7/13/2004	9:03	72.14	22.3	2.56	2564	1370	105.4	303
DIW-P11C	DSR-00368	Sample	7/12/2004	11:43	73.00	22.78	1.98	7473	1150	112	309
DIW-1-2	DSR-00369	Sample	7/13/2004	10:26	77.61	25.34	4.42	490	3670	23.1	218
DIW-P07A	DSR-00370	Sample	7/13/2004	11:26	78.26	25.7	4.94	528	na	5	199
DIW-P07B	DSR-00371	Sample	7/12/2004	12:54	73.80	23.22	3.76	2070	4140	-38	158
DIW-P07C	DSR-00372	Sample	7/12/2004	13:05	73.15	22.86	3.7	2048	4310	-42	155
DIW-P13A	NA	Sample	7/13/2004	10:59	77.36	25.2	5.18	1539	3500	-8.4	186
DIW-P13B	NA	Sample	7/12/2004	14:01	72.32	22.4	3.8	2603	3700	-11	186
DIW-P13C	NA	Sample	7/12/2004	14:11	71.08	21.71	3.69	2796	5980	-5	193
DIW-P09A	NA	Sample	7/13/2004	10:36	76.53	24.74	4.24	584	3950	37	232
DIW-P09B	NA	Sample	7/12/2004	13:16	74.34	23.52	3.85	1065	5480	-42	154
DIW-P09C	NA	Sample	7/12/2004	13:23	71.67	22.04	2.03	6721	3990	93	290
DIW-P03A	NA	Sample	7/13/2004	9:33	74.97	23.87	4.62	367	4950	8.2	204
DIW-P03B	NA	Sample	7/12/2004	14:22	73.78	23.21	5.11	686	2400	-3.5	193
DIW-P03C	NA	Sample	7/12/2004	9:44	72.86	22.7	5.15	599	2570	27	224
DIW-P05A	NA	Sample	7/13/2004	10:15	74.66	23.7	4.75	678	4540	-4.8	191
DIW-P05B	NA	Sample	7/12/2004	14:31	73.87	23.26	4.34	1627	5930	-33	163
DIW-P05C	NA	Sample	7/12/2004	13:33	72.86	22.7	4.25	1839	6560	-58	139

Pre-Injection EBS Analytical Results								Pre-Injection EBS Analytical Results
Well / Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Hydrogen Sulfide (mg/L)	Analysis Date	SRB (cells/ml)	Comments
DCB-8	DSR-00300	11/3/2003	Sample	11/10/2003	0.3557	2/3/2004	1.86E+03	
DCB-21A	DSR-00301	11/3/2003	Sample	11/10/2003	0.6324	2/3/2004	<7.20E+00	
DCB-22C	DSR-00302	11/3/2003	Sample	11/10/2003	0.9486	2/3/2004	<7.20E+00	
DCB-70B	DSR-00303	11/3/2003	Sample	11/10/2003	0.4743	2/3/2004	7.20E+00	
DCB-19A	DSR-00304	11/3/2003	Sample	11/10/2003	0.3557	2/3/2004	<7.20E+00	
DCB-18C	DSR-00305	11/3/2003	Sample	11/10/2003	1.1858	2/3/2004	7.20E+00	
DIW-P11A	DSR-00306	11/4/2003	Sample	11/10/2003	93.8735	2/3/2004	2.40E+06	
DIW-P11B	DSR-00307	11/4/2003	Sample	11/10/2003	513.0435	2/3/2004	3.00E+03	
DIW-P11C	DSR-00308	11/4/2003	Sample	11/10/2003	16.4427	2/3/2004	1.86E+03	
DIW-1-2	DSR-00309	11/4/2003	Sample	11/10/2003	8.4190	2/3/2004	4.80E+04	
DIW-P07A	DSR-00310	11/4/2003	Sample	11/10/2003	3.7549	2/3/2004	3.00E+06	
DIW-P07B	DSR-00311	11/4/2003	Sample	11/10/2003	1.5415	2/3/2004	1.86E+03	
DIW-P07C	DSR-00312	11/4/2003	Sample	11/10/2003	2.8063	2/3/2004	8.60E+02	

1st Post Injection EBS Analytical Results								
Well / Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Hydrogen Sulfide (mg/L)	Analysis Date	SRB (cells/ml)	Comments
DCB-8	DSR-00320	2/3/2004	Sample	2/11/2004	0.739	5/5/2004	8.60E+01	
DCB-21A	DSR-00321	2/3/2004	Sample	2/11/2004	0.022	5/5/2004	<7.20E+00	
DCB-22C	DSR-00322	2/3/2004	Sample	2/11/2004	<0.001	5/5/2004	<7.20E+00	
DCB-70B	DSR-00323	2/3/2004	Sample	2/11/2004	<0.001	5/5/2004	1.84E+01	
DCB-19A	DSR-00324	2/3/2004	Sample	2/11/2004	0.130	5/5/2004	7.20E+00	
DCB-18C	DSR-00325	2/3/2004	Sample	2/11/2004	0.326	5/5/2004	4.60E+01	
DIW-P11A	DSR-00326	2/3/2004	Sample	2/11/2004	138.261	5/5/2004	4.80E+04	
DIW-P11B	DSR-00327	2/3/2004	Sample	2/11/2004	1006.522	5/5/2004	4.80E+02	
DIW-P11C	DSR-00328	2/3/2004	Sample	2/11/2004	295.652	5/5/2004	4.00E+02	
DIW-1-2	DSR-00329	2/3/2004	Sample	2/11/2004	26.087	5/5/2004	7.20E+03	
DIW-P07A	DSR-00330	2/3/2004	Sample	2/11/2004	0.413	5/5/2004	9.20E+07	
DIW-P07B	DSR-00331	2/3/2004	Sample	2/11/2004	223.913	5/5/2004	8.60E+01	
DIW-P07C	DSR-00332	2/3/2004	Sample	2/11/2004	197.826	5/5/2004	1.86E+02	

Well / Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Hydrogen Sulfide (mg/L)	Analysis Date	SRB (cells/ml)	Comments
DCB-8	DSR-00340	5/3/2004	Sample	5/10/2004	<0.001	7/21/2004	1.50E+02	
DCB-21A	DSR-00341	5/3/2004	Sample	5/10/2004	<0.001	7/21/2004	<7.20E+00	
DCB-22C	DSR-00342	5/3/2004	Sample	5/10/2004	<0.001	7/21/2004	<7.20E+00	
DCB-70B	DSR-00343	5/3/2004	Sample	5/10/2004	<0.001	7/21/2004	<7.20E+00	
DCB-19A	DSR-00344	5/3/2004	Sample	5/10/2004	<0.001	7/21/2004	7.20E+00	
DCB-18C	DSR-00345	5/3/2004	Sample	5/10/2004	<0.001	7/21/2004	7.20E+00	
DIW-P11A	DSR-00346	5/3/2004	Sample	5/10/2004	0.3600563	7/21/2004	4.20E+02	
DIW-P11B	DSR-00347	5/3/2004	Sample	5/10/2004	0.3190372	7/21/2004	1.86E+02	
DIW-P11C	DSR-00348	5/3/2004	Sample	5/10/2004	0.3549289	7/21/2004	1.86E+02	
DIW-1-2	DSR-00349	5/3/2004	Sample	5/10/2004	0.1317453	7/21/2004	4.80E+06	
DIW-P07A	DSR-00350					8/26/2004	6.00E+06	Results not availiable
DIW-P07B	DSR-00351	5/3/2004	Sample	5/10/2004	0.3831295	7/21/2004	9.20E+02	
DIW-P07C	DSR-00352	5/3/2004	Sample	5/10/2004	0.3688868	7/21/2004	8.60E+01	

Well / Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Hydrogen Sulfide (mg/L)	Analysis Date	SRB (cells/ml)	Comments
DCB-8	DSR-00360	7/12/2004	Sample	7/15/2004	0.236	10/15/2004	1.86E+02	
DCB-21A	DSR-00361	7/12/2004	Sample	7/15/2004	0.189	10/15/2004	7.20E+00	
DCB-22C	DSR-00362	7/12/2004	Sample	7/15/2004	0.189	10/15/2004	<7.20E+00	
DCB-70B	DSR-00363	7/12/2004	Sample	7/15/2004	0.071	10/15/2004	<7.20E+00	
DCB-19A	DSR-00364	7/12/2004	Sample	7/15/2004	0.165	10/15/2004	<7.20E+00	
DCB-18C	DSR-00365	7/12/2004	Sample	7/15/2004	0.024	10/15/2004	7.20E+00	
DIW-P11A	DSR-00366	7/13/2004	Sample	7/15/2004	548.463	10/15/2004	9.20E+02	
DIW-P11B	DSR-00367	7/13/2004	Sample	7/15/2004	423.641	10/15/2004	1.50E+03	
DIW-P11C	DSR-00368	7/12/2004	Sample	7/15/2004	416.832	10/15/2004	8.60E+01	
DIW-1-2	DSR-00369	7/13/2004	Sample	7/15/2004	248.511	10/15/2004	4.80E+06	
DIW-P07A	DSR-00370	7/13/2004	Sample	7/15/2004	11.040	10/15/2004	4.80E+07	
DIW-P07B	DSR-00371	7/12/2004	Sample	7/15/2004	235.650	10/15/2004	8.60E+02	
DIW-P07C	DSR-00372	7/12/2004	Sample	7/15/2004	239.433	10/15/2004	1.86E+02	

Part 2 Pre-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Potassuim (mg/L)	Magnesium (mg/L)
DCB-8	DSR-00300	11/3/2003	Sample	11/5/2003	0.021	<0.010	<0.010	0.451	<0.010	<0.010	0.017	2.08	0.433	0.434
DCB-21A	DSR-00301	11/3/2003	Sample	11/5/2003	285	<0.010	<0.010	94.1	<0.010	0.076	1.01	250	0.433	88.8
DCB-22C	DSR-00302	11/3/2003	Sample	11/5/2003	2.46	<0.010	<0.010	122	<0.010	<0.010	<0.010	7.35	2.21	40.1
DCB-70B	DSR-00303	11/3/2003	Sample	11/5/2003	2.13	<0.010	<0.010	20.9	<0.010	<0.010	<0.010	3.52	2.93	14.8
DCB-19A	DSR-00304	11/3/2003	Sample	11/5/2003	302	<0.010	<0.010	105	<0.010	0.070	0.807	128	0.715	80.5
DCB-18C	DSR-00305	11/3/2003	Sample	11/5/2003	120	<0.010	<0.010	132	<0.010	<0.010	0.106	118	4.20	66.8
DIW-P11A	DSR-00306	11/4/2003	Sample	11/5/2003	25.6	0.019	<0.010	39.0	<0.010	<0.010	<0.010	161	1.75	30.4
DIW-P11B	DSR-00307	11/4/2003	Sample	11/5/2003	164	<0.010	<0.010	72.4	<0.010	<0.010	<0.010	301	1.68	56.8
DIW-P11C	DSR-00308	11/4/2003	Sample	11/5/2003	302	<0.010	<0.010	115	0.053	0.092	<0.010	1035	4.40	105
DIW-1-2	DSR-00309	11/4/2003	Sample	11/5/2003	0.207	<0.010	<0.010	38.9	<0.010	<0.010	<0.010	75.7	2.90	24.4
DIW-P07A	DSR-00310	11/4/2003	Sample	11/5/2003	0.358	0.065	<0.010	64.9	<0.010	<0.010	<0.010	107	3.57	59.2
DIW-P07B	DSR-00311	11/4/2003	Sample	11/5/2003	263	<0.010	<0.010	99.0	<0.010	<0.010	<0.010	125	2.77	61.4
DIW-P07C	DSR-00312	11/4/2003	Sample	11/5/2003	228	<0.010	<0.010	96.0	<0.010	<0.010	<0.010	131	2.56	58.6
DIW-P11B	DSR-00313	11/4/2003	Duplicate	11/5/2003	164	<0.010	<0.010	70.1	<0.010	<0.010	<0.010	293	1.63	56.4
	Red highlight means that there is no dat													

Part 2 First Post Injection SRTC Mobile Laboratory Analytical Results

Well / Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Potassuim (mg/L)	Magnesium (mg/L)
DCB-8	DSR-00320	2/3/2004	Sample	2/19/2004	0.128	<0.002	<0.010	0.568	<0.003	<0.002	0.032	1.74	0.590	0.473
DCB-21A	DSR-00321	2/3/2004	Sample	2/19/2004	317	<0.002	<0.010	91.1	<0.003	0.146	1.23	313	0.393	88.0
DCB-22C	DSR-00322	2/3/2004	Sample	2/19/2004	1.39	<0.002	<0.010	75.3	<0.003	<0.002	0.025	2.73	1.72	27.0
DCB-70B	DSR-00323	2/3/2004	Sample	2/19/2004	1.08	<0.002	<0.010	9.49	<0.003	<0.002	0.040	0.447	1.84	6.64
DCB-19A	DSR-00324	2/3/2004	Sample	2/19/2004	210	<0.002	<0.010	67.6	<0.003	0.037	0.681	53.2	0.707	60.8
DCB-18C	DSR-00325	2/3/2004	Sample	2/19/2004	99.6	<0.002	<0.010	109	<0.003	<0.002	0.166	108	3.42	61.6
DIW-P11A	DSR-00326	2/3/2004	Sample	2/19/2004	68.8	0.357	<0.010	47.9	<0.003	0.006	0.022	144	1.61	37.8
DIW-P11B	DSR-00327	2/3/2004	Sample	2/19/2004	242	<0.002	<0.010	80.7	<0.003	0.094	0.022	228	2.09	71.7
DIW-P11C	DSR-00328	2/3/2004	Sample	2/19/2004	346	<0.002	<0.010	109	<0.003	0.187	0.021	515	3.38	112
DIW-1-2	DSR-00329	2/3/2004	Sample	2/19/2004	0.763	0.021	<0.010	36.5	<0.003	0.079	0.021	138	2.69	23.6
DIW-P07A	DSR-00330	2/3/2004	Sample	2/19/2004	0.219	0.057	<0.010	44.0	<0.003	<0.002	0.021	105	2.46	27.8
DIW-P07B	DSR-00331	2/3/2004	Sample	2/19/2004	147	<0.002	<0.010	81.5	<0.003	<0.002	0.021	145	2.29	56.0
DIW-P07C	DSR-00332	2/3/2004	Sample	2/19/2004	132	<0.002	<0.010	80.4	<0.003	<0.002	0.021	129	2.29	53.8
DIW-P11B	DSR-00333	2/3/2004	Duplicate	2/19/2004	242	<0.002	<0.010	80.6	<0.003	0.094	0.024	232	2.06	72.8

Part 2 Pre-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Manganese (mg/L)	Sodium (mg/L)	Nickel (mg/L)	Lead (mg/L)	Silicon (mg/L)	Zinc (mg/L)	Analysis Date	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)	Analysis Date	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
DCB-8	<0.010	15.0	<0.020	<0.020	4.89	<0.010	11/5/2003	<Detect	<Detect	11/5/2003	3.58	<1.00	2.70	1.32
DCB-21A	6.910	4.35	1.14	<0.020	104	3.78	11/5/2003	0.10	24.03	11/5/2003	2.06	<1.00	<1.00	6000
DCB-22C	2.310	4.65	<0.020	<0.020	12.7	<0.010	11/5/2003	1.00	7.35	11/5/2003	4.33	<1.00	<1.00	1330
DCB-70B	0.188	17.6	<0.020	<0.020	6.16	<0.010	11/5/2003	1.00	3.52	11/5/2003	3.78	<1.00	<1.00	227
DCB-19A	8.03	4.48	1.05	<0.020	102	3.09	11/5/2003	0.06	8.20	11/5/2003	1.96	<1.00	<1.00	9200
DCB-18C	16.4	8.08	0.591	<0.020	18.5	1.40	11/5/2003	1.00	118.00	11/5/2003	4.60	<1.00	<1.00	3040
DIW-P11A	4.97	11.1	<0.020	<0.020	25.8	<0.010	11/5/2003	1.00	161.00	11/5/2003	2.24	<1.00	<1.00	1320
DIW-P11B	6.50	5.51	0.423	<0.020	79.4	<0.010	11/5/2003	1.00	301.00	11/5/2003	2.12	<1.00	<1.00	6230
DIW-P11C	10.2	10.7	0.953	<0.020	103	2.72	11/5/2003	1.00	1035.00	11/5/2003	2.86	<1.00	<1.00	11000
DIW-1-2	4.03	28.9	<0.020	<0.020	19.2	<0.010	11/5/2003	1.00	75.70	11/5/2003	3.05	<1.00	<1.00	3.90
DIW-P07A	22.2	34.8	<0.020	<0.020	9.57	<0.010	11/5/2003	1.00	107.00	11/5/2003	4.07	<1.00	<1.00	190
DIW-P07B	8.41	18.6	0.769	<0.020	41.0	1.30	11/5/2003	1.00	125.00	11/5/2003	4.18	<1.00	<1.00	7120
DIW-P07C	11.4	12.7	0.754	<0.020	37.3	1.54	11/5/2003	1.00	131.00	11/5/2003	3.99	<1.00	<1.00	7030
DIW-P11B	6.39	5.80	0.418	<0.020	78.2	<0.010	11/5/2003	1.00	293.00	11/5/2003	2.24	<1.00	<1.00	6800
	Red highlight means that there is no dat													

Part 2 First Post Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Manganese (mg/L)	Sodium (mg/L)	Nickel (mg/L)	Lead (mg/L)	Silicon (mg/L)	Zinc (mg/L)	Analysis Date	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)	Analysis Date	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
DCB-8	<0.001	1.84	<0.010	<0.017	4.44	<0.001	2/19/2004	<Detect	<Detect	2/19/2004	5.00	<1.00	2.28	2.44
DCB-21A	8.65	3.08	1.34	<0.017	18.5	5.54	2/19/2004	0	0	2/19/2004	1.91	<1.00	1.42	7520
DCB-22C	1.69	3.70	0.003	<0.017	11.4	<0.001	2/19/2004	<Detect	<Detect	2/19/2004	12.6	<1.00	<1.00	482
DCB-70B	0.064	12.1	<0.010	<0.017	6.44	0.026	2/19/2004	<Detect	<Detect	2/19/2004	3.71	<1.00	<1.00	124
DCB-19A	8.34	2.88	0.921	<0.017	76.3	2.77	2/19/2004	0.00	0	2/19/2004	1.73	<1.00	2.21	3360
DCB-18C	12.26	8.13	0.598	<0.017	17.1	1.46	2/19/2004	1.00	108	2/19/2004	4.54	<1.00	<1.00	2710
DIW-P11A	5.67	11.1	0.218	<0.017	27.2	0.166	2/19/2004	1.00	144	2/19/2004	2.13	<1.00	<1.00	1960
DIW-P11B	8.31	5.74	0.819	<0.017	63.5	0.782	2/19/2004	1.00	228	2/19/2004	1.87	<1.00	1.97	11600
DIW-P11C	9.96	7.74	1.36	<0.017	98.2	0.799	2/19/2004	1.00	515	2/19/2004	2.48	<1.00	<1.00	14100
DIW-1-2	4.09	13.7	<0.010	<0.017	15.8	<0.001	2/19/2004	1.00	138	2/19/2004	7.42	<1.00	<1.00	173
DIW-P07A	10.8	14.7	<0.010	<0.017	6.34	<0.001	2/19/2004	1.00	105	2/19/2004	2.39	<1.00	<1.00	16.0
DIW-P07B	8.65	13.6	0.594	<0.017	25.7	<0.001	2/19/2004	1.00	145	2/19/2004	4.49	<1.00	<1.00	9980
DIW-P07C	9.23	9.11	0.694	<0.017	26.3	<0.001	2/19/2004	1.00	129	2/19/2004	4.29	<1.00	<1.00	7070
DIW-P11B	8.35	5.67	0.818	<0.017	63.9	0.781	2/19/2004			2/19/2004	1.89	<1.00	1.99	13800

Part 2 Second Post Injection SRTC Mobile Laboratory Analytical Results

Well / Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Potassuim (mg/L)	Magnesium (mg/L)
DCB-8	DSR-00340	5/3/2004	Sample	5/18/2004	0.082	<0.001	<0.001	0.610	<0.008	<0.005	0.047	1.01	0.426	0.507
DCB-21A	DSR-00341	5/3/2004	Sample	5/18/2004	277	<0.001	<0.001	79.6	<0.008	0.093	0.809	114	0.500	68.6
DCB-22C	DSR-00342	5/3/2004	Sample	5/18/2004	1.54	<0.001	<0.001	84.1	<0.008	<0.005	0.010	2.56	2.01	29.2
DCB-70B	DSR-00343	5/3/2004	Sample	5/18/2004	1.18	<0.001	<0.001	11.2	<0.008	<0.005	0.032	0.665	2.01	7.41
DCB-19A	DSR-00344	5/3/2004	Sample	5/18/2004	115	<0.001	<0.001	60.0	<0.008	0.010	0.333	26.4	0.494	34.8
DCB-18C	DSR-00345	5/3/2004	Sample	5/18/2004	86.9	<0.001	<0.001	110	<0.008	<0.005	0.149	96.9	3.61	57.1
DIW-P11A	DSR-00346	5/3/2004	Sample	5/18/2004	154	<0.001	<0.001	59.9	<0.008	0.020	0.007	95	1.22	46.8
DIW-P11B	DSR-00347	5/3/2004	Sample	5/18/2004	193	<0.001	<0.001	64.6	<0.008	0.047	0.006	90.8	1.04	53.8
DIW-P11C	DSR-00348	5/3/2004	Sample	5/18/2004	246	<0.001	<0.001	90.3	<0.008	0.105	0.007	270	1.46	70.3
DIW-1-2	DSR-00349	5/3/2004	Sample	5/18/2004	3.04	<0.001	<0.001	25.6	<0.008	0.090	0.013	68.3	2.44	16.8
DIW-P07A	DSR-00350													
DIW-P07B	DSR-00351	5/3/2004	Sample	5/18/2004	166	<0.001	<0.001	100	<0.008	<0.005	0.008	153	2.59	59.3
DIW-P07C	DSR-00352	5/3/2004	Sample	5/18/2004	165	<0.001	<0.001	96.0	<0.008	<0.005	0.006	133	2.48	58.3
DIW-P11B	DSR-00353	5/3/2004	Duplicate	5/18/2004	193	<0.001	<0.001	64.3	<0.008	0.050	0.007	90.7	1.04	53.9

Part 2 Third Post Injection SRTC Mobile Laboratory Analytical Results

Well / Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Potassuim (mg/L)	Magnesium (mg/L)
DCB-8	DSR-00360	7/12/2004	Sample	7/21/2004	0.110	<0.001	<0.001	0.324	<0.008	<0.005	0.034	0.915	0.269	0.428
DCB-21A	DSR-00361	7/12/2004	Sample	7/21/2004	153	<0.001	<0.001	52.0	<0.008	0.046	0.520	60.0	0.590	43.2
DCB-22C	DSR-00362	7/12/2004	Sample	7/21/2004	1.11	<0.001	<0.001	82.9	<0.008	<0.005	<0.001	2.50	1.89	27.9
DCB-70B	DSR-00363	7/12/2004	Sample	7/21/2004	2.74	<0.001	<0.001	21.3	<0.008	<0.005	0.002	2.42	2.60	15.8
DCB-19A	DSR-00364	7/12/2004	Sample	7/21/2004	60.9	<0.001	<0.001	38.2	<0.008	<0.005	0.188	12.6	0.792	20.0
DCB-18C	DSR-00365	7/12/2004	Sample	7/21/2004	87.0	<0.001	<0.001	107	<0.008	<0.005	0.114	93.3	3.54	54.6
DIW-P11A	DSR-00366	7/13/2004	Sample	7/21/2004	126	<0.001	<0.001	57.0	<0.008	0.023	<0.001	137	1.96	44.0
DIW-P11B	DSR-00367	7/13/2004	Sample	7/21/2004	173	<0.001	<0.001	59.2	<0.008	0.062	<0.001	80.5	0.812	48.9
DIW-P11C	DSR-00368	7/12/2004	Sample	7/21/2004	287	<0.001	<0.001	100	<0.008	0.169	<0.001	462	1.19	92.2
DIW-1-2	DSR-00369	7/13/2004	Sample	7/21/2004	1.61	0.089	<0.001	17.1	<0.008	0.100	<0.001	80.9	2.26	8.47
DIW-P07A	DSR-00370	7/13/2004	Sample	7/21/2004	0.223	0.031	<0.001	34.3	<0.008	<0.005	<0.001	77.4	2.79	18.6
DIW-P07B	DSR-00371	7/12/2004	Sample	7/21/2004	138	<0.001	<0.001	110	<0.008	<0.005	<0.001	175	2.91	60.0
DIW-P07C	DSR-00372	7/12/2004	Sample	7/21/2004	152	<0.001	<0.001	104	<0.008	<0.005	<0.001	156	2.62	60.8
DIW-P11B	DSR-00373	7/13/2004	Duplicate	7/21/2004	174	<0.001	<0.001	58.7	<0.008	0.061	<0.001	80.9	0.806	48.7

Part 2 First Post Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Manganese (mg/L)	Sodium (mg/L)	Nickel (mg/L)	Lead (mg/L)	Silicon (mg/L)	Zinc (mg/L)	Analysis Date	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)	Analysis Date	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
DCB-8	<0.001	2.81	<0.020	<0.020	4.42	<0.001	5/18/2004	<Detect	<Detect	5/18/2004	3.61	<1.00	3.07	1.01
DCB-21A	6.90	3.80	0.994	<0.020	82.0	3.97	5/18/2004	0	0	5/18/2004	1.77	<1.00	2.81	7580
DCB-22C	1.99	4.99	<0.020	<0.020	11.8	<0.001	5/18/2004	<Detect	<Detect	5/18/2004	5.15	<1.00	<1.00	454
DCB-70B	0.067	15.2	<0.020	<0.020	6.06	<0.001	5/18/2004	<Detect	<Detect	5/18/2004	3.66	<1.00	<1.00	1550
DCB-19A	5.99	3.42	0.492	<0.020	62.2	1.55	5/18/2004	0	0	5/18/2004	1.68	<1.00	2.25	4430
DCB-18C	11.20	7.97	0.532	<0.020	16.6	1.32	5/18/2004	1	96.9	5/18/2004	4.65	<1.00	<1.00	3500
DIW-P11A	5.58	7.15	0.481	<0.020	66.1	0.043	5/18/2004	1	95	5/18/2004	1.70	<1.00	<1.00	4150
DIW-P11B	5.55	4.05	0.731	<0.020	76.1	1.890	5/18/2004	1	90.8	5/18/2004	1.67	<1.00	<1.00	5410
DIW-P11C	6.97	14.8	0.945	<0.020	84.3	0.827	5/18/2004	1	270	5/18/2004	1.42	<1.00	<1.00	7480
DIW-1-2	3.21	7.34	<0.020	<0.020	21.7	<0.001	5/18/2004	1	68.3	5/18/2004	2.41	<1.00	<1.00	376
DIW-P07A														
DIW-P07B	8.36	18.4	0.555	<0.020	28.7	<0.001	5/18/2004	1	153	5/18/2004	4.28	<1.00	<1.00	6410
DIW-P07C	8.15	14.9	0.700	<0.020	33.1	<0.001	5/18/2004	1	133	5/18/2004	4.63	<1.00	<1.00	5280
DIW-P11B	5.62	4.28	0.737	<0.020	75.8	1.890	5/18/2004	1	90.7	5/18/2004	1.60	<1.00	<1.00	5.48

Part 2 Third Post Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Manganese (mg/L)	Sodium (mg/L)	Nickel (mg/L)	Lead (mg/L)	Silicon (mg/L)	Zinc (mg/L)	Analysis Date	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)	Analysis Date	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
DCB-8	<0.001	2.58	<0.020	<0.020	4.80	<0.001	7/21/2004	<Detect	<Detect	7/21/2004	4.97	<1.00	1.48	<1.00
DCB-21A	4.60	4.88	0.643	<0.020	92.1	2.39	7/21/2004	0	0	7/21/2004	1.59	<1.00	5.22	1880
DCB-22C	1.65	4.11	<0.020	<0.020	11.7	<0.001	7/21/2004	1	2.5	7/21/2004	4.68	<1.00	<1.00	358
DCB-70B	3.11	15.6	0.274	<0.020	5.95	<0.001	7/21/2004	1	2.42	7/21/2004	3.84	<1.00	<1.00	197
DCB-19A	3.11	1.96	0.260	<0.020	95.5	0.837	7/21/2004	0	0	7/21/2004	3.13	<1.00	2.93	1120
DCB-18C	10.7	7.76	0.520	<0.020	17.0	1.34	7/21/2004	1	93.3	7/21/2004	4.78	<1.00	<1.00	1290
DIW-P11A	5.59	7.14	0.260	<0.020	85.1	0.086	7/21/2004	1	137	7/21/2004	2.06	<1.00	<1.00	1520
DIW-P11B	3.11	3.09	0.680	<0.020	95.5	0.460	7/21/2004	1	80.5	7/21/2004	1.75	<1.00	<1.00	2670
DIW-P11C	9.10	4.01	1.29	<0.020	102	4.71	7/21/2004	1	462	7/21/2004	1.75	<1.00	<1.00	5730
DIW-1-2	1.64	6.35	<0.020	<0.020	37.5	<0.001	7/21/2004	1	80.9	7/21/2004	1.91	<1.00	<1.00	162
DIW-P07A	9.00	15.1	<0.020	<0.020	7.22	<0.001	7/21/2004	1	77.4	7/21/2004	2.40	<1.00	<1.00	11.7
DIW-P07B	9.29	20.6	<0.020	<0.020	24.7	<0.001	7/21/2004	1	175	7/21/2004	4.38	<1.00	<1.00	1940
DIW-P07C	62.8	1.49	0.665	<0.020	30.3	<0.001	7/21/2004	1	156	7/21/2004	3.87	<1.00	<1.00	2190
DIW-P11B	5.17	3.15	0.680	<0.020	94.9	0.445	7/21/2004	1	80.9	7/21/2004	1.78	<1.00	<1.00	3010

Part 2 Pre-Injection Field Oil and Water Levels							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	DSR-00300	Field	11/3/2003	9:20	NA	11.67	
DCB-21A	DSR-00301	Field	11/3/2003	9:38	NA	11.35	
DCB-22C	DSR-00302	Field	11/3/2003	9:41	NA	14.17	
DCB-70B	DSR-00303	Field	11/3/2003	9:43	NA	6.29	
DCB-19A	DSR-00304	Field	11/3/2003	9:51	NA	13.6	
DCB-18C	DSR-00305	Field	11/3/2003	9:05	NA	13.5	
DIW-P13A	NA	Field	11/3/2003	9:54	12.16	12.22	
DIW-P13B	NA	Field	11/3/2003	9:39	NA	12.15	
DIW-P14A	NA	Field	11/3/2003	9:40	NA	11.92	
DIW-P11A	DSR-00306	Field	11/3/2003	9:56	12.55	13.26	
DIW-P11B	DSR-00307	Field	11/3/2003	9:36	NA	12.61	
DIW-P11C	DSR-00308	Field	11/3/2003	9:37	NA	12.58	
DIW-P12A	NA	Field	11/3/2003	9:59	12.59	12.66	
DIW-P09A	NA	Field	11/3/2003	10:00	13.14	13.58	
DIW-P09B	NA	Field	11/3/2003	9:30	NA	13.2	
DIW-P10A	NA	Field	11/3/2003	9:32	NA	13.16	
DIW-1-2	DSR-00309	Field	11/3/2003	10:03	14.58	15.34	
DIW-P02A	NA	Field	11/3/2003	9:26	14.82	14.87	
DIW-P03A	NA	Field	11/3/2003	9:15	13.79	14.22	
DIW-P03B	NA	Field	11/3/2003	9:22	NA	13.83	
DIW-P04A	NA	Field	11/3/2003	10:05	13.75	13.93	
DIW-P05A	NA	Field	11/3/2003	10:09	13.79	14.1	
DIW-P05B	NA	Field	11/3/2003	9:50	NA	13.81	
DIW-P06A	NA	Field	11/3/2003	10:08	13.81	13.93	
DIW-07A	DSR-00310	Field	11/3/2003	9:11	14.16	14.28	
DIW-07B	DSR-00311	Field	11/3/2003	9:08	NA	14.18	
DIW-07C	DSR-00312	Field	11/3/2003	9:07	NA	14.14	
DIW-P08A	NA	Field	11/3/2003	9:10	NA	13.67	

Part 2 Pre-Injection Field Oil and Water Levels Just Prior to Injection							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	------	------	------	------	------	------	
DCB-21A	------	------	------	------	------	------	
DCB-22C	------	------	------	------	------	------	
DCB-70B	------	------	------	------	------	------	
DCB-19A	------	------	------	------	------	------	
DCB-18C	------	------	------	------	------	------	
DIW-P13A	NA	Field	11/10/2003	9:17	12.15	12.19	
DIW-P13B	NA	Field	11/10/2003	8:46	NA	12.14	
DIW-P13C	NA	Field	11/10/2003	8:45	NA	12.17	
DIW-P14A	NA	Field	11/10/2003	8:50	NA	11.91	
DIW-P11A	NA	Field	11/10/2003	9:15	12.55	13.08	
DIW-P11B	NA	Field	11/10/2003	8:42	NA	12.59	
DIW-P11C	NA	Field	11/10/2003	8:42	NA	12.58	
DIW-P12A	NA	Field	11/10/2003	8:52	12.57	12.68	
DIW-P09A	NA	Field	11/10/2003	9:14	13.12	13.57	
DIW-P09B	NA	Field	11/10/2003	8:40	NA	13.17	
DIW-P09C	NA	Field	11/10/2003	8:38	NA	13.17	
DIW-P10A	NA	Field	11/10/2003	8:51	NA	13.14	
DIW-1-2	NA	Field	11/10/2003	9:03	14.57	15.1	
DIW-P02A	NA	Field	11/10/2003	8:55	14.81	14.82	
DIW-P03A	NA	Field	11/10/2003	9:02	13.76	14.18	
DIW-P03B	NA	Field	11/10/2003	8:37	NA	13.8	
DIW-P03C	NA	Field	11/10/2003	8:36	NA	13.8	
DIW-P04A	NA	Field	11/10/2003	8:56	13.74	13.88	
DIW-P05A	NA	Field	11/10/2003	9:01	13.48	14.07	
DIW-P05B	NA	Field	11/10/2003	8:34	NA	13.78	
DIW-P05C	NA	Field	11/10/2003	8:33	NA	13.76	
DIW-P06A	NA	Field	11/10/2003	8:58	13.8	13.87	
DIW-07A	NA	Field	11/10/2003	8:59	14.14	14.25	
DIW-07B	NA	Field	11/10/2003	8:28	NA	14.17	
DIW-07C	NA	Field	11/10/2003	8:29	NA	14.12	
DIW-P08A	NA	Field	11/10/2003	8:27	NA	13.65	

Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DIW-P13C	NA	Field	11/11/2003	14:33	11.9	12.1	Check Following injection
DIW-P11C	NA	Field	11/11/2003	13:34	12.2	12.65	Check Following injection
DIW-P09C	NA	Field	11/11/2003	11:53	12.82	12.9	Check Following injection
DIW-P03C	NA	Field	11/11/2003	8:52	13.65	13.75	Check Following injection
DIW-P05C	NA	Field	11/11/2003	8:45	13.6	13.8	Check Following injection
DIW-07C	NA	Field	11/11/2003	8:33	13.85	15.48	Check Following injection

Water Level Monitoring Only							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	------	------	------	------	------	------	
DCB-21A	------	------	------	------	------	------	
DCB-22C	------	------	------	------	------	------	
DCB-70B	------	------	------	------	------	------	
DCB-19A	------	------	------	------	------	------	
DCB-18C	------	------	------	------	------	------	
DIW-P13A	NA	Field	11/13/2003	8:58	11.8	14.42	
DIW-P13B	NA	Field	11/13/2003	8:59	11.94	13.17	
DIW-P13C	NA	Field	11/13/2003	8:57	11.99	12.3	
DIW-P14A	NA	Field	11/13/2003	8:56	NA	11.81	
DIW-P11A	NA	Field	11/13/2003	9:08	12.31	14.15	
DIW-P11B	NA	Field	11/13/2003	9:01	12.39	13.85	
DIW-P11C	NA	Field	11/13/2003	9:06	12.35	13.4	
DIW-P12A	NA	Field	11/13/2003	9:03	12.45	12.5	
DIW-P09A	NA	Field	11/13/2003	8:46	12.92	14.55	
DIW-P09B	NA	Field	11/13/2003	8:48	13	15	
DIW-P09C	NA	Field	11/13/2003	8:44	12.88	15.26	
DIW-P10A	NA	Field	11/13/2003	8:54	NA	13.04	
DIW-1-2	NA	Field	11/13/2003	8:42	14.34	16.08	
DIW-P02A	NA	Field	11/13/2003	9:10	14.7	14.71	
DIW-P03A	NA	Field	11/13/2003	8:39	13.64	14.11	
DIW-P03B	NA	Field	11/13/2003	8:13	13.66	14.45	
DIW-P03C	NA	Field	11/13/2003	8:40	13.66	13.77	
DIW-P04A	NA	Field	11/13/2003	8:37	13.62	13.74	
DIW-P05A	NA	Field	11/13/2003	8:19	13.56	15.06	
DIW-P05B	NA	Field	11/13/2003	8:16	12.88	23.07	
DIW-P05C	NA	Field	11/13/2003	8:22	13.62	13.8	
DIW-P06A	NA	Field	11/13/2003	8:25	13.68	13.75	
DIW-07A	NA	Field	11/13/2003	8:34	13.58	18.93	
DIW-07B	NA	Field	11/13/2003	8:29	13.12	24.75	
DIW-07C	NA	Field	11/13/2003	8:32	13.82	15.55	
DIW-P08A	NA	Field	11/13/2003	8:28	NA	13.53	

Water Level Monitoring Only							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	------	------	------	------	------	------	
DCB-21A	------	------	------	------	------	------	
DCB-22C	------	------	------	------	------	------	
DCB-70B	------	------	------	------	------	------	
DCB-19A	------	------	------	------	------	------	
DCB-18C	------	------	------	------	------	------	
DIW-P13A	NA	Field	11/18/2003	9:03	12.09	14.23	
DIW-P13B	NA	Field	11/18/2003	9:01	12.14	13.34	
DIW-P13C	NA	Field	11/18/2003	8:36	12.2	12.49	
DIW-P14A	NA	Field	11/18/2003	8:17	NA	13.02	
DIW-P11A	NA	Field	11/18/2003	9:00	12.57	13.9	
DIW-P11B	NA	Field	11/18/2003	8:58	12.58	14.08	
DIW-P11C	NA	Field	11/18/2003	8:56	12.55	13.61	
DIW-P12A	NA	Field	11/18/2003	8:34	12.66	12.72	
DIW-P09A	NA	Field	11/18/2003	8:38	13.16	14.38	
DIW-P09B	NA	Field	11/18/2003	9:06	13.18	14.34	
DIW-P09C	NA	Field	11/18/2003	9:08	13.03	15.49	
DIW-P10A	NA	Field	11/18/2003	8:16	NA	13.24	
DIW-1-2	NA	Field	11/18/2003	8:53	14.57	16.02	
DIW-P02A	NA	Field	11/18/2003	8:19	14.9	14.95	
DIW-P03A	NA	Field	11/18/2003	8:42	13.85	14.26	
DIW-P03B	NA	Field	11/18/2003	8:43	13.74	14.63	
DIW-P03C	NA	Field	11/18/2003	8:28	13.92	13.97	
DIW-P04A	NA	Field	11/18/2003	8:29	13.82	14.04	
DIW-P05A	NA	Field	11/18/2003	8:47	13.79	14.88	
DIW-P05B	NA	Field	11/18/2003	9:16	13.1	23.19	
DIW-P05C	NA	Field	11/18/2003	8:24	13.81	14.00	
DIW-P06A	NA	Field	11/18/2003	8:22	13.88	13.99	
DIW-07A	NA	Field	11/18/2003	9:10	13.84	18.56	
DIW-07B	NA	Field	11/18/2003	9:13	13.34	24.78	
DIW-07C	NA	Field	11/18/2003	8:48	14.07	15.75	
DIW-P08A	NA	Field	11/18/2003	8:18	NA	13.73	
Water Level Monitoring Only							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DIW-P13B	NA	Field	11/21/2003	11:22	12.27	12.28	
DIW-P13C	NA	Field	11/21/2003	11:24	NA	12.31	
DIW-P11B	NA	Field	11/21/2003	11:08	NA	12.72	
DIW-P11C	NA	Field	11/21/2003	11:09	NA	12.74	
DIW-P09B	NA	Field	11/21/2003	10:52	NA	13.31	
DIW-P09C	NA	Field	11/21/2003	10:53	13.32	13.33	
DIW-P03B	NA	Field	11/21/2003	10:14	13.93	13.94	Barely Detectable
DIW-P03C	NA	Field	11/21/2003	10:12	13.9	13.91	Barely Detectable
DIW-P05B	NA	Field	11/21/2003	10:08	NA	13.9	
DIW-P05C	NA	Field	11/21/2003	10:09	NA	13.94	
DIW-07B	NA	Field	11/21/2003	9:48	NA	14.27	
DIW-07C	NA	Field	11/21/2003	9:45	NA	14.23	
This water level set was taken following the removal/pumping of oil from the piezometers listed							

Water Level Monitoring Only							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	------	------	------	------	------	------	
DCB-21A	------	------	------	------	------	------	
DCB-22C	------	------	------	------	------	------	
DCB-70B	------	------	------	------	------	------	
DCB-19A	------	------	------	------	------	------	
DCB-18C	------	------	------	------	------	------	
DIW-P13A	NA	Field	11/25/2003	14:08	12.25	13.33	
DIW-P13B	NA	Field	11/25/2003	13:20	12.31	12.315	
DIW-P13C	NA	Field	11/25/2003	13:21	NA	12.35	
DIW-P14A	NA	Field	11/25/2003	13:19	NA	12.07	
DIW-P11A	NA	Field	11/25/2003	14:07	12.64	13.82	
DIW-P11B	NA	Field	11/25/2003	13:25	12.74	12.745	
DIW-P11C	NA	Field	11/25/2003	13:28	12.76	12.765	
DIW-P12A	NA	Field	11/25/2003	13:30	12.71	12.77	
DIW-P09A	NA	Field	11/25/2003	14:05	13.22	14.33	
DIW-P09B	NA	Field	11/25/2003	13:36	13.34	13.35	
DIW-P09C	NA	Field	11/25/2003	13:35	13.35	13.38	
DIW-P10A	NA	Field	11/25/2003	13:34	NA	13.3	
DIW-1-2	NA	Field	11/25/2003	14:11	14.61	16.15	
DIW-P02A	NA	Field	11/25/2003	14:02	14.97	14.99	
DIW-P03A	NA	Field	11/25/2003	14:00	13.91	14.33	
DIW-P03B	NA	Field	11/25/2003	13:38	sheen	13.97	
DIW-P03C	NA	Field	11/25/2003	13:40	sheen	13.94	
DIW-P04A	NA	Field	11/25/2003	13:42	13.88	14.12	
DIW-P05A	NA	Field	11/25/2003	13:57	13.86	14.81	
DIW-P05B	NA	Field	11/25/2003	13:44	13.95	13.96	
DIW-P05C	NA	Field	11/25/2003	13:45	sheen	13.93	
DIW-P06A	NA	Field	11/25/2003	13:46	13.94	14.08	
DIW-07A	NA	Field	11/25/2003	13:54	13.94	18.15	
DIW-07B	NA	Field	11/25/2003	13:50	NA	14.32	
DIW-07C	NA	Field	11/25/2003	13:51	14.27	14.28	
DIW-P08A	NA	Field	11/25/2003	13:53	NA	13.79	

Tier 1 Water Level Monitoring							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	------	------	------	------	------	------	
DCB-21A	NA	Field	12/2/2003	8:35	NA	12.07	
DCB-22C	NA	Field	12/2/2003	8:42	NA	14.56	
DCB-70B	NA	Field	12/2/2003	8:43	NA	6.65	
DCB-19A	NA	Field	12/2/2003	8:48	NA	14	
DCB-18C	NA	Field	12/2/2003	8:47	NA	13.88	
DIW-P13A	NA	Field	12/2/2003	9:45	12.45	13.55	
DIW-P13B	NA	Field	12/2/2003	9:22	sheen	12.57	
DIW-P13C	NA	Field	12/2/2003	8:37	12.56	12.565	
DIW-P14A	NA	Field	12/2/2003	8:36	NA	12.28	
DIW-P11A	NA	Field	12/2/2003	9:43	12.85	14.08	
DIW-P11B	NA	Field	12/2/2003	9:18	sheen	12.95	
DIW-P11C	NA	Field	12/2/2003	9:20	12.97	12.99	
DIW-P12A	NA	Field	12/2/2003	9:11	12.94	12.99	Difficult to obtain reading
DIW-P09A	NA	Field	12/2/2003	9:41	13.44	14.68	
DIW-P09B	NA	Field	12/2/2003	9:07	sheen	13.54	
DIW-P09C	NA	Field	12/2/2003	9:08	13.56	13.58	
DIW-P10A	NA	Field	12/2/2003	8:41	NA	13.51	
DIW-1-2	NA	Field	12/2/2003	9:38	14.82	16.27	
DIW-P02A	NA	Field	12/2/2003	9:02	15.17	15.18	
DIW-P03A	NA	Field	12/2/2003	9:35	14.11	14.61	
DIW-P03B	NA	Field	12/2/2003	8:59	sheen	14.18	
DIW-P03C	NA	Field	12/2/2003	9:00	sheen	14.15	
DIW-P04A	NA	Field	12/2/2003	9:25	14.08	14.42	
DIW-P05A	NA	Field	12/2/2003	9:30	14.08	14.99	
DIW-P05B	NA	Field	12/2/2003	8:54	14.16	14.17	
DIW-P05C	NA	Field	12/2/2003	8:55	14.12	14.15	
DIW-P06A	NA	Field	12/2/2003	9:26	14.15	14.28	
DIW-07A	NA	Field	12/2/2003	9:49	14.19	17.97	
DIW-07B	NA	Field	12/2/2003	8:49	sheen	14.54	
DIW-07C	NA	Field	12/2/2003	8:52	14.48	14.49	
DIW-P08A	NA	Field	12/2/2003	8:50	NA	14.01	

Tier 1 Water Level Monitoring							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	NA	Field	12/14/2003	12:47	NA	11.94	
DCB-21A	NA	Field	12/15/2003	13:01	NA	12.09	
DCB-22C	NA	Field	12/15/2003	13:00	NA	14.31	
DCB-70B	NA	Field	12/15/2003	12:59	NA	6.39	
DCB-19A	NA	Field	12/15/2003	13:09	NA	13.85	
DCB-18C	NA	Field	12/15/2003	13:08	NA	13.66	
DIW-P13A	NA	Field	12/15/2003	13:55	12.3	12.91	
DIW-P13B	NA	Field	12/15/2003	13:32	12.32	12.33	
DIW-P13C	NA	Field	12/15/2003	13:33	sheen	12.36	
DIW-P14A	NA	Field	12/15/2003	13:05	NA	12.07	
DIW-P11A	NA	Field	12/15/2003	13:58	12.66	13.74	
DIW-P11B	NA	Field	12/15/2003	13:29	sheen	12.75	
DIW-P11C	NA	Field	12/15/2003	13:31	12.77	12.78	
DIW-P12A	NA	Field	12/15/2003	13:38	12.72	12.9	Difficult to obtain reading
DIW-P09A	NA	Field	12/15/2003	14:00	13.25	14.39	
DIW-P09B	NA	Field	12/15/2003	13:28	sheen	13.34	
DIW-P09C	NA	Field	12/15/2003	13:25	13.36	13.37	
DIW-P10A	NA	Field	12/15/2003	13:07	NA	13.3	
DIW-1-2	NA	Field	12/15/2003	14:05	14.65	15.91	
DIW-P02A	NA	Field	12/15/2003	13:35	sheen	14.97	
DIW-P03A	NA	Field	12/15/2003	14:03	13.91	14.42	
DIW-P03B	NA	Field	12/15/2003	13:18	sheen	13.98	
DIW-P03C	NA	Field	12/15/2003	13:19	13.94	14.48	
DIW-P04A	NA	Field	12/15/2003	13:47	13.9	14.08	
DIW-P05A	NA	Field	12/15/2003	13:52	13.89	14.6	
DIW-P05B	NA	Field	12/15/2003	13:16	13.96	13.97	
DIW-P05C	NA	Field	12/15/2003	13:17	sheen	13.92	
DIW-P06A	NA	Field	12/15/2003	13:50	13.95	14.03	
DIW-07A	NA	Field	12/15/2003	14:09	14.04	17.24	
DIW-07B	NA	Field	12/15/2003	13:12	NA	14.33	
DIW-07C	NA	Field	12/15/2003	13:13	14.28	14.29	
DIW-P08A	NA	Field	12/15/2003	13:11	NA	13.8	

Tier 1 Water Level Monitoring							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	NA	Field	1/5/2004	8:16	NA	11.9	
DCB-21A	NA	Field	1/5/2004	8:28	NA	11.76	
DCB-22C	NA	Field	1/5/2004	8:31	NA	14.34	
DCB-70B	NA	Field	1/5/2004	8:33	NA	6.44	
DCB-19A	NA	Field	1/5/2004	8:39	NA	14.53	
DCB-18C	NA	Field	1/5/2004	8:36	NA	13.64	
DIW-P13A	NA	Field	1/5/2004	9:36	12.23	13.04	
DIW-P13B	NA	Field	1/5/2004	9:06	Comment	12.28	White emulsion layer
DIW-P13C	NA	Field	1/5/2004	9:05	sheen	12.31	
DIW-P14A	NA	Field	1/5/2004	8:30	NA	12.03	
DIW-P11A	NA	Field	1/5/2004	9:38	12.61	13.71	
DIW-P11B	NA	Field	1/5/2004	9:01	12.7	12.71	
DIW-P11C	NA	Field	1/5/2004	9:02	12.71	12.73	
DIW-P12A	NA	Field	1/5/2004	9:08	12.67	12.85	
DIW-P09A	NA	Field	1/5/2004	9:40	13.22	14.1	
DIW-P09B	NA	Field	1/5/2004	8:57	sheen	13.3	
DIW-P09C	NA	Field	1/5/2004	8:58	13.31	13.32	
DIW-P10A	NA	Field	1/5/2004	8:35	NA	13.25	
DIW-1-2	NA	Field	1/5/2004	8:42	14.62	15.88	
DIW-P02A	NA	Field	1/5/2004	8:54	sheen	14.93	
DIW-P03A	NA	Field	1/5/2004	9:33	13.86	14.38	
DIW-P03B	NA	Field	1/5/2004	8:52	13.92	13.93	
DIW-P03C	NA	Field	1/5/2004	9:31	13.84	14.9	
DIW-P04A	NA	Field	1/5/2004	9:19	13.85	13.97	
DIW-P05A	NA	Field	1/5/2004	9:24	13.83	14.46	
DIW-P05B	NA	Field	1/5/2004	8:44	Comment	13.9	White emulsion layer
DIW-P05C	NA	Field	1/5/2004	8:49	sheen	13.88	
DIW-P06A	NA	Field	1/5/2004	9:22	13.92	14.01	
DIW-07A	NA	Field	1/5/2004	9:45	14.05	16.61	
DIW-07B	NA	Field	1/5/2004	8:37	NA	14.27	
DIW-07C	NA	Field	1/5/2004	8:40	sheen	14.22	
DIW-P08A	NA	Field	1/5/2004	8:38	NA	13.75	

Tier 2/3 Water Level Monitoring First Post Sampling							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	DSR-00320	Field	1/30/2004	10:39	NA	11.64	
DCB-21A	DSR-00321	Field	1/30/2004	11:00	NA	11.48	
DCB-22C	DSR-00322	Field	1/30/2004	10:58	NA	14.06	
DCB-70B	DSR-00323	Field	1/30/2004	10:48	NA	6.14	
DCB-19A	DSR-00324	Field	1/30/2004	11:08	NA	13.33	
DCB-18C	DSR-00325	Field	1/30/2004	11:11	NA	13.38	
DIW-P13A	NA	Field	1/30/2004	12:09	12.08	12.4	
DIW-P13B	NA	Field	1/30/2004	12:01	Emulsion	12.11	
DIW-P13C	NA	Field	1/30/2004	12:07	12.11	12.12	
DIW-P14A	NA	Field	1/30/2004	11:04	NA	11.85	
DIW-P11A	DSR-00326	Field	1/30/2004	12:20	12.44	13.47	
DIW-P11B	DSR-00327	Field	1/30/2004	11:51	Sheen	12.52	
DIW-P11C	DSR-00328	Field	1/30/2004	11:53	12.53	12.54	
DIW-P12A	NA	Field	1/30/2004	11:55	12.49	12.72	
DIW-P09A	NA	Field	1/30/2004	12:27	13.04	13.75	
DIW-P09B	NA	Field	1/30/2004	11:42	NA	13.12	
DIW-P09C	NA	Field	1/30/2004	11:46	13.13	13.14	
DIW-P10A	NA	Field	1/30/2004	11:07	NA	13.08	
DIW-1-2	DSR-00329	Field	1/30/2004	12:30	14.45	15.5	
DIW-P02A	NA	Field	1/30/2004	11:35	NA	14.75	
DIW-P03A	NA	Field	1/30/2004	12:17	13.68	14.15	
DIW-P03B	NA	Field	1/30/2004	11:37	NA	13.75	
DIW-P03C	NA	Field	1/30/2004	12:15	13.73	14.11	
DIW-P04A	NA	Field	1/30/2004	11:40	13.68	13.7	
DIW-P05A	NA	Field	1/30/2004	11:33	13.22	13.68	
DIW-P05B	NA	Field	1/30/2004	11:22	NA	13.73	
DIW-P05C	NA	Field	1/30/2004	11:24	NA	13.71	
DIW-P06A	NA	Field	1/30/2004	11:30	NA	13.72	
DIW-07A	DSR-00330	Field	1/30/2004	12:34	13.86	16.25	
DIW-07B	DSR-00331	Field	1/30/2004	11:13	NA	14.1	
DIW-07C	DSR-00332	Field	1/30/2004	11:17	NA	14.05	
DIW-P08A	NA	Field	1/30/2004	11:16	NA	13.58	

Tier 1 Water Level Monitoring 3/9/04							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	NA	Field	3/9/2004	7:58	NA	9.82	
DCB-21A	NA	Field	3/9/2004	8:39	NA	9.21	
DCB-22C	NA	Field	3/9/2004	8:45	NA	12.76	
DCB-70B	NA	Field	3/9/2004	8:49	NA	4.93	
DCB-19A	NA	Field	3/9/2004	8:20	NA	9.01	
DCB-18C	NA	Field	3/9/2004	8:25	NA	11.99	
DIW-P13A	NA	Field	3/9/2004	9:12	10.06	10.1	
DIW-P13B	NA	Field	3/9/2004	9:10	10.02	10.05	Emulsion
DIW-P13C	NA	Field	3/9/2004	9:13	Sheen	10.06	
DIW-P14A	NA	Field	3/9/2004	8:41	NA	9.82	
DIW-P11A	NA	Field	3/9/2004	9:40	10.44	11.18	
DIW-P11B	NA	Field	3/9/2004	8:56	Sheen	10.5	
DIW-P11C	NA	Field	3/9/2004	8:57	10.5	10.51	
DIW-P12A	NA	Field	3/9/2004	8:59	10.48	10.68	Difficult to measure
DIW-P09A	NA	Field	3/9/2004	9:36	10.85	11.02	
DIW-P09B	NA	Field	3/9/2004	8:34	Sheen	11.09	
DIW-P09C	NA	Field	3/9/2004	8:52	11.1	11.4	Difficult to measure
DIW-P10A	NA	Field	3/9/2004	8:36	NA	11.05	
DIW-1-2	NA	Field	3/9/2004	9:33	12.39	13.05	
DIW-P02A	NA	Field	3/9/2004	8:32	NA	12.73	
DIW-P03A	NA	Field	3/9/2004	9:27	11.68	12.05	
DIW-P03B	NA	Field	3/9/2004	8:10	NA	11.74	
DIW-P03C	NA	Field	3/9/2004	9:25	11.7	12.32	
DIW-P04A	NA	Field	3/9/2004	9:22	Sheen	11.61	
DIW-P05A	NA	Field	3/9/2004	9:31	11.65	12.05	
DIW-P05B	NA	Field	3/9/2004	8:12	NA	11.72	
DIW-P05C	NA	Field	3/9/2004	8:13	NA	11.71	
DIW-P06A	NA	Field	3/9/2004	8:18	NA	11.72	
DIW-07A	NA	Field	3/9/2004	9:47	11.9	13.48	
DIW-07B	NA	Field	3/9/2004	8:21	NA	12.05	
DIW-07C	NA	Field	3/9/2004	8:22	NA	12.02	
DIW-P08A	NA	Field	3/9/2004	8:27	NA	11.52	

Pre Injection Second Injection Water Level Monitoring 3/22/04							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	NA	Field	3/22/2004	NA	NA	NA	
DCB-21A	NA	Field	3/22/2004	8:52	NA	9.9	
DCB-22C	NA	Field	3/22/2004	8:54	NA	13.26	
DCB-70B	NA	Field	3/22/2004	8:56	NA	5.38	
DCB-19A	NA	Field	3/22/2004	8:59	NA	9.65	
DCB-18C	NA	Field	3/22/2004	9:00	NA	12.54	
DIW-P13A	NA	Field	3/22/2004	10:04	10.71	10.82	
DIW-P13B	NA	Field	3/22/2004	9:30	Emulsion	10.75	
DIW-P13C	NA	Field	3/22/2004	9:31	NA	10.76	
DIW-P14A	NA	Field	3/22/2004	9:26	NA	10.54	
DIW-P11A	NA	Field	3/22/2004	10:02	11.14	11.9	
DIW-P11B	NA	Field	3/22/2004	9:32	NA	11.2	
DIW-P11C	NA	Field	3/22/2004	9:33	11.2	11.21	
DIW-P12A	NA	Field	3/22/2004	10:00	11.17	11.35	
DIW-P09A	NA	Field	3/22/2004	10:06	11.7	12.52	
DIW-P09B	NA	Field	3/22/2004	9:19	Emulsion	11.8	
DIW-P09C	NA	Field	3/22/2004	9:37	NA	11.78	
DIW-P10A	NA	Field	3/22/2004	9:18	Sheen	11.75	
DIW-1-2	NA	Field	3/22/2004	10:08	13.12	13.81	
DIW-P02A	NA	Field	3/22/2004	9:16	NA	13.43	
DIW-P03A	NA	Field	3/22/2004	9:55	12.36	12.75	
DIW-P03B	NA	Field	3/22/2004	9:14	NA	12.43	
DIW-P03C	NA	Field	3/22/2004	9:57	12.39	13.11	
DIW-P04A	NA	Field	3/22/2004	9:38	NA	12.36	
DIW-P05A	NA	Field	3/22/2004	9:52	12.35	12.74	
DIW-P05B	NA	Field	3/22/2004	9:12	NA	12.39	
DIW-P05C	NA	Field	3/22/2004	9:11	NA	12.41	
DIW-P06A	NA	Field	3/22/2004	9:10	NA	12.41	
DIW-07A	NA	Field	3/22/2004	9:44	12.6	13.85	
DIW-07B	NA	Field	3/22/2004	9:42	NA	12.78	
DIW-07C	NA	Field	3/22/2004	9:43	NA	12.73	
DIW-P08A	NA	Field	3/22/2004	9:04	NA	12.22	

Post Second Injection Injection Water Level Monitoring 3/31/04							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	NA	Field	3/31/2004	13:11	NA	10.5	
DCB-21A	NA	Field	3/31/2004	11:15	NA	10.11	
DCB-22C	NA	Field	3/31/2004	11:16	NA	13.39	
DCB-70B	NA	Field	3/31/2004	11:18	NA	5.53	
DCB-19A	NA	Field	3/31/2004	11:20	NA	9.97	
DCB-18C	NA	Field	3/31/2004	11:21	NA	12.64	
DIW-P13A	NA	Field	3/31/2004	12:27	10.71	14.35	
DIW-P13B	NA	Field	3/31/2004	11:37	10.99	11.00	
DIW-P13C	NA	Field	3/31/2004	11:38	Sheen	11.02	
DIW-P14A	NA	Field	3/31/2004	11:36	NA	10.78	
DIW-P11A	NA	Field	3/31/2004	12:31	11.25	13.51	
DIW-P11B	NA	Field	3/31/2004	11:33	11.45	11.46	
DIW-P11C	NA	Field	3/31/2004	11:34	11.44	11.45	
DIW-P12A	NA	Field	3/31/2004	12:24	11.41	11.61	
DIW-P09A	NA	Field	3/31/2004	12:34	11.77	14.75	
DIW-P09B	NA	Field	3/31/2004	11:31	Sheen	12.02	
DIW-P09C	NA	Field	3/31/2004	11:32	NA	12.02	
DIW-P10A	NA	Field	3/31/2004	11:26	Sheen	12	
DIW-1-2	NA	Field	3/31/2004	10:05	13.21	16.23	
DIW-P02A	NA	Field	3/31/2004	11:29	NA	13.67	
DIW-P03A	NA	Field	3/31/2004	12:16	12.56	13.17	
DIW-P03B	NA	Field	3/31/2004	11:45	12.67	12.8	Emulsion
DIW-P03C	NA	Field	3/31/2004	11:39	12.65	13.15	Emulsion
DIW-P04A	NA	Field	3/31/2004	11:24	Sheen	12.61	
DIW-P05A	NA	Field	3/31/2004	12:14	12.47	14.47	
DIW-P05B	NA	Field	3/31/2004	11:47	Sheen	12.64	
DIW-P05C	NA	Field	3/31/2004	11:50	NA	12.63	
DIW-P06A	NA	Field	3/31/2004	11:23	NA	12.66	
DIW-07A	NA	Field	3/31/2004	12:42	12.46	19.04	
DIW-07B	NA	Field	3/31/2004	11:51	Sheen	13.02	
DIW-07C	NA	Field	3/31/2004	11:52	12.98	13.05	Emulsion
DIW-P08A	NA	Field	3/31/2004	11:22	NA	12.49	

Post Second Injection Injection Water Level Monitoring 4/7/04							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	NA	Field	4/7/2004	8:35	NA	10.86	
DCB-21A	NA	Field	4/7/2004	8:46	NA	10.38	
DCB-22C	NA	Field	4/7/2004	8:48	NA	13.65	
DCB-70B	NA	Field	4/7/2004	8:54	NA	5.77	
DCB-19A	NA	Field	4/7/2004	8:58	NA	10.36	
DCB-18C	NA	Field	4/7/2004	9:00	NA	12.93	
DIW-P13A	NA	Field	4/7/2004	10:25	11.05	14.5	
DIW-P13B	NA	Field	4/7/2004	9:18	11.29	11.37	
DIW-P13C	NA	Field	4/7/2004	9:17	NA	11.31	
DIW-P14A	NA	Field	4/7/2004	9:15	NA	11.07	
DIW-P11A	NA	Field	4/7/2004	10:10	11.57	13.67	
DIW-P11B	NA	Field	4/7/2004	9:21	11.72	11.85	
DIW-P11C	NA	Field	4/7/2004	9:25	11.72	11.73	
DIW-P12A	NA	Field	4/7/2004	10:05	11.72	11.91	
DIW-P09A	NA	Field	4/7/2004	10:21	12.09	14.98	
DIW-P09B	NA	Field	4/7/2004	9:31	Sheen	12.33	
DIW-P09C	NA	Field	4/7/2004	9:28	Sheen	12.32	
DIW-P10A	NA	Field	4/7/2004	9:09	NA	12.27	
DIW-1-2	NA	Field	4/7/2004	10:16	13.46	16.75	
DIW-P02A	NA	Field	4/7/2004	9:08	NA	13.97	
DIW-P03A	NA	Field	4/7/2004	9:57	12.9	13.55	
DIW-P03B	NA	Field	4/7/2004	9:53	12.98	13.1	
DIW-P03C	NA	Field	4/7/2004	9:50	12.95	12.98	
DIW-P04A	NA	Field	4/7/2004	9:30	NA	12.9	
DIW-P05A	NA	Field	4/7/2004	10:14	12.75	14.96	
DIW-P05B	NA	Field	4/7/2004	9:41	12.93	13.09	
DIW-P05C	NA	Field	4/7/2004	9:38	12.92	12.93	
DIW-P06A	NA	Field	4/7/2004	9:05	NA	12.95	
DIW-07A	NA	Field	4/7/2004	10:30	12.8	18.8	
DIW-07B	NA	Field	4/7/2004	9:43	13.31	13.32	
DIW-07C	NA	Field	4/7/2004	9:45	13.28	13.32	
DIW-P08A	NA	Field	4/7/2004	9:03	NA	12.78	

Post Second Injection Injection Tier 1 Water Level Monitoring 4/19/04							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	NA	Field	4/19/2004	9:32	NA	11.36	
DCB-21A	NA	Field	4/19/2004	9:51	NA	10.94	
DCB-22C	NA	Field	4/19/2004	9:53	NA	14.06	
DCB-70B	NA	Field	4/19/2004	9:54	NA	6.17	
DCB-19A	NA	Field	4/19/2004	9:57	NA	11.17	
DCB-18C	NA	Field	4/19/2004	9:56	NA	13.37	
DIW-P13A	NA	Field	4/19/2004	10:49	11.45	15.85	Verfied Reading
DIW-P13B	NA	Field	4/19/2004	10:34	11.79	11.89	
DIW-P13C	NA	Field	4/19/2004	10:04	sheen	11.82	
DIW-P14A	NA	Field	4/19/2004	10:02	NA	11.56	
DIW-P11A	NA	Field	4/19/2004	10:47	12.08	13.94	
DIW-P11B	NA	Field	4/19/2004	10:07	12.22	12.32	
DIW-P11C	NA	Field	4/19/2004	10:06	sheen	12.22	
DIW-P12A	NA	Field	4/19/2004	10:36	12.2	12.41	
DIW-P09A	NA	Field	4/19/2004	10:45	12.61	15.15	
DIW-P09B	NA	Field	4/19/2004	10:12	Na	12.82	
DIW-P09C	NA	Field	4/19/2004	10:08	Sheen	12.82	
DIW-P10A	NA	Field	4/19/2004	10:03	NA	12.78	
DIW-1-2	NA	Field	4/19/2004	10:51	13.99	16.95	
DIW-P02A	NA	Field	4/19/2004	10:01	NA	14.46	
DIW-P03A	NA	Field	4/19/2004	10:38	13.37	14.12	
DIW-P03B	NA	Field	4/19/2004	10:31	13.46	13.63	
DIW-P03C	NA	Field	4/19/2004	10:14	13.44	13.64	
DIW-P04A	NA	Field	4/19/2004	10:00	NA	13.4	
DIW-P05A	NA	Field	4/19/2004	10:42	13.29	15.05	
DIW-P05B	NA	Field	4/19/2004	10:26	13.43	13.65	
DIW-P05C	NA	Field	4/19/2004	10:16	13.4	13.41	
DIW-P06A	NA	Field	4/19/2004	9:59	NA	13.43	
DIW-07A	NA	Field	4/19/2004	10:55	13.33	18.87	
DIW-07B	NA	Field	4/19/2004	10:19	Emulsion	13.82	
DIW-07C	NA	Field	4/19/2004	10:23	13.77	13.81	
DIW-P08A	NA	Field	4/19/2004	9:58	NA	13.28	

Post Second Injection Injection Tier 2 & 3 Water Level Monitoring 5/3/04							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	DSR-00340	Field	5/3/2004	8:58	NA	11.52	
DCB-21A	DSR-00341	Field	5/3/2004	8:54	NA	11.21	
DCB-22C	DSR-00342	Field	5/3/2004	8:55	NA	14.15	
DCB-70B	DSR-00343	Field	5/3/2004	8:57	NA	6.26	
DCB-19A	DSR-00344	Field	5/3/2004	8:50	NA	12.22	
DCB-18C	DSR-00345	Field	5/3/2004	8:52	NA	13.48	
DIW-P13A	NA	Field	5/3/2004	9:59	11.66	16.06	
DIW-P13B	NA	Field	5/3/2004	9:33	12.00	12.02	
DIW-P13C	NA	Field	5/3/2004	9:32	NA	12.04	
DIW-P14A	NA	Field	5/3/2004	9:31	NA	11.77	
DIW-P11A	DSR-00346	Field	5/3/2004	9:38	12.28	14.07	
DIW-P11B	DSR-00347	Field	5/3/2004	9:28	12.43	12.44	
DIW-P11C	DSR-00348	Field	5/3/2004	9:26	NA	12.42	
DIW-P12A	NA	Field	5/3/2004	9:34	12.41	12.62	
DIW-P09A	NA	Field	5/3/2004	9:54	12.82	15.25	
DIW-P09B	NA	Field	5/3/2004	9:23	NA	13.03	
DIW-P09C	NA	Field	5/3/2004	9:24	13.02	13.03	
DIW-P10A	NA	Field	5/3/2004	9:22	NA	13	
DIW-1-2	DSR-00349	Field	5/3/2004	9:50	14.3	16.63	
DIW-P02A	NA	Field	5/3/2004	9:21	NA	14.66	
DIW-P03A	NA	Field	5/3/2004	9:41	13.51	14.83	
DIW-P03B	NA	Field	5/3/2004	9:15	13.67	13.7	
DIW-P03C	NA	Field	5/3/2004	9:17	13.65	13.89	
DIW-P04A	NA	Field	5/3/2004	9:14	NA	13.59	
DIW-P05A	NA	Field	5/3/2004	9:47	13.51	15.11	
DIW-P05B	NA	Field	5/3/2004	9:12	13.64	13.66	
DIW-P05C	NA	Field	5/3/2004	9:10	13.61	13.62	
DIW-P06A	NA	Field	5/3/2004	9:09	NA	13.64	
DIW-07A	DSR-00350	Field	5/3/2004	10:03	13.57	18.75	
DIW-07B	DSR-00351	Field	5/3/2004	9:03	14.03	14.05	
DIW-07C	DSR-00352	Field	5/3/2004	9:05	13.97	13.99	
DIW-P08A	NA	Field	5/3/2004	9:07	NA	13.48	

Post Second Injection Injection Tier 1 Water Level Monitoring 5/24/04							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8		Field	5/24/2004	8:49	NA	11.97	
DCB-21A		Field	5/24/2004	9:13	NA	11.34	
DCB-22C		Field	5/24/2004	9:14	NA	14.59	
DCB-70B		Field	5/24/2004	9:15	NA	6.72	
DCB-19A		Field	5/24/2004	9:07	NA	12.4	
DCB-18C		Field	5/24/2004	9:09	NA	13.89	
DIW-P13A		Field	5/24/2004	10:20	11.94	16.7	
DIW-P13B		Field	5/24/2004	9:22	12.30	12.33	
DIW-P13C		Field	5/24/2004	9:21	NA	12.35	
DIW-P14A		Field	5/24/2004	9:20	NA	12.08	
DIW-P11A		Field	5/24/2004	10:03	12.58	14.42	
DIW-P11B		Field	5/24/2004	9:27	sheen	12.73	
DIW-P11C		Field	5/24/2004	9:26	NA	12.74	
DIW-P12A		Field	5/24/2004	10:01	12.72	12.94	
DIW-P09A		Field	5/24/2004	10:14	13.14	15.42	
DIW-P09B		Field	5/24/2004	9:29	sheen	13.34	
DIW-P09C		Field	5/24/2004	9:30	sheen	13.34	
DIW-P10A		Field	5/24/2004	9:19	NA	13.3	
DIW-1-2		Field	5/24/2004	10:09	14.61	16.63	
DIW-P02A		Field	5/24/2004	9:18	NA	14.98	
DIW-P03A		Field	5/24/2004	10:05	13.85	15.08	
DIW-P03B		Field	5/24/2004	9:40	13.97	13.99	
DIW-P03C		Field	5/24/2004	9:54	13.92	14.55	
DIW-P04A		Field	5/24/2004	9:11	13.9	13.92	
DIW-P05A		Field	5/24/2004	10:07	13.81	15.27	
DIW-P05B		Field	5/24/2004	9:46	13.94	13.96	
DIW-P05C		Field	5/24/2004	9:47	13.92	13.95	
DIW-P06A		Field	5/24/2004	9:10	NA	13.96	
DIW-07A		Field	5/24/2004	10:20	13.89	18.85	
DIW-07B		Field	5/24/2004	9:50	14.33	14.35	
DIW-07C		Field	5/24/2004	9:52	14.29	14.31	
DIW-P08A		Field	5/24/2004	9:08	NA	13.8	

Post Second Injection Injection Tier 1 Water Level Monitoring 6/14/04							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8		Field	6/14/2004	8:34	NA	12.02	
DCB-21A		Field	6/14/2004	8:49	NA	10.32	
DCB-22C		Field	6/14/2004	8:51	NA	14.29	
DCB-70B		Field	6/14/2004	8:52	NA	6.41	
DCB-19A		Field	6/14/2004	8:55	NA	13.1	
DCB-18C		Field	6/14/2004	8:54	NA	13.64	
DIW-P13A		Field	6/14/2004	9:53	11.9	14.95	
DIW-P13B		Field	6/14/2004	9:31	12.12	12.17	
DIW-P13C		Field	6/14/2004	9:07	NA	12.15	
DIW-P14A		Field	6/14/2004	9:06	NA	11.9	
DIW-P11A		Field	6/14/2004	9:44	12.42	14.1	
DIW-P11B		Field	6/14/2004	9:08	NA	12.56	
DIW-P11C		Field	6/14/2004	9:09	NA	12.56	
DIW-P12A		Field	6/14/2004	9:03	12.57	12.81	
DIW-P09A		Field	6/14/2004	9:41	12.97	15.1	
DIW-P09B		Field	6/14/2004	9:11	NA	13.16	
DIW-P09C		Field	6/14/2004	9:10	NA	13.15	
DIW-P10A		Field	6/14/2004	9:02	NA	13.13	
DIW-1-2		Field	6/14/2004	9:49	14.47	16.25	
DIW-P02A		Field	6/14/2004	9:01	NA	14.8	
DIW-P03A		Field	6/14/2004	9:34	13.71	14.6	
DIW-P03B		Field	6/14/2004	9:29	13.81	13.84	
DIW-P03C		Field	6/14/2004	9:12	13.77	14.3	
DIW-P04A		Field	6/14/2004	8:58	13.72	13.75	
DIW-P05A		Field	6/14/2004	9:37	13.66	14.95	
DIW-P05B		Field	6/14/2004	9:27	13.77	13.9	
DIW-P05C		Field	6/14/2004	8:58	13.76	13.77	
DIW-P06A		Field	6/14/2004	8:57	NA	13.79	
DIW-07A		Field	6/14/2004	9:59	13.73	18.45	
DIW-07B		Field	6/14/2004	9:24	14.15	14.17	
DIW-07C		Field	6/14/2004	9:17	14.11	14.13	Emulsion
DIW-P08A		Field	6/14/2004	8:56		13.62	

Post Second Injection Injection Tier 2 & 3 Water Level Monitoring 7/12/04							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DCB-8	DSR-00360	Field	7/12/2004	14:51	NA	11.32	
DCB-21A	DSR-00361	Field	7/12/2004	8:47	NA	9.91	
DCB-22C	DSR-00362	Field	7/12/2004	8:48	NA	13.69	
DCB-70B	DSR-00363	Field	7/12/2004	8:49	NA	5.86	
DCB-19A	DSR-00364	Field	7/12/2004	8:45	NA	9.98	
DCB-18C	DSR-00365	Field	7/12/2004	8:46	NA	12.94	
DIW-P13A	NA	Field	7/12/2004	10:10	10.9	12.4	
DIW-P13B	NA	Field	7/12/2004	8:54	NA	10.97	
DIW-P13C	NA	Field	7/12/2004	9:00	NA	11.04	
DIW-P14A	NA	Field	7/12/2004	8:51	NA	10.78	
DIW-P11A	DSR-00366	Field	7/12/2004	10:00	11.27	13.11	
DIW-P11B	DSR-00367	Field	7/12/2004	9:08	NA	11.47	
DIW-P11C	DSR-00368	Field	7/12/2004	9:08	NA	11.44	
DIW-P12A	NA	Field	7/12/2004	9:30	11.43	11.62	
DIW-P09A	NA	Field	7/12/2004	10:05	11.92	13.2	
DIW-P09B	NA	Field	7/12/2004	9:07	NA	12.03	
DIW-P09C	NA	Field	7/12/2004	9:07	NA	12.05	
DIW-P10A	NA	Field	7/12/2004	9:02	NA	11.98	
DIW-1-2	DSR-00369	Field	7/12/2004	9:56	13.4	14.8	
DIW-P02A	NA	Field	7/12/2004	9:04	NA	13.68	
DIW-P03A	NA	Field	7/12/2004	9:52	12.64	13.05	
DIW-P03B	NA	Field	7/12/2004	9:10	12.67	12.72	
DIW-P03C	NA	Field	7/12/2004	9:50	12.65	13.35	
DIW-P04A	NA	Field	7/12/2004	8:42	12.61	12.62	
DIW-P05A	NA	Field	7/12/2004	9:45	12.56	13.78	
DIW-P05B	NA	Field	7/12/2004	9:40	12.65	12.76	
DIW-P05C	NA	Field	7/12/2004	9:55	NA	12.62	
DIW-P06A	NA	Field	7/12/2004	9:05	NA	12.67	
DIW-07A	DSR-00370	Field	7/12/2004	10:15	12.58	17.68	
DIW-07B	DSR-00371	Field	7/12/2004	9:20	NA	13.03	
DIW-07C	DSR-00372	Field	7/12/2004	9:25	Sheen	12.99	
DIW-P08A	NA	Field	7/12/2004	9:06	NA	12.49	

Post Second Injection Tier 1 Water Level Monitoring Only 11/11/04							
Well / Piezometer	Sample Number	Sample Type	Date	Time	Depth to Oil (ft)	Depth to Water (ft)	Comments
DIW-P13A	NA	Field	11/11/2004	10:07	12.77	15.8	Verified 3 times
DIW-P11A	NA	Field	11/11/2004	10:09	13.27	14.96	
DIW-P09A	NA	Field	11/11/2004	8:18	13.88	15.48	
DIW-1-2	NA	Field	11/11/2004	8:15	15.32	16.89	
DIW-P03A	NA	Field	11/11/2004	8:10	14.51	15.85	
DIW-P05A	NA	Field	11/11/2004	8:22	14.5	16.13	
DIW-07A	NA	Field	11/11/2004	8:40	14.72	17.72	

Subcontractor Data extracted from ERDMS / BIEDMS

Field Blanks

Well / Piezometer	Sample Number	Sample Date	Sample Type	Lab	Aluminum (mg/L)	Barium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)
DIW-P11B	DSR-00315	11/4/2003	Field Blank	Subcontractor	<0.0322	<0.00083	<0.0296	<0.00041	<0.0011	<0.00055	<0.0192
DIW-P11B	DSR-00335	2/3/2004	Field Blank	Subcontractor	<0.0322	<0.00083	<0.0296	<0.00041	<0.0011	<0.00055	<0.0192
DIW-P11B	DSR-00355	5/3/2004	Field Blank	Subcontractor	<0.0805	0.0058	<0.0074	<0.000102	<0.00275	<0.000138	<0.0048
DIW-P11B	DSR-00375	7/13/2004	Field Blank	Subcontractor	<0.0641	0.0011	<0.0296	<0.00041	0.0027	<0.00055	<0.0192

Replicates

Well / Piezometer	Sample Number	Sample Date	Sample Type	Lab	Aluminum (mg/L)	Barium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)
DIW-P11B	DSR-00314	11/4/2003	Replicate	Subcontractor	164	0.016	66.5	0.0012	0.0655	<0.00055	265
DIW-P11B	DSR-00334	2/3/2004	Replicate	Subcontractor	261	0.0217	89.3	<0.00041	0.139	<0.00055	239
DIW-P11B	DSR-00354	5/3/2004	Replicate	Subcontractor	190	0.0136	66.5	0.000348	0.101	0.00018	89.7
DIW-P11B	DSR-00374	7/13/2004	Replicate	Subcontractor	183	0.016	58.9	<0.00041	0.0956	<0.00055	83.2

Subcontractor Data extracted frc

Field Blanks

Well / Piezometer	Sample Number	Magnesium (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Lead (mg/L)	Silica (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)	Ammonium (mg/L)
DIW-P11B	DSR-00315	<0.017	<0.00015	0.00042	<0.0015	0.0322	<0.0058	0.0398	<0.0057	0.0148	<0.032	<.0035
DIW-P11B	DSR-00335	<0.017	0.00023	<0.00041	<0.0015	0.0227	<0.0058	<0.0214	<0.0057	<0.0101	<0.032	0.038
DIW-P11B	DSR-00355	<0.00425	<0.0000375	<0.000102	<0.0006	1.04	<0.00145	<0.00535	<0.0057	<0.01	4280	0.046
DIW-P11B	DSR-00375	<0.017	<0.00015	0.0008	<0.0015	0.0216	<0.0058	<0.0214	<0.0052	0.0132	0.542	0.048

Replicates

Well / Piezometer	Sample Number	Magnesium (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Lead (mg/L)	Silica (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)	Ammonium (mg/L)
DIW-P11B	DSR-00314	53.2	7.6	0.662	<0.0015	158	0.0774	6.13	<0.0057	0.0807	1800	0.107
DIW-P11B	DSR-00334	74.3	9.51	1.04	<0.0015	135	0.941	7.08	<0.0058	0.238	2600	0.068
DIW-P11B	DSR-00354	51.4	5.98	0.898	<0.0006	77.1	2.12	4.32	<0.0059	0.108	6200	0.501
DIW-P11B	DSR-00374	48.2	5.82	0.866	<0.0015	94.9	0.656	3.73	0.112	0.0248	1730	0.096

SRTC ML, Subcontractor Intra-Laboratory Comparison

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Lab	Aluminum (mg/L)	Barium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)	Nickel (mg/L)
DIW-P11B	DSR-00314	11/4/2003	Replicate	Subcontractor	164	0.016	66.5	0.0012	0.0655	<0.00055	265	53.2	7.6	0.662
DIW-P11B	DSR-00307	11/4/2003	Sample	Mobile	164	<0.010	72.4	<0.010	<0.010	<0.010	301	56.8	6.50	0.423
DIW-P11B	DSR-00313	11/4/2003	Duplicate	Mobile	164	<0.010	70.1	<0.010	<0.010	<0.010	293	56.4	6.39	0.418

Well / Piezometer	Sample Number	Sample Date	Sample Type	Lab	Aluminum (mg/L)	Barium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)	Nickel (mg/L)
DIW-P11B	DSR-00334	2/3/2004	Replicate	Subcontractor	261	0.0217	89.3	<0.00041	0.139	<0.00055	239	74.3	9.51	1.04
DIW-P11B	DSR-00327	2/3/2004	Sample	Mobile	242	<0.002	80.7	<0.003	0.094	0.022	228	71.7	8.31	0.819
DIW-P11B	DSR-00333	2/3/2004	Duplicate	Mobile	242	<0.002	80.6	<0.003	0.094	0.024	232	72.8	8.35	0.818

Well / Piezometer	Sample Number	Sample Date	Sample Type	Lab	Aluminum (mg/L)	Barium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)	Nickel (mg/L)
DIW-P11B	DSR-00354	5/3/2004	Replicate	Subcontractor	190	0.0136	66.5	0.000348	0.101	0.00018	89.7	51.4	5.98	0.898
DIW-P11B	DSR-00347	5/3/2004	Sample	Mobile	193	<0.001	64.6	<0.008	0.047	0.006	90.8	53.8	5.55	0.731
DIW-P11B	DSR-00353	5/3/2004	Duplicate	Mobile	193	<0.001	64.3	<0.008	0.050	0.007	90.7	53.9	5.62	0.737

Well / Piezometer	Sample Number	Sample Date	Sample Type	Lab	Aluminum (mg/L)	Barium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)	Nickel (mg/L)
DIW-P11B	DSR-00374	7/13/2004	Replicate	Subcontractor	183	0.016	58.9	<0.00041	0.0956	<0.00055	83.2	48.2	5.82	0.866
DIW-P11B	DSR-00367	7/13/2004	Sample	Mobile	173	<0.001	59.2	<0.008	0.062	<0.001	80.5	48.9	3.11	0.680
DIW-P11B	DSR-00373	7/13/2004	Duplicate	Mobile	174	<0.001	58.7	<0.008	0.061	<0.001	80.9	48.7	5.17	0.680

SRTC ML, Subcontractor Ir

Well/ Piezometer	Sample Number	Lead (mg/L)	Silica (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
DIW-P11B	DSR-00314	<0.0015	158	0.0774	6.13	<0.0057	1800
DIW-P11B	DSR-00307	<0.020	79.4	<0.010	5.51	<1.00	6230
DIW-P11B	DSR-00313	<0.020	78.2	<0.010	5.80	<1.00	6800

Well / Piezometer	Sample Number	Lead (mg/L)	Silica (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
DIW-P11B	DSR-00334	<0.0015	135	0.941	7.08	<0.0058	2600
DIW-P11B	DSR-00327	<0.017	63.5	0.782	5.74	1.97	11600
DIW-P11B	DSR-00333	<0.017	63.9	0.781	5.67	1.99	13800

Well / Piezometer	Sample Number	Lead (mg/L)	Silica (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
DIW-P11B	DSR-00354	<0.0006	77.1	2.12	4.32	<0.0059	6200
DIW-P11B	DSR-00347	<0.020	76.1	1.890	4.05	<1.00	5410
DIW-P11B	DSR-00353	<0.020	75.8	1.890	4.28	<1.00	5480

Well / Piezometer	Sample Number	Lead (mg/L)	Silica (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
DIW-P11B	DSR-00374	<0.0015	94.9	0.656	3.73	0.112	1730
DIW-P11B	DSR-00367	<0.020	95.5	0.460	3.09	<1.00	2670
DIW-P11B	DSR-00373	<0.020	94.9	0.445	3.15	<1.00	3010

SRTC ML Laboratory Comparison

Part 2 Pre-Injection SRTC Mobile Laboratory Analytical Results

Well/ Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Potassuim (mg/L)	Magnesium (mg/L)
DIW-P11B	DSR-00307	11/4/2003	Sample	11/5/2003	164	<0.010	<0.010	72.4	<0.010	<0.010	<0.010	301	1.68	56.8
DIW-P11B	DSR-00313	11/4/2003	Duplicate	11/5/2003	164	<0.010	<0.010	70.1	<0.010	<0.010	<0.010	293	1.63	56.4

Part 2 First Post Injection SRTC Mobile Laboratory Analytical Results

Well / Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Potassuim (mg/L)	Magnesium (mg/L)
DIW-P11B	DSR-00327	2/3/2004	Sample	2/19/2004	242	<0.002	<0.010	80.7	<0.003	0.094	0.022	228	2.09	71.7
DIW-P11B	DSR-00333	2/3/2004	Duplicate	2/19/2004	242	<0.002	<0.010	80.6	<0.003	0.094	0.024	232	2.06	72.8

Part 2 Second Post Injection SRTC Mobile Laboratory Analytical Results

Well / Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Potassuim (mg/L)	Magnesium (mg/L)
DIW-P11B	DSR-00347	5/3/2004	Sample	5/18/2004	193	<0.001	<0.001	64.6	<0.008	0.047	0.006	90.8	1.04	53.8
DIW-P11B	DSR-00353	5/3/2004	Duplicate	5/18/2004	193	<0.001	<0.001	64.3	<0.008	0.050	0.007	90.7	1.04	53.9

Part 2 Third Post Injection SRTC Mobile Laboratory Analytical Results

Well / Piezometer	Sample Number	Sample Date	Sample Type	Analysis Date	Aluminum (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Potassuim (mg/L)	Magnesium (mg/L)
DIW-P11B	DSR-00367	7/13/2004	Sample	7/21/2004	173	<0.001	<0.001	59.2	<0.008	0.062	<0.001	80.5	0.812	48.9
DIW-P11B	DSR-00373	7/13/2004	Duplicate	7/21/2004	174	<0.001	<0.001	58.7	<0.008	0.061	<0.001	80.9	0.806	48.7

Field Blanks

Well / Piezometer	Sample Number	Sample Date	Sample Type	Lab	Aluminum (mg/L)	Barium (mg/L)	Calcium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)	Nickel (mg/L)
DIW-P11B	DSR-00315	11/4/2003	Field Blank	Subcontractor	<0.0322	<0.00083	<0.0296	<0.00041	<0.0011	<0.00055	<0.0192	<0.017	<0.00015	0.00042
DIW-P11B	DSR-00335	2/3/2004	Field Blank	Subcontractor	<0.0322	<0.00083	<0.0296	<0.00041	<0.0011	<0.00055	<0.0192	<0.017	0.00023	<0.00041
DIW-P11B	DSR-00355	5/3/2004	Field Blank	Subcontractor	<0.0805	0.0058	<0.0074	<0.000102	<0.00275	<0.000138	<0.0048	<0.00425	<0.0000375	<0.000102
DIW-P11B	DSR-00375	7/13/2004	Field Blank	Subcontractor	<0.0641	0.0011	<0.0296	<0.00041	0.0027	<0.00055	<0.0192	<0.017	<0.00015	0.0008

SRTC ML Laboratory Comp

Part 2 Pre-Injection SRTC M

Well/ Piezometer	Sample Number	Manganese (mg/L)	Sodium (mg/L)	Nickel (mg/L)	Lead (mg/L)	Silicon (mg/L)	Zinc (mg/L)	Analysis Date	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)	Analysis Date	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
DIW-P11B	DSR-00307	6.50	5.51	0.423	<0.020	79.4	<0.010	11/5/2003	1.00	301.00	11/5/2003	2.12	<1.00	<1.00	6230
DIW-P11B	DSR-00313	6.39	5.80	0.418	<0.020	78.2	<0.010	11/5/2003	1.00	293.00	11/5/2003	2.24	<1.00	<1.00	6800

Part 2 First Post Injection SR

Well / Piezometer	Sample Number	Manganese (mg/L)	Sodium (mg/L)	Nickel (mg/L)	Lead (mg/L)	Silicon (mg/L)	Zinc (mg/L)	Analysis Date	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)	Analysis Date	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
DIW-P11B	DSR-00327	8.31	5.74	0.819	<0.017	63.5	0.782	2/19/2004	1.00	228	2/19/2004	1.87	<1.00	1.97	11600
DIW-P11B	DSR-00333	8.35	5.67	0.818	<0.017	63.9	0.781	2/19/2004			2/19/2004	1.89	<1.00	1.99	13800

Red highlight means that there is no data

Part 2 Second Post Injection

Well / Piezometer	Sample Number	Manganese (mg/L)	Sodium (mg/L)	Nickel (mg/L)	Lead (mg/L)	Silicon (mg/L)	Zinc (mg/L)	Analysis Date	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)	Analysis Date	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
DIW-P11B	DSR-00347	5.55	4.05	0.731	<0.020	76.1	1.890	5/18/2004	1.00	90.8	5/18/2004	1.67	<1.00	<1.00	5410
DIW-P11B	DSR-00353	5.62	4.28	0.737	<0.020	75.8	1.890	5/18/2004	1.00	90.7	5/18/2004	1.60	<1.00	<1.00	5480

Part 2 Third Post Injection SF

Well / Piezometer	Sample Number	Manganese (mg/L)	Sodium (mg/L)	Nickel (mg/L)	Lead (mg/L)	Silicon (mg/L)	Zinc (mg/L)	Analysis Date	Average Fe(2+)/ Fe(total)	Ferrous Iron (mg/L)	Analysis Date	Chloride (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
DIW-P11B	DSR-00367	3.11	3.09	0.680	<0.020	95.5	0.460	7/21/2004	1.00	80.5	7/21/2004	1.75	<1.00	<1.00	2670
DIW-P11B	DSR-00373	5.17	3.15	0.680	<0.020	94.9	0.445	7/21/2004	1.00	80.9	7/21/2004	1.78	<1.00	<1.00	3010

Field Blanks

Well / Piezometer	Sample Number	Lead (mg/L)	Silica (mg/L)	Zinc (mg/L)	Sodium (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)	Sulfate (mg/L)	Ammonium (mg/L)
DIW-P11B	DSR-00315	<0.0015	0.0322	<0.0058	0.0398	<0.0057	0.0148	<0.032	<.0035
DIW-P11B	DSR-00335	<0.0015	0.0227	<0.0058	<0.0214	<0.0057	<0.0101	<0.032	0.038
DIW-P11B	DSR-00355	<0.0006	1.04	<0.00145	<0.00535	<0.0057	<0.01	4280	0.046
DIW-P11B	DSR-00375	<0.0015	0.0216	<0.0058	<0.0214	<0.0052	0.0132	0.542	0.048