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CROWS LANDING
SSIC NO. 5090.3.A

TRANSMITTAL

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To: Darren Newton **Date:** March 15, 2004

From: David Kelly

Subject: Interim Data Summary
UST Cluster 1 Soil Vapor Extraction Performance Evaluation Testing

Performance evaluation testing was conducted from 23 January 2001 through 15 December 2003 to evaluate the effectiveness of soil vapor extraction (SVE) at recovering petroleum hydrocarbons from the vadose zone soil at Underground Storage Tank (UST) Cluster 1 and to optimize system operation. The work was conducted in accordance with the *Final Project Plans, Verification Activities at Various Sites, NASA Crows Landing Flight Facility, Crows Landing, California* (Shaw, 2003). This transmittal presents a summary of the results of the SVE performance evaluation testing.

Soil vapors were extracted initially from ten wells using a single SVE unit (SVE Unit 1) from 23 January 2001 through 12 March 2001. A second SVE unit (SVE Unit 3) was used concurrently with SVE Unit 1 to extract vapors from an additional ten wells from 12 March 2001 through 18 June 2001. On 18 June 2001, SVE Unit 3 was shut down and vapors were extracted from ten of the twenty extraction wells using SVE Unit 1. On 15 July 2002, SVE was stopped for one week to evaluate system rebound. Following rebound testing, the system was restarted and operated until 22 August 2002. On 24 March 2003, the SVE system was restarted to evaluate operation after long-term rebounding and to further evaluate short-term system rebound testing. One week long rebound tests were conducted starting 20 May 2003, 23 July 2003, 16 September 2003 (2 week test), and 6 October 2003. The performance evaluation testing was stopped on 15 December 2003.

The results from individual well testing, conducted from August 2000 through January 2001 and summarized in an Interim Data Transmittal (the IT Group, 2001), were used to determine extraction wells and system operating parameters for the performance evaluation testing. Table 1 presents the extractions wells and their periods of operation. Figure 1 shows the locations of the extraction wells. Charts included in Attachment A show the operating parameters for SVE Units 1 and 3 during the performance evaluation testing. Charts included in Attachment B show the operating parameters for the individual wells. The operating parameters for the individual wells were consistent with the operating conditions measured during the individual well testing.

Vacuum measurement were taken from several monitoring points within and surrounding the area of the SVE performance evaluation testing to ensure that the SVE system was influencing the entire area of contamination. The locations of the monitoring points are included on Figure 1. The vacuum measurements are shown on a chart included in Attachment A. The data indicates that during the performance evaluation testing, vapor within the entire impacted area was being influence by extraction from the SVE wells. Monitoring points located north of UST Cluster 1, between UST Cluster 1 and IRP Site 17 (17-MW-12(S) and CL1-MW-09(S)), showed no influence from the vapor extraction and demonstrate that the SVE testing was not drawing in vapors from other sites (IRP Site 17 and UST Site 117).

Water level measurements were collected in accordance with the work plan from wells within the treatment area during initial system operations to determine if the SVE testing was influencing groundwater surface elevation. Groundwater extraction activities that were conducted at UST Cluster 1 concurrent with the SVE testing likely had a greater influence on groundwater surface and water level measurements were discontinued.

In accordance with the work plan, vapor samples from the SVE system(s) influent and effluent were collected at start-up and periodically (weekly) during system operation and were screened in the field for petroleum hydrocarbons by photo-ionization detector (PID) and flame-ionization detector (FID) and for oxygen by a combustible gas indicator (CGI) to monitor the progress of the SVE testing. The readings of influent samples from SVE Unit 1 and SVE Unit 3 are included on charts in Attachment A. Samples were also collected at start-up and periodically (monthly) and sent to an off-site laboratory for analysis of total vapor petroleum hydrocarbons (TVPH) and volatile organic compounds (VOC) by EPA Method TO-15. Summaries of the analytical results are included in Tables 2 through 5 and the data are shown in the charts in Attachment A. The FID field screening measurements provided the best correlation to laboratory results.

The field and laboratory results indicate a significant reduction in the concentrations of petroleum hydrocarbons in the SVE Unit 1 influent during the first six to nine months of system operation. After approximately nine months of system operation, the SVE Unit 1 influent concentration remained relatively steady. Influent concentrations measured immediately following rebound testing were relatively higher than concentrations measured before the system was shut off, but returned to lower levels quickly after system operation was re-initiated. Oxygen concentrations in the SVE Unit 1 influent remained between 18 and 21 percent during system operation but dropped below 18 percent during rebound testing. Oxygen concentrations in the system influent dropped below 7 percent while the system was shut down between August 2002 and March 2003. The field and laboratory results indicate a relatively small reduction in the concentrations of petroleum hydrocarbons in the SVE Unit 3 influent during the first month of system operation followed by steady concentrations.

Tables 6 and 7 present the estimated mass removal by SVE Unit 1 and SVE Unit 3 during the performance evaluation testing based on system influent flow rates and laboratory analytical results. Approximately 26,819 pounds of petroleum hydrocarbon were removed during the performance evaluation testing, including approximately 5 pound of benzene, 8 pound of ethylbenzene, 50 pound of toluene, and 114 pounds of xylenes. This total includes

approximately 1600 pounds of petroleum hydrocarbons removed by SVE Unit 3. The chart in Attachment C shows the mass removal rates and cumulative mass removed during the performance evaluation testing. Mass removal rates decreased from greater than 250 pounds per day to less than 30 pounds per day in the first 9 months of system operation. Mass removal rates remained at or below approximately 30 pounds per day for the remainder of the system operation.

Vapor samples were collected at system start-up and weekly from the individual wells and screened for petroleum hydrocarbons by PID and FID and for oxygen by CGI. The screening results are included in the charts in Attachment B. The individual well results showed changes in vapor concentrations that were consistent with the SVE system influents, i.e. a significant initial decrease in petroleum hydrocarbon concentration followed by a period of steady concentration. The individual wells also showed a slight increase in concentration immediately following rebound testing that returned to low levels after a short period of operation.

Vapor samples were collected from the individual extraction wells during the initial individual well testing in fall 2000 and one week after the SVE system was shut off in August 2002. The samples were screened in the field by FID and CGI and samples were sent to an off-site laboratory to determine TVPH and VOC concentrations by EPA Method TO-15. Samples were collected in August 2002 only from wells that had been operating at that time. The analytical results are included in Table 8. The results indicate a significant reduction in the concentrations of TVPH in soil vapor at each well location following the initial SVE performance evaluation testing. The SVE system was restarted in March 2003 because the concentration of TVPH in well CL1-SV-01C was above 2500 ppmv. Field screening results indicated that the concentration of petroleum hydrocarbons decreased in well CL1-SV-01C from March 2003 to December 2003 to less than 1000 ppmv and the system was stopped. Laboratory samples were not collected from the individual wells after the system was shut off in December 2003.

In accordance with the work plan, soil samples will be collected to determine the effectiveness of SVE at removing petroleum hydrocarbons from the vadose zone soil at UST Cluster 1 and to determine the remaining concentrations of petroleum hydrocarbon in the soil at the site. The soil samples will be collected by direct-push techniques as described in the work plan. The samples will be analyzed for total petroleum hydrocarbons (TPH) and VOCs in accordance with the sampling and analysis plan. In addition, the samples will be analyzed for polynuclear aromatic hydrocarbons (PAHs) as described in the sampling and analysis plan. The samples will be collected at the locations shown in Figure 2. The proposed locations are based on previous sample locations, soil vapor concentrations, and space limitations at the site. Soil samples will be collected from three discreet depths at each of the thirteen sample locations. The proposed depths target the area near the bottom of the tank excavation (30 feet below ground surface), the area between the former tank location and groundwater surface (40 feet below ground surface), and the area above the groundwater surface and capillary fringe (55 feet below ground surface). These depths are consistent with previously collected sample depths. The Site-Specific Discrete Sampling Forms for the proposed samples are included in Attachment D.

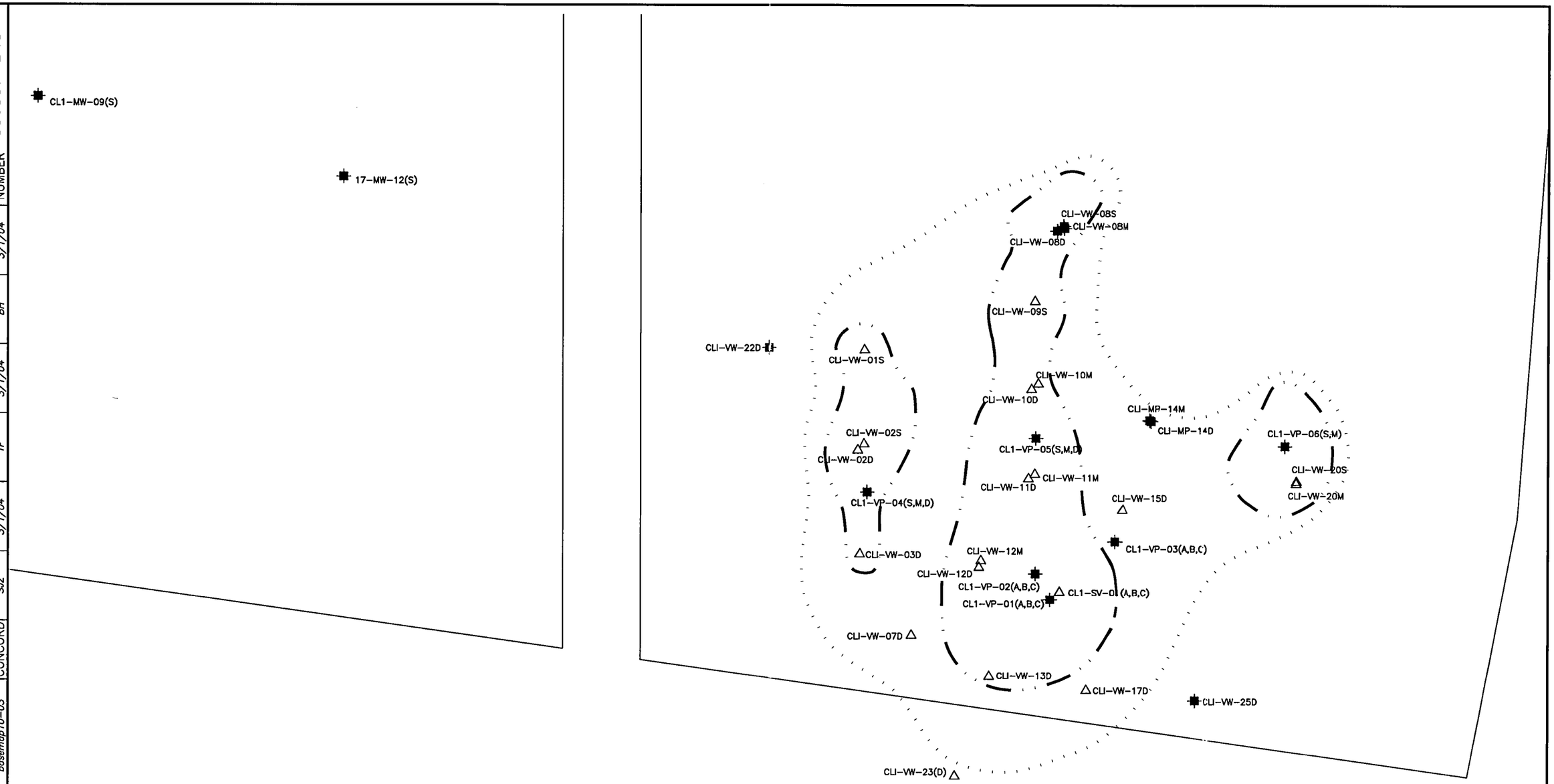
The results from the soil sampling and analysis will be compared to previous soil sampling results to determine the effectiveness of the SVE performance evaluation testing. The results,

data comparison, and all data from the SVE performance evaluation testing will be included in a final report. The soil analytical data will also be used to evaluate the risk associated with the contaminants remaining in place at UST Cluster 1. The results of the risk assessment will be included in a separate document and will be summarized in a revision to the Basewide Corrective Action Plan (Tetra Tech EMI, 1998).

cc: B Hulet
T Barry
T Fenger
Project File

FIGURES

DRAWING NUMBER	APPROVED BY		CHECKED BY		DRAWN BY		OFFICE	X-REF
836557-B48	BH	3/1/04	TF	3/1/04	SJZ	3/1/04	CONCORD	basemap10-03



LEGEND

△	VENT WELL LOCATION
✱	VAPOR MONITORING POINT
	APPROXIMATE EXTENT OF PETROLEUM CONTAMINATION IN SOIL
	APPROXIMATE EXTENT OF TPH-P CONTAMINATION ≥ 100 MILLIGRAMS PER KILOGRAM (mg/kg) IN SOIL
A,B,C	A = SHALLOW DEPTH, B = MEDIUM DEPTH, C = DEEP DEPTH
S,M,D	S= SHALLOW DEPTH, M = MEDIUM DEPTH, D = DEEP DEPTH

SCALE

0 40 80 FEET

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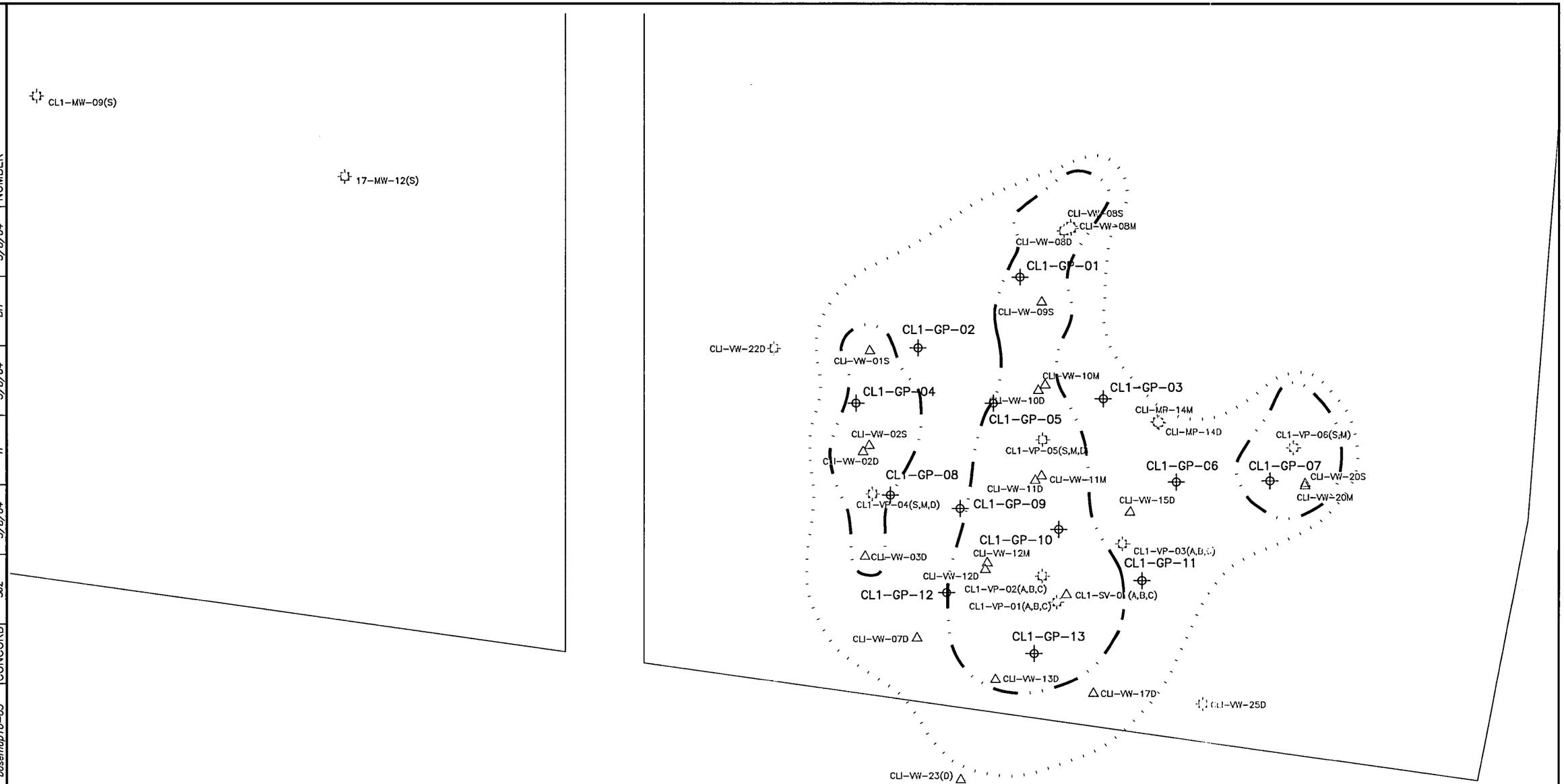
CROWS LANDING, CALIFORNIA

FIGURE 1

SVE WELL LOCATIONS

X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
basemap10-03	CONCORD	SJZ 3/8/04	TF 3/8/04	BH 3/8/04	836557-B49



LEGEND

- PROPOSED SOIL SAMPLE
- VENT WELL LOCATION
- VAPOR MONITORING POINT
- APPROXIMATE EXTENT OF PETROLEUM CONTAMINATION IN SOIL
- APPROXIMATE EXTENT OF TPH-P CONTAMINATION ≥ 100 MILLIGRAMS PER KILOGRAM (mg/kg) IN SOIL
- A,B,C — A = SHALLOW DEPTH, B = MEDIUM DEPTH, C = DEEP DEPTH
- S,M,D — S= SHALLOW DEPTH, M = MEDIUM DEPTH, D = DEEP DEPTH

N

SCALE

0 40 80 FEET

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FIGURE 2

PROPOSED SOIL SAMPLING LOCATIONS

TABLES

Table 1
UST Cluster 1
Performance Evaluation Testing
Extraction Wells

Wells	Period of Operation			
	23 January 2001 - 12 March 2001	12 March 2001 - 18 June 2001	18 June 2001 - 22 August 2002	24 March 2003 - 15 December 2003
CL1-VW-01(S)	SVE Unit #1	SVE Unit #1		
CL1-VW-02(S)	SVE Unit #1	SVE Unit #1	SVE Unit #1	SVE Unit #1
CL1-VW-02(D)	SVE Unit #1	SVE Unit #1	SVE Unit #1	SVE Unit #1
CL1-VW-03(D)	SVE Unit #1	SVE Unit #1		
CL1-VW-07(D)		SVE Unit #3		
CL1-VW-09(S)	SVE Unit #1	SVE Unit #1		
CL1-VW-10(M)	SVE Unit #1	SVE Unit #1	SVE Unit #1	SVE Unit #1
CL1-VW-10(D)		SVE Unit #3		
CL1-VW-11(M)		SVE Unit #3	SVE Unit #1	SVE Unit #1
CL1-VW-11(D)	SVE Unit #1	SVE Unit #1	SVE Unit #1	SVE Unit #1
CL1-VW-12(M)		SVE Unit #3		
CL1-VW-12(D)	SVE Unit #1	SVE Unit #1	SVE Unit #1	SVE Unit #1
CL1-VW-13(D)		SVE Unit #3	SVE Unit #1	SVE Unit #1
CL1-VW-15(D)		SVE Unit #3		
CL1-VW-17(D)		SVE Unit #3		
CL1-VW-20(S)		SVE Unit #3		
CL1-VW-20(M)	SVE Unit #1	SVE Unit #1	SVE Unit #1	SVE Unit #1
CL1-VW-23(D)		SVE Unit #3		
CL1-SV-01A		SVE Unit #3	SVE Unit #1	SVE Unit #1
CL1-SV-01C	SVE Unit #1	SVE Unit #1	SVE Unit #1	SVE Unit #1

Table 2
Soil Vapor Extraction Unit 1
Influent Concentrations
January 2001 through June 2001

Sample ID		4-V-SVE1-1HR-INF	4-V-SVE1-1WK-INF	4-V-SVE1-2WK-INF	4-V-SVE1-1MO-INF	4-V-SVE1-2MO-INF
Description		1 HOUR	1 WEEK	2 WEEK	4 WEEK	8 WEEK
Date		1/23/2001	1/30/2001	2/6/2001	2/20/2001	3/20/2001
	Method					
Field Oxygen	Field	**7.9** %	**17.9** %	**19.3** %	**20.4** %	**19.5** %
PID	Field	**431** ppmv	970 ppmv	420 ppmv	**436** ppmv	**363** ppmv
FID[1]	Field	**7096** ppmv	**3899** ppmv	**4532** ppmv	**2576** ppmv	**1772** ppmv
TVPH	TO-15	**4880** ppmv	**2800** ppmv	**2270** ppmv	**2220** ppmv	**1550** ppmv
Acetone	TO-15	<50.0 ppmv	<80.0 ppmv	<26.0 ppmv	<63.0 ppmv	<77.0 ppmv
Benzene	TO-15	**7.91J** ppmv	<16.0 ppmv	**3.12J** ppmv	<13.0 ppmv	<15.0 ppmv
Ethylbenzene	TO-15	<10.0 ppmv	<16.0 ppmv	**3.08J** ppmv	<13.0 ppmv	<15.0 ppmv
Toluene	TO-15	<10.0 ppmv	**20.4** ppmv	<5.2 ppmv	<13.0 ppmv	<15.0 ppmv
Xylenes	TO-15	**13** ppmv	**18.2J** ppmv	**13.8** ppmv	**8.77J** ppmv	<15.0 ppmv

[1] FID readings were measured in a 1:4 dilution
[2] Sample taken prior to shut down of SVE system

Table 2
Soil Vapor Extraction Unit 1
Influent Concentrations
January 2001 through June 2001

Sample ID		4-V-SVE1-3MO-INF	4-V-SVE1-4MO-INF	4-V-SVE1-5MO-INF	4-V-SVE1-6/18
Description		12 WEEK	16 WEEK	20 WEEK 1 DAY	20 WEEK 6 DAY
Date		4/17/2001	5/15/2001	6/13/2001	06/18/2001[2]
	Method				
Field Oxygen	Field	**20.2** %	**19.6** %	**19.5** %	**19.9** %
PID	Field	**319** ppmv	**231** ppmv	**297** ppmv	**227** ppmv
FID[1]	Field	**1092** ppmv	**972** ppmv	**936** ppmv	**792** ppmv
TVPH	TO-15	**1510** ppmv	**985** ppmv	**1530** ppmv	**623** ppmv
Acetone	TO-15	<30.0 ppmv	<28.0 ppmv	<27.0 ppmv	<22.0 ppmv
Benzene	TO-15	<6.0 ppmv	<5.6 ppmv	<5.3 ppmv	<4.5 ppmv
Ethylbenzene	TO-15	<6.0 ppmv	<5.6 ppmv	<5.3 ppmv	<4.5 ppmv
Toluene	TO-15	<6.0 ppmv	<5.6 ppmv	<5.3 ppmv	<4.5 ppmv
Xylenes	TO-15	**8.22** ppmv	**6.38** ppmv	**5.12J** ppmv	**2.84J** ppmv

[1] FID readings were measured in
[2] Sample taken prior to shut dow

Table 3
Soil Vapor Extraction Unit 3
Influent Concentrations
March 2001 through June 2001

Sample ID		4-V-SVE3-1HR-INF	4-V-SVE3-1WK-INF	4-V-SVE3-2WK-INF	4-V-SVE3-1MO-INF	4-V-SVE3-2MO-INF	4-V-SVE3-3MO-INF	4-V-SVE3-6/18-INF
Description		1 HOUR	1 WEEK	2 WEEK	4 WEEK 1 DAY	8 WEEK 1 DAY	12 WEEK 1 DAY	14 WEEK
Date		3/12/2001	3/19/2001	3/26/2001	4/10/2001	5/8/2001	6/5/2001	06/18/2001[2]
	Method							
Field Oxygen	Field	**18.1** %	**18.4** %	**20.1** %	**20.4** %	**19.1** %	**19.9** %	**20.1** %
PID	Field	**190** ppmv	**288** ppmv	**219** ppmv	**111** ppmv	**161** ppmv	**117** ppmv	**102** ppmv
FID[1]	Field	**468** ppmv	**836** ppmv	**704** ppmv	**277** ppmv	**432** ppmv	**284** ppmv	**259** ppmv
TVPH	TO-15	**339** ppmv	**642** ppmv	**581** ppmv	**386** ppmv	**382** ppmv	**373** ppmv	**343** ppmv
Acetone	TO-15	<47.0 ppmv	<45.0 ppmv	<35.0 ppmv	<30.0 ppmv	**3.91J** ppmv	<12.0 ppmv	<25.0 ppmv
Benzene	TO-15	<9.3 ppmv	<9.0 ppmv	<7.0 ppmv	<6.1 ppmv	<1.20 ppmv	<2.4 ppmv	<4.9 ppmv
Ethylbenzene	TO-15	<9.3 ppmv	<9.0 ppmv	<7.0 ppmv	<6.1 ppmv	<1.20 ppmv	<2.4 ppmv	<4.9 ppmv
Toluene	TO-15	<9.3 ppmv	<9.0 ppmv	<7.0 ppmv	<6.1 ppmv	<1.20 ppmv	<2.4 ppmv	<4.9 ppmv
Xylenes	TO-15	<9.3 ppmv	<9.0 ppmv	<7.0 ppmv	<6.1 ppmv	**1.05J** ppmv	<2.4 ppmv	<4.9 ppmv

[1] FID readings were measured in a 1:4 dilution
[2] sample taken prior to shut down of SVE system

Table 4
Soil Vapor Extraction Unit 1
Influent Concentrations
June 2001 through August 2002

Sample ID Description Date	Method	4-V-SVE1-1HR-INF6/01 20 WEEK 6 DAY 1 HR 6/18/2001	4-V-SVE-1MO-INF7/01 24 WEEK 6 DAY 7/16/2001	4-V-SVE1-INF-8/13 28 WEEK 6 DAY 8/13/2001	4-V-SVE1-INF-9/10 32 WEEK 6 DAY 9/10/2001	4-V-SVE1-INF-10/8 36 WEEK 6 DAY 10/8/2001	4-V-SVE1-INF-11/5 40 WEEK 6 DAY 11/5/2001
Field Oxygen	Field	**19.9** %	**18.7** %	**19.8** %	**19.8** %	**20.8** %	**19.7** %
PID	Field	**256** ppmv	**275** ppmv	**240** ppmv	**151** ppmv	**156** ppmv	**46.4** ppmv
FID[1]	Field	**1176** ppmv	**972** ppmv	**852** ppmv	**588** ppmv	**616** ppmv	**121** ppmv
TVPH	TO-15	**1400** ppmv	**1050** ppmv	**649** ppmv	**869** ppmv	**228** ppmv	**63.8** ppmv
Acetone	TO-15	<35.0 ppmv	<12.0 ppmv	<10.0 ppmv	<60.0 ppmv	**1.31J** ppmv	<0.870 ppmv
Benzene	TO-15	<7.1 ppmv	<2.4 ppmv	<2.0 ppmv	<12.0 ppmv	**0.253J** ppmv	<0.180 ppmv
Bromomethane	TO-15	<7.1 ppmv	<2.4 ppmv	<2.0 ppmv	<12.0 ppmv	<0.400 ppmv	<0.180 ppmv
2-Butanone (MEK)	TO-15	<35.0 ppmv	<12.0 ppmv	<10.0 ppmv	<60.0 ppmv	<2.0 ppmv	<0.870 ppmv
Chloroethane	TO-15	<7.1 ppmv	<2.4 ppmv	<2.0 ppmv	<12.0 ppmv	<0.400 ppmv	<0.180 ppmv
Chloromethane	TO-15	<7.1 ppmv	<2.4 ppmv	<2.0 ppmv	<12.0 ppmv	<0.400 ppmv	<0.180 ppmv
Ethylbenzene	TO-15	<7.1 ppmv	**1.51J** ppmv	<2.0 ppmv	<12.0 ppmv	**0.431** ppmv	<0.180 ppmv
Methylene Chloride	TO-15	<7.1 ppmv	<2.4 ppmv	<2.0 ppmv	<12.0 ppmv	<0.400 ppmv	<0.180 ppmv
Toluene	TO-15	<7.1 ppmv	<2.4 ppmv	<2.0 ppmv	<12.0 ppmv	**2.26** ppmv	**0.113J** ppmv
Xylenes	TO-15	**6.17J** ppmv	**6.88** ppmv	**2.46** ppmv	<12.0 ppmv	**2.09** ppmv	**0.197** ppmv

[1] FID readings were measured in a 1:4 dilution

Table 4
Soil Vapor Extraction Unit 1
Influent Concentrations
June 2001 through August 2002

Sample ID Description Date	Method	4-V-SVE1-INF-12/3 44 WEEK 6 DAY 12/3/2001	4-V-SVE1-INF-1/7 49 WEEK 6 DAY 1/7/2002	4-V-SVE1-INF-2/4 53 WEEK 6 DAY 2/4/2002	4-V-SVE1-INF-3/4 57 WEEK 6 DAY 3/4/2002	4-V-SVE1-INF-4/1 61 WEEK 6 DAY 4/1/2002	4-V-SVE1-INF-5/7 67 WEEK 5/7/2002
Field Oxygen	Field	**20.7** %	**20.9** %	**20.9** %	**20.9** %	**20.7** %	**20.8** %
PID	Field	**44.2** ppmv	**62.9** ppmv	**104** ppmv	**13.9** ppmv	**166** ppmv	**131** ppmv
FID[1]	Field	**141** ppmv	**216** ppmv	**184** ppmv	**90** ppmv	**140** ppmv	**112** ppmv
TVPH	TO-15	**130** ppmv	**373** ppmv	**301** ppmv	**71.6** ppmv	**224** ppmv	**177** ppmv
Acetone	TO-15	<1.8 ppmv	<2.6 ppmv	<1.560 ppmv	<0.378 ppmv	<5.2 ppmv	<4.1 ppmv
Benzene	TO-15	<0.360 ppmv	<0.520 ppmv	<0.312 ppmv	<0.076 ppmv	<1.0 ppmv	<0.810 ppmv
Bromomethane	TO-15	<0.360 ppmv	<0.520 ppmv	<0.312 ppmv	<0.076 ppmv	<1.0 ppmv	<0.810 ppmv
2-Butanone (MEK)	TO-15	<1.8 ppmv	<2.6 ppmv	<1.560 ppmv	<0.378 ppmv	<5.2 ppmv	<4.1 ppmv
Chloroethane	TO-15	<0.360 ppmv	<0.520 ppmv	<0.312 ppmv	<0.076 ppmv	<1.0 ppmv	<0.810 ppmv
Chloromethane	TO-15	<0.360 ppmv	<0.520 ppmv	<0.312 ppmv	<0.076 ppmv	<1.0 ppmv	<0.810 ppmv
Ethylbenzene	TO-15	<0.360 ppmv	<0.520 ppmv	**0.288J** ppmv	**0.06** ppmv	<1.0 ppmv	<0.810 ppmv
Methylene Chloride	TO-15	<0.360 ppmv	<0.520 ppmv	<0.312 ppmv	<0.076 ppmv	<1.0 ppmv	<0.810 ppmv
Toluene	TO-15	<0.360 ppmv	**2.26** ppmv	**1.93** ppmv	**0.3** ppmv	**1.01J** ppmv	**0.489J** ppmv
Xylenes	TO-15	<0.360 ppmv	**1.81** ppmv	**1.4** ppmv	**0.311** ppmv	**1.04J** ppmv	**0.748J** ppmv

[1] FID readings were measured in a 1:4

Table 4
Soil Vapor Extraction Unit 1
Influent Concentrations
June 2001 through August 2002

Sample ID Description Date	Method	4-V-SVE1-INF-6/4 71 WEEK 6/4/2002	4-V-SVE1-INF-7/1 75 WEEK 7/1/2002	4-V-SVE1-INF-7/15 76 WEEK 6 DAY 7/15/2002	4-V-SVE1-INF-7/22-1HR 77 WEEK 6 DAY 1 HR 7/22/2002	4-V-SVE1-INF-7/29-1WK 78 WEEK 6 DAY 7/29/2002	4-V-SVE1-INF-8/5-2WK 80 WEEK 8/5/2002
Field Oxygen	Field	**20.1** %	**20.8** %	**20.6** %	**19.3** %	N/A %	19.8 %
PID	Field	**180** ppmv	**251** ppmv	**152** ppmv	**35.2** ppmv	N/A ppmv	**34.6** ppmv
FID[1]	Field	**202** ppmv	**358** ppmv	**222** ppmv	**126** ppmv	N/A ppmv	**70.8** ppmv
TVPH	TO-15	**556** ppmv	**495** ppmv	**383** ppmv	**77.2** ppmv	**123** ppmv	**163** ppmv
Acetone	TO-15	<15.0 ppmv	<13.0 ppmv	<5.7 ppmv	<1.4 ppmv	<7.6 ppmv	**3.64** ppmv
Benzene	TO-15	<3.1 ppmv	<2.6 ppmv	<1.1 ppmv	<0.280 ppmv	<1.5 ppmv	<0.340 ppmv
Bromomethane	TO-15	<3.1 ppmv	<2.6 ppmv	<1.1 ppmv	<0.280 ppmv	<1.5 ppmv	<0.340 ppmv
2-Butanone (MEK)	TO-15	<15.0 ppmv	<13.0 ppmv	<5.7 ppmv	<1.4 ppmv	<7.6 ppmv	**2.45** ppmv
Chloroethane	TO-15	<3.1 ppmv	<2.6 ppmv	<1.1 ppmv	<0.280 ppmv	<1.5 ppmv	**3.1** ppmv
Chloromethane	TO-15	<3.1 ppmv	<2.6 ppmv	<1.1 ppmv	<0.280 ppmv	<1.5 ppmv	**2.18** ppmv
Ethylbenzene	TO-15	<3.1 ppmv	<2.6 ppmv	<1.1 ppmv	<0.280 ppmv	<1.5 ppmv	<0.340 ppmv
Methylene Chloride	TO-15	<3.1 ppmv	<2.6 ppmv	<1.1 ppmv	<0.280 ppmv	<1.5 ppmv	<0.340 ppmv
Toluene	TO-15	<3.1 ppmv	**1.76J** ppmv	**1.67** ppmv	**0.167J** ppmv	<1.5 ppmv	**0.571** ppmv
Xylenes	TO-15	**2.02J** ppmv	**1.52J** ppmv	**2.11** ppmv	<0.280 ppmv	<1.5 ppmv	**0.53** ppmv

[1] FID readings were measured in a 1:4

Table 5
Soil Vapor Extraction Unit 1
Influent Concetrations
March 2003 through December 2003

Sample ID Description Date	Method	86-V-SVE1-INF-3/24 1 HR 3/24/2003	86-V-SVE1-INF-4/21 4 WEEK 4/21/2003	86-V-SVE1-INF-5/20 8 WEEK 1 DAY 5/20/2003	86-V-SVE1-INF-5/28 9 WEEK 2 DAY 1 HR 5/28/2003	86-V-SVE1-INF-6/24 13 WEEK 1 DAY 6/24/2003	86-V-SVE1-INF-7/23 17 WEEK 2 DAY 7/23/2003
Field Oxygen	Field	**4.2** %	**19.4** %	**20.7** %	**17.9** %	**20.6** %	**20.1** %
PID		**1660** ppmv	**450** ppmv	**338** ppmv	**603** ppmv	**322** ppmv	**329** ppmv
FID[1]	Field	**1192** ppmv	**62** ppmv	**90** ppmv	**937** ppmv	**242** ppmv	**410** ppmv
TVPH	TO-15	**718** ppmv	**558** ppmv	**234** ppmv	**597** ppmv	**550** ppmv	**721** ppmv
Acetone	TO-15	<11.0 ppmv	<5.0 ppmv	<2.0 ppmv	<2.0 ppmv	<2.0 ppmv	<2.0 ppmv
Benzene	TO-15	<2.3 ppmv	<1.0 ppmv	<0.4 ppmv	**0.596** ppmv	**0.621** ppmv	**0.721** ppmv
Ethylbenzene	TO-15	<2.3 ppmv	<1.0 ppmv	<0.4 ppmv	**0.458** ppmv	**0.521** ppmv	<0.400 ppmv
Isopropylbenzene (Cumene)	TO-15	<2.3 ppmv	**2.5** ppmv	**1.32** ppmv	**2** ppmv	**2.49** ppmv	**2.14** ppmv
Toluene	TO-15	**2.89** ppmv	**3.32** ppmv	**1.35** ppmv	**3.34** ppmv	**2.98** ppmv	**4.88** ppmv
Xylenes	TO-15	<2.3 ppmv	**2.8** ppmv	**1.09** ppmv	**2.47** ppmv	**3.12** ppmv	**2.01** ppmv

[1] FID readings were measured in a 1:4 dilution

Table 5
Soil Vapor Extraction Unit 1
Influent Concetrations
March 2003 through December 2003

Sample ID		86-V-SVE1-INF-8/5	86-V-SVE1-INF-9/8	86-V-SVE1-INF-10/06	86-V-SVE1-INF-10/14	86-V-SVE1-INF-11/17	86-V-SVE1-INF-12/15
Description		19 WEEK 1 DAY 1 HR	23 WEEK	28 WEEK	29 WEEK 1 DAY 1 HR	34 WEEK	38 WEEK
Date		8/5/2003	9/8/2003	10/6/2003	10/14/2003	11/17/2003	12/15/2003
	Method						
Field Oxygen	Field	**17.1** %	**20.1** %	**21.2** %	**18.9** %	**20.8** %	**20.7** %
PID		**719** ppmv	**456** ppmv	**337** ppmv	N/A ppmv	**521** ppmv	**257** ppmv
FID[1]	Field	**812** ppmv	**523.1** ppmv	**234** ppmv	**421.2** ppmv	**175.6** ppmv	**238** ppmv
TVPH	TO-15	**622** ppmv	**573** ppmv	**367** ppmv	**500** ppmv	**288** ppmv	**163** ppmv
Acetone	TO-15	<2.0 ppmv	<2.0 ppmv	<2.6 ppmv	<2.0 ppmv	<2.1 ppmv	<2.0 ppmv
Benzene	TO-15	**1.13** ppmv	**1.02** ppmv	**0.703** ppmv	**1.64** ppmv	**0.456** ppmv	**0.421** ppmv
Ethylbenzene	TO-15	**0.498** ppmv	**0.4** ppmv	<0.520 ppmv	**0.557** ppmv	**0.467** ppmv	**0.461** ppmv
Isopropylbenzene (Cumene)	TO-15	**2.32** ppmv	**1.37** ppmv	**2.82** ppmv	**5.02** ppmv	**1.96** ppmv	**1.87** ppmv
Toluene	TO-15	**6.03** ppmv	**6.81** ppmv	**3.15** ppmv	**5.67** ppmv	**2.82** ppmv	**4.73** ppmv
Xylenes	TO-15	**2.58** ppmv	**2.12** ppmv	**1.59** ppmv	**3.12** ppmv	**2.76** ppmv	**2.69** ppmv

[1] FID readings were measured in a 1:4 dilution

Table 6
UST Cluster 1
SVE Performance Evaluation Testing
Mass Removal Estimates

Date	Description	Flowrate scfm	Analyte Concentration (mg/L) Benzene	Ethylbenzene	Toluene	Xylenes	TVPH	Analyte Removed (lbs) Benzene	Ethylbenzene	Toluene	Xylenes	TVPH
23-Jan-01	1 hour	140.9	25	0	0	56	20,000	0.01	0.00	0.00	0.03	11
23-Jan-01	2 hour	142	25	0	0	56	20,000	0.01	0.00	0.00	0.03	11
23-Jan-01	3 hour	143.1	25	0	0	56	20,000	0.01	0.00	0.00	0.03	11
23-Jan-01	4 hour	143.1	25	0	0	56	20,000	0.01	0.00	0.00	0.03	11
23-Jan-01	5 hour	144	25	0	0	56	20,000	0.01	0.00	0.00	0.03	11
23-Jan-01	6 hour	144.5	25	0	0	56	20,000	0.01	0.00	0.00	0.03	11
23-Jan-01	7 hour	144.5	25	0	0	56	20,000	0.01	0.00	0.00	0.03	11
23-Jan-01	8 hour	144.3	25	0	0	56	20,000	0.01	0.00	0.00	0.03	11
30-Jan-01	1 week	158.2	0	0	77	79	11,000	0.00	0.00	7.27	7.48	1,041
06-Feb-01	2 week	162.1	12	13	0	60	9,300	0.35	0.39	0.00	1.74	271
13-Feb-01	3 week	159.5	5	6.5	0	49	9,194	0.50	0.65	0.00	4.91	921
20-Feb-01	4 week	161.7	0	0	0	38	9,087	0.00	0.00	0.00	3.87	923
27-Feb-01	5 week	158.6	0	0	0	38	9,087	0.00	0.00	0.00	3.79	906
06-Mar-01	6 week	155.5	0	0	0	19	7,694	0.00	0.00	0.00	1.86	752
13-Mar-01	7 week	157.6	0	0	0	0	6,300	0.00	0.00	0.00	0.00	624
20-Mar-01	8 week	156.3	0	0	0	0	6,300	0.00	0.00	0.00	0.00	619
27-Mar-01	9 week	157.4	0	0	0	0	6,300	0.00	0.00	0.00	0.00	623
03-Apr-01	10 week	161.1	0	0	0	18	6,250	0.00	0.00	0.00	1.82	633
10-Apr-01	11 week	157.5	0	0	0	36	6,200	0.00	0.00	0.00	3.56	614
17-Apr-01	12 week	159.9	0	0	0	36	6,200	0.00	0.00	0.00	3.62	623
24-Apr-01	13 week	154.6	0	0	0	36	6,200	0.00	0.00	0.00	3.50	602
01-May-01	14 week	159.0	0	0	0	32	5,100	0.00	0.00	0.00	3.20	510
08-May-01	15 week	153.2	0	0	0	28	4,000	0.00	0.00	0.00	2.70	385
15-May-01	16 week	157.6	0	0	0	28	4,000	0.00	0.00	0.00	2.77	396
22-May-01	17 week	157.8	0	0	0	28	4,000	0.00	0.00	0.00	2.78	397
30-May-01	18 wk 1 day	145.4	0	0	0	25	5,250	0.00	0.00	0.00	1.02	214
05-Jun-01	19 week	176.2	0	0	0	22	6,300	0.00	0.00	0.00	2.44	697
13-Jun-01	20 week 1 day	192.3	0	0	0	22	6,300	0.00	0.00	0.00	2.66	761
18-Jun-01	20 week 5 dy 23 hr	176.6	0	0	0	12	2,600	0.00	0.00	0.00	1.33	289
SVE Unit #3 from 12-Mar-01 to 06-Jun-01			Total Removed from SVE Unit #3 (0 to 14 Weeks) (See Table 6)					0.00	0.00	0.00	0.33	1,600
18-Jun-01	20 wk 6 dy 1 hr	173.5	0	0	0	27	5,700	0.00	0.00	0.00	0.02	4
18-Jun-01	20 wk 6 dy 2 hr	172.0	0	0	0	27	5,700	0.00	0.00	0.00	0.02	4
18-Jun-01	20 wk 6 dy 3 hr	171.4	0	0	0	27	5,700	0.00	0.00	0.00	0.02	4
18-Jun-01	20 wk 6 dy 4 hr	169.6	0	0	0	27	5,700	0.00	0.00	0.00	0.02	4
18-Jun-01	20 wk 6 dy 5 hr	168.8	0	0	0	27	5,700	0.00	0.00	0.00	0.02	4
18-Jun-01	20 wk 6 dy 6 hr	168.6	0	0	0	27	5,700	0.00	0.00	0.00	0.02	4
18-Jun-01	20 wk 6 dy 7 hr	169.3	0	0	0	27	5,700	0.00	0.00	0.00	0.02	4
18-Jun-01	20 wk 6 dy 8 hr	169.3	0	0	0	27	5,700	0.00	0.00	0.00	0.02	4
25-Jun-01	21 week 6 day	175.3	0	0	0	27	5,700	0.00	0.00	0.00	2.83	598
02-Jul-01	22 week 6 day	170.6	0	3.3	0	28.5	5,000	0.00	0.35	0.00	3.06	536

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Date	Description	Flowrate scfm	Analyte Concentration (mg/L) Benzene	Ethylbenzene	Toluene	Xylenes	TVPH	Analyte Removed (lbs) Benzene	Ethylbenzene	Toluene	Xylenes	TVPH
09-Jul-01	23 week 6 day	179.2	0	6.6	0	30	4,300	0.00	0.74	0.00	3.38	484
16-Jul-01	24 week 6 day	181.0	0	6.6	0	30	4,300	0.00	0.75	0.00	3.41	489
23-Jul-01	25 week 6 day	178.3	0	6.6	0	30	4,300	0.00	0.74	0.00	3.36	482
30-Jul-01	26 week 6 day	181.5	0	3.3	0	20.5	3,500	0.00	0.38	0.00	2.34	399
06-Aug-01	27 week 6 day	178.4	0	0	0	11	2,700	0.00	0.00	0.00	1.23	303
13-Aug-01	28 week 6 day	185.8	0	0	0	11	2,700	0.00	0.00	0.00	1.28	315
20-Aug-01	29 week 6 day	184.2	0	0	0	11	2,700	0.00	0.00	0.00	1.27	312
27-Aug-01	30 week 6 day	187.2	0	0	0	5.5	3,150	0.00	0.00	0.00	0.00	371
05-Sep-01	32 week 1 day	186.2	0	0	0	0	3,600	0.00	0.00	0.00	0.00	476
10-Sep-01	32 week 6 day	182.6	0	0	0	0	3,600	0.00	0.00	0.00	0.00	297
17-Sep-01	33 week 6 day	181.9	0	0	0	0	3,600	0.00	0.00	0.00	0.00	411
24-Sep-01	34 week 6 day	184.6	0.405	0.95	4.25	4.55	2,265	0.05	0.11	0.49	0.53	263
01-Oct-01	35 week 6 day	182.0	0.81	1.9	8.5	9.1	930	0.09	0.22	0.97	1.04	106
08-Oct-01	36 week 6 day	193.5	0.81	1.9	8.5	9.1	930	0.10	0.23	1.03	1.11	113
15-Oct-01	37 week 6 day	184.0	0.81	1.9	8.5	9.1	930	0.09	0.22	0.98	1.05	108
22-Oct-01	38 week 6 day	193.5	0.405	0.95	4.47	4.98	595	0.05	0.12	0.54	0.61	72
29-Oct-01	39 week 6 day	188.3	0	0	0.43	0.85	260	0.00	0.00	0.05	0.10	31
05-Nov-01	40 week 6 day	180.5	0	0	0.43	0.85	260	0.00	0.00	0.05	0.10	29
12-Nov-01	41 week 6 day	194.6	0	0	0.43	0.85	260	0.00	0.00	0.05	0.10	32
19-Nov-01	42 week 6 day	187.0	0	0	0.22	0.43	395	0.00	0.00	0.03	0.05	46
26-Nov-01	43 week 6 day	193.6	0	0	0	0	530	0.00	0.00	0.00	0.00	64
03-Dec-01	44 week 6 day	183.5	0	0	0	0	530	0.00	0.00	0.00	0.00	61
06-Dec-01	45 week 2 day	124.0	0	0	0	0	530	0.00	0.00	0.00	0.00	18
10-Dec-01	45 week 6 day	134.0	0	0	0	0	530	0.00	0.00	0.00	0.00	25
17-Dec-01	46 week 6 day	114.0	0	0	4.25	3.95	1,015	0.00	0.00	0.22	0.20	52
26-Dec-01	48 week 1 day	84.0	0	0	8.5	7.9	1,500	0.00	0.00	0.32	0.30	56
03-Jan-02	49 week 2 day	100.5	0	0	8.5	7.9	1,500	0.00	0.00	0.51	0.48	90
07-Jan-02	49 week 6 day	108.5	0	0	8.5	7.9	1,500	0.00	0.00	0.33	0.31	58
14-Jan-02	50 week 6 day	101.5	0	0.0	8.5	7.9	1,500	0.00	0.00	0.54	0.50	96
21-Jan-02	51 week 6 day	102.5	0	0.6	7.9	7	1,350	0.00	0.04	0.51	0.45	87
28-Jan-02	52 week 6 day	91.0	0	1.2	7.3	6.1	1,200	0.00	0.07	0.42	0.35	69
04-Feb-02	53 week 6 day	90.3	0	1.2	7.3	6.1	1,200	0.00	0.07	0.41	0.35	68
11-Feb-02	54 week 6 day	95.0	0	1.2	7.3	6.1	1,200	0.00	0.07	0.44	0.36	72
19-Feb-02	56 week	92.5	0	0.73	4.2	3.7	747	0.00	0.05	0.28	0.25	50
25-Feb-02	56 week 6 day	89.5	0	0.26	1.1	1.3	293	0.00	0.01	0.05	0.06	14
04-Mar-02	57 week 6 day	89.5	0	0.26	1.1	1.3	293	0.00	0.01	0.05	0.06	13
11-Mar-02	58 week 6 day	97.5	0	0.3	1.1	1.3	293	0.00	0.02	0.07	0.08	18
18-Mar-02	59 week 6 day	86.0	0	0.15	2.45	2.9	606.5	0.00	0.01	0.13	0.16	33
25-Mar-02	60 week 6 day	95.5	0	0.0	3.8	4.5	920	0.00	0.00	0.20	0.24	49
01-Apr-02	61 week 6 day	99.0	0	0.0	3.8	4.5	920	0.00	0.00	0.16	0.18	38
09-Apr-02	63 week	82.5	0	0.0	3.8	4.5	920	0.00	0.00	0.16	0.19	39

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UST Cluster 1
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Date	Description	Flowrate scfm	Analyte Concentration (mg/L) Benzene	Ethylbenzene	Toluene	Xylenes	TVPH	Analyte Removed (lbs) Benzene	Ethylbenzene	Toluene	Xylenes	TVPH
15-Apr-02	63 week 6 day	84.5	0	0.0	2.85	3.85	820	0.00	0.00	0.11	0.15	31
23-Apr-02	65 week	93.5	0	0.0	2.85	3.85	820	0.00	0.00	0.15	0.20	43
29-Apr-02	65 week 6 day	87.0	0	0.0	1.9	3.2	720	0.00	0.00	0.03	0.05	11
07-May-02	67 week	89.5	0.0	0.0	1.9	3.2	720	0.00	0.00	0.12	0.20	45
14-May-02	68 week	86.5	0.0	0.0	1.9	3.2	720	0.00	0.00	0.10	0.17	39
20-May-02	68 week 6 day	98.5	0.0	0.0	0.95	6	455	0.00	0.00	0.05	0.32	24
28-May-02	70 week	99.0	0.0	0.0	0.0	8.8	190	0.00	0.00	0.00	0.63	14
04-Jun-02	71 week	100.0	0.0	0.0	0.0	8.8	190	0.00	0.00	0.00	0.55	12
11-Jun-02	72 week	95.5	0.0	0.0	0.0	8.8	190	0.00	0.00	0.00	0.53	11
17-Jun-02	72 week 6 day	103.5	0.0	0.0	3.3	7.7	1,095	0.00	0.00	0.18	0.43	61
25-Jun-02	74 week	99.5	0.0	0.0	6.6	6.6	2,000	0.00	0.00	0.47	0.47	143
02-Jul-02	75 week	100.0	0.0	0.0	6.6	6.6	2,000	0.00	0.00	0.41	0.41	126
08-Jul-02	75 week 6 day	104.5	0.0	0.0	6.6	6.6	2,000	0.00	0.00	0.37	0.37	113
15-Jul-02	76 week 6 day	112.5	0.0	0.0	6.3	9.2	1,600	0.00	0.00	0.45	0.65	113
			Rebound Testing									
15-Jul-02	76 wk 6 d 5 hr	Off										
22-Jul-02	77 Week 6 day	Off										
			Recovery Testing									
22-Jul-02	77 wk 6 dy 1 hr	107.0	0.0	0.0	0.63	0	320	0.00	0.00	0.00	0.00	0
22-Jul-02	77 wk 6 dy 2 hr	103.8	0.0	0.0	0.63	0	320	0.00	0.00	0.00	0.00	0
22-Jul-02	77 wk 6 dy 3 hr	101.0	0.0	0.0	0.63	0	320	0.00	0.00	0.00	0.00	0
22-Jul-02	77 wk 6 dy 4 hr	103.5	0.0	0.0	0.63	0	320	0.00	0.00	0.00	0.00	0
22-Jul-02	77 wk 6 dy 5 hr	105.5	0.0	0.0	0.63	0	320	0.00	0.00	0.00	0.00	0
22-Jul-02	77 wk 6 dy 6 hr		0.0	0.0	0.63	0	320	0.00	0.00	0.00	0.00	0
22-Jul-02	77 wk 6 dy 7 hr	103.5	0.0	0.0	0.63	0	320	0.00	0.00	0.00	0.00	0
22-Jul-02	77 wk 6 dy 8 hr	105.5	0.0	0.0	0.63	0	320	0.00	0.00	0.00	0.00	0
29-Jul-02	78 Week 6 day	104.0	0.0	0.0	0	0	500	0.00	0.00	0.00	0.00	28
06-Aug-02	80 Week	106.0	0.0	0.0	2.2	2.3	670	0.00	0.00	0.17	0.18	51
12-Aug-02	80 Week 6 day	106.0	0.0	0.0	2.2	2.3	670	0.00	0.00	0.13	0.13	38
20-Aug-02	82 Week	106.5	0.0	0.0	2.2	2.3	670	0.00	0.00	0.17	0.18	51
20-Aug-02	82 Week 1 hr	Off										
			Performance Evaluation Testing II									
24-Mar-03	1 hr	106.0	0.0	0.0	11	0	2,900	0.00	0.00	0.00	0.00	1.15
24-Mar-03	2 hr	106.0	0.0	0.0	11	0	2,900	0.00	0.00	0.00	0.00	1.15
24-Mar-03	3 hr	106.5	0.0	0.0	11	0	2,900	0.00	0.00	0.00	0.00	1.16
24-Mar-03	4 hr	106.5	0.0	0.0	11	0	2,900	0.00	0.00	0.00	0.00	1.16
24-Mar-03	5 hr	106.0	0.0	0.0	11	0	2,900	0.00	0.00	0.00	0.00	1.15
24-Mar-03	6 hr	105.5	0.0	0.0	11	0	2,900	0.00	0.00	0.00	0.00	1.14

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UST Cluster 1
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Date	Description	Flowrate scfm	Analyte Concentration (mg/L) Benzene	Ethylbenzene	Toluene	Xylenes	TVPH	Analyte Removed (lbs) Benzene	Ethylbenzene	Toluene	Xylenes	TVPH
24-Mar-03	7 hr	105.5	0.0	0.0	11	0	2,900	0.00	0.00	0.00	0.00	1.14
24-Mar-03	8 hr	106.2	0.0	0.0	11	0	2,900	0.00	0.00	0.00	0.00	1.15
31-Mar-03	1 week	107.0	0.0	0.0	11	0	2,900	0.00	0.00	0.70	0.00	185.69
08-Apr-03	2 week 1 day	95.5	0	0	11.5	5.5	2600	0.00	0.00	0.67	0.32	152.30
14-Apr-03	3 week	89.0	0	0	12	11	2300	0.00	0.00	0.37	0.34	70.43
21-Apr-03	4 week	95.0	0	0	12	11	2300	0.00	0.00	0.72	0.66	137.29
29-Apr-03	5 week 1 day	90.5	0	0	12	11	2300	0.00	0.00	0.78	0.71	149.47
05-May-03	6 week	97.0	0	0	8.55	7.85	1630	0.00	0.00	0.29	0.27	56.18
13-May-03	7 week 1 day	99.5	0	0	5.1	4.7	960	0.00	0.00	0.36	0.34	68.59
20-May-03	8 week 1 day	102.0	0	0	5.1	4.7	960	0.00	0.00	0.33	0.30	61.53
				Rebound Testing								
20-May-03	8 week 1 day	Off										
28-May-03	9 week 2 day	Off										
				Recovery Testing								
28-May-03	9 week 2 day 1 hr	110.0	1.9	2	13	11	2400	0.00	0.00	0.01	0.00	0.99
28-May-03	9 week 2 day 4 hr	101.0	1.9	2	13	11	2400	0.00	0.00	0.01	0.01	2.72
28-May-03	9 week 2 day 8 hr	100.0	1.9	2	13	11	2400	0.00	0.00	0.02	0.02	3.59
02-Jun-03	10 week	101.0	1.9	2	13	11	2400	0.08	0.08	0.55	0.47	101.54
09-Jun-03	11 week	103.0	1.95	2.15	12	12.5	2350	0.13	0.14	0.78	0.81	152.09
17-Jun-03	12 week 1 day	99.5	2	2.3	11	14	2300	0.14	0.16	0.79	1.00	164.34
24-Jun-03	13 week 1 day	107.0	2	2.3	11	14	2300	0.13	0.15	0.74	0.94	154.63
30-Jun-03	14 week	107.5	2	2.3	11	14	2300	0.12	0.13	0.64	0.81	133.16
09-Jul-03	15 week 2 day	102.5	2.15	1.15	14.5	11.35	2650	0.18	0.10	1.20	0.94	219.43
17-Jul-03	16 week 3 day	103.5	2.3	0	18	8.7	3000	0.17	0.00	1.34	0.65	222.97
23-Jul-03	17 week 2 day	110.0	2.3	0	18	8.7	3000	0.14	0.00	1.07	0.52	177.73
				Rebound Testing								
23-Jul-03	17 week 2 day	Off										
05-Aug-03	19 week 1 day	Off										
				Recovery Testing								
05-Aug-03	19 week 1 day 1 hr	104.0	3.6	2.2	23	11	2500	0.00	0.00	0.01	0.00	0.97
05-Aug-03	19 week 1 day 4 hr	103.0	3.6	2.2	23	11	2500	0.00	0.00	0.03	0.01	2.89
05-Aug-03	19 week 1 day 8 hr	100.0	3.6	2.2	23	11	2500	0.01	0.00	0.03	0.02	3.74
12-Aug-03	20 week 1 day	107.0	3.6	2.2	23	11	2500	0.23	0.14	1.47	0.70	160.08
18-Aug-03	21 week	112.0	3.45	1.95	24.5	10.1	2400	0.21	0.12	1.48	0.61	144.77
26-Aug-03	22 week 1 day	107.0	3.3	1.7	26	9.2	2300	0.25	0.13	2.00	0.71	176.72
08-Sep-03	23 week	108.0	3.3	1.7	26	9.2	2300	0.42	0.21	3.28	1.16	289.86
16-Sep-03	24 week 1 day	111.0	3.3	1.7	26	9.2	2300	0.26	0.14	2.07	0.73	183.33
30-Sep-03	25 Week 1 day[1]	111.0	2.2	0	12	6.9	1500	0.00	0.00	0.00	0.00	0.00
06-Oct-03	28 week	101.0	2.2	0	12	6.9	1500	0.16	0.00	0.87	0.50	108.79

Table 6
UST Cluster 1
SVE Performance Evaluation Testing
Mass Removal Estimates

Date	Description	Flowrate scfm	Analyte Concentration (mg/L) Benzene	Ethylbenzene	Toluene	Xylenes	TVPH	Analyte Removed (lbs) Benzene	Ethylbenzene	Toluene	Xylenes	TVPH
			Rebound Testing									
06-Oct-03	28 week	Off										
14-Oct-03	29 week 1 day	Off										
			Recovery Testing									
14-Oct-03	29 week 1 day 1 hr	118.0	5.2	2.4	21	14	2000	0.00	0.00	0.01	0.01	0.88
14-Oct-03	29 week 1 day 4 hr	107.0	5.2	2.4	21	14	2000	0.01	0.00	0.03	0.02	2.40
14-Oct-03	29 week 1 day 8 hr	104.0	5.2	2.4	21	14	2000	0.01	0.00	0.03	0.02	3.11
16-Oct-03	29 week 3 day	113.0	5.2	2.4	21	14	2000	0.09	0.04	0.36	0.24	33.81
20-Oct-03	30 week	113.0	5.2	2.4	21	14	2000	0.21	0.10	0.85	0.57	81.14
27-Oct-03	31 week	119.0	3.35	2.2	16	13	1600	0.25	0.16	1.20	0.97	119.63
04-Nov-03	32 week 1 day	118.0	1.5	2	11	12	1200	0.13	0.17	0.93	1.02	101.68
10-Nov-03	33 week	116.0	1.5	2	11	12	1200	0.09	0.12	0.69	0.75	74.97
17-Nov-03	34 week	116.0	1.5	2	11	12	1200	0.11	0.15	0.80	0.87	87.46
25-Nov-03	35 week 1 day	93.0	1.5	2	11	12	1200	0.10	0.13	0.73	0.80	80.14
01-Dec-03	36 week	92.0	1.4	2	14.5	12	935	0.07	0.10	0.72	0.59	46.33
09-Dec-03	37 week 1 day	90.0	1.3	2	18	12	670	0.08	0.13	1.16	0.78	43.30
15-Dec-03	38 week	99.0	1.3	2	18	12	670	0.07	0.11	0.96	0.64	35.72
								Benzene	Ethylbenzene	Toluene	Xylenes	TVPH
							Cumulative Total	5.19	7.98	50.28	113.54	26,818.93

[1] SVE system off--no formal restart of system

Table 7
Soil Vapor Extraction 3
Mass Removal Estimates

Date	Description	Flowrate scfm	Analyte Concentration (mg/L) Benzene	Ethylbenzene	Toluene	Xylenes	TVPH	Analyte Removed (lbs) Benzene	Ethylbenzene	Toluene	Xylenes	TVPH
12-Mar-01	1 hour	119.7	0	0	0	0	1400	0.00	0.00	0.00	0.00	1
19-Mar-01	1 week	117.1	0	0	0	0	2600	0.00	0.00	0.00	0.00	191
26-Mar-01	2 week	118.2	0	0	0	0	2400	0.00	0.00	0.00	0.00	178
02-Apr-01	3 week	114.1	0	0	0	0	2000	0.00	0.00	0.00	0.00	143
10-Apr-01	4 week 1 day	115.4	0	0	0	0	1600	0.00	0.00	0.00	0.00	92
17-Apr-01	5 week 1 day	113.8	0	0	0	0	1600	0.00	0.00	0.00	0.00	114
24-Apr-01	6 week 1 day	111.9	0	0	0	0	1600	0.00	0.00	0.00	0.00	112
01-May-01	7 week 1 day	112.0	0	0	0	0	1600	0.00	0.00	0.00	0.00	113
08-May-01	8 week 1 day	113.2	0	0	0	4.6	1600	0.00	0.00	0.00	0.33	114
15-May-01	9 week 1 day	113.0	0	0	0	0	1600	0.00	0.00	0.00	0.00	114
22-May-01	10 week 1 day	113.1	0	0	0	0	1550	0.00	0.00	0.00	0.00	110
30-May-01	11 week 2 day	109.4	0	0	0	0	1500	0.00	0.00	0.00	0.00	61
05-Jun-01	12 week 1 day	107.5	0	0	0	0	1500	0.00	0.00	0.00	0.00	87
13-Jun-01	13 week 2 day	109.8	0	0	0	0	1450	0.00	0.00	0.00	0.00	103
18-Jun-01	13 wk 6 dy 23 hr	107.8	0	0	0	0	1400	0.00	0.00	0.00	0.00	67

	Benzene	Ethylbenzene	Toluene	Xylenes	TVPH
Cumulative Total	**0.00**	**0.00**	**0.00**	**0.33**	**1600**

note: mass calculation takes into account any down time of the SVE system

Table 8
UST Cluster 1
Vapor Extraction Well Analytical Results

Well ID		CL1-VW-01(S)	CL1-VW-02(S)		CL1-VW-02(D)		CL1-VW-03(D)
Zone		Shallow	Shallow		Deep		Deep
Screen Interval (ft bgs)		9-14	15-25		40-55		47-52
Date		10/18/00[1]	12/08/00[1]	8/27/2002	12/09/00[1]	8/27/2002	09/15/00[1]
	Method						
Field Oxygen	Field	**15.2** %	**17** %	**17.1** %	**4** %	**15.5** %	**4.2** %
Oxygen	ASTM 1945/1946	**12** %	**15.1** %	N/A %	**5.2** %	N/A %	**8.17** %
Carbon Dioxide	ASTM 1945/1946	**7.3** %	**3.4** %	N/A %	**11** %	N/A %	**13.4** %
FID[2]	Field	**235** ppmv	**640** ppmv	0 ppmv	**576** ppmv	**188** ppmv	**1572** ppmv
TVPH	TO-15	**270** ppmv	**464** ppmv	**210** ppmv	**492** ppmv	**420** ppmv	**504** ppmv
Acetone	TO-15	**1.87J** ppmv	<10.0 ppmv	<4.5 ppmv	<16.0 ppmv	<6.8 ppmv	<10.0 ppmv
Benzene	TO-15	<1.6 ppmv	<2.0 ppmv	<0.9 ppmv	<3.1 ppmv	<1.4 ppmv	<2.0 ppmv
2-Butanone (MEK)	TO-15	<8.1 ppmv	<10.0 ppmv	<4.5 ppmv	<16.0 ppmv	<6.8 ppmv	<10.0 ppmv
Ethylbenzene	TO-15	<1.6 ppmv	**1.34J** ppmv	<0.9 ppmv	<3.1 ppmv	<1.4 ppmv	<2.0 ppmv
Methyl Isobutyl Ketone (MIBK)	TO-15	<8.1 ppmv	<10.0 ppmv	<4.5 ppmv	<16.0 ppmv	<6.8 ppmv	<10.0 ppmv
Methyl Tertbutyl Ether (MTBE)	TO-15	<1.6 ppmv	<2.0 ppmv	<0.9 ppmv	<3.1 ppmv	<1.4 ppmv	<2.0 ppmv
Toluene	TO-15	<1.6 ppmv	<2.0 ppmv	<0.9 ppmv	<3.1 ppmv	<1.4 ppmv	<2.0 ppmv
Xylenes	TO-15	<1.6 ppmv	**2.6** ppmv	<0.9 ppmv	<3.1 ppmv	<1.4 ppmv	<2.0 ppmv

[1] taken during individual well testing at 48 hours after start of test
[2] FID readings were measured in a 1:4 dilution and corrected

Table 8
UST Cluster 1
Vapor Extraction Well Analytical Results

Well ID		CL1-VW-07(D)	CL1-VW-09(S)	CL1-VW-10(M)		CL1-VW-10(D)
Zone		Deep	Shallow	Middle		Deep
Screen Interval (ft bgs)		48-58	25-34	38-43		45-55
Date		10/04/00[1]	11/30/00[1]	11/15/00[1]	8/27/2002	11/29/00[1]
	Method					
Field Oxygen	Field	**4.8** %	**17.4** %	**4.3** %	**19.9** %	**6.6** %
Oxygen	ASTM 1945/1946	**10** %	**15.4** %	**5.8** %	N/A %	**5.5** %
Carbon Dioxide	ASTM 1945/1946	**9.5** %	**4.6** %	**9.9** %	N/A %	**8.4** %
FID[2]	Field	**8020** ppmv	**2040** ppmv	**1492** ppmv	**26.4** ppmv	**1619** ppmv
TVPH	TO-15	**4530** ppmv	**1060** ppmv	**1230** ppmv	**60** ppmv	**1370** ppmv
Acetone	TO-15	<50.0 ppmv	**12.9J** ppmv	**17.9J** ppmv	<1.3 ppmv	<27.0 ppmv
Benzene	TO-15	<10.0 ppmv	<8.0 ppmv	<6.7 ppmv	<0.27 ppmv	**0.620J** ppmv
2-Butanone (MEK)	TO-15	<50.0 ppmv	<40.0 ppmv	<33.0 ppmv	<1.3 ppmv	<27.0 ppmv
Ethylbenzene	TO-15	<10.0 ppmv	**5.92J** ppmv	**0.95J** ppmv	<0.27 ppmv	**1.46J** ppmv
Methyl Isobutyl Ketone (MIBK)	TO-15	<50.0 ppmv	<40.0 ppmv	<33.0 ppmv	<1.3 ppmv	<27.0 ppmv
Methyl Tertbutyl Ether (MTBE)	TO-15	<10.0 ppmv	<8.0 ppmv	<6.7 ppmv	<0.27 ppmv	<5.3 ppmv
Toluene	TO-15	<10.0 ppmv	<8.0 ppmv	<6.7 ppmv	<0.27 ppmv	<5.3 ppmv
Xylenes	TO-15	<10.0 ppmv	**41.4** ppmv	<6.7 ppmv	<0.27 ppmv	**6.96** ppmv

[1] taken during individual well testing at 48 hours after start of test
[2] FID readings were measured in a 1:4 dilution and corrected

Table 8
UST Cluster 1
Vapor Extraction Well Analytical Results

Well ID		CL1-VW-11(M)		CL1-VW-11(D)		CL1-VW-12(M)
Zone		Middle		Deep		Middle
Screen Interval (ft bgs)		38-43		46-56		30-40
Date		10/26/00[1]	8/27/2002	10/27/00[1]	8/27/2002	11/02/00[1]
	Method					
Field Oxygen	Field	**3.4** %	**18** %	**2.3** %	**18** %	**6.4** %
Oxygen	ASTM 1945/1946	**4.1** %	N/A %	**2.4** %	N/A %	**2.4** %
Carbon Dioxide	ASTM 1945/1946	**12** %	N/A %	**14** %	N/A %	**14** %
FID[2]	Field	**15900** ppmv	**251.6** ppmv	**14500** ppmv	**262.4** ppmv	**4595** ppmv
TVPH	TO-15	**3400** ppmv	**470** ppmv	**5570** ppmv	**160** ppmv	**2880** ppmv
Acetone	TO-15	<50.0 ppmv	<6.9 ppmv	<25.0 ppmv	<2.2 ppmv	<50.0 ppmv
Benzene	TO-15	<10.0 ppmv	<1.4 ppmv	**11.2** ppmv	<0.44 ppmv	<10.0 ppmv
2-Butanone (MEK)	TO-15	<50.0 ppmv	<6.9 ppmv	<25.0 ppmv	<2.2 ppmv	<50.0 ppmv
Ethylbenzene	TO-15	<10.0 ppmv	<1.4 ppmv	**1.85J** ppmv	<0.44 ppmv	<10.0 ppmv
Methyl Isobutyl Ketone (MIBK)	TO-15	<50.0 ppmv	<6.9 ppmv	<25.0 ppmv	<2.2 ppmv	<50.0 ppmv
Methyl Tertbutyl Ether (MTBE)	TO-15	<10.0 ppmv	<1.4 ppmv	<5.0 ppmv	<0.44 ppmv	<10.0 ppmv
Toluene	TO-15	<10.0 ppmv	<1.4 ppmv	<5.0 ppmv	<0.44 ppmv	<10.0 ppmv
Xylenes	TO-15	<10.0 ppmv	<1.4 ppmv	<5.0 ppmv	<0.44 ppmv	<10.0 ppmv

[1] taken during individual well testing at 48 hours after start of test
[2] FID readings were measured in a 1:4 dilution and corrected

Table 8
UST Cluster 1
Vapor Extraction Well Analytical Results

Well ID		CL1-VW-12(D)		CL1-VW-13(D)		CL1-VW-15(D)	CL1-VW-17(D)
Zone		Deep		Deep		Deep	Deep
Screen Interval (ft bgs)		45-55		46-56		46-56	46-56
Date		11/01/00[1]	8/27/2002	11/18/00[1]	8/27/2002	11/10/00[1]	10/11/00[1]
	Method						
Field Oxygen	Field	**2** %	**15.5** %	**9.3** %	**18.8** %	**10.6** %	**7.5** %
Oxygen	ASTM 1945/1946	**2.4** %	N/A %	**8.8** %	N/A %	**9.9** %	**9.7** %
Carbon Dioxide	ASTM 1945/1946	**14** %	N/A %	**9** %	N/A %	**10** %	**15** %
FID[2]	Field	**76800** ppmv	**57.2** ppmv	**13000** ppmv	**22** ppmv	**12464** ppmv	**27500** ppmv
TVPH	TO-15	**4900** ppmv	**240** ppmv	**7780** ppmv	**19.2** ppmv	**2510** ppmv	**6110** ppmv
Acetone	TO-15	<100.0 ppmv	<2.1 ppmv	<160.0 ppmv	<0.44 ppmv	<100.0 ppmv	<80.0 ppmv
Benzene	TO-15	**7.32J** ppmv	<0.42 ppmv	<32.0 ppmv	<0.087 ppmv	<20.0 ppmv	**7.39J** ppmv
2-Butanone (MEK)	TO-15	<100.0 ppmv	<2.1 ppmv	<160.0 ppmv	<0.44 ppmv	<100.0 ppmv	<80.0 ppmv
Ethylbenzene	TO-15	<20.0 ppmv	<0.42 ppmv	<32.0 ppmv	<0.087 ppmv	<20.0 ppmv	<16.0 ppmv
Methyl Isobutyl Ketone (MIBK)	TO-15	<100.0 ppmv	<2.1 ppmv	<160.0 ppmv	<0.44 ppmv	<100.0 ppmv	<80.0 ppmv
Methyl Tertbutyl Ether (MTBE)	TO-15	<20.0 ppmv	<0.42 ppmv	<32.0 ppmv	<0.087 ppmv	<20.0 ppmv	<16.0 ppmv
Toluene	TO-15	**37.2** ppmv	<0.42 ppmv	<32.0 ppmv	<0.087 ppmv	<20.0 ppmv	<16.0 ppmv
Xylenes	TO-15	**3.84J** ppmv	<0.42 ppmv	<32.0 ppmv	<0.087 ppmv	<20.0 ppmv	<16.0 ppmv

[1] taken during individual well testing at 48 hours after start of test
[2] FID readings were measured in a 1:4 dilution and corrected

Table 8
UST Cluster 1
Vapor Extraction Well Analytical Results

Well ID		CL1-VW-20(S)	CL1-VW-20(M)		CL1-VW-23(D)	CL1-SV-01A	
Zone		Shallow	Middle		Deep	Shallow	
Screen Interval (ft bgs)		18-23	27-32		48-53	20-30	
Date		09/07/00[1]	08/01/00[1]	8/27/2002	08/18/00[1]	11/04/00[1]	8/27/2002
	Method						
Field Oxygen	Field	**10.6** %	**3.5** %	**19.2** %	**3.5** %	**13** %	**18** %
Oxygen	ASTM 1945/1946	**11.6** %	**5.69** %	N/A %	**5.14** %	**12** %	N/A %
Carbon Dioxide	ASTM 1945/1946	**3.28** %	**12.5** %	N/A %	**14.2** %	**5.9** %	N/A %
FID[2]	Field	**396** ppmv	**1310** ppmv	**60.3** ppmv	**1196** ppmv	**7072** ppmv	**220.8** ppmv
TVPH	TO-15	**193** ppmv	**1140** ppmv	**290** ppmv	**1520** ppmv	**1710** ppmv	**330** ppmv
Acetone	TO-15	**2.86J** ppmv	**22.0J** ppmv	<6.5 ppmv	**5.96J** ppmv	**10.9J** ppmv	<5.3 ppmv
Benzene	TO-15	<0.67 ppmv	<5.0 ppmv	<1.3 ppmv	**0.556J** ppmv	**1.03J** ppmv	<1.1 ppmv
2-Butanone (MEK)	TO-15	<3.3 ppmv	**3.6J** ppmv	<6.5 ppmv	<20.0 ppmv	<31.0 ppmv	<5.3 ppmv
Ethylbenzene	TO-15	**0.246J** ppmv	**4.4J** ppmv	<1.3 ppmv	<4.0 ppmv	<6.3 ppmv	<1.1 ppmv
Methyl Isobutyl Ketone (MIBK)	TO-15	<3.3 ppmv	<25.0 ppmv	<6.5 ppmv	<20.0 ppmv	<31.0 ppmv	<5.3 ppmv
Methyl Tertbutyl Ether (MTBE)	TO-15	<0.67 ppmv	<5.0 ppmv	<1.3 ppmv	<4.0 ppmv	<6.3 ppmv	<1.1 ppmv
Toluene	TO-15	<0.67 ppmv	**1.0J** ppmv	<1.3 ppmv	<4.0 ppmv	<6.3 ppmv	<1.1 ppmv
Xylenes	TO-15	**1.95** ppmv	**23.5** ppmv	<1.3 ppmv	**1.32J** ppmv	**7.76** ppmv	<1.1 ppmv

[1] taken during individual well testing at 48 hours after start of test
[2] FID readings were measured in a 1:4 dilution and corrected

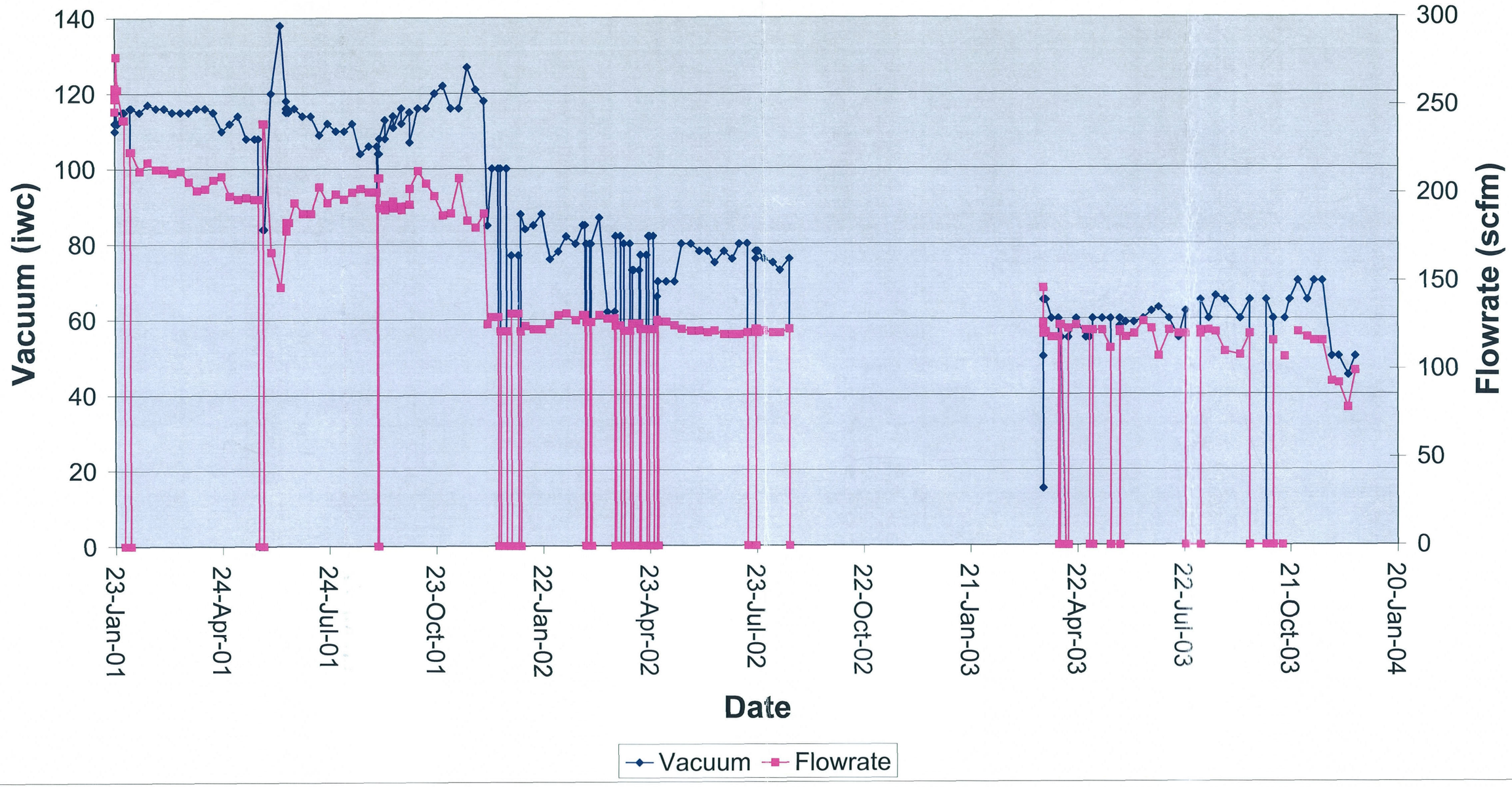
Table 8
UST Cluster 1
Vapor Extraction Well Analytical Results

Well ID		CL1-SV-01C	
Zone		Deep	
Screen Interval (ft bgs)		46-60	
Date		08/11/00[1]	8/27/2002
	Method		
Field Oxygen	Field	**0.8** %	**13.1** %
Oxygen	ASTM 1945/1946	**3.96** %	N/A %
Carbon Dioxide	ASTM 1945/1946	**15.9** %	N/A %
FID[2]	Field	**36000** ppmv	**2731.8** ppmv
TVPH	TO-15	**1730** ppmv	**2800** ppmv
Acetone	TO-15	<200.0 ppmv	<22.0 ppmv
Benzene	TO-15	**49.6** ppmv	**3.6J** ppmv
2-Butanone (MEK)	TO-15	<200.0 ppmv	<22.0 ppmv
Ethylbenzene	TO-15	**27.8J** ppmv	**2.6J** ppmv
Methyl Isobutyl Ketone (MIBK)	TO-15	<200.0 ppmv	<22.0 ppmv
Methyl Tertbutyl Ether (MTBE)	TO-15	<40.0 ppmv	<4.3 ppmv
Toluene	TO-15	**157** ppmv	**30** ppmv
Xylenes	TO-15	**104** ppmv	**12** ppmv

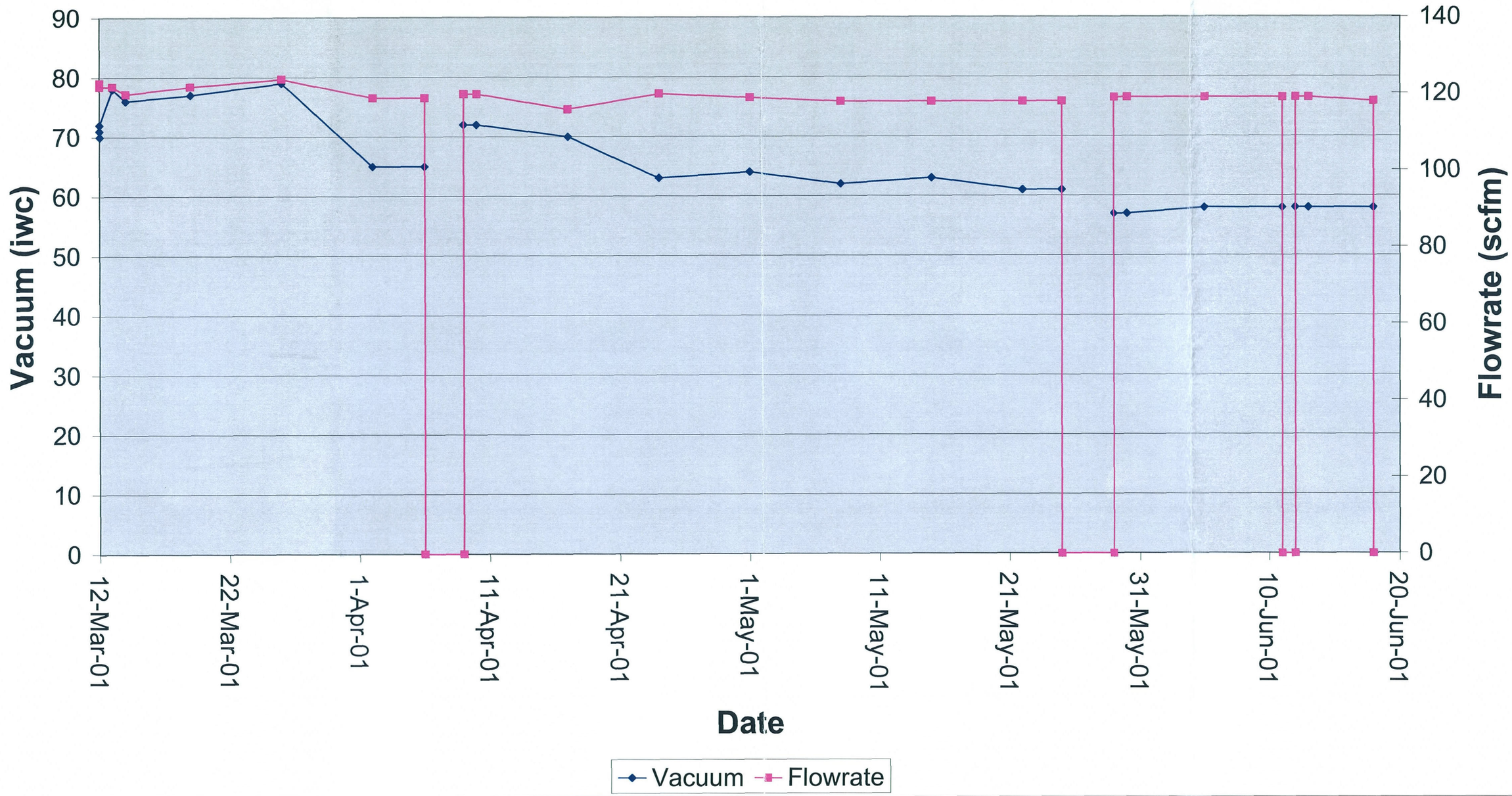
[1] taken during individual well testing at 48 hours after start of test
[2] FID readings were measured in a 1:4 dilution and corrected

Attachment A
SVE Unit Data

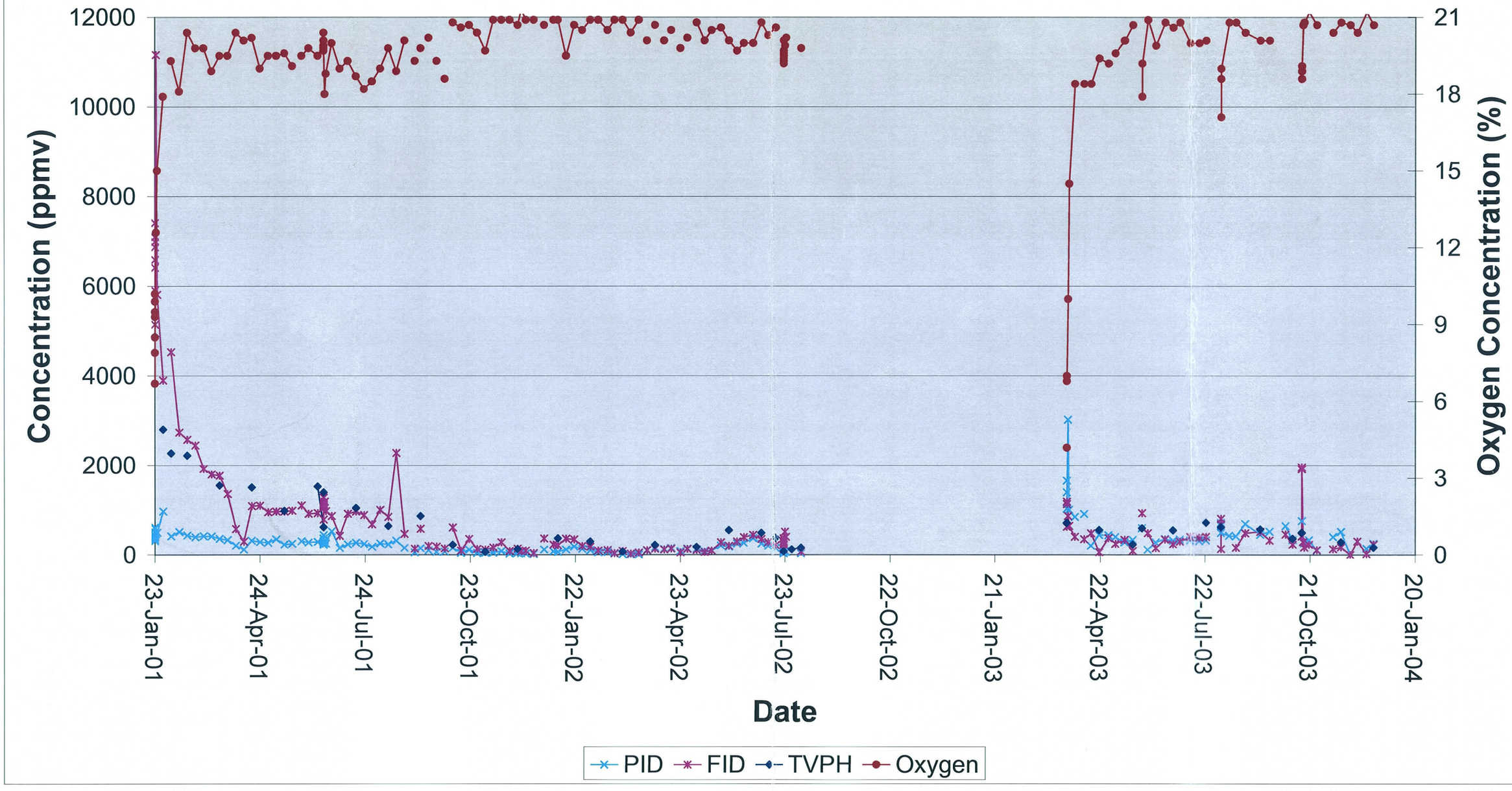
SVE Unit 1
System Operating Parameters



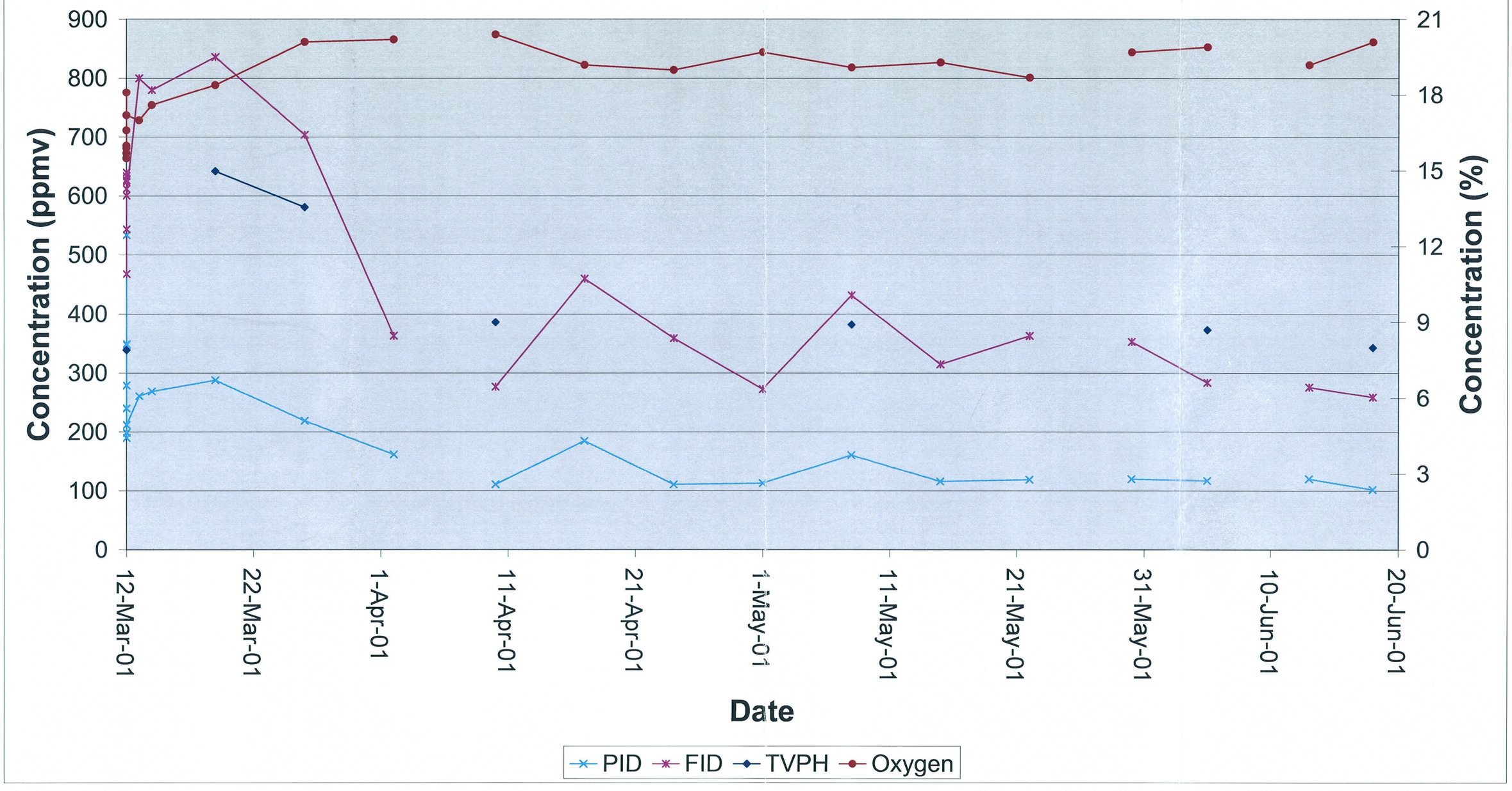
SVE Unit 3
System Operating Parameters

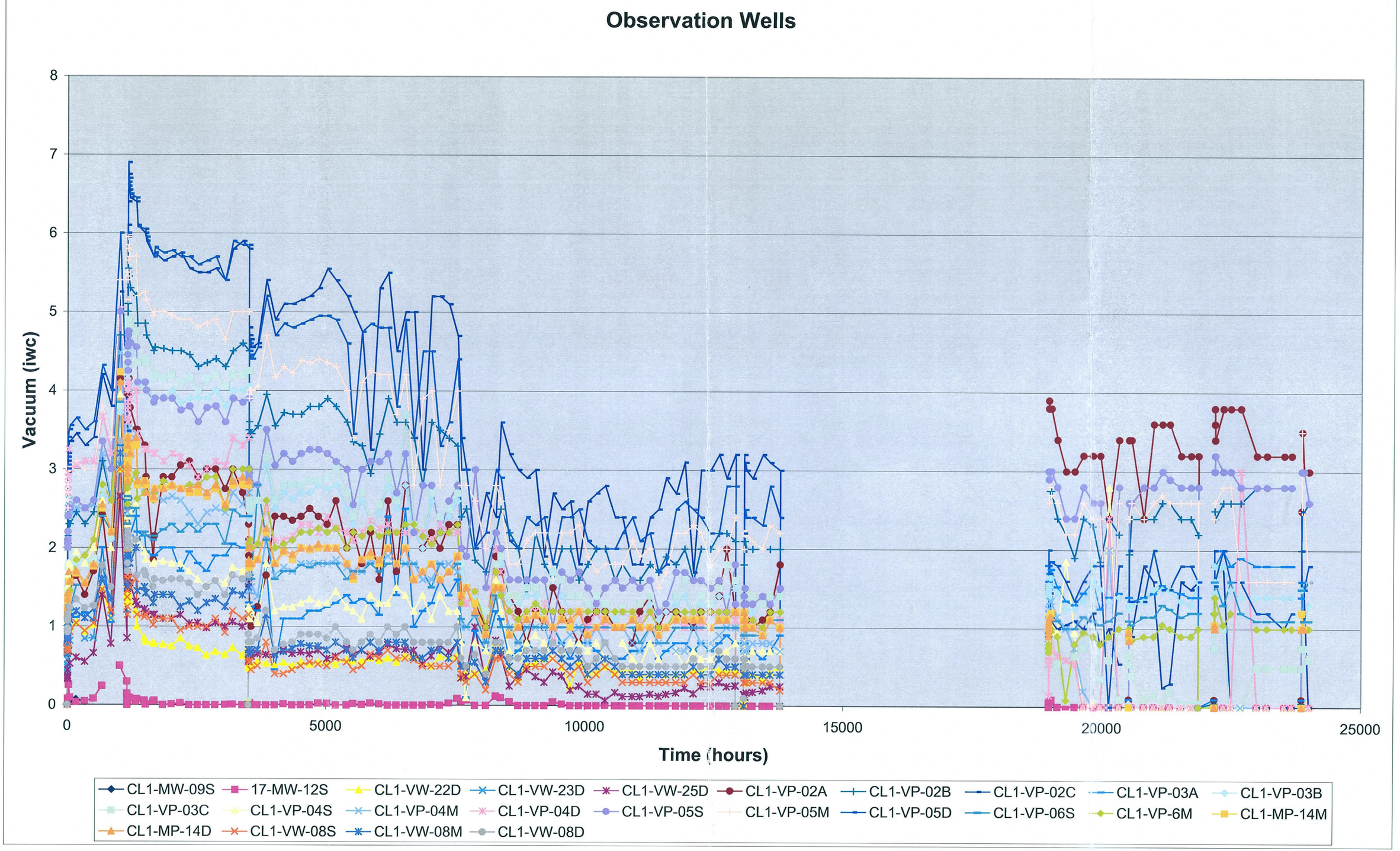


SVE Unit 1
Influent Concentrations

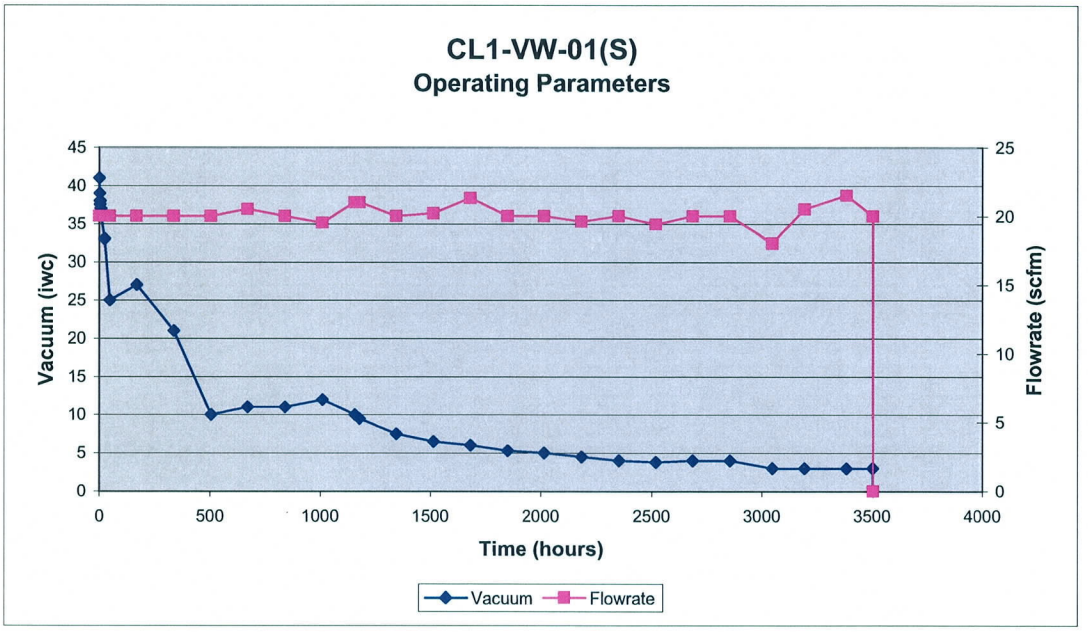


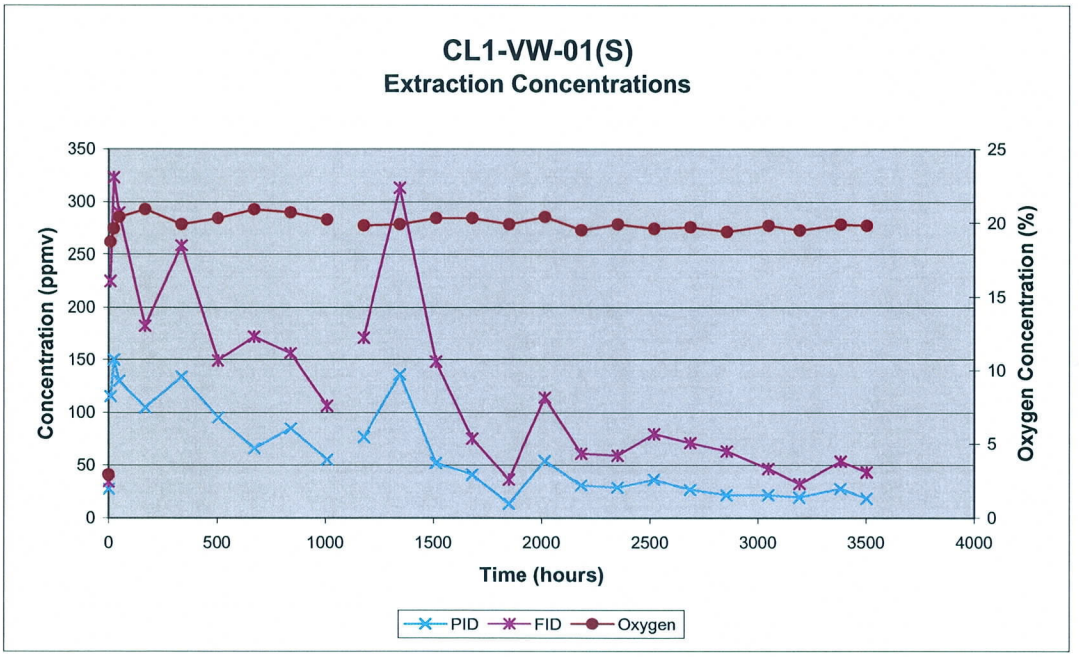
SVE Unit 3
Influent Concentrations

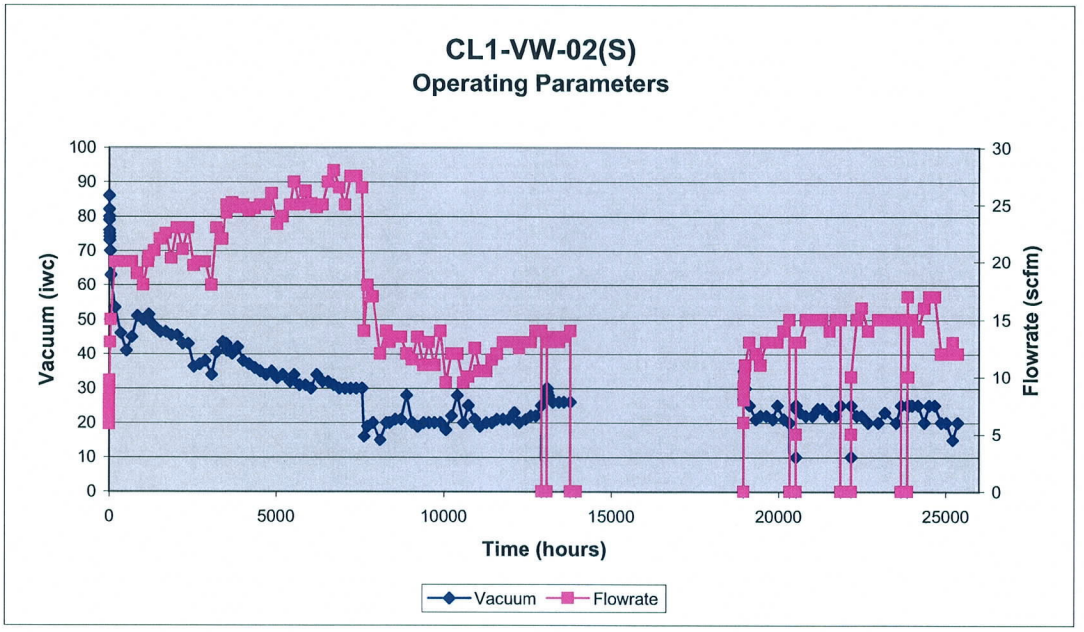


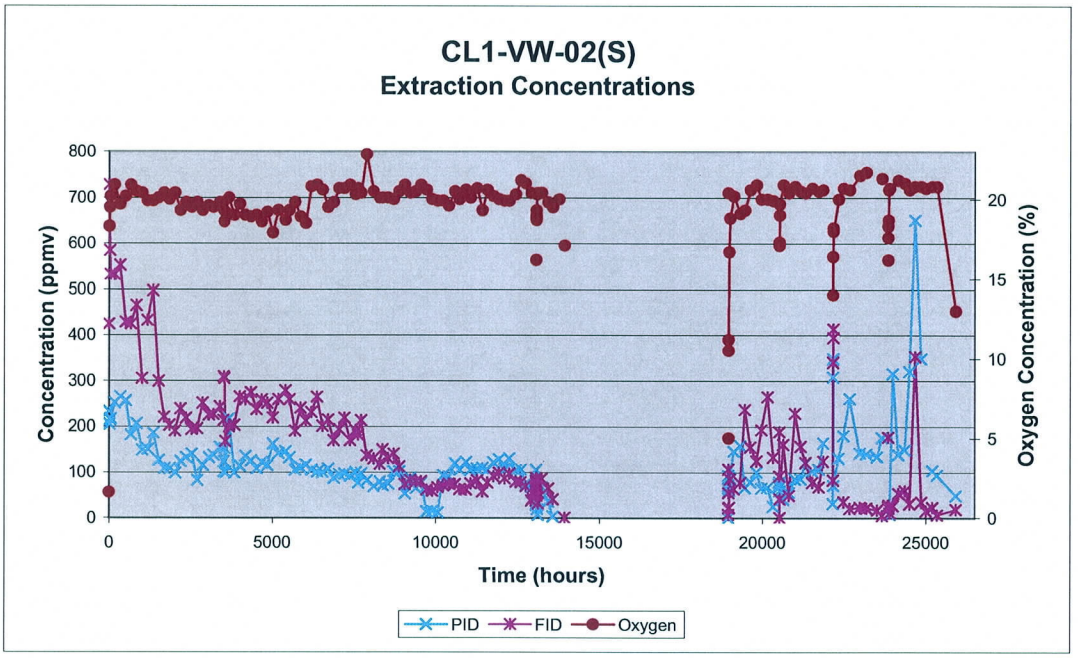

Observation Wells
Vacuum (iwc)
0
1
2
3
4
5
6
7
8
0
5000
10000
15000
20000
25000
Time (hours)
CL1-MW-09S
17-MW-12S
CL1-VW-22D
CL1-VW-23D
CL1-VW-25D
CL1-VP-02A
CL1-VP-02B
CL1-VP-02C
CL1-VP-03A
CL1-VP-03B
CL1-VP-03C
CL1-VP-04S
CL1-VP-04M
CL1-VP-04D
CL1-VP-05S
CL1-VP-05M
CL1-VP-05D
CL1-VP-06S
CL1-VP-6M
CL1-MP-14M
CL1-MP-14D
CL1-VW-08S
CL1-VW-08M
CL1-VW-08D

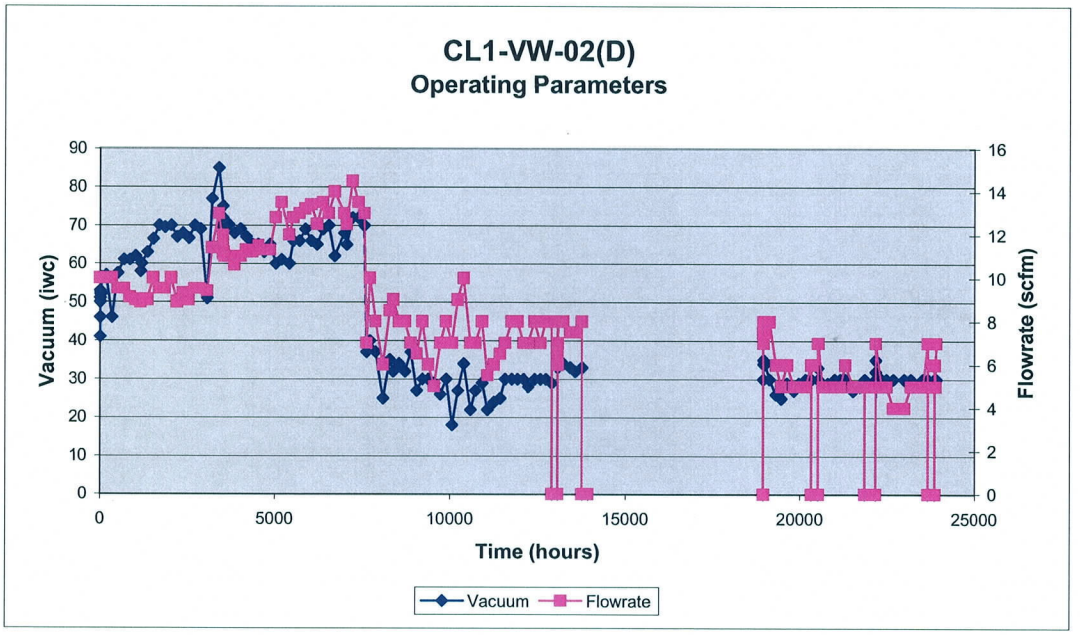
Attachment B
SVE Well Data

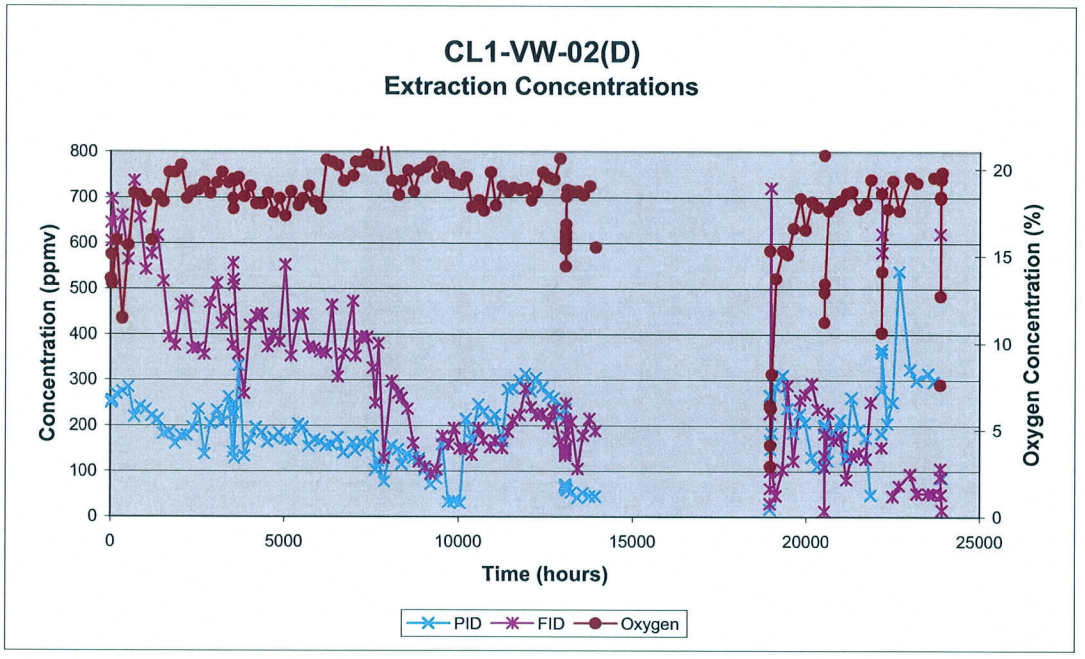

CL1-VW-01(S)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
Vacuum
Flowrate

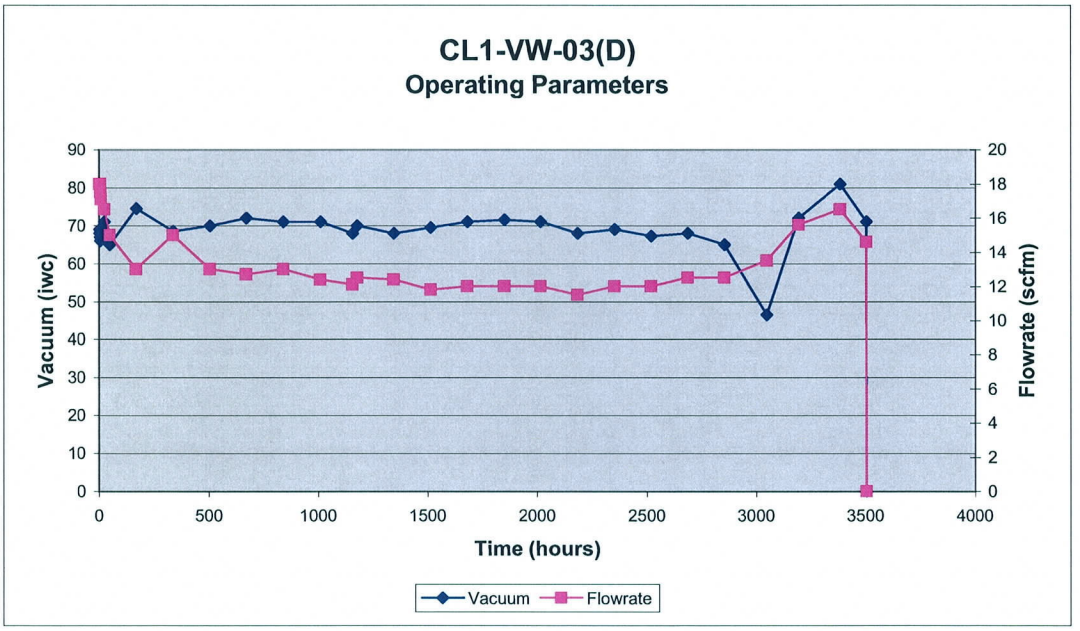

CL1-VW-01(S)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
PID
FID
Oxygen

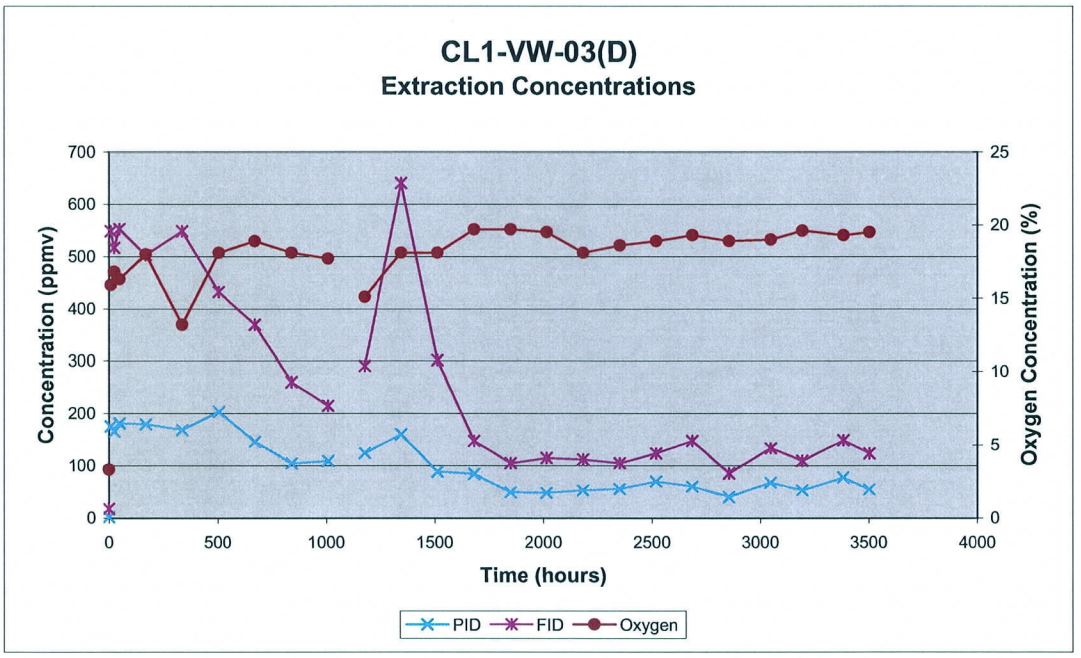

CL1-VW-02(S)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
Vacuum
Flowrate

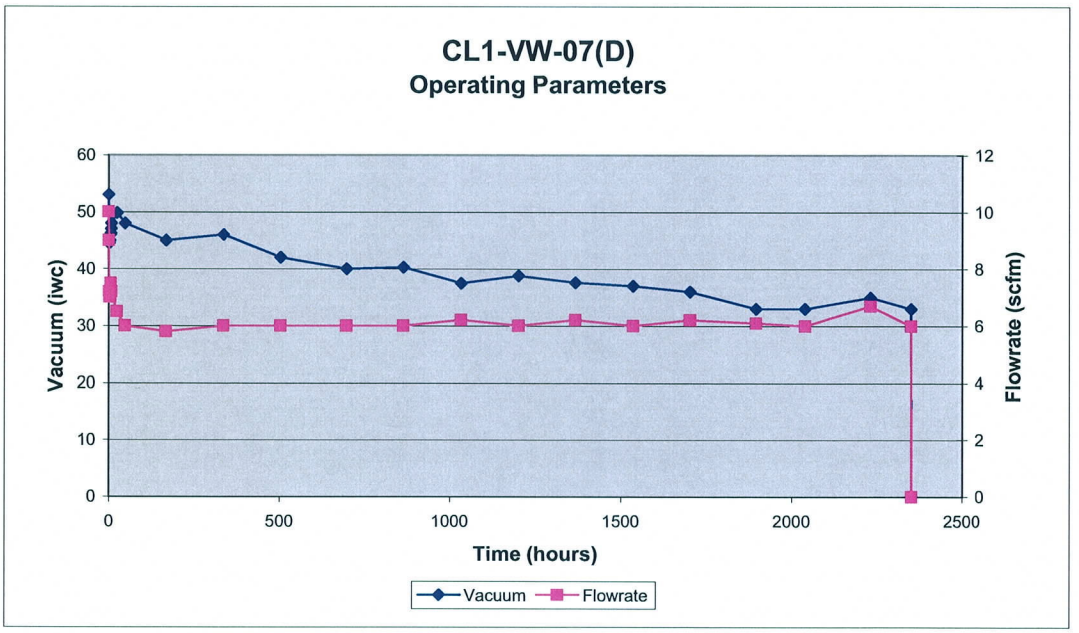

CL1-VW-02(S)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
PID
FID
Oxygen

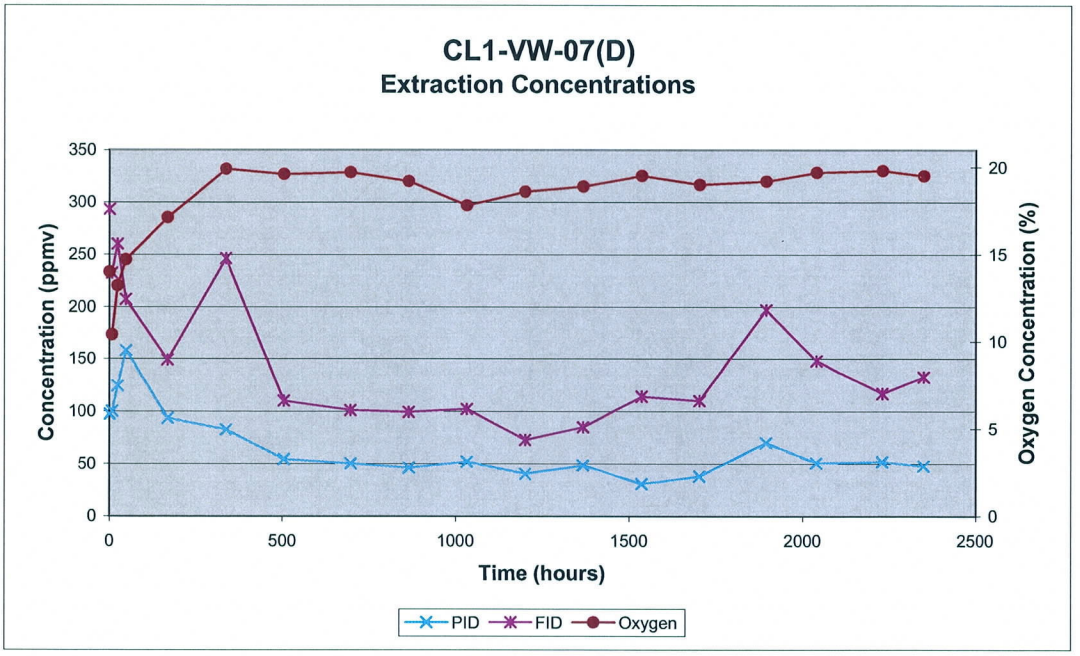

CL1-VW-02(D)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
Vacuum
Flowrate

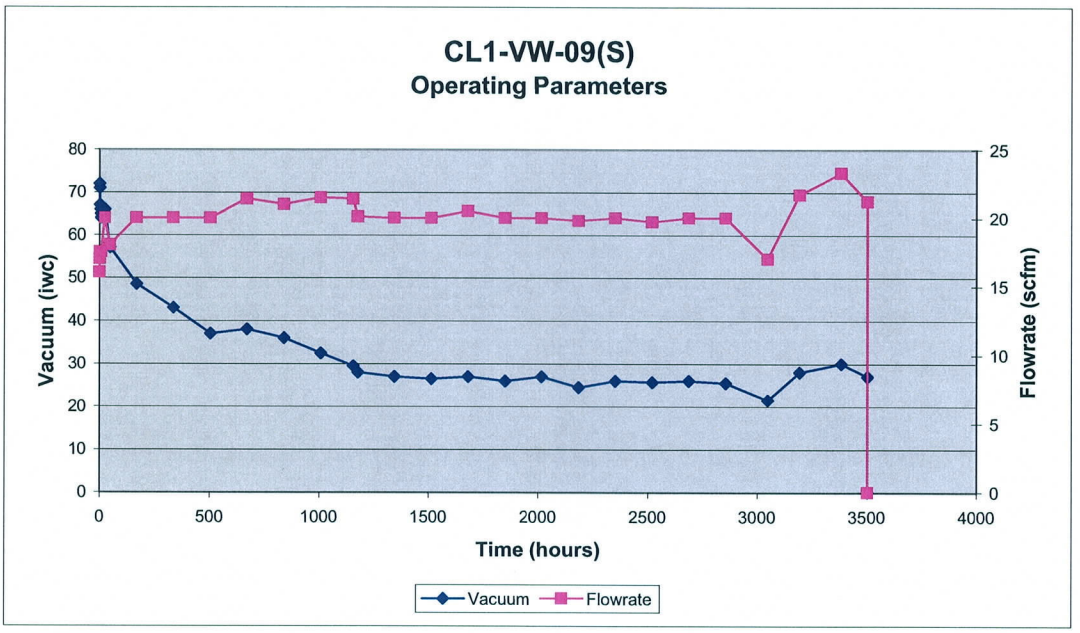

CL1-VW-02(D)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
PID
FID
Oxygen

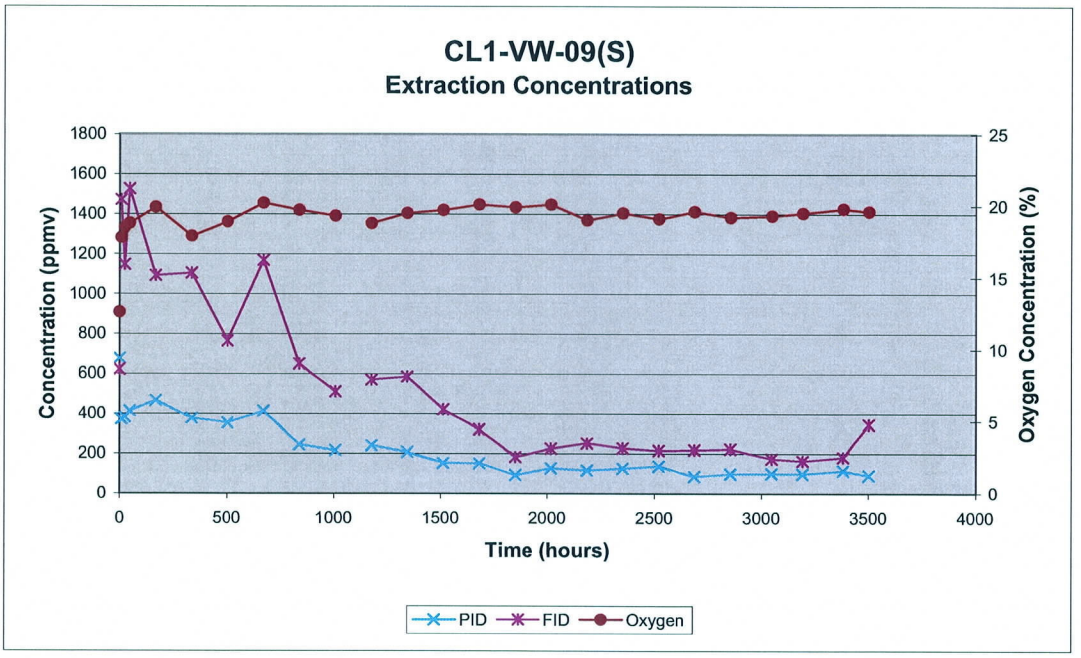

CL1-VW-03(D)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
Vacuum
Flowrate

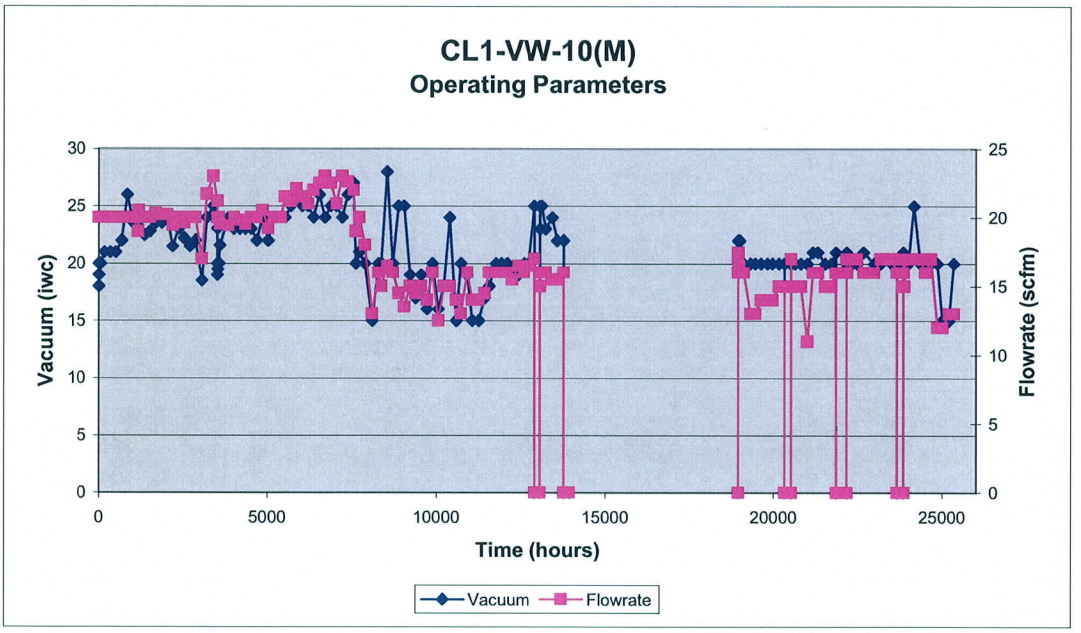

CL1-VW-03(D)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
PID
FID
Oxygen

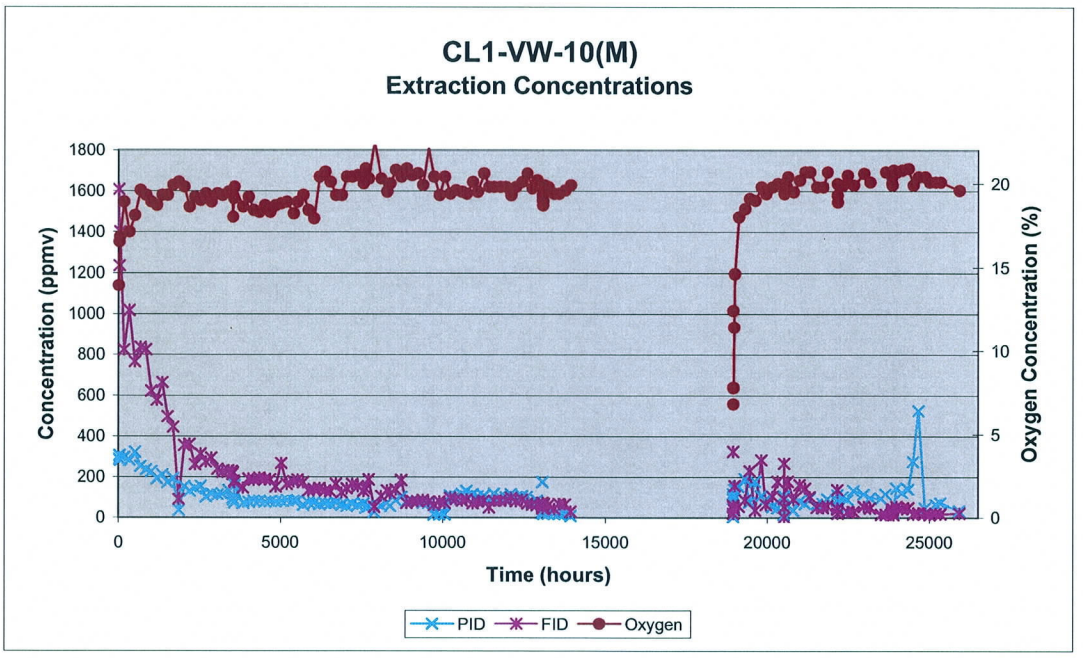

CL1-VW-07(D)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
Vacuum
Flowrate


CL1-VW-07(D)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
PID
FID
Oxygen

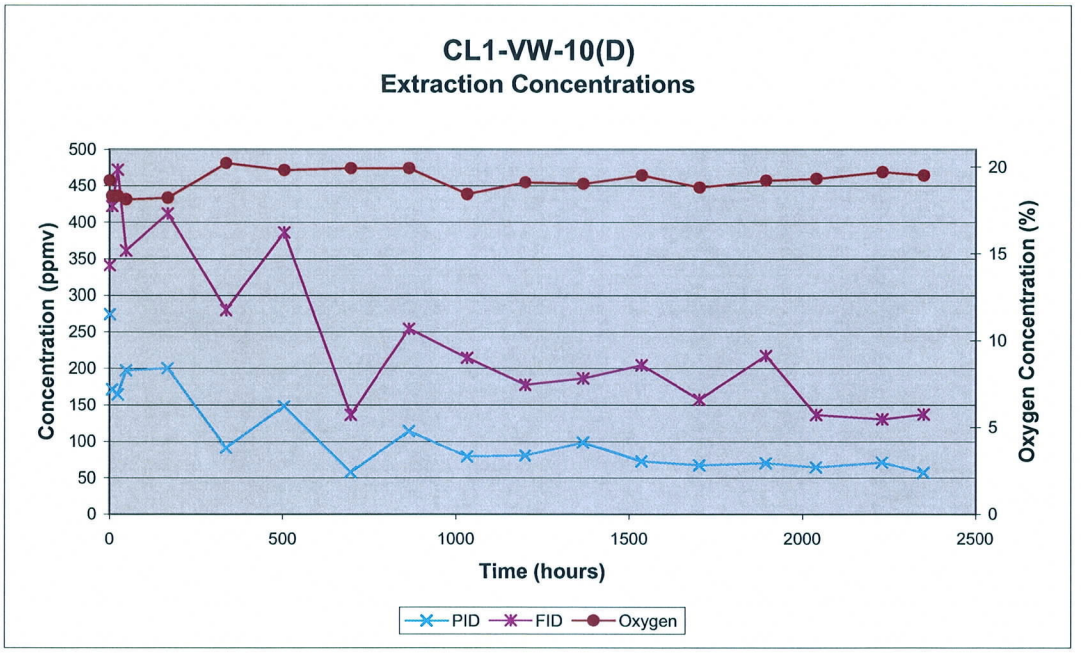

CL1-VW-09(S)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
Vacuum
Flowrate

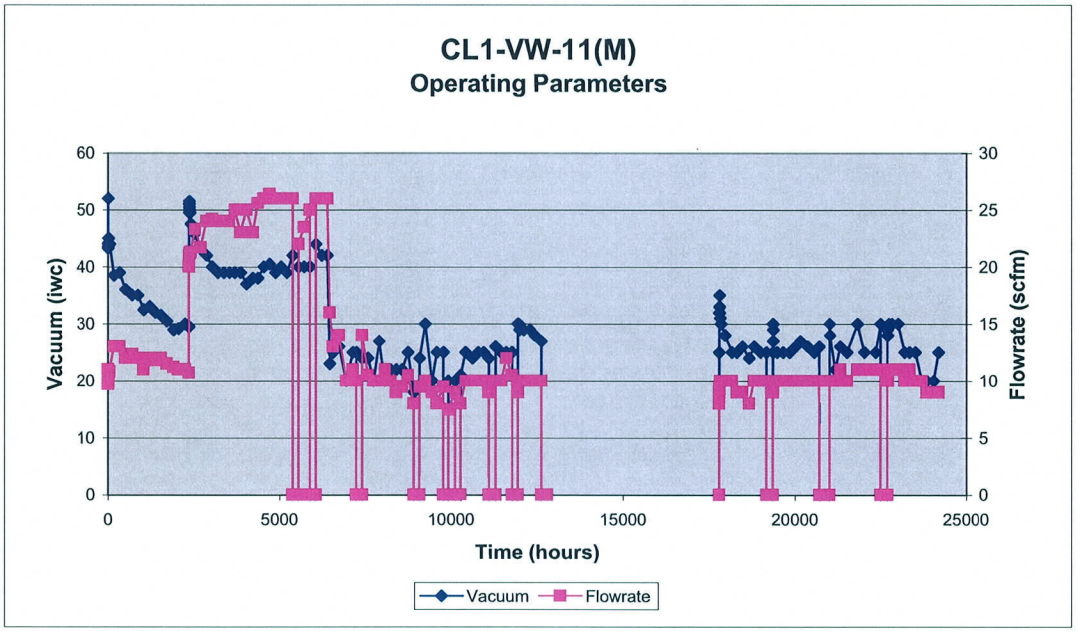

CL1-VW-09(S)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
PID
FID
Oxygen


CL1-VW-10(M)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
0
5000
10000
15000
20000
25000
0
5
10
15
20
25
30
Vacuum
Flowrate


CL1-VW-10(M)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
0
5000
10000
15000
20000
25000
0
200
400
600
800
1000
1200
1400
1600
1800
0
5
10
15
20
PID
FID
Oxygen

CL1-VW-10(D)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
Vacuum
Flowrate


CL1-VW-10(D)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
PID
FID
Oxygen


CL1-VW-11(M)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
0
10
20
30
40
50
60
0
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10
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20
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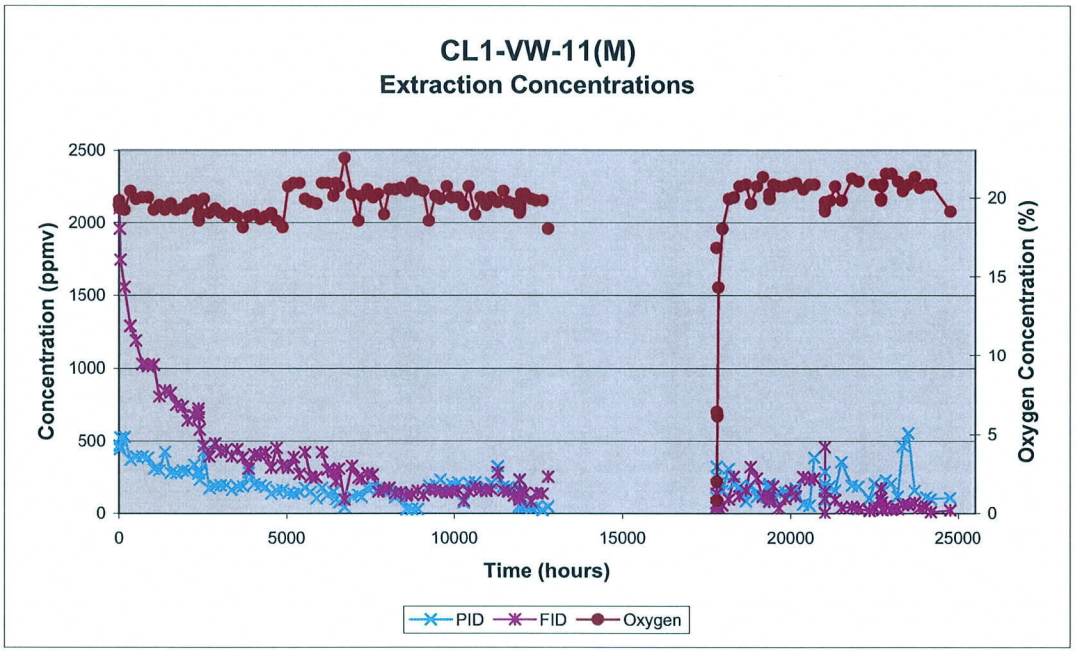
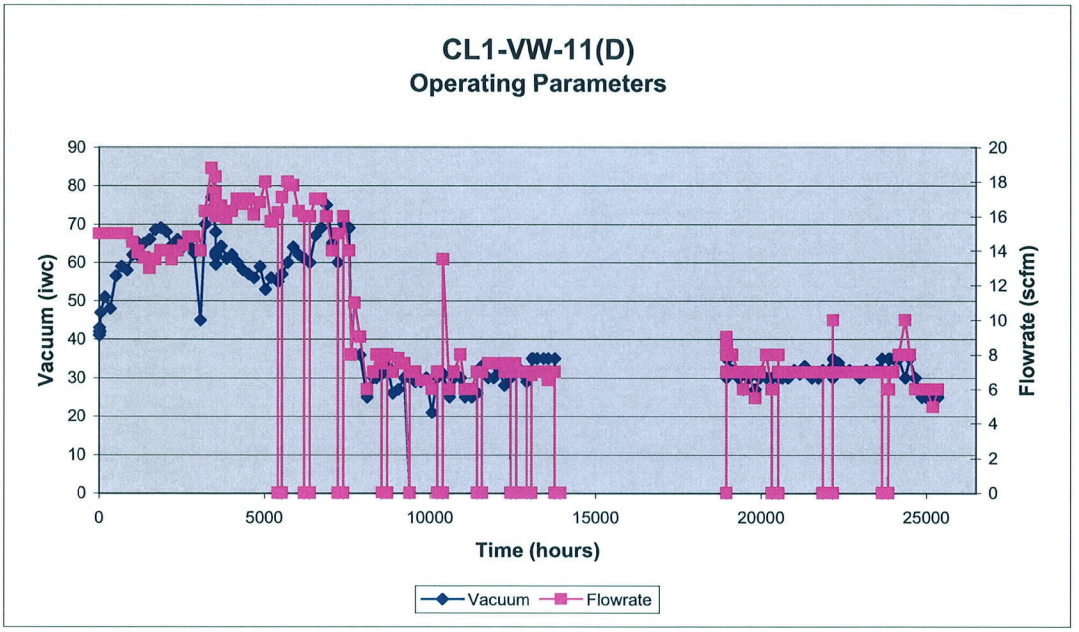
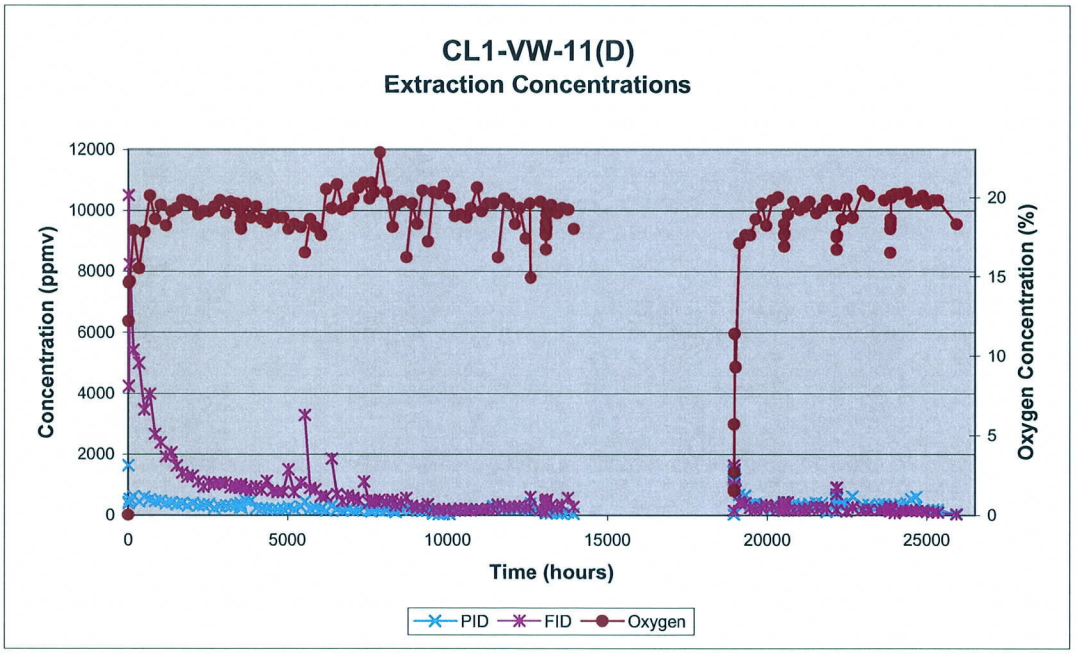
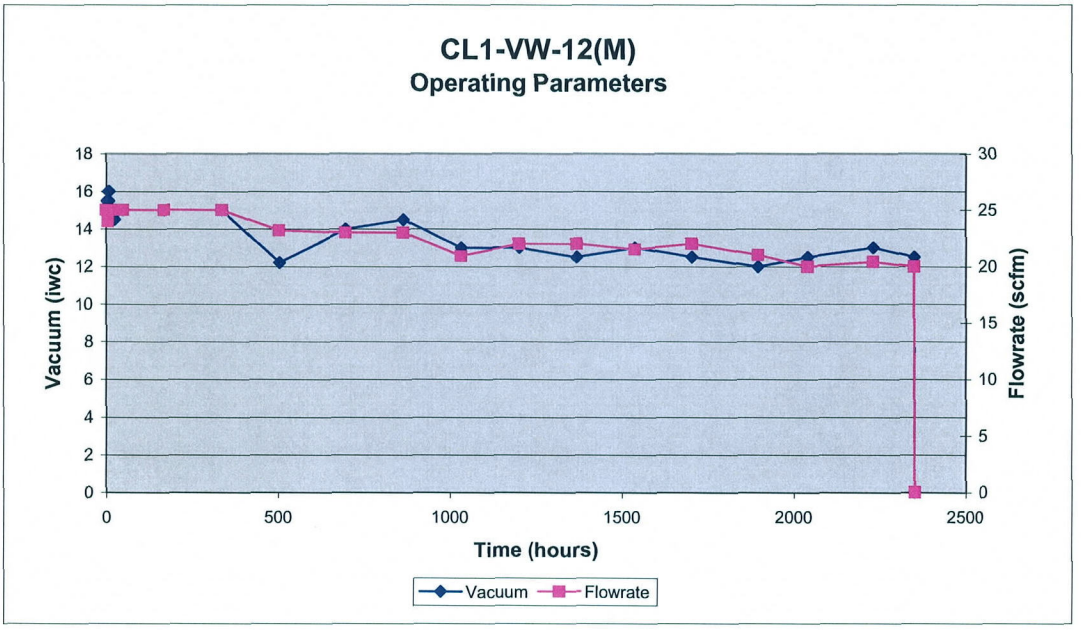
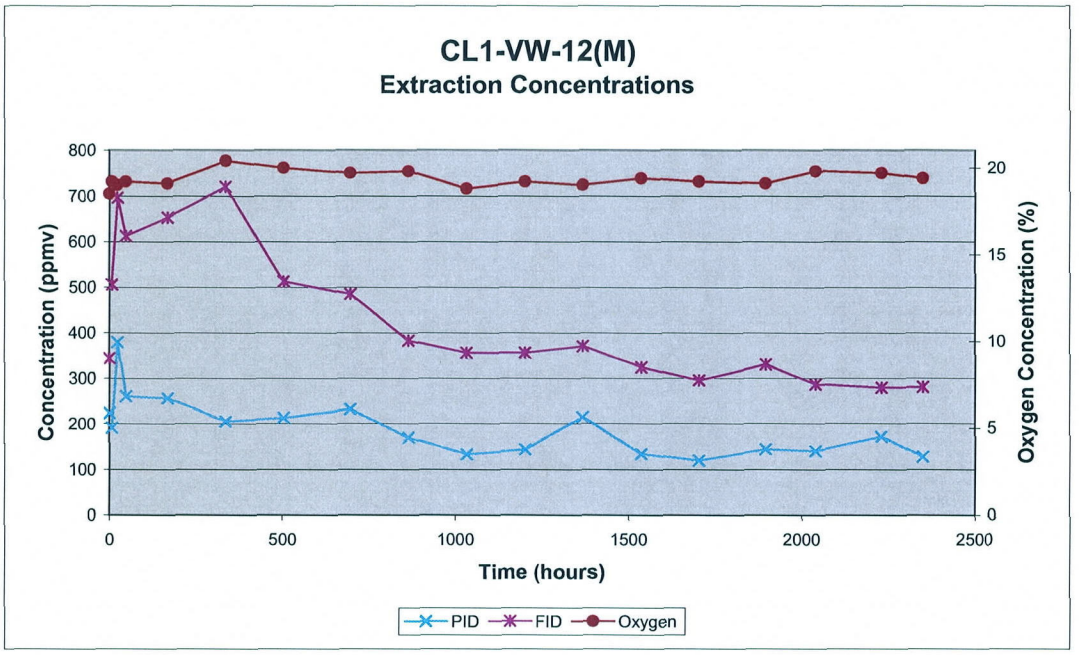
30
0
5000
10000
15000
20000
25000
Vacuum
Flowrate

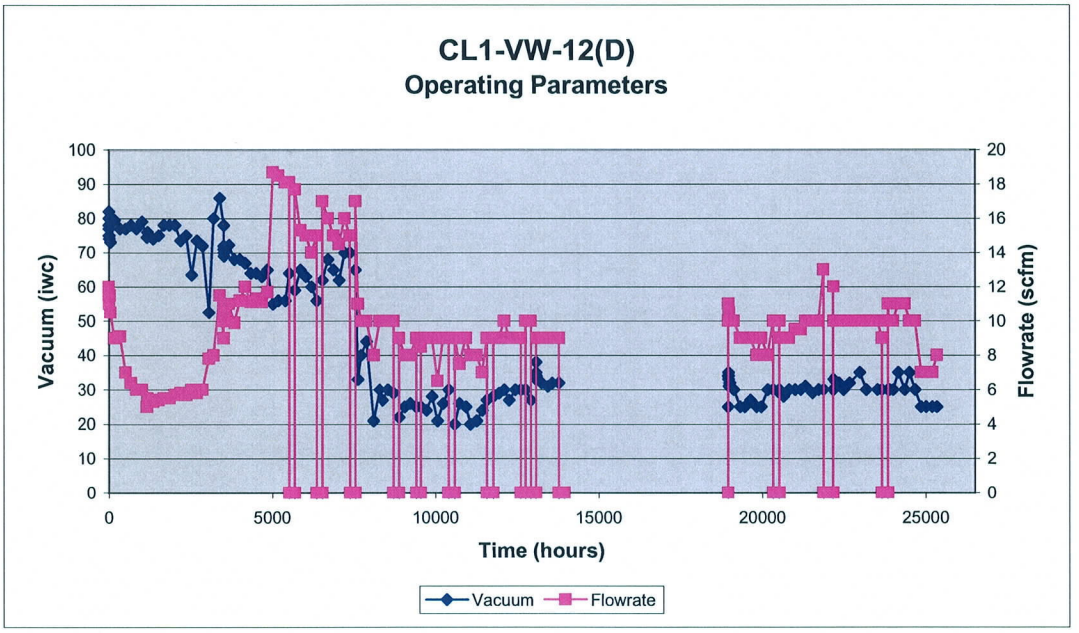

CL1-VW-11(M)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
0
500
1000
1500
2000
2500
0
5
10
15
20
0
5000
10000
15000
20000
25000
PID
FID
Oxygen

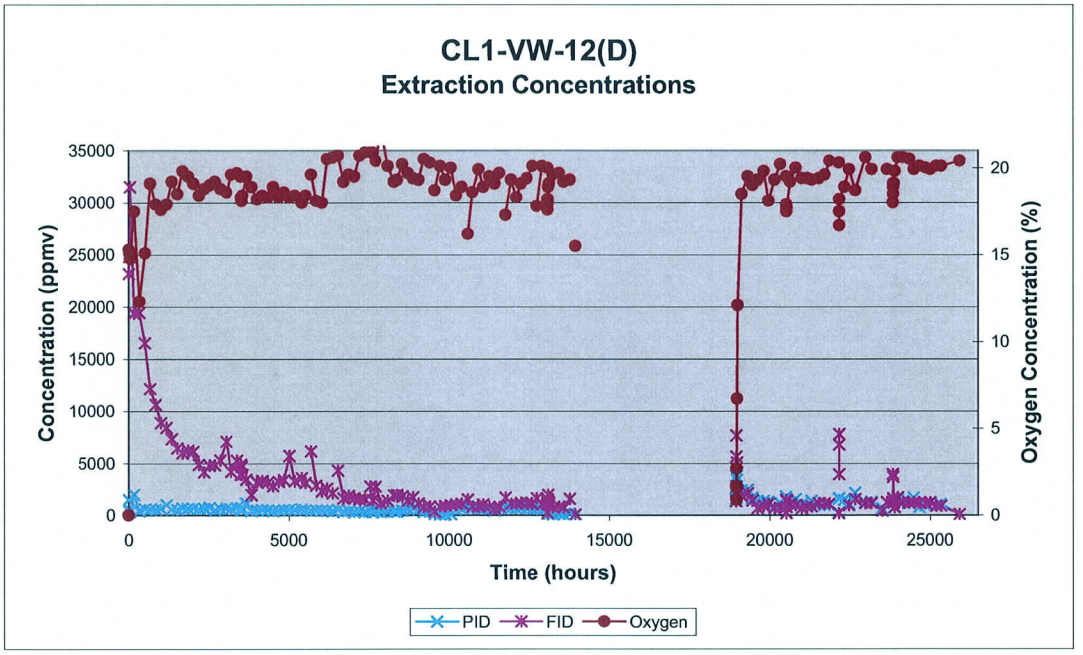

CL1-VW-11(D)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
Vacuum
Flowrate

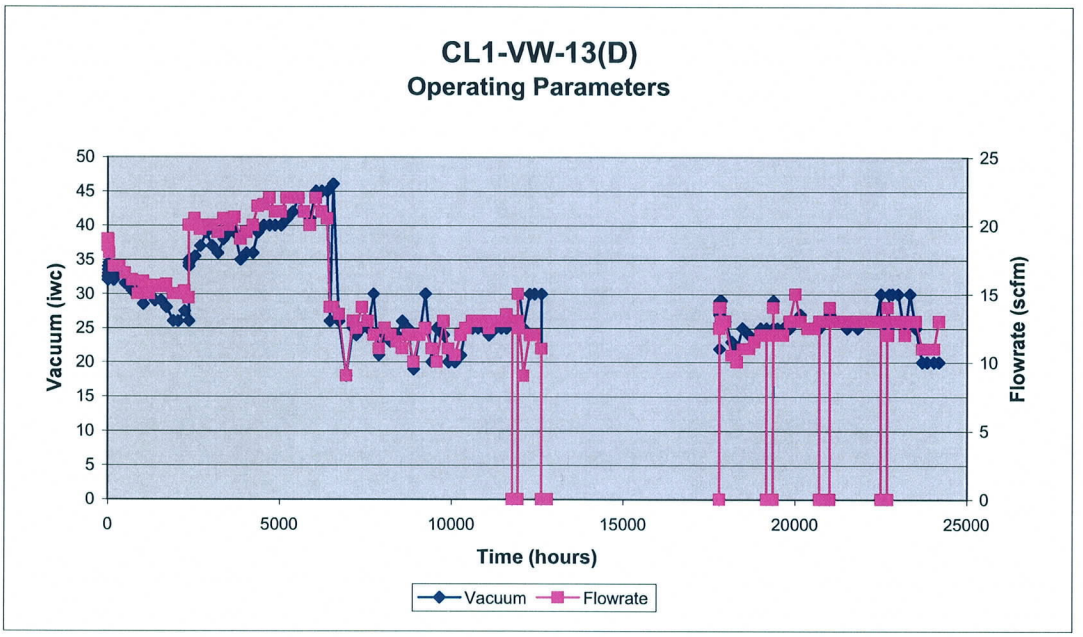

CL1-VW-11(D)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
PID
FID
Oxygen

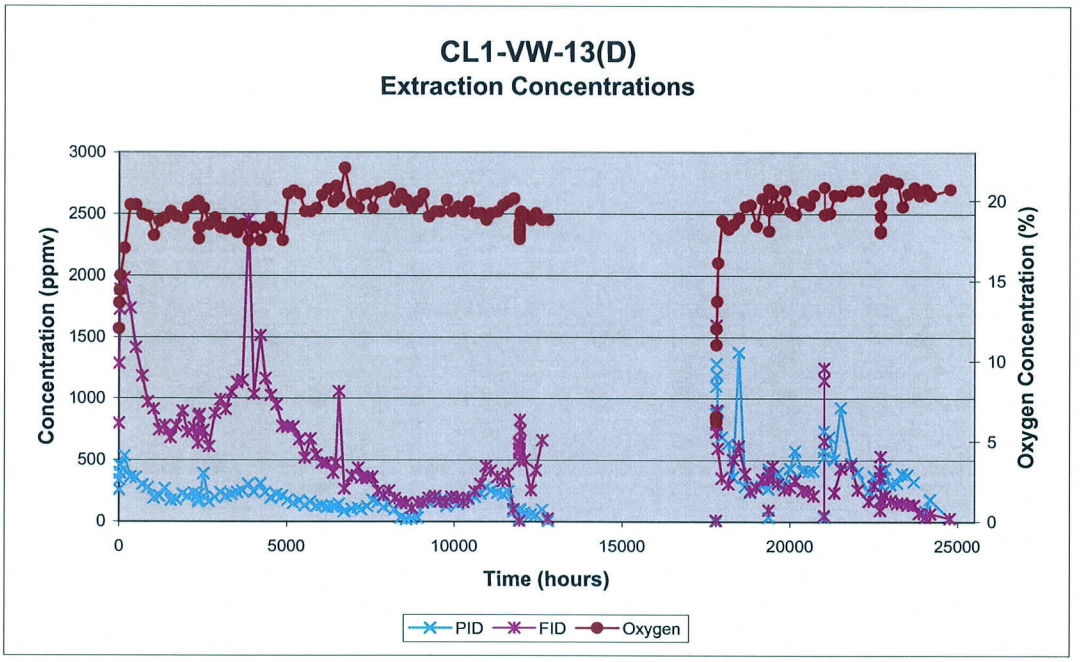

CL1-VW-12(M)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
Vacuum
Flowrate

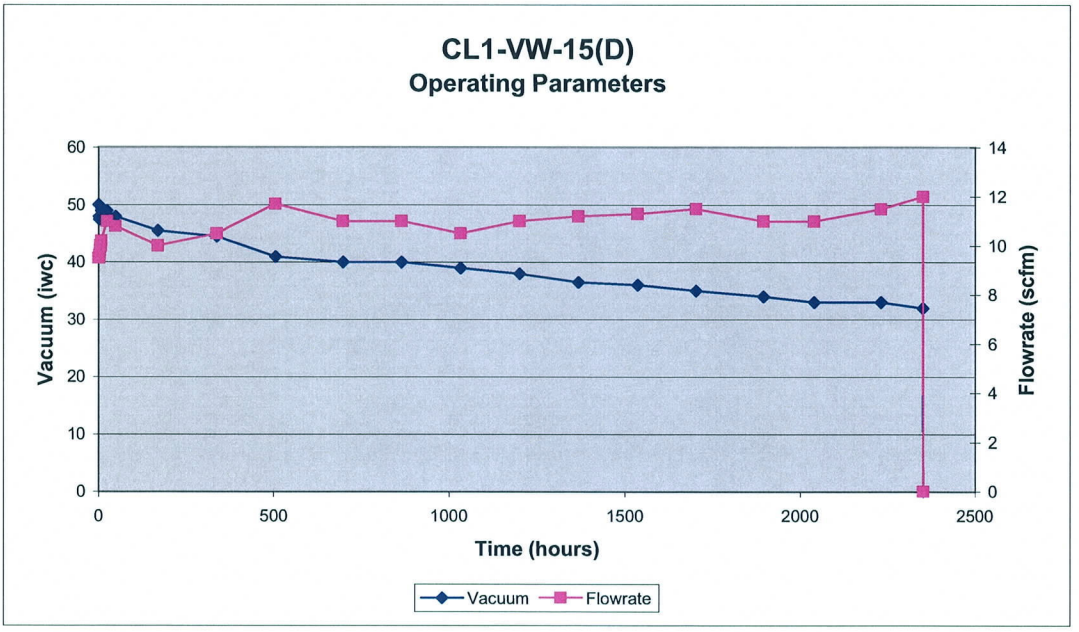

CL1-VW-12(M)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
PID
FID
Oxygen

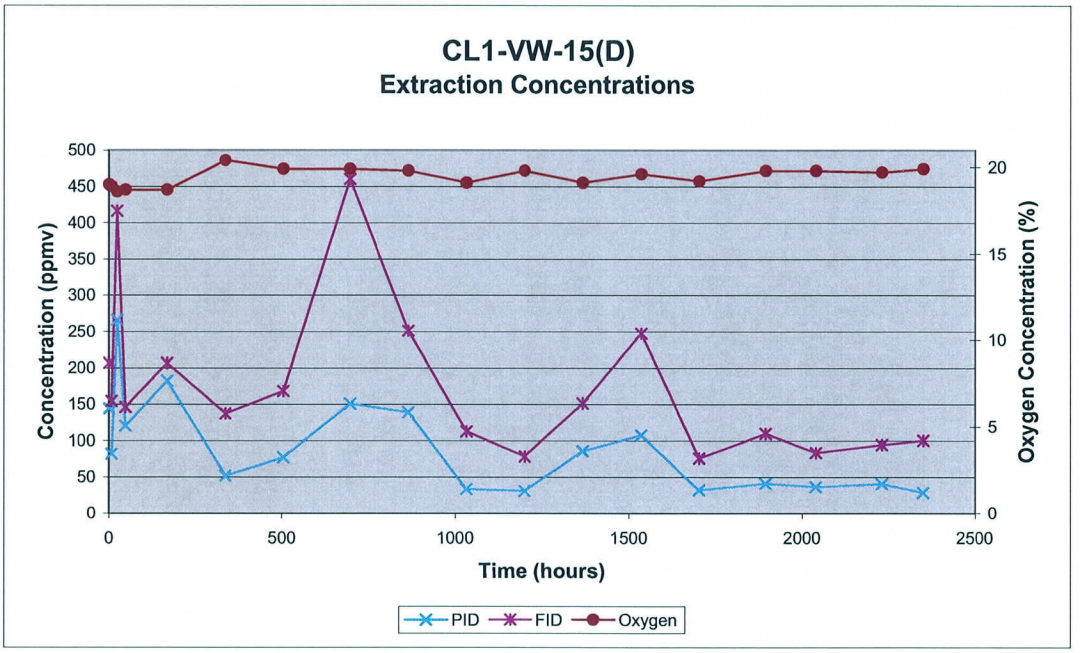

CL1-VW-12(D)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
Vacuum
Flowrate

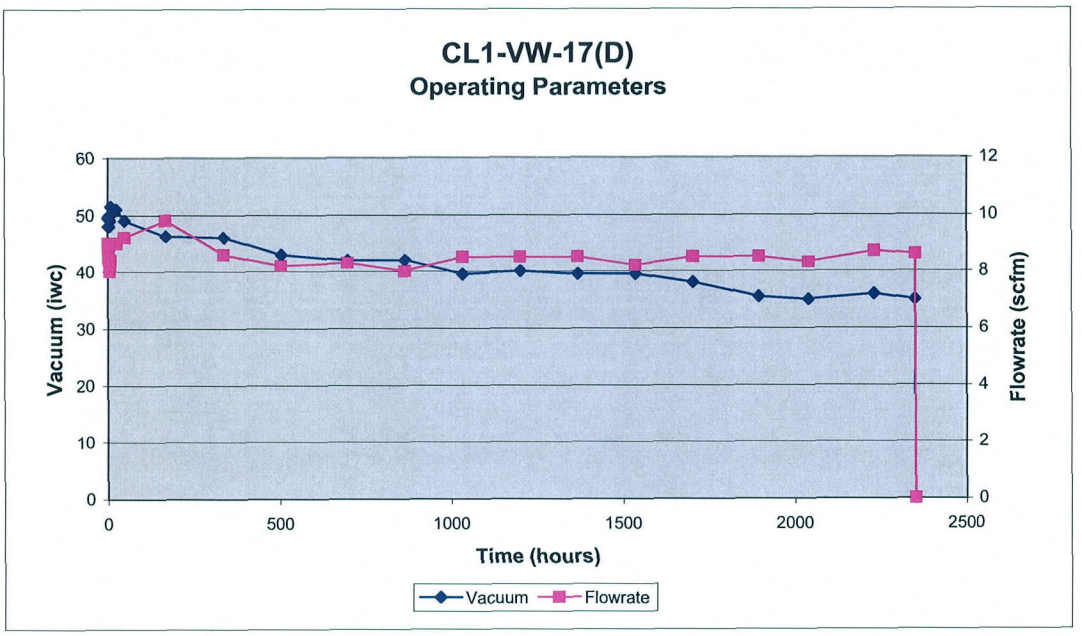

CL1-VW-12(D)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
PID
FID
Oxygen


CL1-VW-13(D)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
Vacuum
Flowrate


CL1-VW-13(D)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
PID
FID
Oxygen


CL1-VW-15(D)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
0
10
20
30
40
50
60
0
2
4
6
8
10
12
14
0
500
1000
1500
2000
2500
Vacuum
Flowrate


CL1-VW-15(D)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
0
50
100
150
200
250
300
350
400
450
500
0
5
10
15
20
0
500
1000
1500
2000
2500
PID
FID
Oxygen


CL1-VW-17(D)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
0
10
20
30
40
50
60
0
2
4
6
8
10
12
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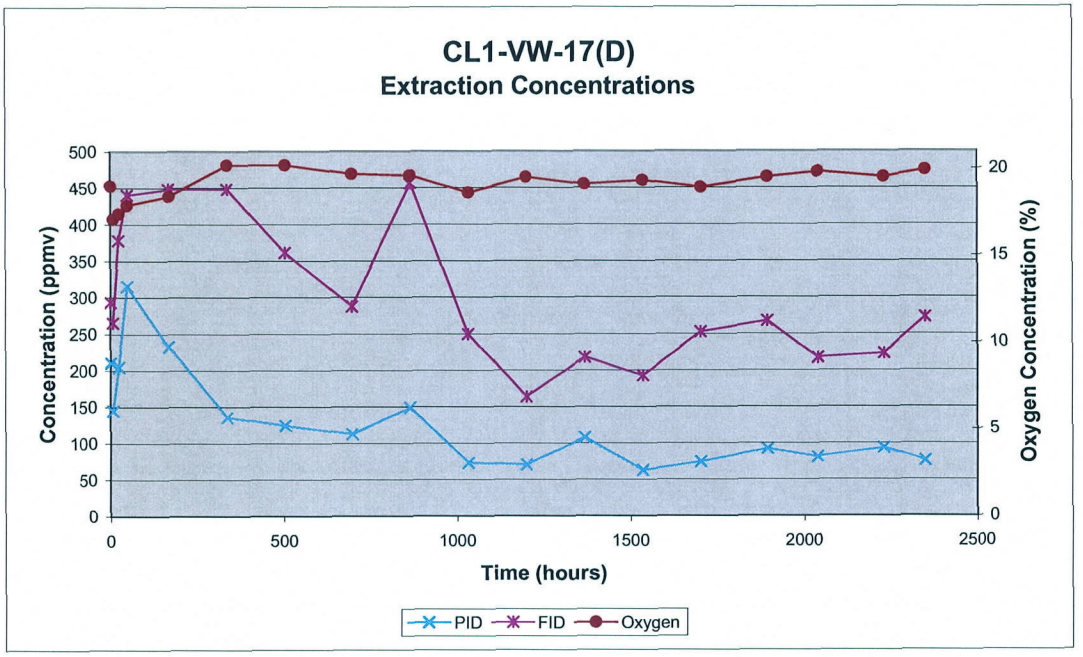
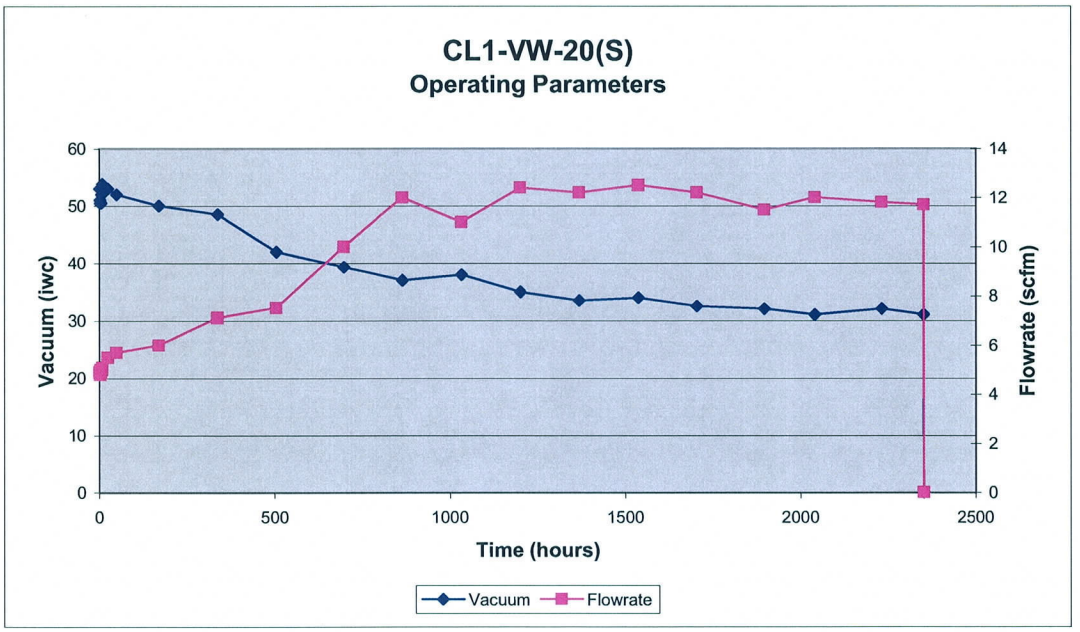
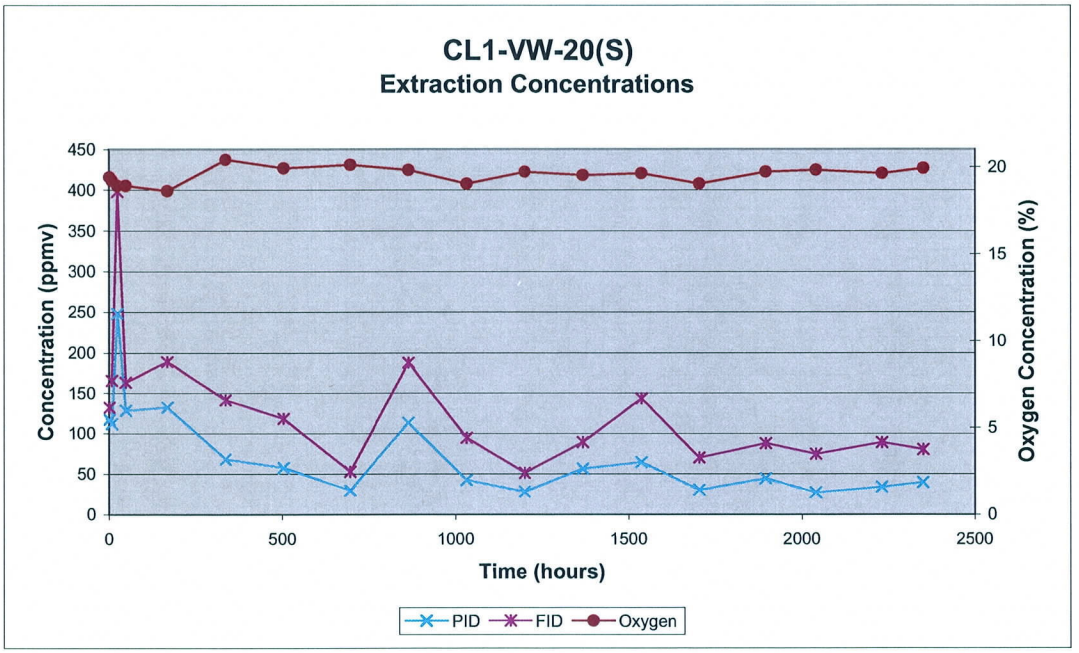
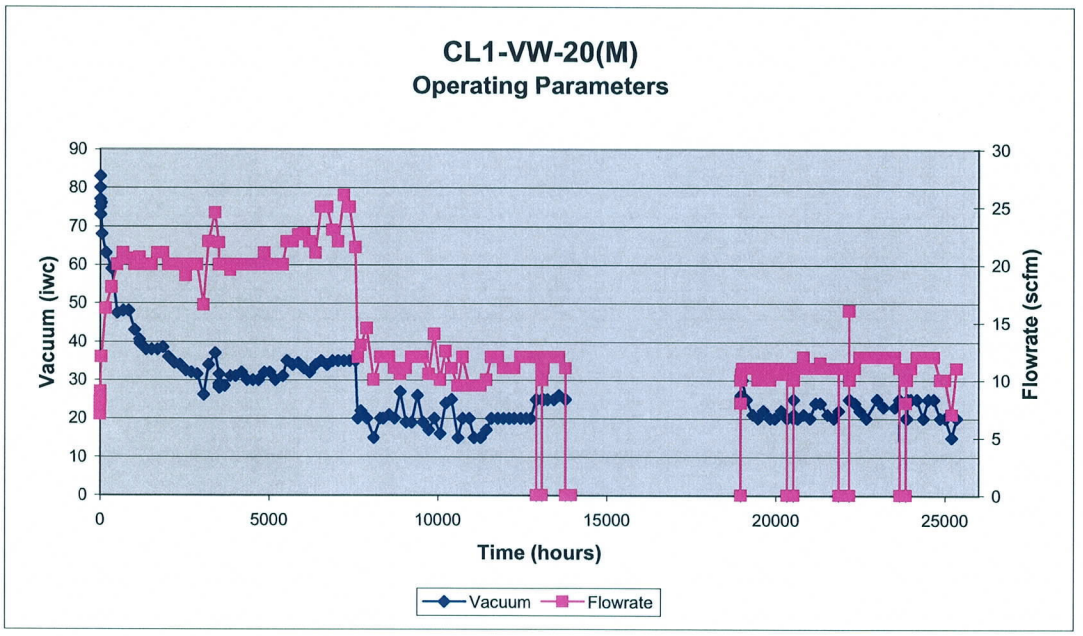
500
1000
1500
2000
2500
Vacuum
Flowrate


CL1-VW-17(D)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
0
50
100
150
200
250
300
350
400
450
500
0
5
10
15
20
0
500
1000
1500
2000
2500
PID
FID
Oxygen


CL1-VW-20(S)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
0
10
20
30
40
50
60
0
2
4
6
8
10
12
14
0
500
1000
1500
2000
2500
Vacuum
Flowrate


CL1-VW-20(S)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
0
50
100
150
200
250
300
350
400
450
0
5
10
15
20
0
500
1000
1500
2000
2500
PID
FID
Oxygen


CL1-VW-20(M)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
0
10
20
30
40
50
60
70
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90
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5
10
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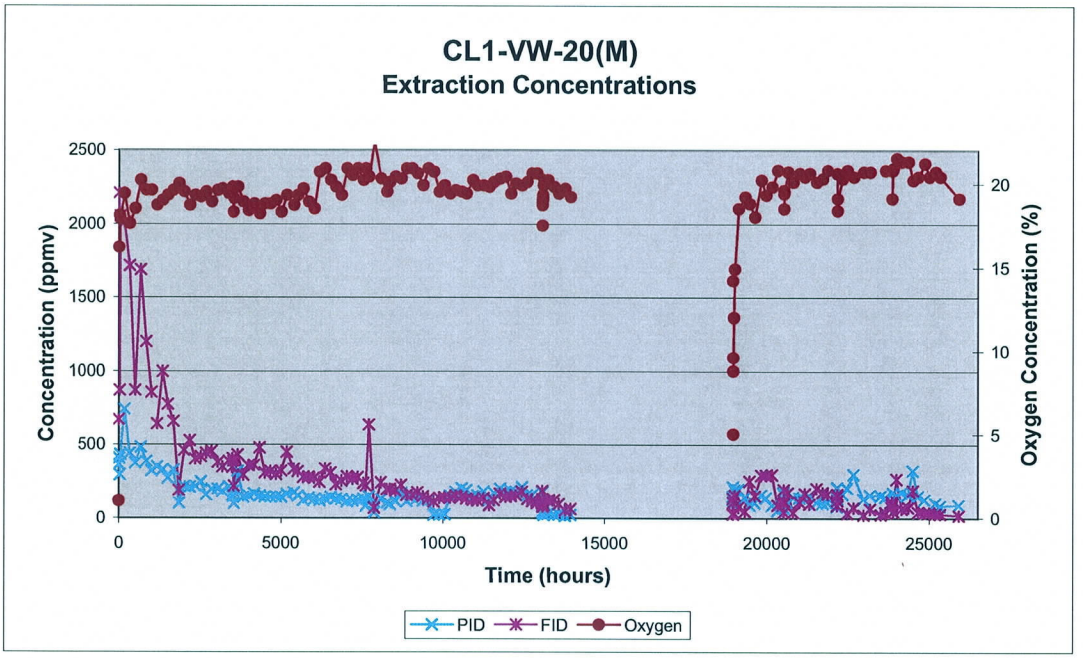
20
25
30
0
5000
10000
15000
20000
25000
Vacuum
Flowrate


CL1-VW-20(M)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
0
500
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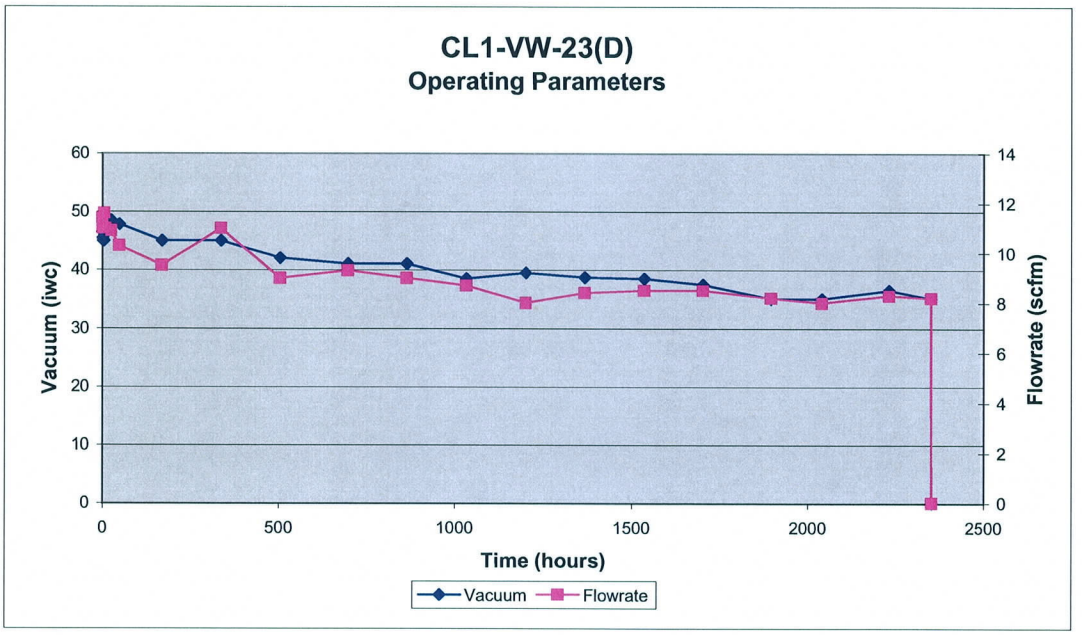
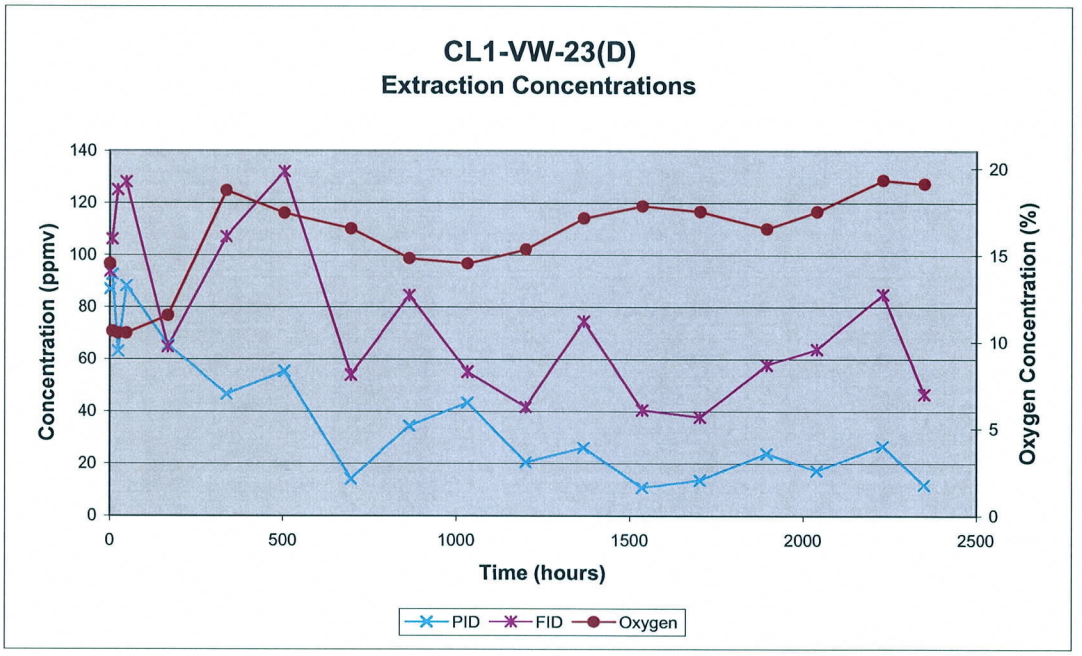
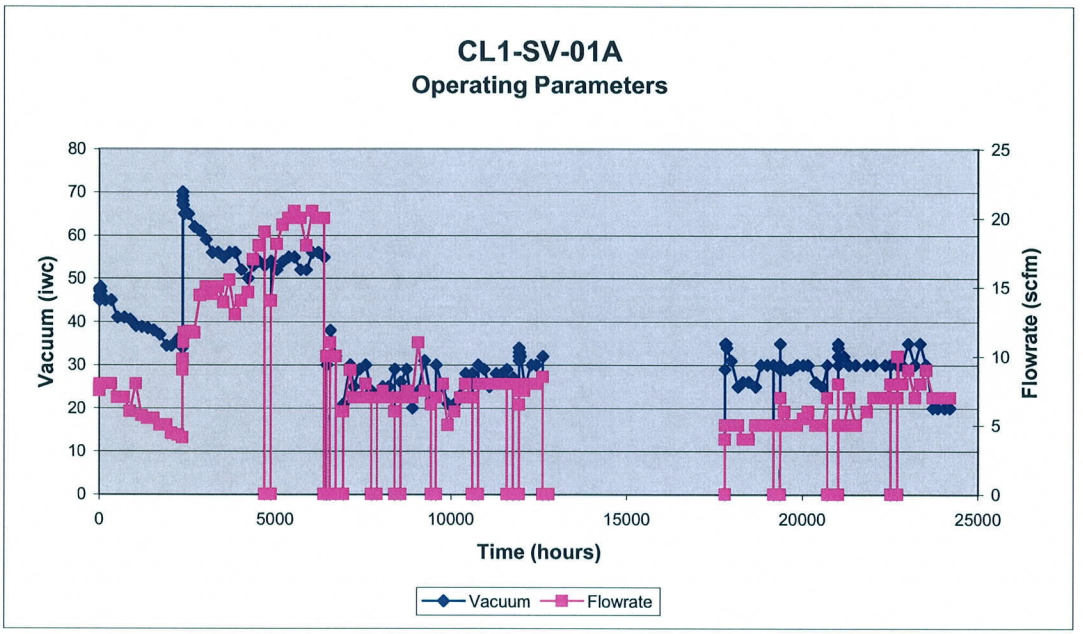
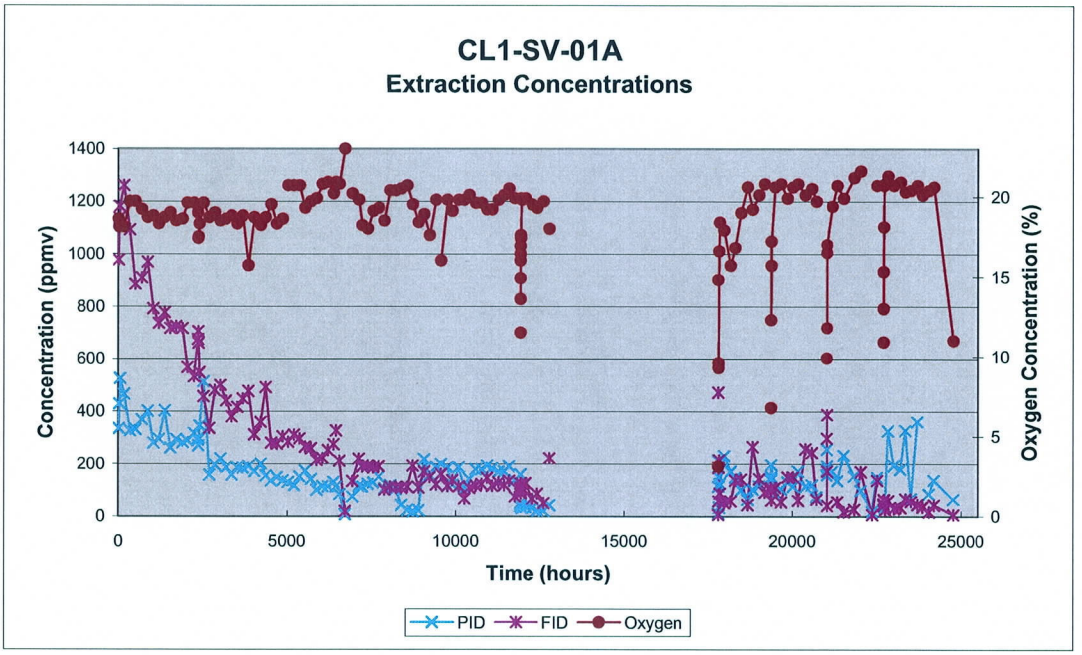
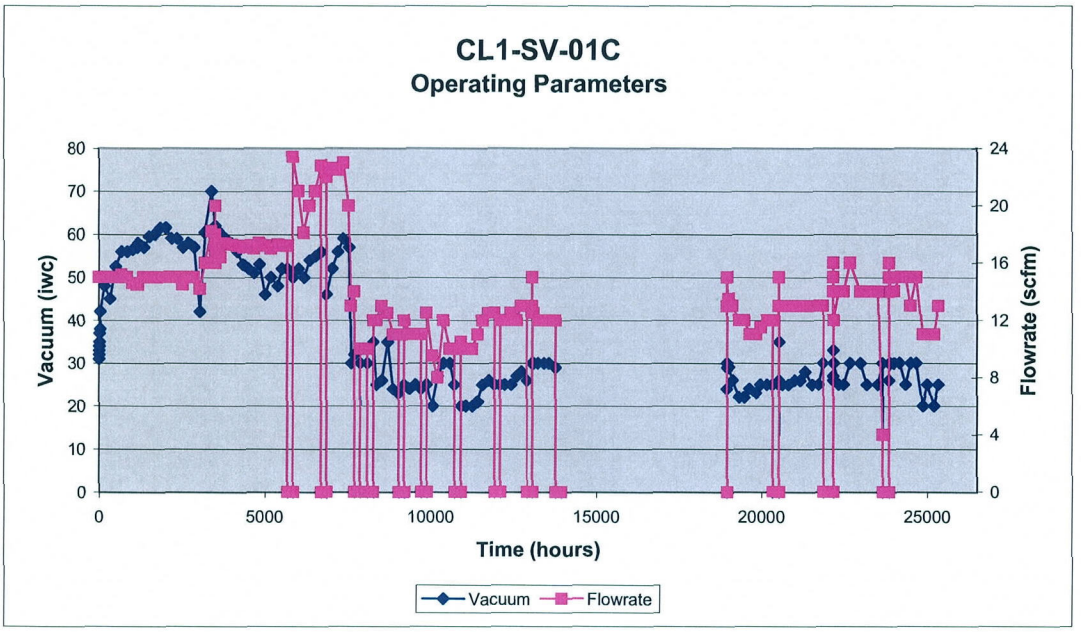
1500
2000
2500
0
5
10
15
20
0
5000
10000
15000
20000
25000
PID
FID
Oxygen

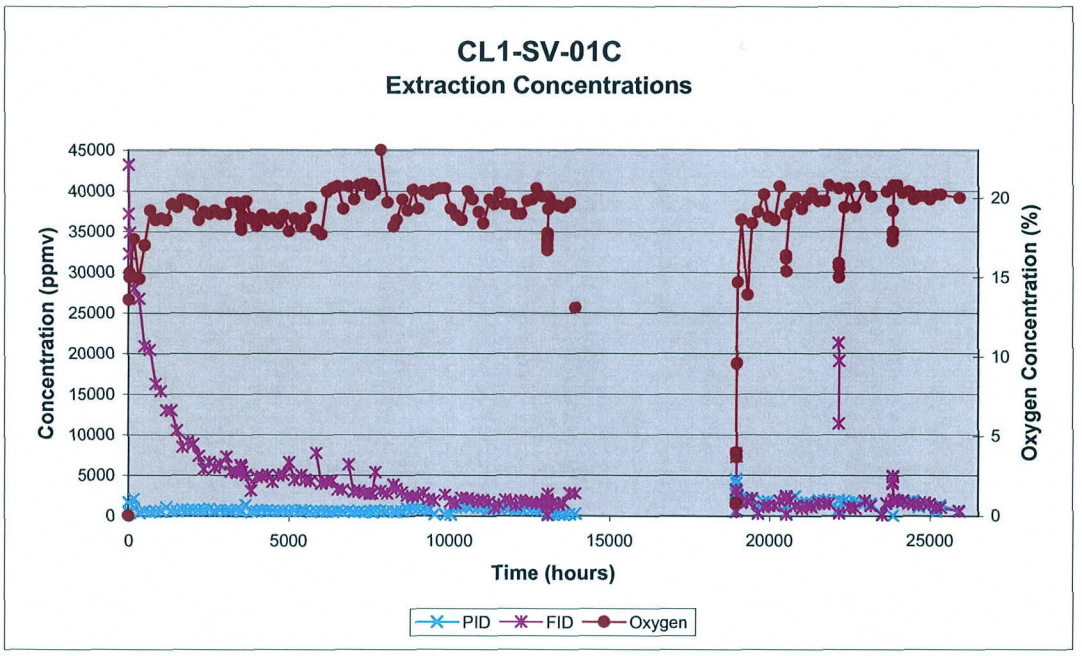

CL1-VW-23(D)
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
Vacuum
Flowrate


CL1-VW-23(D)
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
PID
FID
Oxygen


CL1-SV-01A
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
0
10
20
30
40
50
60
70
80
0
5
10
15
20
25
0
5000
10000
15000
20000
25000
Vacuum
Flowrate

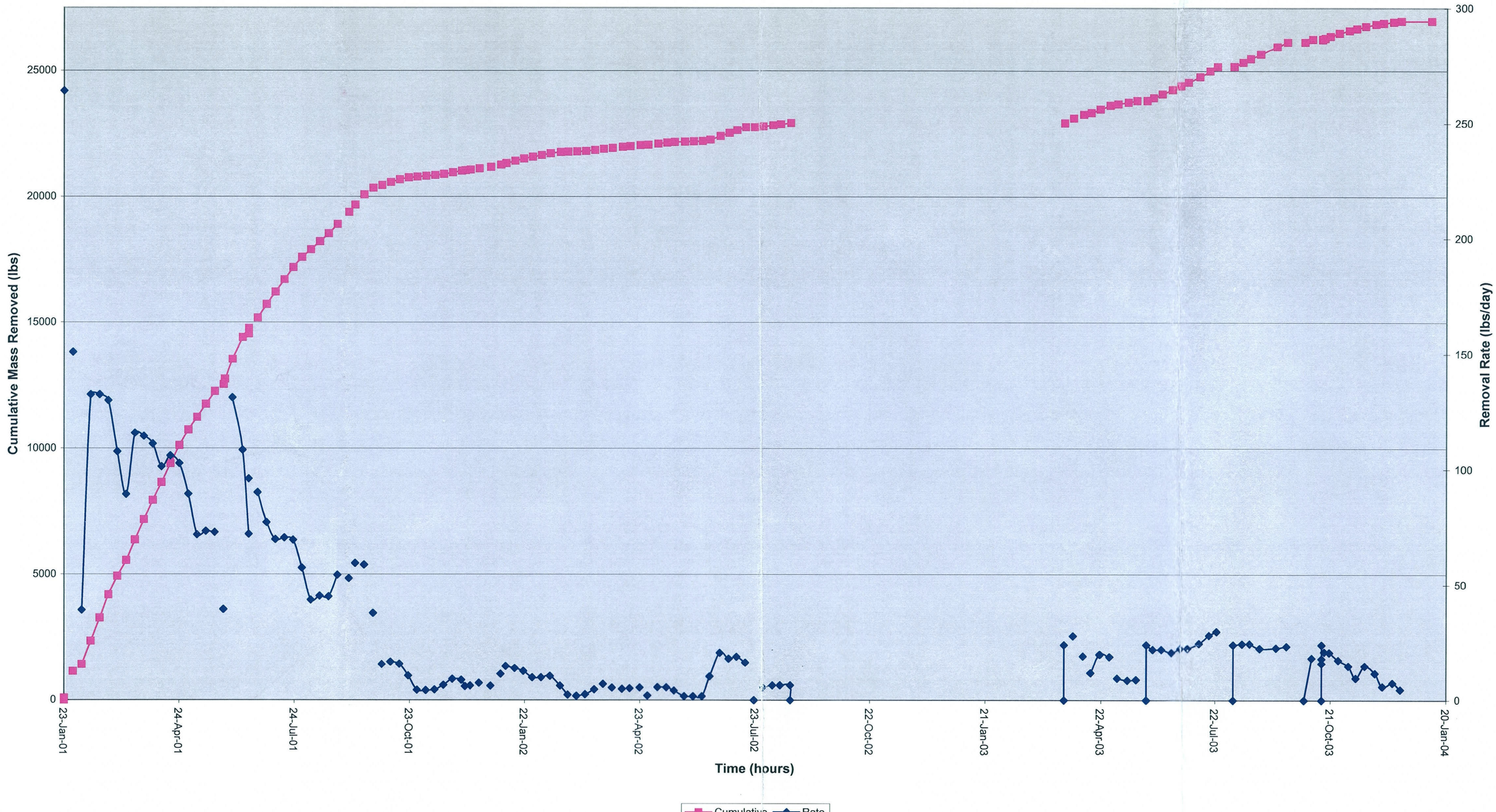

CL1-SV-01A
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
0
200
400
600
800
1000
1200
1400
0
5
10
15
20
0
5000
10000
15000
20000
25000
PID
FID
Oxygen


CL1-SV-01C
Operating Parameters
Vacuum (iwc)
Flowrate (scfm)
Time (hours)
Vacuum
Flowrate


CL1-SV-01C
Extraction Concentrations
Concentration (ppmv)
Oxygen Concentration (%)
Time (hours)
PID
FID
Oxygen

Attachment C
Mass Removal Charts

UST Cluster 1
Performance Evaluation Testing



Attachment D
Site-Specific Discrete Sampling Forms

SITE-SPECIFIC DISCRETE SAMPLING FORM
NASA Crows Landing Flight Facility

Investigation Site:	UST Cluster 1
Sampling Rig Type:	AMS Powerprobe Direct Push
Borehole/Rod Diameter:	2 1/8" O.D. and 1 1/2" core
Anticipated Depth to Groundwater	58.83' (CL1-MW-05 on 10/30/03)

Date: 3/5/2004
Page 1 of 8

Purpose of Investigation:	verify current concentrations of petroleum hydrocarbons in vadose zone soil to evaluate effectiveness of long-term SVE testing and to assess risk of contamination remaining in soil at the site.

Sampling Collection Rationale:	collect soil samples from below the tank removal excavation (30 ft), within the vadose zone (40'), and above groundwater surface (55 ft) near and away from previous soil sample locations to evaluate changes in concentration of petroleum hydrocarbons.

Sketch Site Map:
See Figure 2
Proposed Soil Sampling Locations

Groundwater Sample ID	Depth (ft bgs)	VOCs (EPA 8260B)	TPH as Gas, Jet Fuel (EPA 8015B)	TPH as Diesel / Motorl Oil (EPA 8015B)	PAH's (EPA 8270-SIM/8310)	Title 22 Metals - Dissolved (EPA 6010B/7000)	Hexavalent Chromium (EPA 7196A)	Anions (EPA 300)	Alkalinity (EPA 310.1)	Total Dissolved Solids (EPA 160.1)	Other*			

Soil Samples Collected: Yes No (If yes, prepare boring log)

Soil Sample ID	Depth (ft bgs)													
CL1-GP-01 (30)	30	X	X	X	X									
CL1-GP-01 (40)	40	X	X	X	X									
CL1-GP-01 (55)	55	X	X	X	X									
CL1-GP-02 (30)	30	X	X	X	X									
CL1-GP-02 (40)	40	X	X	X	X									
Total Advanced Depth:	55													

* Confirm method is described in the SAP (IT, 2003a). If not, prepare variance for new method.

Investigation Site:	UST Cluster 1
Sampling Rig Type:	AMS Powerprobe Direct Push
Borehole/Rod Diameter:	2 1/8" O.D. and 1 1/2" core
Anticipated Depth to Groundwater	58.83' (CL1-MW-05 on 10/30/03)

Date: 3/5/2004
Page 2 of 8

Purpose of Investigation:	verify current concentrations of petroleum hydrocarbons in vadose zone soil to evaluate effectiveness of long-term SVE testing and to assess risk of contamination remaining in soil at the site.

Sampling Collection Rationale:	collect soil samples from below the tank removal excavation (30 ft), within the vadose zone (40'), and above groundwater surface (55 ft) near and away from previous soil sample locations to evaluate changes in concentration of petroleum hydrocarbons.

Sketch Site Map:
See Figure 2
Proposed Soil Sampling Locations

Groundwater Sample ID	Depth (ft bgs)	VOCs (EPA 8260B)	TPH as Gas, Jet Fuel (EPA 8015B)	TPH as Diesel / Motorl Oil (EPA 8015B)	PAH's (EPA 8270-SIM/8310)	Title 22 Metals - Dissolved (EPA 6010B/7000)	Hexavalent Chromium (EPA 7196A)	Anions (EPA 300)	Alkalinity (EPA 310.1)	Total Dissolved Solids (EPA 160.1)	Other*			

Soil Samples Collected: Yes No (If yes, prepare boring log)

Soil Sample ID	Depth (ft bgs)													
CL1-GP-02 (55)	55	X	X	X	X									
CL1-GP-03 (30)	30	X	X	X	X									
CL1-GP-03 (40)	40	X	X	X	X									
CL1-GP-03 (55)	55	X	X	X	X									
CL1-GP-04 (30)	30	X	X	X	X									
Total Advanced Depth:	55													

* Confirm method is described in the SAP (IT, 2003a). If not, prepare variance for new method.

Investigation Site:	UST Cluster 1
Sampling Rig Type:	AMS Powerprobe Direct Push
Borehole/Rod Diameter:	2 1/8" O.D. and 1 1/2" core
Anticipated Depth to Groundwater	58.83' (CL1-MW-05 on 10/30/03)

Date: 3/5/2004

Purpose of Investigation:	verify current concentrations of petroleum hydrocarbons in vadose zone soil to evaluate effectiveness of long-term SVE testing and to assess risk of contamination remaining in soil at the site.

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Sketch Site Map:
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Proposed Soil Sampling Locations

Groundwater Sample ID	Depth (ft bgs)	*VOCs (EPA 8260B)*	*TPH as Gas, Jet Fuel (EPA 8015B)*	*TPH as Diesel / Motorl Oil (EPA 8015B)*	*PAH's (EPA 8270-SIM/8310)*	*Title 22 Metals - Dissolved (EPA 6010B/7000)*	*Hexavalent Chromium (EPA 7196A)*	*Anions (EPA 300)*	*Alkalinity (EPA 310.1)*	*Total Dissolved Solids (EPA 160.1)*	Other*			

Soil Samples Collected: Yes No (If yes, prepare boring log)

Soil Sample ID	Depth (ft bgs)													
CL1-GP-04 (40)	40	X	X	X	X									
CL1-GP-04 (55)	55	X	X	X	X									
CL1-GP-05 (30)	30	X	X	X	X									
CL1-GP-05 (40)	40	X	X	X	X									
CL1-GP-05 (55)	55	X	X	X	X									
Total Advanced Depth:	55													

* Confirm method is described in the SAP (IT, 2003a). If not, prepare variance for new method.

Investigation Site:	UST Cluster 1
Sampling Rig Type:	AMS Powerprobe Direct Push
Borehole/Rod Diameter:	2 1/8" O.D. and 1 1/2" core
Anticipated Depth to Groundwater	58.83' (CL1-MW-05 on 10/30/03)

Date: 3/5/2004
Page 4 of 8

Purpose of Investigation:	verify current concentrations of petroleum hydrocarbons in vadose zone soil to evaluate effectiveness of long-term SVE testing and to assess risk of contamination remaining in soil at the site.

Sampling Collection Rationale:	collect soil samples from below the tank removal excavation (30 ft), within the vadose zone (40'), and above groundwater surface (55 ft) near and away from previous soil sample locations to evaluate changes in concentration of petroleum hydrocarbons.

Sketch Site Map:
See Figure 2
Proposed Soil Sampling Locations

Groundwater Sample ID	Depth (ft bgs)	*VOCs (EPA 8260B)*	*TPH as Gas, Jet Fuel (EPA 8015B)*	*TPH as Diesel / Motorl Oil (EPA 8015B)*	*PAH's (EPA 8270-SIM/8310)*	*Title 22 Metals - Dissolved (EPA 6010B/7000)*	*Hexavalent Chromium (EPA 7196A)*	*Anions (EPA 300)*	*Alkalinity (EPA 310.1)*	*Total Dissolved Solids (EPA 160.1)*	Other*			

Soil Samples Collected: Yes No (If yes, prepare boring log)

Soil Sample ID	Depth (ft bgs)													
CL1-GP-06 (30)	30	X	X	X	X									
CL1-GP-06 (40)	40	X	X	X	X									
CL1-GP-06 (55)	55	X	X	X	X									
CL1-GP-07 (30)	30	X	X	X	X									
CL1-GP-07 (40)	40	X	X	X	X									
Total Advanced Depth:	55													

* Confirm method is described in the SAP (IT, 2003a). If not, prepare variance for new method.

Investigation Site:	UST Cluster 1	**Date:**	**3/5/2004**
Sampling Rig Type:	AMS Powerprobe Direct Push	**Page**	**5 of 8**
Borehole/Rod Diameter:	2 1/8" O.D. and 1 1/2" core		
Anticipated Depth to Groundwater	58.83' (CL1-MW-05 on 10/30/03)		

Purpose of Investigation:	verify current concentrations of petroleum hydrocarbons in vadose zone soil to evaluate effectiveness of long-term SVE testing and to assess risk of contamination remaining in soil at the site.

Sampling Collection Rationale:	collect soil samples from below the tank removal excavation (30 ft), within the vadose zone (40'), and above groundwater surface (55 ft) near and away from previous soil sample locations to evaluate changes in concentration of petroleum hydrocarbons.

Sketch Site Map:
See Figure 2
Proposed Soil Sampling Locations

Groundwater Sample ID	Depth (ft bgs)	*VOCs (EPA 8260B)*	*TPH as Gas, Jet Fuel (EPA 8015B)*	*TPH as Diesel / Motorl Oil (EPA 8015B)*	*PAH's (EPA 8270-SIM/8310)*	*Title 22 Metals - Dissolved (EPA 6010B/7000)*	*Hexavalent Chromium (EPA 7196A)*	*Anions (EPA 300)*	*Alkalinity (EPA 310.1)*	*Total Dissolved Solids (EPA 160.1)*	Other*			

Soil Samples Collected: Yes No (If yes, prepare boring log)

Soil Sample ID	Depth (ft bgs)													
CL1-GP-07 (55)	55	X	X	X	X									
CL1-GP-08 (30)	30	X	X	X	X									
CL1-GP-08 (40)	40	X	X	X	X									
CL1-GP-08 (55)	55	X	X	X	X									
CL1-GP-09 (30)	30	X	X	X	X									
Total Advanced Depth:	55													

* Confirm method is described in the SAP (IT, 2003a). If not, prepare variance for new method.

Investigation Site:	UST Cluster 1
Sampling Rig Type:	AMS Powerprobe Direct Push
Borehole/Rod Diameter:	2 1/8" O.D. and 1 1/2" core
Anticipated Depth to Groundwater	58.83' (CL1-MW-05 on 10/30/03)

Date: 3/5/2004
Page 6 of 8

Purpose of Investigation:	verify current concentrations of petroleum hydrocarbons in vadose zone soil to evaluate effectiveness of long-term SVE testing and to assess risk of contamination remaining in soil at the site.

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Soil Samples Collected: **Yes** No (If yes, prepare boring log)

Soil Sample ID	Depth (ft bgs)													
CL1-GP-09 (40)	40	X	X	X	X									
CL1-GP-09 (55)	55	X	X	X	X									
CL1-GP-10 (30)	30	X	X	X	X									
CL1-GP-10 (40)	40	X	X	X	X									
CL1-GP-10 (55)	55	X	X	X	X									
Total Advanced Depth:	55													

* Confirm method is described in the SAP (IT, 2003a). If not, prepare variance for new method.

Investigation Site:	UST Cluster 1
Sampling Rig Type:	AMS Powerprobe Direct Push
Borehole/Rod Diameter:	2 1/8" O.D. and 1 1/2" core
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Date: 3/5/2004
Page 7 of 8

Purpose of Investigation:	verify current concentrations of petroleum hydrocarbons in vadose zone soil to evaluate effectiveness of long-term SVE testing and to assess risk of contamination remaining in soil at the site.

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Soil Samples Collected: Yes No (If yes, prepare boring log)

Soil Sample ID	Depth (ft bgs)													
CL1-GP-11 (30)	30	X	X	X	X									
CL1-GP-11 (40)	40	X	X	X	X									
CL1-GP-11 (55)	55	X	X	X	X									
CL1-GP-12 (30)	30	X	X	X	X									
CL1-GP-12 (40)	40	X	X	X	X									
Total Advanced Depth:	55													

* Confirm method is described in the SAP (IT, 2003a). If not, prepare variance for new method.

Investigation Site:	UST Cluster 1
Sampling Rig Type:	AMS Powerprobe Direct Push
Borehole/Rod Diameter:	2 1/8" O.D. and 1 1/2" core
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Soil Samples Collected: Yes No (If yes, prepare boring log)

Soil Sample ID	Depth (ft bgs)													
CL1-GP-12 (55)	55	X	X	X	X									
CL1-GP-13 (30)	30	X	X	X	X									
CL1-GP-13 (40)	40	X	X	X	X									
CL1-GP-13 (55)	55	X	X	X	X									
Total Advanced Depth:	55													

* Confirm method is described in the SAP (IT, 2003a). If not, prepare variance for new method.