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Date: September 15, 2008
Refer To: EP2008-0494

James P. Bearzi, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Material Disposal Area G Soil Vapor Extraction Test Status Report

Dear Mr. Bearzi:

The purpose of this letter is to provide a status of the ongoing soil vapor extraction (SVE) pilot study at Material Disposal Area (MDA) G within Technical Area 54 (TA-54). The pilot test is being conducted to evaluate the effectiveness of using SVE to remove volatile organic compounds (VOCs) from the subsurface at MDA G. All data included in this second status report are preliminary and will be finalized for the SVE pilot test report to be submitted to the New Mexico Environment Department (NMED) on October 31, 2008.

This status report includes all information to date that should allow NMED to evaluate the feasibility of SVE as a remedy option within the MDA G corrective measures evaluation (CME). Los Alamos National Laboratory (the Laboratory) believes this status report satisfies the second of three reporting requirements on the SVE pilot test identified in NMED's June 11, 2008, approval with modifications to the revised work plan for implementation of an in situ SVE pilot study at MDA G. The Laboratory will submit a final SVE pilot test report to NMED by October 31, 2008.

To date, the deep-extraction test has been operating for 21 days with no interruptions, and the shallow-extraction test is complete. The deep-extraction test is not completed as originally planned because of delays experienced in the field. Currently, data are being collected on the deep-extraction test to measure system performance and effectiveness and will be included in their entirety in the final SVE pilot test report. If NMED believes these additional data are crucial to its ability to review the CME report for MDA G, the Laboratory will provide the shallow and deep-extraction test data 2 wk after the deep-extraction test is completed, currently scheduled for September 23, 2008.

In order to evaluate the potential for SVE to treat the VOC plumes beneath MDA G, SVE pilot tests are being conducted in two separate geologic zones beneath MDA G in the vicinity of the north-central shaft field (Attachment 1, Figure 1): the shallow Tshirege Member of the Bandelier Tuff immediately below the shaft fields, and the deeper Otowi Member located above the basalt. Following a period of baseline monitoring, the shallow-extraction test was performed from July 8, 2008, to August 7, 2008, in the Tshirege Member of the Bandelier Tuff to evaluate source removal and control immediately beneath the shaft field source zone. Data were collected from the shallow-extraction borehole (Attachment 1, Figure 2) during the test to measure system performance and effectiveness. These data will be included in their entirety in the final SVE pilot test report to be submitted to NMED. Concentrations of VOCs were monitored at the extraction borehole and at the four monitoring borehole locations: 54-24378, 54-01116, 54-24388, and 54-01117.

During the shallow test, tricholoroethane (TCA), the primary constituent in the plume, peaked at approximately 315 parts per million by volume (ppmv) shortly after the start of the test and decreased to approximately 140 ppmv at the end of the 30-day test (Attachment 1, Figure 3). Preliminary VOC mass removal estimates indicate that more than 250 lb of VOCs was removed during the shallow extraction pilot test (Attachment 1, Figure 4). During the shallow test, five drums of granular activated carbon (GAC) waste were produced. Final waste determination is pending waste sample analytical results. TCA data from the SVE monitoring boreholes during the shallow extraction test show a decrease in TCA concentrations in all monitoring boreholes (Attachment 1, Tables 1 through 4; Figures 5 through 8). TCA levels decreased the most in boreholes closest to the extraction well and in ports within the extraction interval.

Differential pressure readings collected each morning of the test also show a pressure response to the vacuum at all port depths in all monitoring boreholes (Attachment 1, Tables 5 through 8; Figures 9 through 12). Based on preliminary data, the lowest differential pressure reading was –1.18 kPa in the closest borehole, 54-24378, with lowest readings in each borehole decreasing with distance from the extraction borehole to –0.88 kPa in 54-01116, and –0.52 kPa in both 54-24388 and 54-01117. As indicated in the graphs, pressure readings rebounded to near background within several days of the end of active extraction. Active extraction in the Tshirege was followed by approximately two-and-a-half weeks of rebound monitoring in the monitoring boreholes. Preliminary data indicates that TCA concentrations rebounded slightly in monitoring boreholes farthest from the extraction well; however, monitoring ports with significant decreases in TCA concentrations did not rebound to preextraction levels (Attachment 1, Figures 5 and 6).

During the rebound phase of the shallow test, the deep-extraction borehole was drilled and constructed. The deep extraction borehole was drilled in the vicinity of the large shaft field in the north-central portion of the site near the center of the VOC plume (Attachment 1, Figure 1). This second test is being conducted in the deeper Otowi Member of the Bandelier Tuff to evaluate the ability of SVE to remove contaminated pore gas from the subsurface strata overlying the basalt. Drilling operations began on August 8, 2008, and were complete on August 22, 2008. The deep-extraction borehole was drilled to 179.5 ft below ground surface (bgs) with a hollow-stem auger, and a grout plug was installed to 178.5 ft bgs to ensure the extraction interval would not be affected by the more permeable Guaje Pumice Bed. The extraction borehole was cased with 10-in. steel from ground surface to 161 ft bgs, approximately 2 ft into the top of the Otowi Member, resulting in a

17.5-ft extraction interval within the Otowi Member of the Bandelier Tuff from 161 ft bgs to 178.5 ft bgs (Attachment 1, Figure 13).

The deep-extraction borehole was not cored and logged as was done during the drilling of the shallow borehole because of its close proximity to the first borehole. The following geological contacts encountered in the shallow borehole are assumed to be representative of those encountered in the deep borehole:

- Soil/fill, 0–2 ft bgs
- Unit 2 of the Tshirege Member of the Bandelier Tuff (Qbt 2), 2–60 ft bgs
- Unit 1v (upper slope-forming tuff) of the Tshirege Member of the Bandelier Tuff (extraction interval) (Qbt 1v-u), 60–80 ft bgs
- Unit 1v (colonade tuff) of the Tshirege Member of the Bandelier Tuff (extraction interval) (Qbt 1v-c), 80–87 ft bgs
- Unit 1g of the Tshirege Member of the Bandelier Tuff (extraction interval) (Qbt 1g), 87-147.5 ft bgs
- Tsankawi Pumice Bed (Qbtt), 147.5–149.5 ft bgs
- Cerro Toledo Formation (Qct), 149.5–159 ft bgs
- Otowi Member of the Bandelier Tuff (Qbo), 159–180 ft bgs
- Guaje Pumice Bed (Qbog), 180–182.5 ft bgs
- Basalt, 182.5 ft bgs

Monitoring boreholes were constructed before the first active test and used during both extraction tests. These monitoring boreholes used existing boreholes that were extended and were located approximately 25 ft (54-24378), 50 ft (54-01116), 115 ft (54-24388), and 135 ft (54-01117) away from the extraction borehole. Each borehole was extended to refusal and air-rotary drilled 15 ft into the basalt. Once drilled, nine vapor-monitoring ports were installed to sample each major geologic unit. Ports were installed at each of the following approximate depths: 22.5 ft (Qbt 2), 42.5 ft (Qbt 2), 66.5 ft (Qbt 1v-u), 82.5 ft (Qbt 1v-c), 97.5 ft (Qbt 1g), 132.5 ft (Qbt 1g), 151.5 ft (Qct), 167.5 ft (Qbo), and 190 ft (Tcb). Each port was installed in a 5-ft interval of sand (2.5 ft of sand above and below the port) and capped on the top and bottom with 2.5 ft of hydrated bentonite chips to seal off the interval.

Concentrations of VOCs are being monitored at the extraction borehole and at the four monitoring borehole locations. To determine the near-source effects on the extraction system, all nine ports in the four monitoring boreholes are being screened for both contaminant concentrations and pressure. Preliminary data show concentrations in the extraction well ranging from 55 ppmv to 70 ppmv and confirms the Laboratory's original position that the deep active SVE test was unnecessary (Attachment 1, Figure 15). Formation gas is being extracted at a rate of approximately 15 scfm, and to date, approximately 10 lb of VOCs has been removed from the subsurface.

If you have any questions, please contact Steve Paris at (505) 606-0915 (smparis@lanl.gov) or Edwin Worth at (505) 606-0398 (eworth@doeal.gov).

Sincerely,

Susan G. Stiger, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

David R. Gregory, Project Director
Environmental Operations
Los Alamos Site Office

SS/DG/DM/SP:sm

Attachments: a/s

Cy: (w/enc.)
Neil Weber, San Ildefonso Pueblo
Steve Paris, EP-CAP, MS M992
RPF, MS M707 (with two CDs)
Public Reading Room, MS M992

Cy: (Letter and CD only)
Laurie King, EPA Region 6, Dallas, TX
Steve Yanicak, NMED-OB, White Rock, NM
Ed Worth, DOE-LASO, MS A316
Tom Anderson, Apogen, Los Alamos, NM
Kristine Smeltz, WES-DO, MS M992
EP-CAP File, MS M992

Cy: (w/o enc.)
Tom Skibitski, NMED-OB, Santa Fe, NM
Alison Bennett, DOE-LASO (date-stamped letter emailed)
Susan G. Stiger, ADEP, MS M991
Alison M. Dorries, WES-DO, MS M992
Dave McInroy, EP-CAP, MS M992
IRM-RMMSO, MS A150 (date-stamped letter emailed)

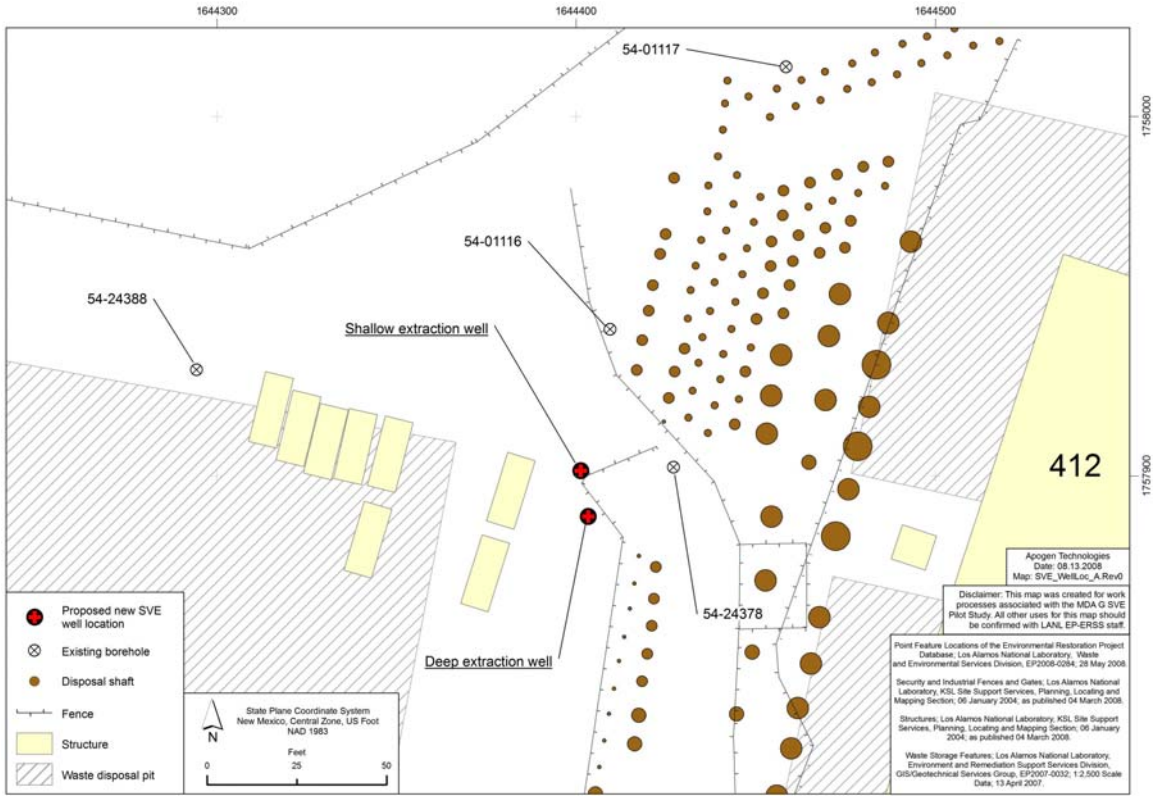

Figure 1 Locations of MDA G extraction and monitoring boreholes

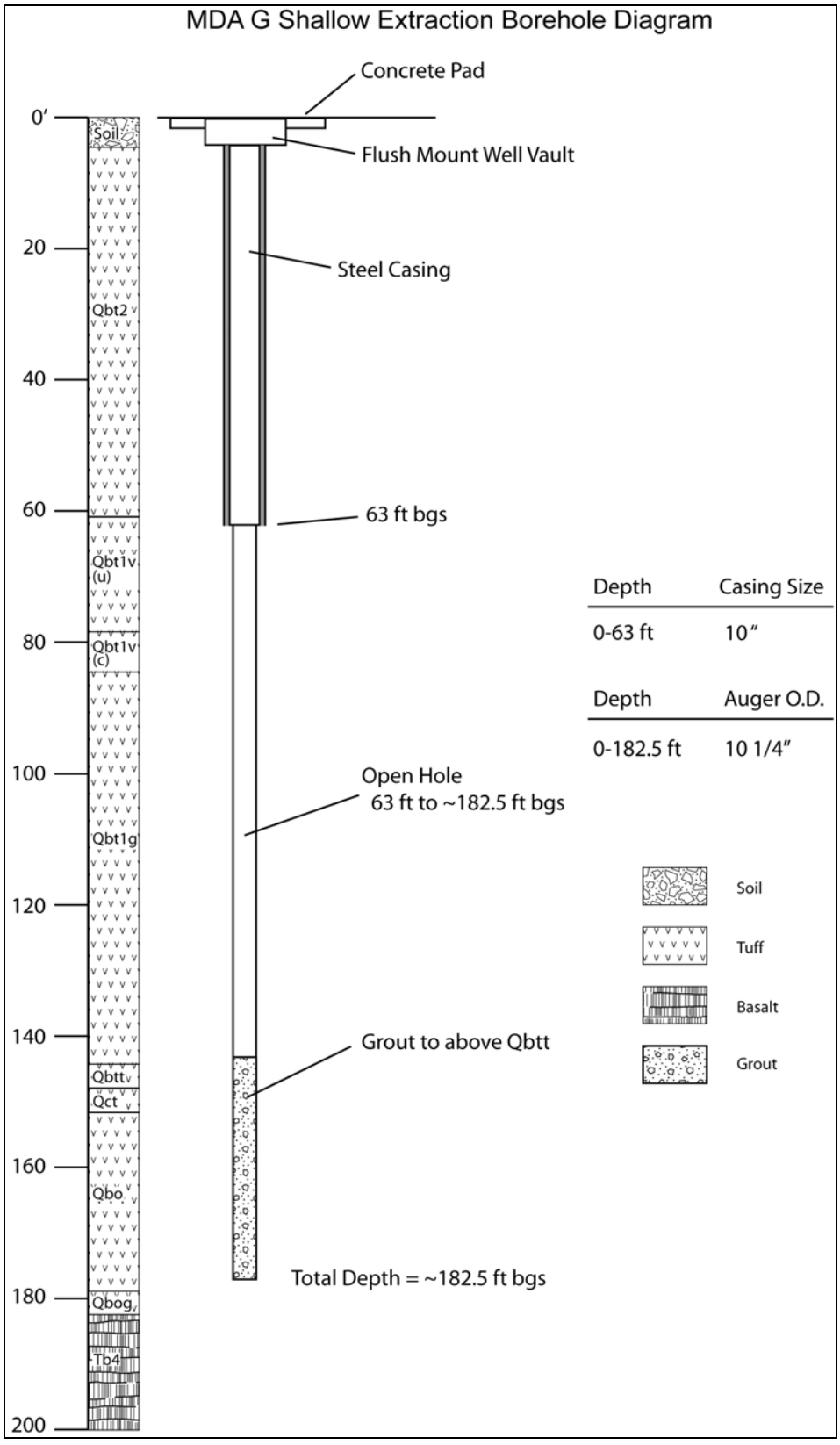

Figure 2 MDA G shallow-extraction borehole

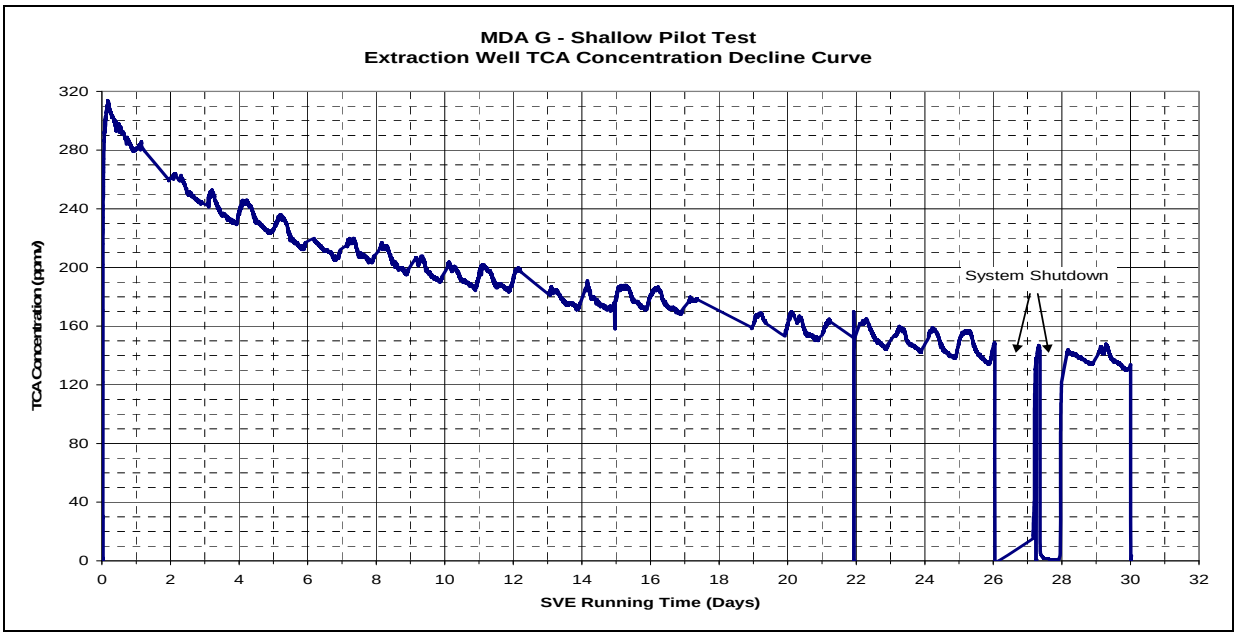

Figure 3 TCA concentration trends during the MDA G shallow SVE pilot test

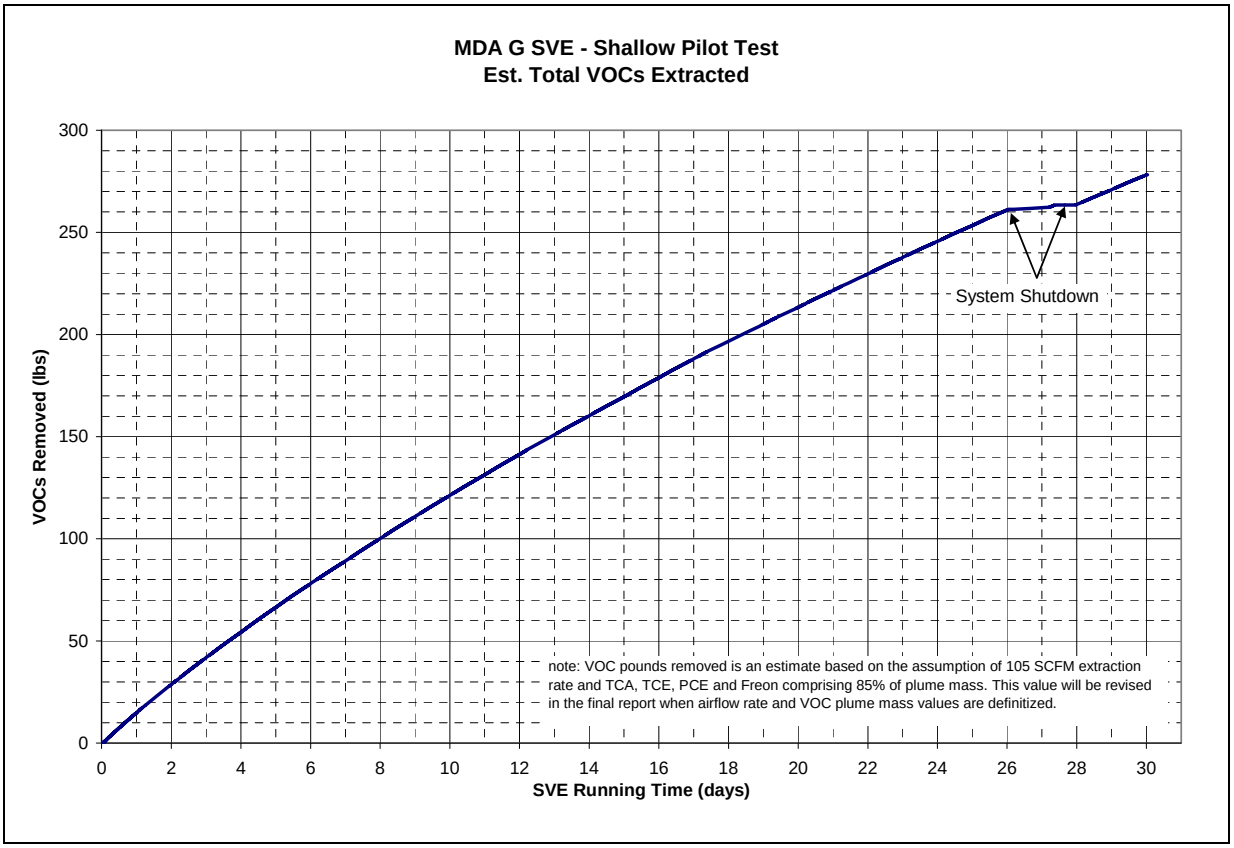

Figure 4 MDA G shallow SVE pilot test VOC mass trend

Table 1
Shallow Extraction Test TCA Results from 54-24378 (in ppmv)

Depth (ft)	5/30/2008	6/5/2008	6/12/2008	7/8/2008	7/15/2008	7/22/2008	7/30/2008	8/6/2008	8/13/2008	8/20/2008
22.5	520	539	571	543	412	250	114	111	122	143
42.5	544	547	583	570	507	401	250	241	223	194
66.5	446	490	474	444	462	340	264	212	239	216
82.5	380	496	375	740	460	403	372	342	319	228
97.5	349	331	363	339	171	133	76.2	130	319	307
132.1	203	200	184	207	186	183	183	176	178	173
151.5	156	160	143	178	144	130	104	116	152	145
167.5	118	120	103	140	115	98.5	77.5	83.2	102	98.5
190	0.658	8.35	2.59	3.21	0.132	0.95	0.412	-0.322	1.23	1.66

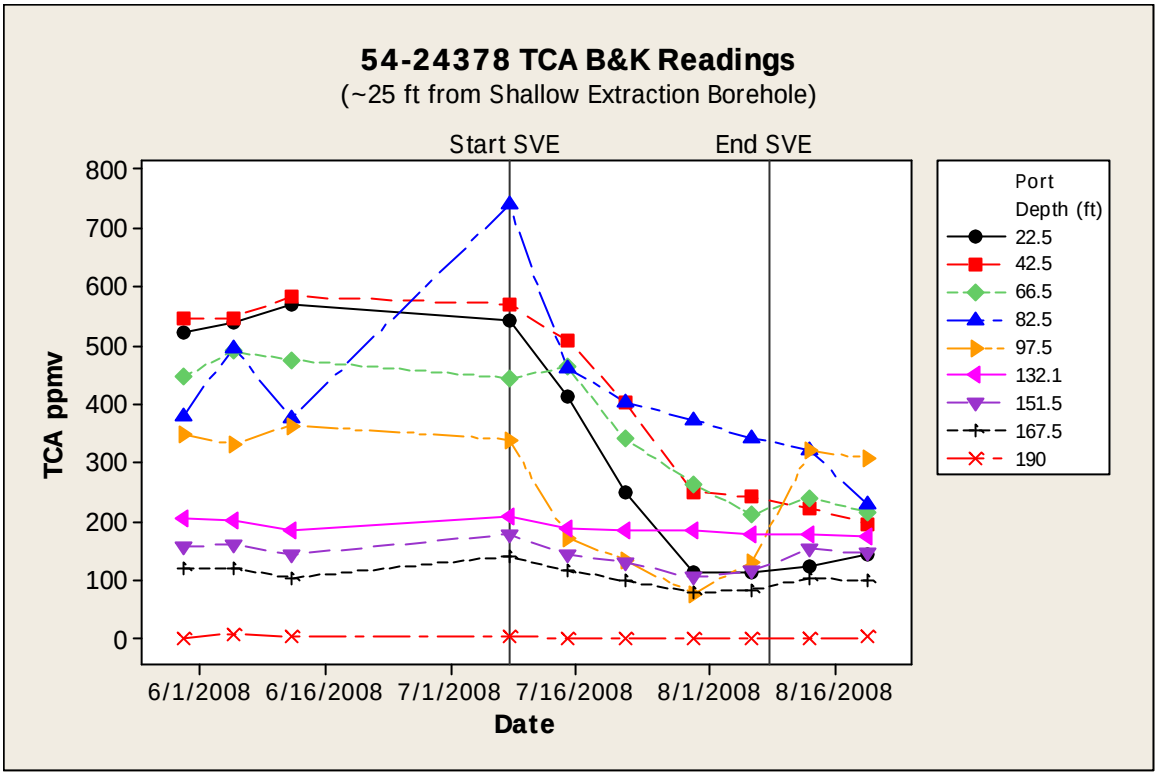

Figure 5 TCA concentrations at borehole 54-24378 during the shallow SVE pilot test

Table 2
Shallow Extraction Test TCA Results from 54-01116 (in ppmv)

Depth (ft)	5/30/2008	6/4/2008	6/11/2008	7/9/2008	7/15/2008	7/16/2008	7/22/2008	7/30/2008	8/6/2008	8/13/2008	8/20/2008
22.5	265	269	303	257	136	122	53.7	27.5	14.4	18.4	21.9
42.5	262	266	286	262	217	203	140	76.7	44.6	34.5	25.1
67.5	233	236	259	236	180	169	106	56.6	36.8	38	35.3
82.5	210	215	235	136	75.1	52.2	56.9	44.8	37.9	66.6	68.9
97.5	187	180	200	165	124	103	113	94.6	94.6	132	135
132.5	117	122	133	111	91.5	88.2	78.8	68.9	63.1	67.8	71.9
151.5	90.9	104	109	77.4	62.9	62.7	58.6	50.4	44.2	42.6	45.6
165	65.4	71	73.4	64.6	50.6	43.6	42.6	29.7	25.9	33.3	33.6
187.8	-0.227	-0.553	-0.208	0.804	0.47	0.697	1.21	1.19	0.313	1.23	-2.4

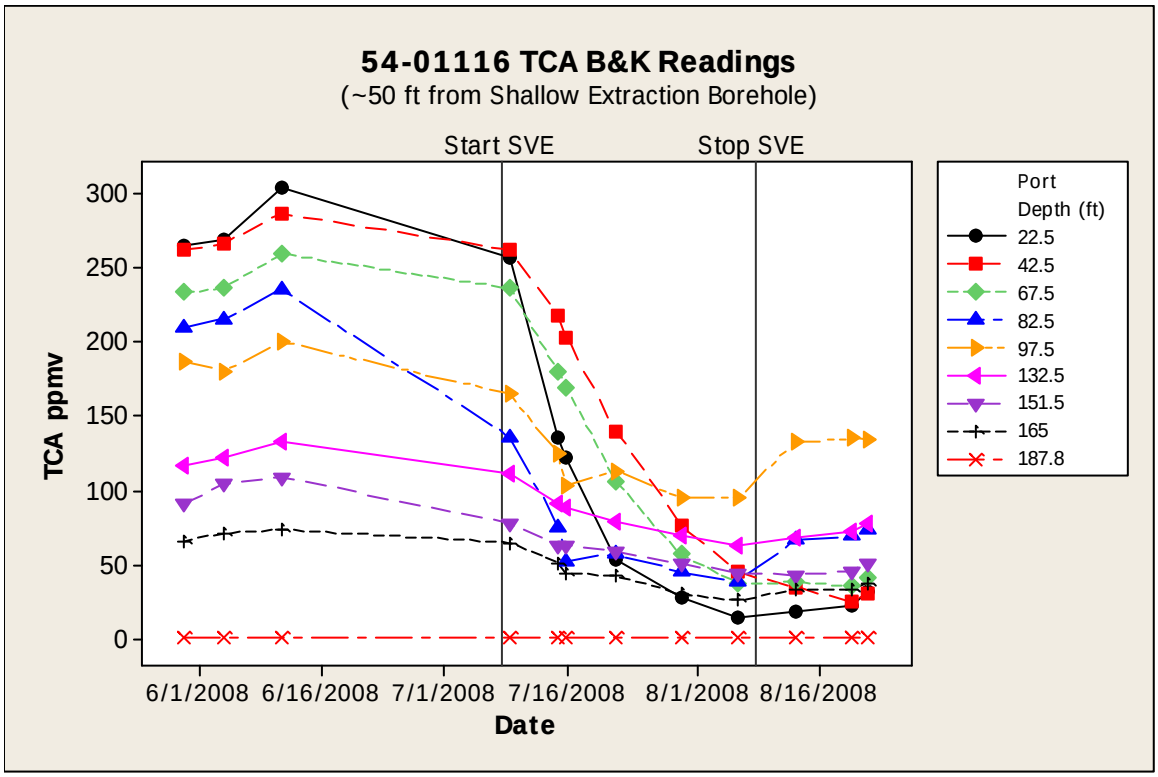

Figure 6 **TCA concentrations at borehole 54-01116 during the shallow SVE pilot test**

Table 3
Shallow Extraction Test TCA Results from 54-24388 (in ppmv)

Depth (ft)	5/30/2008	6/5/2008	6/12/2008	7/10/2008	7/17/2008	7/22/2008	7/30/2008	8/6/2008	8/13/2008	8/21/2008
22.5	51.7	60.7	68.3	44.8	21.5	17.3	15.5	8.19	13.4	12.1
42.5	49.1	54.3	63.5	42.9	25	21.7	17.8	10.6	16.6	15.8
67.5	48.6	41	61.8	55.7	47.1	43.7	37.1	27.1	32.5	22.4
82.5	44.9	38.8	53.9	26.1	16.9	18.7	20.6	13.1	20.4	17.7
97.5	35.6	39.8	44.8	44	24.1	39	37.1	30.3	38.7	32.6
132.5	34.4	34.2	32.2	37.1	31.8	29.8	32.6	27.9	31.9	28.2
151.5	29.2	29.2	28.2	28.6	23.3	26	21.1	17.7	26.1	25.5
167.5	4.47	4.43	7.04	5.47	5.58	5.98	5.84	2.54	3.7	3.99
189.5	0.024	-0.562	0.588	-0.103	0.411	0.72	1.26	0.012	0.694	0.602

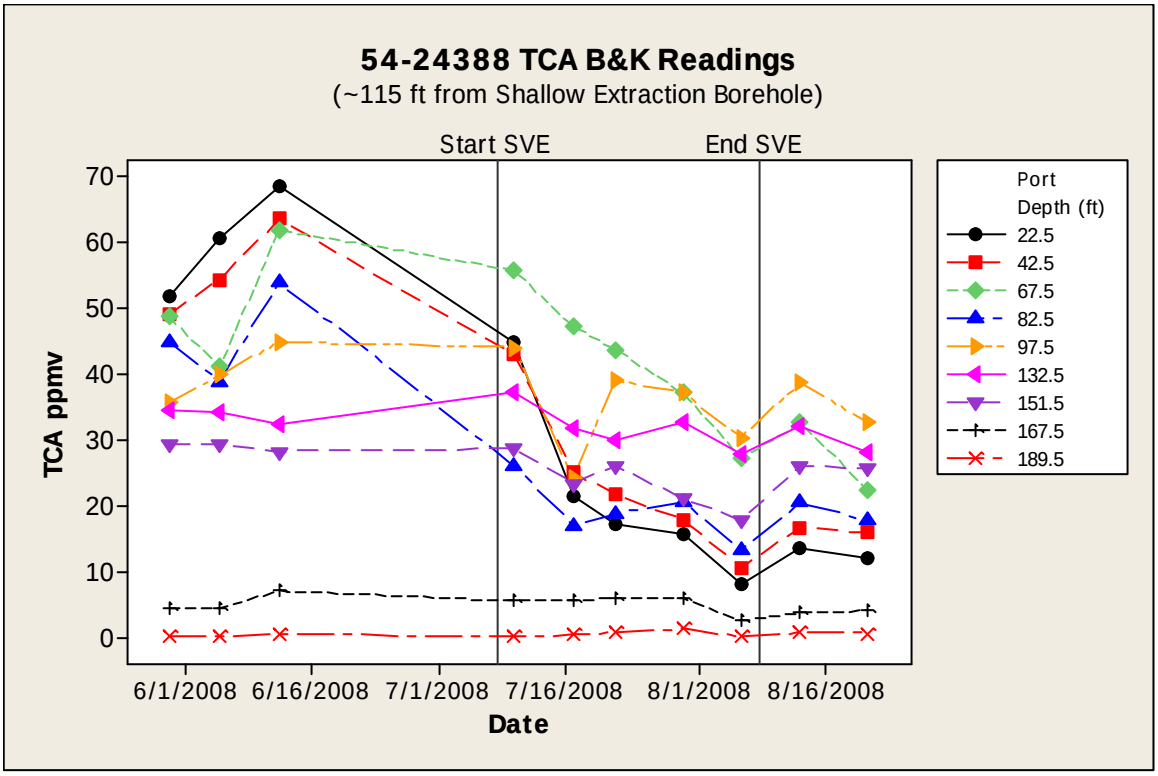

Figure 7 TCA concentrations at borehole 54-24388 during the shallow SVE pilot test

Table 4
Shallow Extraction Test TCA Results from 54-01117

Depth (ft)	6/9/2008	6/12/2008	7/10/2008	7/17/2008	7/21/2008	7/25/2008	7/30/2008	8/6/2008	8/13/2008	8/20/2008
20	30.2	33.9	27.2	18	10.6	10.6	9.65	4.55	-1.8	2.46
42.5	45.8	31.1	40	29.2	23.9	20.9	18.1	12.9	8.87	14.6
67.5	56.1	63	57.9	48	44	39.6	35.4	27.6	26.1	32.3
82	55	64.1	66.6	45.8	65.9	46.3	52	44.6	49	55.4
97.5	58.7	72.2	74.8	51.7	74.7	56.7	61.3	59.8	63.6	71.9
132.5	46.4	63.6	73.8	58.9	69.9	53.8	58.1	56.7	57.6	69.8
150	17.7	25.7	38.2	36.5	38.4	32.2	34.1	30.9	28.7	36.4
159.5	17.9	27.5	36.4	32.9	29.9	27.2	28.9	27	27.3	31.7
179.8	0.139	1.84	0.487	0.914	1.05	0.928	1.4	0.679	-0.317	-0.221

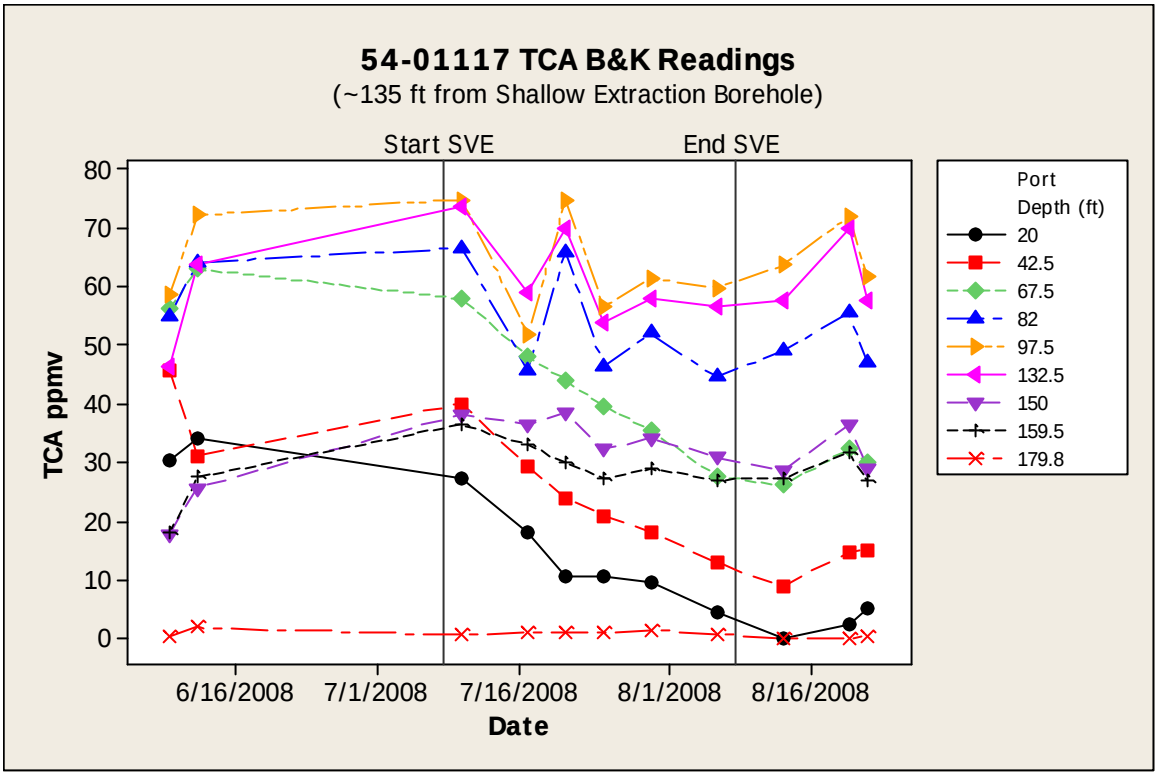

Figure 8 TCA concentrations at borehole 54-01117 during the shallow SVE pilot test

Table 5
Shallow Extraction Test Morning Manometer Readings in Borehole 54-24378 (in kPa)

Depth (ft)	5/30/2008	6/5/2008	6/12/2008	7/8/2008	7/15/2008	7/22/2008	7/30/2008	8/6/2008	8/13/2008	8/20/2008
22.5	0.00	0.00	0.00	0.00	-0.10	-0.09	-0.12	-0.11	-0.04	-0.02
42.5	0.00	0.00	0.00	0.00	-0.11	-0.10	-0.13	-0.11	-0.03	-0.02
66.5	0.00	0.00	-0.02	-0.06	-0.17	-0.98	-1.09	-1.07	-0.09	-0.03
82.5	0.00	0.00	-0.03	-0.07	-1.04	-1.05	-1.18	-1.13	-0.10	-0.03
97.5	0.00	0.00	-0.05	-0.09	-0.94	-0.98	-1.09	-1.06	-0.11	-0.03
132.1	0.00	0.00	-0.19	-0.16	-0.59	-0.59	-0.74	-0.70	-0.15	-0.03
151.5	0.00	0.00	-0.21	-0.17	-0.30	-0.21	-0.35	-0.33	-0.15	-0.03
167.5	0.00	0.00	-0.15	-0.04	-0.13	-0.16	-0.26	-0.21	-0.13	-0.03
190	0.00	0.00	-0.03	-0.06	-0.05	-0.05	-0.10	-0.07	-0.09	-0.03

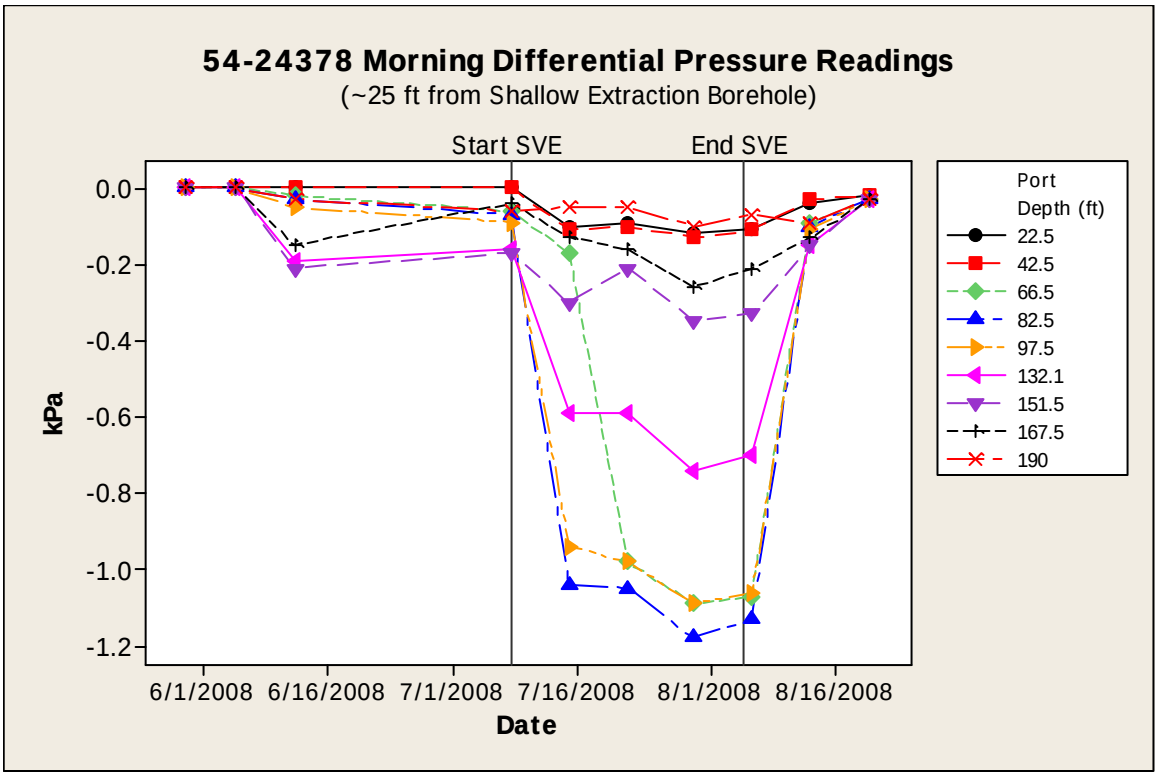

Figure 9 Differential pressure in borehole 54-24378 during the shallow SVE pilot test

Table 6
Shallow Extraction Test Morning Manometer Readings in Borehole 54-01116 (in kPa)

Depth (ft)	5/30/2008	6/4/2008	6/11/2008	7/9/2008	7/15/2008	7/16/2008	7/22/2008	7/30/2008	8/6/2008	8/13/2008	8/20/2008
22.5	0.00	0.00	0.00	-0.07	-0.08	-0.09	-0.07	-0.09	-0.08	-0.02	0.00
42.5	0.00	0.00	0.00	-0.09	-0.10	-0.11	-0.09	-0.12	-0.10	-0.03	0.00
67.5	0.00	0.00	0.01	-0.63	-0.59	-0.61	-0.60	-0.67	-0.61	-0.08	-0.02
82.5	0.00	0.00	0.01	-0.86	-0.78	-0.81	-0.79	-0.88	-0.85	-0.09	-0.02
97.5	0.00	0.00	0.02	-0.81	-0.71	-0.75	-0.72	-0.83	-0.78	-0.11	-0.02
132.5	0.00	0.00	0.01	-0.58	-0.48	-0.55	-0.43	-0.59	-0.53	-0.15	-0.02
151.5	0.00	0.00	0.05	-0.36	-0.29	-0.35	-0.20	-0.37	-0.32	-0.15	-0.03
165	0.00	0.00	0.02	-0.24	-0.20	-0.24	-0.14	-0.26	-0.22	-0.13	-0.02
187.8	0.00	0.00	0.05	-0.06	-0.06	-0.08	-0.05	-0.10	-0.06	-0.09	-0.02

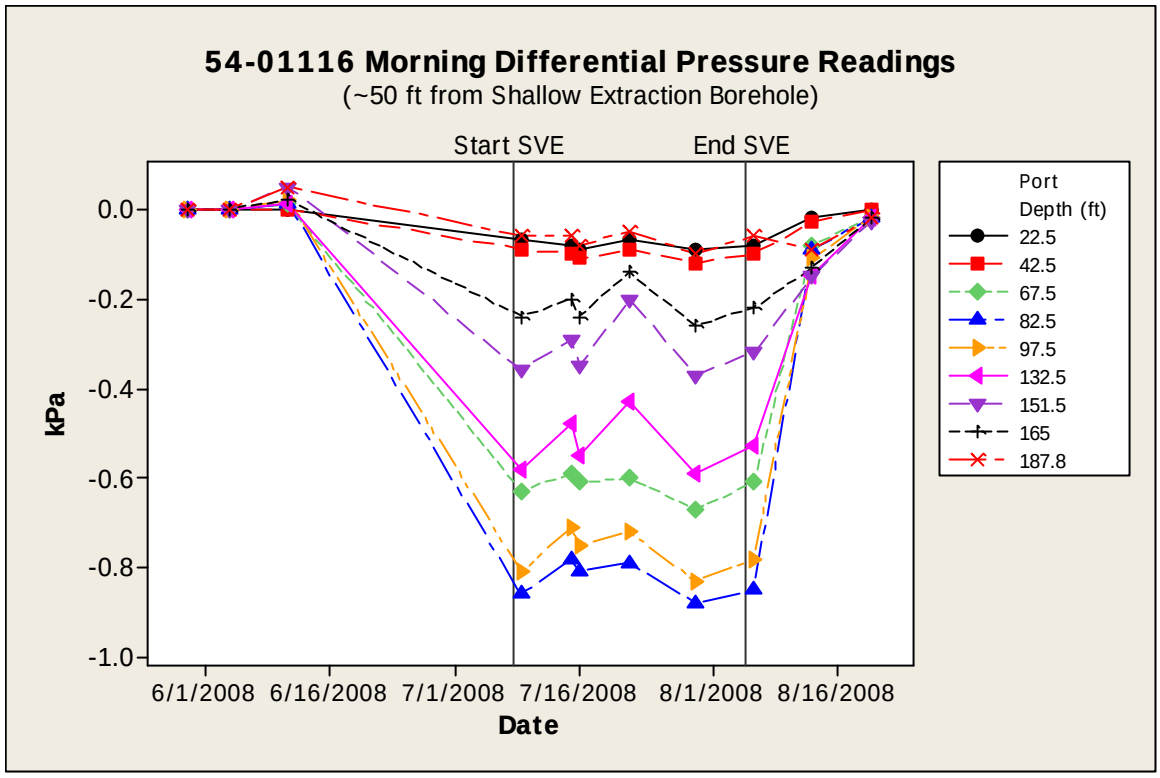

Figure 10 Differential pressure in borehole 54-01116 during the shallow SVE pilot test

Table 7
Shallow Extraction Test Morning Manometer Readings in Borehole 54-24388 (in kPa)

Depth (ft)	5/30/2008	6/5/2008	6/12/2008	7/10/2008	7/17/2008	7/22/2008	7/29/2008	8/6/2008	8/13/2008	8/20/2008
22.5	0.01	0.00	0.00	-0.07	-0.06	-0.07	-0.10	-0.08	-0.02	0.00
42.5	0.01	0.00	0.00	-0.08	-0.07	-0.07	-0.10	-0.08	-0.03	0.00
67.5	0.00	0.00	-0.02	-0.31	-0.24	-0.30	-0.35	-0.32	-0.07	-0.02
82.5	0.00	0.00	-0.04	-0.47	-0.34	-0.48	-0.52	-0.48	-0.09	-0.03
97.5	0.00	0.00	-0.09	-0.39	-0.34	-0.36	-0.45	-0.42	-0.11	-0.02
132.5	0.00	0.00	-0.19	-0.26	-0.23	-0.24	-0.32	-0.30	-0.14	-0.02
151.5	0.00	0.00	-0.17	-0.21	-0.18	-0.19	-0.23	-0.25	-0.14	-0.02
167.5	0.00	0.00	-0.08	-0.09	-0.08	-0.09	-0.18	-0.13	-0.12	-0.03
189.5	0.00	0.00	-0.02	-0.04	-0.04	-0.04	-0.11	-0.06	-0.08	-0.02

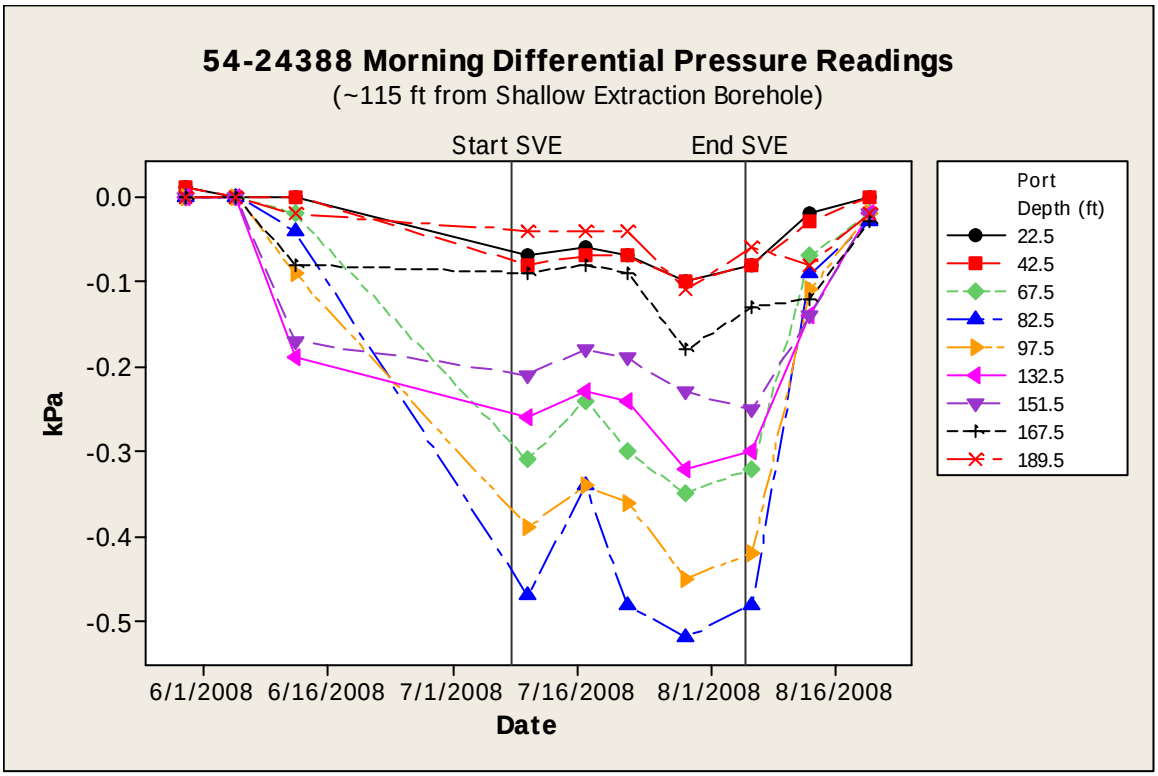

Figure 11 **Differential pressure in borehole 54-24388 during the shallow SVE pilot test**

Table 8
Shallow Extraction Test Morning Manometer Readings in Borehole 54-01117 (in kPa)

Depth (ft)	6/9/2008	6/12/2008	7/10/2008	7/17/2008	7/21/2008	7/25/2008	8/1/2008	8/6/2008	8/13/2008	8/20/2008
20	0.00	0.00	-0.08	-0.07	-0.07	-0.10	-0.11	-0.08	0.00	0.00
42.5	0.02	0.00	-0.09	-0.07	-0.07	-0.12	-0.12	-0.08	-0.02	0.00
67.5	0.00	0.00	-0.35	-0.29	-0.32	-0.41	-0.42	-0.36	-0.06	-0.02
82	-0.02	0.00	-0.42	-0.36	-0.40	-0.51	-0.52	-0.45	-0.08	-0.02
97.5	-0.11	-0.04	-0.37	-0.35	-0.33	-0.48	-0.49	-0.40	-0.12	-0.02
132.5	-0.15	-0.08	-0.27	-0.27	-0.23	-0.41	-0.43	-0.31	-0.14	-0.02
150	-0.11	-0.03	-0.16	-0.16	-0.13	-0.27	-0.30	-0.19	-0.12	-0.02
159.5	-0.08	-0.01	-0.13	-0.13	-0.10	-0.24	-0.24	-0.16	-0.11	-0.02
179.8	0.00	0.00	-0.04	-0.04	-0.08	-0.12	-0.12	-0.06	-0.07	0.00

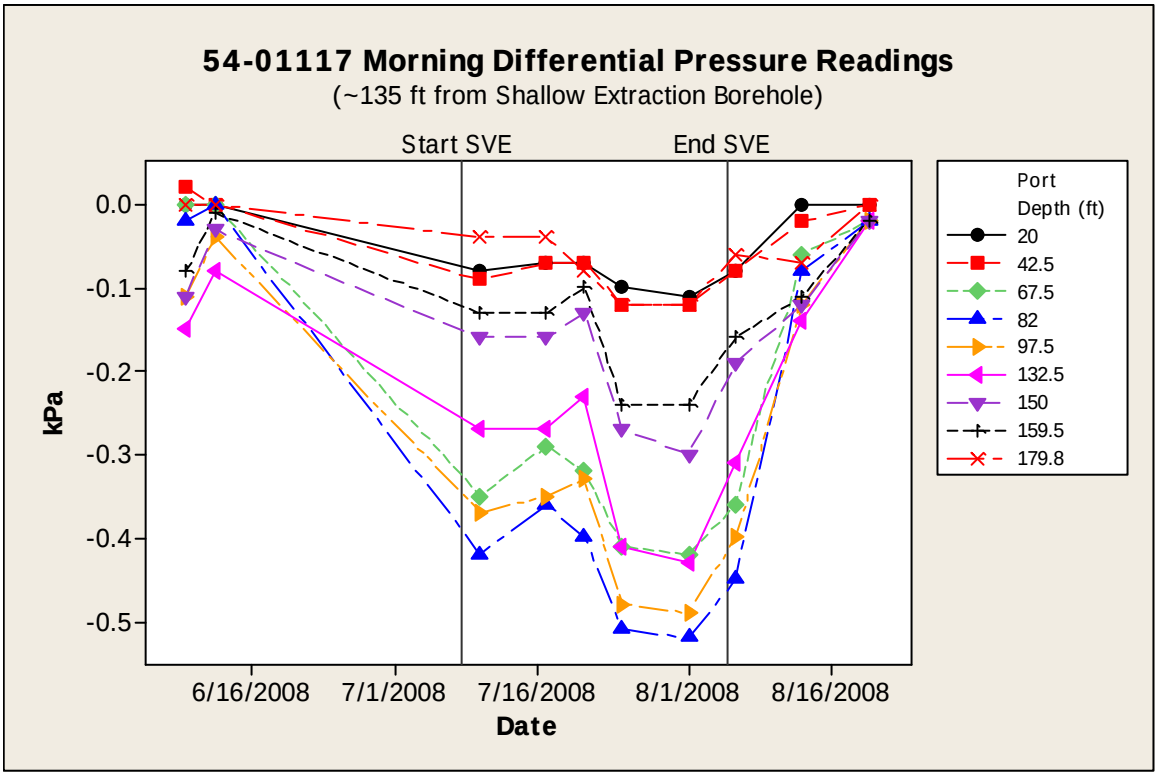

Figure 12 Differential pressure in borehole 54-01117 during the shallow SVE pilot test

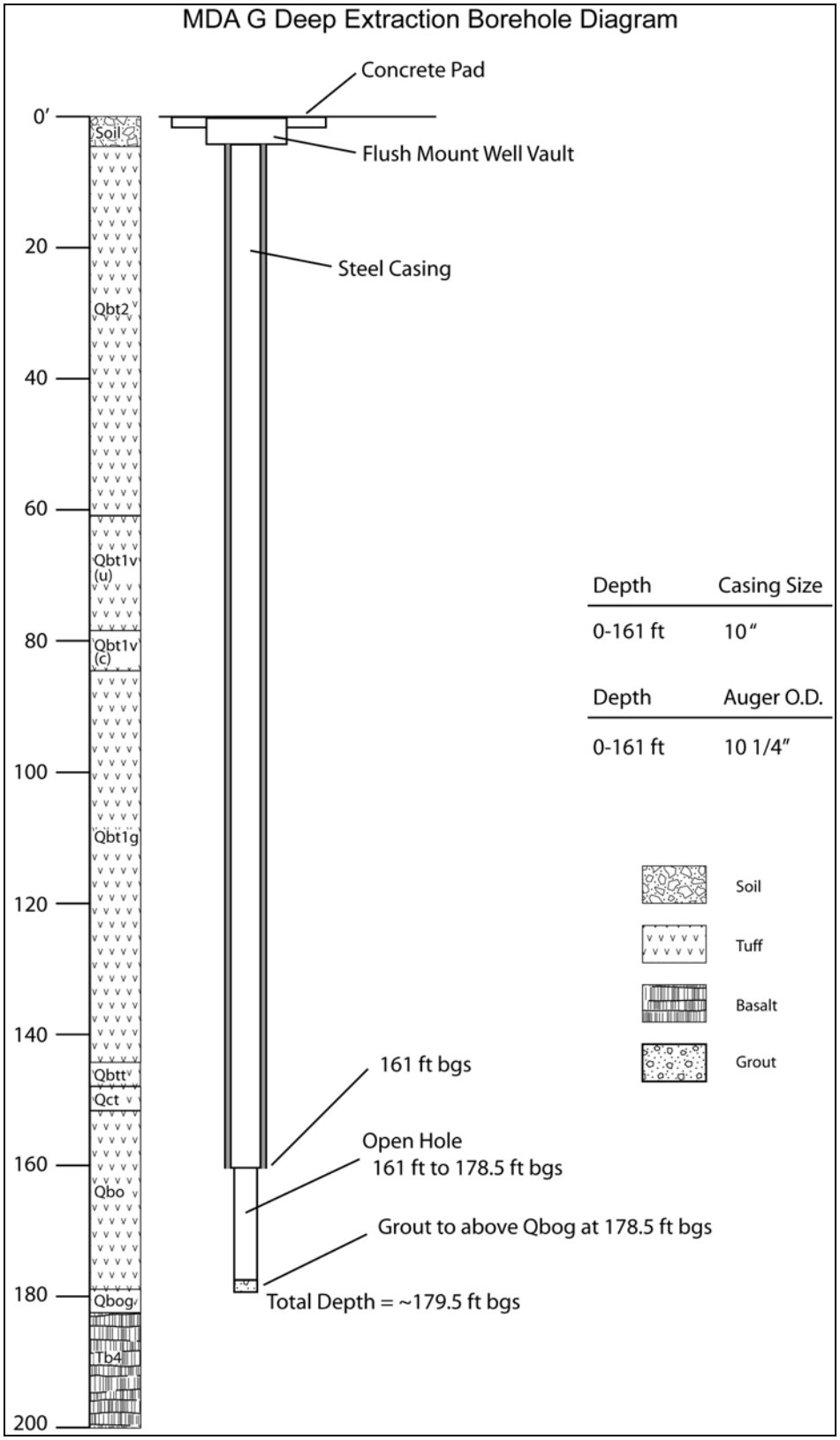

Figure 13 MDA G deep-extraction borehole

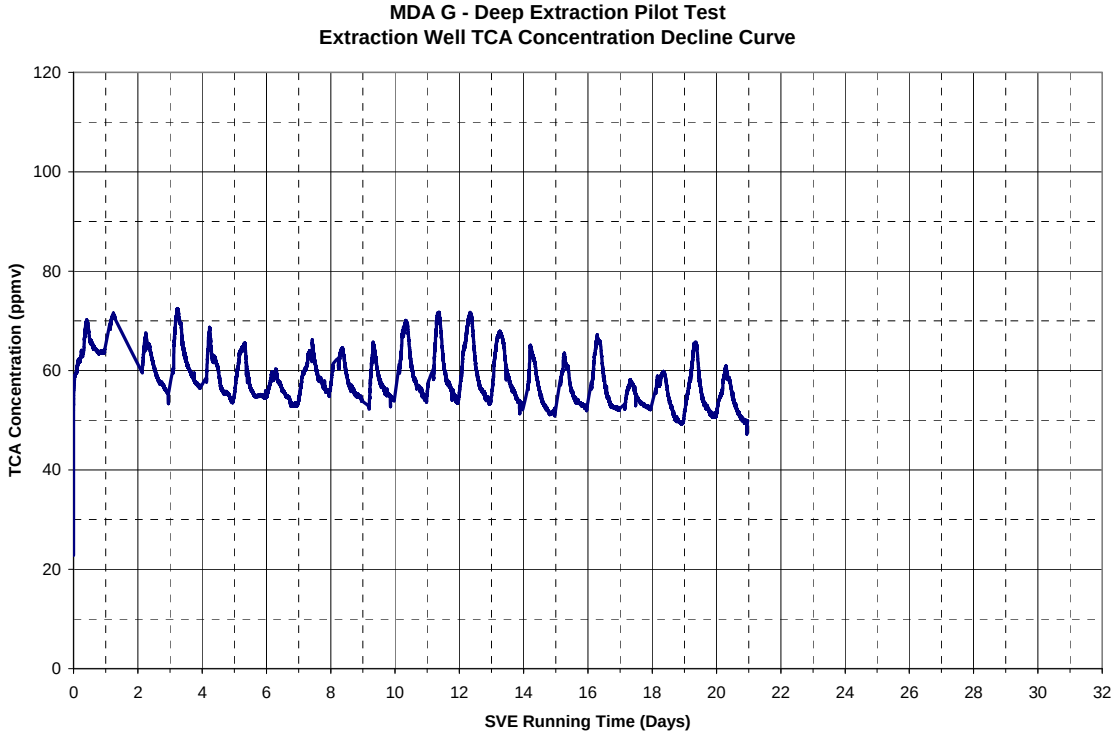

Figure 14 TCA concentration trends during the MDA G deep SVE pilot test

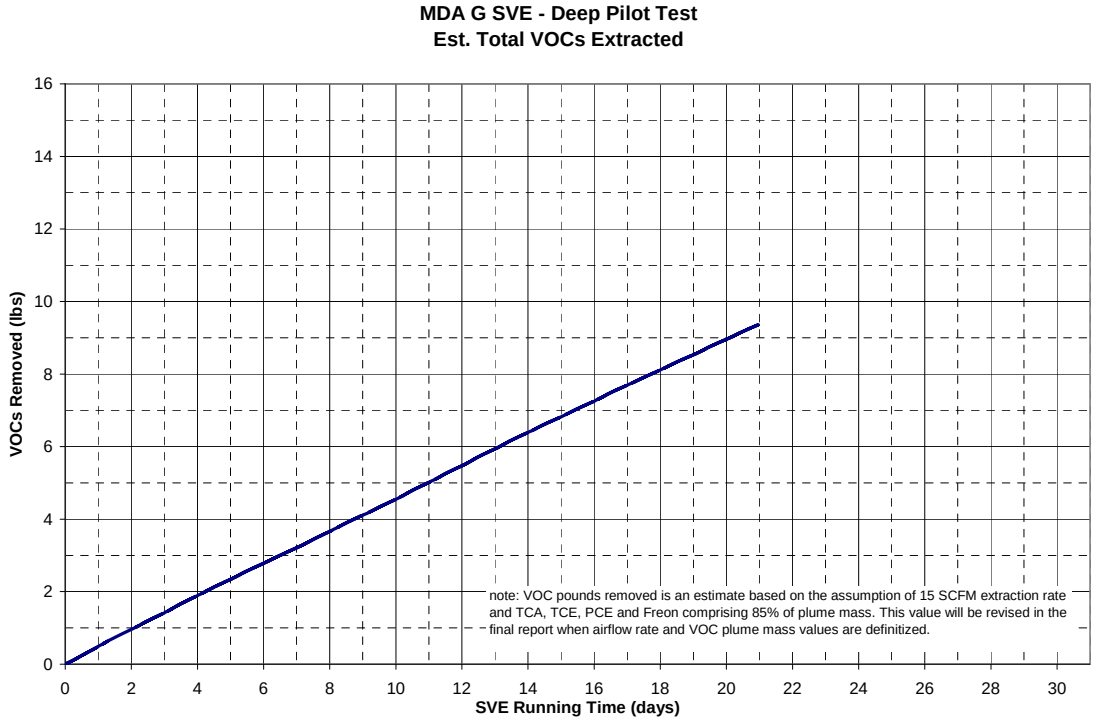

Figure 15 Estimated mass of VOCs removed during deep-extraction test