HERRERA
Science + Planning + Design

July 5, 2023

Frank P. Winslow, LHG
Toxics Cleanup Program
Department of Ecology–Central Regional Office
1250 West Alder Street
Union Gap, Washington 98903

Subject: Elk Plain County Shop XS0007–Soil Vapor Monitoring Results for AOC#22 (Vapor/Air Pathway)

Dear Mr. Winslow:

This memorandum and attachments present information intended to help provide closure for Area of Concern (AOC) #22 (Vapor/Air Pathway) at the Elk Plain County Shop site (Site). The information contained herein is provided for your review, and to demonstrate that no further remedial action is warranted at this AOC. Attached with this letter are the following:

- Two figures showing the investigation areas and soil vapor monitoring locations (Attachment A), and
- Soil vapor probe data sheets with monitoring results for methane, carbon dioxide, oxygen, and hydrogen sulfide (Attachment B).

AOC#22–Vapor/Air Pathway

Background

On May 27, 2022, Ecology issued an opinion letter for the Site under VCP project number XS0007 and provided a status review for 25 Areas of Concern (AOCs). Ecology summarized that two potential vapor concerns were identified within Ecology's previous Opinion Letter (dated February 18, 2021).

The first concern was with respect to potential for vapors from "the extensive contaminated soils identified associated with the northwest/southeast berm AOC, and that this area is proposed for residential land use." The second concern was the potential for Site fill materials to present a soil gas concern for non-petroleum hydrocarbon related gases, such as hydrogen sulfide, carbon monoxide, or methane. Ecology's February 2021 letter recommended completion of a Tier 1 vapor intrusion (VI) evaluation for those AOCs where vapor intrusion remains a concern. A Tier 1 evaluation involves assessment of potential VI risk using data collected outside of a building 1. No vapor intrusion risks have been identified at the Site to date. The remaining contamination at the Site is primarily heavy oil and CPAHs with lesser diesel. No exceedances of VI screening levels have been identified. The low vapor pressure of the Site contaminants indicates that they are unlikely to present a vapor intrusion concern.

Herrera also corresponded with Pierce County staff in February 2022 regarding Ecology's question of whether the County had buried woody debris at the Site in the past, and whether there may be areas with buried wood debris with the potential to generate methane gas. The County responded that they historically managed woody debris and grass clippings in a designated storage area labeled "Brush/Wood Debris" until it could be disposed offsite, and that they did not bury wood debris at the Site (J. Rudolph, personal communication).

April 2021 Monitoring at Existing Wells

In April 2021, methane monitoring was conducted within the eight Site groundwater monitoring wells as presented in the Interim Action and Groundwater Monitoring Report (Herrera 2021). No methane was detected at these locations. The potential for non-petroleum hydrocarbon related gases, in particular methane, pertains to potential gas generation from fill materials such as wood waste, peat, and other organic materials.

A total of 70 test pit logs and boring logs were reviewed by Ecology to assess potential for methane gas production. The only areas with fill materials noted within these logs were AOC-14 (Southeast [SE] and Northwest [NW] Berm) and AOC-21 (Perimeter Soil Berm). Nine (9) test pits were installed in the perimeter soil berm; 16 test pits or borings were in the southeast berm area and 17 test pits or borings were in the NW berm area. Test pits and borings located outside of these areas all appear to indicate a lack of significant fill materials in other areas (other than the coarse-grained material piles observed in AOC-15).

The test pits within the AOC-21 (Perimeter Soil Berm) indicated that the fill materials that comprise the perimeter berm consisted of soil (sand and silt with gravel) with minor plastic at two (2) of nine (9) locations. No wood or organic materials were noted in any of the perimeter berm test pits. Therefore, no methane production is anticipated in the perimeter berm area.

In AOC-14 (SE and NW Berm), fill materials were noted as deep as 19 feet below ground surface (bgs), although at many locations, the bottom of fill was noted at depths between 12 and 16 feet bgs. Although these fill soils contained some waste materials, it does not appear that any of it would be characterized as refuse. Based on the organic fill materials observed in AOC-14, Ecology stated that there appeared to be some potential for methane production and suggested soil gas sampling for methane.

March 2023 Soil Vapor Probe Monitoring

On March 31, 2023, Herrera mobilized to oversee installation and monitoring of six soil vapor probes at the SE and NW Berm Areas. Drilling contractor Holt Services, Inc. (Holt) of Puyallup, Washington installed temporary soil vapor probes to depths of five feet (SVP-I, SVP-K, SVP-M, and SVP-S), or ten feet (SVP-D and SVP-X) bgs at locations adjacent to former soil borings BD, BI, BK, BM, BS, and BX. This included three locations across the SE Berm Area and three across the NW Berm Area (see Attachment A, Figures 1 and 2). The locations were selected to provide broad spatial distribution across both areas as well as target a few former soil borings where trace amounts of roots or similar woody debris were observed in samples taken during the December 2019 and March 2020 investigations.

At each location, Holt used a geoprobe drill rig to install a temporary soil vapor probe that consisted of an expendable tip driven to depth, with a six-inch-long screen and 0.25-inch diameter Teflon tubing attached. The tubing was installed to extend a few feet above the ground surface and a temporary valve fitting was attached (see photos below). A sand filter pack was installed around the screen and extending approximately six inches above it, and the remainder of the boring was sealed up to the ground surface with hydrated granular bentonite chips to create a tight seal. After installation, each probe was left undisturbed for a minimum of 1.5 hours before monitoring soil vapor to allow time for the bentonite seal to fully form.

To obtain soil vapor measurements, Herrera connected a calibrated Eagle 2 model four-gas meter by RKI instruments to the Teflon tubing. The total casing volume, volume purged, purge rate, purge time, barometric pressure, and measurements for methane (CH_4), carbon dioxide (CO_2), oxygen (O_2), and hydrogen sulfide (H_2S) were recorded on a soil vapor probe data sheet (see Attachment B). The barometric pressure was observed to be falling that day which is good for monitoring soil vapor. No methane or hydrogen sulfide was detected during monitoring at any of the six soil vapor probes.

Photo number 1:
geoprobe drill rig used to install temporary probes.

Photo number 2:
screen and expendable tip.

Photo number 3:
0.25" diameter Teflon tubing installed at each probe.

Photo number 4:
soil vapor probe monitoring with meter.

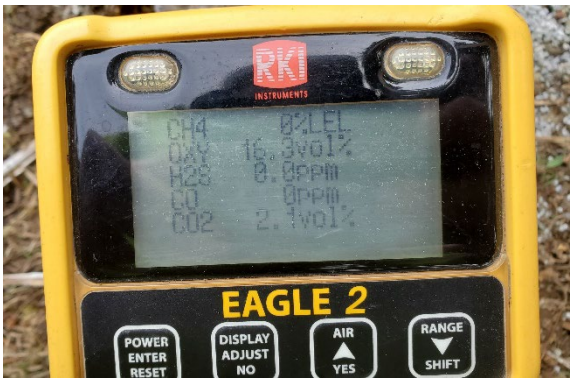


Photo number 5:
RKI Eagle 2 4four-gas meter used for soil vapor monitoring.

Conclusion

The enclosed documentation in this technical memorandum demonstrates that no further remedial investigation or soil remediation is warranted for AOC #22–Vapor/Air Pathway. No methane or hydrogen sulfide was detected during soil vapor monitoring conducted in March 2023 at any of the six locations monitored in the SE and NW Berm Areas. In addition, no methane was previously detected in groundwater monitoring wells onsite, no source areas with soil vapor remain at the site that haven't been remediated, and there is no history of the County burying wood debris at the site.

Please contact me if you have any further questions.

Sincerely,

Herrera Environmental Consultants, Inc.

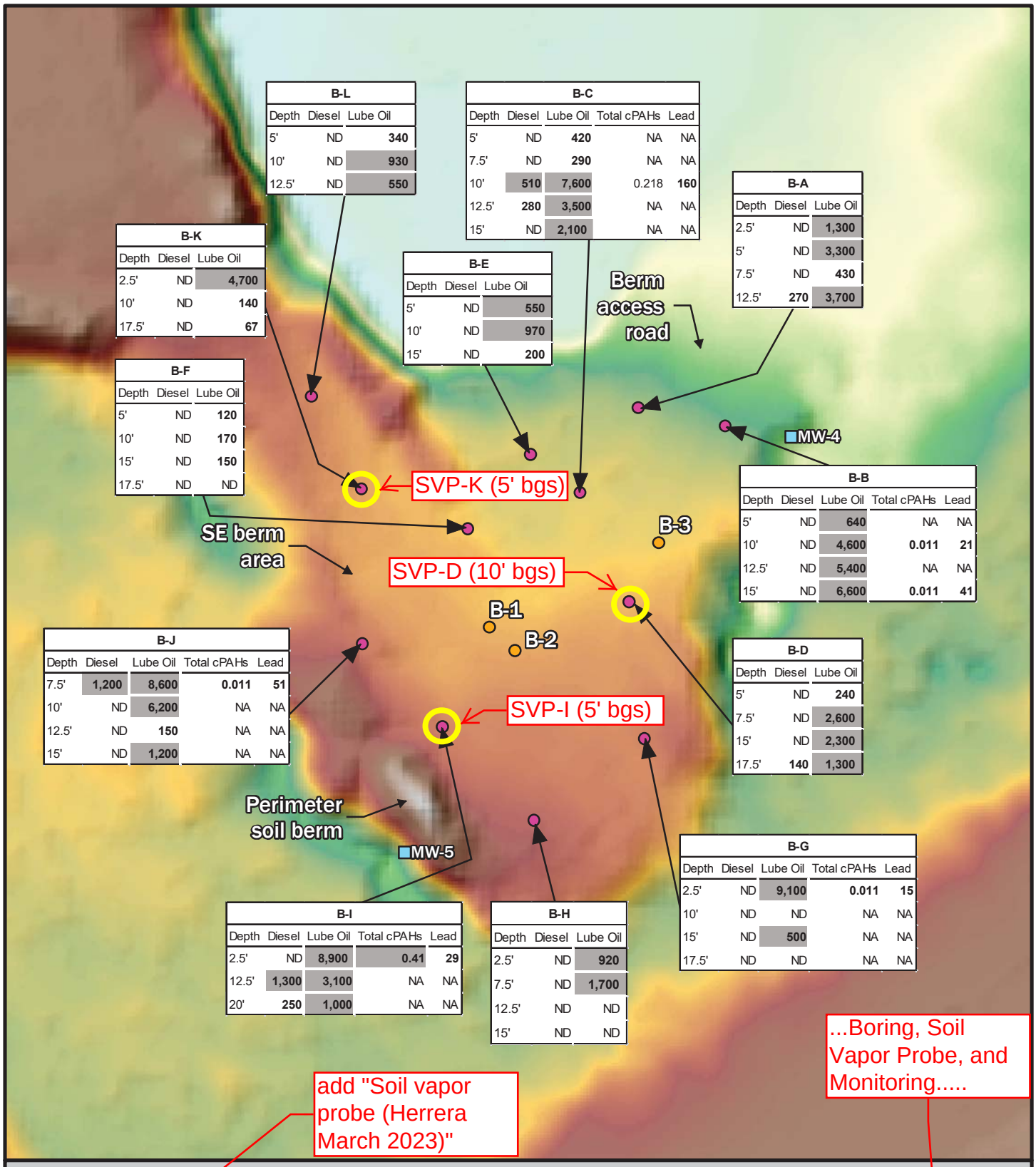
George Iftner, L.G.
Associate Scientist

Enclosure:

cc: Terry Wise

ATTACHMENT A

Investigation Areas and Soil Vapor Monitoring Locations



Legend

- Berm soil boring (Herrera December 2019)
- Berm soil boring (ESNW October 2019)
- Monitoring Well

Elevation (ft)
High : 435
Low : 415

Notes:
1. All soil results reported in milligrams per kilogram (mg/kg) on a dry weight basis.
2. NA - not analyzed.
3. ND - not detected above the laboratory reporting limit (RL).
4. Values in **bold** detected above the laboratory RL.
5. Values exceeding the MTCA Method A or TEE cleanup levels are **bold and shaded.**
6. All samples B-A through B-L and B-1 through B-3 did not exceed cleanup levels for VOCs and PCBs.

Figure 1.
Southeast Berm Area Soil Boring and Monitoring Well Locations, Former Elk Plain Roads Maintenance Facility, Pierce County, Washington.

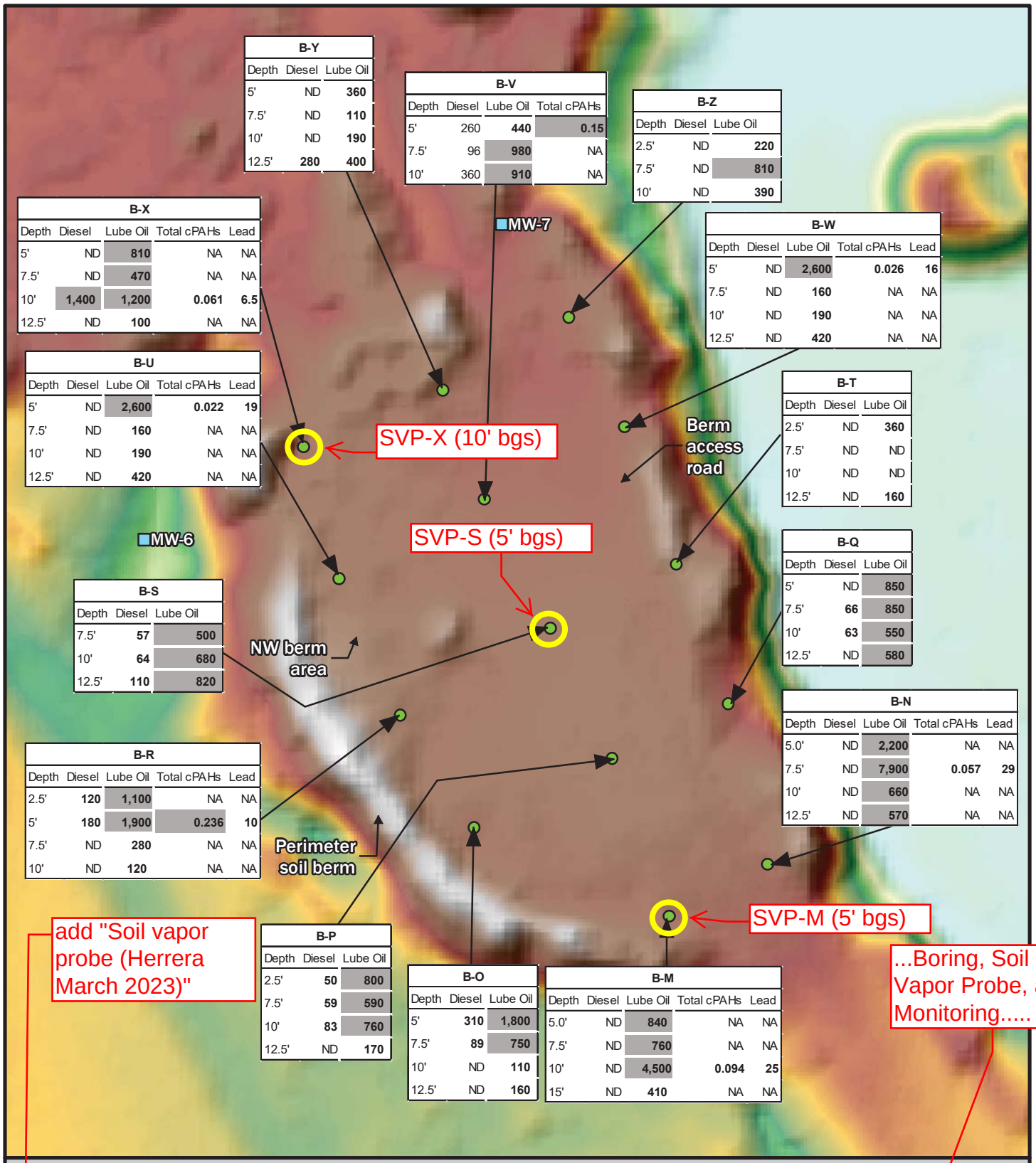
0 15 30 60 Feet

N

HERRERA

Pierce County, LiDAR (2011)

K:\Projects\Y2016\16-06310-012\Project\Report\Dec 2021 Figures\FigureG_BermSoilBoring_Southeast_211216.mxd



Legend

- Berm soil boring (Herrera March 2020)
- Monitoring Well

Elevation (ft)
High : 435
Low : 415

Notes:
1. All soil results reported in milligrams per kilogram (mg/kg) on a dry weight basis.
2. NA - not analyzed.
3. ND - not detected above the laboratory reporting limit (RL).
4. Values in **bold** detected above the laboratory RL.
5. Values exceeding the MTCA Method A or TEE cleanup levels are **bold and shaded.**
6. All samples B-M through BZ did not exceed cleanup levels for VOCs and PCBs.

Figure 2.
Northwest Berm Area Soil Boring and Monitoring Well Locations, Former Elk Plain Roads Maintenance Facility, Pierce County, Washington.

0 15 30 60 Feet

HERRERA

Pierce County, LiDAR (2011)

K:\Projects\Y2016\16-06310-012\Project\Report\Dec 2021 Figures\FigureH_BermSoilBoring_Southeast_211216.mxd

ATTACHMENT B

Soil Vapor Probe Data Sheets

Soil Vapor Probe Data Sheet

Project: Elk Plain Roads Maintenance Shop Site

Gas Probe ID: SVP-D (former soil boring B-D) SE Berm Area

Sample ID: NA

Date and Time: 3/31/23 @ 10:34

Total Casing Volume: 9.65cc/foot x 10' = 96.5 cc

Canister ID: NA

Initial Canister Pressure: NA

Final Canister Pressure NA

Field Personnel George Iftner

Casing Volume Purged	Volume Purged (cc)	Purge Rate (ml/min)	Purge Time (sec)	CH_4 (% Volume)	CO_2 (% Volume)	O_2 (% Volume)	H2S (% Volume)
0	0	940	0	0	0	20.9	0
2.4	235	940	15	0	1.7	16.4	0
4.8	470	940	30	0	2.1	16.2	0
7.2	705	940	45	0	2.2	16.2	0
9.6	940	940	60	0	2.2	16.1	0
12	1175	940	75	0	2.3	16.1	0
14.4	1410	940	90	0	2.3	16.0	0
16.8	1645	940	105	0	2.3	16.0	0
19.2	1880	940	120	0	2.3	16.0	0
21.3	2115	940	135	0	2.3	16.0	0
24	2350	940	150	0	2.3	16.0	0
26.4	2585	940	165	0	2.3	16.0	0
28.8	8820	940	180	0	2.4	15.9	0

Comments/Special Instructions:2820

0.25" inner diameter (ID) Teflon tubing with 9.65cc/foot to purge. Eagle 2 purge rate listed @ 2 SCFH (940 cc/min) [1 SCFH = 470 cc/min]

Barometric Pressure:	29.93" Hg and falling during the sampling event.
Well Diameter:	0.25" ID Teflon tubing in geoprobe boring, with sand pack around 6" long screen, and sealed with bentonite chips above.
Water Level/Well Bottom:	NA
Screened Interval	9.6' – 10'
Equipment Used:	RKI Instruments Eagle 2 4-gas meter.

Soil Vapor Probe Data Sheet

Project: Elk Plain Roads Maintenance Shop Site

Gas Probe ID: SVP-I (former soil boring B-I) SE Berm Area

Total Probe Depth: 5 feet bgs

Sample ID: NA

Date and Time: 3/31/23 @ 10:50

Total Casing Volume: 9.65cc/foot x 5' = 48.3 cc

Canister ID: NA

Initial Canister Pressure: NA

Final Canister Pressure: NA

Field Personnel: George Iftner

Casing Volume Purged	Volume Purged (cc)	Purge Rate (ml/min)	Purge Time (sec)	CH_4 (% Volume)	CO_2 (% Volume)	O_2 (% Volume)	H2S (% Volume)
0	0	940	0	0	0	20.9	0
4.8	235	940	15	0	8.5	7.5	0
9.7	470	940	30	0	8.5	8.9	0
14.5	705	940	45	0	8.4	9.1	0
19.3	940	940	60	0	8.5	9.1	0
24.1	1175	940	75	0	8.5	9.1	0
28.9	1410	940	90	0	8.6	9.0	0
33.7	1645	940	105	0	8.5	9.1	0
38.5	1880	940	120	0	8.7	9.1	0
43.3	2115	940	135	0	8.6	9.0	0
48.1	2350	940	150	0	8.6	9.1	0
52.9	2585	940	165	0	8.7	8.9	0
57.7	2820	940	180	0	8.7	8.9	0

Comments/Special Instructions:

0.25" inner diameter (ID) Teflon tubing with 9.65cc/foot to purge. Eagle 2 purge rate listed @ 2 SCFH = 940 CC/min (1 SCFH = 470 cc/min)

Barometric Pressure:	29.93" Hg and falling during the sampling event.
Well Diameter:	0.25" ID Teflon tubing in geoprobe boring, with sand pack around 6" long screen, and sealed with bentonite chips above.
Water Level/Well Bottom:	NA
Screened Interval	4.6' – 5'
Equipment Used:	RKI Instruments Eagle 2 4-gas meter.

Soil Vapor Probe Data Sheet

Project: Elk Plain Roads Maintenance Shop Site

Gas Probe ID: SVP-K (former soil boring B-K) SE Berm Area
Total Probe Depth: 5 feet bgs
Sample ID: NA
Date and Time: 3/31/23 @ 11:00
Total Casing Volume: 9.65cc/foot x 5' = 48.3 cc

Canister ID: NA
Initial Canister Pressure: NA
Final Canister Pressure: NA
Field Personnel: George Iftner

Casing Volume Purged	Volume Purged (cc)	Purge Rate (ml/min)	Purge Time (sec)	CH_4 (% Volume)	CO_2 (% Volume)	O_2 (% Volume)	H2S (% Volume)
0	0	940	0	0	0.7	20.9	0
4.8	235	940	15	0	5.8	13.6	0
9.7	470	940	30	0	5.9	13.5	0
14.5	705	940	45	0	5.9	13.3	0
19.3	940	940	60	0	5.9	13.3	0
24.1	1175	940	75	0	5.9	13.3	0
28.9	1410	940	90	0	5.9	13.3	0
33.7	1645	940	105	0	5.9	13.3	0
38.5	1880	940	120	0	5.9	13.3	0
43.3	2115	940	135	0	5.9	13.3	0
48.1	2350	940	150	0	5.9	13.2	0
52.9	2585	940	165	0	5.9	13.2	0
57.7	2820	940	180	0	5.9	13.2	0

Comments/Special Instructions:

0.25" inner diameter (ID) Teflon tubing with 9.65cc/foot to purge. Eagle 2 purge rate listed @ 2 SCFH = 940 CC/min (1 SCFH = 470 cc/min)

Barometric Pressure:	29.93" Hg and falling during the sampling event.
Well Diameter:	0.25" ID Teflon tubing in geoprobe boring, with sand pack around 6" long screen, and sealed with bentonite chips above.
Water Level/Well Bottom:	NA
Screened Interval	4.6' – 5'
Equipment Used:	RKI Instruments Eagle 2 4-gas meter.

Soil Vapor Probe Data Sheet

Project: Elk Plain Roads Maintenance Shop Site

Gas Probe ID: SVP-M (former soil boring B-M) NW Berm Area
Total Probe Depth: 5 feet bgs
Sample ID: NA
Date and Time: 3/31/23 @ 11:07
Total Casing Volume: 9.65cc/foot x 5' = 48.3 cc

Canister ID: NA
Initial Canister Pressure: NA
Final Canister Pressure: NA
Field Personnel: George Iftner

Casing Volume Purged	Volume Purged (cc)	Purge Rate (ml/min)	Purge Time (sec)	CH_4 (% Volume)	CO_2 (% Volume)	O_2 (% Volume)	H_2S (% Volume)
0	0	940	0	0	6.2	20.4	0
4.8	235	940	15	0	5.4	12.3	0
9.7	470	940	30	0	6.5	12.1	0
14.5	705	940	45	0	6.7	12.0	0
19.3	940	940	60	0	6.7	12.0	0
24.1	1175	940	75	0	6.7	11.9	0
28.9	1410	940	90	0	6.8	11.9	0
33.7	1645	940	105	0	6.7	11.9	0
38.5	1880	940	120	0	6.8	11.8	0
43.3	2115	940	135	0	6.9	11.8	0
48.1	2350	940	150	0	6.9	11.8	0
52.9	2585	940	165	0	6.8	11.8	0
57.7	2820	940	180	0	6.8	11.8	0

Comments/Special Instructions:

0.25" inner diameter (ID) Teflon tubing with 9.65cc/foot to purge. Eagle 2 purge rate listed @ 2 SCFH = 940 CC/min (1 SCFH = 470 cc/min)

Barometric Pressure:	29.93" Hg and falling during the sampling event.
Well Diameter:	0.25" ID Teflon tubing in geoprobe boring, with sand pack around 6" long screen, and sealed with bentonite chips above.
Water Level/Well Bottom:	NA
Screened Interval	4.6' – 5'
Equipment Used:	RKI Instruments Eagle 2 4-gas meter.

Soil Vapor Probe Data Sheet

Project: Elk Plain Roads Maintenance Shop Site

Gas Probe ID: SVP-S (former soil boring B-S) NW Berm Area

Total Probe Depth: 5 feet bgs

Sample ID: NA

Date and Time: 3/31/23 @ 11:12

Total Casing Volume: 9.65cc/foot x 5' = 48.3 cc

Canister ID: NA

Initial Canister Pressure: NA

Final Canister Pressure: NA

Field Personnel: George Iftner

Casing Volume Purged	Volume Purged (cc)	Purge Rate (ml/min)	Purge Time (sec)	CH_4 (% Volume)	CO_2 (% Volume)	O_2 (% Volume)	H2S (% Volume)
0	0	940	0	0	0.0	20.9	0
4.8	235	940	15	0	11.0	5.1	0
9.7	470	940	30	0	10.7	6.0	0
14.5	705	940	45	0	10.5	6.4	0
19.3	940	940	60	0	10.5	6.5	0
24.1	1175	940	75	0	10.3	6.8	0
28.9	1410	940	90	0	10.0	7.1	0
33.7	1645	940	105	0	10.0	7.3	0
38.5	1880	940	120	0	9.9	7.5	0
43.3	2115	940	135	0	9.7	~~9.3~~ 7.7 Hot	0
48.1	2350	940	150	0	9.3	8.4	0
52.9	2585	940	165	0	9.2	8.4	0
57.7	2820	940	180	0	9.2	8.4	0

Comments/Special Instructions:

0.25" inner diameter (ID) Teflon tubing with 9.65cc/foot to purge. Eagle 2 purge rate listed @ 2 SCFH = 940 CC/min (1 SCFH = 470 cc/min)

Barometric Pressure:	29.93" Hg and falling during the sampling event.
Well Diameter:	0.25" ID Teflon tubing in geoprobe boring, with sand pack around 6" long screen, and sealed with bentonite chips above.
Water Level/Well Bottom:	NA
Screened Interval	4.6' – 5'
Equipment Used:	RKI Instruments Eagle 2 4-gas meter.

Soil Vapor Probe Data Sheet

Project: Elk Plain Roads Maintenance Shop Site

Gas Probe ID: SVP-X (former soil boring B-X) NW Berm Area

Sample ID: NA

Date and Time: 3/31/23 @ 11:24

Total Casing Volume: 9.65cc/foot x 10' = 96.5 cc

Canister ID: NA

Initial Canister Pressure: NA

Final Canister Pressure NA

Field Personnel George Iftner

Casing Volume Purged	Volume Purged (cc)	Purge Rate (ml/min)	Purge Time (sec)	CH_4 (% Volume)	CO_2 (% Volume)	O_2 (% Volume)	H2S (% Volume)
0	0	940	0	0	0.8	20.7	0
2.4	235	940	15	0	7.5	10.9	0
4.8	470	940	30	0	8.8	10.6	0
7.2	705	940	45	0	9.1	10.5	0
9.6	940	940	60	0	9.2	10.4	0
12	1175	940	75	0	9.4	10.1	0
14.4	1410	940	90	0	9.4	10.0	0
16.8	1645	940	105	0	9.6	10.0	0
19.2	1880	940	120	0	9.6	10.0	0
21.3	2115	940	135	0	9.6	9.7	0
24	2350	940	150	0	9.7	9.6	0
26.4	2585	940	165	0	9.8	9.5	0
28.8	8820	940	180	0	9.9	9.5	0

Comments/Special Instructions:2820

0.25" inner diameter (ID) Teflon tubing with 9.65cc/foot to purge. Eagle 2 purge rate listed @ 2 SCFH (940 cc/min) [1 SCFH = 470 cc/min]

Barometric Pressure:	29.93" Hg and falling during the sampling event.
Well Diameter:	0.25" ID Teflon tubing in geoprobe boring, with sand pack around 6" long screen, and sealed with bentonite chips above.
Water Level/Well Bottom:	NA
Screened Interval	9.6' – 10'
Equipment Used:	RKI Instruments Eagle 2 4-gas meter.