Long-Term SSD/SVE System
Operation, Maintenance and Monitoring

June 2018 Data Summary Report

Wendell Avenue Site

Fairbanks, Alaska

June 2018

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SUMMARY OF FINDINGS

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1. SUMMARY OF FINDINGS

Wendell Avenue SSD/SVE System Remediation: Overall the 314 Wendell Avenue remediation system continues to remove chlorinated ethenes (PCE primarily) from the subsurface soil. The rate of PCE removal by the SVE system has declined from the initial removal rate of over 1 pound per day (lb/day) to the present rate (observed in 2016 and 2017) of approximately 0.1 lb/day or less. The December 2017 Data Summary Report included an estimate of 523 lbs of PCE removed since operations began in 2011.

1. Table 1 presents all the chlorinated ethene concentrations (PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, and VC) collected from the ESL building and remediation system through September 2017 when the system was shut down for winter. No analytical samples were collected during the first half of 2018 in accordance with the ADEC approved scope of work.

   Figure 1 presents the 2016 and 2017 PCE, TCE, and trans-1,2-DCE concentrations at selected soil gas monitoring locations at Wendell Avenue.

2. Figure 2 presents field screening measurements collected from various sub-slab, soil gas vapor monitoring points, and SVE well locations near the ESL building after the SVE system was started on March 27, 2018, and had been operational for approximately five hours. The readings included induced vacuum, oxygen (O2) concentration, carbon dioxide (CO2) concentration, and chlorinated ethene concentrations based on Color Tec tube readings. The air flow rate was also recorded for the operating SVE wells. The Color Tec readings show that SVE-4 and SVE-5 have the highest chlorinated ethene concentrations of 0.9 and 3.0 ppm, respectively. This is consistent with the two previous field screening events conducted during September of 2016 and 2017 where SVE-4 and SVE-5 were observed to have the highest Color Tec readings. Analytical results from SVE-4 and SVE-5 also show that PCE concentrations are above ADEC target levels for commercial deep soil gas values (Table 1).

3. Figure 2 also shows that after five hours of SVE operation the O2 and CO2 concentrations at the soil gas monitoring locations are all near atmospheric conditions with the exception of SG-3 @ 8 feet bgs, SG-7 @ 9 feet bgs, and SG-8 @ 5 feet bgs. The two previous field screening events from September 2016 and 2017 that were conducted after approximately six months of SVE operation show near atmospheric conditions in all soil gas monitoring points, including the deeper locations mentioned above with the exception of SG-2 @ 8 feet bgs during 2017. This demonstrates that the SVE system is influencing the soil gas chemistry at these locations.

4. Figure 3 presents the PCE mass emission estimate over the course of SSD/SVE system operation at Wendell Avenue. As of 2017 a total PCE removal amount of 523 pounds is estimated as compared to a removal amount of 340 pounds in March 2014.

The daily PCE mass removal rate has declined from over 1 lb/day in 2011 to 0.1 lbs/day or less in 2016/2017.

5. Soil gas data, field screening results, and groundwater monitoring results all suggests that the area of greatest remaining PCE contamination is at the southern end of the ESL building adjacent to Wendell Avenue.

2. RECOMMENDATIONS

SSD/SVE System Conclusions: SVE system-only operation has been shown to be effective at mitigating VI at the ESL Building as previous testing in 2014 has shown that indoor air chlorinated ethene concentrations remain below target levels. Recent 2016-2017 VI sampling demonstrates that sub-slab soil gas and deep vadose zone soil gas levels are also below ADEC commercial levels at all locations sampled with the exception of SS-4, SVE-4, and SVE-5. The sub-slab soil gas PCE concentrations at SS-4 were below the ADEC target level in 2016 but went back above the target level in 2017 (Table 1). The deep vadose zone soil gas PCE concentrations for SVE-4 and SVE-5 were above the ADEC target level during 2016 and 2017. The PCE concentrations for SVE-4 were observed to be higher during periods when the SVE system was operational as compared to samples collected after the SVE system had been shut down for approximately six months. This data suggests that the highest remaining soil gas concentrations are not located in the immediate vicinity of SVE-4. The higher Color Tec readings at SVE-5 as compared to SVE-4 during March 2018 (collected on system startup after being inoperable for six months) may indicate that SVE-5 is closer to the highest remaining soil gas concentrations or source area. However differences in subsurface soil moisture saturation levels and resulting air phase hydraulic conductivities could also explain this observed difference.

SSD/SVE System Recommendations: The ESL Building is presently unoccupied however if the building were to be occupied continued mitigation and VI sampling efforts would be necessary to ensure that indoor air concentrations remained below ADEC target levels. The following options could be used to maintain safe commercial indoor air concentrations during building occupation:

What is needed to operate building safely?

- Mitigation efforts are needed until VI sampling demonstrates that it is no longer necessary to ensure concentrations remain below ADEC target levels. The following are a couple of mitigation methods that could be used.
    - Continued SVE or SSD system operation. Both of these mitigation methods have been demonstrated to be effective at controlling VI in the ESL Building. Previous SSD system operational data shows that effective VI control was obtained with DW extraction well vacuums of 10 to 28 inWC and well extraction flow rates of 5 to 20 cfm.

- Installation of a RadonAway HS5000 blower at a site in Anchorage demonstrated it was capable of generating extraction well vacuums of 17 to 27 inWC and flow rates of 30 to 37 cfm. Note that performance data will vary by site depending on several factors including soil permeability and sub-slab construction.
- As an option to SVE/SSD operation a set of high vacuum radon blowers could be used to extract air and vapors from select SSD wells in the areas where chlorinated ethenes are still present beneath the ESL Building floor slab. Initially recommend starting with three radon HS5000 blowers connected to DW-1, DW-2, and DW-3 for VI mitigation. To ensure the system is protective and meets ADEC target levels, indoor air and sub-slab sampling should be performed after installation. The system could then be modified appropriately based on the results obtained.

SVE System Effectiveness and Optimization.

- The daily PCE mass removal rate has declined from over 1 lb/day in 2011 to 0.1 lbs/day or less in 2016/2017 as indicated on Figure 3. Although the mass removal rate is approaching asymptotic conditions, data from other sites indicate that asymptotic conditions are not sufficient to stop SVE, since significant mass removal can often be achieved, even though the VOC mass removal rate is constant (*Soil Vapor Extraction System Optimization, Transition, and Closure Guidance*, USDOE, February 2013).
- The March 2017 groundwater monitoring results show that wells MW-6S and MW-8SR, located on the east and west sides of the ESL Building, have the highest PCE concentrations and they are above ADEC groundwater cleanup levels (Figure 4). This area of saturated soil and groundwater contamination may still represent a significant source of contamination for the SVE system.
- A review of the historical soil analytical results show that the area of highest soil concentrations is found in the vicinity of soil vapor extraction wells SVE-1, SVE-4, and to a lesser extent SVE-5 (Figure 5). The highest soil concentrations appear to coincide with a silt layer that occurs from about 2 to 6 or 8 feet bgs. They also appear to coincide along the sewer line that is exiting the ESL Building.
- A review of field screening measurements presented in Figure 2 and from previous September 2016 and 2017 monitoring events suggest that the SVE system is influencing the area of soil contamination shown on Figure 5 with the possible exception of soils near the water table (i.e., deepest soil gas point is SG-7 @ 9 feet bgs) whereas water table is around 11 to 14 feet bgs).
- Figure 6 is a graph of the soil vapor concentrations at select locations during SVE system operation and after shutdown equilibrium rebound testing. Both the SS-4 and SG-3 PCE concentrations show that significant rebound is occurring after the shutdown tests and that SS-4 PCE rebound concentrations remain above the

ADEC sub-slab commercial soil gas target level of 1,800 ug/m^3. This data indicate that continued operation of the SVE system is necessary for removal of PCE from subsurface soils. Once rebound soil gas concentration remain below ADEC target levels soil sampling is recommended to verify that soil concentrations are below regulatory cleanup levels. Note that the SG-3 PCE shutdown rebound concentrations already remain below the ADEC deep commercial soil gas target level of 18,000 ug/m^3.

- Recommend replacing SG-3 with SG-7 at 9 foot depth or SG-8 to evaluate future equilibrium rebound concentrations along with continued monitoring of SS-4. This will provide shutdown rebound testing results from the areas of the site where the highest field screening results for PCE are observed.
- Recommend sampling soil gas concentrations from SG-7 at 9 foot depth, MW-6S, and MW-8SR to evaluate distribution of PCE and other HVOCs in subsurface soils particularly at depth. This data would be used to help determine if remaining PCE source contamination is from potential smear zone contamination or possibly groundwater contamination. SVE operation during periods of low groundwater will help to increase SVE effectiveness. However, PCE contamination in groundwater and saturated soils will not be removed by SVE operations. Natural attenuation or other remedial technologies will be necessary before ADEC cleanup levels are achievable for these matrices.
- **SVE System Optimization:** Based on the results obtained from soil gas sampling and the source (i.e., highest soil concentrations) area from historical soil data – it is recommended that soil vapor extraction efforts be concentrated on soil vapor extraction wells SVE-1, SVE-4, and SVE-5. This means that SVE-1 would need to be connected to the SVE system - this could be done on a temporary basis with above ground piping or permanently by moving the SVE-2 conveyance piping to connect with SVE-1.
- **SVE System Optimization:** Another item to consider regarding optimization of SVE extraction, particularly with the deeper contamination, would be to install one or two passive injection wells that are screened around 8 to 13 feet bgs. This will help to concentrate air flow at the deeper areas of the contamination, just above the groundwater table.

ATTACHMENT 1

Figures

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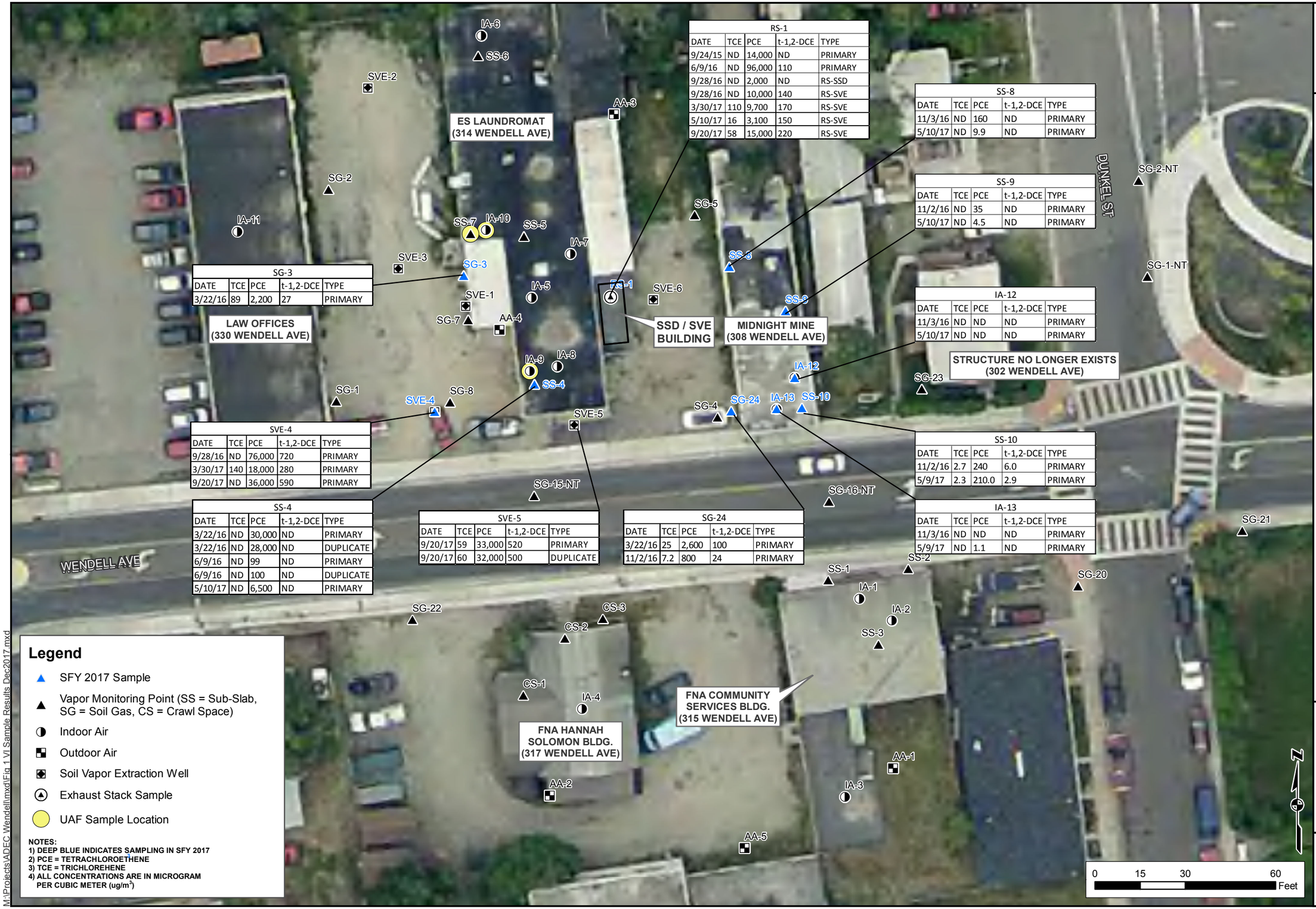
FIGURE 1

DECEMBER 2017 DATA SUMMARY REPORT
SFY 2017 PCE AND TCE SAMPLE RESULTS

WENDELL AVENUE STUDY
Fairbanks, Alaska



RS-1				
DATE	TCE	PCE	t-1,2-DCE	TYPE
9/24/15	ND	14,000	ND	PRIMARY
6/9/16	ND	96,000	110	PRIMARY
9/28/16	ND	2,000	ND	RS-SSD
9/28/16	ND	10,000	140	RS-SVE
3/30/17	110	9,700	170	RS-SVE
5/10/17	16	3,100	150	RS-SVE
9/20/17	58	15,000	220	RS-SVE

SS-8				
DATE	TCE	PCE	t-1,2-DCE	TYPE
11/3/16	ND	160	ND	PRIMARY
5/10/17	ND	9.9	ND	PRIMARY

SS-9				
DATE	TCE	PCE	t-1,2-DCE	TYPE
11/2/16	ND	35	ND	PRIMARY
5/10/17	ND	4.5	ND	PRIMARY

SG-3				
DATE	TCE	PCE	t-1,2-DCE	TYPE
3/22/16	89	2,200	27	PRIMARY

IA-12				
DATE	TCE	PCE	t-1,2-DCE	TYPE
11/3/16	ND	ND	ND	PRIMARY
5/10/17	ND	ND	ND	PRIMARY

SVE-4				
DATE	TCE	PCE	t-1,2-DCE	TYPE
9/28/16	ND	76,000	720	PRIMARY
3/30/17	140	18,000	280	PRIMARY
9/20/17	ND	36,000	590	PRIMARY

SS-10				
DATE	TCE	PCE	t-1,2-DCE	TYPE
11/2/16	2.7	240	6.0	PRIMARY
5/9/17	2.3	210.0	2.9	PRIMARY

SS-4				
DATE	TCE	PCE	t-1,2-DCE	TYPE
3/22/16	ND	30,000	ND	PRIMARY
3/22/16	ND	28,000	ND	DUPLICATE
6/9/16	ND	99	ND	PRIMARY
6/9/16	ND	100	ND	DUPLICATE
5/10/17	ND	6,500	ND	PRIMARY

SVE-5				
DATE	TCE	PCE	t-1,2-DCE	TYPE
9/20/17	59	33,000	520	PRIMARY
9/20/17	60	32,000	500	DUPLICATE

SG-24				
DATE	TCE	PCE	t-1,2-DCE	TYPE
3/22/16	25	2,600	100	PRIMARY
11/2/16	7.2	800	24	PRIMARY

IA-13				
DATE	TCE	PCE	t-1,2-DCE	TYPE
11/3/16	ND	ND	ND	PRIMARY
5/9/17	ND	1.1	ND	PRIMARY

Legend

- SFY 2017 Sample
- Vapor Monitoring Point (SS = Sub-Slab, SG = Soil Gas, CS = Crawl Space)
- Indoor Air
- Outdoor Air
- Soil Vapor Extraction Well
- Exhaust Stack Sample
- UAF Sample Location

NOTES:
1) DEEP BLUE INDICATES SAMPLING IN SFY 2017
2) PCE = TETRACHLOROETHENE
3) TCE = TRICHLOREHENE
4) ALL CONCENTRATIONS ARE IN MICROGRAM PER CUBIC METER (ug/m^3)

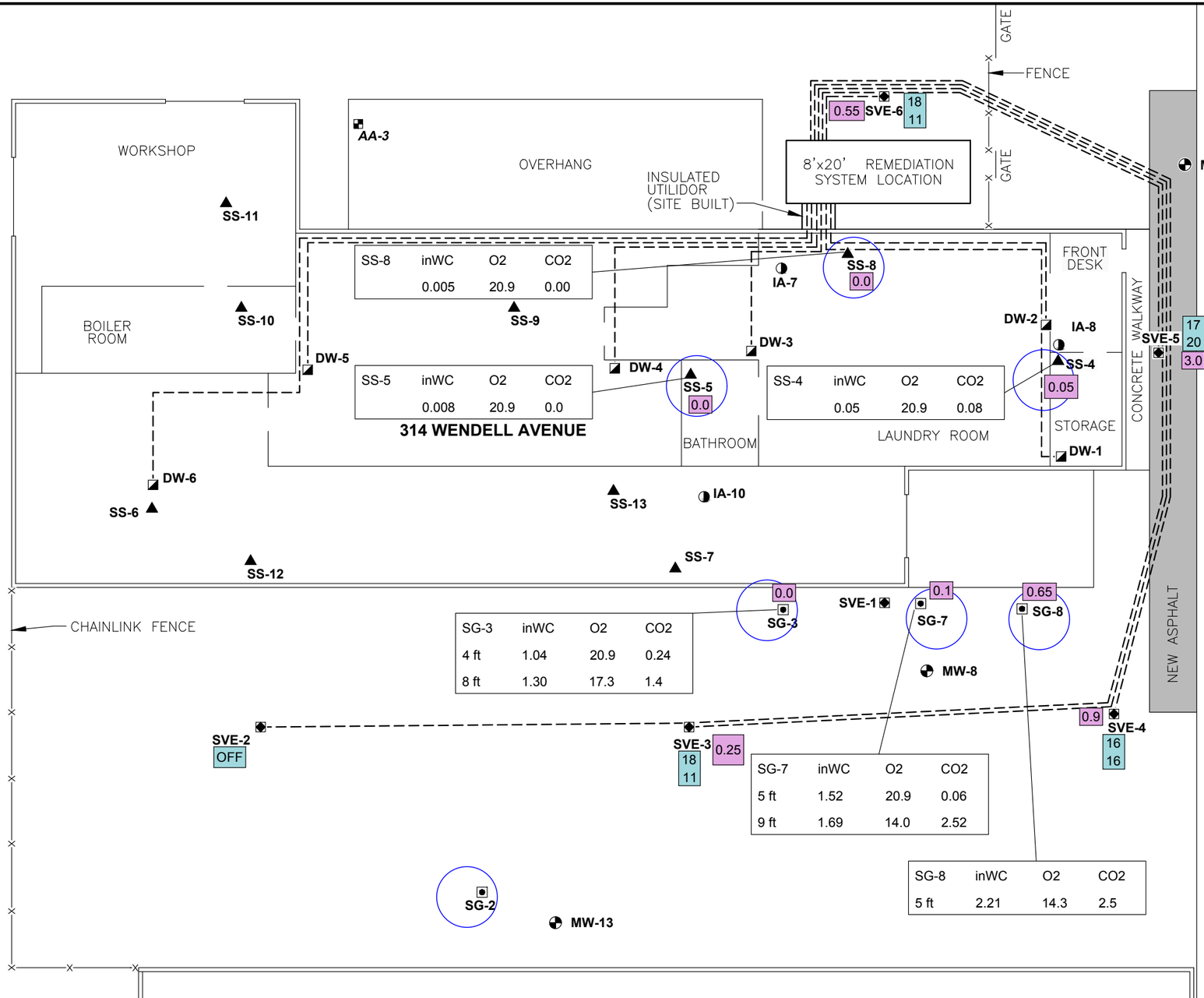
IMAGERY SOURCE: FBNSB 2012-13 Imagery Web Mapping Service

DATE: DEC. 2017
CHKD: T.M.
DRWN: A.V.K. & J.E.C.
PROJ. No.: 0227323

825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

ERM

M:\Projects\ADEC Wendell\mxd\Fig 1 VI Sample Results Dec2017.mxd



LEGEND

- MW-6 — MONITORING WELL
- DW-1 — DEPRESSURIZATION WELL LOCATION
- SVE-1 — SOIL VAPOR EXTRACTION WELL LOCATION
- SG-8 — VAPOR MONITORING POINT LOCATION
- CONVEYANCE PIPING
- FY16 OM&M LOCATION
- 6.0 — COLOR-TEC (ppm)
- 19 / 15 — SVE READINGS VACUUM (inWC) AIR FLOW (scfm)

330 WENDELL AVENUE (LAW OFFICES)

NOTE:
Readings taken on 3/27/18
5 hrs after startup

FIGURE 2

JUNE 2018 DATA SUMMARY REPORT SSD/SVE SYSTEM MONITORING LOCATIONS AND RESULTS

WENDELL AVENUE SITE
Fairbanks, Alaska

DATE: JULY 2016
CHKD: N.B.B
DRAWN: N.B.B
PROJ. No.: 0227323

825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

ERM

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Figure 3: SSD/SVE System PCE Emission Mass Estimate
December 2017 Data Summary Report
Wendell Avenue Site

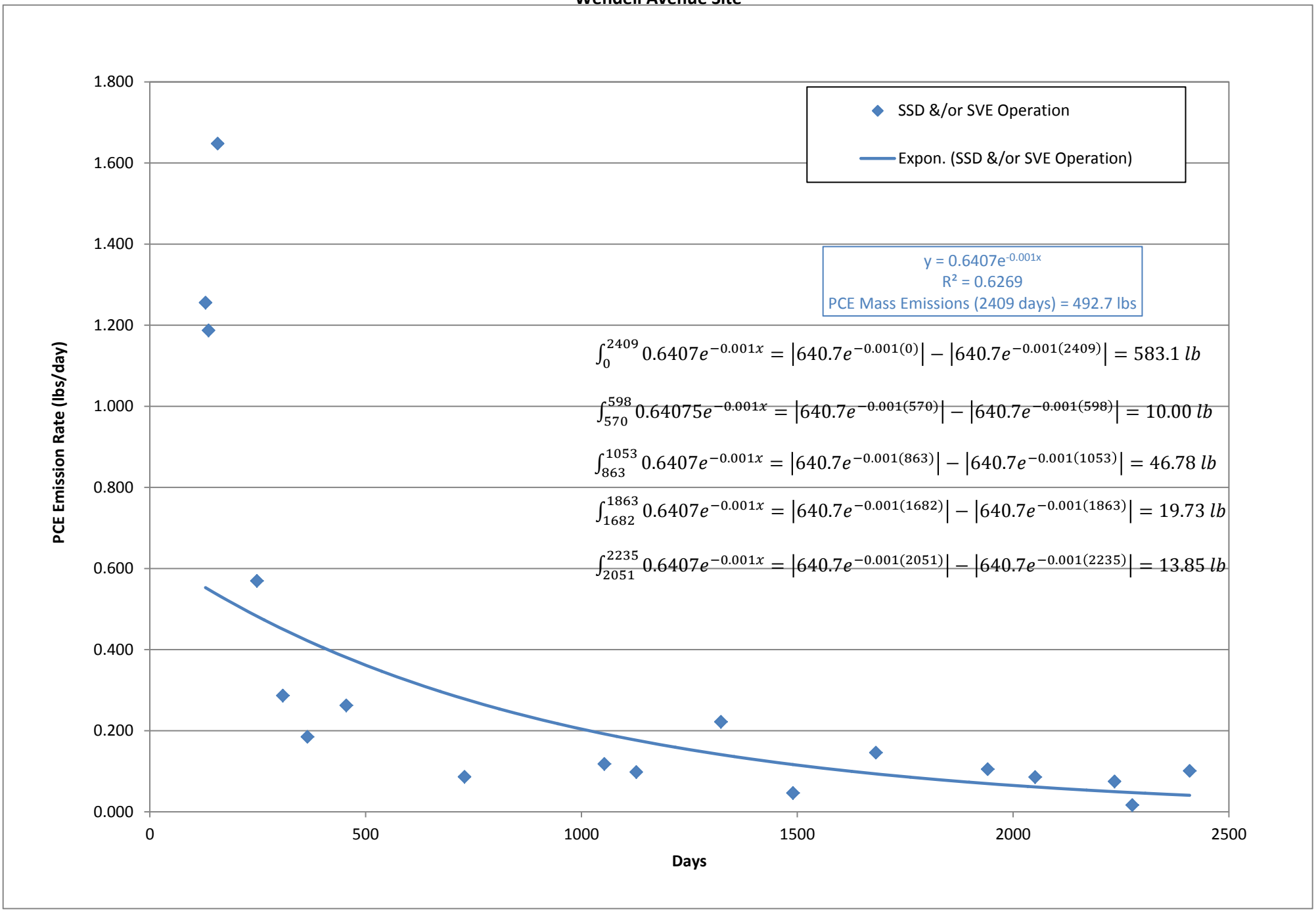

FIGURE 4

JUNE 2017 DATA SUMMARY REPORT
GROUNDWATER MONITORING LOCATIONS WITH MARCH 2017 RESULTS

WENDELL AVENUE STUDY
Fairbanks, Alaska

IMAGERY SOURCE: FBNSB 2012-13 Imagery Web Mapping Service

DATE: AUG. 2017
CHKD: T.M.
DRWN: A.V.K.
PROJ. No.: 0227323

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825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

SS-6
SVE-2
ES LAUNDROMAT
(314 WENDELL AVE.)
SG-5
SG-2
SS-7
SS-5
LAW OFFICES (330
WENDELL AVENUE)
SVE-3
SG-3
SVE-6
MIDNITE MINE
(308 WENDELL AVE.)
STRUCTURE NO
LONGER EXISTS
(302 WENDELL AVE.
RS-1
SSD/SVE
BUILDING
SVE-1
SG-7
SG-8
SS-4
SG-4
SVE-4
SVE-5
SG-24
SG-6
APPROXIMATE EXTENT OF HISTORICAL PCE SOIL
CONCENTRATIONS ABOVE 2,000 UG/KG
FORMER SPLINTERED
AREA (APPROX. 7 FEET
IN LENGTH)
WENDELL AVENUE
S
S
M
N
0 10 20 40 FEET

LEGEND

SS-7 ▲ VAPOR MONITORING POINT LOCATION (SS=SUB-SLAB, SG=SOIL GAS, CS=CRAWL SPACE)
SVE-1 ◆ SOIL VAPOR EXTRACTION WELL LOCATION
RS-1 EXHAUST STACK SAMPLE LOCATION
M MANHOLE
SEWER LINE AND FLOW DIRECTION (APPROXIMATE)

FIGURE 5

JUNE 2018 DATA SUMMARY REPORT
APPROXIMATE EXTENT OF HISTORICAL PCE IN SOIL

SFY 2017 VAPOR INTRUSION ASSESSMENT
AND SSD/SVE SYSTEM OM&M WORK PLAN
WENDELL AVENUE SITE
Fairbanks, Alaska

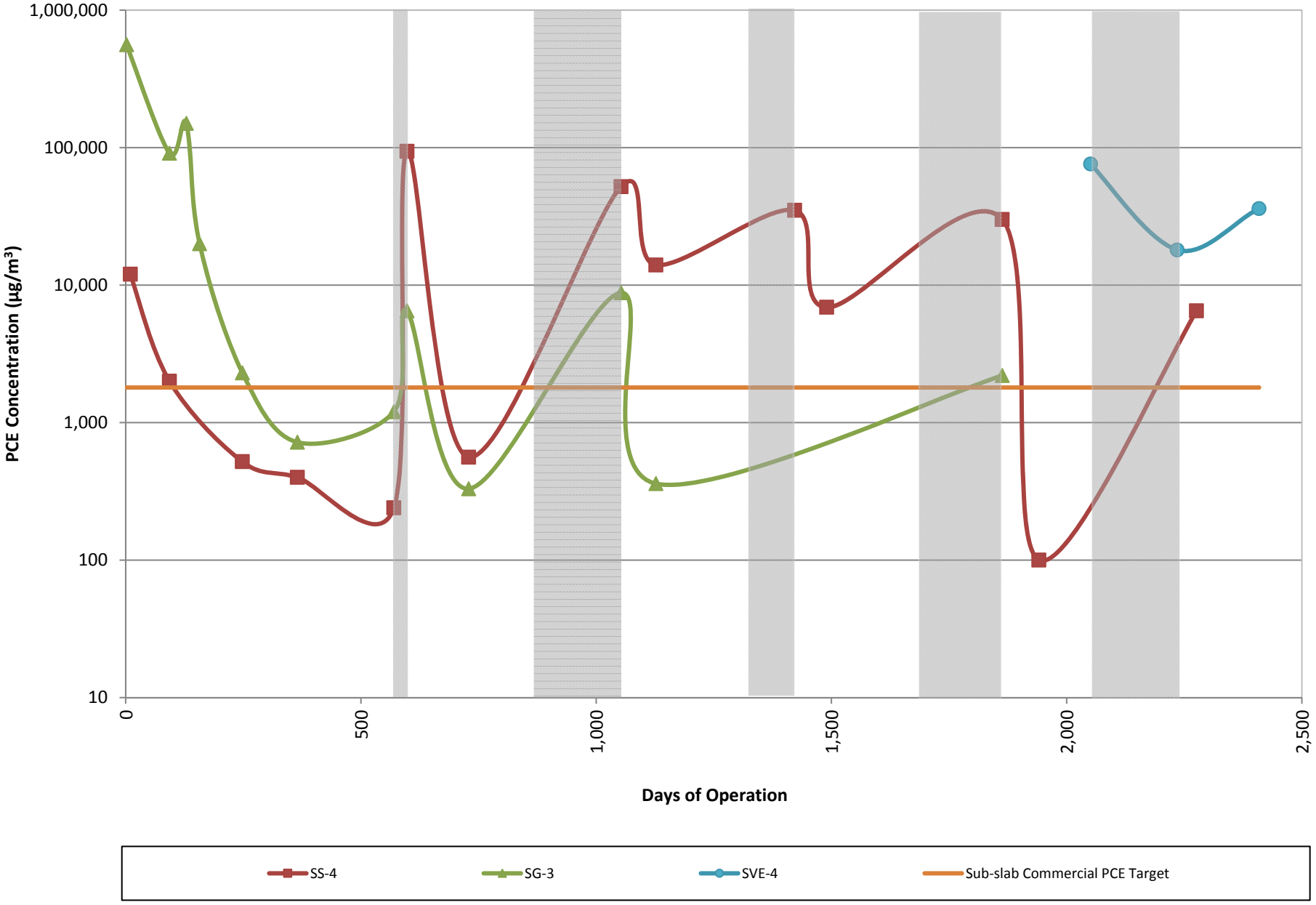
DATE: JULY 2015
CHKD: C.B.
DRAWN: M.L.B.
PROJ. No.: 0227323

ERM
825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

SOURCE: AERIAL PHOTO AERIAL.JPG DATED 7/29/15 PROVIDED BY BING MAPS.

C:\Users\jesoor.rahmani\appdata\local\temp\AcPublish_8548\0227323030 4-01.dwg Jun 26, 2018.

Figure 6: Soil Gas Shutdown Rebound Test Results
June 2018 Data Summary Report
Wendell Avenue Site



ATTACHMENT 2

Tables

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Table 1: OM&M and VI Assessment Analytical Results - October 2010 to September 2017
December 2017 Data Summary Report
314 Wendell Avenue Site

Remediation System Status	Location	Sample ID	Date Measured	Sample Type	Matrix	Tetrachloroethene (µg/m³)			Trichloroethene (µg/m³)			cis-1,2-Dichloroethene (µg/m³)			trans-1,2-Dichloroethene (µg/m³)			Vinyl Chloride (µg/m³)		
						Result	MRL	Dataflag	Result	MRL	Dataflag	Result	MRL	Dataflag	Result	MRL	Dataflag	Result	MRL	Dataflag
Pre-Installation	IA-7	10WAS402IA	10/21/2010	Primary	Indoor Air	**320**	0.48		1.2	0.38		0.82	0.28			1.4	ND		0.09	ND
		10WAS403IA	10/21/2010	Duplicate	Indoor Air	**320**	0.5		1.2	0.39		0.81	0.29			1.4	ND		0.093	ND
SSD System Operating		11-WAS-006-IA	2/24/2011	Primary	Indoor Air	**110**	0.22		0.34	0.18		0.24	0.13		7.1	0.65			0.042	ND
		11-WAS-007-IA	2/24/2011	Duplicate	Indoor Air	**110**	0.24		0.32	0.19		0.24	0.14		6.9	0.71			0.046	ND
		11-WAS-047-IA	5/18/2011	Primary	Indoor Air	**160**	0.24		0.4	0.19		0.25	0.14		1.5	0.71			0.046	ND
		11-WAS-048-IA	5/18/2011	Duplicate	Indoor Air	**160**	0.29		0.41	0.23		0.25	0.17		1.5	0.85			0.055	ND
SSD/SVE System Operating		11-WAS-064-IA	10/20/2011	Primary	Indoor Air	27	0.23			0.18	ND		0.14	ND		0.68	ND		0.044	ND
		11-WAS-065-IA	10/20/2011	Duplicate	Indoor Air	27	0.24			0.19	ND		0.14	ND		0.69	ND		0.045	ND
SVE System Operating		13-WAS-007-IA	2/13/2013	Primary	Indoor Air	7.5	0.18			0.15	ND		0.11	ND		0.54	ND		0.035	ND
Post 190-day Shutdown		14-WAS-002-IA	1/2/2014	Primary	Indoor Air	22	0.17	JA		0.13	JA		0.098	JA		0.49	JA		0.032	JA
SVE System Operating		14-WAS-024-IA	3/18/2014	Primary	Indoor Air	4.6	0.19			0.15	ND		0.11	ND		0.56	ND		0.036	ND
Pre-Installation	IA-8	10WAS401IA	10/21/2010	Primary	Indoor Air	**400**	0.68		1.7	0.54		0.96	0.4			2	ND		0.13	ND
SSD System Operating		11-WAS-005-IA	2/24/2011	Primary	Indoor Air	**180**	0.24		0.53	0.19		0.32	0.14		8.1	0.69			0.045	ND
		11-WAS-049-IA	5/18/2011	Primary	Indoor Air	**210**	0.28		0.5	0.22		0.26	0.17		1.5	0.83			0.054	ND
SSD/SVE System Operating		11-WAS-063-IA	10/20/2011	Primary	Indoor Air	**66**	0.25			0.2	ND		0.14	ND		0.73	ND		0.047	ND
		12-WAS-074-IA	2/15/2012	Primary	Indoor Air	3.3	0.23			0.18	ND		0.13	ND		0.67	ND		0.043	ND
		12-WAS-075-IA	2/15/2012	Duplicate	Indoor Air	3.4	0.28			0.22	ND		0.16	ND		0.82	ND		0.053	ND
		12-WAS-129-IA	9/5/2012	Primary	Indoor Air	3.5	0.22			0.18	ND	0.23	0.13			0.65	ND		0.042	ND
Post 28-day Shutdown		12-WAS-133-IA	10/4/2012	Primary	Indoor Air	16	0.18			0.15	ND	0.98	0.11			0.54	ND		0.035	ND
		12-WAS-134-IA	10/4/2012	Duplicate	Indoor Air	16	0.2		0.16	0.15		0.92	0.11			0.57	ND		0.037	ND
SVE System Operating		13-WAS-005-IA	2/13/2013	Primary	Indoor Air	6.9	0.2			0.15	ND		0.11	ND		0.57	ND		0.037	ND
		13-WAS-006-IA	2/13/2013	Duplicate	Indoor Air	7.6	0.2			0.15	ND		0.11	ND		0.57	ND		0.037	ND
Post 190-day Shutdown		14-WAS-003-IA	1/2/2014	Primary	Indoor Air	20	0.16	JA	0.2	0.13	JA		0.097	JA		0.48	JA		0.031	JA
		14-WAS-004-IA	1/2/2014	Duplicate	Indoor Air	23	0.18	JA		0.14	JA		0.1	JA		0.51	JA		0.033	JA
SVE System Operating		14-WAS-022-IA	3/18/2014	Primary	Indoor Air	4.3	0.21			0.17	ND		0.12	ND		0.63	ND		0.04	ND
		14-WAS-023-IA	3/18/2014	Duplicate	Indoor Air	4.4	0.21	JA		0.17	JA		0.12	JA		0.62	JA		0.04	JA
ADEC Target Levels for Commercial Indoor Air						**180 - 41**			**8.4**			**31 - NA**			**260 - NA**			**28**		
Pre-Installation	SS-4	10WAS405SS	10/21/2010	Primary	Sub-Slab Soil Gas	**5,900,000**	**5900**		**10000**	**4600**			**3400**	ND		**3400**	ND		**2200**	ND
SSD System Operating		11-WAS-008-SS	2/24/2011	Primary	Sub-Slab Soil Gas	**12,000**	34			27	ND		20	ND		20	ND		**13**	ND
		11-WAS-052-SS	5/18/2011	Primary	Sub-Slab Soil Gas	**2,000**	6.1			4.8	ND		3.5	ND		3.5	ND		2.3	ND
SSD/SVE System Operating		11-WAS-066-SS	10/21/2011	Primary	Sub-Slab Soil Gas	520	6.0			4.7	ND		3.5	ND		3.5	ND		2.2	ND
		12-WAS-076-SS	2/15/2012	Primary	Sub-Slab Soil Gas	390	5.0			4.0	ND		3.0	ND		3.0	ND		1.9	ND
		12-WAS-077-SS	2/15/2012	Duplicate	Sub-Slab Soil Gas	400	5.4			4.2	ND		3.1	ND		3.1	ND		2	ND
		12-WAS-130-SS	9/5/2012	Primary	Sub-Slab Soil Gas	240	6.6			5.3	ND		3.9	ND		3.9	ND		2.5	ND
Post 28-day Shutdown		12-WAS-135-SS	10/5/2012	Primary	Sub-Slab Soil Gas	**94,000**	390			**310**	ND		230	ND		230	ND		150	ND
SVE System Operating		13-WAS-010-SS	2/14/2013	Primary	Sub-Slab Soil Gas	560	5.7			4.5	ND		3.3	ND		3.3	ND		2.1	ND
		13-WAS-011-SS	2/14/2013	Duplicate	Sub-Slab Soil Gas	560	5.5			4.3	ND		3.2	ND		3.2	ND		2.0	ND
Post 190-day Shutdown		14-WAS-010-SS	1/2/2014	Primary	Sub-Slab Soil Gas	**52,000**	220			**170**	ND		130	ND		130	ND		82	ND
		14-WAS-011-SS	1/2/2014	Duplicate	Sub-Slab Soil Gas	**49,000**	220			**170**	ND		130	ND		130	ND		82	ND
SVE System Operating		14-WAS-026-SS	3/18/2014	Primary	Sub-Slab Soil Gas	**13,000**	49			**39**	ND		29	ND		29	ND		18	ND
		14-WAS-027-SS	3/18/2014	Duplicate	Sub-Slab Soil Gas	**14,000**	59			46	ND		34	ND		34	ND		22	ND
Post 92-day Shutdown		15-WAS-004-SS	1/7/2015	Primary	Sub-Slab Soil Gas	**35,000**	120			**98**	ND		72	ND		72	ND		46	ND
		15-WAS-005-SS	1/7/2015	Duplicate	Sub-Slab Soil Gas	**33,000**	130			**100**	ND		74	ND		74	ND		48	ND
SVE System Operating		15-WAS-006-SS	3/16/2015	Primary	Sub-Slab Soil Gas	**6,900**	26			20	ND		15	ND		15	ND		9.7	ND
		15-WAS-007-SS	3/16/2015	Duplicate	Sub-Slab Soil Gas	**6,900**	26			20	ND		15	ND		15	ND		9.6	ND
Post 180-day Shutdown		16-WAS-018-SS	3/22/2016	Primary	Sub-Slab Soil Gas	**30,000**	55			43	ND		32	ND		32	ND		20	ND
		16-WAS-019-SS	3/22/2016	Duplicate	Sub-Slab Soil Gas	**28,000**	52			41	ND		30	ND		30	ND		19	ND
SVE System Operating		16-WAS-022-SS	6/9/2016	Primary	Sub-Slab Soil Gas	99	1.2			0.91	ND		0.67	ND		0.67	ND		0.43	ND
		16-WAS-023-SS	6/9/2016	Duplicate	Sub-Slab Soil Gas	100	1.2			0.92	ND		0.68	ND		0.68	ND		0.44	ND
		17-WAS-004-SS	5/10/2017	Primary	Sub-Slab Soil Gas	**6,500**	21			17	ND		12	ND		12	ND		8.0	ND
ADEC Target Levels for Commercial Sub-Slab Soil Gas						**1,800**			**88 - 84**			**310 - NA**			**2,600 - NA**			**280**		

Table 1: OM&M and VI Assessment Analytical Results - October 2010 to September 2017
December 2017 Data Summary Report
314 Wendell Avenue Site

Remediation System Status	Location	Sample ID	Date Measured	Sample Type	Matrix	Tetrachloroethene (µg/m³)			Trichloroethene (µg/m³)			cis-1,2-Dichloroethene (µg/m³)			trans-1,2-Dichloroethene (µg/m³)			Vinyl Chloride (µg/m³)		
						Result	MRL	Dataflag	Result	MRL	Dataflag	Result	MRL	Dataflag	Result	MRL	Dataflag	Result	MRL	Dataflag
Pre-Installation	SS-5	10WAS404SS	10/21/2010	Primary	Sub-Slab Soil Gas	**310,000**	490		**3900**	**390**			280	ND		280	ND		180	ND
SSD System Operating		11-WAS-011-SS	2/24/2011	Primary	Sub-Slab Soil Gas	200	5.9			4.7	ND		3.5	ND		3.5	ND		2.2	ND
		11-WAS-053-SS	5/18/2011	Primary	Sub-Slab Soil Gas	61	7.4			5.8	ND		4.3	ND		4.3	ND		2.8	ND
SSD/SVE System Operating		11-WAS-067-SS	10/21/2011	Primary	Sub-Slab Soil Gas	19	6.7			5.3	ND		3.9	ND		3.9	ND		2.5	ND
SVE System Operating		13-WAS-012-SS	2/13/2013	Primary	Sub-Slab Soil Gas	8.9	6.5			5.1	ND		3.8	ND		3.8	ND		2.4	ND
SVE System Operating		14-WAS-028-SS	3/18/2014	Primary	Sub-Slab Soil Gas	16	5.2			4.1	ND		3	ND		3	ND		2	ND
Pre-Installation	SS-6	10WAS406SS	10/21/2010	Primary	Sub-Slab Soil Gas	**14,000**	40			31	ND		23	ND		23	ND		15	ND
		10WAS407SS	10/21/2010	Duplicate	Sub-Slab Soil Gas	**15,000**	43			34	ND		25	ND		25	ND		16	ND
SSD System Operating		11-WAS-009-SS	2/24/2011	Primary	Sub-Slab Soil Gas	19	5.2			4.1	ND		3	ND		3	ND		1.9	ND
		11-WAS-010-SS	2/24/2011	Duplicate	Sub-Slab Soil Gas	19	5.7			4.5	ND		3.3	ND		3.3	ND		2.1	ND
		11-WAS-050-SS	5/18/2011	Primary	Sub-Slab Soil Gas	21	5.5			4.3	ND		3.2	ND		3.2	ND		2	ND
		11-WAS-051-SS	5/18/2011	Duplicate	Sub-Slab Soil Gas	22	5.8			4.6	ND		3.4	ND		3.4	ND		2.2	ND
SSD/SVE System Operating		11-WAS-068-SS	10/21/2011	Primary	Sub-Slab Soil Gas		5.5	ND		4.4	ND		3.2	ND		3.2	ND		2.1	ND
		11-WAS-069-SS	10/21/2011	Duplicate	Sub-Slab Soil Gas		5.6	ND		4.4	ND		3.2	ND		3.3	ND		2.1	ND
SVE System Operating		13-WAS-009-SS	2/13/2013	Primary	Sub-Slab Soil Gas	100	5.6			4.4	ND		3.2	ND		3.2	ND		2.1	ND
Post 190-day Shutdown		14-WAS-012-SS	1/2/2014	Primary	Sub-Slab Soil Gas	250	5.2			**4.1**	ND		3	ND		3	ND		1.9	ND
ADEC Target Levels for Commercial Sub-Slab Soil Gas						**1,800**			**88 - 84**			**310 - NA**			**2,600 - NA**			**280**		
Pre-Installation	SG-2 @ 8' bgs	08WAS531SG	10/8/2008	Primary	Deep Soil Gas	8,200	39		790	31		150	23		73	23			15	ND
SSD/SVE System Operating		12-WAS-132-SG	9/5/2012	Primary	Deep Soil Gas	930	6.6		15	**5.3**			3.9	ND		3.9	ND		2.5	ND
Post 28-day Shutdown		12-WAS-137-SG	10/5/2012	Primary	Deep Soil Gas	3,000	11		87	9		10	6.7			6.7	ND		4.3	ND
Post 190-day Shutdown		14-WAS-014-SG	1/2/2014	Primary	Deep Soil Gas	280	7.3			5.8	ND		4.3	ND		4.3	ND		2.8	ND
Post 180-day Shutdown		16-WAS-017-SG	3/22/2016	Primary	Deep Soil Gas	990	5.2		98	4.2		36	3.1		14	3.1			2.0	ND
SSD System Operating	SG-3 @ 8' bgs	11-WAS-003-SG	2/18/2011	Primary	Deep Soil Gas	**560,000**	1500		**4800**	**1200**		1600	860			860	ND		550	ND
		11-WAS-054-SG	5/18/2011	Primary	Deep Soil Gas	**91,000**	370		**970**	290		370	210			210	ND		140	ND
SSD/SVE System Operating		11-WAS-058-SG	6/24/2011	Primary	Deep Soil Gas	**150,000**	440		390	350			260	ND		260	ND		160	ND
		11-WAS-061-SG	7/22/2011	Primary	Deep Soil Gas	**20,000**	91			72	ND		53	ND		53	ND		34	ND
		11-WAS-070-SG	10/21/2011	Primary	Deep Soil Gas	2300	9.7		10	7.7			5.7	ND		5.7	ND		3.6	ND
		12-WAS-078-SS	2/15/2012	Primary	Deep Soil Gas	720	5.5		5.7	4.3			3.2	ND		3.2	ND		2	ND
		12-WAS-131-SG	9/5/2012	Primary	Deep Soil Gas	1200	6.5		10	5.1			3.8	ND		3.8	ND		2.4	ND
Post 28-day Shutdown		12-WAS-136-SG	10/5/2012	Primary	Deep Soil Gas	6500	26		87	21		48	15			15	ND		10	ND
SVE System Operating		13-WAS-008-SG	2/13/2013	Primary	Deep Soil Gas	330	7.6			6.0	ND		4.4	ND		4.4	ND		2.9	ND
Post 190-day Shutdown		14-WAS-013-SG	1/2/2014	Primary	Deep Soil Gas	8800	29		360	23		120	17		58	17			11	ND
SVE System Operating		14-WAS-029-SG	3/18/2014	Primary	Deep Soil Gas	360	7.2			5.7	ND		4.2	ND		4.2	ND		2.7	ND
Post 180-day Shutdown		16-WAS-016-SG	3/22/2016	Primary	Deep Soil Gas	2200	10		89	8.3		73	6.1		27	6.1			4.0	ND
SVE System Operating	SVE-4	16-WAS-001-SG	9/28/2016	Primary	Deep Soil Gas	**76,000**	120			93	ND		68	ND	720	68			44	ND
Post 180-day Shutdown		17-WAS-001-SG	3/30/2017	Primary	Deep Soil Gas	**18,000**	82		140	65		69	48		280	48			31	ND
SVE System Operating		17-WAS-003-SG	9/20/2017	Primary	Deep Soil Gas	**36,000**	54			43	ND		32	ND	590	32			20	ND
SVE System Operating	SVE-5	17-WAS-002-SG	9/20/2017	Primary	Deep Soil Gas	**33,000**	54		59	43			32	ND	520	32			20	ND
SVE System Operating		17-WAS-004-SG	9/20/2017	Duplicate	Deep Soil Gas	**32,000**	53		60	42			31	ND	500	31			20	ND
ADEC Target Levels for Commercial Deep Soil Gas						**18,000**			**880 - 840**			**3,100 - NA**			**26,000 - NA**			**2,800**		

Table 1: OM&M and VI Assessment Analytical Results - October 2010 to September 2017
December 2017 Data Summary Report
314 Wendell Avenue Site

Remediation System Status	Location	Sample ID	Date Measured	Sample Type	Matrix	Tetrachloroethene (µg/m³)			Trichloroethene (µg/m³)			cis-1,2-Dichloroethene (µg/m³)			trans-1,2-Dichloroethene (µg/m³)			Vinyl Chloride (µg/m³)		
						Result	MRL	Dataflag	Result	MRL	Dataflag	Result	MRL	Dataflag	Result	MRL	Dataflag	Result	MRL	Dataflag
Pre-Installation	AA-3	10WAS400AA	10/21/2010	Primary	Outdoor Air	1.6	0.21			0.17	ND		0.12	ND		0.63	ND		0.04	ND
SSD System Operating		11WAS-001-AA	2/17/2011	Primary	Outdoor Air	1.7	0.17			0.13	ND		0.099	ND		0.5	ND		0.032	ND
		11-WAS-004-AA	2/24/2011	Primary	Outdoor Air	3.6	0.19			0.15	ND		0.11	ND		0.55	ND		0.036	ND
		11-WAS-046-AA	5/18/2011	Primary	Outdoor Air	1.5	0.21			0.17	ND		0.12	ND		0.61	ND		0.04	ND
SSD/SVE System Operating		11-WAS-056-AA	6/23/2011	Primary	Outdoor Air	1.2	0.23			0.18	ND		0.13	ND	0.7	0.67			0.043	ND
		11-WAS-062-AA	10/20/2011	Primary	Outdoor Air	0.76	0.2			0.16	ND		0.12	ND		0.59	ND		0.038	ND
		12-WAS-073-AA	2/15/2012	Primary	Outdoor Air	2.3	0.19			0.15	ND		0.11	ND		0.55	ND		0.036	ND
SVE System Operating		13-WAS-004-AA	2/13/2013	Primary	Outdoor Air	6.3	0.26			0.2	ND		0.15	ND		0.76	ND		0.049	ND
Post 190-day Shutdown		14-WAS-001-AA	1/2/2014	Primary	Outdoor Air	1.3	0.16	JA		0.13	JA		0.096	JA		0.48	JA		0.031	JA
SVE System Operating		14-WAS-021-AA	3/18/2014	Primary	Outdoor Air	1.6	0.22			0.17	ND		0.13	ND		0.64	ND		0.041	ND
SSD System Operating	RS-1	11WAS-002-ES	2/17/2011	Primary	RS Exhaust Stack	130,000	570			450	ND		330	ND		330	ND		210	ND
		11-WAS-012-ES	2/25/2011	Primary	RS Exhaust Stack	120,000	360		330	280			210	ND		210	ND		140	ND
		11-WAS-055-ES	5/19/2011	Primary	RS Exhaust Stack	57,000	220			170	ND		120	ND		120	ND		81	ND
SSD/SVE System Operating		11-WAS-057-ES	6/24/2011	Primary	RS Exhaust Stack	97,000	350		450	280		260	200			200	ND		130	ND
		11-WAS-059-ES	7/1/2011	Primary	RS Exhaust Stack	93,000	360			280	ND		210	ND		210	ND		140	ND
		11-WAS-060-ES	7/22/2011	Primary	RS Exhaust Stack	130,000	450			350	ND		260	ND	2700	260			170	ND
		11-WAS-071-ES	10/21/2011	Primary	RS Exhaust Stack	44,000	120			94	ND		69	ND	440	69			44	ND
		11-WAS-072-ES	12/20/2011	Primary	RS Exhaust Stack	22,000	71			56	ND		42	ND	250	42			27	ND
		12-WAS-079-ES	2/15/2012	Primary	RS Exhaust Stack	14,000	85			67	ND		50	ND	140	50			32	ND
SVE System Operating		13-WAS-003-ES	2/13/2013	Primary	RS Exhaust Stack	13,000	41		64	32		60	24		240	24			15	ND
Post 190-day Shutdown		14-WAS-015-ES	1/3/2014	Primary	RS Exhaust Stack	18,000	76		290	60		260	44		690	44			29	ND
SVE System Operating		14-WAS-030-ES	3/18/2014	Primary	RS Exhaust Stack	14,000	83			66	ND		49	ND	180	49			31	ND
		14-WAS-047-ES	10/7/2014	Primary	RS Exhaust Stack	19,000	79			63	ND		46	ND					30	ND
		15-WAS-008-ES	3/16/2015	Primary	RS Exhaust Stack	7,400	34		33	27		24	20		130	20			13	ND
		15-WAS-009-ES	9/24/2015	Primary	RS Exhaust Stack	14,000	54			42	ND		31	ND	170	31			20	ND
		16-WAS-024-ES	6/9/2016	Primary	RS Exhaust Stack	9,600	34			27	ND		20	ND	110	20			13	ND
	RS-SSD	16-WAS-001-ES	9/28/2016	Primary	SSD Exhaust Stack	2,000	6.8	JA		5.4	ND, JA		4.0	ND, JA		4.0	ND, JA		2.6	ND, JA
	RS-SVE	16-WAS-002-ES	9/28/2016	Primary	SVE Exhaust Stack	10,000	41			32	ND		24	ND	140	24			15	ND
Post 180 day Shutdown	RS-SVE	17-WAS-001-ES	3/30/2017	Primary	SVE Exhaust Stack	9,700	42		110	33		140	24		170	24			16	ND
SVE System Operating	RS-SVE	17-WAS-002-ES	5/10/2017	Primary	SVE Exhaust Stack	3,100	12		16	9.7			7.2	ND	150	7.2			4.6	ND
SVE System Operating	RS-SVE	17-WAS-003-ES	9/20/2017	Primary	SVE Exhaust Stack	15,000	54		58	42			31	ND	220	31			20	ND

Notes:

Significant figures may not have been retained from the original laboratory results

Bold values indicate exceedance of ADEC Target Levels

NA = ADEC has not calculated a Target Level for this chemical due to lack of toxicity information for inhalation exposure pathway.

Soil gas samples were taken at an interval of 7.5 - 8.0 feet below ground surface

' bgs = feet below ground surface

µg/m³ = micrograms per cubic meter

MRL = Method Reporting Limit

ND = Not detected above method reporting limit

JA = Analytical result considered estimated because canister received by laboratory at ambient pressure

ATTACHMENT 3

SVE/SSD System OM&M Data Sheets

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Wendell Ave SVE/SSD System OM&M Data Sheet

Wendell Ave - SVE/SSD OM&M Data Sheet

Date: 3/27/18 **Time:** 12:45 **Ambient Temp (^{0}F):** 23 **Technician:** Murray/Kersten **Field Instrument Used/Last Calibrated:** RKI 3/27/18

SSD System

Depressurization Wells

Line	Vacuum (inWC)	Flow (scfm)	Valve % Open	Hex (ppm)	% CO2	%O2
DW-1	*<54*	*~10*				
DW-2	*<54*	*~10*				
DW-3	*<54*	*~10*				
DW-4	*<54*	*~10*				
DW-5	*<54*	*~10*				
DW-6	*<54*	*~10*				
Spare						
Spare						

SSD System Mechanical Parameters

Dilution Valve % open		*Closed*
Knockout drum level		*Empty*
Manifold Vacuum (inWC)		*Max < 54 inWC*
Blower Vacuum (inWC)		*Δ < 10 inWC*
Exhaust Temp Digital (°F)		*< 215 °F*
Exhaust Temp Gauge (°F)		*< 215 °F*
Exhaust Flow (cfm)		*~60*
Filters Checked/Cleaned?		

Indoor Vapor Monitoring Points

Point ID	Vacuum (inWC)		Hex (ppm)	% CO2	% O2
SS-4	0.05	*> 0.02*	0	0.08	20.9
SS-5	0.008	*> 0.02*	0	0	20.9
SS-8	0.005	*> 0.02*	0	0	20.9

SVE System

Extraction Wells

Line	Vacuum (inWC)		Flow (scfm)		Valve % Open	Hex (ppm)	% CO2	%O2
SVE-1	-	*<81*	-	*~15*	-	-	-	-
SVE-2	0	*<81*	0	*~15*	closed	-	-	-
SVE-3	11	*<81*	20	*~15*	75	0	1.7	20.9
SVE-4	16	*<81*	16	*~15*	75	0	2.3	20.9
SVE-5	17	*<81*	20	*~15*	75	0	2.7	20.9
SVE-6	18	*<81*	11	*~15*	100	0	0.2	20.9
Spare								
TOTAL FLOW			**67**					

SVE System Mechanical Parameters

Dilution Valve % open	0	*Closed*
Knockout drum level	Empty	*Empty*
Manifold Vacuum (inWC)	35	*Max < 81 inWC*
Blower Vacuum (inWC)	39	*Δ < 10 inWC*
Exhaust Temp Digital (°F)	112	*< 275 °F*
Exhaust Temp Gauge (°F)	120	*< 275 °F*
Exhaust Flow (cfm)	* / 67	*~75*
Filters Checked/Cleaned?	no	

Outdoor Vapor Monitoring Points

Point ID	Vacuum (inWC)		Hex (ppm)	%CO2	%O2
SG-2 @ 4' bgs		*> 0.1*			
SG-2 @ 8' bgs		*> 0.1*			
SG-3 @ 4' bgs	1.04	*> 0.1*	0	0.24	20.9
SG-3 @ 8' bgs	1.3	*> 0.1*	0	1.4	17.3
SG-7 @ 5' bgs	1.52	*> 0.1*	0	0.06	20.9
SG-7 @ 9' bgs	1.69	*> 0.1*	0	2.52	14
SG-8 @ 5' bgs	2.21	*> 0.1*	0	2.5	14.3
SG-22 @ 8' bgs		*> 0.1*			
SG-24 @ 8' bgs		*> 0.1*			

At least one reading below 20.9%

Field Notes:

Additional Mechanical and Shared Elements

Control Room

Parameter		SSD	SVE System
Motor Speed (Hz)			65
IDEC Hourmeter Reading/Time			30557.4
Hobbs Hourmeter Reading/Time			8474.7
Previous IDEC Hourmeter Reading/Date/Time			30534.0
Previous Hobbs Hourmeter Reading/Date/Time			8451.1
Total Hours Since Last Event IDEC/Hobbs	0.0		23.6
Percent Operability	23.4		1%

Exhaust Stack/Heat Trace

Exhaust Stack Drained?	Yes
Exhaust Stack (Hex (ppm), %O2, %CO2)	0.0, 15.4%, 2.8%
Exhaust Stack Colortec (ppm)	NA
Heat Trace On?	Yes
LEL Monitor Reading (%LEL)	0
GVEA Meter Reading (kW-hr)	200043
	199956
	87

Laboratory Sample

Effluent Sample ID		
Summa Canister ID		
Time/Date		
Initial Vacuum ("Hg)		
Final Vacuum ("Hg)		

Field Notes:

SVE System was started at 7:45 on 3/27/2018 after approximately 180 day shutdown period.

SSD System remains shut down.

* - The SVE Exhaust flow gauge was not functioning properly, therefore sum of well flows used to obtain total flow.

Itemized values are the operational target for this monitoring parameter. Observed values should be entered and compared to the target values to determine if operational adjustement or maintenance is required

NR = not recorded

##/## = "/" between readings indicates guage reading "before" and "after" adjustment

SG-1 destroyed: SS-6, SS-7, SS-9, SS-10, SS-11, SS-12, SS-13 no longer safely accessible due to building condition

ATTACHMENT 4

Photo Log

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PHOTOGRAPH 1: SOIL GAS SAMPLE LOCATION SG-3 OUTSIDE ESL BUILDING.

PHOTOGRAPH 2: COLLECTING READINGS AT SG-8 OUTSIDE ESL BUILDING.

PHOTOGRAPH 3: SVE SAMPLE LOCATION SVE-4 AT WENDELL AVENUE SITE.

PHOTOGRAPH 4: COLLECTING COLOR TEC READING AT SVE-4.