KANE ENVIRONMENTAL INC

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MEMORANDUM

March 28, 2019

TO: Jerome B. Cruz, Ph.D. and Ching Pi Wang
Washington State Department of Ecology
Toxics Cleanup Program, Northwest Regional Office
3190 - 160th SE Bellevue, WA 98008

FROM: John Kane

SUBJECT: Post-ERH Groundwater Sampling – Select Groundwater Wells
Bothell Service Center Simon & Sons (BSCSS)
Bothell, WA 98011

This groundwater sampling task was completed as requested by Jerome Cruz and Ching Pi Wang at Ecology NWRO. Kane Environmental collected a total of 14 groundwater samples from existing groundwater monitoring wells within and in proximity to the Electrical Resistance Heating treatment area at the BSCSS site. Figure 1 shows the location of the 14 wells sampled outlined in green boxes. The analytical data is provided in the attached table. For comparison purposes, we included only the most recent previous groundwater sampling round of the same wells from November/December 2018.

The purpose of this memorandum is to provide an overview of similar or decreasing PCE analytical results between the two sampling events, not a detailed review of analytical data results. Please note that PCE breakdown products are also presented in the Table 1, but not summarized in this memorandum. This recent sampling serves as a baseline for post-ERH treatment for the wells within and in the vicinity of the ERH treatment area.

Shallow Wells
6 shallow wells were sampled.

3 wells were either non-detect or below MTCA PCE cleanup level (CUL)
1 well decreased in PCE concentration
2 wells remained about the same PCE concentration (MW-4 & MW-40).

Intermediate Wells
3 intermediate wells were sampled.

1 well decreased in PCE concentration
2 wells were non-detect for PCE

Deep Wells
5 deep wells were sampled.

Note: All 5 wells were either non-detect or below the PCE CUL and below breakdown product CULs.

cc: Nduta Mbuthia, City of Bothell

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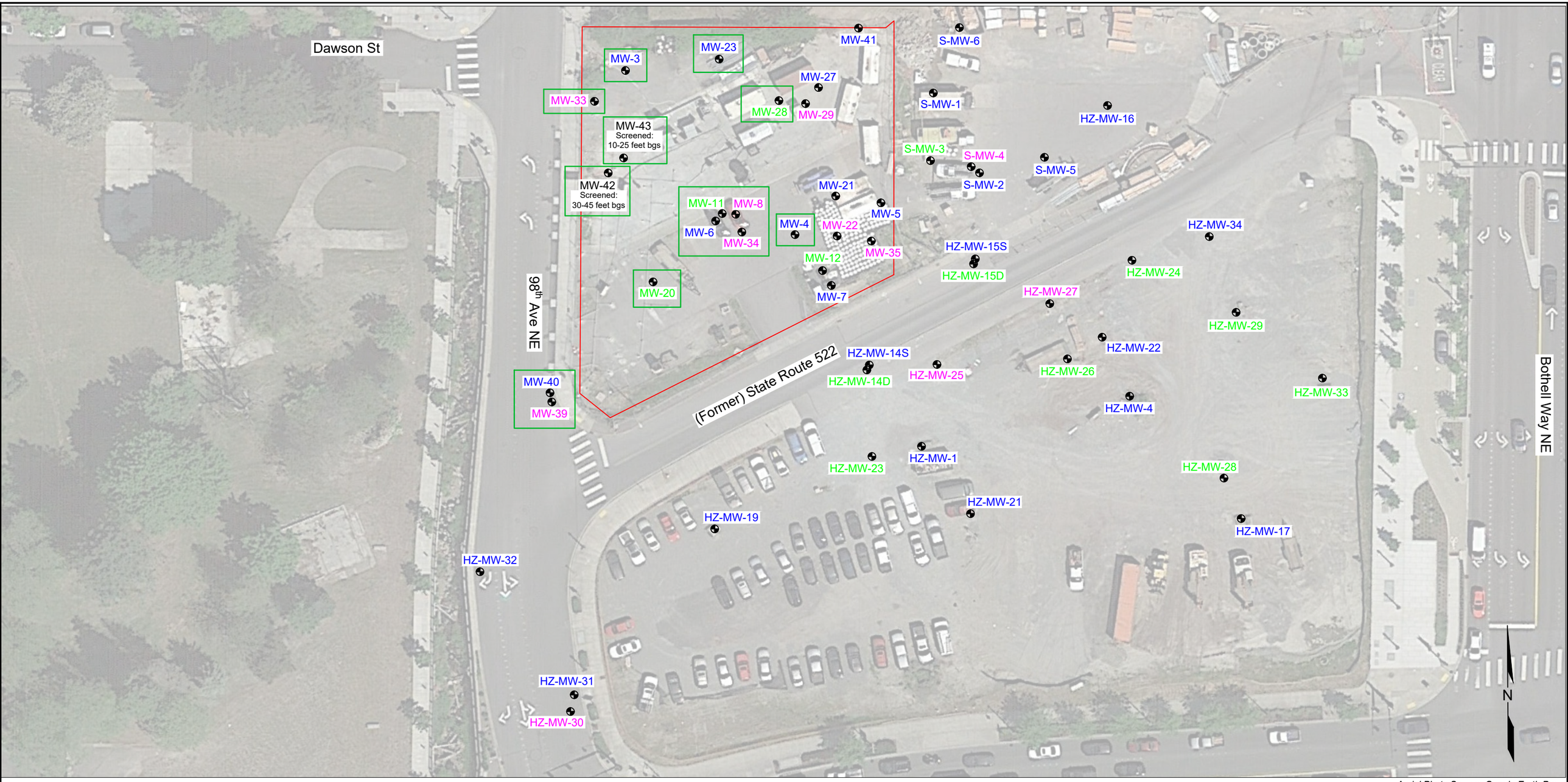

LEGEND

- BSCA Property Boundary
- MW-1 Monitoring Well, Shallow (5-25ft)
- MW-2 Monitoring Well, Intermediate (25-35 ft)
- MW-3 Monitoring Well, Deep (35-55 ft)
- MW-4 New Monitoring Well, Screened as Noted
- Wells sampled in February-March, 2019

Aerial Photo Source: Google Earth Pro
Aerial Photo Date: May, 2018

0 50 100
Approximate Scale in Feet

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Figure 1
Groundwater Monitoring Well Locations

Table 1
Bothell Service Center Simon Son
ERH Area Groundwater Analytical Results

Well	Well Type and Water Bearing Zone	Screened Depth, (ft bgs)	Date Sampled	Depth to Water (ft below TOC)	Sampled By	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	(cis) 1,2-DCE (µg/L)	(trans) 1,2-DCE (µg/L)	Vinyl Chloride (µg/L)	pH (units)	Conductivity (µS)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	Dissolved Iron (ug/L)	Sulfate (mg/L)	Chloride (mg/L)	Ammonia as N (mg/L)	Methane (mg/L)	Ethane (mg/L)	Ethene (mg/L)	Total Organic Carbon (mg/L)
MW-3	Shallow	5 to 20	12/5/18	7.93	Kane	<1.00	<0.50	<1.0	<1.00	<1.0	<0.20	5.90	62.5	38.7	6.94	<100	3.18	2.79	<0.100	<0.00863	<0.0162	<0.0151	2.7
			2/12/19	7.79	Kane	<1.0	<0.50	<1.0	<1.0	<1.0	<0.20	6.03	57.5	8.2	141.5	<100	4.16	3	<0.10	<0.00863	<0.0162	<0.0151	2.36
MW-4	Shallow	10 to 25	11/30/18	7.67	Kane	**4,370**	**373**	<50	**1,720**	<50	*<10*	6.35	347.4	0.12	50	**604**	18.8	16	<0.100	0.721	<0.162	<0.151	3.1
			2/22/19	7.23	Kane	**4,080**	**343**	<1.0	**1,790**	**10.7**	**9.72**	6.49	311.5	0.22	19.9	<100	16.2	16.5	<0.10	4.12	<0.0162	<0.0151	1.94
MW-6	Shallow	10 to 25	12/21/18	8.79	Kane	**2,670**	**1,000**	<1.0	**2,560**	<1.0	**25.5**	5.96	378	0.23	-65.4	**5,260**	8.68	11.2	0.413	0.0808	<0.162	<0.151	14.3
			2/22/19	7.79	Kane	**1,820**	**568**	<1.0	**1,040**	**14.2**	**14**	6.16	295.1	0.15	-52	**5,800**	13	7.69	<0.10	0.706	<0.0162	<0.0151	13.2
MW-8	Deep	45 to 50	12/20/18	10.05	Kane	**14.5**	**4.37**	<1.0	**9.38**	<1.0	<0.20	6.13	197.6	0.28	30	<100	4.13	6.53	<0.100	<0.00863	<0.0162	<0.0151	1.66
			2/22/19	8.75	Kane	**4.98**	**2.9**	<1.0	**7.33**	<1.0	<0.20	6.28	183.2	0.24	65	<100	4.95	7.14	<0.10	0.0173	<0.0162	<0.0151	1.82
MW-11	Intermediate	25 to 33	12/20/18	8.56	Kane	**41**	**11.5**	<1.0	**4.92**	<1.0	<0.20	5.72	287	0.16	14.3	**611**	37.4	13.5	<0.100	0.109	<0.162	<0.151	8.99
			2/21/19	7.9	Kane	**16.9**	**14.6**	<1.0	**9.58**	<1.0	<0.20	5.96	316.3	0.16	-70	**1,240**	10.3	14.4	<0.10	0.87	<0.0162	<0.0151	23.7
MW-20	Intermediate	25 to 30	12/20/18	7.5	Kane	**32**	**879**	<1.0	**552**	<1.0	**2.23**	5.72	264	0.05	-4.4	**3,140**	2.56	8.88	1.54	0.0446	<0.0162	<0.0151	95.4
			3/14/19	7.55	Kane	<0.841	**136**	<10	**163**	**84.3**	*<2.0*	6	219.3	0.2	68.3	**1,460**	0.348	7.8	1.07	0.0463	<0.0162	<0.0151	45.3
MW-23	Shallow	6 to 16	12/5/18	8.70	Kane	**1.05**	<0.50	<1.0	<1.00	<1.0	<0.20	5.65	112	1.24	49.8	**124**	10.3	2.16	<0.100	0.0854	<0.0162	<0.0151	2.4
			2/12/19	8.18	Kane	**2.11**	<0.50	<1.0	<1.0	<1.0	<0.20	5.34	75.1	5.16	128.7	<100	6.02	1.46	<0.10	<0.00863	<0.0162	<0.0151	1.17
MW-28	Intermediate	25 to 35	12/12/18	10.01	Kane	<1.00	<0.50	<1.0	<1.00	<1.0	<0.20	5.70	130	1.78	48.7	<100	11.8	8.06	<0.100	<0.00863	<0.0162	<0.0151	0.69
			2/19/19	9.07	Kane	<1.0	<0.50	<1.0	<1.0	<1.0	<0.20	5.73	108.6	2.56	202.9	<100	8.78	5.65	<0.10	<0.00863	<0.0162	<0.0151	0.618
MW-33	Deep	40 to 50	12/5/18	10.4	Kane	<1.00	<0.50	<1.0	<1.00	<1.0	<0.20	6.13	174	0.07	43.5	<100	10.6	6.74	<0.100	<0.00863	<0.0162	<0.0151	3.01
			2/19/19	9.17	Kane	<1.0	<0.50	<1.0	<1.0	<1.0	<0.20	6.35	164.3	0.18	204.8	<100	11.5	6.45	<0.10	<0.00863	<0.0162	<0.0151	1.44
MW-34	Deep	40 to 50	12/11/18	8.5	Kane	<1.00	<0.50	<1.0	<1.00	<1.0	<0.20	5.92	285	0.09	44.3	**561**	13.5	39	<0.100	0.0103	<0.0162	<0.0151	1.2
			2/21/19	7.59	Kane	**1.29**	<0.50	<1.0	**1.52**	<1.0	<0.20	5.95	255.8	0.22	91.9	**367**	14.6	32.7	<0.10	0.0274	<0.0162	<0.0151	10.49
MW-39	Deep	40 to 50	12/17/18	6.33	Kane	**2.32**	**2.62**	<1.0	**6.81**	<1.0	<0.20	6.39	225.4	0.15	-3.5	**4,580**	2.13	3.45	0.563	0.364	<0.0162	<0.0151	3.36
			3/13/19	6.32	Kane	<1.0	<0.50	<1.0	**1.99**	<1.0	<0.20	6.4	205.6	0.09	-44.3	**4,380**	<0.30	3.76	0.445	0.552	<0.0162	<0.0151	4.15
MW-40	Shallow	15 to 25	12/17/18	6.28	Kane	**212**	**46**	<1.0	**56.7**	<1.0	<0.20	6.43	69.2	2.39	52.6	<100	1.55	0.586	<0.100	<0.00863	<0.0162	<0.0151	1.11
			3/13/19	6.29	Kane	**213**	**146**	**1.49**	**746**	**1.3**	<0.20	6.08	63.3	1.33	82.2	<100	0.819	2.08	<0.10	0.00959	<0.0162	<0.0151	2.03
MW-42	Deep	30 to 45	1/3/19	10.21	Kane	<1.0	<0.50	<1.0	<1.0	<1.0	<0.2												
			3/18/19	8.79	Kane	<1.0	<0.50	<1.0	<1.0	<1.0	<0.20	6.63	155.4	0.06	76.4	**821**	1.99	3.57	0.266	0.177	<0.0162	<0.0151	1.9
MW-43	Shallow	10 to 25	1/2/19	10.4	Kane	**225**	**32**	**5.95**	**7.16**	**3.24**	<0.2												
			3/18/19	8.42	Kane	**2**	<0.50	<1.0	**1.2**	<1.0	<0.20	6.61	183.6	0.1	-4.6	**286**	14.4	3.34	<0.10	0.0336	<0.0162	<0.0151	8.25
MTCA Method A Cleanup Level[1]						5.0	5.0				0.2												
MTCA Method B Cleanup Level[2]								400	16	160						11,200							

Notes:

PCE – Tetrachloroethene
TCE – Trichloroethene
1,1-DCE - 1,1-Dichloroethene
(cis) 1,2-DCE - (cis) 1,2-Dichloroethene
Blank – Not analyzed or not available
Bold – Analyte detected
Bold / highlighted – Analyte exceeds MTCA A/B cleanup level
< – Analyte not detected at listed reporting limit
Italicized - Reporting limit exceeds MTCA A/B cleanup level
ug/L – micrograms per liter
1 – Table 720-1, WAC 173-340-900
2 – WA Dept. of Ecology CLARC ground water data table
(https://fortress.wa.gov/ecy/clarc/FocusSheets/Groundwater%20Methods%20B%20and%20A%20and%20ARARs.pdf)
NA – Not Applicable