Kennedy Jenks
32001 32nd Avenue South, Suite 100
Federal Way, Washington 98001
253-835-6400

21 February 2019

Ms. Sandra Treccani
Site Manager
Washington State Department of Ecology
4601 North Monroe Street
Spokane, Washington 99205

Subject: First Semiannual 2018 Groundwater Sampling Results
BNSF Railway Company, Parkwater Rail Yard
Spokane, Washington
KJ 1896110.00

Dear Ms. Treccani:

This letter summarizes the monitoring activities and presents the field and laboratory results for samples collected during the first semiannual 2018 groundwater sampling event at the BNSF Railway Company (BNSF) Parkwater Rail Yard (Site) located in Spokane, Washington.

Cleanup work at the Site is being implemented under Consent Decree No. 12202548-1 between BNSF and the Washington State Department of Ecology (Ecology). A soil and groundwater remediation system operated at the Site from March 2009 to May 2016. Ecology approved a request to shut down the remediation system and continue with a reduced groundwater monitoring schedule in a letter dated 26 January 2016.

Groundwater monitoring activities are conducted in accordance with the Compliance Monitoring Plan (CMP) included in the Engineering Design Report (EDR)[1]. As specified in the CMP, the reduced monitoring will be conducted on monitoring wells MW-6, MW 7, MW-14, and MW-19 (Fueling Area wells) for a minimum of four consecutive quarters. According to the CMP, groundwater monitoring "will be ceased in the Fueling Area wells after the remediation system has been shut down for one full year and laboratory data from four consecutive quarters of monitoring indicate diesel-range organics (DRO) and arsenic concentrations in groundwater samples are less than cleanup criteria." Four consecutive quarters of monitoring were conducted following the shutdown of the remediation system in 2016. In a letter dated 28 August 2017, BNSF requested that the frequency of groundwater monitoring and cap integrity inspections be reduced from quarterly to semiannual (second and fourth quarter each year). Ecology approved the proposed sampling reduction in a letter dated 25 September 2017.

The first semiannual 2018 groundwater sampling event was conducted on 28 June 2018. Groundwater monitoring activities included measuring depth-to-water in the four monitoring wells, then purging groundwater from each well using a stainless steel bladder pump, and collecting groundwater samples. Purging and sampling was conducted in general conformance

[1] GeoEngineers. 2013. Engineering Design Report, BNSF Parkwater Rail Yard Site, Spokane, Washington.

with the U.S. Environmental Protection Agency's (EPA) low-flow groundwater sampling procedures[2]. Groundwater samples were collected in accordance with the requirements of the CMP, and stored in a cooler containing crushed ice until being delivered to ESC Lab Sciences Inc., of Mt. Juliet, Tennessee (now Pace National), a Washington State-accredited environmental laboratory, under appropriate chain-of-custody. Samples were analyzed by Pace National for DRO by Method NWTPH-Dx, and total arsenic by EPA Method 6020.

Depth-to-groundwater measurements and resulting groundwater elevation calculations are summarized in Table 1 and presented on Figure 1. Water quality parameters measured during purging are summarized in Table 2, and monitoring well purge forms are included in Attachment A. Analytical results are summarized in Table 3, and the laboratory report is included in Attachment B.

Groundwater elevation measurements indicate a west to west-northwest groundwater flow direction with an average hydraulic gradient of 0.0027 feet per foot. This is consistent with the groundwater flow direction observed during previous monitoring events at the site.

During the June 2018 sampling event, total arsenic was detected at a concentration of 0.00564 milligrams per liter (mg/L) in the sample collected from monitoring well MW-19, which exceeds the Site-specific cleanup level established in the EDR of 0.005 mg/L. The turbidity of the sample collected from well MW-19 was 75.70 NTU, which is an order of magnitude higher than turbidity measured in this well during previous sampling events, and higher than turbidity measurements from wells MW-6, MW-7, and MW-14 during this event. Therefore, the arsenic concentration reported in the sample collected from well MW-19 in June 2018 is likely not representative of groundwater quality due to the elevated turbidity of the sample. Previous detections of total arsenic above the Site-specific cleanup level are also generally associated with elevated turbidity in the associated samples, indicating that elevated arsenic concentrations are likely associated with the suspended sediment and not representative of groundwater quality. The remaining analytes were reported at concentrations below their respective Site-specific cleanup levels established in the EDR.

In the four consecutive sampling events conducted since November 2016, the following constituents have been detected at concentrations greater than the Site-specific cleanup levels established in the EDR:

- Arsenic
    - Monitoring Well MW-14 - first quarter 2017 event (elevated turbidity in sample).
    - Monitoring Well MW-19 – first semiannual 2018 event (elevated turbidity in sample).

[2] U.S. Environmental Protection Agency, Region 1. 1996. Low Stress (low-flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells, EPA SOP No. GW 0001, Revision No. 2, July 30.

- DRO
  - Monitoring Wells MW-6 - fourth quarter 2016 event.
  - Monitoring Wells MW-14 - fourth quarter 2016 event (elevated turbidity in sample).

No other constituents of concern were reported at concentrations greater than their respective Site-specific cleanup levels established in the EDR during the sampling events conducted since system shutdown.

Please contact us at (253) 835-6400 if you have questions regarding the above information.

Very truly yours,

KENNEDY/JENKS CONSULTANTS

Ryan Hultgren
Project Manager

Todd Miller
Principal Geologist

cc: Shane DeGross, BNSF Railway Company

Attachments:
Table 1 – Groundwater Elevation Summary, 28 June 2018
Table 2 – Water Quality Parameters Summary
Table 3 – 2016-2018 Groundwater Analytical Results Summary
Figure 1 – Groundwater Potentiometric Map, June 28, 2018
Attachment A – Spokane Environmental Services Monitoring Well Sampling Field Log
Attachment B – Laboratory Analytical Report and Chain-of-Custody Documentation

Tables

TABLE 1

GROUNDWATER ELEVATION SUMMARY
28 June 2018
BNSF Parkwater Rail Yard
Spokane, Washington

Well Number	Date	Top of Casing Elevation (feet)[(a)]	Depth to Groundwater (feet btoc)	Groundwater Elevation (feet amsl)[(a)]
MW-4	6/28/2018	1,950.76	64.42	1,886.34
MW-6	6/28/2018	1,951.04	65.77	1,885.27
MW-7	6/28/2018	1,951.13	65.96	1,885.17
MW-11	6/28/2018	1,951.20	68.91	1,882.29
MW-14	6/28/2018	1,951.41	66.00	1,885.41
MW-16	6/28/2018	1,950.44	66.53	1,883.91
MW-19	6/28/2018	1,951.24	65.96	1,885.28

Notes:

(a) Elevations are referenced to the North American Vertical Datum of 1988 (NAVD 88).

btoc = below top of casing

amsl = above mean sea level

TABLE 2

WATER QUALITY PARAMETERS SUMMARY
BNSF Parkwater Rail Yard, Spokane, Washington

Monitoring Well ID	Sample Collection Date	Water Quality Parameters					
		pH	Conductivity (mS/cm)	Turbidity (NTU)	Temperature (°C)	Dissolved Oxygen (mg/L)	ORP (mV)
MW-6	3/15/2016	7.37	0.278	0.72	11.17	1.34	76.4
	5/24/2016	7.41	0.254	1.63	12.59	1.03	83.9
	8/17/2016	7.40	0.255	5.78	14.37	6.56	14.8
	11/7/2016	6.79	0.412	1.21	12.66	0.60	-20.1
	3/8/2017	7.22	0.265	2.46	10.22	1.82	44.9
	11/6/2017	7.18	0.232	2.74	11.03	2.91	72.5
	6/28/2018	7.57	0.286	0.00	15.77	0.00	35.0
MW-7	3/15/2016	7.70	0.252	2.82	11.37	5.32	101.8
	5/24/2016	7.69	0.250	2.45	12.95	7.69	-72.9
	8/17/2016	7.87	0.244	3.42	15.11	7.77	38.8
	11/7/2016	7.53	0.255	0.23	11.93	6.45	83.6
	3/8/2017	7.32	0.290	2.77	10.29	4.46	51.5
	11/6/2017	7.88	0.251	7.79	11.33	5.89	73.9
	6/28/2018	7.82	0.275	0.00	14.91	1.78	131.0
MW-14	3/15/2016	7.64	0.251	0.00	10.21	7.26	75.8
	5/24/2016	7.72	0.252	2.48	13.27	7.84	45.5
	8/17/2016	7.48	0.261	2.92	17.13	5.12	17.2
	11/7/2016	7.00	0.372	0.88	12.64	1.47	-24.3
	3/8/2017	7.14	0.265	11.71	9.35	7.11	65.3
	11/6/2017	7.52	0.289	13.59	8.96	3.58	33.3
	6/28/2018	8.02	0.261	0.00	17.12	5.15	173.0
MW-19	3/15/2016	7.90	0.243	1.43	11.06	9.25	114.3
	5/24/2016	7.91	0.242	1.25	13.17	9.72	81.5
	8/17/2016	7.71	0.251	1.47	17.05	8.45	40.7
	11/7/2016	7.57	0.256	1.37	12.20	7.96	114.9
	3/8/2017	7.54	0.252	4.41	10.12	9.21	59.5
	11/6/2017	7.72	0.255	5.67	10.63	7.53	78.6
	6/28/2018	7.97	0.264	75.70	12.28	0.60	125.0

Notes:
mS/cm = milli-Siemens per centimeter.
NTU = nephelometric turbidity units.
°C = degrees Celsius.
mg/L = milligrams per liter.
ORP = oxidation-reduction potential.
mV = millivolts.

TABLE 3

2016-2018 GROUNDWATER ANALYTICAL RESULTS SUMMARY
BNSF Parkwater Rail Yard, Spokane, Washington

Monitoring Well ID[a]	Date	Total Arsenic[b] (mg/L)		Dissolved Arsenic[b] (mg/L)		Diesel-Range Organics[c] (mg/L)		Turbidity (NTU)
MW-6	3/15/2016	0.002	U	0.002	U	0.488		0.72
	5/24/2016	0.002	U	--		0.201		1.63
	8/17/2016	**0.00505**		--		0.131	B	5.78
	11/7/2016	0.00450		--		**1.560**		1.21
	3/8/2017	0.00323		--		0.250	U	2.46
	11/6/2017	0.00139	J	--		0.095	J	2.74
	6/28/2018	0.00334		--		0.200	U	0.00
MW-7	3/15/2016	0.00336		0.0032		0.153		2.82
	5/24/2016	0.00485		--		0.138		2.45
	8/17/2016	**0.00548**		--		0.100	U	3.42
	11/7/2016	0.00342		--		0.250	U	0.23
	3/8/2017	0.002	U	--		0.250	U	2.77
	11/6/2017	0.0037		--		0.200	U	7.79
	6/28/2018	0.0039		--		0.200	U	0.00
MW-14	3/15/2016	0.00283/0.00289[d]		0.00272/0.00279		0.100/0.100	U	0.00
	5/24/2016	0.00423/0.00397		--/--		0.100/0.100	U	2.48
	8/17/2016	0.00445/0.00371		--/--		0.100/0.112	U/B	2.42
	11/7/2016	0.00223/0.00225		--/--		**0.647/0.648**		0.88
	3/8/2017	**0.0104/0.0107**		--/--		0.250/0.250	U/U	11.71
	11/6/2017	0.00286/0.00295		--/--		0.200/0.200	U	13.59
	6/28/2018	0.00482/0.00474		--/--		0.200/0.200	U	0.00
MW-19	3/15/2016	0.00394		0.00455		0.100	U	1.43
	5/24/2016	0.00416		--		0.100	U	1.25
	8/17/2016	0.00367		--		0.100	U	1.47
	11/7/2016	0.00334		--		0.250	U	1.37
	3/8/2017	0.00387				0.250	U	4.41
	11/6/2017	0.00302		--		0.200	U	5.67
	6/28/2018	**0.00564**		--		0.200	U	75.70
Field Blank	3/15/2016	0.002	U	0.002	U	0.100	U	--
	5/24/2016	0.002	U	--		0.100	U	--
	8/17/2016	0.002	U	--		0.100	U	--
	11/7/2016	0.002	U	--		0.250	U	--
	3/8/2017	0.002	U	--		0.250	U	--
Rinsate Blank	3/15/2016	0.002	U	0.002	U	0.100	U	--
	5/24/2016	0.002	U	--		0.218		--
	8/17/2016	0.002	U	--		0.100	U	--
	11/7/2016	0.002	U	--		0.250	U	--
	3/8/2017	0.002	U	--		0.250	U	--
EDR Site-Specific Cleanup Levels		0.005		0.005		0.5		--

Notes:

(a) Samples analyzed by ESC Lab Sciences Inc., Mt. Juliet, Tennessee (now Pace National).

(b) Total and dissolved arsenic analyzed using U.S. Environmental Protection Agency Method 6020.

(c) Diesel-range petroleum hydrocarbons analyzed using Northwest Method NWTPH-Dx with silica-gel cleanup during 2016, November 2017, and 2018 sampling events. Diesel-range petroleum hydrocarbons analyzed using Northwest Method NWTPH-Dx without silica-gel cleanup during the March 2017 sampling event.

(d) Where two values are displayed for the same date, the second value is the analytical result for a duplicate sample.

Bold indicates detected concentration exceeds the EDR Site-Specific cleanup level.

mg/L = milligrams per liter.

U = not detected at a concentration greater than or equal to the listed laboratory reporting limit.

B = The sample analyte is found in the associated blank.

J = Analyte concentration is an estimated value less than the laboratory reporting limit.

-- = not sampled

Rinsate blank was collected by pumping distilled water through the sampling pump after it was decontaminated.

NTU = nephelometric turbidity units.

Figure

Path: N:\BNSF Washington\Parkwater\Events\ParkwaterGWContours_June2018.mxd ©2017 Kennedy/Jenks Consultants

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Monitoring Well, Groundwater Elevation, Sample Collected
- Monitoring Well, Groundwater Elevation Only
- Monitoring Well, Groundwater Not Measured
- 1883.91 Groundwater Elevation
- Groundwater Contour (Dashed Where Inferred)
- Approximate Direction of Hydraulic Flow
- Site Boundary

Note:
1. All locations are approximate.
2. Groundwater elevation measured in feet above mean sea level.
3. Groundwater elevations are relative to the NAVD 88 Datum.

N

0 75 150

Scale: Feet

Kennedy/Jenks Consultants

BNSF Railway Company
Parkwater Railyard
Spokane, Washington

Groundwater Potentiometric Map
June 28, 2018

1896110*00
September 2018

Figure 1

Attachment A

Spokane Environmental Services Monitoring Well Sampling Field Log

Monitoring Well Sampling Field Log

1896110.00

(1)

Well Number: MW-14

Date: 6/28/18

Project Information	
Project Name:	KJ (BNSF)
SES Project Number:	0110-001

Sampling Information	
Field Team:	GP
Purge Method:	Low Flow
Sampling Method:	Low Flow
Water Quality Meter:	Model: U-52
	Serial Number:
Purge Water Disposition:	~~ONSITE~~

Comments

COMMENCE PURGE @ 11:52

FDTW = 66.70

Well Construction Information

Stick-up or Flush	Well Diameter (in)	Total Depth (ft btoc)	Screen Interval (ft bgs or btoc)
F	2	—	—

Monitoring Information

Initial DTW (ft btoc)	Saturated Screen Interval (ft bgs or btoc)	Pump Intake Depth (ft btoc): (Mid Sat. Screen Interval)
66.70	—	—

Sample Containers

Number	Type	Preservative	Analytical Parameters	Filtered?
1			ASG	
2	1		NWTPHDX	

Well Purge Data

Time	Volume Purged (L)	Purge Rate (L/min) (<0.5 L/min)	DTW (ft btoc)	Temp. (°C)	Conductivity (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTUs)	Clarity/Color/ Remarks
	Pump On		Initial	-	±3%	±10%	±0.1	±10mv	±10%	<= Stabilization Criteria
12:06	2	.250		18.99	0.260	6.17	7.03	210	0.0	
12:09	2.75	"		18.25	0.255	6.87	7.45	193	0.0	
12:12	3.5	"		17.57	0.258	7.22	7.65	187	0.0	
12:15	4.25			17.20	0.258	6.80	7.82	183	0.0	
12:18	5			16.76	0.259	6.03	7.96	178	0.0	
12:21	5.75			16.83	0.261	5.71	7.97	178	0.0	
12:24	6.5			16.91	0.260	5.01	8.01	176	0.0	
12:27	7.25			17.06	0.262	4.71	8.01	175	0.0	
12:30	8			17.12	0.261	5.15	8.02	173	0.0	

	Start Sampling	10:00	Sample ID: PW-MW14-062818	Sample Time:	12:30
	End Sampling	12:40	QA/QC Sample ID:	QA/QC Sample Time:	

Note: bgs= below ground surface btoc=below top of casing DTW=depth to water
Clarity: VC=very cloudy Cl=cloudy SC=slightly cloudy AC=almost clear C=clear CC=crystal clear

PW-MW14-062818 @ 12:30

PW-DUP-062818 @ 11:30

Monitoring Well Sampling Field Log

2

SPOKANE ENVIRONMENTAL SOLUTIONS

Well Number: MW-7

Date: 6-28-18

Project Information	
Project Name:	KJ (BNSF)
SES Project Number:	0110-001
Sampling Information	
Field Team:	FI
Purge Method:	Low Flow
Sampling Method:	Low Flow
Water Quality Meter:	Model: U-52
	Serial Number:
Purge Water Disposition:	

Comments

Well Construction Information

Stick-up or Flush	Well Diameter (in)	Total Depth (ft btoc)	Screen Interval (ft bgs or btoc)
F	2		

Monitoring Information

Initial DTW (ft btoc)	Saturated Screen Interval (ft bgs or btoc)	Pump Intake Depth (ft btoc): (Mid Sat. Screen Interval)
65.96		

Sample Containers

Number	Type	Preservative	Analytical Parameters	Filtered?
1			ASG	
2			NW TPHDX	

Well Purge Data

Time	Volume Purged (L)	Purge Rate (L/min) (<0.5 L/min)	DTW (ft btoc)	Temp. (°C)	Conductivity (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTUs)	Clarity/Color/ Remarks
13:00	Pump On		Initial 65.96	-	±3%	±10%	±0.1	±10mv	±10%	<= Stabilization Criteria
13:18	2	0.250		17.10	0.267	6.23	7.91	132	0.0	
13:21	2.75			16.15	0.266	4.26	7.89	125	0.0	
13:24	3.5			16.03	0.274	3.73	7.87	124	0.0	
13:27	4.25			15.66	0.267	3.68	7.86	126	0.0	
13:30	5			15.49	0.274	2.43	7.85	128	0.0	
13:33	5.75			15.25	0.275	2.46	7.84	128	0.0	
13:36	6.5			15.00	0.269	2.75	7.83	130	0.0	
13:39	7.25			14.99	0.274	2.21	7.84	130	0.0	
13:42	8			14.87	0.277	2.25	7.83	131	0.0	
13:45	8.75			14.91	0.275	1.78	7.82	131	0.0	

Start Sampling	13:00	Sample ID: PW-MW7-062818	Sample Time: 13:45
End Sampling	13:50	QA/QC Sample ID:	QA/QC Sample Time:

Note: bgs= below ground surface btoc=below top of casing DTW=depth to water
Clarity: VC=very cloudy CI=cloudy SC=slightly cloudy AC=almost clear C=clear CC=crystal clear

PW-MW7-062818 @ 13:45

Monitoring Well Sampling Field Log

SES SPOKANE ENVIRONMENTAL SOLUTIONS

Well Number: MW-19

Date: 6-28-18

Project Information	
Project Name:	KJ (BNSF)
SES Project Number:	0110-001

Sampling Information	
Field Team:	GP
Purge Method:	Low Flow
Sampling Method:	Low Flow
Water Quality Meter:	Model: U-52
	Serial Number:
Purge Water Disposition:	OWS

Comments

purge water was clear when samples were collected

Well Construction Information

Stick-up or Flush	Well Diameter (in)	Total Depth (ft btoc)	Screen Interval (ft bgs or btoc)
F	2	–	–

Monitoring Information

Initial DTW (ft btoc)	Saturated Screen Interval (ft bgs or btoc)	Pump Intake Depth (ft btoc): (Mid Sat. Screen Interval)
65.96	–	

Sample Containers

Number	Type	Preservative	Analytical Parameters	Filtered?
1			ASG	
2			NWTPHDX	

Well Purge Data

Time	Volume Purged (L)	Purge Rate (L/min) (<0.5 L/min)	DTW (ft btoc)	Temp. (°C)	Conductivity (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTUs)	Clarity/Color/ Remarks
14:00	Pump On		Initial 65.96	-	±3%	±10%	±0.1	±10mv	±10%	<= Stabilization Criteria
14:27	1.0	0.250		13.05	0.265	2.57	7.99	125	210	
14:30	1.75	"		12.59	0.265	0.03	7.98	125	140	
14:33	2.5			12.58	0.265	0.00	7.96	124	114	
14:36	3.25			12.47	0.264	0.00	7.98	124	102	
14:39	4.0			12.45	0.265	0.00	7.98	124	94.1	
14:42	4.75			12.46	0.264	0.00	7.97	124	73.6	
14:45	5.5			12.44	0.264	0.09	7.98	124	69.2	
14:48	6.25			12.41	0.264	0.28	7.98	125	66.1	
14:51	7			12.40	0.264	0.41	7.97	125	73.1	
14:54	7.75			12.28	0.264	0.60	7.97	125	75.7	

	Start Sampling	14:00	Sample ID:	PW-MW19-062819	Sample Time: 14:54
	End Sampling	15:00	QA/QC Sample ID:		QA/QC Sample Time:

Note: bgs= below ground surface btoc=below top of casing DTW=depth to water
Clarity: VC=very cloudy Cl=cloudy SC=slightly cloudy AC=almost clear C=clear CC=crystal clear

PW-MW19-062819 @ 14:54

Monitoring Well Sampling Field Log

4

Well Number: MW-6

Date: 6-28-18

Project Information	
Project Name:	KJ (BNSF)
SES Project Number:	0110-001

Sampling Information	
Field Team:	GP
Purge Method:	Low Flow
Sampling Method:	Low Flow
Water Quality Meter:	Model: U-52
	Serial Number:
Purge Water Disposition:	OWS

Comments

Tank swap @ 15:40

Re-START @ 16:10
NEW REPLACEMENT TANK
WAS EMPTY 16:25

Well Construction Information

Stick-up or Flush	Well Diameter (in)	Total Depth (ft btoc)	Screen Interval (ft bgs or btoc)
F	2	—	—

Monitoring Information

Initial DTW (ft btoc)	Saturated Screen Interval (ft bgs or btoc)	Pump Intake Depth (ft btoc): (Mid Sat. Screen Interval)
65.77	—	—

Sample Containers

Number	Type	Preservative	Analytical Parameters	Filtered?
1			As	
2			NWTPH-Dx	

Well Purge Data

Time	Volume Purged (L)	Purge Rate (L/min) (<0.5 L/min)	DTW (ft btoc)	Temp. (°C)	Conductivity (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTUs)	Clarity/Color/ Remarks
15:15	Pump On		Initial 65.77	-	±3%	±10%	±0.1	±10mv	±10%	<= Stabilization Criteria
15:30	1	0.250		13.31	0.288	0.00	7.65	53	40.8	
15:33	1.75			13.26	0.284	0.00	7.58	32	0.0	
15:36	2.5			13.80	0.284	0.00	7.58	27	0.0	
15:39	3.25			15.14	0.281	0.00	7.61	25	0.0	
15:42	4.0			15.28	0.280	0.00	7.60	25	0.0	
16:12	4.75			18:03	0.282	0.00	7.53	38	0.0	
16:15	5.5			15:77	0.286	0.00	7.57	35	0.0	
	6.25									
	7									
	7.75									

	Start Sampling	15:15	Sample ID: PW-MW6-062818	Sample Time:	16:45
	End Sampling	17:00	QA/QC Sample ID:	QA/QC Sample Time:	

Note: bgs= below ground surface btoc=below top of casing DTW=depth to water
Clarity: VC=very cloudy Cl=cloudy SC=slightly cloudy AC=almost clear C=clear CC=crystal clear

PW-MW6-062818 @ ~~16:24~~ 16:45

Attachment B

Laboratory Analytical Report and Chain-of-Custody Documentation

ANALYTICAL REPORT

July 06, 2018

Kennedy/Jenks Con-BNSF Region 1

Sample Delivery Group:	L1006013
Samples Received:	06/30/2018
Project Number:	1896110.00
Description:	BNSF - Parkwater, WA

Report To: Steve Misner
421 SW 6th Avenue, Suite 1000
Portland, OR 97204

Entire Report Reviewed By:

Jason Romer
Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

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PW-MW14-062818 L1006013-01 GW

Collected by: Flavio Ishihara | Collected date/time: 06/28/18 12:30 | Received date/time: 06/30/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICPMS) by Method 6020A	WG1132448	1	07/05/18 10:30	07/05/18 17:42	LAT
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1133164	1	07/03/18 09:05	07/03/18 17:44	SHG

PW-MW-DUP-062818 L1006013-02 GW

Collected by: Flavio Ishihara | Collected date/time: 06/28/18 11:30 | Received date/time: 06/30/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICPMS) by Method 6020A	WG1132448	1	07/05/18 10:30	07/05/18 17:46	LAT
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1133164	1	07/03/18 09:05	07/03/18 18:05	SHG

PW-MW7-062818 L1006013-03 GW

Collected by: Flavio Ishihara | Collected date/time: 06/28/18 13:45 | Received date/time: 06/30/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICPMS) by Method 6020A	WG1132448	1	07/05/18 10:30	07/05/18 17:50	LAT
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1133164	1	07/03/18 09:05	07/03/18 18:27	SHG

PW-MW19-062818 L1006013-04 GW

Collected by: Flavio Ishihara | Collected date/time: 06/28/18 14:54 | Received date/time: 06/30/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICPMS) by Method 6020A	WG1132448	1	07/05/18 10:30	07/05/18 17:54	LAT
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1133164	1	07/03/18 09:05	07/03/18 18:48	SHG

PW-MW6-062818 L1006013-05 GW

Collected by: Flavio Ishihara | Collected date/time: 06/28/18 16:45 | Received date/time: 06/30/18 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICPMS) by Method 6020A	WG1132448	1	07/05/18 10:30	07/05/18 15:53	LAT
Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT	WG1133164	1	07/03/18 09:05	07/03/18 19:10	SHG

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Jason Romer
Technical Service Representative

Metals (ICPMS) by Method 6020A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Arsenic	4.82		0.250	2.00	1	07/05/2018 17:42	WG1132448

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Diesel Range Organics (DRO)	U		66.0	200	1	07/03/2018 17:44	WG1133164
(S) o-Terphenyl	*84.7*			*52.0-156*		*07/03/2018 17:44*	WG1133164

Metals (ICPMS) by Method 6020A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Arsenic	4.74		0.250	2.00	1	07/05/2018 17:46	WG1132448

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Diesel Range Organics (DRO)	U		66.0	200	1	07/03/2018 18:05	WG1133164
(S) o-Terphenyl	*85.0*			*52.0-156*		*07/03/2018 18:05*	WG1133164

Metals (ICPMS) by Method 6020A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Arsenic	3.88		0.250	2.00	1	07/05/2018 17:50	WG1132448

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Diesel Range Organics (DRO)	U		66.0	200	1	07/03/2018 18:27	WG1133164
(S) o-Terphenyl	*92.8*			*52.0-156*		*07/03/2018 18:27*	WG1133164

Metals (ICPMS) by Method 6020A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Arsenic	5.64		0.250	2.00	1	07/05/2018 17:54	WG1132448

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Diesel Range Organics (DRO)	U		66.0	200	1	07/03/2018 18:48	WG1133164
(S) o-Terphenyl	*83.7*			*52.0-156*		*07/03/2018 18:48*	WG1133164

Metals (ICPMS) by Method 6020A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Arsenic	3.34		0.250	2.00	1	07/05/2018 15:53	WG1132448

Semi-Volatile Organic Compounds (GC) by Method NWTPHDX-SGT

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	ug/l		ug/l	ug/l		date / time	
Diesel Range Organics (DRO)	U		66.0	200	1	07/03/2018 19:10	WG1133164
(S) o-Terphenyl	*83.3*			*52.0-156*		*07/03/2018 19:10*	WG1133164

Method Blank (MB)

(MB) R3323454-1 07/05/18 15:40

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	ug/l		ug/l	ug/l
Arsenic	U		0.250	2.00

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3323454-2 07/05/18 15:45 • (LCSD) R3323454-3 07/05/18 15:49

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	ug/l	ug/l	ug/l	%	%	%			%	%
Arsenic	50.0	50.4	48.9	101	97.8	80.0-120			2.92	20

L1006013-05 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1006013-05 07/05/18 15:53 • (MS) R3323454-5 07/05/18 16:02 • (MSD) R3323454-6 07/05/18 16:06

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	ug/l	ug/l	ug/l	ug/l	%	%		%			%	%
Arsenic	50.0	3.34	51.9	52.5	97.2	98.3	1	75.0-125			1.10	20

Method Blank (MB)

(MB) R3322895-1 07/03/18 14:29

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	ug/l		ug/l	ug/l
Diesel Range Organics (DRO)	U		66.7	200
(S) o-Terphenyl	*91.7*			*52.0-156*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3322895-2 07/03/18 14:50 • (LCSD) R3322895-3 07/03/18 15:11

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	ug/l	ug/l	ug/l	%	%	%			%	%
Diesel Range Organics (DRO)	750	678	719	90.4	95.8	50.0-150			5.83	20
(S) o-Terphenyl				*95.2*	*97.9*	*52.0-156*				

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

MDL	Method Detection Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.

State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO00356
Kentucky [1 6]	90010	South Carolina	84004
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana [1]	LA180010	Texas	T 104704245-17-14
Maine	TN0002	Texas [5]	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

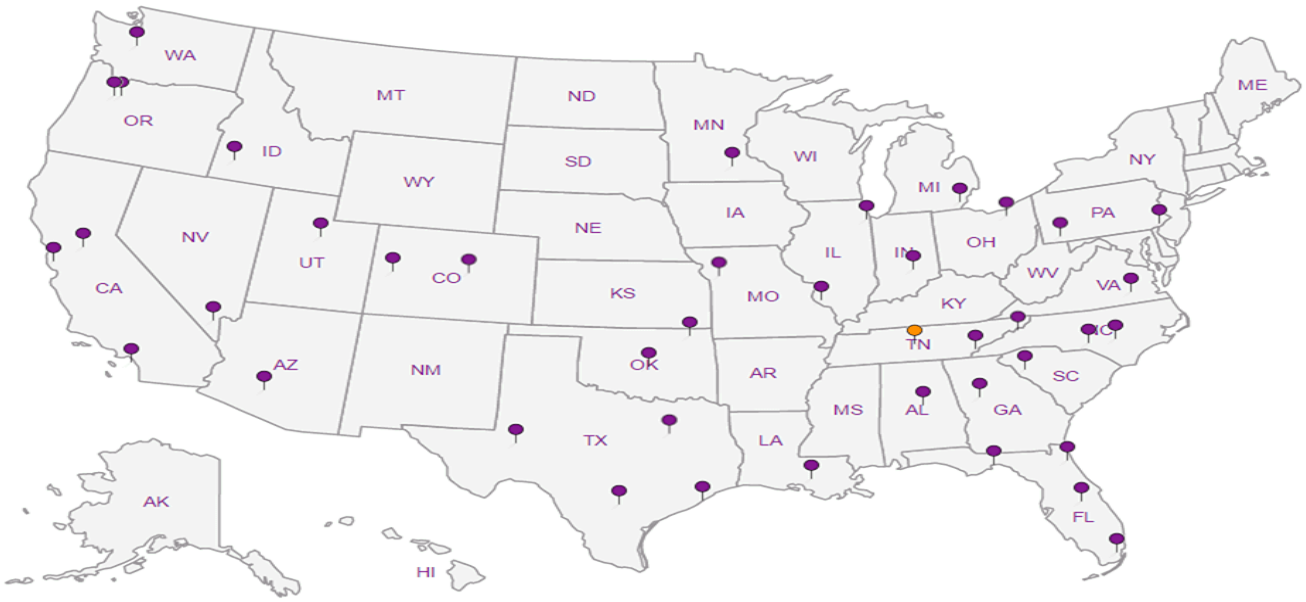
Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. ESC Lab Sciences performs all testing at our central laboratory.



Kennedy/Jenks Con-BNSF Region 1

421 SW 6th Avenue, Suite 1000
Portland, OR 97204

Billing Information:
Accounts Payable
32001 32nd Ave. S.,Ste. 100
Federal Way, WA 98001

Report to: Steve Misner

Email To: stevenmisner@KennedyJenks.com

Project Description: BNSF - Parkwater, WA

City/State Collected: SPOKANE, WA

Phone: 503-423-4000
Fax:

Client Project # 1896110.00

Lab Project # BNSF1KEN-PARKWATER

Collected by (print): FLAVIO ISHIHARA

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N ___ Y ✓

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed: STANDARD TA

Pres Chk: N ✓

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	ASG 250mlHDPE-HNO3	NWTPHDXLVI w/SGT 40mlAmb-HCl-BT								Remarks	Sample # (lab only)
~~MW-6~~ PW-MW14-062818		GW		06-28-18	12:30	3	X	X									-01
~~MW-7~~ PW-DUP-062818		GW		06-28-18	11:30	3	X	X									-02
~~MW-14~~		GW				3	X	X									
~~MW-19~~		GW				3	X	X									
~~DUP~~		GW				3	X	X									
PW-MW7-062818		GW		6-28-18	13:45	3	X	X									-03
PW-MW19-062818		GW		6-28-18	14:54	3	X	X									-04
PW-MW6-062818		GW		6-28-18	16:45												-05

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____

Flow _____ Other _____

Samples returned via:
__ UPS __ FedEx __ Courier _____

Tracking # 7466 1466 8990

Sample Receipt Checklist
COC Seal Present/Intact: NP Y N
COC Signed/Accurate: NO Y N
Bottles arrive intact: Y N
Correct bottles used: Y N
Sufficient volume sent: Y N
If Applicable
VOA Zero Headspace: Y N
Preservation Correct/Checked: Y N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR
	6-28-18	16:57	6.28.18 1657	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: 3.2 °C Bottles Received: 15
	6.28.18	17:15		If preservation required by Login: Date/Time
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 6/28/18 Time: 0845
				Hold: Condition: NCF / OK

Chain of Custody Page ___ of ___

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L# L1006013
C250

Acctnum: BNSF1KEN
Template: T137690
Prelogin: P659823
TSR: 134 - Mark W. Beasley
PB:
Shipped Via: