2016 and 2017 Riverfront Park Soil Management Report

Riverfront Park
Spokane, Washington

for
City of Spokane

July 13, 2018

GeoEngineers
Earth Science + Technology

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July 13, 2018

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1.0 INTRODUCTION

This report documents results of soil sampling and disposal activities conducted in 2016 and 2017 at Riverfront Park (the Park) in Spokane, Washington. Four Projects were under construction during this time and include:

- The Howard Street Bridge South Channel (HSBSC)
- North Bank Soil Stockpile
- Ice Ribbon
- Looff Carrousel

This report provides documentation of remedial activities at the park and to identify locations contaminated soil was left in place.

Before the Park was established as part of the World's Fair of 1974 (Expo '74), it was occupied by many industrial facilities and as a result, contaminants of concern (COCs) associated with historical industrial use have been identified in soil parkwide. Soil sampling conducted in the park (GeoEngineers 2016b and c) has identified the following COCs greater than the Model Toxics Control Act (MTCA) Method A Cleanup Levels (CULs):

- Polycyclic Aromatic Hydrocarbons (PAHs);
- Lead;
- Cadmium;
- Arsenic; and
- Diesel- and oil-range petroleum hydrocarbons (DRPH and ORPH).

In 2014, The City of Spokane passed a $64 million bond for the revitalization of the Park. The City of Spokane Parks and Recreation Department (Parks) expected to encounter contamination because of the historical uses and decided to engage regulatory agencies to ensure soil management was conducted with regulatory approval. Riverfront Park was entered into the Washington State Department of Ecology (Ecology) Voluntary Cleanup Program (VCP) under Site CSID 13026, VCP project number EA0318. To manage contaminated soil at the site in a manner protective of human health and the environment, a Soil Management Plan (SMP) was developed to provide guidance for the park revitalization projects. The SMP included requirements to collect characterization samples of soil left in place and to document contaminated soil uses at the site. This report describes soil handling and characterization activities for the Riverfront Park revitalization projects between August 2016 and December 2017.

2.0 SITE DESCRIPTION AND BACKGROUND

2.1. Site History

The project site is located at 507 North Howard Street, in Spokane, Washington and is bound by Spokane Falls Boulevard to the south, Post Street to the west, Division Street to the east and West Cataldo Avenue to the north. The property is currently owned by the City of Spokane (City) and used as a public park and outdoor recreation area. The site includes portions of Havermale Island, snxw meneɂ Island (formerly Canada Island) and areas on the north and south banks of the Spokane River (Vicinity Map, Figure 1).

Development in the Park area began in the late 1870s. The falls were the source of early power for industries in the city, then known as Spokane Falls. Factories, mills (flour and lumber) and various commercial, industrial and railroad properties near the project site were constructed in the 1880s to harness the power of the falls.

Several commercial buildings including a paint shop were present on the South Bank of the Spokane River in the 1880s. The Great Fire of August 4, 1889, destroyed much of downtown Spokane, and several buildings within the current extent of the Park. The area was rebuilt after the fire and by about 1900, additional development had occurred along the South Bank. This new development consisted of City/municipal buildings and multiple railroad trestles. Substantially more development occurred by about 1910 in the Park area including several paint shops and printing facilities near the southwest portion of the Park.

Development and building density on Havermale Island and the North Bank increased from approximately 1884 to 1910. From 1910 through 1970, the building density in these areas remained similar, though the occupants of some buildings change. By 1929, the area currently occupied by the Park was almost completely developed with buildings and railroad infrastructure. Mill activities utilized the channel between the South Bank and Havermale Island to transport logs down the river and store them for mill use. A 1960 photograph shows that many of the buildings on Havermale Island had been demolished and parking areas occupied most of the island. By 1970 a railroad depot was located on Havermale Island. The City acquired the railroad properties in the Park in 1972. The railroad yards and industrial structures on Havermale Island were removed by 1973 according to documents from the Spokane Public Library's Northwest Room.

Riverfront Park as it is today was constructed to host Expo '74. Construction for Expo '74 began in 1973 and the existing structures on the islands, North Bank and South Bank were demolished except for the clock tower on Havermale Island. Plans for Expo '74 called for a radical alteration of the Park, including site elevations (Youngs 1996). Large amounts of fill (including topsoil) were brought in to grade the Park and according to one source (Youngs 1996), at least 200,000 cubic yards of fill was used in support of construction. It is not documented how much fill was used, but aerial photographs and Sanborn maps indicate that large portions of the Park were altered with fill. Temporary buildings constructed for Expo '74 were demolished within about a year after Expo '74. Relatively few changes were made to the Park between removal of the temporary buildings from Expo '74 and 2016, except for the removal of almost 17 acres of asphalt, concrete and pavement that covered the subject property at the time of Expo '74.

2.2. Previous Investigations

GeoEngineers has conducted environmental and geotechnical sampling at the site in support of redevelopment activities. Soil in the following areas has been characterized:

- Access Road from Post Street to the Sister Cities Garden (GeoEngineers 2016a);
- Ice Ribbon (GeoEngineers 2016b);
- Looff Carrousel (GeoEngineers 2016c);

- North Bank (GeoEngineers 2016e);
- Canada Island (GeoEngineers 2016e);
- Central Green (GeoEngineers 2016e);
- Theme Stream (GeoEngineers 2016e); and
- US Pavilion (GeoEngineers 2018).

Soil sample locations and laboratory analytical results are provided in the referenced reports.

3.0 SUMMARY OF 2016 AND 2017 EARTHMOVING ACTIVITIES

In 2016, two major revitalization projects broke ground and construction of these projects continued into 2017. These included the Ice Ribbon and the replacement of the HSBSC. The HSBSC project also included construction of a new park access road between a pay parking lot adjacent to Post Street and the north end of the HSBSC. In 2017, a soil stockpile was constructed on the North Bank and construction of the Looff Carrousel started. The following sections describe earthwork activities, and soil sampling conducted in support for the construction projects. Analytical reports and a data validation report for the soil samples collected are provided in Appendix A.

3.1. Howard Street Bridge South Channel

Construction for the HSBSC project started in August 2016. Initial work included: leveling out a path from Post Street to the north bridge abutment, stopping water flow through the theme stream by plugging inlet pipes, removing sediment and rock from the theme stream, removing a bridge over the theme stream, filling in the disturbed portion of the theme stream with soil, and paving a path from the parking lot access to the north bridge abutment. The north bridge abutment was also leveled and two lined stormwater ponds were constructed to manage stormwater from the new access road. Stormwater from the access road was directed to one of the two stormwater ponds and then allowed to infiltrate through treatment soil. A high density polyethylene (HDPE) geomembrane was installed at the bottom of the treatment soil to prevent stormwater from infiltrating further into the subsurface. Infiltrated water was then discharged to the Theme Stream via underground piping.

During demolition of the bridge deck, sand and railroad ties were discovered on the bridge when the bridge deck was covered with the most recent lifts of asphalt. This sand and treated wood waste was not sampled, but was transported to Waste Management's Graham Road Landfill (Graham Road) for disposal.

Contaminated soil encountered for construction of the access road and Howard Street Bridge project was disposed off-site. This included soil from the bridge deck and abutments, access road, stormwater ponds and the former sister cities garden located at the north end of the bridge. Approximately 4,203 tons of contaminated soil were taken off site and disposed of at Graham Road in 2016 and 304 tons was taken to Graham Road in 2017. Disposal tickets are included in Appendix B.

During construction, multiple soil samples were collected to profile soil for disposal or characterize soil left in place. The following sections describe the soil sampling conducted for the HSBSC project. Analytical results of soil samples collected for the HSBSC project are summarized in Table 1 and sample locations are shown on Construction Sample Locations, Figure 2.

3.1.1. Waste Profile Samples

On August 22, 2016, five test pits (HSBTP-1 HSBTP-2, HSBTP-3, HSBTP-4 and HSBTP-5) were excavated to characterize soil for the HSBSC project (Figure 2). Two test pits were excavated to characterize soil designated for export to construct stormwater ponds along the new access road and two additional test pits were excavated to characterize soil at the HSBSC north and south abutments. The fifth test pit was excavated to characterize soil designated for export to construct a construction entrance to the site from Spokane Falls Boulevard. One soil sample from each test pit was collected from depths ranging from about 1 to 2½ feet below ground surface and submitted for laboratory chemical analysis. Analytical results generally indicated the soil was contaminated or impacted in accordance with the project SMP (GeoEngineers 2017). Results are summarized in Table 1. Soil characterized by these test pits was excavated and disposed at Graham Road.

After the water to the Theme Stream was shut off, a sample of the sediment from the Theme Stream (HSBTS-1) was collected on September 8, 2016. Analytical results indicated the sediment was less than MTCA Method A cleanup levels and the soil was disposed off-site at Spokane Rock Products in Airway Heights, Washington. Analytical results are included in Table 1.

On November 29, 2016 a sediment sample was collected from the south abutment of the Howard Street Bridge (HSBRS-1). The sample was collected approximately 2 feet from the river edge and about 4 to 5 inches below the water surface. Laboratory analytical results indicated that lead in the sediment was less than the MTCA Method A cleanup level (250 milligrams per kilogram [mg/kg]), but more than the threshold for Toxicity Characteristic Leaching Procedure (TCLP) testing (100 mg/kg). TCLP testing indicated the soil could designate as a dangerous waste. Initially it was expected that this soil would be excavated to accommodate bridge construction, but the soil was left in place and a coffer dam was constructed over the sediment instead.

On February 2, 2017 a sample of soil from the south abutment (HSBSB-1) was collected to characterize the soil for disposal. The results indicated PAHs concentrations greater than the MTCA Method A cleanup level (Table 1). This soil was excavated and then temporarily stockpiled. On February 9, 2017, three 3-point composite samples (HSBSS-1, HSBSS-2 and HSBSS-3) were collected of the soil removed from the south abutment. The chemical analysis was limited to cadmium and lead to evaluate the soil as a potential dangerous waste since HSBRS-1 indicated lead near the area was greater than the dangerous waste threshold. Chemical analysis did not indicate cadmium and lead and concentrations that required TCLP testing (Table 1) and as a result, the soil was disposed at Graham Road.

On February 9, 2017 a sample was collected of drill cuttings from the installation of a bridge pier within the river channel (HSBRS-2). The cuttings were generally sediment, rock and soil from the river bottom. Analytical results indicated the cuttings could be classified as clean in accordance with the SMP and the soil was disposed off-site at at Spokane Rock Products in Airway Heights, Washington.

3.1.2. Soil Characterization Samples

On September 16 and 22, 2016, characterization samples were collected from the bottom of excavations for the east (HSBTP-6C) and west (HSBTP-7C) stormwater treatment ponds respectively (Figure 2). After the characterization samples were collected, the stormwater ponds were constructed in general accordance with the project plans and specifications. This included placing a HDPE geomembrane liner over the soil left in place after the pond excavation was finished. Chemical analysis indicated lead and PAHs concentrations greater than MTCA Method A cleanup levels were located under the east stormwater pond. COCs were less than the MTCA Method A cleanup levels in the sample collected under the west stormwater pond.

On May 15, 2017 a characterization sample was collected from the south abutment of the Howard Street Bridge (HSBTP-8C). This sample was collected at the bottom of an excavation for an underground transformer. Chemical analysis indicated the presence of PAHs greater than MTCA Method A cleanup level.

Confirmation samples were not collected from the north bridge abutment, because it was founded on bedrock and limited soil was available for sampling.

3.2. North Bank Soil Stockpile

Construction plans for the Ice Ribbon, HSBSC and Looff Carrousel resulted in a net export of soil from the site. To reduce project costs and beneficially use the soil in accordance with the project SMP (GeoEngineers 2017), Parks determined that the excavated soil should be stockpiled at the site until a suitable reuse of the soil could be identified. A stockpile management plan (GeoEngineers 2016d) was developed and a temporary stockpile location on the North Bank of the Spokane River was identified. This plan was not developed and implemented before construction activities for the HSBSC started and as a result, soil from that project was exported off-site.

The site designated for the soil stockpile was located on the North Bank where a large volume of soil was anticipated (as part of initial design concepts) to connect upper and lower parcels of the park adjacent to Cataldo Avenue and in an area currently used as a parking lot. This location was also where petroleum contaminated soil (PCS) was identified overlying shallow bedrock during the Phase II Investigation (Geoengineers 2016e). Review of a 1950 Sanborn map (1950 Certified Sanborn Map, Figure 3) indicated that a boiler and fuel room from the former Broadview Dairy was located immediately adjacent to the PCS. Petroleum used to fuel the boilers at the dairy might have been the source for PCS identified in the footprint of the proposed soil stockpile location.

Parks anticipated the soil stockpile would remain in place, and therefore, initiated a removal action for the PCS between March 6 and March 9, 2017. PCS excavation was limited to the bedrock bluff to the north and a masonry wall to the east. PCS excavation to the south and west was terminated under direction from Parks, was anticipated that the stockpile footprint would not exceed the southern and western extents of the excavation at the time of termination. Parks planned to remove the remaining PCS in the future during construction of improvements in that area. Characterization results of samples collected from the excavation are provided in Table 2 and Locations are showing on North Bank Remedial Excavation, Figure 4.

During remedial excavation, groundwater was observed on top of the bedrock surface. NRC Environmental Services (NRC) deployed oil absorbent pads to collect oil from the water surface. NRC also used a large water truck to dewater the excavation and collect the oily water. The water was transported to an off-site temporary holding tank until the water could be sampled as a batch. The absorbent pads were disposed of with the excavated soil at Graham Road.

Approximately 21,000 gallons of contaminated water was collected from the excavation by NRC. The water was sampled on March 13, 2017 in accordance with City of Spokane Wastewater Management Division

Industrial Discharge Agreement 16-C0701 (IDA No. 16-C07010). A discharge monitoring report (DMR) and laboratory analysis results for the water are included in Appendix C. On March 22, 2017, Parks received approval and the water was transported by truck to the City of Spokane's Riverside Water Reclamation Facility or Publicly Operated Treatment Works (POTW). The water was discharged to the POTW between March 27 and March 30, 2017. Water discharged to the POTW is combined with the influent and treated before discharge to the Spokane River.

Approximately 500 tons of contaminated soil was removed by T. LaRiviere and transported to Graham Road for disposal. The completed limits of excavation measured approximately 135 feet long by 48 feet wide by 3½ feet deep (Figure). Laboratory analysis results for characterization samples of soil left in place at the excavation extents (RFPNB-1C through RFPNB-6C) are shown on Table 2. The excavation was backfilled with soil from the ice ribbon construction project. As the stockpile was constructed, the footprint of the stockpile eventually exceeded the footprint of the excavation as shown on Figure 4.

Characterization samples indicated that PCS remained in place adjacent to the masonry wall and basalt outcrop to the north. Analytical results also indicated PAHS greater than the MTCA Method A cleanup level in five of the six samples analyzed.

3.3. Ice Ribbon

Construction for the Ice Ribbon started in February 2017. Initial work included leveling the site and excavating for utilities and building footings. Along the alignment of the ice ribbon, the soil was excavated about 2 feet to accommodate the ice ribbon foundation and cooling system. Soil excavated from the site was stockpiled on the North Bank of the Spokane River (Figure 4). Stockpile construction and preparation is discussed in Section 2.1. Approximately 7,000 cubic yards (CY) of soil were hauled from the Ice Ribbon project and stockpiled at the North Bank. Waste profile samples were not collected for the soil removed for the Ice Ribbon project. The soil excavated from the site was generally characterized using the results of the Geotechnical Engineering Evaluation and Environmental Site assessment for the project (GeoEngineers 2016b). As earthwork was completed, characterization samples of soil left in place were collected. Characterization analytical results of samples collected for the Ice Ribbon project are summarized in Table 3 and sample locations are shown on Figure 2.

3.3.1. Soil Characterization Samples

A total of 10 characterization samples were collected for the Ice Ribbon project as shown on Figure 2. Eighty percent of the characterization samples contained PAH concentrations greater than the MTCA Method A cleanup level. In addition, 30 percent of the samples contained lead concentrations greater than the MTCA Method A cleanup level. Soil with lead concentrations greater than the MTCA Method A cleanup level was generally located on the western portion of the site. Other COCs were less than their respective MTCA Method A cleanup levels.

3.4. Looff Carrousel

Construction for the Carrousel began in March 2017. After demolition of the old building, the site was leveled and excavation for the new building foundation commenced. As part of the Looff Carrousel project, an existing 12-inch-diameter water main running from the intersection of Spokane Falls Boulevard and Howard Street to the HSBSC was replaced with an 18-inch-diameter water main. Soil and rock excavated from the site was transported to the North Bank and placed into the temporary stockpile. The soil transported to the stockpile was generally characterized by the results of the Geotechnical Engineering Evaluation and Environmental Site assessment for the project (GeoEngineers 2016c).

Excavation for the building foundation was generally conducted into bedrock and as a result, a limited number of characterization soil samples were collected for the Looff Carrousel Project. Analytical results of soil samples collected for the project are summarized in Table 4 and sample locations are shown on Figure 2.

3.4.1. Waste Profile Samples

On April 24, 2017, four samples (RFPLC-SP1, RFPLC-SP2, RFPLC-SP3 and RFPLC-SP4) were collected from stockpiled soil at the site, which had been excavated to construct the new carrousel building. The results indicated PAH concentrations in three of the four samples and lead concentrations in one sample were greater than the MTCA Method A cleanup levels. As a result, this soil was hauled to the soil stockpile area on the North Bank.

On July 27, 2017, three samples (RFPLC-SP5, RFPLC-SP6 and RFPLC-SP7) were collected from a soil stockpile from a water main excavation through the site. The results indicated that PAHs were greater than the MTCA Method A cleanup level in two of the three samples. As a result, the soil was transported to the soil stockpile and imported fill was used to backfill around the water main.

On this same day, a sample (RFPLC-SP8) was collected from a stockpile of rock and soil excavated from the Looff Carrousel site. Approximately 20 to 30 percent of the stockpile was less than 1-inch-diameter and the soil sample was collected from this portion of the pile. The results indicated PAH concentrations were greater than the MTCA Method A cleanup level, therefore; the soil and rock was transported to the North Bank Stockpile.

3.4.2. Soil Characterization Samples

During excavation, shallow bedrock was encountered through most of the Looff Carrousel site. As a result, much of the excavation for the project was completed in bedrock. The bedrock was considered to be naturally occurring. As a result, minimal characterization samples were collected from the site. Just two characterization samples were collected from the Looff Carrousel site on June 5, 2017. One sample was collected from a utility excavation in the southeast corner of the site, and a second sample was collected under part of the new building where soil was still present.

4.0 SUMMARY

In 2016 and 2017, three construction projects occurred in the southwest portion of the Park. Each project resulted in a net export of soil. Soil from the HSBSC project was disposed offsite at the Graham Road Landfill. Soil from the Ice Ribbon and Looff Carrousel projects was stockpiled in the northern section of the Park. The stockpiled soil is planned to be incorporated into a future construction project at the park and will be reused in accordance with the project SMP.

Characterization samples of soil left in place after construction activities were collected and summarized in the attached tables. A geographic information system (GIS) database has been developed for this project to document soil samples collected during construction activities. The database is maintained by

GeoEngineers and can be utilized by the city to identify contaminated soil left in place at Riverfront Park in future.

5.0 REFERENCES

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TABLES

Table 1

Soil Chemical Analytical Data - TPH, Metals, PAHs, PCBs[1]

Riverfront Park - Howard Street Bridge
Spokane, Washington

Analyte Group	Analyte	Units	Twice the Spokane Basin Background Metal Concentration[2]	MTCA Method A CUL[3]	Location ID, Sample Date and Depth Interval									
					HSBTP-1	**HSBTP-2**	**HSBTP-3**	**HSBTP-4**	**HSBTP-5**	**HSBTP-6C**	**HSBTP-7C**	**HSBTP-8C**	**HSBRS-1**	**HSBRS-2**
					8/22/2016	**8/22/2016**	**8/22/2016**	**8/22/2016**	**8/22/2016**	**9/16/2016**	**9/22/2016**	**5/15/2017**	**11/29/2016**	**2/9/2017**
					2 - 2.5 ft	**1.5 - 2 ft**	**2 - 2.5 ft**	**1.5 - 2 ft**	**1 - 1.5 ft**	**0 - 0.5 ft**	**0 - 0.5 ft**	**6 ft**	**0 - 0.5 ft**	**NA**
				Justification	**Profile for Disposal**	**Profile for Disposal**	**Profile for Disposal**	**Profile for Disposal**	**Profile for Disposal**	**Confirmation Sample**	**Confirmation Sample**	**Confirmation Sample**	**Profile for Disposal**	**Profile for Disposal**
				Fate	**Graham Road**	**Graham Road**	**Graham Road**	**Graham Road**	**Graham Road**	**Left In-place**	**Left In-place**	**Left In-place**	**Left In-place**	**Spokane Rock Products**
TPH[4]	Diesel-range Hydrocarbons	mg/Kg	NA	2,000	97 U	96 U	100 U	110 U	110 U	100 U	100 U	100 U	110 U	110 U
	Gasoline-range Hydrocarbons	mg/Kg	NA	100	39 U	38 U	40 U	42 U	43 U	41 U	40 U	42 U	44 U	42 U
	Lube Oil-range Hydrocarbons	mg/Kg	NA	2,000	97 U	**110**	**180**	110 U	110 U	**410**	100 U	100 U	**870**	110 U
Metals[5]	Arsenic	mg/Kg	18.68	20	**9.9 J**	**12**	**11**	**9.1**	**11**	**13**	**9.5**	**8.1**	**11**	7.9 U
	Barium	mg/Kg	NE	NE	**34 J**	**100**	**50**	**71**	**55**	**100**	**39**	**87**	**63**	**100 J**
	Cadmium	mg/Kg	1.4	2	0.49 U	0.54 U	0.50 U	0.53 U	0.50 U	2.7 U	0.63 U	0.88 U	**1.8**	3.9 U
	Chromium	mg/Kg	35.6	2,000[6]	**7.8 J**	**9.7**	**8.9**	**9.5**	**8.3**	**10**	**6.7**	**14**	**11**	**6.0**
	Lead	mg/Kg	29.8	250	**6.2 J**	**190**	**11**	**69**	**55**	**390**	**11**	**130**	**240**	7.9 U
	TCLP Lead[7]	mg/L	NE	5	--	--	--	--	--	--	--	**--**	**18**	**--**
	Mercury	ug/Kg	40	2,000	36 U	**150**	33 U	**190**	38 U	**410**	48 U	**210 J**	40 U	44 U
	Selenium	mg/Kg	NE	NE	2.3 U	2.6 U	2.4 U	2.5 U	2.4 U	13 U	3 U	4.2 U	5.2 U	19 U
	Silver	mg/Kg	NE	NE	0.49 U	0.54 U	0.50 U	0.53 U	0.50 U	2.7 U	2.3 U	0.88 U	1.1 U	3.9 U
PAHs[8]	1-Methylnaphthalene	µg/Kg	NA	NE	10 U	**26**	9.9 U	10 U	**16**	**120**	9.9 U	11 U	11 U	13 U
	2-Methylnaphthalene	µg/Kg	NA	NE	10 U	**34**	9.9 U	**11**	**19**	**110**	9.9 U	11 U	**16**	13 U
	Naphthalene	µg/Kg	NA	NE	10 U	**24**	9.9 U	**14**	**12**	**89**	9.9 U	11 U	**11**	13 U
	Total Naphthalene	µg/Kg	NA	5,000[9]	10 U	**84**	9.9 U	**35**	**47**	**319**	9.9 U	11 U	**27**	26 U
	Acenaphthene	µg/Kg	NA	NE	10 U	9.9 U	9.9 U	**10**	**13**	**490**	9.9 U	**16**	11 U	13 U
	Acenaphthylene	µg/Kg	NA	NE	10 U	**37**	9.9 U	**73**	**18**	**240**	9.9 U	11 U	11 U	13 U
	Anthracene	µg/Kg	NA	NE	10 U	**43**	9.9 U	**110**	**38**	**1,600**	9.9 U	**39**	11 U	13 U
	Benzo(a)anthracene	µg/Kg	NA	NE	10 U	**200**	9.9 U	**270**	**94**	**2,600**	9.9 U	**110**	**21**	13 U
	Benzo(a)pyrene	µg/Kg	NA	100	10 U	**230**	9.9 U	**350**	**100**	**2,700**	**9.9**	**110**	**38**	13 U
	Benzo(b)fluoranthene	µg/Kg	NA	NE	10 U	**290**	**13**	**360**	**110**	**3,400**	**12**	**130**	**54**	13 U
	Benzo(g,h,i)perylene	µg/Kg	NA	NE	10 U	**180**	9.9 U	**220**	**69**	**1,500**	9.9 U	**57**	**32**	13 U
	Benzo(k)fluoranthene	µg/Kg	NA	NE	10 U	**110**	9.9 U	**140**	**40**	**980**	9.9 U	**52**	**17**	13 U
	Chrysene	µg/Kg	NA	NE	10 U	**220**	9.9 U	**300**	**120**	**2,400**	9.9 U	**120**	**32**	13 U
	Dibenzo(a,h)anthracene	µg/Kg	NA	NE	10 U	**52**	9.9 U	**60**	**18**	**360**	9.9 U	**19**	**11**	13 U
	Fluoranthene	µg/Kg	NA	NE	10 U	**390**	9.9 U	**480**	**220**	**6,100**	**12**	**210**	**29**	13 U
PAHs[8]	Fluorene	µg/Kg	NA	NE	10 U	9.9 U	9.9 U	**13**	11 U	**340**	9.9 U	**13**	11 U	13 U
	Indeno(1,2,3-c,d)pyrene	µg/Kg	NA	NE	10 U	**150**	9.9 U	**180**	**50**	**1,200**	9.9 U	**47**	**21**	13 U
	Phenanthrene	µg/Kg	NA	NE	10 U	**160**	9.9 U	**300**	**180**	**5,100**	9.9 U	**120**	**20**	13 U
	Pyrene	µg/Kg	NA	NE	10 U	**380**	9.9 U	**540**	**210**	**5,400**	**14**	**220**	**38**	13 U
	Total cPAH TEQ[10] (ND=0.5RL)[11]	µg/Kg	NA	100	8 U	**312**	**8.28**	**454**	**132**	**3,578**	**13**	**147**	**51**	10 U

Analyte Group	Analyte	Units	Twice the Spokane Basin Background Metal Concentration[2]	MTCA Method A CUL[3]	Location ID, Sample Date and Depth Interval									
					HSBTP-1 8/22/2016 2 - 2.5 ft	HSBTP-2 8/22/2016 1.5 - 2 ft	HSBTP-3 8/22/2016 2 - 2.5 ft	HSBTP-4 8/22/2016 1.5 - 2 ft	HSBTP-5 8/22/2016 1 - 1.5 ft	HSBTP-6C 9/16/2016 0 - 0.5 ft	HSBTP-7C 9/22/2016 0 - 0.5 ft	HSBTP-8C 5/15/2017 6 ft	HSBRS-1 11/29/2016 0 - 0.5 ft	HSBRS-2 2/9/2017 NA
				Justification	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal	Confirmation Sample	Confirmation Sample	Confirmation Sample	Profile for Disposal	Profile for Disposal
				Fate	Graham Road	Graham Road	Graham Road	Graham Road	Graham Road	Left In-place	Left In-place	Left In-place	Left In-place	Spokane Rock Products
PCBs[12]	PCB-Aroclor 1016	µg/Kg	NA	NE	--	--	--	--	--	--	--	--	11 U	--
	PCB-Aroclor 1221	µg/Kg	NA	NE	--	--	--	--	--	--	--	--	11 U	--
	PCB-Aroclor 1232	µg/Kg	NA	NE	--	--	--	--	--	--	--	--	11 U	--
	PCB-Aroclor 1242	µg/Kg	NA	NE	--	--	--	--	--	--	--	--	11 U	--
	PCB-Aroclor 1248	µg/Kg	NA	NE	--	--	--	--	--	--	--	--	11 U	--
	PCB-Aroclor 1254	µg/Kg	NA	NE	--	--	--	--	--	--	--	--	11 U	--
	PCB-Aroclor 1260	µg/Kg	NA	NE	--	--	--	--	--	--	--	--	11 U	--
	PCB-Aroclor 1262	µg/Kg	NA	NE	--	--	--	--	--	--	--	--	11 U	--
	PCB-Aroclor 1268	µg/Kg	NA	NE	--	--	--	--	--	--	--	--	11 U	--
	Total PCBs	µg/Kg	NA	1,000[13]	--	--	--	--	--	--	--	--	11 U	--

Analyte Group	Analyte	Units	Twice the Spokane Basin Background Metal Concentration[2]	MTCA Method A CUL[3]	HSBTS-1 9/8/2016 0 - 0.5 ft	HSBSB-1 2/2/2017 0 - 0.5 ft	HSBSS-1 2/9/2017 NA	HSBSS-2 2/9/2017 NA	HSBSS-3 2/9/2017 NA
				Justification	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal
				Fate	Spokane Rock Products	Graham Road	Graham Road	Graham Road	Graham Road
TPH[4]	Diesel-range Hydrocarbons	mg/Kg	NA	2,000	500 U	100 U	--	--	--
	Gasoline-range Hydrocarbons	mg/Kg	NA	100	200 U	42 U	--	--	--
	Lube Oil-range Hydrocarbons	mg/Kg	NA	2,000	500 U	**280 J**	--	--	--
Metals[5]	Arsenic	mg/Kg	18.68	20	**1.4**	**7.8**	--	--	--
	Barium	mg/Kg	NE	NE	**9.3**	**82**	--	--	--
	Cadmium	mg/Kg	1.4	2	**1.5**	0.65 U	0.54 U	0.61 U	**0.76**
	Chromium	mg/Kg	35.6	2,000[6]	**1.4**	**9.9**	--	--	--
	Lead	mg/Kg	29.8	250	**24**	**80**	**37**	**58**	**86**
	TCLP Lead[7]	mg/L	NE	5	--	--	--	--	--
	Mercury	ug/Kg	40	2,000	40 U	**150**	--	--	--
	Selenium	mg/Kg	NE	NE	2.6 U	3.1 U	--	--	--
	Silver	mg/Kg	NE	NE	0.54 U	0.65 U	--	--	--
PAHs[8]	1-Methylnaphthalene	µg/Kg	NA	NE	310 U	18 U	--	--	--
	2-Methylnaphthalene	µg/Kg	NA	NE	310 U	18 U	--	--	--
	Naphthalene	µg/Kg	NA	NE	310 U	18 U	--	--	--
	Total Naphthalene	µg/Kg	NA	5,000[9]	310 U	18 U	--	--	--
	Acenaphthene	µg/Kg	NA	NE	310 U	**27**	--	--	--
	Acenaphthylene	µg/Kg	NA	NE	310 U	**39**	--	--	--
	Anthracene	µg/Kg	NA	NE	310 U	**98**	--	--	--
	Benzo(a)anthracene	µg/Kg	NA	NE	310 U	**180**	--	--	--
	Benzo(a)pyrene	µg/Kg	NA	100	310 U	**190**	--	--	--
	Benzo(b)fluoranthene	µg/Kg	NA	NE	310 U	**240**	--	--	--
	Benzo(g,h,i)perylene	µg/Kg	NA	NE	310 U	**130**	--	--	--
	Benzo(k)fluoranthene	µg/Kg	NA	NE	310 U	**79**	--	--	--
	Chrysene	µg/Kg	NA	NE	310 U	**200**	--	--	--
	Dibenzo(a,h)anthracene	µg/Kg	NA	NE	310 U	**29**	--	--	--
	Fluoranthene	µg/Kg	NA	NE	310 U	**330**	--	--	--
PAHs[8]	Fluorene	µg/Kg	NA	NE	310 U	**21**	--	--	--
	Indeno(1,2,3-c,d)pyrene	µg/Kg	NA	NE	310 U	**80**	--	--	--
	Phenanthrene	µg/Kg	NA	NE	310 U	**240**	--	--	--
	Pyrene	µg/Kg	NA	NE	310 U	**380**	--	--	--
	Total cPAH TEQ[10] (ND=0.5RL)[11]	µg/Kg	NA	100	234 U	**253**	--	--	--

Analyte Group	Analyte	Units	Twice the Spokane Basin Background Metal Concentration[2]	MTCA Method A CUL[3]	HSBTS-1 9/8/2016 0 - 0.5 ft	HSBSB-1 2/2/2017 0 - 0.5 ft	HSBSS-1 2/9/2017 NA	HSBSS-2 2/9/2017 NA	HSBSS-3 2/9/2017 NA
				Justification	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal
				Fate	Spokane Rock Products	Graham Road	Graham Road	Graham Road	Graham Road
PCBs[12]	PCB-Aroclor 1016	µg/Kg	NA	NE	--	--	--	--	--
	PCB-Aroclor 1221	µg/Kg	NA	NE	--	--	--	--	--
	PCB-Aroclor 1232	µg/Kg	NA	NE	--	--	--	--	--
	PCB-Aroclor 1242	µg/Kg	NA	NE	--	--	--	--	--
	PCB-Aroclor 1248	µg/Kg	NA	NE	--	--	--	--	--
	PCB-Aroclor 1254	µg/Kg	NA	NE	--	--	--	--	--
	PCB-Aroclor 1260	µg/Kg	NA	NE	--	--	--	--	--
	PCB-Aroclor 1262	µg/Kg	NA	NE	--	--	--	--	--
	PCB-Aroclor 1268	µg/Kg	NA	NE	--	--	--	--	--
	Total PCBs	µg/Kg	NA	1,000[13]	--	--	--	--	--

Notes

[1] Samples analyzed by TestAmerica Laboratories, Inc. located in Spokane Valley, Washington.

[2] Background level used for metals in soil is the Washington State Department of Ecology Natural Background 90th Percentile Value for the Spokane Basin (Ecology 1994).

[3] Model Toxics Control Act (MTCA) Method A unrestricted land use cleanup levels (CUL).

[4] Total Petroleum Hydrocarbons (TPH) analyzed using Method Northwest Method TPH-HCID.

[5] Metals analyzed using Environmental Protection Agency (EPA) Method 6010C. Mercury analyzed using EPA Method 7471B.

[6] Chromium III cleanup level. MTCA Method A cleanup level for Chromium VI is 19 mg/kg.

[7] Toxicity Characteristic Leaching Procedure (TCLP): Samples extracted using EPA Method 1311 and analyzed by EPA Method 6020A and/or EPA Method 7470A.

[8] Polycyclic aromatic hydrocarbons analyzed using EPA Method 8270D.

[9] Cleanup level based on protection of groundwater for drinking water use, using the procedures described in WAC 173-340-747(4). This is a total value for napthalene, 1-methyl napthalene and 2-methyl napthalene.

[10] Carcinogenic PAH (cPAH) toxic equivalency (TEQ) calculated using toxicity equivalency factors (TEF) from MTCA Table 708-2, based on methodology described in MTCA Cleanup Regulation Washington Administrative Code (WAC) 173-340-708.

[11] The TEQ reported was calculated using half the laboratory reporting limits for cPAHs less than reporting limits.

[12] PCBs analyzed using EPA Method 8082A.

[13] Cleanup level based on applicable federal law (40 C.F.R. 761.61). This is a total value for all PCBs.

-- = not tested; mg/kg = milligrams per kilogram; ND = non-detect; RL = reporting limit; NE = not established; NA = Not Applicable; ft = feet

ug/kg = micrograms per kilogram; mg/L = milligrams per liter; U = analyte was not detected above the laboratory reporting limit; J = estimated result.

Bold indicates that the analyte was detected above the reporting limit.

⬜ Shading indicates that the analyte was detected above the MTCA Method A CUL.

🟨 Gold shading indicates reporting limit for this specific compound is greater than the MTCA Method A CUL.

🟦 Blue shading indicates the reported concentration was greater than twice the Spokane Basin background metals concentration (Ecology 1994).

Justification is the reason to collect the sample and fate indicates where the soil that is represented by that sample is located after construction activities.

Table 2

Soil Chemical Analytical Data - TPH, Metals, PAHs & PCBs[1]

Riverfront Park - North Bank Remedial Excavation
Spokane, Washington

Analyte Group	Analyte	Units	Twice the Spokane Basin Background Metal Concentration[2]	MTCA Method A CUL[3]	Location ID, Date and Depth Interval					
					RFPNB-1C 3/7/2017 1.5 - 2 ft	**RFPNB-2C 3/7/2017 2.5 - 3 ft**	**RFPNB-3C 3/7/2017 2.5 - 3 ft**	**RFPNB-4C 3/9/2017 3 - 3.5 ft**	**RFPNB-5C 3/9/2017 1.5 - 2 ft**	**RFPNB-6C 3/10/2017 1 - 1.5 ft**
				Justification	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**
				Fate	**Left In-place**	**Left In-place**	**Left In-place**	**Left In-place**	**Left In-place**	**Left In-place**
TPH[4]	Diesel-range Hydrocarbons	mg/Kg	NA	2,000	**12,000 J**	**1,900 J**	**190 J**	**9,600 J**	**260**	**970**
	Lube Oil-range Hydrocarbons	mg/Kg	NA	2,000	**17,000**	**4,200**	**360**	**13,000**	**500**	**3,600**
Metals[5]	Cadmium	mg/Kg	1.4	2	0.60 U	**0.70**	0.52 U	1.1 U	1.3 U	**0.62**
	Lead	mg/Kg	29.8	250	**910**	**90**	**20**	**42**	**77**	**160**
PAHs[6]	1-Methylnaphthalene	µg/Kg	NA	NE	**240**	**96**	**88**	**130**	**260**	**120**
	2-Methylnaphthalene	µg/Kg	NA	NE	**240**	**110**	**73**	**140**	**310**	**130**
	Naphthalene	µg/Kg	NA	NE	160 U	**78**	**28**	**82**	**100**	**130**
	Total Naphthalene	µg/Kg	NA	5,000[7]	**640**	**284**	**189**	**352**	**670**	**380**
	Acenaphthene	µg/Kg	NA	NE	160 U	**25**	11 U	**17**	**18**	110 U
	Acenaphthylene	µg/Kg	NA	NE	160 U	**31**	11 U	**36**	13 U	110 U
	Anthracene	µg/Kg	NA	NE	**210**	**58**	**12**	**130**	**24**	**140**
	Benzo(a)anthracene	µg/Kg	NA	NE	160 U	**100**	**28**	**120**	**59**	**160**
	Benzo(a)pyrene	µg/Kg	NA	100	160 U	**120**	**29**	**210**	**90**	**220**
	Benzo(b)fluoranthene	µg/Kg	NA	NE	160 U	**190**	**51**	**210**	**140**	**340**
	Benzo(g,h,i)perylene	µg/Kg	NA	NE	160 U	**130**	**20**	**150**	**75**	**130**
	Benzo(k)fluoranthene	µg/Kg	NA	NE	160 U	**61**	**16**	**210**	**28**	**120**
	Chrysene	µg/Kg	NA	NE	160 U	**140**	**50**	**170**	**130**	**400**
	Dibenzo(a,h)anthracene	µg/Kg	NA	NE	160 U	**32**	11 U	54 U	**57**	110 U
	Fluoranthene	µg/Kg	NA	NE	160 U	**200**	**41**	**180**	**62**	**280**
	Fluorene	µg/Kg	NA	NE	160 U	**20**	11 U	**38**	**30**	110 U
	Indeno(1,2,3-c,d)pyrene	µg/Kg	NA	NE	160 U	**95**	**17**	**130**	**49**	110 U
	Phenanthrene	µg/Kg	NA	NE	**250**	**240**	**67**	**180**	**300**	**360**
	Pyrene	µg/Kg	NA	NE	**270**	**230**	**57**	**430**	**89**	**420**
	Total cPAH TEQ[8] (ND=0.5RL)[9]	µg/Kg	NA	100	**121**	**169**	**41**	**281**	**125**	**297**

Analyte Group	Analyte	Units	Twice the Spokane Basin Background Metal Concentration[2]	MTCA Method A CUL[3]	Location ID, Date and Depth Interval RFPNB-1C 3/7/2017 1.5 - 2 ft	RFPNB-2C 3/7/2017 2.5 - 3 ft	RFPNB-3C 3/7/2017 2.5 - 3 ft	RFPNB-4C 3/9/2017 3 - 3.5 ft	RFPNB-5C 3/9/2017 1.5 - 2 ft	RFPNB-6C 3/10/2017 1 - 1.5 ft
				Justification	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**
				Fate	**Left In-place**	**Left In-place**	**Left In-place**	**Left In-place**	**Left In-place**	**Left In-place**
PCBs[10]	PCB-Aroclor 1016	µg/Kg	NA	NE	12 U	12 U	11 U	--	--	--
	PCB-Aroclor 1221	µg/Kg	NA	NE	12 U	12 U	11 U	--	--	--
	PCB-Aroclor 1232	µg/Kg	NA	NE	12 U	12 U	11 U	--	--	--
	PCB-Aroclor 1242	µg/Kg	NA	NE	12 U	12 U	11 U	--	--	--
	PCB-Aroclor 1248	µg/Kg	NA	NE	12 U	12 U	11 U	--	--	--
	PCB-Aroclor 1254	µg/Kg	NA	NE	12 U	12 U	11 U	--	--	--
	PCB-Aroclor 1260	µg/Kg	NA	NE	12 U	12 U	11 U	--	--	--
	PCB-Aroclor 1262	µg/Kg	NA	NE	12 U	12 U	11 U	--	--	--
	PCB-Aroclor 1268	µg/Kg	NA	NE	12 U	12 U	11 U	--	--	--
	Total PCBs	µg/Kg	NA	1,000[11]	12 U	12 U	11 U	--	--	--

Notes

[1] Samples analyzed by TestAmerica Laboratories, Inc. located in Spokane Valley, Washington.

[2] Background level used for metals in soil is the Washington State Department of Ecology Natural Background 90th Percentile Value for the Spokane Basin (Ecology 1994).

[3] Model Toxics Control Act (MTCA) Method A unrestricted land use cleanup levels (CUL).

[4] Total Petroleum Hydrocarbons (TPH) analyzed using Method Northwest Method TPH-Dx.

[5] Metals analyzed using Environmental Protection Agency (EPA) Method 6010C.

[6] Polycyclic aromatic hydrocarbons analyzed using EPA Method 8270D.

[7] Cleanup level based on protection of groundwater for drinking water use, using the procedures described in WAC 173-340-747(4). This is a total value for naphthalene, 1-methyl naphthalene and 2-methyl naphthalene.

[8] Carcinogenic PAH (cPAH) toxic equivalency (TEQ) calculated using toxicity equivalency factors (TEF) from MTCA Table 708-2, based on methodology described in MTCA Cleanup Regulation Washington Administrative Code (WAC) 173-340-708.

[9] The TEQ reported was calculated using half the laboratory reporting limits for cPAHs less than reporting limits.

[10] PCBs analyzed using EPA Method 8082A.

[11] Cleanup level based on applicable federal law (40 C.F.R. 761.61). This is a total value for all PCBs.

-- = not tested; J = estimated result; mg/kg = milligrams per kilogram; NE = not established; ug/kg = micrograms per kilogram; U = analyte was not detected above the laboratory reporting limit; NA = Not Applicable; ft = feet

Bold indicates that the analyte was detected above the reporting limit.

⬜ Shading indicates that the analyte was detected above the MTCA Method A CUL.

🟨 Gold shading indicates reporting limit for this specific compound is greater than the MTCA Method A CUL.

🟦 Blue shading indicates the reported concentration was greater than twice the Spokane Basin background metals concentration (Ecology 1994).

Justification is the reason to collect the sample and fate indicates where the soil that is represented by that sample is located after construction activities.

Table 3

Soil Chemical Analytical Data - TPH, Metals, PAHs[1]

Riverfront Park - Ice Ribbon
Spokane, Washington

Analyte Group	Analyte	Units	Twice the Spokane Basin Background Metal Concentration[2]	MTCA Method A CUL[3]	Location ID, Date and Depth									
				Justification Fate	**RFPIR-1C 3/6/2017 3 ft Characterization Sample Left In-place**	**RFPIR-2C 3/6/2017 0 ft Characterization Sample Left In-place**	**RFPIR-3C 3/6/2017 3 ft Characterization Sample Left In-place**	**RFPIR-4C 3/6/2017 0 ft Characterization Sample Left In-place**	**RFPIR-5C 3/21/2017 2 ft Characterization Sample Left In-place**	**RFPIR-6C 3/21/2017 2 ft Characterization Sample Left In-place**	**RFPIR-7C 4/6/2017 1 ft Characterization Sample Left In-place**	**RFPIR-8C 4/6/2017 1 ft Characterization Sample Left In-place**	**RFPIR-9C 4/6/2017 1 ft Characterization Sample Left In-place**	**RFPIR-10C 4/24/2017 3 ft Characterization Sample Left In-place**
TPH[4]	Diesel-range Hydrocarbons	mg/Kg	NA	2,000	**23 J**	**20 J**	**530 J**	99 U	110 U	**17**	**68**	**43**	**65**	**41 J**
	Lube Oil-range Hydrocarbons	mg/Kg	NA	2,000	**180**	**120**	**190**	**1,100**	**590**	**140**	**780**	**270**	**310**	**310**
Metals[5]	Arsenic	mg/Kg	18.68	20	**7.9**	**7.7**	**8.3**	**9.6**	**13**	**11**	**8.7**	**6.6**	**7.6**	**8.7**
	Barium	mg/Kg	NE	NE	**56**	**53**	**56**	**47**	**150**	**79**	**75**	**59**	**130**	**73**
	Cadmium	mg/Kg	1.4	2	0.44 U	0.48 U	0.4 U	0.48 U	**1.3**	0.57 U	2.5 U	2.4 U	2.8 U	2.6 U
	Chromium	mg/Kg	35.6	2,000[6]	**9.3**	**6.3**	**10**	**9.9**	**11**	**11**	**9.3**	**7.9**	**9.2**	**11**
	Lead	mg/Kg	29.8	250	**31**	**16**	**28**	**40**	**490**	**820**	**310**	**43**	**100**	**79**
	Mercury	ug/Kg	40	2,000	**110**	33 U	**120**	**36**	**420**	**140**	**650**	**66**	**170**	**82**
	Selenium	mg/Kg	NE	NE	2.1 U	2.3 U	1.9 U	2.3 U	4.8 U	2.7 U	12 U	12 U	13 U	13 U
	Silver	mg/Kg	NE	NE	0.44 U	0.48 U	0.4 U	0.48 U	1 U	0.57 U	2.5 U	2.4 U	2.8 U	2.6 U
PAHs[7]	1-Methylnaphthalene	ug/Kg	NA	NE	**160**	11 U	56 U	200 U	110 U	22 U	57 U	**13**	**17**	**38**
	2-Methylnaphthalene	ug/Kg	NA	NE	**190**	11 U	56 U	200 U	110 U	22 U	57 U	**18**	**22**	**50**
	Naphthalene	ug/Kg	NA	NE	**260**	11 U	56 U	200 U	110 U	22 U	57 U	11 U	**14**	**50**
	Total Naphthalene	ug/Kg	NA	5,000[8]	**610**	11 U	56 U	200 U	110 U	22 U	57 U	11 U	**53**	**138**
	Acenaphthene	ug/Kg	NA	NE	**67**	11 U	56 U	200 U	110 U	22 U	57 U	**17**	**19**	**56**
	Acenaphthylene	ug/Kg	NA	NE	**55**	11 U	56 U	200 U	110 U	**28**	**120**	**43**	**44**	**37**
	Anthracene	ug/Kg	NA	NE	**230**	**18**	56 U	200 U	**170**	**47**	**180**	**69**	**68**	**330**
	Benzo(a)anthracene	ug/Kg	NA	NE	**700**	**35**	56 U	200 U	**440**	**150**	**430**	**200**	**240**	**360**
	Benzo(a)pyrene	ug/Kg	NA	100	**930**	**44**	**56**	200 U	**570**	**170**	**510**	**200**	**250**	**350**
	Benzo(b)fluoranthene	ug/Kg	NA	NE	**1,200**	**53**	**81**	200 U	**670**	**220**	**760**	**300**	**360**	**470**
	Benzo(g,h,i)perylene	ug/Kg	NA	NE	**480**	**21**	56 U	200 U	**330**	**85**	**240**	**82**	**110**	**120**
	Benzo(k)fluoranthene	ug/Kg	NA	NE	**400**	**26**	56 U	200 U	**270**	**86**	**290**	**110**	**140**	**180**
	Chrysene	ug/Kg	NA	NE	**800**	**42**	56 U	200 U	**520**	**160**	**550**	**200**	**260**	**340**
	Dibenzo(a,h)anthracene	ug/Kg	NA	NE	**140**	11 U	56 U	200 U	110 U	**26**	**87**	**27**	**35**	**44**
	Fluoranthene	ug/Kg	NA	NE	**1,100**	**68**	**73**	**230**	**820**	**290**	**870**	**370**	**420**	**750**
	Fluorene	ug/Kg	NA	NE	**80**	11 U	56 U	200 U	110 U	22 U	57 U	**14**	**17**	**110**
	Indeno(1,2,3-c,d)pyrene	ug/Kg	NA	NE	**430**	**17**	56 U	200 U	**260**	**75**	**230**	**79**	**95**	**120**

Analyte Group	Analyte	Units	Twice the Spokane Basin Background Metal Concentration[2]	MTCA Method A CUL[3]	Location ID, Date and Depth									
					RFPIR-1C 3/6/2017 3 ft	**RFPIR-2C 3/6/2017 0 ft**	**RFPIR-3C 3/6/2017 3 ft**	**RFPIR-4C 3/6/2017 0 ft**	**RFPIR-5C 3/21/2017 2 ft**	**RFPIR-6C 3/21/2017 2 ft**	**RFPIR-7C 4/6/2017 1 ft**	**RFPIR-8C 4/6/2017 1 ft**	**RFPIR-9C 4/6/2017 1 ft**	**RFPIR-10C 4/24/2017 3 ft**
				Justification	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**	**Characterization Sample**
				Fate	**Left In-place**	**Left In-place**	**Left In-place**	**Left In-place**	**Left In-place**	**Left In-place**	**Left In-place**	**Left In-place**	**Left In-place**	**Left In-place**
PAHs[7]	Phenanthrene	ug/Kg	NA	NE	**720**	**56**	56 U	**260**	**540**	**160**	**580**	**190**	**210**	**790**
	Pyrene	ug/Kg	NA	NE	**1,200**	**75**	**100**	**270**	**960**	**290**	**980**	**390**	**510**	**710**
	Total cPAH TEQ[9] (ND=0.5RL)[10]	ug/Kg	NA	100	**1,225**	**58**	**76**	151 U	**745**	**227**	**695**	**274**	**340**	**471**

Notes

[1] Samples analyzed by TestAmerica Laboratories, Inc. located in Spokane Valley, Washington.

[2] Background level used for metals in soil is the Washington State Department of Ecology Natural Background 90th Percentile Value for the Spokane Basin (Ecology 1994).

[3] Model Toxics Control Act (MTCA) Method A unrestricted land use cleanup levels (CUL).

[4] Total Petroleum Hydrocarbons (TPH) analyzed using Method Northwest Method TPH-HCID.

[5] Metals analyzed using Environmental Protection Agency (EPA) Method 6010C. Mercury analyzed using EPA Method 7471B.

[6] Chromium III cleanup level. MTCA Method A cleanup level for Chromium VI is 19 mg/kg.

[7] Polycyclic aromatic hydrocarbons (PAHs) analyzed using EPA Method 8270DSIM.

[8] Sum total value for naphthalene, 1-methyl naphthalene and 2-methyl naphthalene.

[9] Carcinogenic PAH (cPAH) toxic equivalency (TEQ) calculated using toxicity equivalency factors (TEF) from MTCA Table 708-2, based on methodology described in MTCA Cleanup Regulation Washington Administrative Code (WAC) 173-340-708.

[10] The TEQ reported was calculated using half the laboratory reporting limits for cPAHs less than reporting limits.

J = estimated result; mg/kg = milligrams per kilogram; ND = non-detect; NE = not established; RL = reporting limit; NA = Not Applicable; ft = feet

ug/kg = micrograms per kilogram; U = analyte was not detected above the laboratory reporting limit.

Bold indicates that the analyte was detected above the reporting limit.

▨ **Bold** and shaded indicates that the analyte was detected above the MTCA Method A CUL.

🟨 Gold shading indicates analyte was not detected above the reporting limit, but the concentration was greater than or equal to the MTCA Method A CUL.

🟦 Blue shading indicates the reported concentration was greater than twice the Spokane Basin background metals concentration (Ecology 1994).

Justification is the reason to collect the sample and fate indicates where the soil that is represented by that sample is located after construction activities.

Table 4

Soil Chemical Analytical Data - TPH, Metals, PAHs[1]

Riverfront Park - Looff Carousel
Spokane, Washington

					Location ID, Date and Depth Interval									
				MTCA Method A CUL[3]	RFPLC-1C 6/5/2017 2-2.5 ft	RFPLC-2C 6/5/2017 2-2.5 ft	RFPLC-SP1 4/24/2017 NA	RFPLC-SP2 4/24/2017 NA	RFPLC-SP3 4/24/2017 NA	RFPLC-SP4 4/24/2017 NA	RFPLC-SP5 7/27/2017 NA	RFPLC-SP6 7/27/2017 NA	RFPLC-SP7 7/27/2017 NA	RFPLC-SP8 7/27/2017 NA
			Twice the Spokane Basin Background Metal Concentration[2]	Justification	Characterization Sample	Characterization Sample	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal
Analyte Group	Analyte	Units		Fate	Left In-place	Left In-place	North Bank Stockpile	North Bank Stockpile	North Bank Stockpile	North Bank Stockpile	North Bank Stockpile	North Bank Stockpile	North Bank Stockpile	North Bank Stockpile
TPH[4]	Diesel-range Hydrocarbons	mg/Kg	NA	2,000	**23 J**	11 U	**31**	**24**	**11**	**25**	--	--	--	--
	Lube Oil-range Hydrocarbons	mg/Kg	NA	2,000	**200**	27 U	**240**	**180**	**65**	**160**	--	--	--	--
Metals[5]	Arsenic	mg/Kg	18.68	20	**15**	**19**	--	--	--	--	**7.1**	**6.7**	**9.7**	**10**
	Barium	mg/Kg	NE	NE	**76**	**62**	--	--	--	--	**75**	**120**	**110**	**100**
	Cadmium	mg/Kg	1.4	2	1.1 U	1.1 U	2.7 U	2.6 U	1.8 U	3.0 U	0.84 U	0.93 U	1.1 U	5.2 U
	Chromium	mg/Kg	35.6	2,000[6]	**11**	**10**	--	--	--	--	**8.7**	**12**	**13**	**12**
	Lead	mg/Kg	29.8	250	**64 J**	**7.7**	**420**	**190**	**73**	**140**	**74**	**58**	**81**	**85**
	Mercury	ug/Kg	40	2,000	**110**	41 U	--	--	--	--	**260 J**	**67**	**110**	**240**
	Selenium	mg/Kg	NE	NE	5.3 U	5.3 U	--	--	--	--	4.0 U	4.4 U	26 U	25 U
	Silver	mg/Kg	NE	NE	1.1 U	1.1 U	--	--	--	--	0.84 U	0.93 U	1.1 U	5.2 U
PAHs[7]	1-Methylnaphthalene	ug/Kg	NA	NE	**19**	11 U	10 U	12 U	8.4 U	13 U	52 U	9.9 U	10 U	**25**
	2-Methylnaphthalene	ug/Kg	NA	NE	**17**	11 U	10 U	12 U	8.4 U	13 U	52 U	9.9 U	10 U	**26**
	Naphthalene	ug/Kg	NA	NE	**14**	11 U	10 U	12 U	8.4 U	13 U	52 U	9.9 U	10 U	**35**
	Total Naphthalenes	ug/Kg	NA	5,000[8]	**31**	11 U	10 U	12 U	8.4 U	13 U	52 U	9.9 U	10 U	**86**
	Acenaphthene	ug/Kg	NA	NE	**69**	11 U	10 U	12 U	8.4 U	**19**	52 U	9.9 U	10 U	**100**
	Acenaphthylene	ug/Kg	NA	NE	**120**	11 U	10 U	**35**	**28**	**96**	52 U	**12**	**11**	**150**
	Anthracene	ug/Kg	NA	NE	**190**	11 U	10 U	**32**	**64**	**80**	52 U	**22**	**13**	**380**
	Benzo(a)anthracene	ug/Kg	NA	NE	**500**	11 U	**35**	**130**	**190**	**330**	**110**	**76**	**57**	**720**
	Benzo(a)pyrene	ug/Kg	NA	100	**550**	11 U	**43**	**140**	**190**	**350**	**130**	**95**	**70**	**800**
	Benzo(b)fluoranthene	ug/Kg	NA	NE	**620**	11 U	**56**	**170**	**240**	**420**	**140**	**120**	**79**	**850**
	Benzo(g,h,i)perylene	ug/Kg	NA	NE	**270**	11 U	**24**	**59**	**82**	**130**	**120**	**62**	**45**	**420**
	Benzo(k)fluoranthene	ug/Kg	NA	NE	**240**	11 U	**22**	**73**	**94**	**170**	**54**	**47**	**30**	**350**
	Chrysene	ug/Kg	NA	NE	**540**	11 U	**47**	**120**	**190**	**290**	**140**	**94**	**67**	**810**
	Dibenzo(a,h)anthracene	ug/Kg	NA	NE	**86**	11 U	10 U	**20**	**26**	**43**	52 U	**18**	**13**	**110**
	Fluoranthene	ug/Kg	NA	NE	**840**	11 U	**59**	**220**	**380**	**560**	**170**	**130**	**71**	**1,300**
	Fluorene	ug/Kg	NA	NE	**60**	11 U	10 U	12 U	**9.0**	**22**	52 U	9.9 U	10 U	**100**

Analyte Group	Analyte	Units	Twice the Spokane Basin Background Metal Concentration[2]	MTCA Method A CUL[3]	Location ID, Date and Depth Interval RFPLC-1C 6/5/2017 2-2.5 ft	RFPLC-2C 6/5/2017 2-2.5 ft	RFPLC-SP1 4/24/2017 NA	RFPLC-SP2 4/24/2017 NA	RFPLC-SP3 4/24/2017 NA	RFPLC-SP4 4/24/2017 NA	RFPLC-SP5 7/27/2017 NA	RFPLC-SP6 7/27/2017 NA	RFPLC-SP7 7/27/2017 NA	RFPLC-SP8 7/27/2017 NA
				Justification	Characterization Sample	Characterization Sample	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal	Profile for Disposal
				Fate	Left In-place	Left In-place	North Bank Stockpile	North Bank Stockpile	North Bank Stockpile	North Bank Stockpile	North Bank Stockpile	North Bank Stockpile	North Bank Stockpile	North Bank Stockpile
PAHs[7]	Indeno(1,2,3-c,d)pyrene	ug/Kg	NA	NE	**250**	11 U	**19**	**56**	**77**	**120**	**80**	**50**	**35**	**350**
	Phenanthrene	ug/Kg	NA	NE	**620**	11 U	30	**75**	**220**	**210**	**120**	**76**	**21**	**1,000**
	Pyrene	ug/Kg	NA	NE	**1100**	11 U	**76**	**250**	**430**	**680**	**220**	**140**	**100**	**1,600**
	Total cPAH TEQ[9] (ND=0.5RL)[10]	ug/Kg	NA	100	**725**	**8**	**57**	**186**	**255**	**461**	**172**	**127**	**92**	**1046**

Notes

[1] Samples analyzed by TestAmerica Laboratories, Inc. located in Spokane Valley, Washington.

[2] Background level used for metals in soil is the Washington State Department of Ecology Natural Background 90th Percentile Value for the Spokane Basin (Ecology 1994).

[3] Model Toxics Control Act (MTCA) Method A unrestricted land use cleanup levels (CUL).

[4] Total Petroleum Hydrocarbons (TPH) analyzed using Method Northwest Method TPH-Dx.

[5] Metals analyzed using Environmental Protection Agency (EPA) Method 6010C. Mercury by EPA Method 7471B.

[6] Chromium III cleanup level. MTCA Method A cleanup level for Chromium VI is 19 mg/kg.

[7] Polycyclic aromatic hydrocarbons analyzed using EPA Method 8270DSIM.

[8] Sum total value for naphthalene, 1-methyl naphthalene and 2-methyl naphthalene.

[9] Carcinogenic PAH (cPAH) toxic equivalency (TEQ) calculated using toxicity equivalency factors (TEF) from MTCA Table 708-2, based on methodology described in MTCA Cleanup Regulation Washington Administrative Code (WAC) 173-340-708.

[10] The TEQ reported was calculated using half the laboratory reporting limits for cPAHs less than reporting limits.

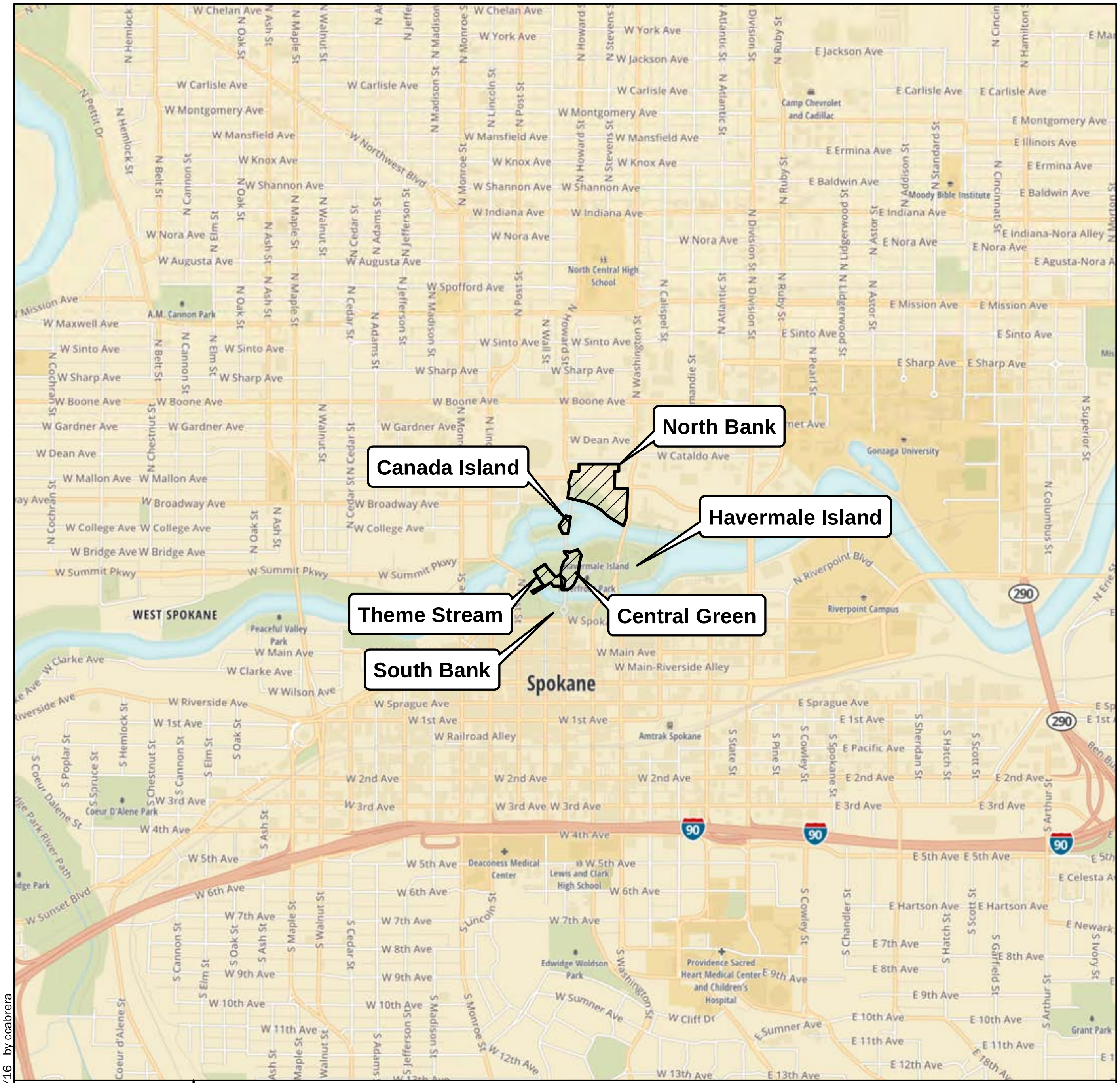
J = estimated result; mg/kg = milligrams per kilogram; NE = not established; ug/kg = micrograms per kilogram; U = analyte was not detected above the laboratory reporting limit; NA = Not Applicable; ft = feet

Bold indicates that the analyte was detected above the reporting limit.

▨	Shading indicates that the analyte was detected above the MTCA Method A CUL.
🟨	Gold shading indicates analyte was not detected above the reporting limit, but the concentration was greater than or equal to the MTCA Method A CUL.
🟦	Blue shading indicates the reported concentration was greater than twice the Spokane Basin background metals concentration (Ecology 1994).

Justification is the reason to collect the sample and fate indicates where the soil that is represented by that sample is located after construction activities.

FIGURES



Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Mapbox Open Street Map, 2016

Projection: NAD 1983 UTM Zone 11N

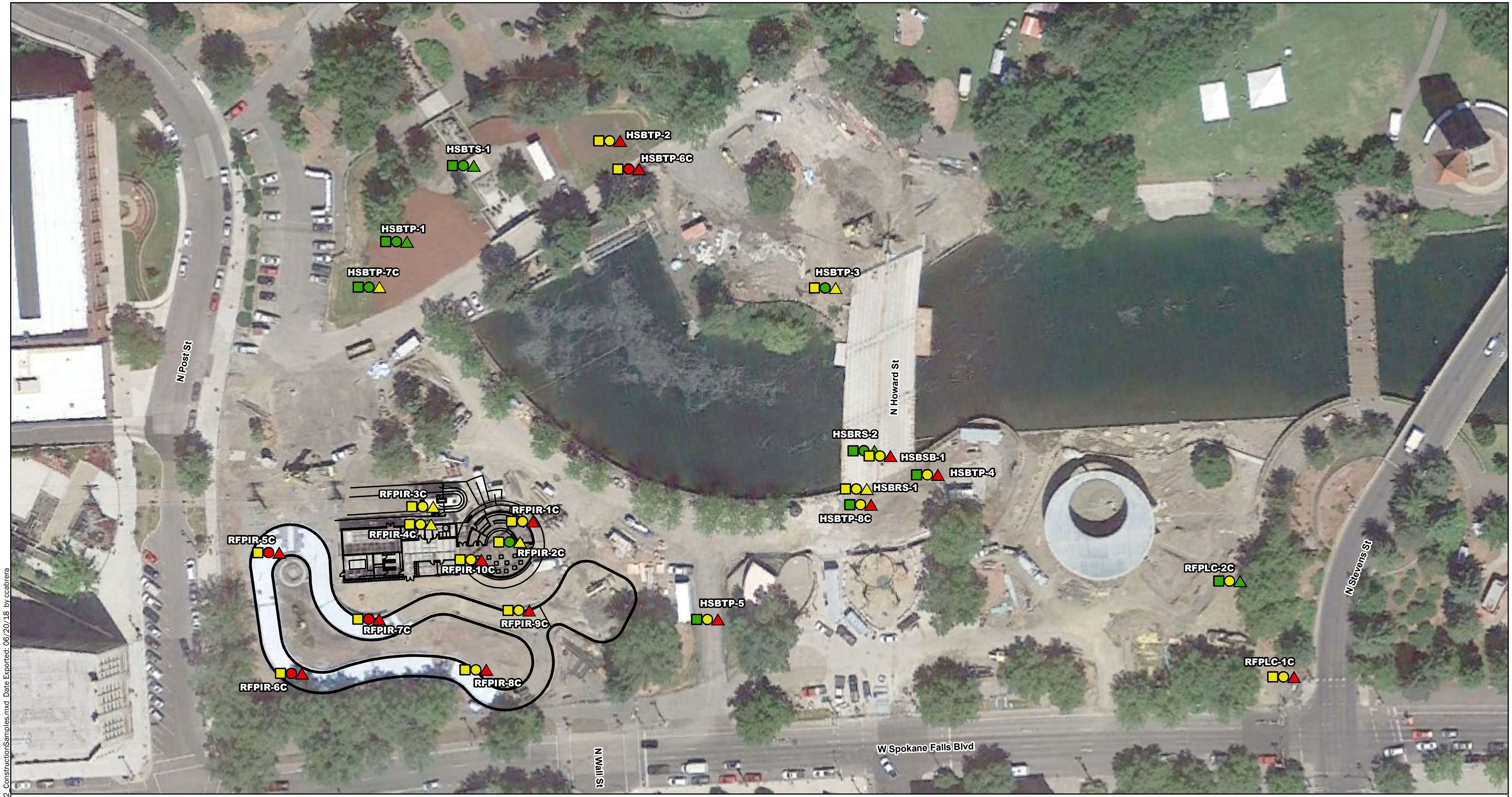
Vicinity Map

Riverfront Park
Spokane, Washington

GEOENGINEERS

Figure 1

P:\0\0110148\GIS\06\MXD\0011014806_F01_VM.mxd Date Exported: 11/11/16 by ccabrera



P:\0\0110148\GIS\06\MXD\0011014806_F02_ConstructionSamples.mxd Date Exported: 06/20/18 by ccabrera

Notes:

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3. The circle representing metals also represents the sample location.

Data Source: June 2017 image from Google Earth Pro.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

🔴	Contaminated – Concentration greater than MTCA Method A Cleanup Level for one or more COC analyzed
🟡	Impacted – Concentration less than MTCA Method A Cleanup Levels and greater than laboratory reporting limits or twice the available background metals concentration for each COC analyzed
🟢	Clean – Concentration less than laboratory reporting limits or less than twice the available background metals concentrations for each COC analyzed

■	TPH
●	Metals
▲	PAHs

N
W E
S

80 0 80

Feet

Construction Sample Locations

Riverfront Park
Spokane, Washington

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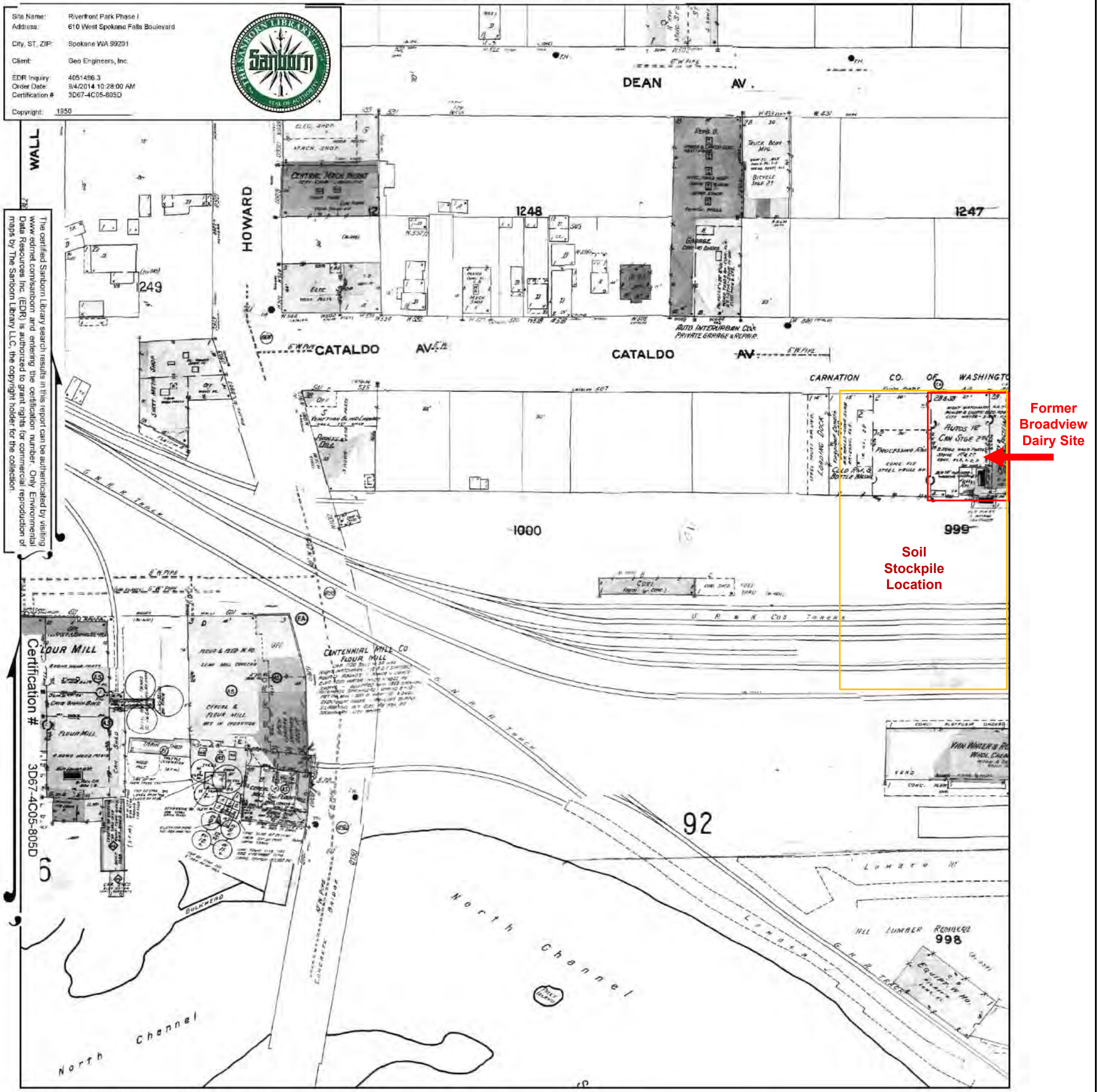
Figure 2

1950 Certified Sanborn Map

Site Name: Riverfront Park Phase I
Address: 610 West Spokane Falls Boulevard
City, ST, ZIP: Spokane WA 99201
Client: Geo Engineers, Inc.
EDR Inquiry: 4051496.3
Order Date: 8/4/2014 10:28:00 AM
Certification #: 3D67-4C05-805D
Copyright: 1950

Certification # 3D67-4C05-805D



This Certified Sanborn Map combines the following sheets.
Outlined areas indicate map sheets within the collection.

0 Feet 165 330 660

Volume 1, Sheet 91
Volume 1, Sheet 92
Volume 1, Sheet 106
Volume 1, Sheet 107
Volume 3, Sheet xxxx

Volume 3, Sheet xxxx

N

1950 Certified Sanborn Map

Riverfront Park
Spokane, Washington

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Figure 3

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. The circle representing metals also represents the sample location.

Data Source: June 2017 image from Google Earth Pro.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

🔴	Contaminated - Concentration greater than MTCA Method A Cleanup Level for one or more COC analyzed
🟡	Impacted - Concentration less than MTCA Method A Cleanup Levels and greater than laboratory reporting limits or twice the available background metals concentration for each COC analyzed
🟢	Clean - Concentration less than laboratory reporting limits or less than twice the available background metals concentrations for each COC analyzed
■	TPH
●	Metals
▲	PAHs
☐	Approximate Limits of Remedial Excavation

W N E S

30 0 30

Feet

North Bank Remedial Excavation

Riverfront Park
Spokane, Washington

GEOENGINEERS

Figure 4

P:\0\0110148\GIS\06\MXD\0011014806 F04 RemedialExcavation NB.mxd Date Exported: 06/20/18 by ccabrera

APPENDICES

GeoEngineers

APPENDIX A
Soil Laboratory Reports and Data Validation Report

GEOENGINEERS

Data Validation Report

523 East Second Avenue, Spokane, Washington 99202, Telephone: 509.363.3125 www.geoengineers.com

Project:	City of Spokane –Riverfront Park August, September, November 2016 and February, March, April, May, June 2017 Soil Samples; and March 2017 Water Sample
GEI File No:	0110-148-06
Date:	June 7, 2018

This report documents the results of a United States Environmental Protection Agency (EPA)-defined Stage 2A data validation (EPA Document 540-R-08-005; EPA 2009) of analytical data from the analyses of soil and water samples collected as part of the August, September, November 2016 and February, March, April, May, June 2017 sampling events, and the associated laboratory quality control samples. The samples were obtained from the Riverfront Park Site located between Spokane Falls Boulevard to the south, Post Street to the west, Division Street to the east, and the Spokane River to the north, at 507 North Howard Street, in Spokane, Washington.

OBJECTIVE AND QUALITY CONTROL ELEMENTS

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with the EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (EPA 2016a) and Inorganic Superfund Data Review (EPA 2016b) (National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

The data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Surrogate Recoveries
- Method Blanks
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory Control Samples/Laboratory Control Sample Duplicates
- Laboratory Duplicates
- Miscellaneous

VALIDATED SAMPLE DELIVERY GROUPS

This data validation included review of the sample delivery groups (SDGs) listed below in Table 1.

TABLE 1: SUMMARY OF VALIDATED SAMPLE DELIVERY GROUPS

Laboratory SDG	Samples Validated
590-4272-1	HSBTP-1:2.0 FT, HSBTP-3:2.0 FT, HSBTP-4:1.5 FT
590-4272-2	HSBTP-2:1.5 FT, HSBTP-5:1.0 FT
590-4431-1	HSBTS-1:090816
590-4511-1	HSBTP-6C:091616
590-4571-1	HSBTP-7C:092216
590-5088-1	HSBRS-1:112916
590-5088-2	
590-5468-1	HSBSB-1:020217
590-5505-1	HSBRS-2:020917, HSBSS-1:020917, HSBSS-2:020917, HSBSS-3:020917
590-5617-1	RFPIR-1C (3):030617, RFPIR-2C (0):030617, RFPIR-3C (3):030617, RFPIR-4C (0):030617
590-5625-1	RFPNB-1C(1.5):030717, RFPNB-2C(2.5):030717, RFPNB-3C(2.5):030717
590-5655-1	RFPNB-4C(3):030917, RFPNB-5C(1.5):030917
590-5660-1	RFPNB-6C(1-2):031017
590-5668-1	RFP-DWTANK:031317
590-5738-1	RFPIR-5c(2):032117, RFPIR-6c(2):032117
590-5854-1	RFPIR-7C(2):040617, RFPIR-8C(2):040617, RFPIR-9C(2):040617
590-5975-1	RFPIR-10C (3):042417
590-6135-1	HSBTP-8C (6-6.5):051517
590-6270-1	RFPLC-1C (2ft) 060517, RFPLC-2C (2ft) 060517

CHEMICAL ANALYSIS PERFORMED

TestAmerica Laboratories, Inc. (TestAmerica), located in Spokane, Washington, performed laboratory analyses on the samples using one or more of the following methods:

Soil

- Hydrocarbon Identification (NWTPH-HCID) by Method NWTPH-HCID;
- Petroleum Hydrocarbons (NWTPH-Dx) by Method NWTPH-Dx;
- Polychlorinated Biphenyls (PCBs) by Method SW8082A;
- Polycyclic Aromatic Hydrocarbons (PAHs) by Method SW8270D-SIM;
- Total Metals by Method EPA6010C/7471B; and
- Total Metals Toxicity Characteristic Leaching Procedure (Metals-TCLP) by Method EPA6010C

Water

- Volatile Organic Compounds (VOCs) by Method EPA 624;
- Semi-volatile Organic Compounds (SVOCs) by Method EPA 625;
- Polychlorinated Biphenyls (PCBs) by Method EPA 608;
- Organochlorine Pesticides (Pesticides) by Method EPA 608;
- Total Metals by Methods EPA200.7 Rev 4.4 and EPA245.1;
- Hexane Extractable Material - Oil and Grease by Method EPA1664B;
- Total Cyanide by Method EPA335.4; and
- pH by Method SM4500-HB

DATA VALIDATION SUMMARY

The results for each of the QC elements are summarized below.

Data Package Completeness

TestAmerica provided the required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and the identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COCs were accurate and complete when submitted to the laboratory, with the following exceptions:

SDG 590-5088-2: The laboratory noted that PCBs and TCLP analyses were requested in Sample HSBRS-1:112916 by GeoEngineers on 12/7/2016. These analyses were not originally listed on the COC.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. Established holding times were met for each analysis. The sample coolers arrived at the laboratory within the appropriate temperatures of between 2 and 6 degrees Celsius, with the exceptions noted below.

SDGs 590-4272-1 and 590-4272-2: The sample cooler temperature recorded at the laboratory was 0.3 degrees Celsius. It was determined through professional judgment that since the samples were not frozen, this temperature should not affect the sample analytical results.

SDG 590-4431-1: The sample cooler temperature recorded at the laboratory was 20.1 degrees Celsius. It was determined through professional judgment that since the sample was received on ice at the laboratory the same day it was collected, and the cooling process had begun, this temperature should likely not affect the sample analytical results.

SDG 590-5617-1: The sample cooler temperature recorded at the laboratory was 8.5 degrees Celsius. It was determined through professional judgment that since the samples were received on ice at the laboratory the same day they were collected, and the cooling process had begun, this temperature should likely not affect the sample analytical results.

SDG 590-5655-1: The sample cooler temperature recorded at the laboratory was 6.8 degrees Celsius. It was determined through professional judgment that since the samples were received on ice at the laboratory the same day they were collected, and the cooling process had begun, this temperature should likely not affect the sample analytical results.

SDG 590-5660-1: The sample cooler temperature recorded at the laboratory was 16.3 degrees Celsius. It was determined through professional judgment that since the sample was received on ice at the laboratory the same day it was collected, and the cooling process had begun, this temperature should likely not affect the sample analytical results.

SDG 590-5668-1: (pH) The 15-minute holding time for pH analysis was exceeded by one day in Sample RFP-DWTANK:031317. The positive result for pH was qualified as estimated (J) in this sample.

The sample cooler temperature recorded at the laboratory was 8.2 degrees Celsius. It was determined through professional judgment that since the sample was received on ice at the laboratory the same day it was collected, and the cooling process had begun, this temperature should likely not affect the sample analytical results.

SDG 590-5854-1: The sample cooler temperature recorded at the laboratory was 7.8 degrees Celsius. It was determined through professional judgment that since the samples were received on ice at the laboratory the same day they were collected, and the cooling process had begun, this temperature should likely not affect the sample analytical results.

SDG 590-5975-1: The sample cooler temperature recorded at the laboratory was 11.2 degrees Celsius. It was determined through professional judgment that since the sample was received on ice at the laboratory the same day it was collected, and the cooling process had begun, this temperature should likely not affect the sample analytical results.

SDG 590-6135-1: The sample cooler temperature recorded at the laboratory was 17.7 degrees Celsius. It was determined through professional judgment that since the sample was received on ice at the laboratory the same day it was collected, and the cooling process had begun, this temperature should likely not affect the sample analytical results.

SDG 590-6270-1: The sample cooler temperature recorded at the laboratory was 8.9 degrees Celsius. It was determined through professional judgment that since the samples were received on ice at the laboratory the same day they were collected, and the cooling process had begun, this temperature should likely not affect the sample analytical results.

Surrogate Recoveries

A surrogate compound is a compound that is chemically similar to the organic analytes of interest, but unlikely to be found in an environmental sample. Surrogates are used for organic analyses and are added to the samples, standards, and blanks to serve as an accuracy and specificity check of each analysis.

The surrogates are added to the samples at a known concentration and percent recoveries are calculated following analysis. The surrogate percent recoveries for field samples were within the laboratory control limits, with the following exceptions:

SDG 590-4272-2: (PAHs) The percent recovery for surrogate p-Terphenyl-d14 was greater than the control limits in Sample HSBTP-5:1.0 FT; however, the sample was spiked with two additional surrogates, each within the control limits. No action was required for this outlier.

SDG 590-4431-1: (PAHs) The percent recoveries for 2-Fluorobiphenyl, nitrobenzene-d5, and p-Terphenyl-d14 were greater than the control limits in Sample HSBTS-1:090816. There were no positive results for the associated PAHs target analytes in this sample; therefore, no qualifications were required.

SDG 590-5625-1: (NWTPH-Dx) The percent recoveries for surrogates o-Terphenyl and n-Triacontane-d62 were outside the control limits in Samples RFPNB-1C(1.5):030717 and RFPNB-2C(2.5):030717, respectively, because of sample dilution (10X). The surrogates are added to the sample when it is extracted. If the sample is diluted 10X or more, recovery of the surrogates is often not possible because it is also diluted below the linear calibration range of the instrument. No action was required for these outliers.

SDG 590-5655-1: (NWTPH-Dx) The percent recoveries for surrogates o-Terphenyl and n-Triacontane-d62 were outside the control limits in Sample RFPNB-4C(3):030917, because of sample dilution (40X). The surrogates are added to the sample when it is extracted. If the sample is diluted 10X or more, recovery of the surrogates is often not possible because it is also diluted below the linear calibration range of the instrument. No action was required for these outliers.

SDG 590-5668-1: (SVOCs) The percent recovery for surrogate 2-Fluorophenol was less than the control limits in Sample RFP-DWTANK:031317; however, the sample was spiked with three additional surrogates, each within the control limits. No action was required for this outlier.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For each sample batch, method blanks for the applicable methods were analyzed at the required frequency. None of the analytes of interest were detected in the method blanks.

Matrix Spikes/Matrix Spike Duplicates

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a percent recovery is calculated. Matrix spike duplicate (MSD) analyses are generally performed for organic analyses as a precision check and analyzed in the same sequence as a matrix spike. Using the result values from the MS and MSD, the relative percent difference (RPD) is calculated. The percent recovery control limits for MS and MSD analyses are specified in the laboratory documents, as are the RPD control limits for MS/MSD sample sets.

One MS/MSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for each analysis and the percent recovery and RPD values were within the proper control limits, with the following exceptions:

SDG 590-4272-1: (PAHs) The laboratory performed an MS/MSD sample set on Sample HSBTP-1:2.0 FT. The RPD values for chrysene, fluorene, and naphthalene were greater than the control limit in the MS/MSD sample set extracted on 8/24/2016. There were no positive results for these target analytes in Sample HSBTP-1:2.0 FT; therefore, no qualifications were required.

(Total Metals) The laboratory performed an MS/MSD sample set on Sample HSBTP-1:2.0 FT. The percent recoveries for total barium were greater than the control limits in the MS/MSD sample set digested on 8/23/2016. The positive result for total barium was qualified as estimated (J) in Sample HSBTP-1:2.0 FT.

SDG 590-5088-2: (PCBs) The laboratory performed an MS/MSD sample set on Sample HSBRS-1:112916. The percent recovery for PCB-1260 was less than the control limits in the MSD extracted on 12/12/2016; however, the percent recovery for this target analyte was within the control limits in the corresponding MS. No action was required for this outlier.

SDG 590-5468-1: (PAHs) The laboratory performed an MS/MSD sample set on Sample HSBSB-1:020217. The percent recovery for benzo(g,h,i)perylene was less than the control limits in the MSD extracted on 2/8/2017; however, the percent recovery for this target analyte was within the control limits in the corresponding MS. No action was required for this outlier.

SDG 590-5505-1: (Total Metals) The laboratory performed an MS/MSD sample set on Sample HSBRS-2:020917. The percent recoveries and the RPD for total barium were greater than the control limits in the MS/MSD digested on 2/10/2017. The positive result for total barium was qualified as estimated (J) in Sample HSBRS-2:020917.

The laboratory performed an MS/MSD sample set on Sample HSBRS-2:020917. The RPD for total mercury was greater than the control limit in the MS/MSD digested on 2/13/2017. There were no positive results for this target analyte in Sample HSBRS-2:020917; therefore, no qualification was required.

SDG 590-6135-1: (Total Metals) The laboratory performed an MS/MSD sample set on Sample HSBTP-8C (6-6.5):051517. The percent recovery for total mercury was less than the control limits in the MSD digested on 5/25/2017; however, the percent recovery for this target analyte was within the control limits in the corresponding MS. No action was required for this outlier.

SDG 590-6270-1: (PAHs) The laboratory performed an MS/MSD sample set on Sample RFPLC-1C (2ft) 060517. The percent recoveries and RPD values for the PAHs target analytes were outside the control limits due to high concentration of analytes and could not be evaluated for accuracy and precision in the MS/MSD extracted on 6/8/2017. The percent recoveries and RPD values for the PAHs target analytes were within the control limits in the associated sample batch LCS/LCSD; therefore, the data were not qualified.

(Total Metals) The laboratory performed an MS/MSD sample set on Sample RFPLC-1C (2ft) 060517. The percent recoveries and the RPD for total lead were greater than the control limits in the MS/MSD digested on 6/6/2017. The positive result for total lead was qualified as estimated (J) in Sample RFPLC-1C (2ft) 060517.

Laboratory Control Samples/Laboratory Control Sample Duplicates

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to an MS, but without the possibility of matrix interference. Given that matrix interference is not an issue, the LCS/LCSD control limits for accuracy and precision are usually more rigorous than for MS/MSD analyses. Additionally, data qualification based on LCS/LCSD analyses would apply to all samples in the associated batch, instead of just the parent sample. The percent recovery control limits for LCS and LCSD analyses are specified in the laboratory documents, as are the RPD control limits for LCS/LCSD sample sets.

One LCS/LCSD analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the percent recovery and RPD values were within the proper control limits, with the following exceptions:

SDG 590-5668-1: (Pesticides) The RPD values for most of the pesticides target analytes were greater than the control limits in the LCS/LCSD sample set extracted on 3/14/2017. There were no positive results for these target analytes in the associated field sample; therefore, no qualifications were required.

Laboratory Duplicates

Internal laboratory duplicate analyses are performed to monitor the precision of the analyses. Two separate aliquots of a sample are analyzed as distinct samples in the laboratory and the RPD between the two results is calculated. Duplicate analyses should be performed once per analytical batch. If one or more of the samples used has a concentration less than five times the reporting limit for that sample, the absolute difference is used instead of the RPD. The RPD control limits are specified in the laboratory documents. Laboratory duplicates were analyzed at the proper frequency and the specified acceptance criteria were met, with the following exceptions:

SDG 590-4272-1: (Total Metals) The laboratory performed a laboratory duplicate sample set on Sample HSBTP-1:2.0 FT. The RPD values for total arsenic, total barium, total chromium, and total lead were greater than the control limit in the laboratory duplicate sample set digested on 8/23/2016. The positive results for these target analytes were qualified as estimated (J) in Sample HSBTP-1:2.0 FT.

SDG 590-5468-1: (NWTPH-HCID) The laboratory performed a laboratory duplicate sample set on Sample HSBSB-1:020217. The RPD for lube oil-range hydrocarbons was greater than the control limit in the laboratory duplicate sample set extracted on 2/8/2017. The positive result for this target analyte was qualified as estimated (J) in Sample HSBSB-1:020217.

SDG 590-6135-1: (Total Metals) The laboratory performed a laboratory duplicate sample set on Sample HSBTP-8C (6-6.5):051517. The RPD for total mercury was greater than the control limit in the laboratory duplicate sample set digested on 5/25/2017. The positive result for this target analyte was qualified as estimated (J) in Sample HSBTP-8C (6-6.5):051517.

SDG 590-6270-1: (Total Metals) The laboratory performed a laboratory duplicate sample set on Sample RFPLC-1C (2ft) 060517. The RPD for total lead was greater than the control limit in the laboratory duplicate sample set digested on 6/6/2017. The positive result for this target analyte was qualified as estimated (J) in Sample RFPLC-1C (2ft) 060517.

MISCELLANEOUS

SDG 590-5617-1: (NWTPH-Dx) The positive results for diesel-range hydrocarbons in Samples RFPIR-1C (3):030617, RFPIR-2C (0):030617, and RFPIR-3C (3):030617 may be influenced by the relative concentration of lube oil-range hydrocarbons in the samples. For this reason, the positive results for diesel-range hydrocarbons were qualified as estimated (J) in these samples, in order to signify a potential high bias.

SDG 590-5625-1: (NWTPH-Dx) The positive results for diesel-range hydrocarbons in Samples RFPNB-1C(1.5):030717, RFPNB-2C(2.5):030717, and RFPNB-3C(2.5):030717 may be influenced by the relative concentration of lube oil-range hydrocarbons in the samples. For this reason, the positive results for diesel-range hydrocarbons were qualified as estimated (J) in these samples, in order to signify a potential high bias.

SDG 590-5655-1: (NWTPH-Dx) The positive result for diesel-range hydrocarbons in Sample RFPNB-4C(3):030917 may be influenced by the relative concentration of lube oil-range hydrocarbons in the sample. For this reason, the positive result for diesel-range hydrocarbons was qualified as estimated (J) in this sample, in order to signify a potential high bias.

SDG 590-5975-1: (NWTPH-Dx) The positive result for diesel-range hydrocarbons in Sample RFPIR-10C (3):042417 may be influenced by the relative concentration of lube oil-range hydrocarbons in the sample. For this reason, the positive result for diesel-range hydrocarbons was qualified as estimated (J) in this sample, in order to signify a potential high bias.

SDG 590-6270-1: (NWTPH-Dx) The positive result for diesel-range hydrocarbons in Sample RFPLC-1C (2ft) 060517 may be influenced by the relative concentration of lube oil-range hydrocarbons in the sample. For this reason, the positive result for diesel-range hydrocarbons was qualified as estimated (J) in this sample, in order to signify a potential high bias.

OVERALL ASSESSMENT

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD, and MS/MSD percent recovery values, with the exceptions noted above. Precision was acceptable, as demonstrated by the LCS/LCSD, MS/MSD, and laboratory duplicate RPD values, with the exceptions noted above.

The data are acceptable for the intended use, with the following qualifications listed below in Table 2.

TABLE 2: SUMMARY OF QUALIFIED SAMPLES

Sample ID	Analyte	Qualifier	Reason
HSBRS-2:020917	Total barium	J	MS/MSD Recovery and RPD
HSBSB-1:020217	Lube oil-range hydrocarbons	J	Laboratory Duplicate RPD
HSBTP-1:2.0 FT	Total arsenic Total barium Total chromium Total lead	J J J J	Laboratory Duplicate RPD MS/MSD Recovery/Laboratory Duplicate RPD Laboratory Duplicate RPD Laboratory Duplicate RPD
HSBTP-8C (6-6.5):051517	Total mercury	J	Laboratory Duplicate RPD
RFPIR-1C (3):030617	Diesel-range hydrocarbons	J	See Miscellaneous
RFPIR-2C (0):030617	Diesel-range hydrocarbons	J	See Miscellaneous
RFPIR-3C (3):030617	Diesel-range hydrocarbons	J	See Miscellaneous
RFPIR-10C (3):042417	Diesel-range hydrocarbons	J	See Miscellaneous
RFPLC-1C (2ft) 060517	Diesel-range hydrocarbons Total lead	J J	See Miscellaneous MS/MSD Recovery/RPD and Laboratory Duplicate RPD
RFPNB-1C(1.5):030717	Diesel-range hydrocarbons	J	See Miscellaneous
RFPNB-2C(2.5):030717	Diesel-range hydrocarbons	J	See Miscellaneous
RFPNB-3C(2.5):030717	Diesel-range hydrocarbons	J	See Miscellaneous
RFPNB-4C(3):030917	Diesel-range hydrocarbons	J	See Miscellaneous
RFP-DWTANK:031317	pH	J	Holding Time

REFERENCES

U.S. Environmental Protection Agency (EPA). 2009. “Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use,” EPA-540-R-08-005.

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U.S. Environmental Protection Agency (EPA), 2016b. “Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review,” EPA-540-R-2016-001.

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