GeoEngineers

October 27, 2009

Puget Sound Energy
PO Box 90868, PSE-11N
Bellevue, Washington 98009

Attention: Greg Andrina and John Rork

Subject: Sampling and Analysis Plan – Supplemental Site Investigation
Former Columbia Street Manufactured Gas Plant Site
320 Columbia Street NW
Olympia, Washington
File No. 0186-774-00

INTRODUCTION

This sampling and analysis plan (SAP) presents details regarding soil and groundwater sampling to be performed during the planned supplemental site investigation at the Former Columbia Street Manufactured Gas Plant (MGP) Site in Olympia, Washington. As requested by the Washington Department of Ecology (Ecology), the supplemental investigation will build on previous site characterization work completed in 2006 and 2008. The overall objective of the supplemental investigation is to obtain the data needed to prepare a cleanup action plan that will allow the subject property to be remediated of contamination attributable to the operation of the former MGP and to obtain a No Further Action determination from Ecology. The specific objectives of the investigation include:

- Characterize soil conditions beneath the existing office building after the building is demolished.
- Fill data gaps identified in Ecology's Opinion Letter dated February 23, 2009.
- Collect soil characterization and geotechnical data for remedial excavation planning purposes.

Site history and previous investigations are discussed in the SAP prepared for the 2008 site investigation (GeoEngineers, 2008a) and in the *Site Investigation Report* (GeoEngineers, 2008b). This SAP focuses on the sampling and analytical testing to be performed during the supplemental site investigation.

PROPOSED EXPLORATIONS

Nine soil borings (SB-9 through SB-17) and three new monitoring wells (MW-5, MW-7, and MW-8) will be completed on the property. The explorations will be completed both in the interior portion of the property (primarily in the area of the existing office building) and along the perimeter of the property, as shown in Figure 1. The majority of the explorations will extend to a maximum depth of 20 feet below ground surface (bgs). However, one exploration on each of the northern, southern, eastern and western property boundaries will be advanced to 30 feet bgs for geotechnical evaluation purposes (i.e., to evaluate soils for possible shoring requirements). The three new monitoring wells will be approximately 20 feet deep. Wells MW-5 and MW-8 will be installed in two of the 20-foot soil borings; well MW-7 will be installed in one of the 30-foot borings after grouting the bottom 10 feet of the boring.

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In addition to soil evaluation and testing, the supplemental investigation will include up to four rounds of quarterly groundwater monitoring at the three new and six existing on- and off-property monitoring wells. The first quarterly monitoring event will be completed the day after the new wells are developed. The three additional monitoring events will be completed to the extent practicable depending on the scope and timing of future cleanup actions conducted by PSE.

The proposed soil and groundwater sampling and analytical testing plans are presented in Tables 1 and 2. Table 3 summarizes the field quality assurance/quality control (QA/QC) sampling and analytical testing plan. The sampling locations, depths, and analytical parameters presented in these tables were chosen to satisfy the investigation objectives outlined above. Analytical parameters were selected based on the known site history and the results of previous investigations. All samples collected for analytical testing will be submitted to OnSite Environmental in Redmond, Washington. Analytical methods will have target detection limits less than Model Toxics Control Act (MTCA) Method A cleanup levels. Laboratory QA/QC reporting will be consistent with U.S. Environmental Protection Agency (EPA) Level II analytical data.

The soil sampling and testing plan presented in Table 1 will be used as general guidance during field activities. However, final sampling decisions will be based on field-screening results and observations during drilling. Additionally, the groundwater monitoring plan summarized in Table 3 assumes that the monitoring wells to be sampled each quarter will be intact and accessible. If this is not the case (due to well abandonment in conjunction with future cleanup actions, for example), the groundwater monitoring plan may require revision.

FIELD PROCEDURES

The supplemental investigation will utilize field procedures consistent with those used during the 2008 site investigation (GeoEngineers, 2008a, 2008b). This includes utility location, drilling, field screening, well installation, soil and groundwater sampling, QA/QC sampling, equipment decontamination, and investigation-derived waste management procedures.

DRILLING, WELL INSTALLATION, AND GROUNDWATER SAMPLING

The soil borings will be advanced using a hollow-stem auger drilling rig. Soil samples will be obtained at approximately 2.5-foot and 5-foot intervals during drilling for lithologic description and chemical analysis (see Table 1). The three new monitoring wells installed in borings MW-5, MW-7, and MW-8 (see Figure 1) will be constructed of 2-inch-diameter polyvinyl chloride (PVC) casings and machine-slotted screens. Each well will be installed to a depth of 20 feet bgs and will have a 15-foot screen that spans the groundwater table, which occurs at approximately 7 to 8 feet bgs. The wells will be completed with flush-with-grade surface monuments. The bottom 10 feet of boring MW-7 (total depth = 30 feet bgs) will be grouted prior to installing the well in this boring. The nine soil borings not completed as monitoring wells will be abandoned using a bentonite or cement-bentonite grout.

Following installation, the new monitoring wells will be developed by surging and purging the wells. The day after the new wells are developed, groundwater levels will be measured and groundwater samples will be collected from the three new and six existing wells. The groundwater samples will be collected using low-flow sampling methodology and analyzed for the parameters listed in Table 2. The initial groundwater sampling round will constitute the first of up to four quarterly groundwater monitoring events. Table 2 shows the proposed groundwater analyses to be performed each quarter, assuming the listed wells are accessible each quarter.

A GeoEngineers geologist will be present on site to observe the drilling, well installation, and well development procedures. The geologist will describe soil types and document sampling and other field activities in field reports and boring logs. Soil and groundwater samples will be placed in appropriate containers in accordance with applicable Ecology and EPA analytical protocols. The samples will be stored in coolers containing ice and delivered to the analytical laboratory (OnSite Environmental) under chain-of-custody procedures.

FIELD SCREENING

Soil samples will be screened in the field for the potential presence of contamination using visual observation, water sheen screening, and headspace organic vapor screening using a photoionization detector (PID). Field screening results will be recorded on boring logs.

FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Field QA/QC samples will consist of field duplicates, equipment rinsate (decontamination) blanks, and trip blanks. Table 3 lists the proposed sampling frequency and analytical parameters for field QA/QC samples.

EQUIPMENT DECONTAMINATION

Drilling equipment will be decontaminated between exploration locations using a pressure washer. Reusable sampling and water-level measurement equipment will be decontaminated before and after each use by washing in an aqueous solution of Liqui-Nox® or equivalent detergent and rinsing with distilled water.

INVESTIGATION-DERIVED WASTE MANAGEMENT

Soil cuttings generated during drilling will be contained on site in 55-gallon drums pending receipt of soil analytical results. If the analytical results indicate that the drummed soil exceeds applicable MTCA cleanup criteria, the soil will be transported off site and disposed of at a permitted facility.

Monitoring well purge water and equipment decontamination water will be contained on site in 55-gallon drums, and a sample of the water will be obtained and analyzed for waste characterization purposes. The purge and decontamination water will be disposed of at an appropriate facility depending on the analytical results.

DATA ANALYSIS AND REPORTING

The laboratory analytical data will be reviewed to confirm acceptable laboratory QA/QC performance. Soil and groundwater analytical results will be compared to MTCA Method A cleanup levels, and constituent concentrations exceeding cleanup levels will be identified. Groundwater elevations measured in the monitoring wells will be used to estimate vertical and horizontal groundwater gradients. A report summarizing the results of the soil sampling and the first quarter groundwater monitoring event will be prepared after analytical results for these samples are received and assessed for data quality. The results of subsequent quarterly groundwater monitoring events will be reported in brief technical memoranda to be prepared following each monitoring event.

REFERENCES

GeoEngineers. 2008a. *Sampling and Analysis Plan, Former Columbia Street Manufactured Gas Plant Site, 320 Columbia Street NW, Olympia, Washington.* Letter submitted to Puget Sound Energy. July 16, 2008.

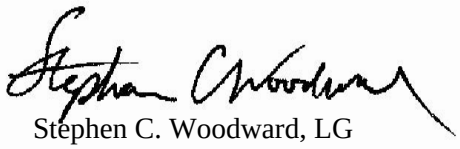
GeoEngineers. 2008b. *Site Investigation Report, Former Columbia Street MGP Site, Olympia, Washington.* November 26, 2008.

Please contact us should you have questions about this SAP. We appreciate the opportunity to assist PSE with this project.

Sincerely,

GeoEngineers, Inc.

Robert C. Leet, PhD, LG
Senior Project Manager



Stephen C. Woodward, LG
Principal

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Attachments: Table 1. Soil Sampling and Analytical Testing Plan
Table 2. Groundwater Sampling and Analytical Testing Plan
Table 3. Field QA/QC Sampling and Analytical Testing Plan
Figure 1. Previous MTCA Method A Exceedances in Soil and Proposed Supplemental Investigation Explorations

cc: Mark Schneider, Perkins Coie
Kelly Moser, Perkins Coie

TABLE 1
Soil Sampling and Analytical Testing Plan
November 2009 Supplemental Investigation
Former Columbia Street MGP Site
320 Columbia Street NW, Olympia, Washington
Puget Sound Energy

Location	Planned Total Depth (feet bgs)	Sample Depth (feet bgs)	Analytical Parameters						Sampling Objective
			cPAHs (EPA 8270D-SIM)	TPH-G/BTEX (NWTPH-Gx/ EPA 8021B)	BTEX (EPA 8021B)	TPH-D/HO (NWTPH-Dx)	EDB/EDC/MTBE (EPA 8260B/8011)	Metals (a) (EPA 6010/7000)	
SB-9	20	2.5	x		x	x		x	Assess soil conditions near southwest corner/western property boundary.
		7.5	x		x	x		x	
		10	x		x	x		x	
		15							
		20							
SB-10	30	2.5	x		x	x		x	Assess soil conditions (env + geotech) along southern property boundary adjacent to alley.
		7.5	x		x	x		x	
		10	x		x	x		x	
		15							
		20							
		25							
		30							
SB-11	20	2.5	x		x	x		x	Assess soil conditions (env + geotech) along southern property boundary adjacent to alley.
		7.5	x		x	x		x	
		10	x		x	x		x	
		15							
		20	x						
SB-12	20	2.5	x		x	x		x	Assess soil conditions (env + geotech) along northern property boundary adjacent to sidewalk/street and near former gasoline UST location.
		7.5	x		x	x		x	
		10	x		x	x		x	
		15							
		20							
SB-13	30	2.5	x		x	x		x	Assess soil conditions (env + geotech) along northern property boundary adjacent to sidewalk/street and within office building footprint.
		7.5	x		x	x		x	
		10	x		x	x		x	
		15							
		20							
		25							
		30							
SB-14	30	2.5	x		x	x		x	Assess soil conditions (env + geotech) along western property boundary adjacent to sidewalk/street and within former outbuilding footprint.
		7.5	x		x	x		x	
		10	x		x	x		x	
		15							
		20							
		25							
		30							
SB-15	20	2.5	x		x	x		x	Assess soil conditions within office building footprint, between former small gas holder and 1908 shoreline.
		7.5	x		x	x		x	
		10	x		x	x		x	
		15							
		20	x		x	x			
SB-16*	20	2.5	x	x		x		x	Assess soil conditions within office building footprint, at former scrubber location and near/downgradient of former gasoline UST location.
		7.5	x	x		x	x (b)	x	
		10	x			x		x	
		15							
		20	x		x	x			

TABLE 1
Soil Sampling and Analytical Testing Plan
November 2009 Supplemental Investigation
Former Columbia Street MGP Site
320 Columbia Street NW, Olympia, Washington
Puget Sound Energy

Location	Planned Total Depth (feet bgs)	Sample Depth (feet bgs)	Analytical Parameters						Sampling Objective
			cPAHs (EPA 8270D-SIM)	TPH-G/BTEX (NWTPH-Gx/ EPA 8021B)	BTEX (EPA 8021B)	TPH-D/HO (NWTPH-Dx)	EDB/EDC/MTBE (EPA 8260B/8011)	Metals (a) (EPA 6010/7000)	
SB-17*	20	2.5		x					Assess soil conditions at former gasoline UST location, as requested by Ecology.
		7.5		x			x (b)		
		10	x	x			x (b)	x	
		15		x					
		20							
MW-5*	20	2.5	x	x		x		x	Assess soil (env + geotech) and groundwater conditions in southeast corner of property, upgradient of former MGP facilities and adjacent to off-property building and highest previous cPAH detection in soil.
		7.5	x	x		x	x (b)	x	
		10							
		15						x	
		20	x						
MW-7*	30 (c)	2.5	x	x		x		x	Assess soil (env + geotech) and groundwater conditions along eastern property boundary, adjacent to off-property building and near/upgradient of former Production Building and gasoline UST location.
		7.5	x	x		x	x (b)	x	
		10	x	x		x			
		15						x	
		20							
		25							
		30							
MW-8*	20	2.5	x	x		x		x	Assess soil and groundwater conditions near western property boundary, downgradient of former large gas holder and near purifiers.
		7.5	x	x		x		x	
		10	x						
		15						x	
		20							

Notes:
* Soil samples from SB-16, SB-17, MW-5, MW-7, and MW-8 will be placed on hold at the laboratory until results of expedited groundwater EDB/EDC/MTBE analyses are available; see Table 2.
(a) Arsenic, lead and mercury
(b) Analyze for EDB/EDC/MTBE in SB-16, SB-17, MW-5 and MW-7 soils only if these compounds are detected in at least one groundwater sample obtained from wells MW-2, MW-5, MW-6 and MW-7; see Table 2.
(c) The bottom 10 feet of the borehole for well MW-7 will be backfilled with grout prior to installing the well.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
EDB = 1,2-Dibromoethane
EDC = 1,2-Dichloroethane
MTBE = Methyl tertiary butyl ether
TPH-G = Gasoline-range total petroleum hydrocarbons
TPH-D/HO = Diesel- and heavy oil-range total petroleum hydrocarbons
UST = Underground storage tank

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TABLE 2
Groundwater Sampling and Analytical Testing Plan
November 2009 Supplemental Investigation
Former Columbia Street MGP Site
320 Columbia Street NW, Olympia, Washington
Puget Sound Energy

Monitoring Well	Screened Interval (feet bgs)	Quarterly Monitoring Event	Analytical Parameters				
			cPAHs (EPA 8270D-SIM)	TPH-G/BTEX (NWTPH-Gx/ EPA 8021B)	TPH-D/HO (NWTPH-Dx)	EDB/EDC/MTBE (EPA 8260B/8011)	Metals (a) (EPA 6010/7000)
MW-1	5.0-20.0	Q1	x				x
		Q2	x				x
		Q3	x				x
		Q4	x (g)				x (d)
MW-2	5.0-20.0	Q1	x	x	x	x (b)	x
		Q2	x	x	x	x (c)	x
		Q3	x	x	x	x (c)	x
		Q4	x (g)	x (g)	x (g)	x (c)	x (d)
MW-3	39.5-44.5	Q1	x				x
		Q2	x				x
		Q3	x				x
		Q4	x (g)				x (d)
MW-4	23.5-28.5	Q1	x				x
		Q2	x				x
		Q3	x				x
		Q4	x (g)				x (d)
MW-5*	5.0-20.0 (e)	Q1	x	x	x		x
		Q2	x	x	x		x
		Q3	x	x	x		x
		Q4	x	x (g)	x		x
MW-6	15 (f)	Q1	x	x	x	x (b)	x
		Q2	x	x	x	x (c)	x
		Q3	x	x	x	x (c)	x
		Q4	x (g)	x (g)	x (g)	x (c)	x (d)
MW-7*	5.0-20.0 (e)	Q1	x	x	x	x (b)	x
		Q2	x	x (c)	x (c)	x (c)	x
		Q3	x	x (c)	x (c)	x (c)	x
		Q4	x	x (c)	x (c)	x (c)	x
MW-8*	5.0-20.0 (e)	Q1	x	x	x		x
		Q2	x	x (c)	x (c)		x
		Q3	x	x (c)	x (c)		x
		Q4	x	x (c)	x (c)		x
MW-10	15 (f)	Q1	x	x	x		x
		Q2	x	x	x		x
		Q3	x	x	x		x
		Q4	x (g)	x (g)	x (g)		x (d)

Notes:

All groundwater samples will be unfiltered.

* Proposed new well

(a) Total arsenic, mercury, lead, and chromium

(b) During Q1 only, run EDB/EDC/MTBE analysis on expedited (2-day) turnaround; if these compounds are detected, analyze soil samples for EDB/EDC/MTBE per Table 1.

(c) May analyze during Q2, Q3, and Q4 depending on analytical results for soil samples and groundwater samples obtained during Q1.

(d) Analyze for total mercury, lead and/or chromium during Q4 only if these metals are detected above MTCA Method A cleanup levels during Q1, Q2, or Q3. Arsenic is assumed to not be site-related, so will not require more than four quarters of analysis.

(e) Screened intervals shown for new wells MW-5, MW-7, and MW-8 are proposed.

(f) Wells MW-6 and MW-10 were installed by others; screened interval unknown. The measured depth to bottom of well casing is approximately 15 feet bgs (measured October 6, 2008).

(g) Analyze during Q4 only if detected above MTCA Method A cleanup levels during Q1, Q2, or Q3.

BTEX = Benzene, toluene, ethylbenzene, and xylenes

cPAHs = Carcinogenic polycyclic aromatic hydrocarbons

EDB = 1,2-Dibromoethane

EDC = 1,2-Dichloroethane

MTBE = Methyl tertiary butyl ether

TPH-G = Gasoline-range total petroleum hydrocarbons

TPH-D/HO = Diesel- and heavy oil-range total petroleum hydrocarbons

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TABLE 3
Field QA/QC Sampling and Analytical Testing Plan
November 2009 Supplemental Investigation
Former Columbia Street MGP Site
320 Columbia Street NW, Olympia, Washington
Puget Sound Energy

Primary Sample Matrix	QA/QC Sample Type	QA/QC Sample Matrix	Frequency of Analysis	Analytical Parameters
Soil	Field Duplicate	Soil	One per 20 primary samples (minimum of one duplicate)	Same parameters as the associated primary sample
	Equipment Rinsate Blank	Distilled Water	One per day of sampling activities	Same parameters as all associated soil samples (incl. EDB/EDC/MTBE)
	Trip Blank	Laboratory Reagent Water	One per cooler containing samples for volatiles analysis	TPH-G/BTEX and EDB/EDC/MTBE
Groundwater	Field Duplicate	Groundwater	One per 20 primary samples (minimum of one duplicate)	Same parameters as the associated primary sample
	Equipment Rinsate Blank	Distilled Water	One per day of sampling activities	Same parameters as all associated groundwater samples
	Trip Blank	Laboratory Reagent Water	One per cooler containing samples for volatiles analysis	TPH-G/BTEX and/or EDB/EDC/MTBE (a)

Notes:
(a) Analyze trip blank for the same volatile parameters that are analyzed in the associated groundwater samples.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
EDB = 1,2-Dibromoethane
EDC = 1,2-Dichloroethane
MTBE = Methyl tertiary butyl ether
TPH-G = Gasoline-range total petroleum hydrocarbons

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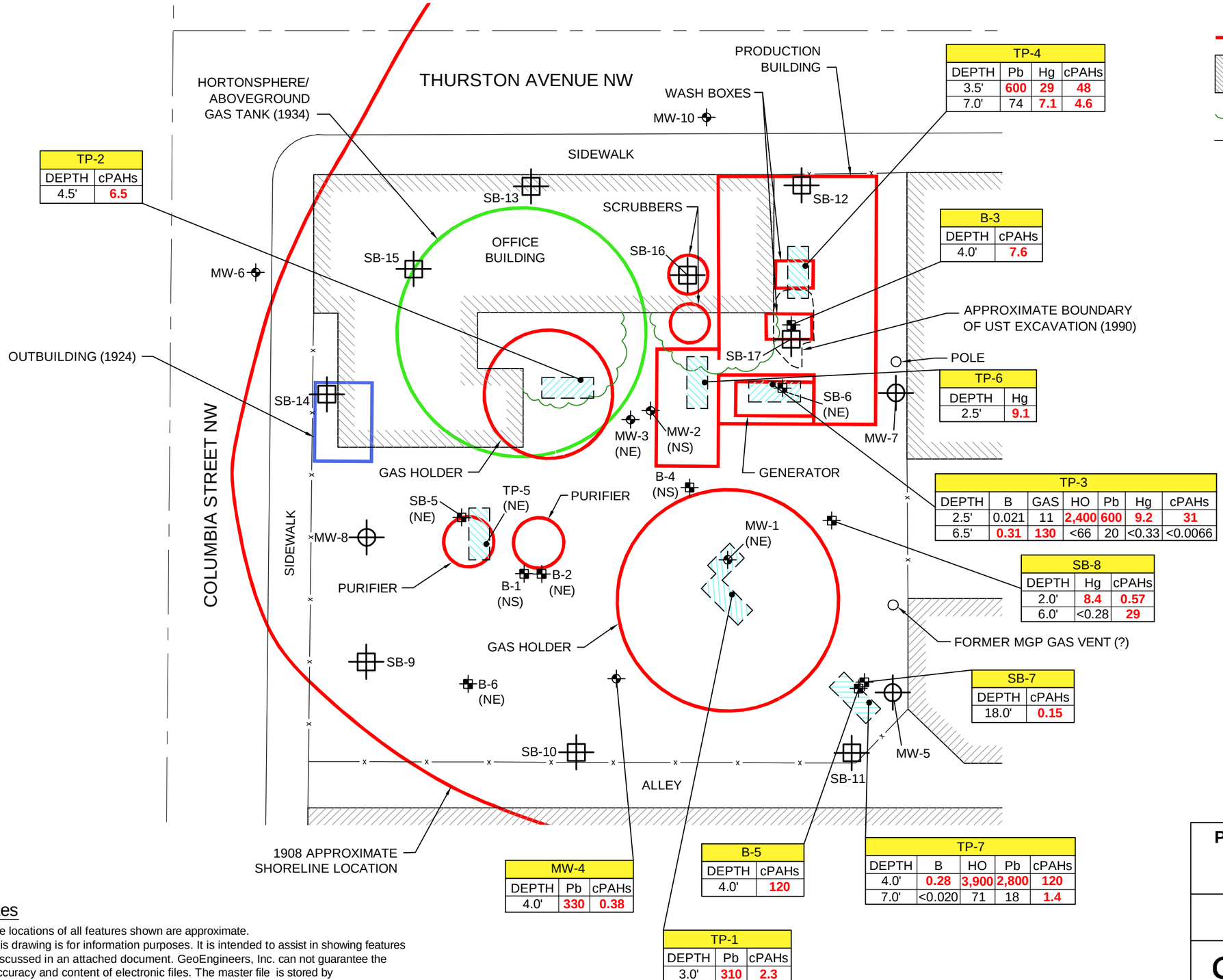

TP-2	
DEPTH	cPAHs
4.5'	**6.5**

TP-4			
DEPTH	Pb	Hg	cPAHs
3.5'	**600**	**29**	**48**
7.0'	74	**7.1**	**4.6**

B-3	
DEPTH	cPAHs
4.0'	**7.6**

TP-6	
DEPTH	Hg
2.5'	**9.1**

TP-3						
DEPTH	B	GAS	HO	Pb	Hg	cPAHs
2.5'	0.021	11	**2,400**	**600**	**9.2**	**31**
6.5'	**0.31**	**130**	<66	20	<0.33	<0.0066

SB-8		
DEPTH	Hg	cPAHs
2.0'	**8.4**	**0.57**
6.0'	<0.28	**29**

SB-7	
DEPTH	cPAHs
18.0'	**0.15**

MW-4		
DEPTH	Pb	cPAHs
4.0'	**330**	**0.38**

B-5	
DEPTH	cPAHs
4.0'	**120**

TP-7				
DEPTH	B	HO	Pb	cPAHs
4.0'	**0.28**	**3,900**	**2,800**	**120**
7.0'	<0.020	71	18	**1.4**

TP-1		
DEPTH	Pb	cPAHs
3.0'	**310**	**2.3**

Legend

- 1908 Site facilities / features
- Existing structure
- Edge of vegetation
- Existing fence
- Existing monitoring well
- Previous soil boring
- Test pit (GeoEngineers 2008)
- Test pit sidewall soil sampling location
- Proposed soil boring
- Proposed monitoring well

Soil results in mg/kg

cPAHs = Total carcinogenic polycyclic aromatic hydrocarbons – toxic equivalent concentration

B = Benzene

GAS = Gasoline-range hydrocarbons

HO = Heavy oil-range hydrocarbons

Pb = Lead

Hg = Mercury

(NS) = No soil samples analyzed

(NE) = No MTCA exceedances

Red/bold values exceed MTCA Method A cleanup levels

N W E S

20 0 20
FEET

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. can not 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.

Previous MTCA Method A Exceedances in Soil and Proposed Supplemental Investigation Explorations

Former Columbia Street MGP Site
Olympia, Washington

GeoEngineers

Figure 1