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Technical Memorandum

Date:	February 7, 2020	From:	Timothy S. Brown, L.Hg. Kellie M. Andrews, G.I.T.
To:	Washington State Department of Ecology	Project Manager:	Timothy S. Brown, L.Hg.
	3190 160 th Avenue SE	Principal/Associate in Charge:	Timothy S. Brown, L.Hg. <i>TSB</i>
	Bellevue, Washington 98008	Project Name:	Former Mill E/Koppers Facility
Attn:	Mr. Ron Timm	Project No:	20050654V001
Subject:	2019 Annual Performance and Compliance Monitoring Report		

Associated Earth Sciences, Inc. (AESI) performed the 2019 annual performance and compliance monitoring for the Former Mill E/Koppers Facility (Site) in Everett, Washington on September 24, 2019 in accordance with the "Performance and Compliance Monitoring Plan" (PCMP; EMCON, 1998) and the "Performance and Compliance Monitoring Plan Addendum" (PCMP Addendum; Floyd|Snider, 2017). The most recent monitoring report titled "Former Mill E/Koppers Site 2018 Annual Performance and Compliance Monitoring Report" prepared by Floyd|Snider in November 2018 (2018 Annual Monitoring Report; Floyd|Snider, 2018) provided a summary of monitoring activities completed from October 2017 to September 2018. This report provides a summary of performance and compliance monitoring from October 2018 through September 2019.

The Site is located on the east side of Riverside Road in Everett, Washington as shown on Figure 1. Site features, including piezometers and monitoring wells, are shown on Figure 2.

Monitoring activities performed during the 2019 annual performance and compliance monitoring included annual groundwater quality monitoring of PZ-3A, annual groundwater level monitoring, and annual asphalt and soil cap inspection. The following sections present the groundwater monitoring and cap inspection results.

GROUNDWATER LEVEL MONITORING

AESI performed annual groundwater monitoring at the Site on September 24, 2019. During the September 2019 monitoring event, water levels were measured in the three Upper Sand Aquifer piezometers inside the barrier wall (PZ-1A, PZ-2A, and PZ-3A), the three piezometers outside the barrier wall screened in the Upper Sand Aquifer (PZ-1B, PZ-2B, and PZ-3B), and the three wells/piezometers located outside the barrier wall and screened in the Lower Sand Aquifer

(LLWM-19D, PZ-2D, and LLMW-20D). A site plan showing the approximate well locations, groundwater elevations measured on September 24, 2019, and the approximate timing of the measurements relative to the 24-hour tidal cycle is presented as Figure 2.

The groundwater levels were collected within 2 hours of the daytime low tide, consistent with Section 2.1 of the PCMP Addendum. Daytime low tide (0.16 feet elevation) was at 7:31 am on September 24, 2019 based on the National Oceanic and Atmospheric Administration tide chart for Everett, Washington (Station 9447659). AESI personnel opened the piezometers/wells to provide for water levels to equilibrate with atmospheric pressure before obtaining depth-to-water measurements. Water levels were measured relative to the top of casing to an accuracy of 0.01 feet using an electronic water level indicator. The electronic water level indicator was cleaned using an Alconox[®] wash and potable water rinse prior to each groundwater level measurement. Groundwater level measurements were collected between 8:07 am and 8:31 am, following the daytime low tide.

Elevations for the top of well casing for the six Upper Sand Aquifer piezometers, except for piezometer PZ-1B, were referenced from the “2003 Annual Groundwater Compliance Monitoring and Five-Year Data Review Report” (Shaw, 2003). Top of well casing elevations for the two Lower Sand Aquifer wells were documented in the “Final Supplemental Remedial Investigation Report: Everett Smelter Lowland Area” (GeoEngineers, 2016). PZ-1B (repaired in September 2017) and piezometer PZ-2D (installed in September 2017) were surveyed on September 22, 2017 by Floyd|Snider using a level-loop survey. The top of casing elevations for the three Lower Sand Aquifer wells and the repaired piezometer PZ-1B were referenced from the 2018 Annual Monitoring Report (Floyd|Snider, 2018). Measurable groundwater was not observed in piezometer PZ-3B during the 2019 annual performance and compliance monitoring performed by AESI; therefore, a groundwater elevation could not be calculated. Because similar water level conditions were observed in September 2018, Floyd|Snider performed an additional monitoring event on December 17, 2018 to measure groundwater elevations at PZ-3A, PZ-3B, and LLMW-20D when the water table returned to normal conditions. The depth to water measurements and respective groundwater elevations are summarized in Table 1.

HYDRAULIC HEAD DIFFERENCE COMPARISON

Groundwater elevations were used to calculate vertical and horizontal hydraulic head differences inside and outside the barrier wall as the primary indicator of the barrier wall’s performance to control the hydraulic movement of contaminants. As indicated in the PCMP Addendum, the Site’s piezometers are referred to as pairs and triplets (PCMP Addendum; Floyd|Snider, 2017). The piezometer pairs consist of one piezometer inside the barrier wall (PZ-#A) and one piezometer outside the barrier wall (PZ-#B), both in the Upper Sand Aquifer, in the same vicinity. The piezometer triplets consist of one piezometer pair and one well or piezometer outside the barrier wall (LLMW-#D or PZ-#D) representative of the Lower Sand Aquifer for that vicinity.

Horizontal head differences were calculated by taking the Upper Sand Aquifer piezometer groundwater elevation from inside the barrier wall and comparing to the Upper Sand Aquifer piezometer groundwater elevation from outside the barrier wall within the same vicinity. Horizontal head differences for September 2018 and September 2019 are presented in Table 2. The groundwater elevation of the Upper Sand Aquifer inside the barrier wall was lower than the groundwater elevation outside the barrier wall for both the piezometer PZ-1 and PZ-2 pairs. The piezometer outside the barrier wall for the piezometer PZ-3 pair (PZ-3B) was dry during the monitoring event in September 2019. This observation in piezometer PZ-3B has been noted during previous monitoring events in 1999, 2002, 2009, and 2018, and it is likely due to the result of low rainfall during the 2019 dry season. Measurable groundwater was observed in piezometer PZ-3B during quarterly monitoring events completed in December 2017 and March and June 2018 (2018 Annual Monitoring Report) and in December 2018 by Floyd|Snider. and the groundwater elevation of the Upper Sand Aquifer inside the barrier wall was lower than the groundwater elevation outside the barrier wall. The lower groundwater elevation inside the barrier wall indicates a positive horizontal head difference with groundwater fluxing inward through the barrier wall.

Vertical head differences were calculated by taking the Upper Sand Aquifer groundwater elevations from both inside and outside of the barrier wall and comparing to the Lower Sand Aquifer groundwater elevations for each piezometer triplet. Vertical head differences are presented in Table 3. The vertical head difference inside the barrier wall was lower than the vertical head difference outside the barrier wall at the three piezometer pair locations. The lower vertical head inside the barrier wall indicates the barrier wall and asphalt cap are functioning as intended by limiting the downward flux of groundwater inside the barrier wall through the Upper Silt Aquitard.

Groundwater elevation trends for each piezometer pair are presented on Figures 3 through 5 and show a comparison of historical groundwater elevation data over time obtained for the Site. Review of the data indicates that consistently the groundwater elevations outside of the barrier wall are higher than inside the barrier wall with the exception for piezometer PZ-1A in 2007. The higher than expected water level in piezometer PZ-1A in 2007 was assessed and it was determined to be a result of surface water collecting in the well monument. After this observation, the top of the well monument was raised to prevent surface water from seeping into the monument (AESI; Technical Memorandum dated December 17, 2009).

The groundwater elevation data for the piezometers suggests the barrier wall is performing as intended and isolating groundwater inside the barrier from that outside the barrier.

GROUNDWATER QUALITY MONITORING

AESI performed annual groundwater quality monitoring at the Site on September 24, 2019. A groundwater sample was collected from piezometer PZ-3A inside the barrier wall for chemical analysis. Sampling was performed in general accordance with Environmental Protection Agency low-flow sampling protocols. Following stabilization, the groundwater sample was collected from

the pump outlet tubing and placed directly into laboratory-prepared glass sample containers and labeled with a unique sample identification. Sample containers were placed in a chilled cooler immediately following sampling, and subsequently transported to the analytical laboratory under standard chain-of-custody protocols. The groundwater sample was analyzed for gasoline-range petroleum hydrocarbons (GRPH) using the Northwest Total Petroleum Hydrocarbon (NWTPH) Method NWTPH-Gx, diesel- and heavy oil-range petroleum hydrocarbons (DRPH and ORPH) using the NWTPH Method NWTPH-Dx, arsenic using EPA Method 200.8, and pentachlorophenol (PCP) using EPA Method 8270D SIM.

Groundwater analytical results are presented in Table 4 and a copy of the analytical laboratory report and chain-of-custody is included as Attachment 1. The results are compared to the Washington State Model Toxics Control Act (MTCA) Method A and Method C cleanup levels that were established for the Site during the 1998 Consent Decree. GRPH and DRPH were detected at concentrations below the established MTCA cleanup level of 10,000 micrograms per Liter ($\mu\text{g/L}$). ORPH and PCP were not detected at concentrations exceeding their laboratory reporting limits. Total arsenic was detected at a concentration of 546 $\mu\text{g/L}$, which exceeds the established MTCA cleanup level of 5 $\mu\text{g/L}$ and is consistent with previous data. Groundwater quality concentration over time trends (time-concentration) graphs over the past several years for total petroleum hydrocarbons (TPH), PCP, and arsenic are presented on Figures 6 through 8, respectively.

QUALITY ASSURANCE/QUALITY CONTROL

Laboratory quality assurance/quality control (QA/QC) analyses were performed in conjunction with the September 2019 groundwater quality monitoring event. Laboratory results were evaluated by Friedman & Bruya, Inc. against analysis of the method blank, matrix spike, matrix spike duplicates, laboratory duplicates, and calibrations as required by the specific analytical methods. The Lab Control Spike percent recovery for both the neutral blank and the samples analyzed are within the QC limits. All other QA/QC results were judged to be acceptable for their intended use. The laboratory analytical report is included as Attachment 1.

After the data were received from the laboratory, data validation QC procedures were followed to provide an accurate evaluation of the data quality and usability. The analytical holding times were met, and the method blanks had no detections. All quality control requirements were acceptable, and no qualifiers were added to the analytical laboratory report.

ASPHALT CAP AND SOIL COVER

An asphalt cap and soil cover inspection was performed on September 24, 2019 by AESI personnel. The Site is currently occupied by an Amazon delivery service and several vehicles were parked at the time of our visit. The majority of the cap, approximately 90 to 95 percent, was visible at the time of the Site visit. A copy of the field report from the Site visit is attached as Attachment 2.

Where observed, the asphalt cap exhibited little evidence of deterioration and no signs of excessive settlement. Small shallow depressions in the cover were observed in some places. The asphalt cap is functioning as intended and meeting performance objectives. Photographs taken at the time of the Site visit are included in the attached field report.

The areas to the south of the asphalt cap are covered with an approximate 1-foot-thick soil cover with grass and some scattered brush. The soil cap appeared intact and was performing as intended.

PERFORMANCE AND COMPLIANCE MONITORING SCHEDULE

Annual groundwater monitoring and cap inspection will continue in September of 2020 and the results will be reported as part of the annual PCMP summary report to the Washington State Department of Ecology (Ecology). Ecology will be notified if monitoring and inspection results indicate significant deviations from recent performance and compliance monitoring results observed over the last 10 years.

In addition, it is recommended that an additional water level monitoring event be performed prior to the end of the wet season to measure groundwater elevations in the piezometer/well triplets PZ-3A, PZ-3B, and LLMW-20D due to observed dry conditions at piezometer PZ-3B. The results of this additional monitoring event will be included in the 2020 Annual Performance and Compliance Report.

Attachments:	Figure 1:	Vicinity Map
	Figure 2:	Site Plan and Groundwater Elevations
	Figure 3:	Groundwater Elevation Trends PZ-1A and PZ-1B
	Figure 4:	Groundwater Elevation Trends PZ-2A and PZ-2B
	Figure 5:	Groundwater Elevation Trends PZ-3A and PZ-3B
	Figure 6:	Groundwater Quality Trends - TPH
	Figure 7:	Groundwater Quality Trends - PCP
	Figure 8:	Groundwater Quality Trends - Arsenic
	Table 1:	Groundwater Elevation Measurements
	Table 2:	Horizontal Hydraulic Head Difference Comparisons
	Table 3:	Vertical Hydraulic Head Difference Comparisons
	Table 4:	Summary of Groundwater Analytical Results
	Attachment 1:	Laboratory Test Certificates and Chain-of-Custody
	Attachment 2:	Field Report of Cap Inspection

Cc: Sandy Forman, Pacific Topsoils
Carol Wiseman, Weyerhaeuser
Lynn Grochala, Floyd|Snider

REFERENCES

Associated Earth Sciences, Inc., 2009, Technical memorandum: Mill E 2009 ground water monitoring summary: Prepared for Pacific Topsoils, Inc.

EMCON, 1998, Performance and compliance monitoring plan, Former Mill E/Koppers Facility, Everett, Washington: Prepared for Weyerhaeuser Company, October 8, 1998.

Floyd|Snider, 2017, Former Mill E/Koppers Facility, Performance and compliance monitoring plan addendum: Prepared for The Weyerhaeuser Company, August 2017.

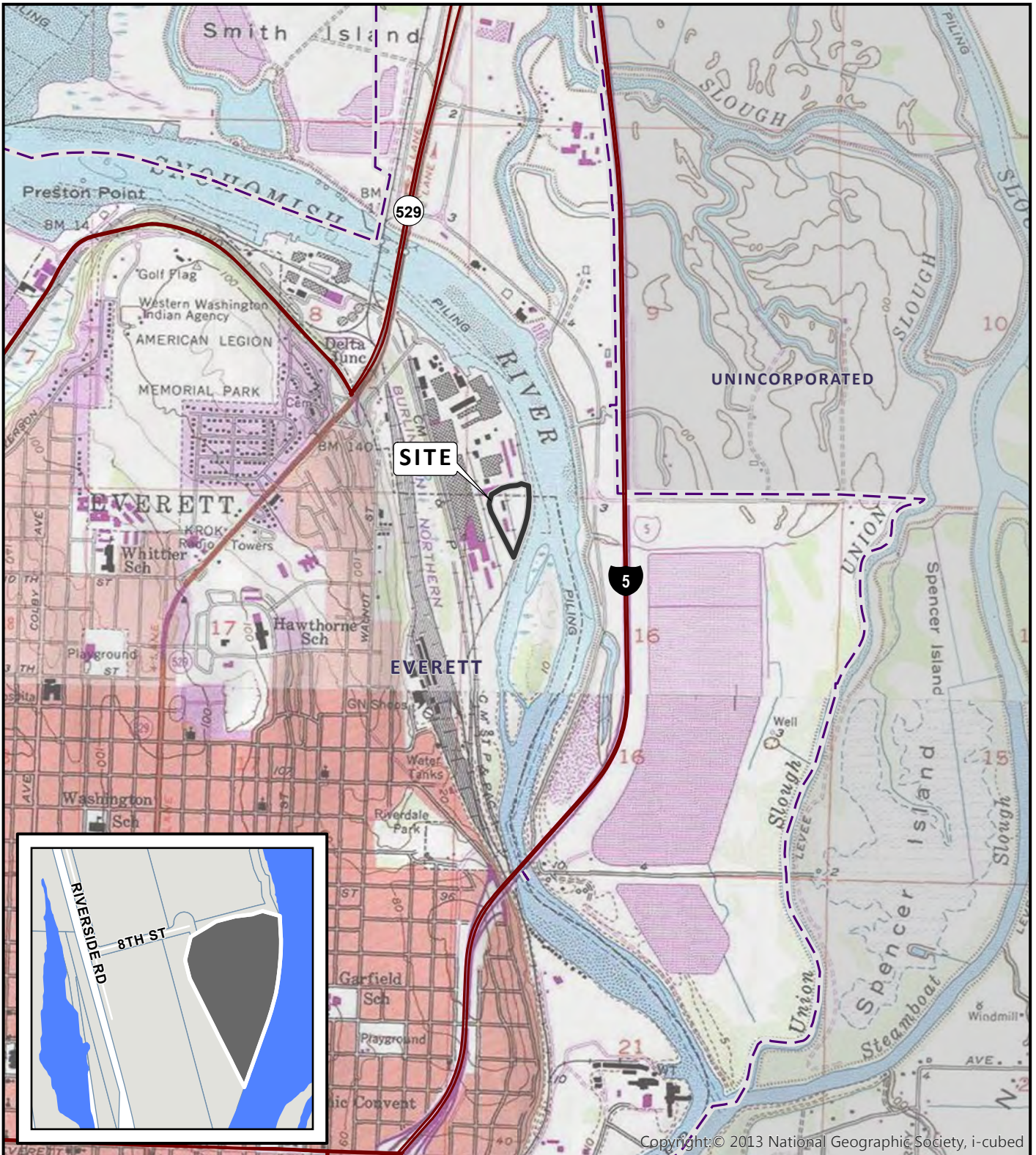
Floyd|Snider, 2018, Former Mill E/Koppers Site 2018 annual performance and compliance monitoring report: Prepared for Washington State Department of Ecology, November 8, 2018.

GeoEngineers, 2016, Final supplemental remedial investigation report: Everett smelter lowland area, Everett, Washington: Prepared for the Washington State Department of Ecology, February 8, 2016.

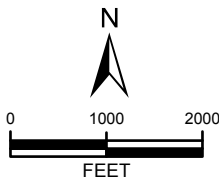
Shaw Environmental, Inc., 2003, 2003 annual groundwater compliance monitoring and five-year data review report, Weyerhaeuser Everett Former Mill E/Koppers Site, Everett, Washington: Prepared for the Weyerhaeuser Company, November 10, 2003.

Washington State Department of Ecology, 1998, Consent decree: Weyerhaeuser Mill E/Koppers Site, Everett, Washington, October 8, 1998.

FIGURES



DATA SOURCES / REFERENCES:
 USGS: 7.5' SERIES TOPOGRAPHIC MAPS, ESRI/I-CUBED/NATIONAL GEOGRAPHIC SOCIETY 2013
 SNOHOMISH CO: STREETS, CITY LIMITS, PARCELS, 2/19
 LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION



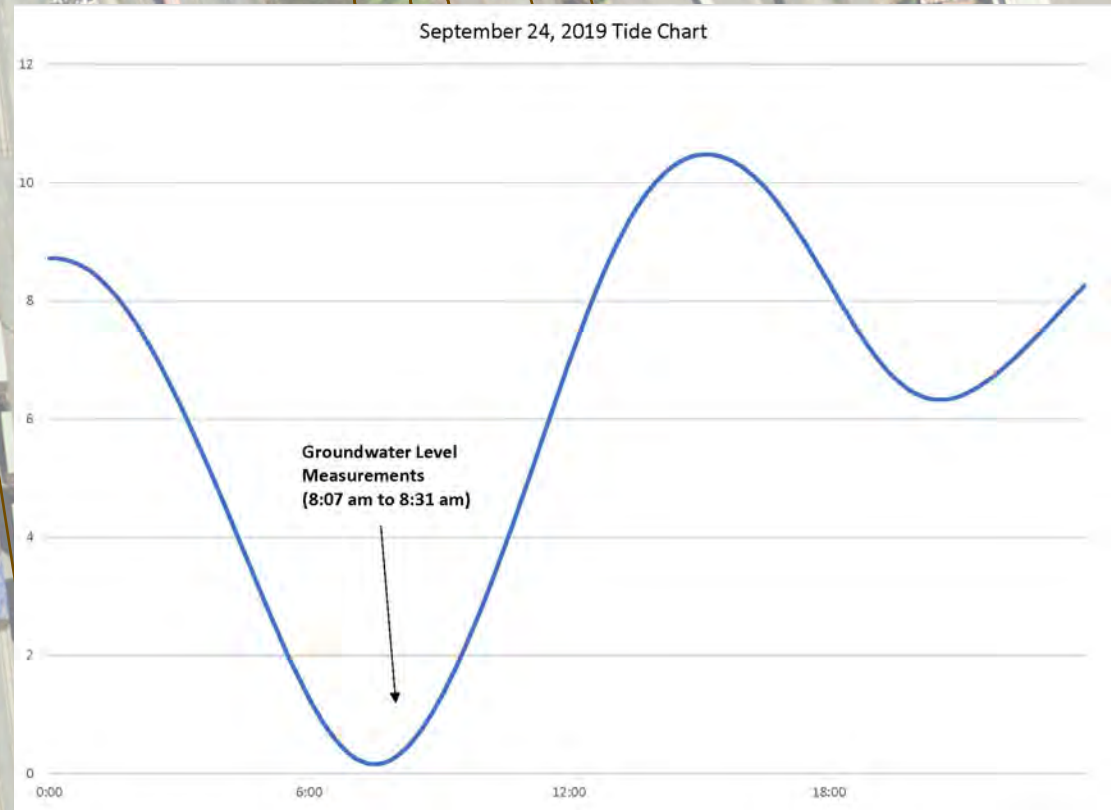
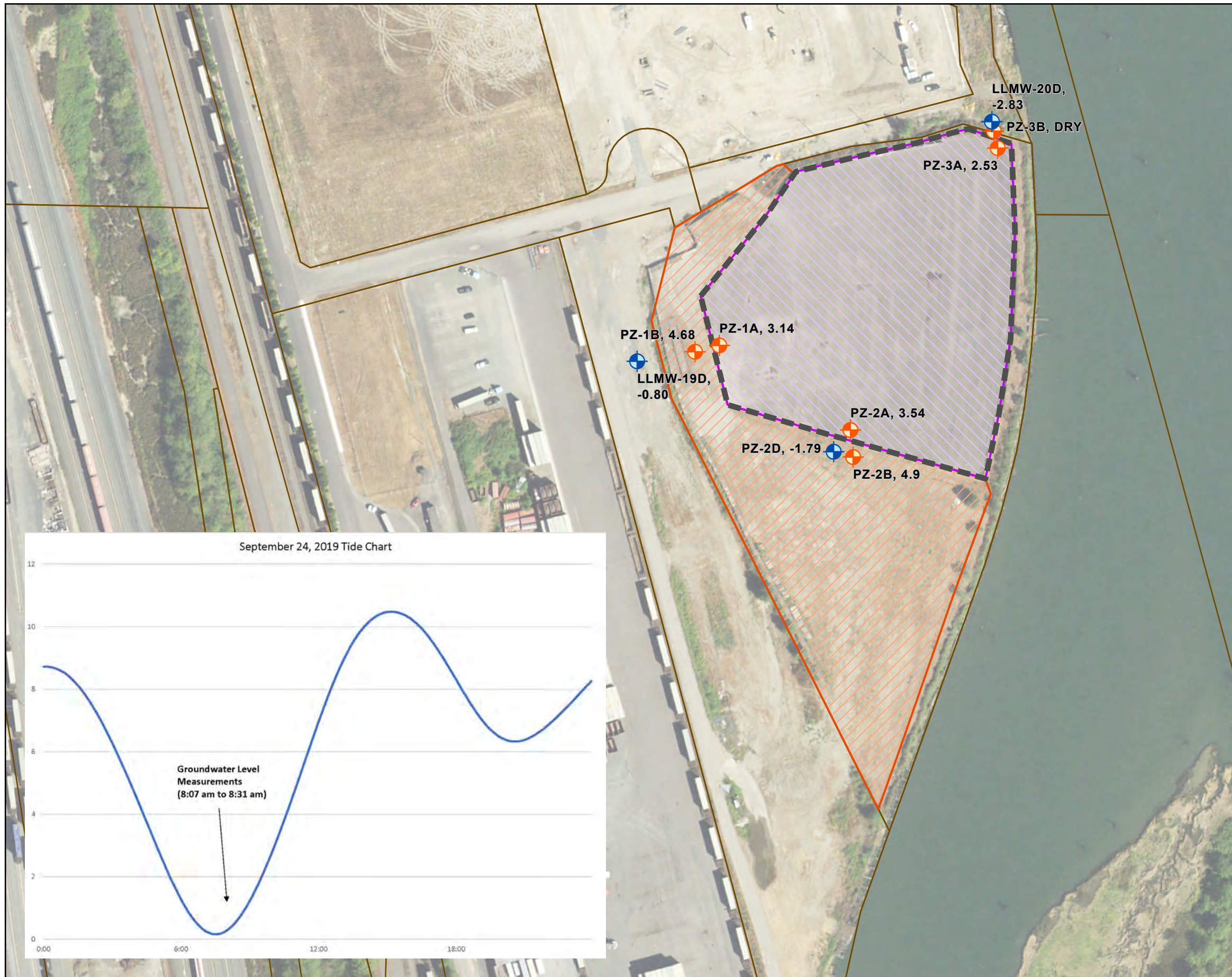
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VICINITY MAP

FORMER MILL E/KOPPERS FACILITY
 EVERETT, WASHINGTON

PROJ NO.	050654V001	DATE:	11/19	FIGURE:	1
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Path: \\kirkflie2\GIS\Projects\16\050654 Mill E\aprx_mxd\050654V001 F2 ESM_MillE.aprx



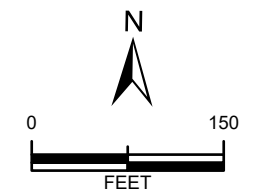
- SITE
- BARRIER WALL
- ASPHALT CAP AREA
- SOIL CAP AREA
- PARCEL
- LOWER SAND AQUIFER
PIEZOMETER/WELL, GW ELEVATION
MEASURED 9/24/19
- UPPER SAND AQUIFER
PIEZOMETER, GW ELEVATION
MEASURED 9/24/19

DATA SOURCES / REFERENCES:
TIDE CHART DATA ACQUIRED FROM THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION STATION ID #9447659, EVERETT WA

SITE DATA PROVIDED BY FLOYD SNIDER
2018 ANNUAL PERFORMANCE AND COMPLIANCE MONITORING REPORT FIGURE 3A 12/2017

SNOHOMISH CO: STREETS, PARCELS 1/18
AERIAL: SNOHOMISH CO., PICTOMETRY INT. 2017

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

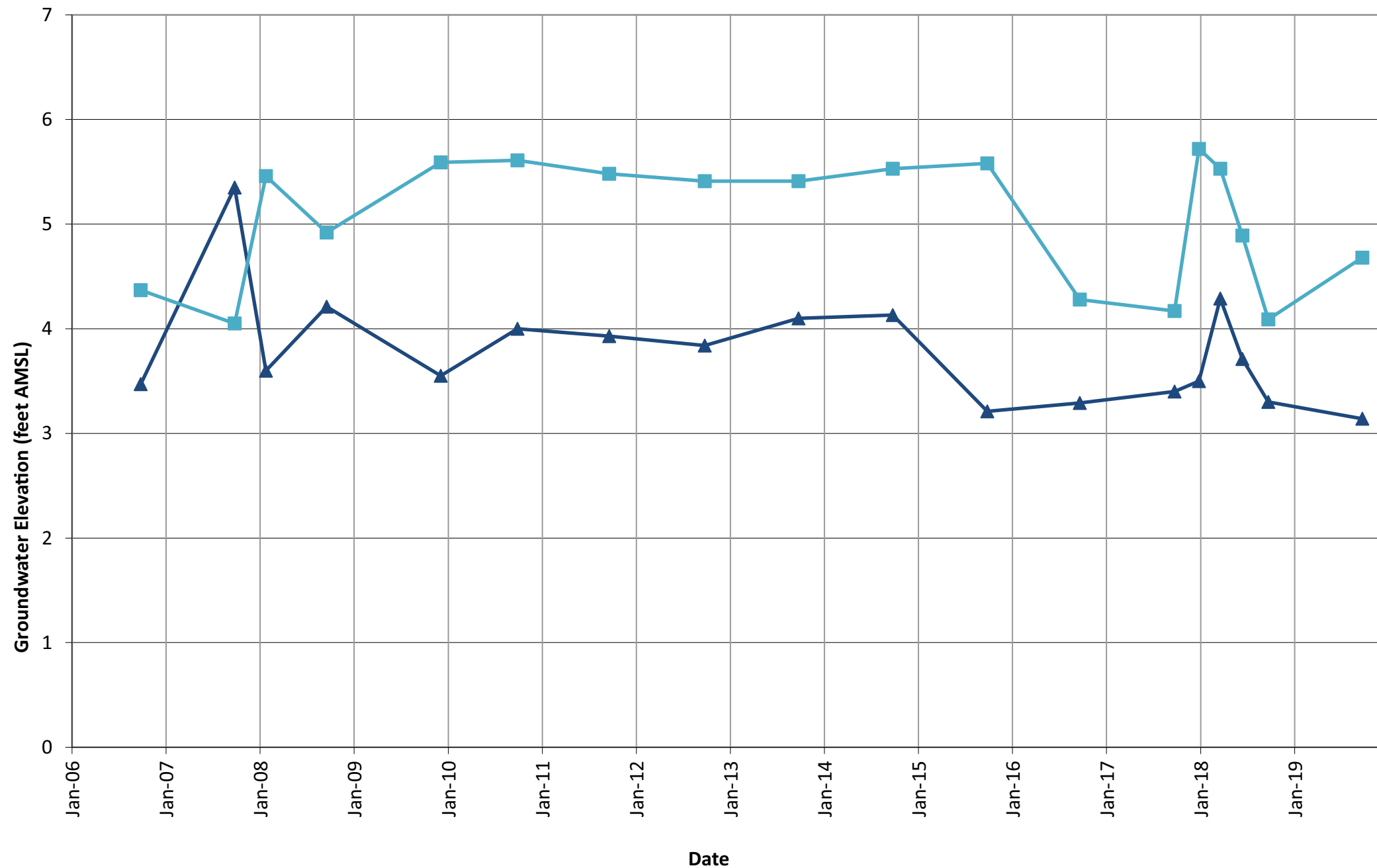


BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION



**SITE PLAN AND SEPTEMBER
GROUNDWATER ELEVATIONS**
FORMER MILL E/KOPPERS FACILITY
EVERETT, WASHINGTON

PROJ NO. 050654V001 DATE: 11/19 FIGURE: 2



LEGEND:

- AMSL ABOVE MEAN SEA LEVEL
- ▲ PZ-1A
- PZ-1B

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

NOTES:

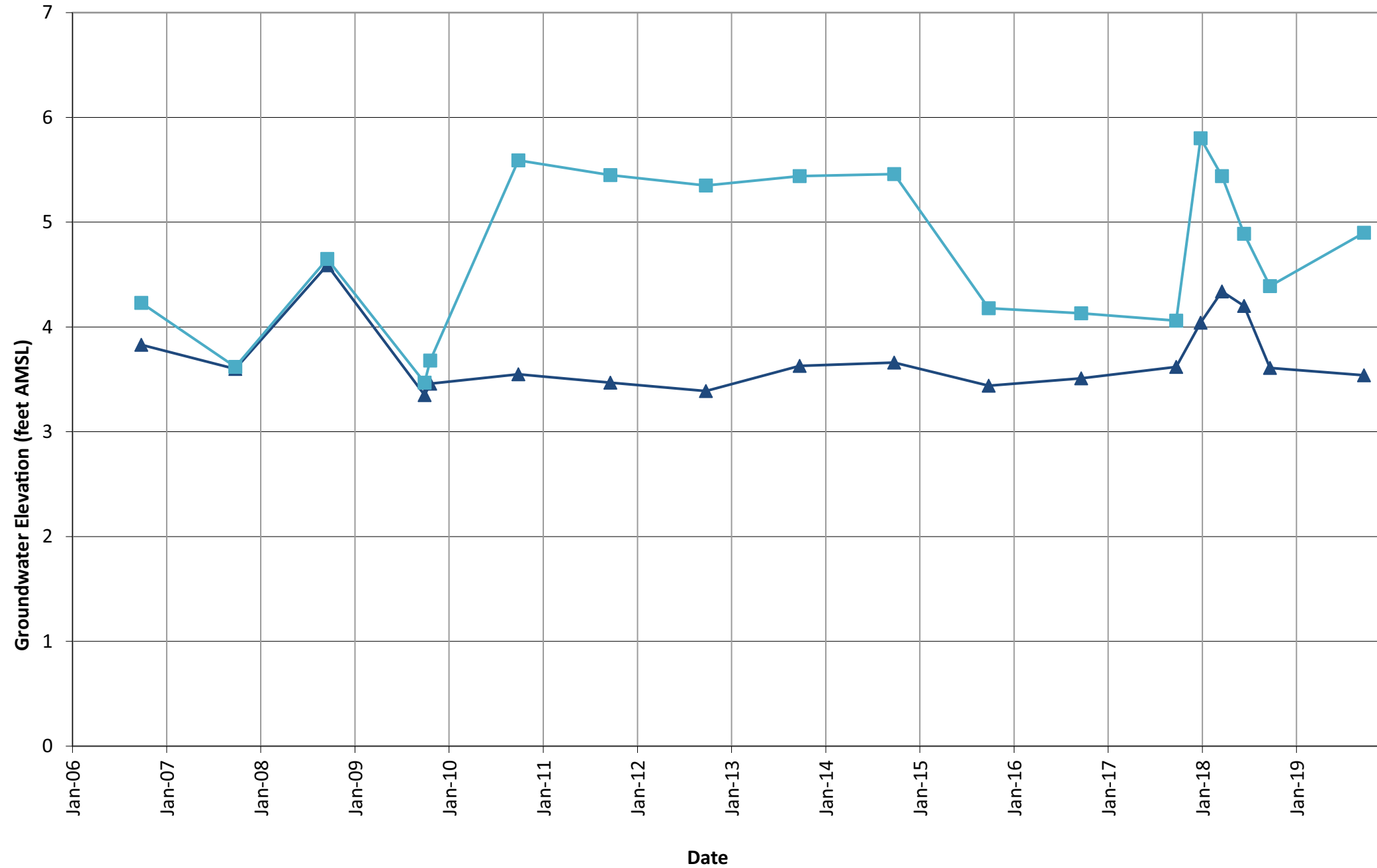
1. "A" WELLS ARE LOCATED INSIDE THE BARRIER WALL (IN THE UPPER SAND AQUIFER);
2. "B" WELLS ARE LOCATED OUTSIDE THE BARRIER WALL (IN THE UPPER SAND AQUIFER).

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.



**GROUNDWATER ELEVATION TRENDS
PZ-1A AND PZ-1B
FORMER MILL E / KOPPERS FACILITY
EVERETT, WASHINGTON**

PROJ NO.	050654V001	DATE:	1/20	FIGURE:	3
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LEGEND:

AMSL ABOVE MEAN SEA LEVEL

▲ PZ-2A

■ PZ-2B

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

NOTES:

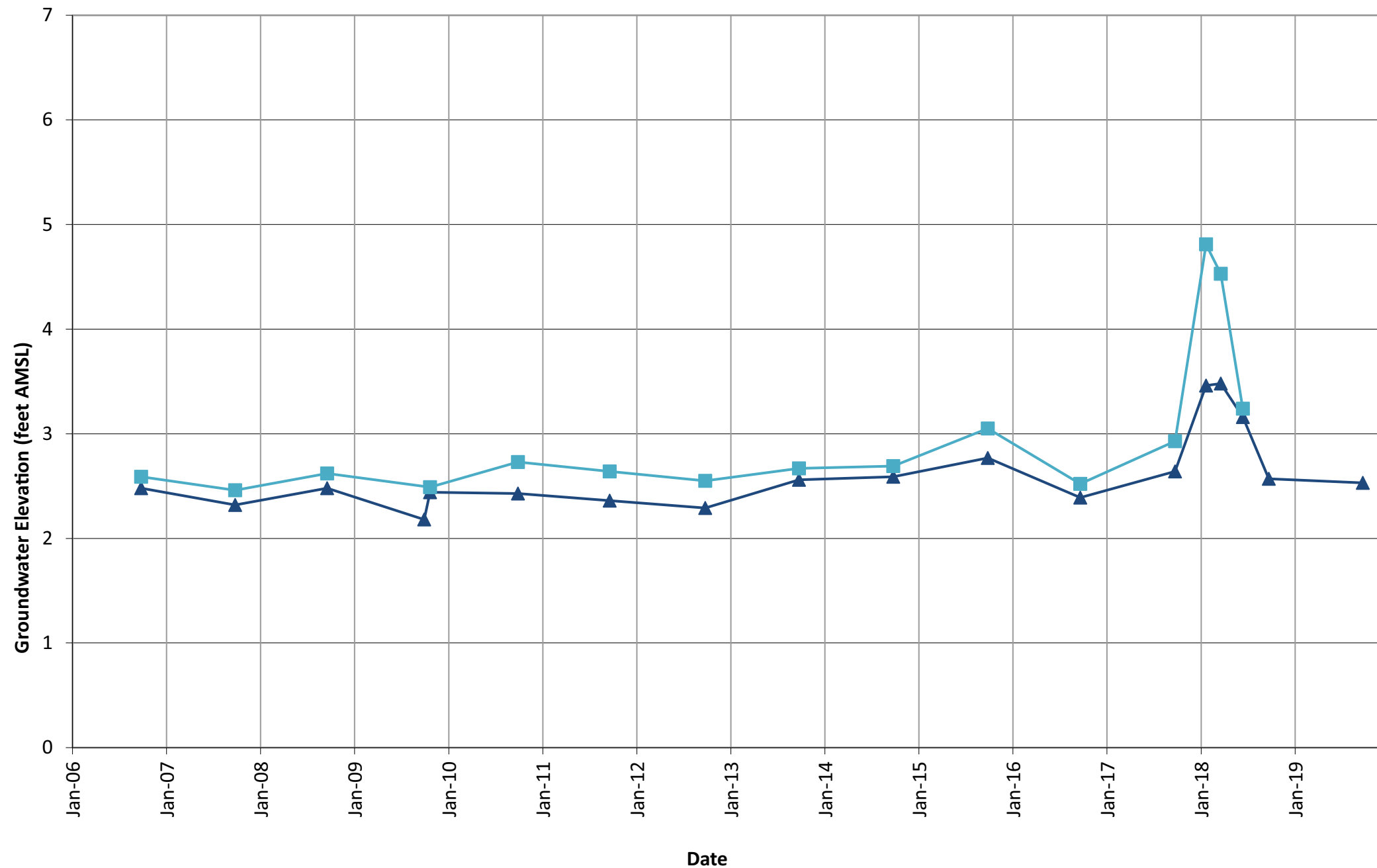
1. "A" WELLS ARE LOCATED INSIDE THE BARRIER WALL (IN THE UPPER SAND AQUIFER);
2. "B" WELLS ARE LOCATED OUTSIDE THE BARRIER WALL (IN THE UPPER SAND AQUIFER).

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.



**GROUNDWATER ELEVATION TRENDS
PZ-2A AND PZ-2B
FORMER MILL E / KOPPERS FACILITY
EVERETT, WASHINGTON**

PROJ NO. 050654V001	DATE: 1/20	FIGURE: 4
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LEGEND:

AMSL ABOVE MEAN SEA LEVEL

▲ PZ-3A

■ PZ-3B

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

NOTES:

1. "A" WELLS ARE LOCATED INSIDE THE BARRIER WALL (IN THE UPPER SAND AQUIFER);
2. "B" WELLS ARE LOCATED OUTSIDE THE BARRIER WALL (IN THE UPPER SAND AQUIFER).
3. PZ-3B WAS DRY DURING THE SEPTEMBER 2018 AND 2019 EVENTS.

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.

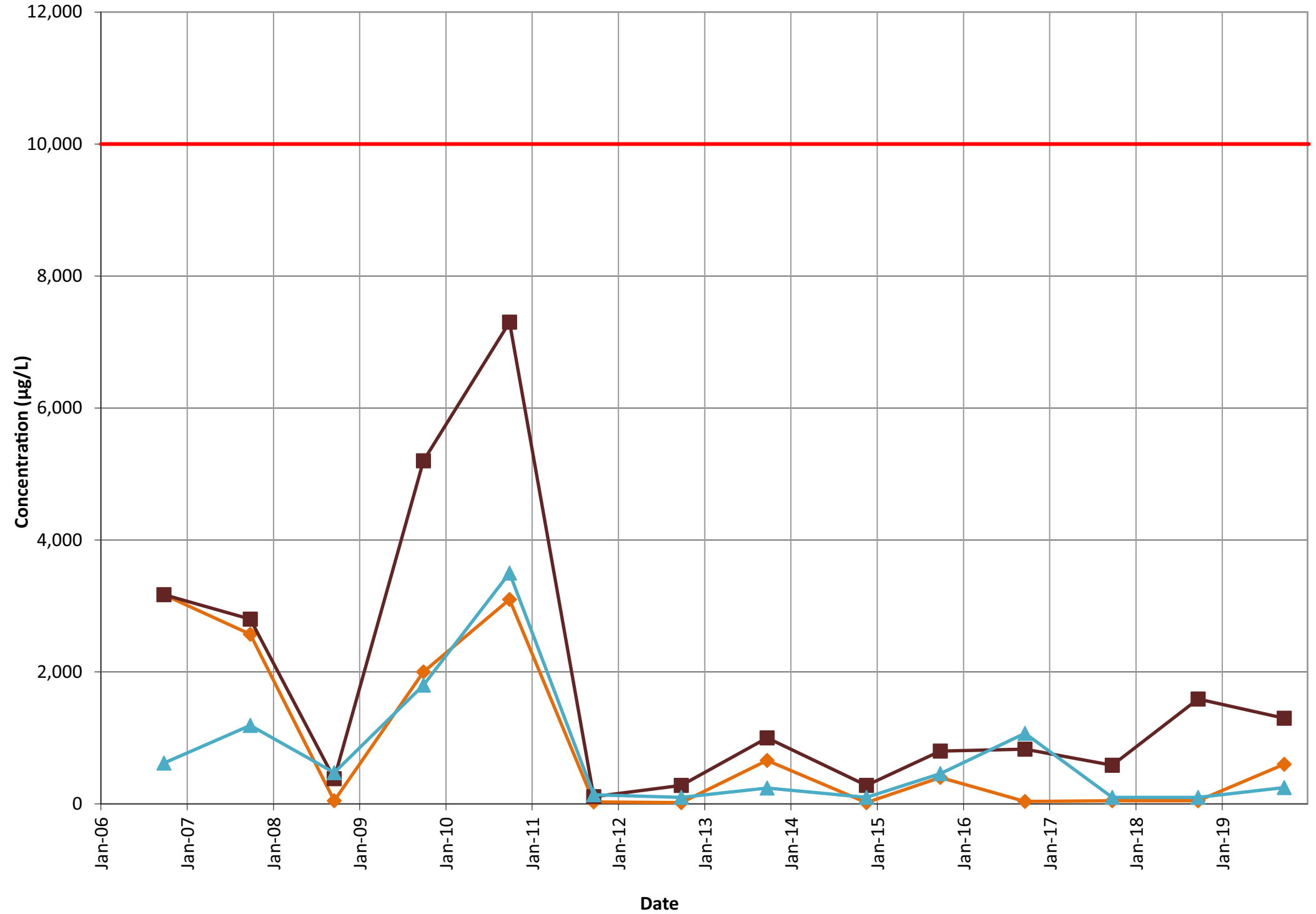


**GROUNDWATER ELEVATION TRENDS
PZ-3A AND PZ-3B
FORMER MILL E / KOPPERS FACILITY
EVERETT, WASHINGTON**

PROJ NO.	050654V001	DATE:	1/20	FIGURE:	5
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05654 Mill E \ 050654V001 F6 GW QTY TPH 1-20.cdr

Total Petroleum Hydrocarbon Concentrations



LEGEND:

- MTCA CLEANUP (10,000 ug/L)
- ◆ GASOLINE
- DIESEL
- ▲ MOTOR OIL
- MTCA MODEL TOXICS CONTROL ACT
- ug/L MICROGRAMS PER LITER
- TPH TOTAL PETROLEUM HYDROCARBONS

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

NOTES:
1. MTCA CLEANUP LEVELS ESTABLISHED IN THE 1998 CONSENT DECREE.

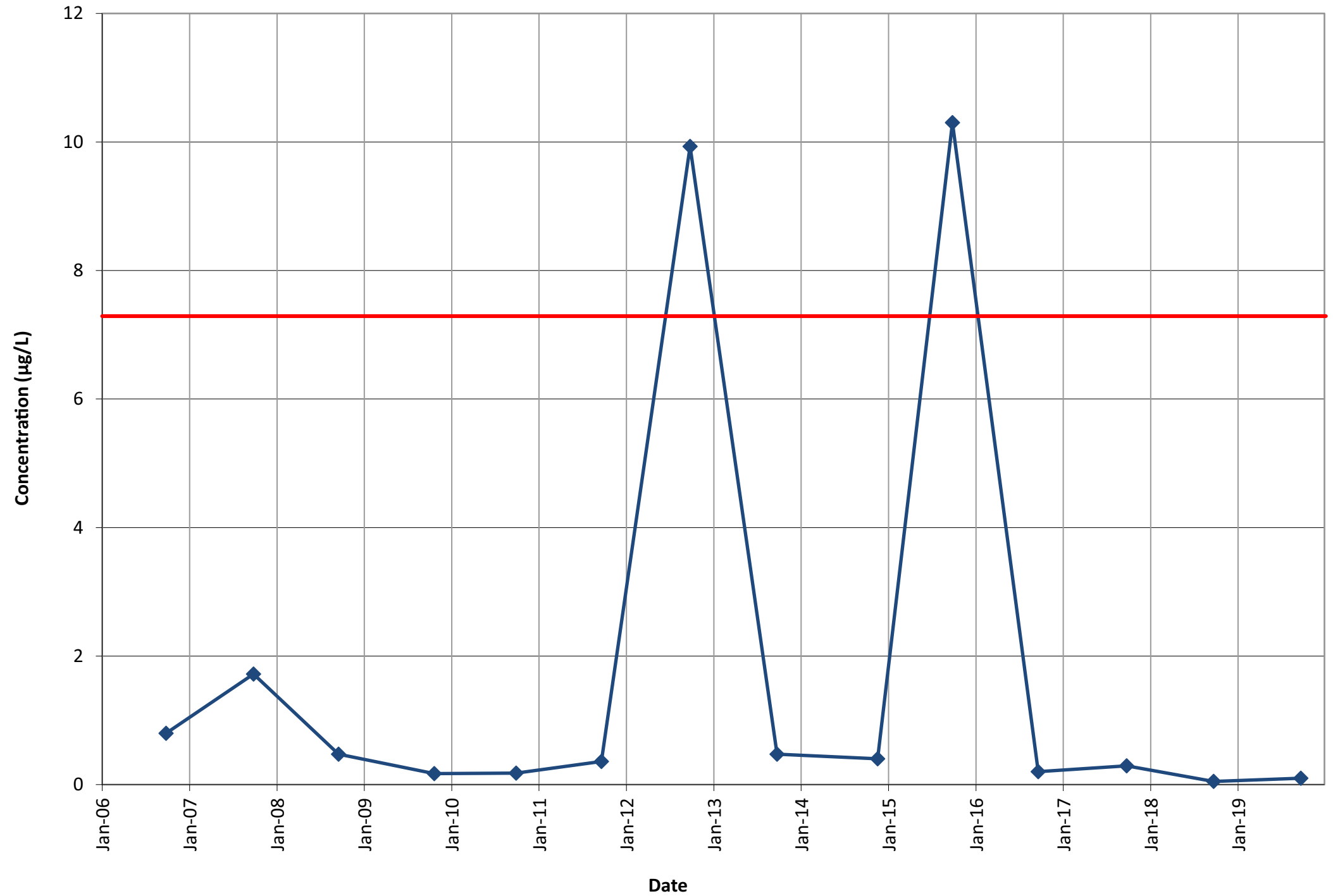
BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.



GROUNDWATER QUALITY TRENDS
TPH
FORMER MILL E / KOPPERS FACILITY
EVERETT, WASHINGTON

PROJ NO.	050654V001	DATE:	1/20	FIGURE:	6
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Pentachlorophenol Concentrations



LEGEND:

- MTCA CLEANUP (7.29 ug/L)
- ◆ PCP
- MTCA MODEL TOXICS CONTROL ACT
- ug/L MICROGRAMS PER LITER
- PCP PENTACHLOROPHENOL

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

NOTES:

1. MTCA CLEANUP LEVELS ESTABLISHED IN THE 1998 CONSENT DECREE.
2. NON-DETECTABLE CONCENTRATIONS OF PCP ARE PLOTTED AS HALF THE REPORTING LIMIT.

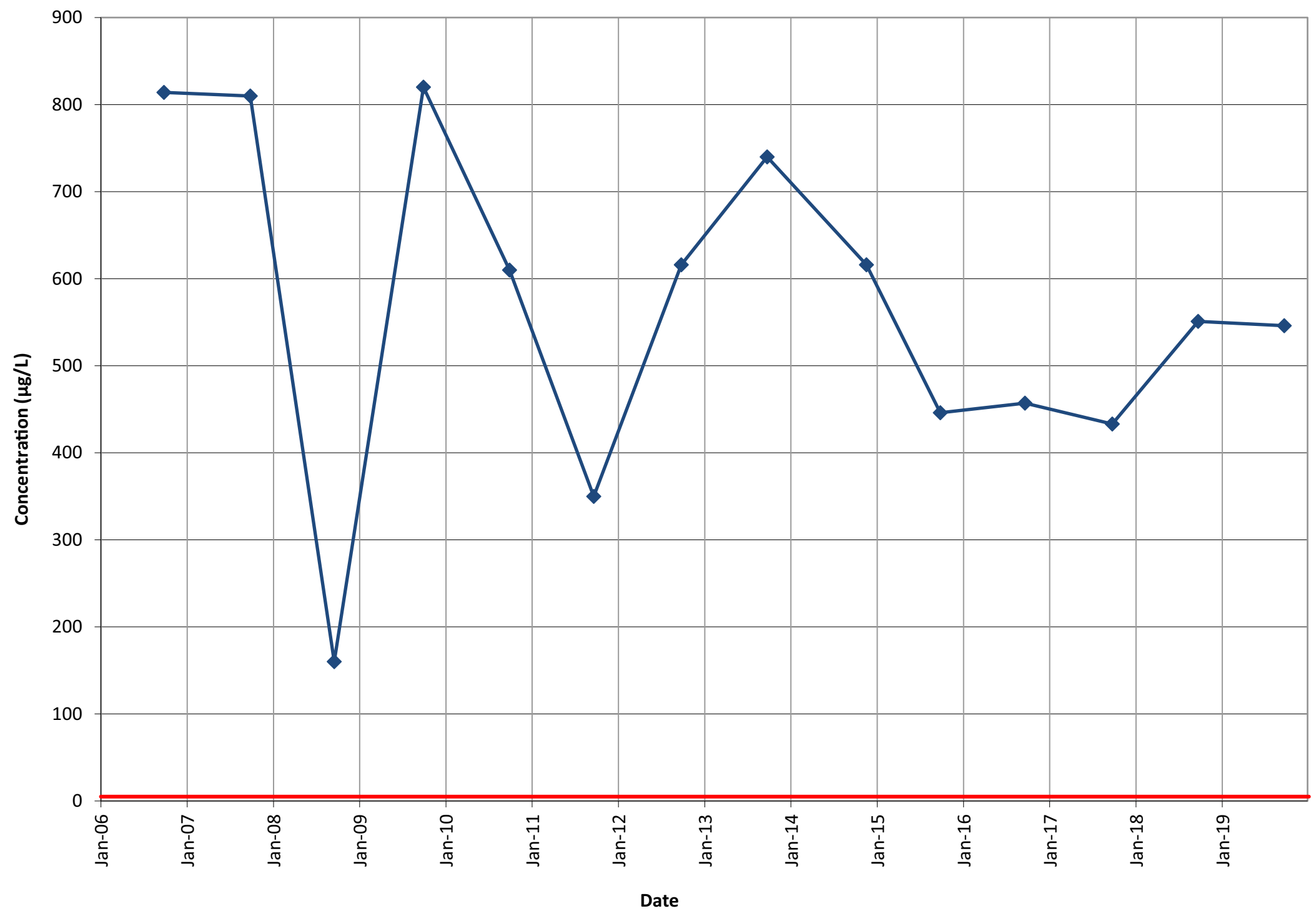
BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.



GROUNDWATER QUALITY TRENDS
PCP
 FORMER MILL E / KOPPERS FACILITY
 EVERETT, WASHINGTON

PROJ NO. 050654V001	DATE: 1/20	FIGURE: 7
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Arsenic Concentrations

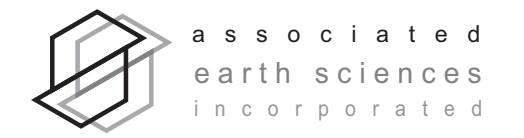


LEGEND:
 — MTCA CLEANUP (5 ug/L)
 ◆ ARSENIC
 MTCA MODEL TOXICS CONTROL ACT
 ug/L MICROGRAMS PER LITER

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

NOTES:
1. MTCA CLEANUP LEVELS ESTABLISHED IN THE 1998 CONSENT DECREE.

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.



GROUNDWATER QUALITY TRENDS
ARSENIC
 FORMER MILL E / KOPPERS FACILITY
 EVERETT, WASHINGTON

PROJ NO.	050654V001	DATE:	1/20	FIGURE:	8
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TABLES

Table 1
Summary of Groundwater Elevation Measurements
Former Mill E/Koppers Facility
Everett, Washington

Piezometer / Well Location ⁽¹⁾	Date	Time Measured ⁽²⁾	Top of Casing Elevation ⁽³⁾	Depth to Water (feet btoc)	Groundwater Elevation ⁽³⁾
PZ-1A	9/24/2019	8:22	9.90	6.76	3.14
PZ-1B	9/24/2019	8:27	9.82	5.14	4.68
LLMW-19D	9/24/2019	8:31	10.56	11.36	-0.80
PZ-2A	9/24/2019	8:14	9.40	5.86	3.54
PZ-2B	9/24/2019	8:15	8.38	3.48	4.90
PZ-2D	9/24/2019	8:17	9.08	10.87	-1.79
PZ-3A	9/24/2019	8:10	10.31	7.78	2.53
PZ-3B	9/24/2019	8:08	10.80	Dry	NA
LLMW-20D	9/24/2019	8:07	11.26	14.09	-2.83

NOTES:

- (1) "A" wells are located inside the barrier wall in the Upper Sand Aquifer; "B" wells are located outside the barrier wall in the Upper Sand Aquifer; "D" wells are located outside the barrier wall in the Lower Sand Aquifer.
- (2) Time measured is in the 24 hour format.
- (3) Top of well casing and groundwater elevations are presented in feet above or below mean sea level (MSL) (Shaw 2003; Floyd|Snider 2018)

btoc = below top of casing

Dry = no measurable groundwater was observed.

NA = not applicable, well PZ-3B was dry during monitoring event.

Table 2
Horizontal Hydraulic Head Difference Comparisons
Former Mill E/Koppers Facility
Everett, Washington

Piezometer / Well Pair ⁽¹⁾	Date	"B" Piezometer Upper Sand Aquifer Elevation	"A" Piezometer Upper Sand Aquifer Elevation	Horizontal Head Difference
PZ-1A/PZ-1B	9/24/2018	4.09	3.30	0.79
	9/24/2019	4.68	3.14	1.54
PZ-2A/PZ-2B	9/24/2018	4.39	3.61	0.78
	9/24/2019	4.90	3.54	1.36
PZ-3A/PZ-3B	9/24/2018	Dry	2.57	NA
	9/24/2019	Dry	2.53	NA

NOTES:

(1) "A" wells are located inside the barrier wall in the Upper Sand Aquifer; "B" wells are located outside the barrier wall in the Upper Sand Aquifer.

(2) Elevations are presented in feet above or below mean sea level (MSL)

Dry = no measurable groundwater was observed.

NA = not applicable, piezometer PZ-3B was dry during monitoring event.

Table 3
Vertical Hydraulic Head Difference Comparisons
Former Mill E/Koppers Facility
Everett, Washington

Piezometer / Well Pair ⁽¹⁾	Date	Location Relative to Barrier Wall	Upper Sand Aquifer Elevation	Lower Sand Aquifer Elevation	Vertical Head Difference
PZ-1A/LLMW-19D	9/24/2019	Inside	3.14	-0.80	3.94
PZ-1B/LLMW-19D	9/24/2019	Outside	4.68	-0.80	5.48
PZ-2A/PZ-2D	9/24/2019	Inside	3.54	-1.79	5.33
PZ-2B/PZ-2D	9/24/2019	Outside	4.90	-1.79	6.69
PZ-3A/LLMW-20D	9/24/2019	Inside	2.53	-2.83	5.36
PZ-3B/LLMW-20D	9/24/2019	Outside	Dry	-2.83	NA

NOTES:

(1) "A" wells are located inside the barrier wall in the Upper Sand Aquifer; "B" wells are located outside the barrier wall in the Upper Sand Aquifer.

(2) Elevations are presented in feet above or below mean sea level (MSL)

Dry = no measurable groundwater was observed.

NA = not applicable, well PZ-3B was dry during monitoring event.

Table 4
Summary of Groundwater Analytical Results
SVOCs, Total Petroleum Hydrocarbons, and Metals
Former Mill E/Koppers Facility
Everett, Washington

Piezometer	Sample ID	Sample Date	Analytical Results (1) (micrograms per Liter)				
			Total Petroleum Hydrocarbons			SVOCs	Metals
			Gasoline Range Hydrocarbons ⁽²⁾	Diesel Range Hydrocarbons ⁽³⁾	Heavy Oil Range Hydrocarbons ⁽³⁾	PCP ⁽⁴⁾	Total Arsenic ⁽⁵⁾
PZ-3A	PZ-3A-20190924	9/24/2019	600	1,300	< 250	< 0.2	546
Criteria⁽⁶⁾			10,000	10,000	10,000	7.29	5

NOTES:

- (1) Samples were analyzed by Friedman & Bruya, Inc. of Seattle, Washington.
 - (2) Sample analyzed by NWTPH Method NWTPH-Gx
 - (3) Sample analyzed by NWTPH Method NWTPH-Dx
 - (4) Sample analyzed by EPA Method 8270D SIM
 - (5) Sample analyzed by EPA Method 200.8
 - (6) Criteria are from the cleanup levels established in the 1998 Consent Decree based on MTCA Method A and C.
- < = not detected at concentration exceeding the laboratory reporting limit.

Red = concentration exceeds Criteria.

EPA = Environmental Protection Agency

MTCA = Washington State Model Toxics Control Act

NWTPH = Northwest Total Petroleum Hydrocarbon

SVOCs = Semivolatile organic compounds

PCP = pentachlorophenol

ATTACHMENT 1

Laboratory Test Certificates and Chain-of-Custody

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

October 3, 2019

Tim Brown, Project Manager
Associated Earth Sciences, Inc.
911 5th Avenue, Suite 100
Kirkland, WA 98033

Dear Mr Brown:

Included are the results from the testing of material submitted on September 24, 2019 from the Mill E 050654V001, F&BI 909410 project. There are 12 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl
Project Manager

Enclosures
c: Kellie Andrews
AE11003R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on September 24, 2019 by Friedman & Bruya, Inc. from the Associated Earth Sciences Mill E 050654V001, F&BI 909410 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID

909410 -01

Associated Earth Sciences

PZ-3A-20190924

All quality control requirements were acceptable.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/03/19
Date Received: 09/24/19
Project: Mill E 050654V001, F&BI 909410
Date Extracted: 09/30/19
Date Analyzed: 09/30/19

**RESULTS FROM THE ANALYSIS OF WATER SAMPLES
FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE
USING METHOD NWTPH-G_x**
Results Reported as ug/L (ppb)

<u>Sample ID</u> Laboratory ID	<u>Gasoline Range</u>	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 51-134)
PZ-3A-20190924 909410-01	600	93
Method Blank 09-2316 MB	<100	94

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/03/19
Date Received: 09/24/19
Project: Mill E 050654V001, F&BI 909410
Date Extracted: 09/26/19
Date Analyzed: 09/26/19

**RESULTS FROM THE ANALYSIS OF WATER SAMPLES
FOR TOTAL PETROLEUM HYDROCARBONS AS
DIESEL AND MOTOR OIL
USING METHOD NWTPH-D_x**
Results Reported as ug/L (ppb)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C ₁₀ -C ₂₅)	<u>Motor Oil Range</u> (C ₂₅ -C ₃₆)	<u>Surrogate</u> (% Recovery) (Limit 41-152)
PZ-3A-20190924 909410-01	1,300	<250	111
Method Blank 09-2368 MB	<50	<250	97

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 200.8

Client ID:	PZ-3A-20190924	Client:	Associated Earth Sciences
Date Received:	09/24/19	Project:	Mill E 050654V001, F&BI 909410
Date Extracted:	09/30/19	Lab ID:	909410-01 x10
Date Analyzed:	10/01/19	Data File:	909410-01 x10.062
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
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Arsenic	546
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FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Associated Earth Sciences
Date Received:	NA	Project:	Mill E 050654V001, F&BI 909410
Date Extracted:	09/30/19	Lab ID:	I9-599 mb
Date Analyzed:	09/30/19	Data File:	I9-599 mb.104
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
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Arsenic	<1
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FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis for Semivolatile Phenols By EPA Method 8270D SIM

Client Sample ID:	PZ-3A-20190924	Client:	Associated Earth Sciences
Date Received:	09/24/19	Project:	Mill E 050654V001, F&BI 909410
Date Extracted:	09/30/19	Lab ID:	909410-01
Date Analyzed:	09/30/19	Data File:	093020.D
Matrix:	Water	Instrument:	GCMS8
Units:	ug/L (ppb)	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	26	17	97
Phenol-d6	16 ca	10	62
2,4,6-Tribromophenol	107	33	166

Compounds:	Concentration ug/L (ppb)
Pentachlorophenol	<0.2

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis for Semivolatile Phenols By EPA Method 8270D SIM

Client Sample ID:	Method Blank	Client:	Associated Earth Sciences
Date Received:	Not Applicable	Project:	Mill E 050654V001, F&BI 909410
Date Extracted:	09/30/19	Lab ID:	09-2381 mb
Date Analyzed:	09/30/19	Data File:	093019.D
Matrix:	Water	Instrument:	GCMS8
Units:	ug/L (ppb)	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	28	17	97
Phenol-d6	15 ca	10	62
2,4,6-Tribromophenol	85	33	166

Compounds:	Concentration ug/L (ppb)
Pentachlorophenol	<0.2

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/03/19

Date Received: 09/24/19

Project: Mill E 050654V001, F&BI 909410

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER
SAMPLES FOR TPH AS GASOLINE
USING METHOD NWTPH-G_x**

Laboratory Code: 909383-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Gasoline	ug/L (ppb)	3,200	3,100	4

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Gasoline	ug/L (ppb)	1,000	92	69-134

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/03/19

Date Received: 09/24/19

Project: Mill E 050654V001, F&BI 909410

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER
SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS
DIESEL EXTENDED USING METHOD NWTPH-D_x**

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	110	103	63-142	7

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/03/19

Date Received: 09/24/19

Project: Mill E 050654V001, F&BI 909410

**QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF WATER SAMPLES
FOR TOTAL METALS USING EPA METHOD 200.8**

Laboratory Code: 909377-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	<1	83	79	70-130	5

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	88	85-115

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 10/03/19

Date Received: 09/24/19

Project: Mill E 050654V001, F&BI 909410

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER
SAMPLES FOR SEMIVOLATILE PHENOLS BY EPA METHOD 8270D SIM**

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 30)
Pentachlorophenol	ug/L (ppb)	2.5	83	88	23-185	6

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

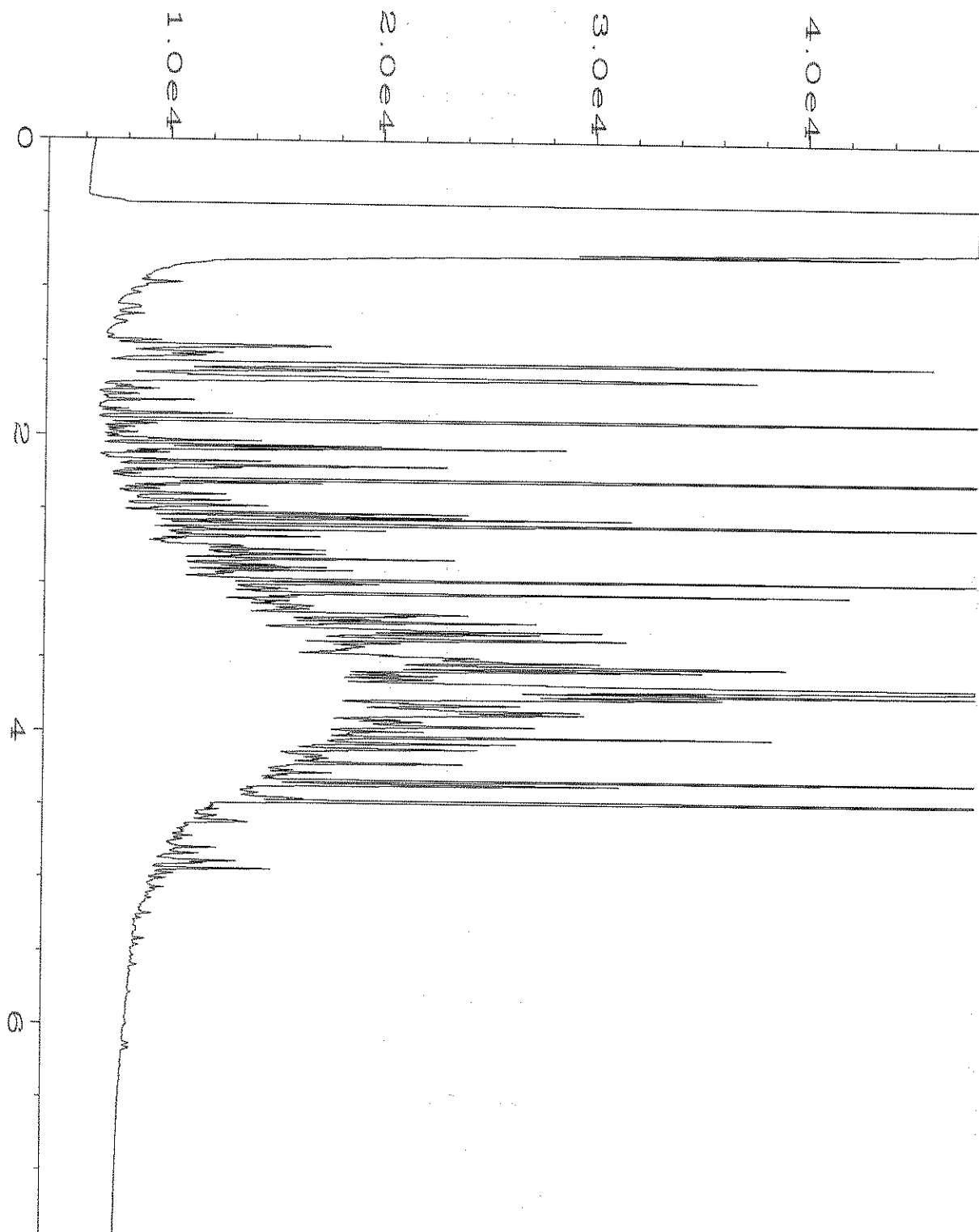
nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

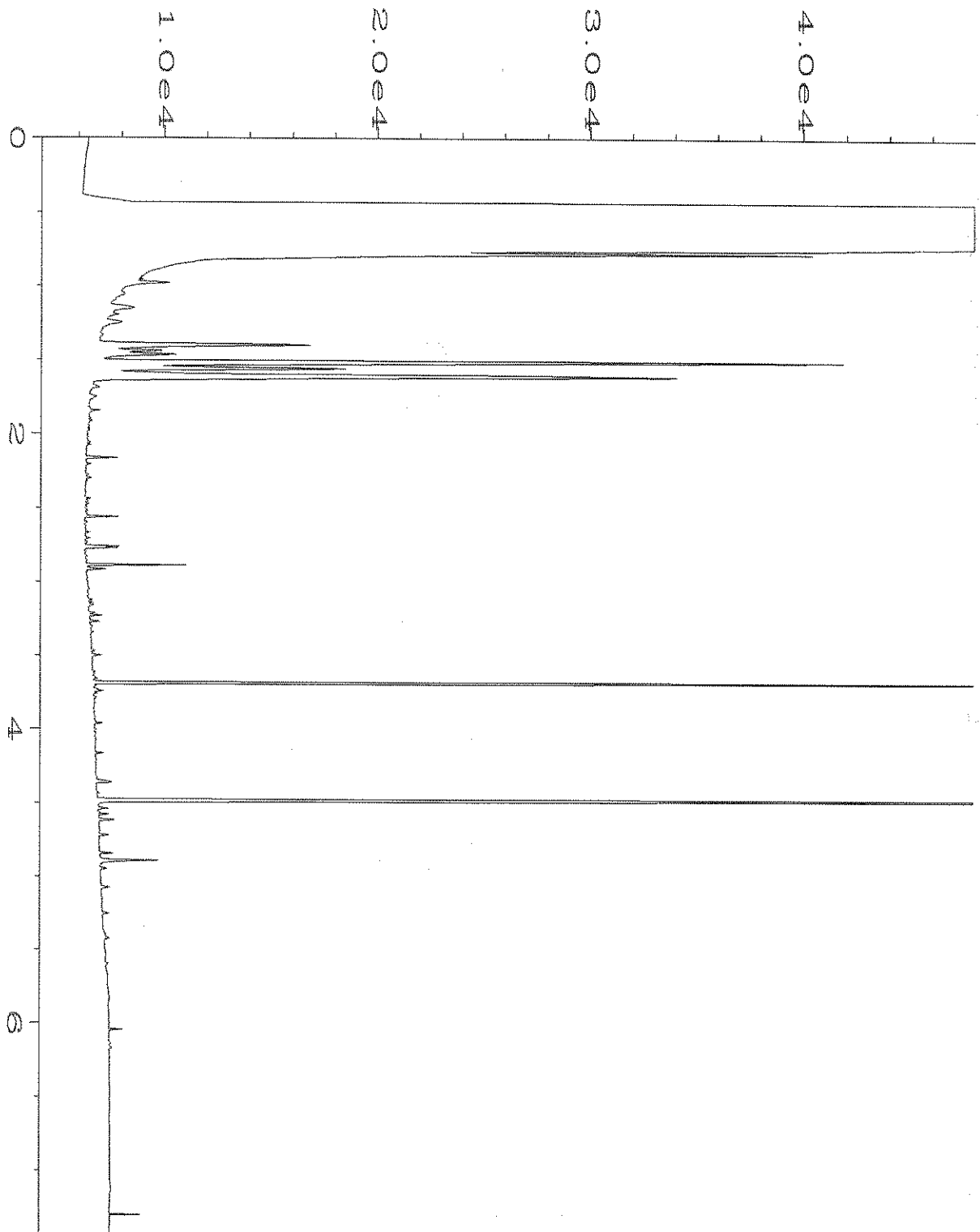
ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

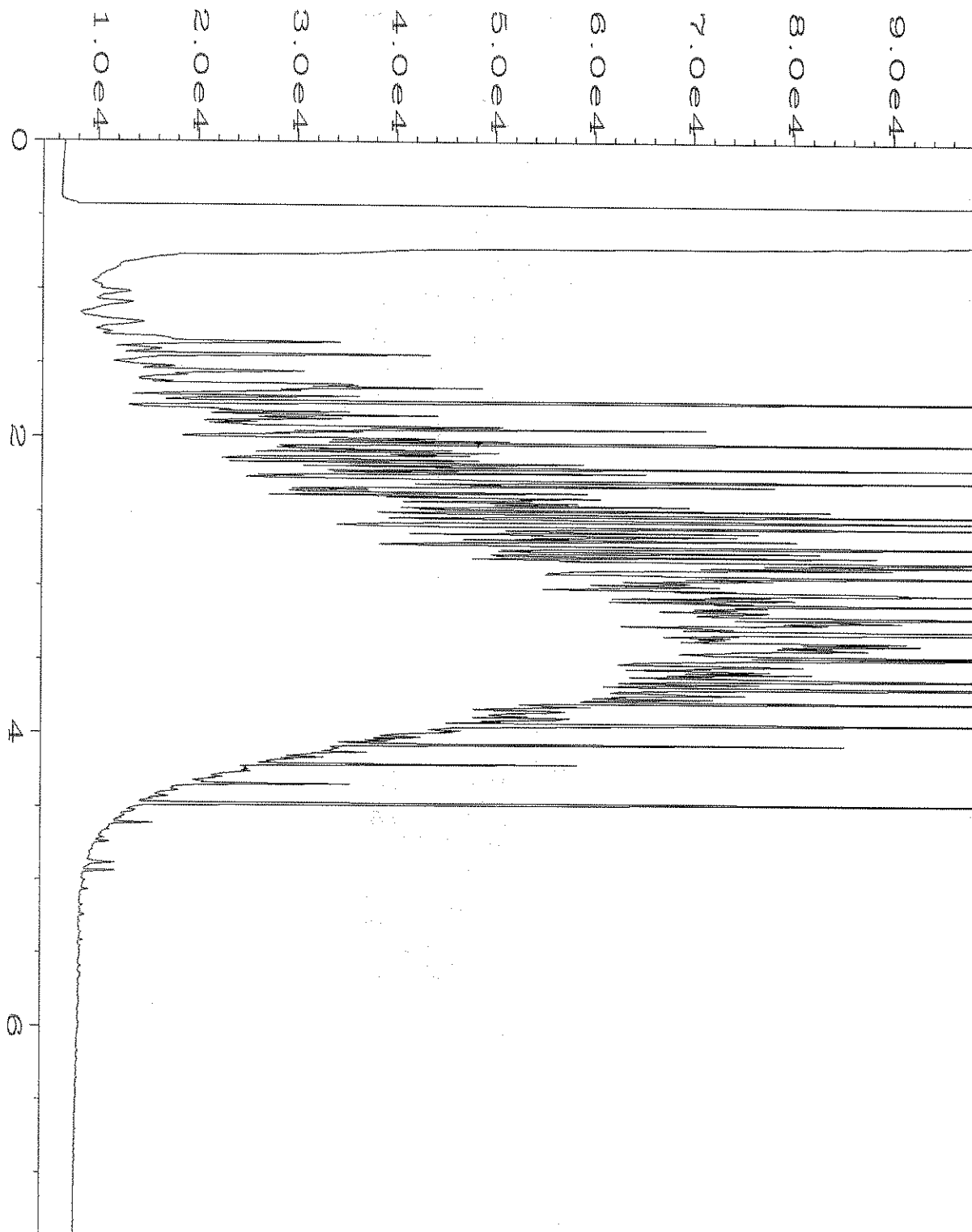
x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.



Data File Name	: C:\HPCHEM\1\DATA\09-26-19\014F0501.D	Page Number	: 1
Operator	: TL	Vial Number	: 14
Instrument	: GC1	Injection Number	: 1
Sample Name	: 909410-01	Sequence Line	: 5
Run Time Bar Code:		Instrument Method:	DX.MTH
Acquired on	: 26 Sep 19 01:56 PM	Analysis Method	: DEFAULT.MTH
Report Created on:	27 Sep 19 09:54 AM		



Data File Name	: C:\HPCHEM\1\DATA\09-26-19\013F0501.D	Page Number	: 1
Operator	: TL	Vial Number	: 13
Instrument	: GC1	Injection Number	: 1
Sample Name	: 09-2368 mb	Sequence Line	: 5
Run Time Bar Code:		Instrument Method	: DX.MTH
Acquired on	: 26 Sep 19 01:44 PM	Analysis Method	: DEFAULT.MTH
Report Created on:	27 Sep 19 09:56 AM		



Data File Name	: C:\HPCHEM\1\DATA\09-26-19\005F0901.D	Page Number	: 1
Operator	: TL	Vial Number	: 5
Instrument	: GC1	Injection Number	: 1
Sample Name	: 1000 Dx 57-78B	Sequence Line	: 9
Run Time Bar Code:		Instrument Method	: DX.MTH
Acquired on	: 26 Sep 19 03:28 PM	Analysis Method	: DEFAULT.MTH
Report Created on:	27 Sep 19 01:30 PM		

ATTACHMENT 2

Field Report of Cap Inspection

911 Fifth Avenue
Kirkland, Washington 98033
Phone: 425-827-7701
Fax: 425-827-5424
www.aesgeo.com

Date 9/24/2019	Project Name Former Mill E/Koppers Facility	Project No. 050654V001
Location Riverside Business Park		Municipality Everett
Permit No. Not Applicable	DCI Permit No. Not Applicable	Weather 60's, Overcast
Report No. 1		
Engineer/Architect Not Applicable		
Client/Owner Pacific Topsoils, Inc.		
General Contractor/Superintendent Not Applicable		

TO: Pacific Topsoils Inc.
805 80th Street SW
Everett, Washington 98203

ATTN: Mr. Janusz Bajsarowicz

PERFORMANCE AND COMPLIANCE MONITORING PLAN UPDATE:

As part of the Performance and Compliance Monitoring Plan (EMCON 1998), an inspection of the Asphalt Cap and Soil Cover is to be conducted annually. Associated Earth Sciences Inc. (AESI) personnel arrived on site to observe the existing asphalt cap and fill soil covering previously identified contaminated soils on site.

Kellie M. Andrews with AESI was onsite to perform site observations. The property is currently occupied by an Amazon delivery service and several vehicles were parked at the time of our visit. White paint has been used to mark parking spaces on the site. Majority of the cap, approximately 90 to 95 percent was visible at the time of the site visit. The asphalt cap was observed to be in serviceable condition with no obvious signs of cracking, fissures, or pumping. There are areas where shallow depressions were observed, which were less than 2-inches in depth from recent rainfall. These shallow depressions were less than 10 feet in diameter. Drainage ditches had minimal accumulated sediment, less than 1-inch, and no major cracks or vegetation was observed in the drainage ditches.

The soil cap to the south of the asphalt cap appeared intact and is performing as intended. No major ponding or erosion was observed. Photographs of general observations are provided below.



Facing west-southwest from the northeast corner of the property, observing the asphalt cap.

Copies To: _____

Field Rep: _____

Date Mailed: _____

Principal / PM: _____



AESI FIELD REPORT

To: _____
Date: _____
Permit No. _____

Project Name: _____
Project No.: _____
DCI No. _____



Facing south from the northwest portion of the property at one of the drainage ditches.



Facing south-southwest from the southern portion of the asphalt cap at the soil cover and the southern drainage ditch.

Copies To: _____

Field Rep: Kellie M. Andrews, G.I.T.

Date Mailed: _____

Principal / PM: _____