DEPARTMENT OF ECOLOGY
State of Washington

PERIODIC REVIEW
PALOUSE PRODUCERS SITE

Facility Site ID 787
Cleanup Site ID 4973

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Publication and Contact Information

This document is available on the Department of Ecology's website at: https://apps.ecology.wa.gov/gsp/Sitepage.aspx?csid=4973.

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1.0 INTRODUCTION

This report presents the Washington State Department of Ecology's (Ecology) periodic review for Palouse Producers Site (Site). This periodic review is required as part of the site cleanup process under the Model Toxics Control Act (MTCA), Ch. 70.105D Revised Code of Washington, implemented by Ecology. Periodic reviews evaluate post-cleanup site conditions and monitoring data to assure human health and the environment are being protected. They are required for sites where an institutional control is part of the cleanup action.

The City of Palouse conducted cleanup actions at the Site in 2012. These actions addressed contaminated soils, but residual soil and groundwater contamination remains at the Site. Groundwater monitoring has been ongoing since completion of the cleanup action, and institutional controls are in place to ensure the remedy remains protective of human health and the environment.

2.0 SUMMARY OF SITE CONDITIONS

2.1 Site Description and History

The Site is located in downtown Palouse in Whitman County, Washington (Figure 1). It is approximately 150 feet long with 200 feet of Main Street frontage. The southern edge of the property is bordered by the Palouse River.

The Site has been used for commercial agricultural support activities for over a century, from a blacksmith/welding shop to a vehicle maintenance and fueling facility. Petroleum product storage occurred at the property from 1955 through 1985. Palouse Producers took over operation of the facility from Conoco in 1977. Five aboveground storage tanks and four underground storage tanks were in use. In 1985, all of the aboveground storage tanks and three of the underground storage tanks were removed. The final underground tank was removed in 1992. During that time, releases to the environment occurred in the form of uncontained spills, drips, and leaks from underground tanks and piping.

2.2 Physical Site Characteristics

2.2.1 Geology

The lithology across the Site does not vary east to west, but does slope downward to the south, toward the river. Gravelly fill, ranging in thickness from 0.5 to 5 feet, covers most of the Site. Fill materials, including silts, sands, gravels, and debris, have been observed at the surface and described as thickest near the river (up to 10 feet below ground surface[bgs]). Examples of some of the waste encountered are rubber tires, wood, farm machinery and parts, wagon wheels, concrete and asphalt chunks, and organic material. Sandy silt and silty sand have been observed beneath the fill and extend approximately 10 feet bgs near the north end of the Site and up to 17 feet bgs near the river on the south end. Silt has been identified beneath the

sandy silt on the north end of the Site but is not present on the southern portion of the Site. Beneath all is a fairly flat sandy gravel and basalt. The sandy gravel is approximately 2 feet thick and above the basalt. The basalt was also observed as the bottom of the Palouse River.

2.2.2 Hydrogeology

Groundwater was observed in the sand and silty sands at approximately 6 feet to 12 feet bgs on the Site. The Site topography slopes toward the Palouse River and the presumed groundwater flow direction is to the south, toward the Palouse River.

Groundwater seeps have not been identified. The river bottom offshore of the Site consists of basalt. The elevations of basalt beneath the river and the basalt encountered on the Site are similar. Based on groundwater elevations and lithology, it appears that shallow groundwater discharges to the Palouse River.

2.3 Previous Site Investigations

A series of investigations have taken place to aid in determining the type, amount, extent, and source of the petroleum hydrocarbon contamination. Reports documenting these investigations can be found at Ecology's Eastern Regional Office in Spokane.

From 1984 through 1985, several interceptor trenches were installed to the water table to remove floating petroleum products from groundwater. During those installations, approximately 850 cubic yards of contaminated soil was removed. Additionally, a polymer liner was installed on the riverbank to limit contaminant migration to the river. Both these trenches were removed in 1992.

In 1989 soil samples were collected, and in 1991 soil and groundwater samples were collected from four new monitoring wells, along with sediment samples from the Palouse River. Ecology collected follow up soil and groundwater samples in 1992 and 1993. In 1999, Ecology completed a full investigation with soil and groundwater samples. The U.S. Environmental Protection Agency (EPA) followed up with additional soil, groundwater, and sediment sampling in 2007 using Targeted Brownfield Assessment funding.

In 2011, a Remedial Investigation/Feasibility Study (RI/FS) was completed using previous data and new soil, surface water, soil vapor, and groundwater sampling. The site was contaminated with petroleum hydrocarbons (gasoline, diesel, and heavy oil), benzene, arsenic, lead, and manganese in both soil and groundwater. The outcome was a recommendation to excavate contaminated soils to the water table during the driest part of the year.

2.4 Nature and Extent of Contamination

2.4.1 Soils

Concentrations of total petroleum hydrocarbons (TPH), benzene, and lead are above screening levels in former source areas (former under- and aboveground tanks and diesel dispensing areas) and near the riverbank. Except for TPH and benzene in a few locations, the extent of indicator hazardous substances (IHS) contamination in subsurface soil is generally near the east, north, and west property boundaries. However, elevated concentrations are present in subsurface soil near the riverbank. Because of the lighter density of petroleum constituents relative to water, the constituents tend to be most concentrated around the water table and in the smear zone. Data also shows that in many areas of the Site, TPH and benzene appear to be co-located with high concentrations of metals. With a few exceptions, arsenic appears to occur naturally on the Site and is not a result of Site activities. However, a few samples exceeded natural background concentration.

2.4.2 Groundwater

Petroleum hydrocarbons, benzene, arsenic, manganese, and lead are considered IHSs in groundwater. Petroleum hydrocarbons, benzene, and lead are significantly elevated in locations where tanks, piping, or other fueling infrastructure was located. Arsenic is typically present in groundwater petroleum plumes due to mobilization of naturally occurring arsenic in soil.

Manganese is detected in groundwater above the screening level at concentrations that are generally similar throughout the site. Concentrations may be indicative of background concentrations, but since no data are available to assess that, manganese remains an IHS for the Site. Groundwater was analyzed for pesticides; none were detected.

2.4.3 Soil Vapor

Benzene and petroleum hydrocarbons exceeded air screening levels in one of two locations.

2.4.4 Sediment

Sediment samples did not exceed screening levels.

2.4.5 Surface Water

Surface water samples were collected adjacent to, downstream, and upstream of the Site. Benzene was not detected in the surface water samples. Lead was detected in surface water samples, but below screening levels.

While some groundwater concentrations exceeded surface water criteria on the riverbank, groundwater does not appear to be discharging to surface water at concentrations above screening levels.

3.0 CLEANUP ACTION PLAN

Following completion of the RI/FS, Ecology issued a Cleanup Action Plan in December 2011.

3.1 Cleanup Standards

The two primary components of cleanup standards are cleanup levels and points of compliance.

3.1.1 Cleanup Levels

Cleanup levels determine the concentration in which a particular hazardous substance does not threaten human health or the environment. Site cleanup levels were developed as follows:

- Groundwater – Method B cleanup levels protective of drinking water and surface water were used. IHSs were arsenic, lead, manganese, TPH, and benzene.

- Soils - Method B cleanup levels protective of groundwater and ecological receptors were used for Site soils. IHSs were arsenic, lead, and TPH.

Table 1 shows the final cleanup levels for the identified Site indicators after consideration of background concentrations, Practical Quantitation Limits (PQLs), and total Site risk.

3.1.2 Points of Compliance

The point of compliance is defined in MTCA as the point or points where cleanup levels shall be attained Washington Administrative Code (WAC) 173-340-200. Once those cleanup levels have been attained at that point, the site is no longer considered a threat to human health and the environment.

For soil cleanup levels based on protection of groundwater, the point of compliance is in the soils throughout the site.

Groundwater points of compliance are established for the entire Site from the top of the saturated zone to the lowest potentially affected portion of the aquifer. Alternatively, a conditional point of compliance may be set if it can be demonstrated that it is not practicable to meet cleanup levels throughout the site within a reasonable restoration time frame. This conditional point of compliance will be as close as practicable to the source, not to exceed the property boundary. Where the groundwater cleanup level is based on protection of surface water beneficial uses, and the contaminated property abuts the surface water, Ecology may approve a conditional point of compliance that is located within the surface water as close as technically possible to the point or points where groundwater flows into surface water subject to the conditions specified under WAC 173-340-720(8)(d)(i). A conditional point of compliance was approved for groundwater.

3.2 Site Cleanup

Site cleanup was completed in 2012. Prior to the start of work, all on-site structures were demolished and two existing sumps were vacuumed out. All unsaturated contaminated soils were excavated and disposed at an approved off-site landfill. Work was done at the driest part of the year (late summer) to maximize the depth of unsaturated soil that could be removed. On-site x-ray fluorescence was used to help segregate highly lead-contaminated soils that required pre-treatment with Portland cement prior to disposal. Laboratory confirmation sampling was used to determine the lateral extent of excavation; the vertical extent was limited by the presence of groundwater. Approximately 3,000 cubic yards of contaminated soil was excavated. Following completion, three new groundwater monitoring wells were installed for ongoing compliance monitoring.

Figure 2 shows the locations of all remedial actions.

Institutional controls were also placed on the property to minimize the potential for exposure to remaining contamination. An environmental covenant was placed on the property to restrict activities that may interfere with the integrity of the cleanup action or cause an exposure to remaining contamination at depth.

The cleanup action required semi-annual monitoring of all three monitoring wells at the Site (Figure 3). Samples are collected for all Site indicators, which include petroleum hydrocarbons, benzene, arsenic, lead, and manganese. In 2017, monitoring was changed to once a year.

4.0 Periodic Review

4.1 Regulation

A periodic review of the cleanup action takes place at least every five years after the initiation of the cleanup action. A periodic review is required at sites where any of the following occur:

- Ecology conducts a cleanup action.
- Ecology approves a cleanup action under an order, agreed order, or consent decree.
- As resources permit, whenever Ecology issues a no further action opinion.

AND one of the following conditions exists:

- An institutional control and/or financial assurance is required as part of the cleanup action.
- The cleanup level is based on a PQL as provided for under WAC 173-340-707.
- Modifications to the default equations or assumptions using site-specific information would significantly increase the concentration of hazardous substances remaining at the Site after

cleanup or the uncertainty in the ecological evaluation or the reliability of the cleanup action is such that additional review is necessary to assure long-term protection of human health and the environment.

When conducting a periodic review of a cleanup action and evaluating whether human health and the environment are being protected, the factors the department shall consider include [WAC 173-340-420(4)]:

- The effectiveness of ongoing or completed cleanup actions.
- New scientific information for individual hazardous substances of mixtures present at the Site.
- New applicable state and federal laws for hazardous substances present at the Site.
- Current and projected Site use.
- Availability and practicability of higher preference technologies.
- The availability of improved analytical techniques to evaluate compliance with cleanup levels.

4.2 Basis

Because the Site underwent a cleanup action Ecology approved under a consent decree and institutional controls were required as part of the cleanup action, periodic reviews are required at a frequency of at least every five years.

This review is based on documents describing the actions listed in Section 2.2, and on seven years of compliance monitoring data documenting Site conditions and contaminant concentrations.

4.3 The Effectiveness of Ongoing or Completed Cleanup Actions

Evaluating the cleanup action effectiveness involves assessing contaminant levels and trends to determine if the cleanup actions are performing as expected.

Benzene concentrations have shown decreasing trends at all wells. Benzene is below cleanup levels (CULs) at monitoring well 1 (MW-1) and MW-2. Benzene has shown a 75 percent to 90 percent reduction at MW-3, but still exceeds the CUL.

TPH has shown decreasing trends at all wells. Diesel has been below CULs at MW-1 and MW-2 since 2015, and MW-3 reached concentrations below CULs in 2019. Gasoline has been below CULs at MW-1 and MW-2 since completion of the cleanup action. MW-3 decreased to below CULs in 2017, and has shown an upward trend since then to back above CULs.

The greatest decreases in TPH and benzene concentrations were due to the removal of highly contaminated unsaturated soils that continued to leach contamination into groundwater. The residual concentrations now seen at the Site are due to contaminated groundwater in saturated soils that couldn't be removed during the cleanup action. This remaining contamination will slowly be degraded by naturally occurring soil bacteria. These bacteria work best in an oxygenated environment. However, due to the low porosity of the soils and slow movement of groundwater, once the bacteria use up the available oxygen, it isn't replenished quickly. Therefore, bacteria work much more slowly and cleanup will take longer.

Arsenic and manganese show stable, if slightly reducing, trends in groundwater. Both of these metals are naturally occurring within soils, and can be desorbed from soil particles in low oxygen environments. The degradation of petroleum contamination by soil bacteria can cause low oxygen environments, which can then mobilize naturally occurring metals into groundwater. At many sites with petroleum groundwater plumes, higher concentrations of certain metals are often seen. Concentrations typically won't reduce until the petroleum is fully degraded and oxygen levels have rebounded.

Lead has remained below the CUL for all wells since completion of the cleanup action.

4.4 New Scientific Information for Individual Hazardous Substances or Mixtures Present at the Site

There is no new scientific information that affects the Site.

4.5 New Applicable State and Federal Laws for Hazardous Substances Present at the Site

No new federal or state laws exist that would apply to contaminants at the Site.

4.6 Current and Projected Site and Resource Uses

The Site is zoned as high intensity. The Site has recently been sold to a private local development group who plan to build several commercial structures serving local businesses. The new Site owners were made aware of the existing environmental conditions, and the planned redevelopment will not adversely affect the cleanup nor provide any exposures to residual contamination. The City of Palouse retains the responsibility to continue groundwater monitoring at the Site, and the new owners will maintain all groundwater monitoring wells and access to them.

4.7 The Availability and Practicability of More Permanent Remedies

Similar sites in Eastern Washington, with petroleum groundwater contamination in low permeability soils near surface water, have evaluated additional treatment technologies. These have included lance injection emplacement, in-situ biological oxidation, and phytoremediation. None have significantly enhanced the degradation of petroleum or benzene faster than natural

attenuation. Therefore, given the site similarities, it is expected that these technologies also would not be effective at this site.

4.8 The Availability and Practicability of Improved Analytical Techniques to Evaluate Compliance with Cleanup Levels

Metals are evaluated with EPA Method 200.8, petroleum with NWTPH, and benzene with EPA Method 8260C. No improved analytical techniques are available.

5.0 CONCLUSIONS

- Significant reductions in benzene concentrations (up to 90 percent) have been observed; MW-3 is the only well with concentrations still exceeding CULs.

- All TPH concentrations have shown decreasing trends. Diesel concentrations have shown reductions in all wells and no longer exceed CULs. Gasoline concentrations showed decreasing trends, but had an upward trend in MW-3 since 2017. All other wells remain below CULs.

- Metals concentrations haven't shown any prominent trends; arsenic and manganese remain above CULs while lead remains below CULs.

- Monitoring should continue on an annual or biennial basis. If a contaminant remains below CULs for four consecutive monitoring events, it may be considered remediated and no further monitoring for it would be required.

- Redevelopment plans for the Site are appropriate as long as access to wells remains in place. Site owners should continue to work with Ecology as needed to ensure their development does not impair the remedy and is consistent with the environmental covenants.

6.0 REFERENCES CITED

Maul Foster & Alongi, 2011, *Remedial Investigation and Feasibility Study Report, Former Palouse Producers Property.*

Washington State Department of Ecology, 2011, *Final Cleanup Action Plan, Palouse Producers Site.*

Washington State Department of Ecology, 2001, *Model Toxics Cleanup Act Regulation, Chapter 173-340 WAC.*

FIGURES

Figure 1: Site Location

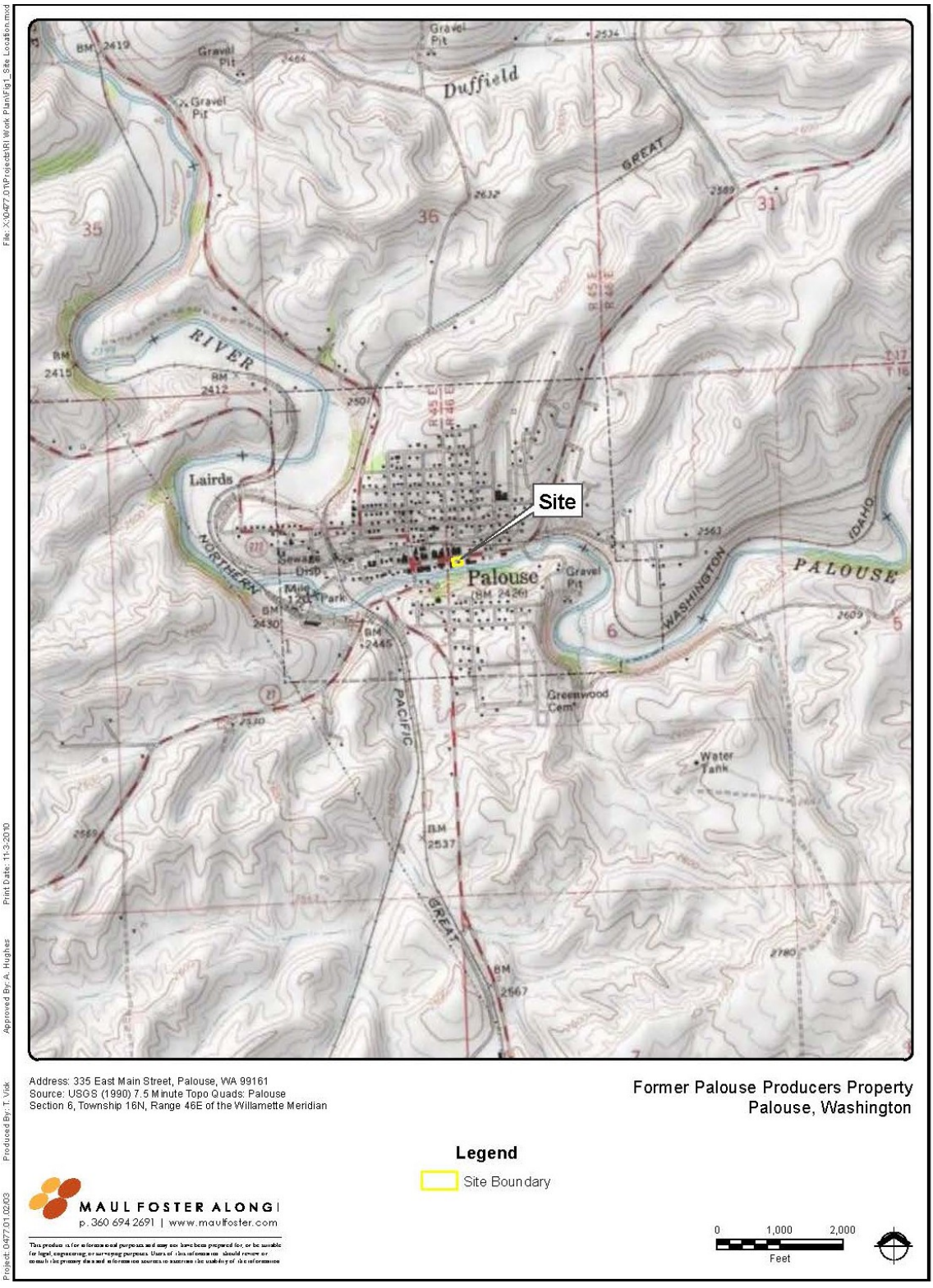


Figure 2: Remedial Actions

Figure 3: Well Locations

Figure 4: TPH Diesel Concentrations

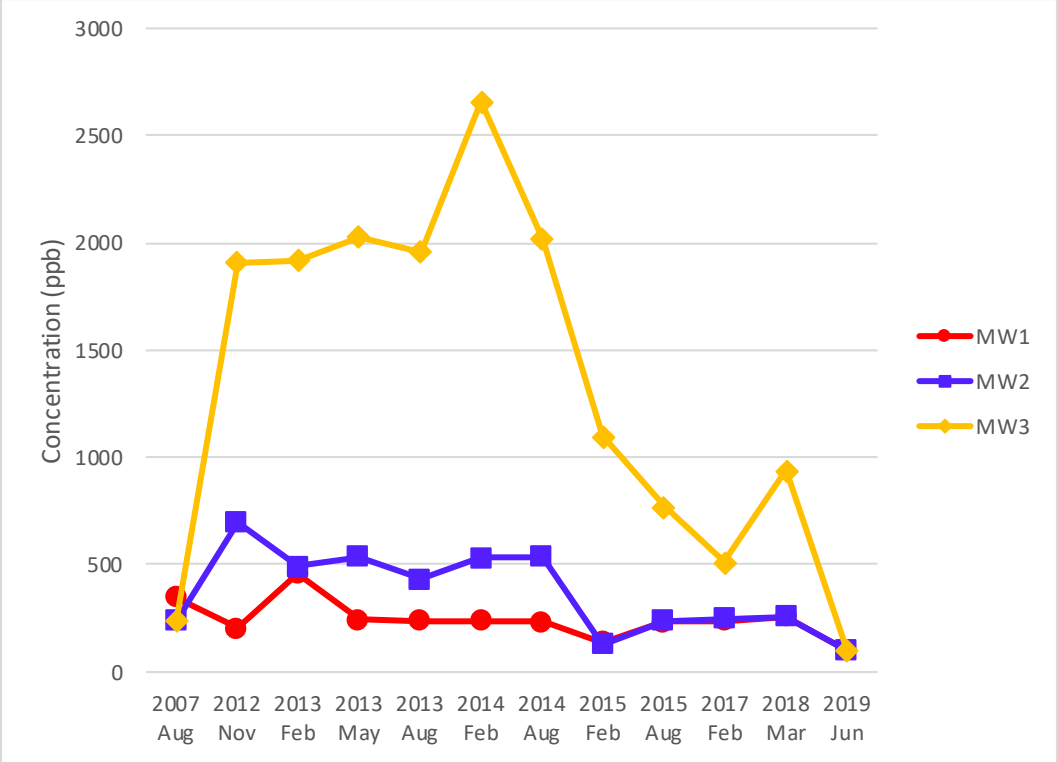


Figure 5: TPH Gasoline Concentrations

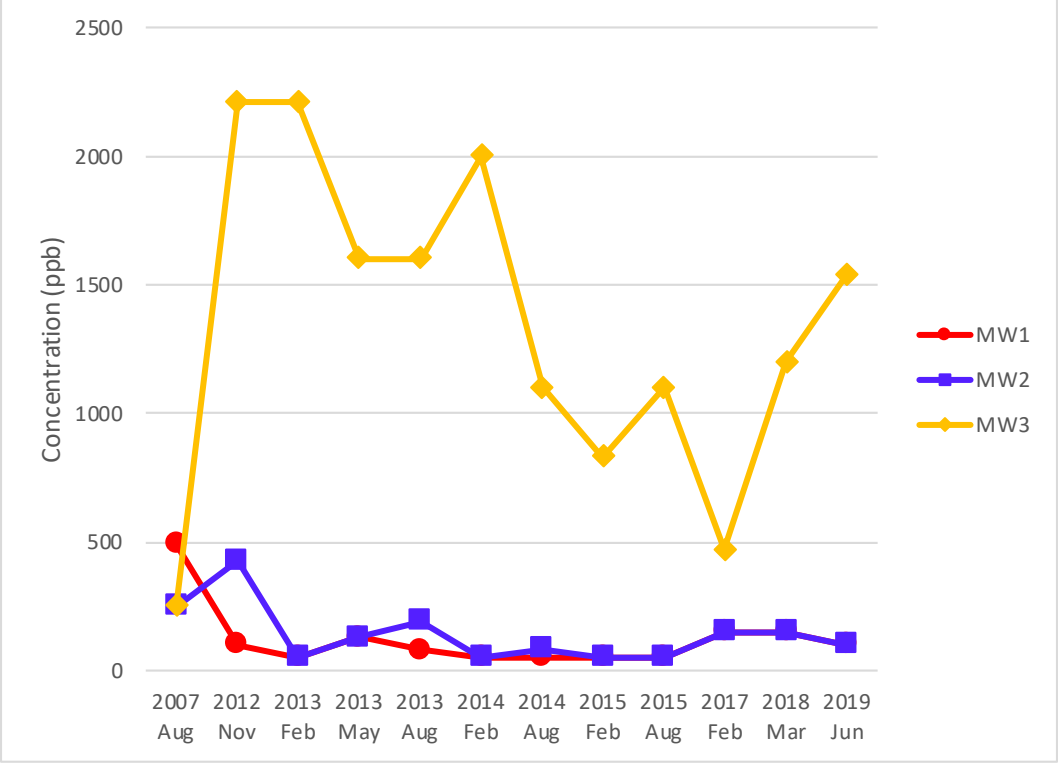


Figure 6: Benzene Concentrations

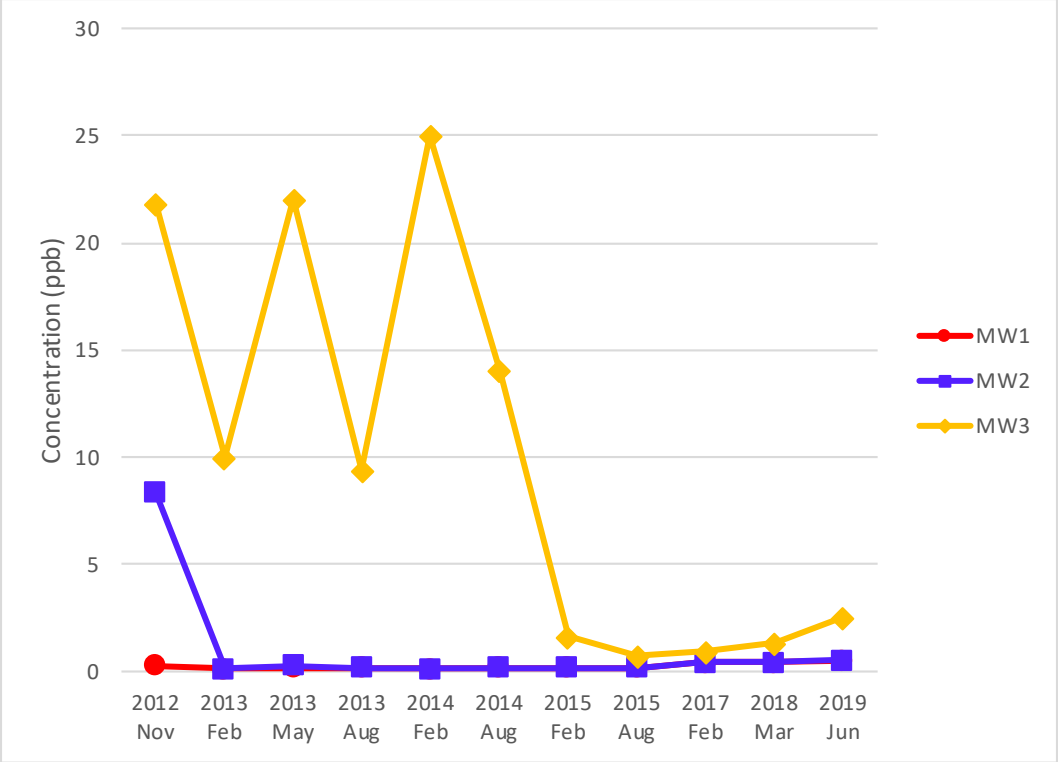


Figure 7: Arsenic Concentrations

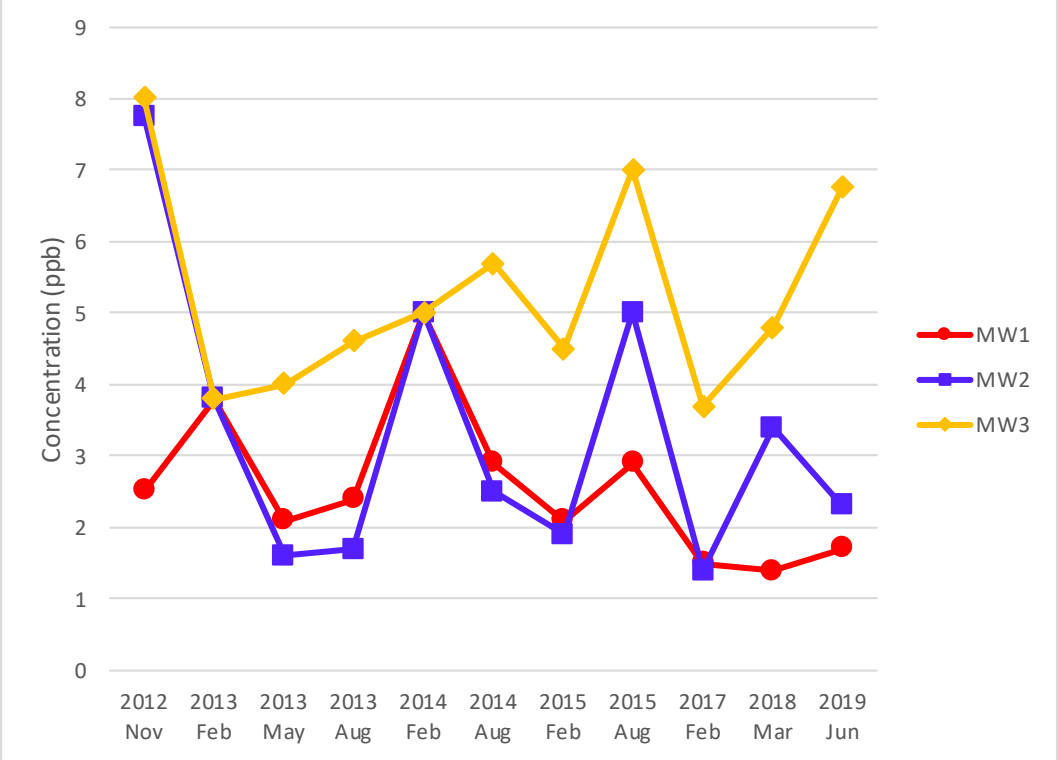


Figure 8: Manganese Concentrations

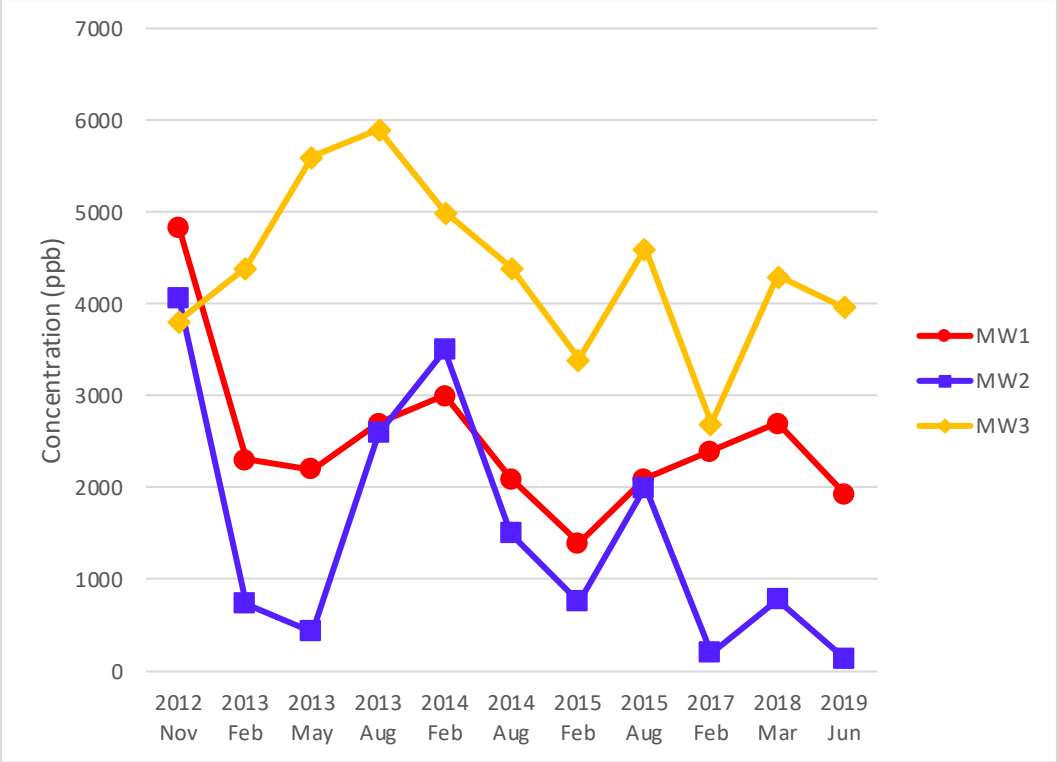
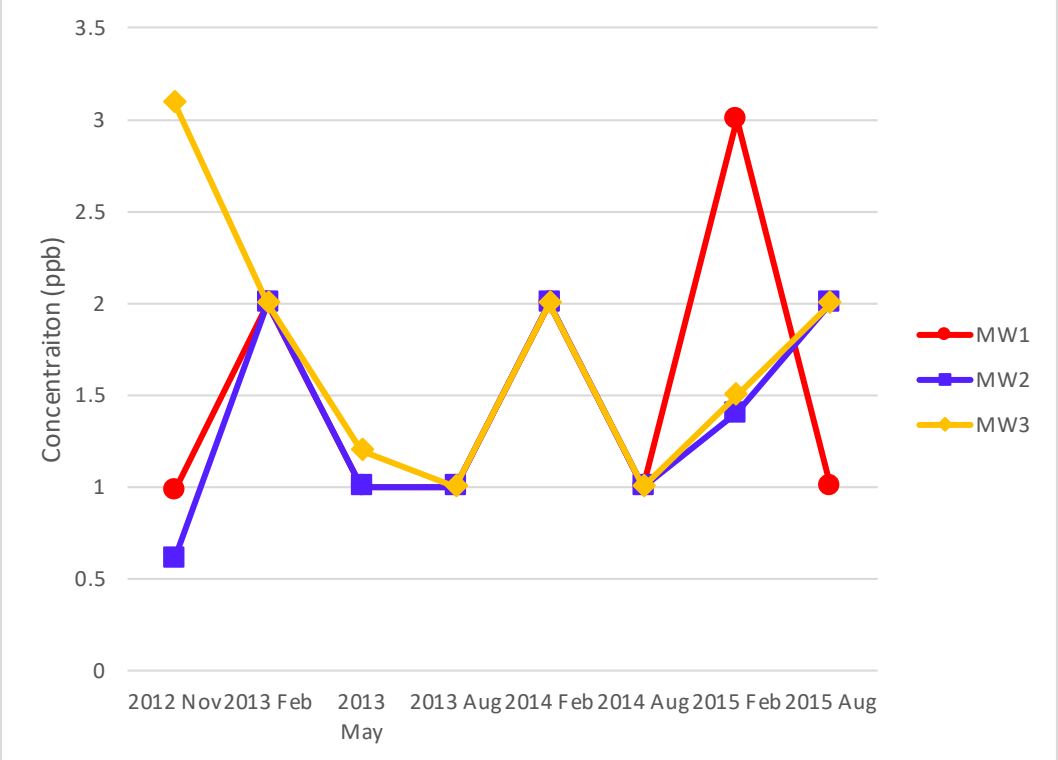


Figure 9: Lead Concentrations



TABLES

Table 1: Cleanup Levels

Contaminant	Cleanup Level
Groundwater	
Arsenic	5 ppb
Lead	5 ppb
Manganese	2200 ppb
TPH-diesel	500 ppb
TPH-gasoline	500 ppb
Benzene	0.8 ppb
Soil	
Arsenic	9 ppm
Lead	118 ppm
TPH-diesel	172 ppm
TPH-gasoline	172 ppm
Benzene	0.005 ppm

ppb = parts per billion
ppm = parts per million
TPH = total petroleum hydrocarbons

Table 2: MW-1 Groundwater Data

	Arsenic dissolved	Arsenic total	Manganese dissolved	Manganese total	Lead dissolved	Lead total	TPH-diesel	TPH-gas	TPH-oil	Benzene
Aug 2007							350	490	480	
Nov 2012	2.14	2.52	2660	4830	0.243	0.975	206	100	269	0.3
Feb 2013	3.8	3.8	2400	2300	2	2	458	50	381	0.15
May 2013	1.8	2.1	2000	2200	1	1	242	130	387	0.2
Aug 2103	2.4	2.4	2500	2700	1	1	238	80	380	0.2
Feb 2014	5	5	2800	3000	2	2	239	50	398	0.15
Aug 2014	3	2.9	2100	2100	1	1	235	50	392	0.2
Feb 2015	2	2.1	1600	1400	1	3	140	50	240	0.2
Aug 2015	3	2.9	2100	2100	1	1	235	50	392	0.2
Feb 2017	1.4	1.5	2500	2400			240	150	410	0.4
Mar 2018	1.4	1.4	2500	2700			260	150	440	0.4
Jun 2019	1.17	1.71	1870	1930			100	100	500	0.5

Table 3: MW-2 Groundwater Data

	Arsenic dissolved	Arsenic total	Manganese dissolved	Manganese total	Lead dissolved	Lead total	TPH-diesel	TPH-gas	TPH-oil	Benzene
Aug 2007							240	250	480	
Nov 2012	7.85	7.75	2310	4060	0.44	0.605	697	427	528	8.33
Feb 2013	3.8	3.8	98	740	2	2	493	50	381	0.15
May 2013	1.2	1.6	400	440	1	1	535	130	378	0.3
Aug 2013	2.1	1.7	2800	2600	1	1	433	190	411	0.2
Feb 2014	5	5	2900	3500	2	2	532	50	532	0.15
Aug 2014	2.3	2.5	1400	1500	1	1	538	85	390	0.2
Feb 2015	1.2	1.9	2	760	1	1.4	130	50	250	0.2
Aug 2015	5	5	2000	2000	2	2	240	50	400	0.2
Feb 2017	1.4	1.4	6	200			250	150	410	0.4
Mar 2018	1.4	3.4	50	780			260	150	430	0.4
Jun 2019	1.73	2.31	14.7	145			100	100	500	0.5

Table 4: MW-3 Groundwater Data

	Arsenic dissolved	Arsenic total	Manganese dissolved	Manganese total	Lead dissolved	Lead total	TPH-diesel	TPH-gas	TPH-oil	Benzene
Aug 2007							240	250	480	
Nov 2012	6.87	8	3560	3820	2.42	3.09	1910	2210	470	21.8
Feb 2013	3.8	3.8	4700	4400	2	2	1920	2210	405	10
May 2013	3.6	4	5600	5600	1	1.2	2030	1600	391	22
Aug 2013	4.8	4.6	5800	5900	1	1	1960	1600	391	9.4
Feb 2014	5	5	5100	5000	2	2	2660	2000	467	25
Aug 2014	5.8	5.7	4400	4400	1	1	2020	1100	424	14
Feb 2015	3.8	4.5	3500	3400	1	1.5	1100	830	260	1.6
Aug 2015	6.7	7	4800	4600	2	2	770	1100	500	0.74
Feb 2017	3.8	3.7	3400	2700			510	470	410	0.9
Mar 2018	4.2	4.8	3700	4300			940	1200	450	1.3
Jun 2019	3.12	6.77	3630	3960			100	1540	500	2.5