DEPARTMENT OF ECOLOGY
State of Washington

PERIODIC REVIEW
PASCO BULK FUEL TERMINAL SITE
(FORMERLY PORT OF PASCO SITE)

Facility Site ID 579
Cleanup Site ID 1985

July 2020

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=1985.

For more information contact:

Toxics Cleanup Program, Eastern Region
4601 North Monroe Street
Spokane, WA 99205

Sandra Treccani, Site Manager
509-329-3412, sandra.treccani@ecy.wa.gov

Erika Beresovoy, Public Involvement Coordinator
509-329-3546, erika.beresovoy@ecy.wa.gov

Washington State Department of Ecology — www.ecology.wa.gov

- Headquarters, Olympia 360-407-6000
- Northwest Regional Office, Bellevue 425-649-7000
- Southwest Regional Office, Olympia 360-407-6300
- Central Regional Office, Union Gap 509-575-2490
- Eastern Regional Office, Spokane 509-329-3400

July 2020

TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

This report presents the Washington State Department of Ecology's (Ecology) second periodic review for the Pasco Bulk Fuel Terminal 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.

Cleanup actions at this Site are in accordance with the general requirements of Consent Decree No. 00 2 50546 1 that was filed in Franklin County Superior Court on August 25, 2000. The Pasco Bulk Fuel Terminal Coordinating Group implemented the remedial actions in accordance with the design documents required by the Site's March 1999 Cleanup Action Plan (CAP) as amended on August 25, 2000.

Cleanup actions were conducted at the Site in three stages starting in 2001 and ending in 2006. These actions addressed contaminated soils and groundwater through soil vapor extraction (SVE) and in-situ air sparging (IAS). A second action was performed in 2014 as an outcome of the first periodic review completed in 2009. Groundwater monitoring has been ongoing since completion of the cleanup action.

2.0 SUMMARY OF SITE CONDITIONS

2.1 Site Description and History

The Site is located in Section 31, Township 9 North, Range 30 East, Willamette Meridian, on the north bank of the Columbia River in Pasco, Washington (See Figure 1). The Site is approximately 90 acres, and its boundaries are described as follows (Figure 2):

- Ainsworth Avenue on the north.
- The U. S. Army Corps of Engineers (COE) levee on the south.
- South 5th Avenue on the east.
- A line extending from the intersection of South 9th Avenue and Ainsworth Avenue to the intersection of the COE interceptor drain and the extension of South 12th Avenue on the west.

The Site also includes a strip of land located west of South 12th Avenue that includes the COE interceptor drain, the Port of Pasco oil/water separator, and the COE drainage ditch.

The Site lies behind dikes maintained by the COE. The COE facilities on the Site, which were all constructed prior to 1952, include:

- An embankment levee that parallels the Columbia River.
- A 42-inch-diameter interceptor drain located beneath the southern portion of the Site.
- A cutoff wall surrounding the Continental Grain facility (designated as Area 9 in Figure 4.1) with two dewatering wells inside this wall.

The Site had been used primarily as a petroleum storage and distribution facility since the early 1940s. Other industrial and commercial uses had also occurred at the Site. The Site once included three tank farms that consisted of approximately 50 aboveground tanks during peak operating periods. Other smaller tank farms also were operated at the Site. In addition to petroleum products, agricultural chemicals including soil fumigants, fertilizers, and solvents were stored. The Site contained rail car and truck loading racks, railroad spurs, and underground and aboveground pipelines. In 1992, all operating storage tanks were emptied of petroleum products and agricultural chemicals, and tanks not owned by the Port of Pasco were removed from the Site. Some buildings and underground sumps associated with loading and distribution areas were also removed. In 1999, the remaining storage tanks were removed from the Site.

Oil films on the water discharging from the interceptor drain to the collection pond have been observed since the 1950s. Site investigations starting in 1969 found petroleum contamination in the form of free-phase petroleum on groundwater as well as in soils and dissolved-phase groundwater contamination. In addition, chlorinated solvents and one fumigant constituent were found in soils and groundwater.

In 1990, Ecology conducted a Site Hazard Assessment of the Site to determine its ranking relative to other contaminated sites in the state. The Site ranked a 1 on a scale of 1 to 5, 1 being the highest risk.

The Remedial Investigation (RI) conducted from 1993 through 1995 characterized Site contamination. The Feasibility Study (FS) Report, completed in 1997, described the applicable cleanup requirements for the Site, proposed cleanup standards, identified and evaluated remedial action alternatives for the Site, and recommended remedial alternatives for the Site.

Ecology issued the final CAP in March 1999. An IAS/SVE pilot test was conducted on Site starting in April 1999 to evaluate the effectiveness of treating the Site contaminants. The CAP was amended in August 2000 when the Consent Decree to implement the cleanup actions was entered in Superior Court.

Following the first periodic review in 2009, a report reviewing additional potential cleanup actions was prepared. After discussing this report in 2014, an additional action was taken to pilot test an in-situ chemical treatment using lance injection to reduce hot spot concentrations.

2.2 Physical Site Characteristics

2.2.1 Geology

Site soils are divided into four primary stratigraphic units, consisting from top to bottom: Fill, Alluvium, the Pasco Gravel, and the Ringold Formation. Fill material including sandy silt, silty sand, sand, sand with gravel, and gravel are present in the upper few feet over most of the Site, with a maximum thickness of approximately 7 feet. Alluvium at the Site consists of silt and fine sand with less extensive deposits of clayey silt and clay. In general, this alluvium is present in a

wedge that thickened toward the southern portion of the Site near the banks of the Columbia River. The Pasco Gravel consists primarily of sandy gravel with cobbles and ranges from 13 to 34 feet in thickness. The Ringold Formation encountered beneath the Pasco Gravel is about 40 feet below ground surface (bgs). It consists of indurated to cemented, hard silt and clayey silt interbedded with fine sand.

2.2.2 Hydrogeology

The groundwater flow system consists of a shallow, unconfined aquifer within the alluvium and the underlying Pasco Gravels. Depth to groundwater across the Site ranges from roughly 4 to 10 feet bgs. The base of the unconfined aquifer system is the upper surface of the Ringold Formation.

Groundwater flow within the unconfined aquifer is generally from east to west, but it turns south in the immediate vicinity of the COE interceptor drain. The COE interceptor drain acts as a line sink that locally lowers the groundwater table and is the discharge point for COE dewatering wells. Groundwater levels are generally lowest during the month of October and highest during May and June. Annual groundwater level fluctuations across the Site average about one foot.

The Columbia River is located immediately south of the Site. Hydraulic interconnection between the Site and the river is minimized by the COE levee that is keyed into the Ringold Formation.

2.3 Nature and Extent of Contamination

The nature and extent of contamination, described in detail in the RI report, is summarized below. Figures illustrating the extent of contamination can be found in that report.

2.3.1 Free-phase Petroleum

Free-phase petroleum was present at the Site in identified areas generally at a depth of 4 to 6 feet. The free product consisted of gasoline and diesel. The free-phase product thickness was observed to increase during periods of low groundwater elevation. Free-phase petroleum discharged to the COE drain and was collected in the oil/water separator.

2.3.2 Soils

The main tank farm area had significant total petroleum hydrocarbons (TPH) contamination from the surface to depths of 2 to 4 feet. A much broader portion of Site soils had significant TPH concentrations at the 4 to 6.5 feet depth, generally associated with the water table. Detections of polynuclear aromatic hydrocarbons (PAHs) and benzene, toluene, ethylbenzene, and xylenes (BTEX) in soils were generally located within the areas delineated by TPH.

Perchloroethylene (PCE), also known as tetrachloroethylene, was detected at former PCE tank locations. Trichloroethylene (TCE) occurred only in association with PCE and is not detected

above the cleanup level (CUL) considered protective of human health and the environment. The chemical 1,2-dichloropropane (1,2-DCP), a soil fumigant, was detected in one soil boring.

Arsenic levels in soil were all within background levels. Lead levels in soils were below CULs.

2.3.2.1 Groundwater

Dissolved gasoline and diesel in groundwater were the major contaminants at the Site. The occurrences of lead, PAHs, and BTEX were essentially within the TPH plume, consistent with the presence of these compounds in petroleum products. Arsenic concentrations exceeding the background concentration had the same general distribution as the TPH plume. A correlation was also noted between low dissolved oxygen (DO) and elevated arsenic levels in groundwater.

PCE, TCE, dichloroethenes, and 1,2-dichloroethane (1,2-DCA) detections were found in some wells. The relative percentages of these compounds varied from well to well.

The greatest concentration of 1,2-DCP measured at the Site occurred near the former west tank farm. The dissolved-phase 1,2-DCP plume extended downgradient to the COE drain. The southward extent was limited by the COE drain.

2.3.3 COE Interceptor Drain

The dissolved-phase contaminants in the drain water were consistent with the nature and extent of dissolved-phase contaminants identified in groundwater adjacent to the drain.

2.3.4 Surface Water and Sediments

TPH, lead, and volatile organic carbons (VOCs) were detected in the ditch surface water and sediments. Concentrations of PCE and lead were higher in the collection pond than at the point where the ditch water entered the pond. This suggested that other contaminant sources were discharging to the pond that were not related to the Site. For this reason, the Site included the ditch but not the COE Collection Pond.

TPH, lead, and a few VOCs were detected in the ditch sediments. Benzene, PCE, TCE, and 1,2-DCP were not detected in sediment samples. Contaminant concentrations were higher in the sediments found at the head of the ditch immediately downstream of the oil/water separator.

3.0 INTERIM ACTIONS

Interim actions at the Site started in 1993 and included:

- Installing a trench and a well with skimmer pumps to recover free-phase petroleum from groundwater. More than 4,000 gallons of free product were recovered from groundwater as a result. Ten additional recovery trenches, later installed as a supplemental interim action to recover additional free product from the groundwater, did not result in a significant recovery.

- Evaluating and abating risks posed by the free-phase petroleum in utility manholes and in a residence basement sump near the Site. The residential basement sump was sealed. The Port of Pasco then purchased this property, and the residence was later demolished. Utility companies had been warned of the dangers of vapors in the affected manholes.

4.0 CLEANUP ACTION PLAN

Following completion of the FS, Ecology issued a CAP in March 1999. This CAP was amended in 2000 to change the remedy selected for the main tank farm soils from "excavation followed by ex-situ bioremediation" to an "in-situ treatment by SVE in combination with IAS." The following are elements of the amended final CAP.

4.1 Remedial Action Goals

- Remove free-phase petroleum product.
- Prevent contaminants leaching from soil into the groundwater that would result in exceedance of groundwater CULs.
- Prevent direct contact and ingestion of soils in excess of CULs by humans.
- Prevent direct contact and ingestion of contaminated groundwater beneath the Site by humans.
- Prevent direct contact and ingestion of contaminated groundwater, leaving the COE interceptor drain through the oil/water separator, by humans and biota in surface water.

4.2 Cleanup Standards

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

4.2.1 Cleanup Levels

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

- Groundwater – Method B CULs protective of drinking water and surface water were used.
- Soils – Method C Commercial CULs were used for Site soils. The 1997 Interim TPH Policy was used to develop CULs for TPH.

- Surface Water – Ditch surface water is technically groundwater discharging via the interceptor drain. Surface water CULs were therefore taken to be the same as those for groundwater.

- Sediments – No indicators were identified for ditch sediments, thus no CULs were necessary.

Table 1 shows the final CULs for the identified site indicators after consideration of background concentrations, practical quantitation limits (PQLs), and total Site risk.

4.2.2 Points of Compliance

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

For soil CULs based on protection of groundwater, the point of compliance is in the soils throughout the site. For soil CULs based on human exposure via direct contact, the point of compliance is established from the ground surface to 15 feet below the ground surface. This represents a reasonable estimate of the depth of the soil that could be excavated and distributed at the soil surface as a result of site development activities.

As stated in the CAP, actual soil concentrations based on protection of groundwater will be determined from groundwater monitoring data according to the Compliance Monitoring Plan and will override the theoretical numbers specified. Soil CULs based on protection of groundwater will be met if groundwater CULs have been achieved as determined using the statistical requirements under MTCA for meeting cleanup levels. Should soil levels result in continued contamination of groundwater, further remedial action will be necessary.

The point of compliance in groundwater is established throughout the Site from the uppermost level of the saturated zone extending vertically to the lowest most depth that could potentially be affected by the site.

The point of compliance for surface water is established at the point(s) where hazardous substances are released to the surface water. At this site, that is at the outlet of the COE interceptor drain to the ditch, which is the outlet of the oil/water separator.

4.3 Cleanup Decision

The selected cleanup actions identified in the CAP include the following:

- Continue free-phase product recovery until the apparent free-phase product thickness is reduced to 0.1 foot or less and remains such for a period of two years or upon Ecology's concurrence.

- Install a monitoring well to effectively monitor possible accumulations of free-phase product in the area beneath the Continental Grain facility. If recoverable thicknesses of free-phase product are detected in the well, then a passive skimming system will be implemented.

- Treat Site soils, including soils in the Main Tank Farm, in-situ by SVE in combination with IAS to treat the groundwater. Pilot tests on IAS/SVE may be conducted to determine design parameters. Effluent from the IAS/SVE system will be treated as necessary to meet applicable air emissions limits.

- Continue IAS/SVE until groundwater CULs are met. Compliance with groundwater CULs will be done in accordance with statistical requirements of MTCA and with Ecology's concurrence.

- Perform a sampling and analysis program following MTCA requirements upon completion of the IAS/SVE to determine the extent of unsaturated soils remaining above CULs. If necessary, remaining soils exceeding the CULs will be treated by bioremediation. Applicable air emission requirements on bioremediation must be met.

- Treat contaminated soils that are stockpiled on site to CULs by SVE and/or biotreatment. Applicable air emission requirements must be complied with.

- Treat groundwater collected in the COE interceptor drain to meet groundwater CULs. Air discharges from the treatment systems will meet applicable air emission limits.

- Treat groundwater in-situ using aeration trenches or as modified in the approved engineering design plans. Effluent from the aeration trenches will be removed through the SVE piping and treated as necessary to meet applicable air emission limits.

- Groundwater pumped for water depression in product recovery, for pump and treat pilot tests, or for dewatering excavations will be required to meet discharge requirements.

- Groundwater discharging to the ditch from the COE drain-oil/water separator system will be treated to meet groundwater CULs that are protective of surface water. No remediation of surface water in the ditch is required.

4.4 Site Cleanup

Cleanup actions completed at the Site included the following:

- Free-product recovery continued until 2003. Free-product monitoring ended after May 2006 since free-product thicknesses in all wells had been <0.1 ft.

- Soil piles on Site were placed over the surface soils of the main tank farm and were treated in-situ together with other soils.

- IAS/SVE treatment systems were constructed in seven (Areas 1 to 7) of the nine remediation areas shown in Figure 4.1. IAS systems consist of wells and SVE systems use trenches. Treatment system designs are in the Cleanup Action Reports. Construction was implemented in three stages. Operation of these systems has involved alternating active treatment and recovery, as necessary.

- Pump and treat tests were conducted in MW-34 and MW-48.

- Groundwater monitoring started and is ongoing to determine compliance with CULs and treatment system performance.

4.4.1 Construction Stage 1

Stage 1 construction started and completed in 2001. Treatment systems were put in full-time operation by February 2002.

- Installation and operation of IAS-SVE in Area 2 (the Main Tank Farm area).

- Installation and operation of IAS-Biosparging in Area 3.

- Continued operation of the IAS-SVE pilot system in MW- 46 (Area 4).

- Installation and operation of a pump-and-treat system in MW- 48 (Area 8).

4.4.2 Construction Stage 2

Stage 2 construction started in 2002 and was completed in January 2003. Treatment started between January and April 2003.

- Continued Stage 1 IAS/SVE treatment in Area 2, and pump-and-treat in Area 8.

- Full-scale installation of IAS-SVE in Area 4, replacing the pilot system in MW-46.

- Expansion of the Area 3 system, including the addition of SVE, and integration with Area 4.

- Installation and operation of IAS-SVE in Areas 1 and 5. In Area 5, the IAS-SVE system installed in MW-35 and MW-38 areas was later expanded in 2005/2006 to include the area around MW-34.

4.4.3 Construction Stage 3

Stage 3 construction started and was completed in 2006. IAS/SVE in Areas 6 and 7 started in August 2006.

- Installation and operation of IAS-SVE in Areas 6 and 7.

4.4.4 Additional Action

Area 9, the area contained by the slurry wall, was investigated in 2006 after the grain facility was demolished, and COE ceased dewatering this area in 2004. The investigation showed no indications of free product in the wells installed. Contamination was found to be very limited. Thus, no remedial action was required for this area.

4.4.5 Groundwater Monitoring

In accordance with the Compliance Monitoring Plan, groundwater monitoring is being conducted to determine compliance with CULs. Monitoring well locations are shown in Figure 4.1.

4.4.6 Institutional Controls

Institutional controls are required when residual concentrations of hazardous substances that exceed CULs remain on-site or when industrial or commercial exposure assumptions are used. For this Site, Method C Commercial soil CULs were used, under the Interim TPH Policy. Therefore, institutional controls are required.

Currently, no institutional controls are in place for the Site. As remediation is ongoing in-situ at the Site, activities involving groundwater extraction and/or soil excavations/drilling are all related to the cleanup operations. Thus, after groundwater and soil CULs are met, environmental covenants will be placed on areas that exceed Method B soil CULs.

4.4.7 Additional Post-CAP Actions

Since completing the CAP requirements, several additional actions have taken place. These actions have attempted to improve existing remedial action performance or provide additional contaminant removal in hot spots.

In 2006, two rows of hybrid poplars were planted downgradient of the plume in an attempt to phytoremediate groundwater contamination. In 2010, a pilot study was performed where the existing IAS-SVE system was enhanced by adding ozone to the air that was sparged through groundwater near MW-11A in Area 4. Neither of these efforts significantly improved contaminant removal.

After the 2009 periodic review, Ecology requested an evaluation of additional remedial technologies to address residual contamination in areas where IAS-SVE effectiveness was

reduced but contamination still exceeded CULs. After completing that review, Ecology and the potentially liable persons (PLPs) agreed to move forward with a pilot test of in-situ chemical treatment using lance injection in 2013. A combination of chemicals designed to enhance biological oxidation of contaminants were injected near MW-63 in Area 2. Results were mixed, and ultimately Ecology agreed that the technology was not appropriate for full-scale application.

Due to decreasing IAS-SVE effectiveness and the infeasibility of other remedial technologies, the PLPs proposed revising the remedial approach to monitored natural attenuation (MNA). IAS-SVE equipment would remain on-site and available, but would no longer be used as the primary remedial action. Ecology approved the transition to MNA in 2018. Wells designated for MNA monitoring are the ones that have been evaluated in this periodic review. Preparation of this second periodic review had been suspended to allow for the completion of the above actions.

5.0 GROUNDWATER DATA REVIEW

This periodic review evaluates groundwater data for all compliance monitoring wells from 2011 through May 2018.

The discussions that follow for each remediation area include:

- A table showing indicators that exceeded CULs during the review period and their concentrations.
- Pertinent graphs for illustration purposes.
- Discussion of contaminant trends.

Of the designated indicator hazardous substances at the Site, toluene, xylene, chloroform, cis-1,2-dichloroethene, and trans-1,2-dichloroethene were not detected at any wells above CULs.

Figures 3-18 show trends for highlighted contaminants in each area.

Tables 2 through 9 summarize the groundwater data for each area. Wells, sampling events, and contaminants are only shown in the tables if there was an exceedance of the CUL.

5.1 Area 1

Area 1 was determined to have attained groundwater CULs in November 2010; no further monitoring is performed. After additional soil sampling and evaluation, Ecology determined that soils had attained CULs in August 2011.

5.2 Area 2 (MW-6, MW-12, MW-13, MW-62R, MW-63)

- TPH continued to decrease or remain stable in wells. Well MW-62R had no detections throughout the monitoring period; well MW-6 was only sporadically above CULs. Wells

MW-63 and MW-12 show the biggest reductions, but both seem to have leveled out in the range of 1–3 parts per million (ppm) in the last few years (the CUL is 1 ppm). (Figure 3)

- Arsenic continues to exceed CULs in all wells except MW-62R. Since arsenic is expected in areas of low oxygen due to petroleum degradation, reductions will likely not occur until TPH is degraded. (Figure 4)

- In the last periodic review, benzene concentrations reduced in all wells. Wells MW-6 and MW-13 had reduced to below CULs. In this review, neither well had detections of benzene. MW-63 had reduced from over 17,000 parts per billion (ppb) to 460 ppb previously, and, in this review, has further degraded from a high of 450 ppb to 28 ppb. MW-12 previously had decreased from 2,830 ppb to 81 ppb, and, in this review, has decreased to 30 ppb. Both of these wells remain above CULs. (Figure 5)

- All other contaminants were not detected; however, several VOCs (1,1-dichloroethene, 1,2-dichloroethane, 1,2-dichloropropane, PCE, and TCE) have detection limits that exceed their CULs.

5.3 Area 3 (MW-10A, MW-17, MW21R)

- Previously, all wells were below CULs for TPH. In this review, MW-17 had five detections above CULs (27 percent of the samples), but the maximum was only 1.51 ppm. MW-21R had one detection above the CUL (5 percent of the samples) with a value of 2.35 ppm. (Figure 6)

- Arsenic had CUL exceedances in MW-10A and MW-17. This is the same as in the previous periodic review. (Figure 7)

- Benzene was not detected in all wells. This represents a reduction from values seen in the previous review.

- All VOCs were not detected in all wells; however, several VOCs (1,1-dichloroethene, 1,2-dichloroethane, 1,2-dichloropropane, PCE, and TCE) have detection limits that exceed their CULs.

5.4 Area 4 (MW-11A, MW-46R, MW-47)

- MW-11A showed a decreasing trend for TPH, going from 5.24 ppm to around 2–3 ppm. (Figure 8)

- Arsenic exceeded its CUL in MW-11A. (Figure 9)

- Benzene was only detected in MW-11A, and showed a decreasing trend (from a high of 18 ppb to 0.47 ppb). This is consistent with what was seen in the previous review. (Figure 10)

- Most VOCs were not detected, except for 1,1-dichloroethene in MW-46R and MW-47, and TCE in MW-47. All VOCs were below CULs in the previous review, so this represents a decrease in water quality. Several VOCs (1,1-dichloroethene, 1,2-dichloroethane, 1,2-dichloropropane, PCE, and TCE) have detection limits that exceed their CULs.

5.5 Area 5

Area 5 was determined to have met soil and groundwater CULs in November 2010; no further monitoring is performed.

5.6 Area 6 (MW-8, MW-18, MW-19)

- TPH was not detected in MW-18. However, MW-8 and MW-19 showed consistent exceedances with no clear trend. Concentrations ranged from 2–5.65 ppm in MW-8 and 0.78–2.41 ppm in MW-19. These represent similar ranges as in the previous review. (Figure 11)

- Arsenic remains above CULs in wells MW-8 and MW-19, but was not detected in MW-18. MW-8 showed a reduction from the previous review, with exceedances barely above the CUL. However, MW-19 exceeded the CUL in every sample, with a range of 0.068–0.11 ppm. This could indicate a change in upgradient conditions; wells in Area 4 showed some increasing trends in TPH, which could affect arsenic concentrations here.

- Benzene significantly exceeded CULs in wells MW-8 and MW-19 in the previous review (ranging from 72–180 ppb in MW-8 and 7–48 ppb in MW-19). In this review, benzene was no longer detected in MW-19 and only showed a range of 5.2–20 ppb in MW-19. This shows a marked improvement. (Figure 12)

- All VOCs were not detected in all wells; however, several VOCs (1,1-dichloroethene, 1,2-dichloroethane, 1,2-dichloropropane, PCE, and TCE) have detection limits that exceed their CULs.

5.7 Area 7 (MW-20, MW-31, MW-33, MW-34, MW-49)

- TPH concentrations have reduced by about half in MW-33 (from nearly 18 ppm to 5.49 ppm), and show stable trends in the range of 1–2.5 ppm in the other wells. The area has shown decreases since the previous periodic review. (Figure 13)

- PCE and TCE have shown mixed trends. Overall, concentration ranges are the same. But MW-49 now shows an increasing trend with the highest concentrations at the Site (up to 22 ppb). Other wells in this area (MW-20 and MW-31) also show PCE concentrations

around five times the CUL. Also, all wells except MW-33 show regular exceedances for TCE; all had shown decreasing trends in the previous periodic review. (Figures 14 and 15)

- Arsenic had only one exceedance out of all the wells (at MW-33) in the previous periodic review. Now, MW-34 exceeded the CUL for every sample.

- All other VOCs were not detected in all wells; however, several VOCs (1,1-dichloroethene, 1,2-dichloroethane, and 1,2-dichloropropane) have detection limits that exceed their CULs.

5.8 Area 8 (MW-48, MW-60)

- TPH had previously exceeded CULs for all samples at MW-48, with a range of about 2–7 ppm. Now, concentrations show a decreasing trend and are below CULs. (Figure 16)

- Arsenic remains barely above CULs and ranges from 0.012–0.026 ppm.

- All VOCs were not detected in all wells; however, several VOCs (1,1-dichloroethene, 1,2-dichloroethane, PCE, and TCE) have detection limits that exceed their CULs.

5.9 Area 9 (MW-66)

- TPH exceeds the CUL for most samples and shows a decreasing trend, ranging from 0.56–1.88 ppm. (Figure 17)

- Arsenic exceeds the CUL for most samples and shows a stable trend ranging from 0.004–0.026 ppm. (Figure 17)

- All VOCs were not detected in all wells; however, several VOCs (1,1-dichloroethene, 1,2-dichloroethane, 1,2-dichloropropane, PCE, and TCE) have detection limits that exceed their CULs.

5.10 Oil/Water Separator

- PCE remains above the CUL (2.5–4.9 ppb), but is lower than in the previous periodic review. (Figure 18)

- TCE had some CUL exceedances in the previous periodic review, but now has had no exceedances. (Figure 18)

- All other VOCs were not detected; however, several VOCs (1,1-dichloroethene and 1,2-dichloroethane) have detection limits that exceed their CULs.

- Carcinogenic PAHs (cPAHs) had some CUL exceedances later in the monitoring period. Additional time will be needed to determine if these represent an increasing trend.

6.0 PERIODIC REVIEW

6.1 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 practical quantitation limit 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.

6.2 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. The first periodic review was completed in 2009; the second one was delayed while additional remedial actions were evaluated.

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.

6.3 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.

- Naphthalene, toluene, xylene, chloroform, and trans-1,2-dichloroethene were not detected at any wells exceeding CULs during the monitoring period.
- Significant reductions in TPH concentrations have occurred across the site (as compared to the changes seen in the first periodic review).
    - Area 2 – no change to up to 92 percent additional reductions
    - Area 3 – no significant change
    - Area 4 – a 43 percent additional reduction and a 73 percent increase
    - Area 6 – a 9 percent and 26 percent additional reduction
    - Area 7 – ranges from 31 percent to 68 percent additional reductions
    - Area 8 – a 54 percent additional reduction
    - Area 9 – a 32 percent additional reduction
- Arsenic remains elevated, but that is expected given the continued presence of petroleum hydrocarbons. The degradation of petroleum hydrocarbons decreases the amount of dissolved oxygen, which then causes arsenic to be mobilized from native soil. Significant arsenic reductions would not be expected to be seen until petroleum hydrocarbons are degraded and DO levels have a chance to recover.
- Benzene has continued to be present in Areas 2 and 4; however, both areas showed decreases. Area 4 had a 95 percent reduction in concentration and now is below CULs. Although Area 2 still exceeds CULs, the wells with detections showed a 25 percent and 91 percent reduction in concentrations.
- PCE and TCE still exceed CULs in Area 7, and are showing increasing trends, especially in wells MW-20 and MW-49.
- Maximum detection levels (MDLs) for many VOCs and some cPAHs are not sufficient to assess compliance with CULs.

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

Implementation Memorandum #10, dated April 20, 2015, outlines procedures for evaluating cPAH compliance with CULs using toxicity equivalency factors. This memorandum does not represent a change, but merely details how toxicity equivalency factors are used. It has been applied to the evaluation of cPAHs at this Site.

6.5 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.

6.6 Current and Projected Site and Resource Uses

The Site is zoned industrial. There is no projected change in the future use of the Site.

6.7 The Availability and Practicability of More Permanent Remedies

Several new technologies have been evaluated since the recommendation of the last periodic review, including the evaluation of in-situ biological oxidation and the use of ozone. Both were intended to enhance the capabilities of existing systems to further degrade contaminants. Additionally, a new lance injection technology was used to emplace biological oxidants at a lower cost and with a higher density of injection points. Although the injection technology was successful, both treatment technologies were deemed to not be effective for Site-wide use.

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

Originally, the CULs for arsenic and lead were set at PQLs of 10 ppb. Since then, analytical techniques have improved. In the 2009 periodic review, CULs for lead and arsenic were adjusted due to decreases in the PQL. They are now set at the health-based levels of 5 ppb for arsenic and 3.2 ppb for lead.

Analytical techniques for several VOCs (1,1-DCE, 1,2-DCA, 1,2-DCP, PCE, and TCE) use MDLs that exceed CULs. Therefore, these MDLs need to be lowered so compliance with CULs can be fully assessed.

7.0 CONCLUSIONS

- Active remedial technologies have been successful in reducing soil and groundwater contamination.

- Trends for degradable contamination, such as petroleum, VOCs, and benzene, have shown stable or decreasing concentrations across most of the Site.

- Arsenic concentrations still exceed the CUL in most of the monitoring wells and have responded slowly to decreases in TPH and VOCs concentrations.

- Area 7 showed increasing PCE and TCE concentrations. This is a concerning trend that will need to be monitored.

- CULs developed for the Site were based on MTCA rules in effect when Ecology issued the final CAP in 1999. New toxicity information and MTCA amendments in 2001 and 2007 have resulted in updated CULs and risk calculations. WAC 173-340-702(12)(c) [2001/2007 eds.] provides that "A release cleaned up under the cleanup levels determined in (a) or (b) of this subsection shall not be subject to further cleanup action due solely to subsequent amendments to the provision in this chapter on cleanup levels, unless the department determines, on a case-by-case basis, that the previous cleanup action is no longer sufficiently protective of human health and the environment." Ecology is not proposing to change CULs at this time.

- Continue passive remediation using MNA.

- Continue groundwater monitoring using the revised compliance monitoring plan (entitled "Monitored Natural Attenuation Performance Monitoring Plan" dated June 12, 2019).

- Evaluate improved analytical techniques for 1,1-DCE, 1,2-DCA, 1,2-DCP, PCE, and TCE such that MDLs lower than CULs can be achieved.

- Should redevelopment be planned for the Site, environmental covenants will need to be placed on the appropriate parcels prior to construction to protect potential receptors. Ecology remains available to work with the site owners at any time.

8.0 REFERENCES CITED

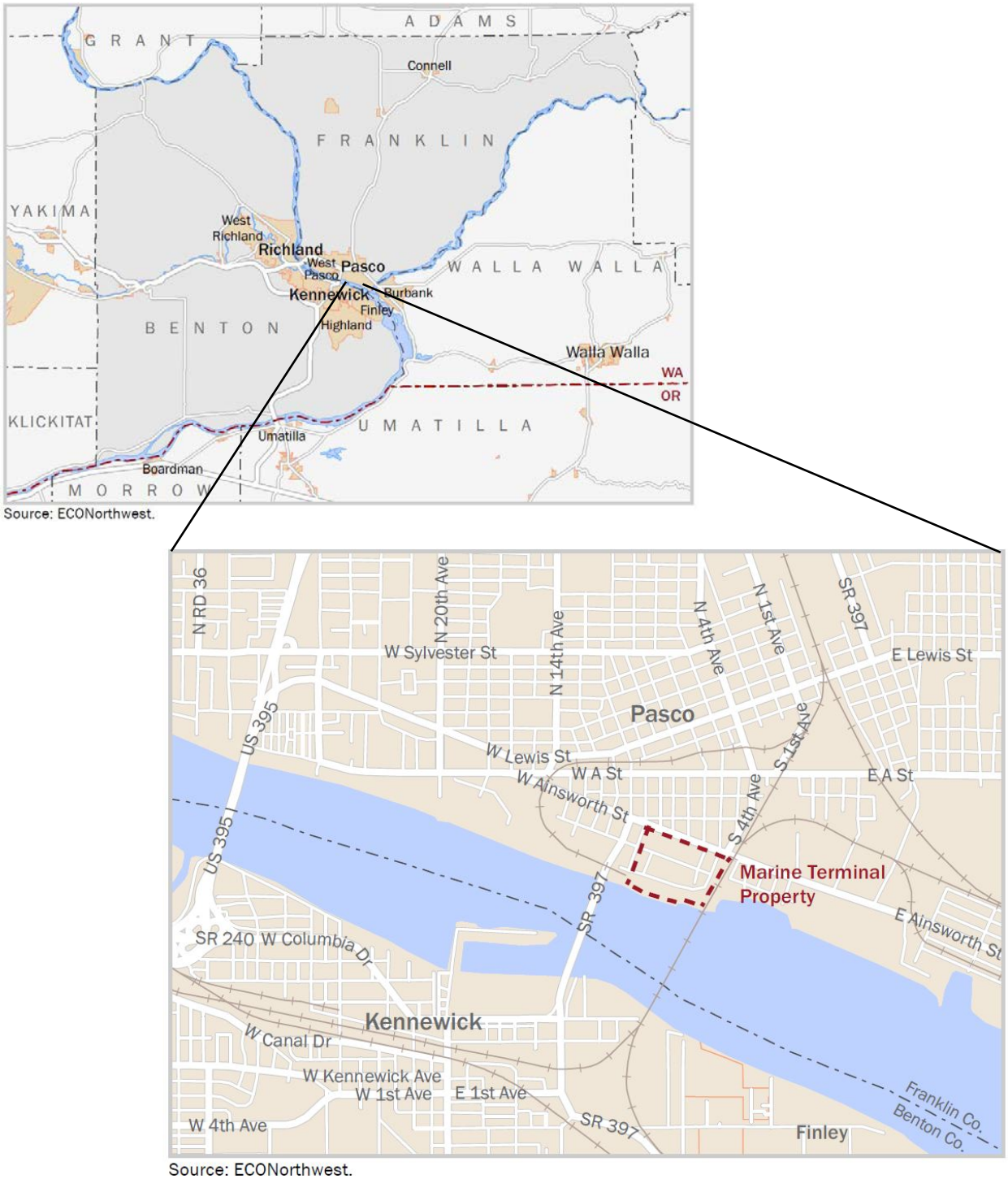
Washington State Department of Ecology, 2009, *Periodic Review, Pasco Bulk Fuels Terminal Site.*

Washington State Department of Ecology, 1999, *Final Cleanup Action Plan, Pasco Bulk Fuels Terminal Site.*

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

FIGURES

Figure 1: Pasco Bulk Fuel Terminal Location



Source: ECONorthwest.

Source: ECONorthwest.

Figure 2: Site Map and Well Locations

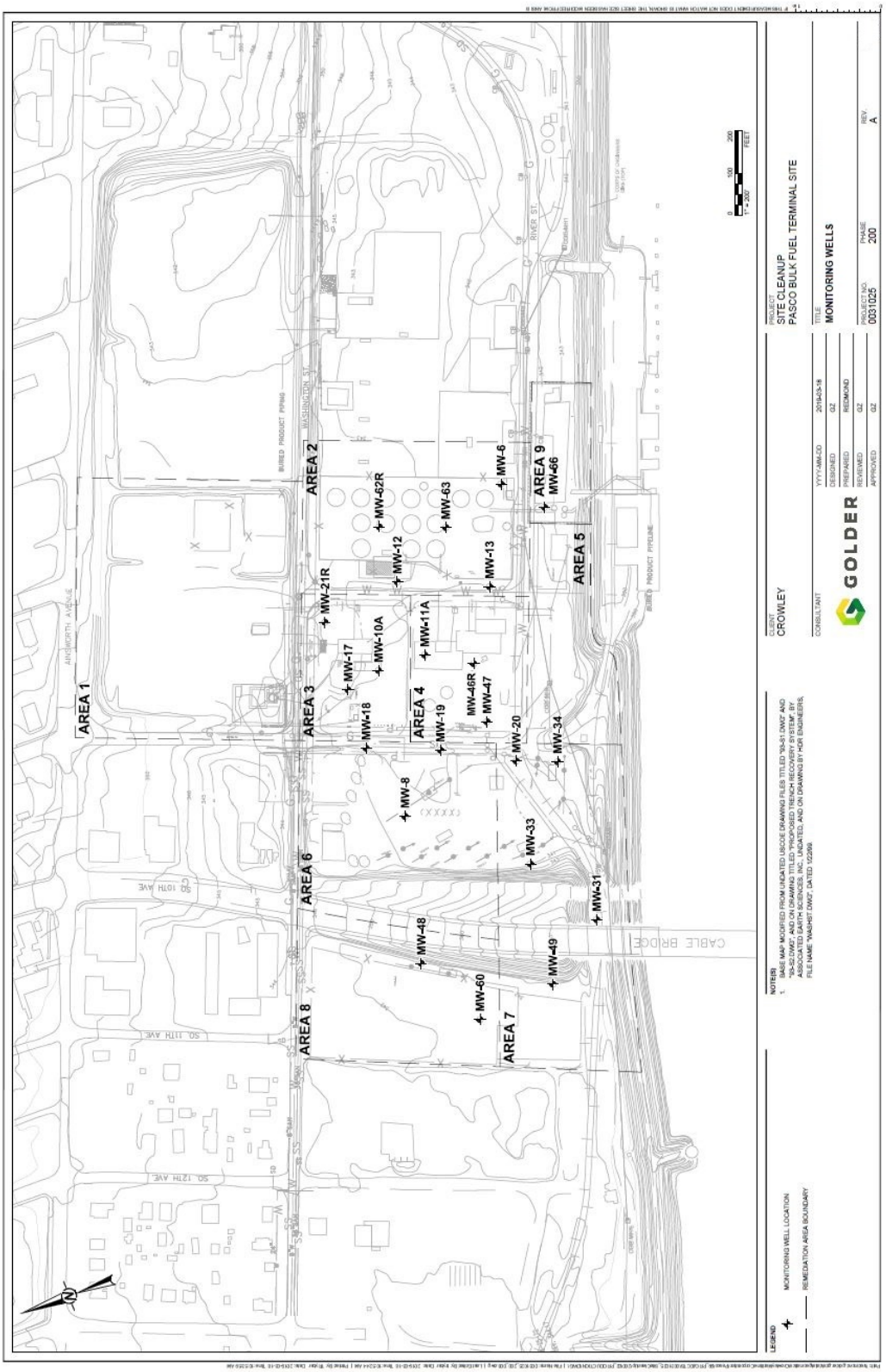


Figure 3: Area 2 TPH Concentrations

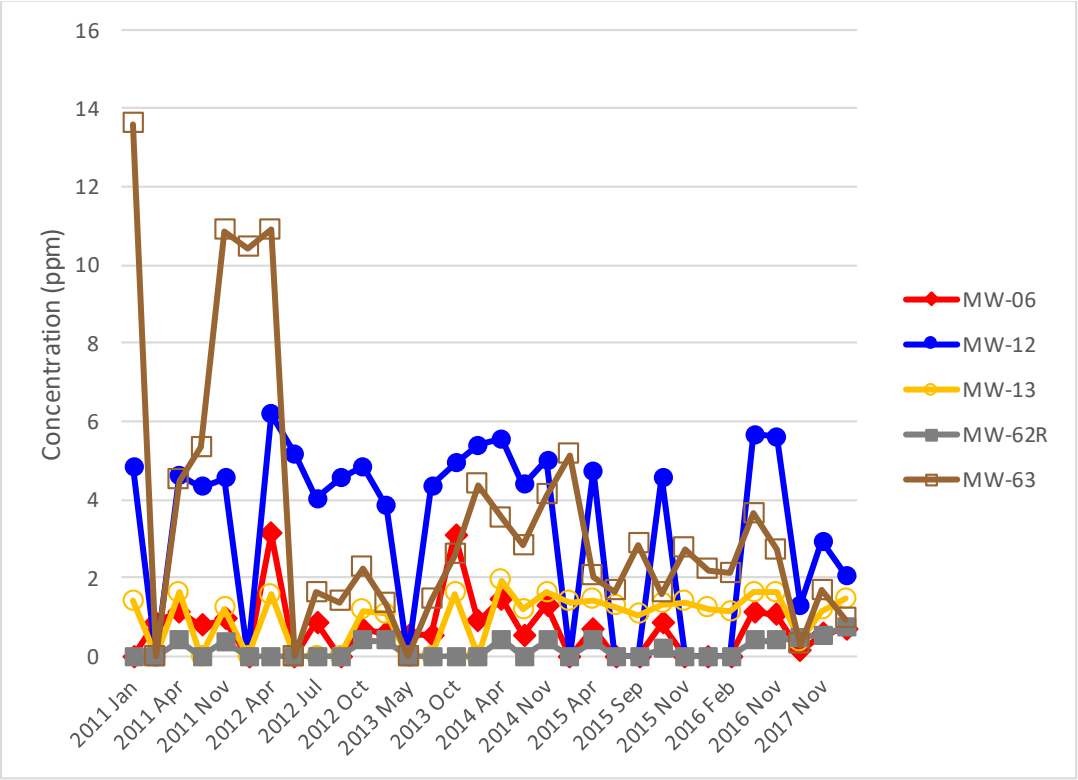


Figure 4: Area 2 Arsenic Concentrations

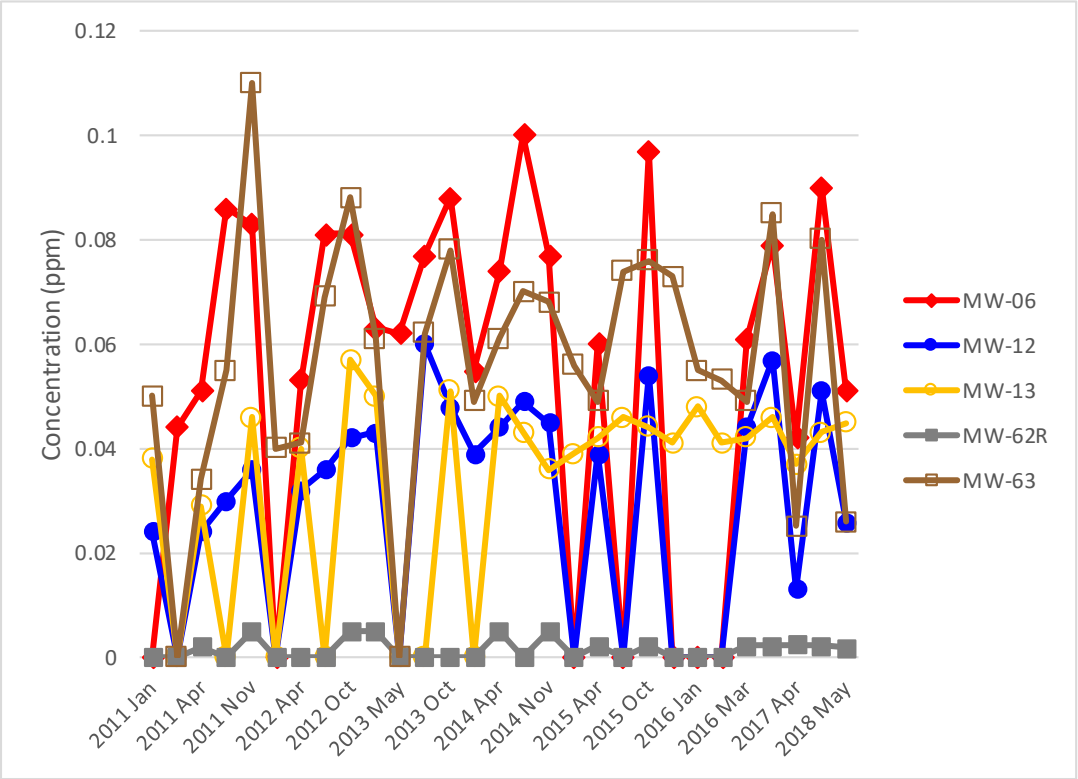


Figure 5: Area 2 Benzene Concentrations

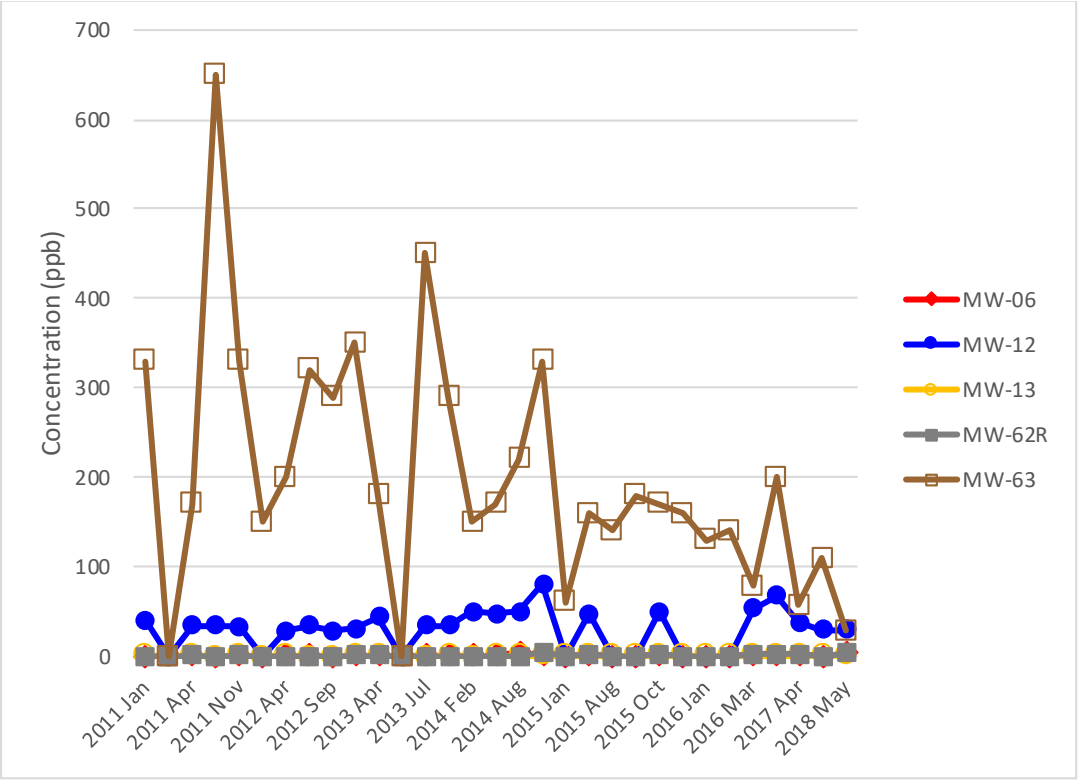


Figure 6: Area 3 TPH Concentrations

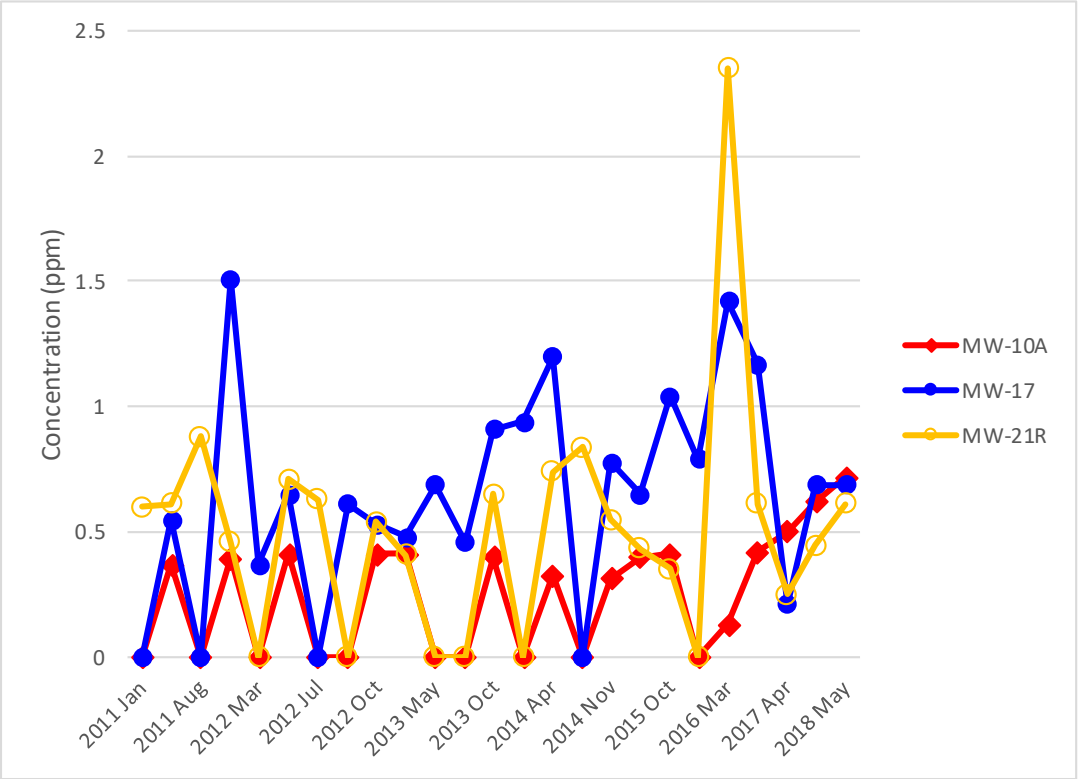


Figure 7: Area 3 Arsenic Concentrations

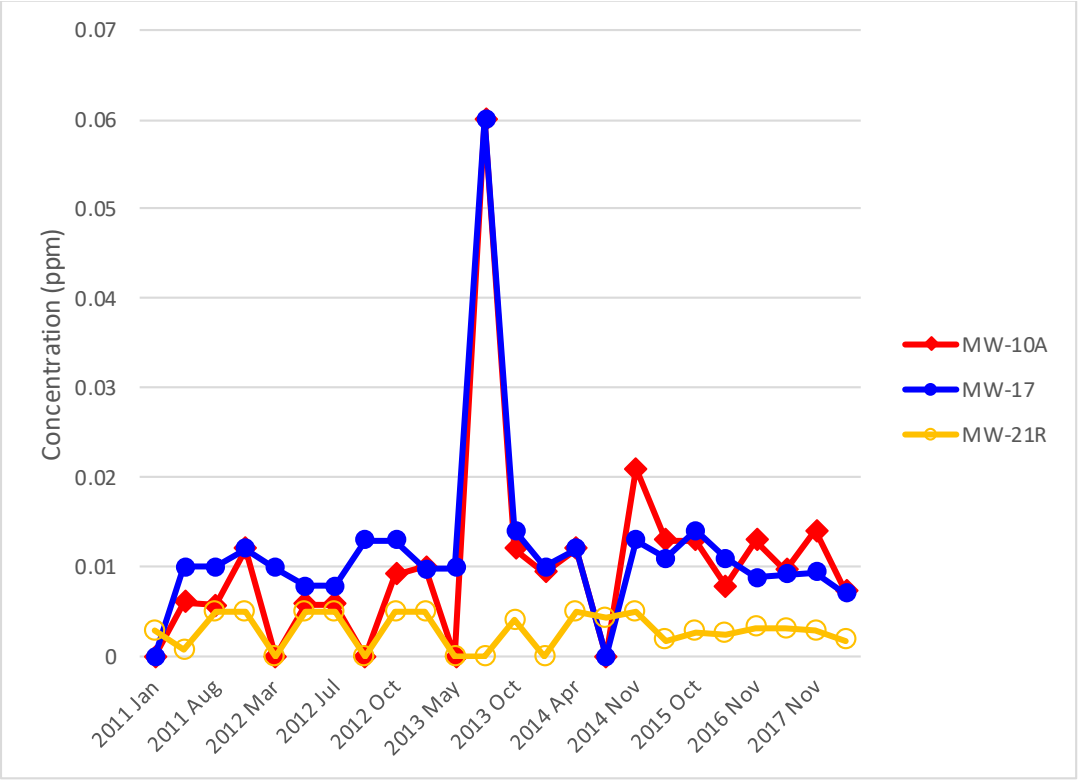


Figure 8: Area 4 TPH Concentrations

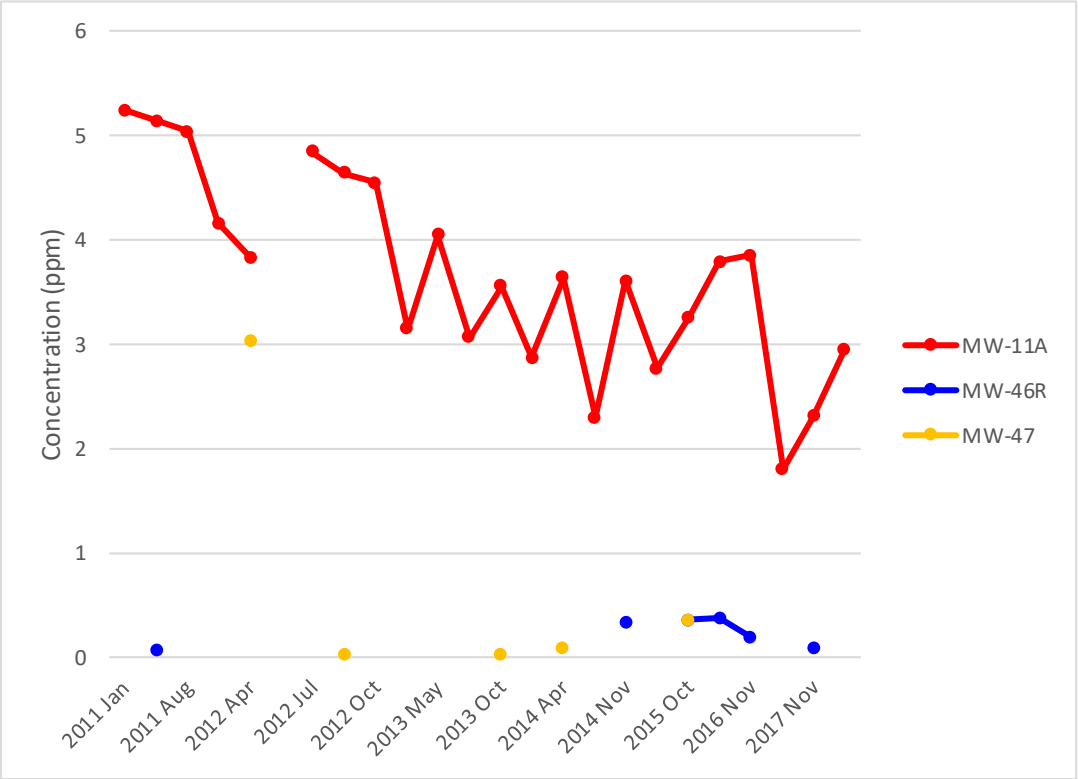


Figure 9: Area 4 Arsenic Concentrations

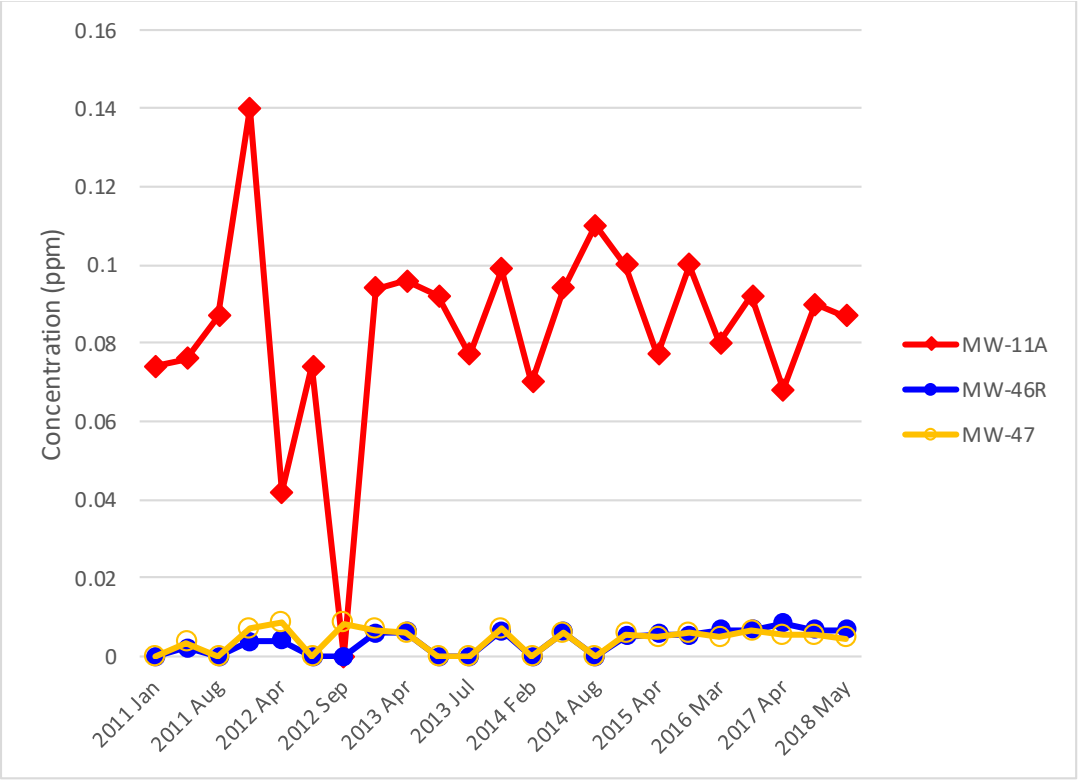


Figure 10: Area 4 Benzene Concentrations

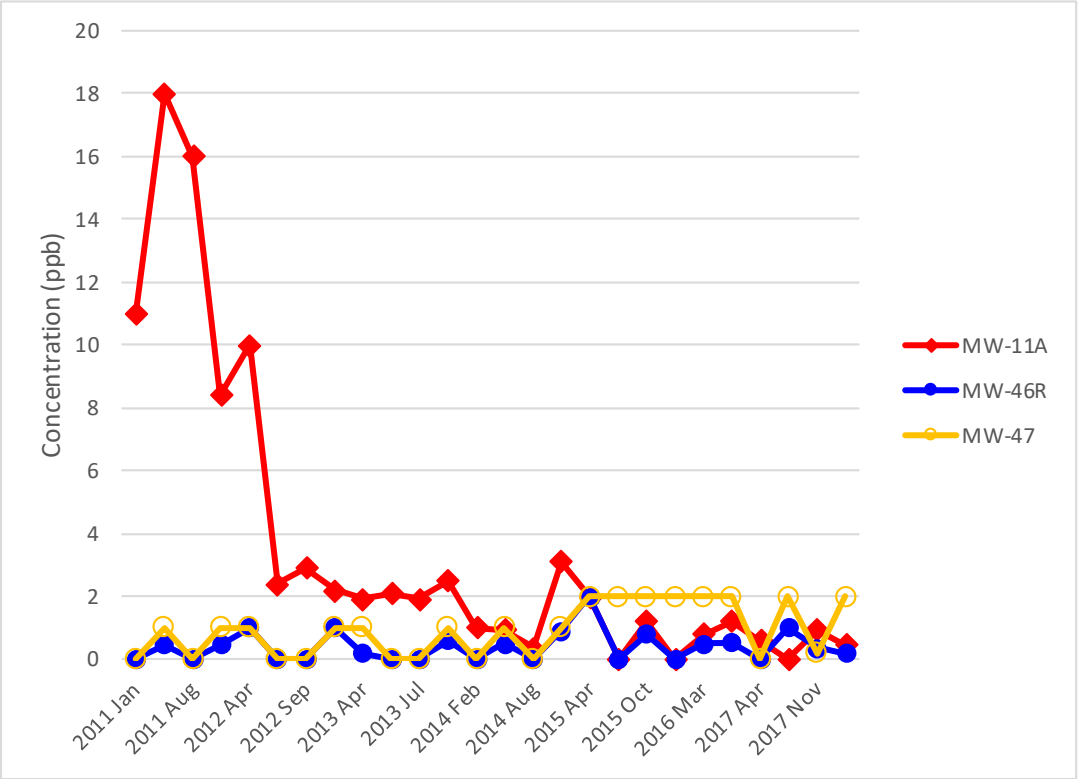


Figure 11: Area 6 TPH Concentrations

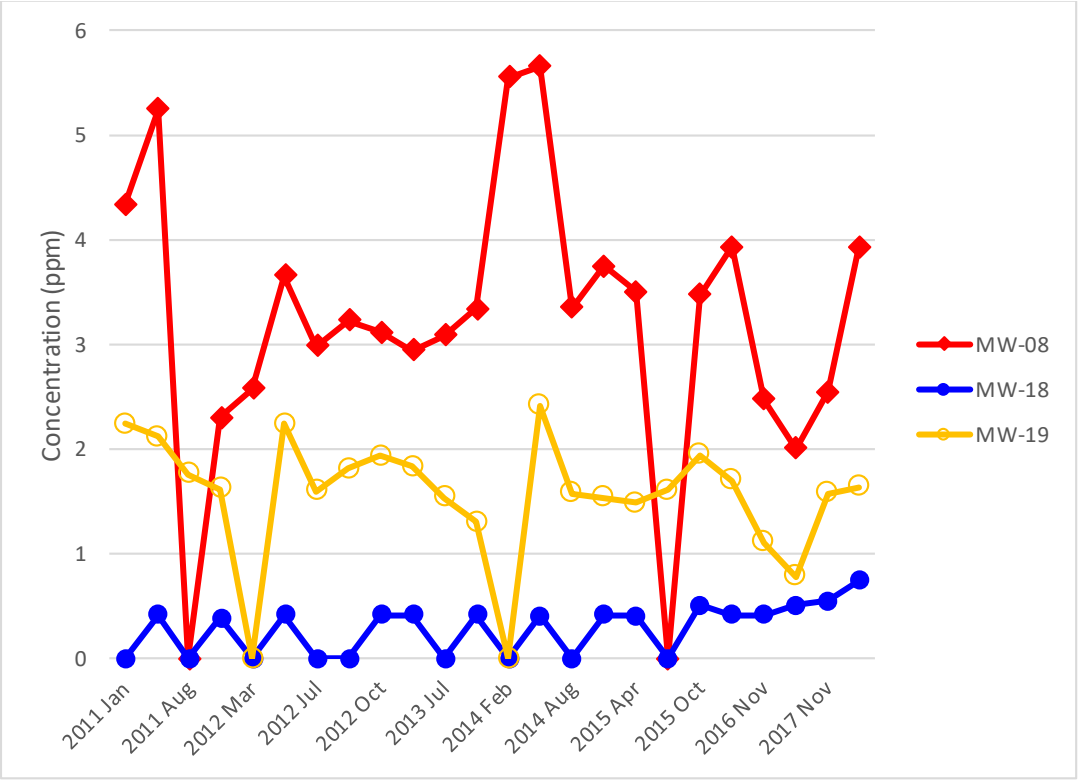


Figure 12: Area 6 Benzene Concentrations

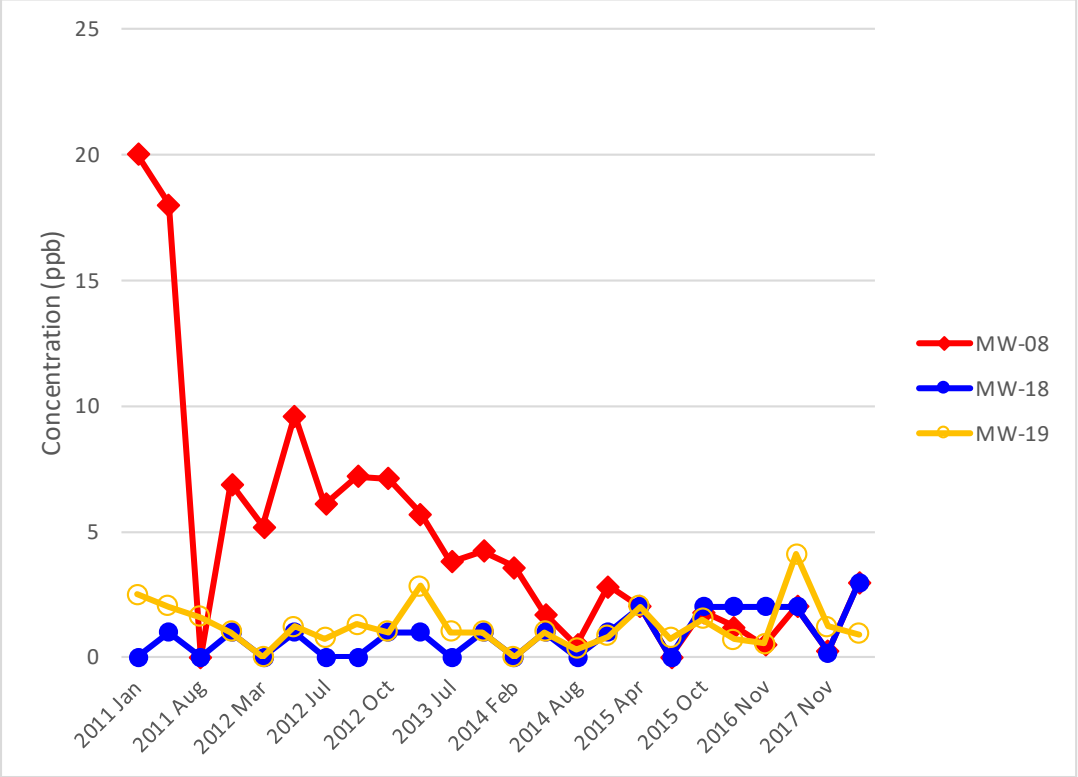


Figure 13: Area 7 TPH Concentrations

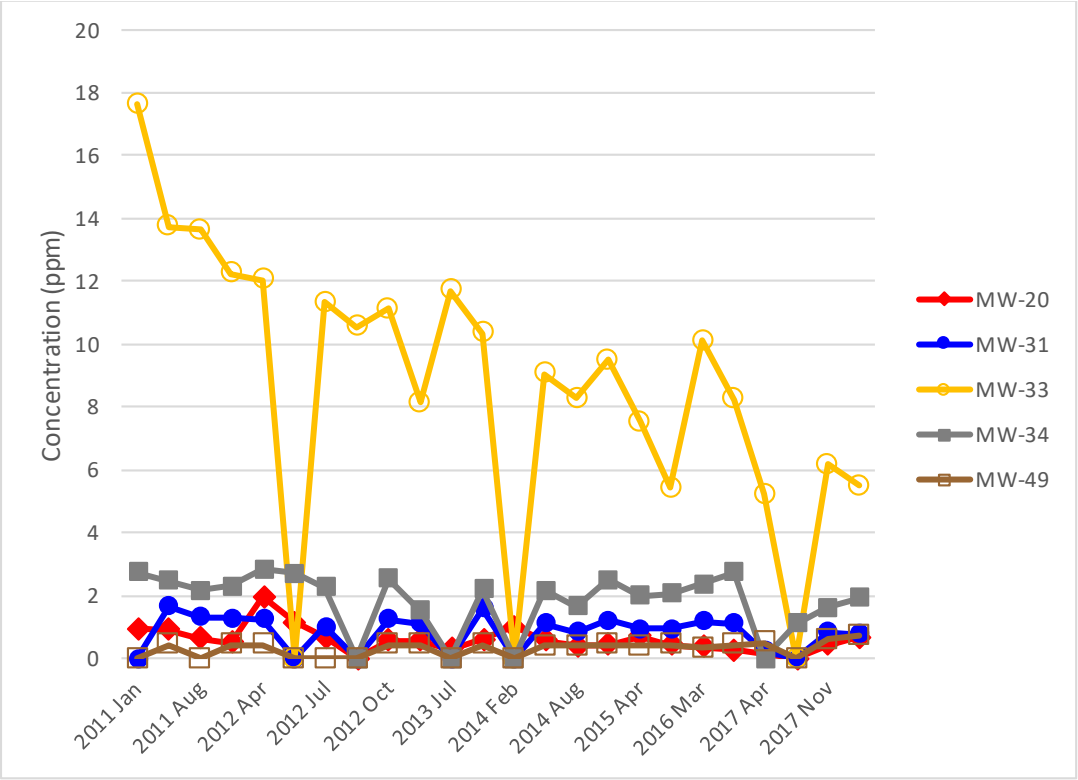


Figure 14: Area 7 PCE Concentrations

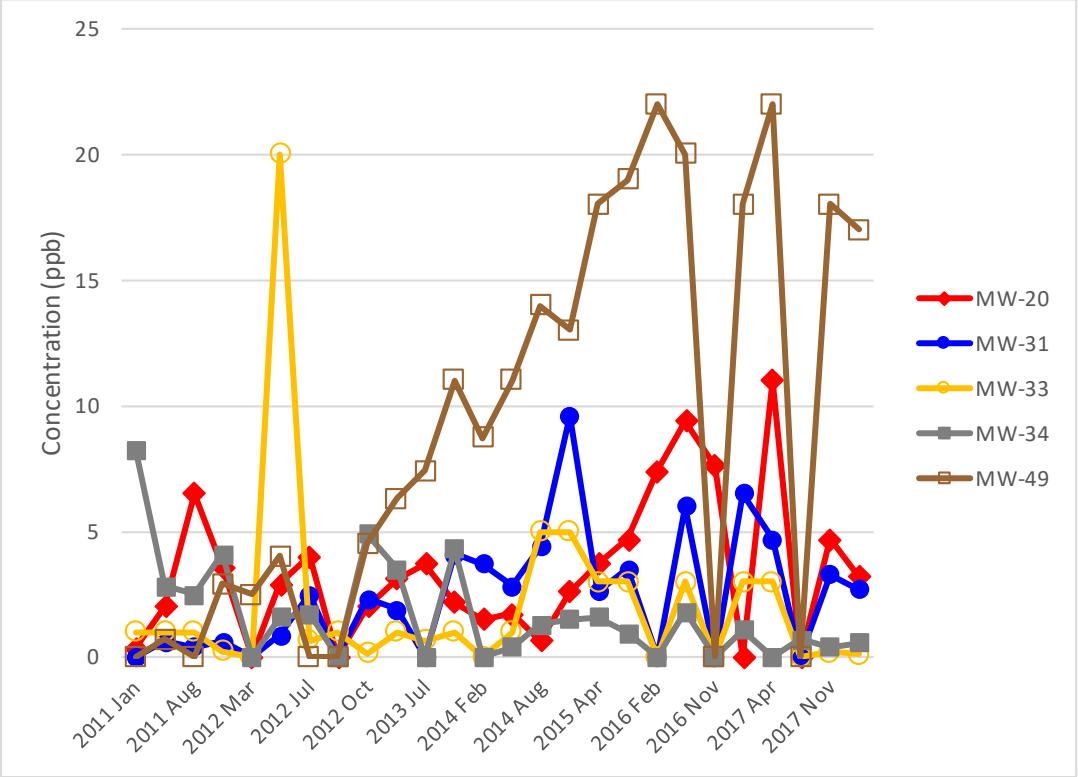


Figure 15: Area 7 TCE Concentrations

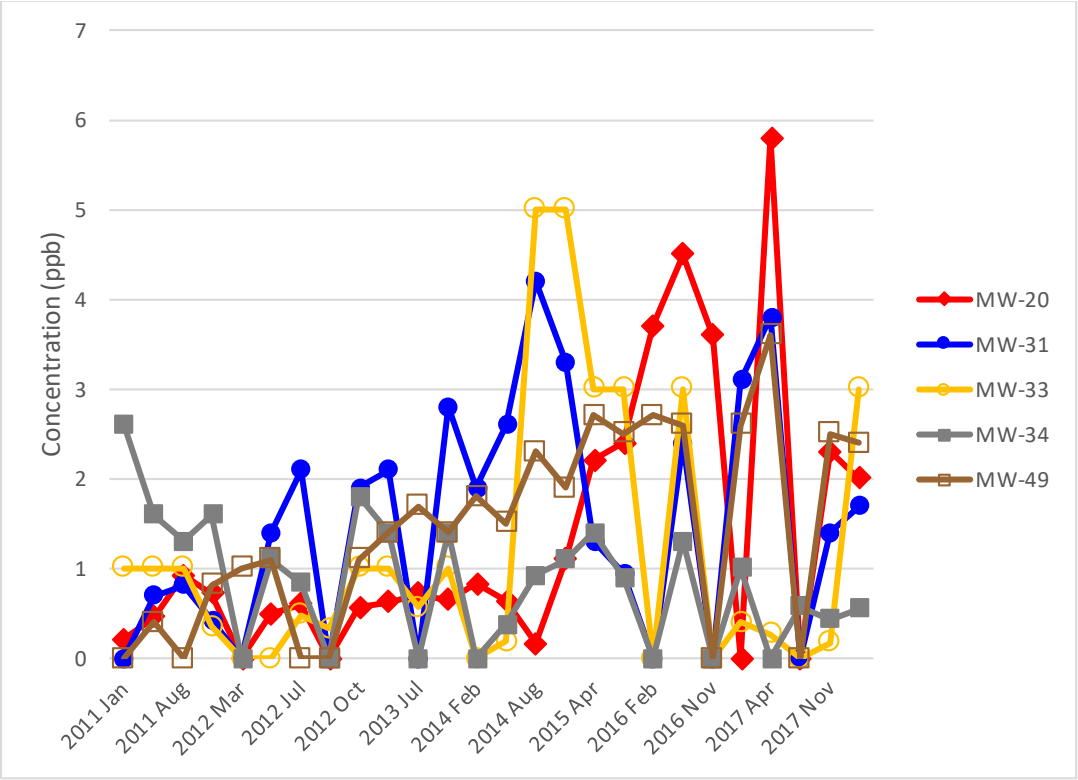


Figure 16: Area 8 TPH Concentrations

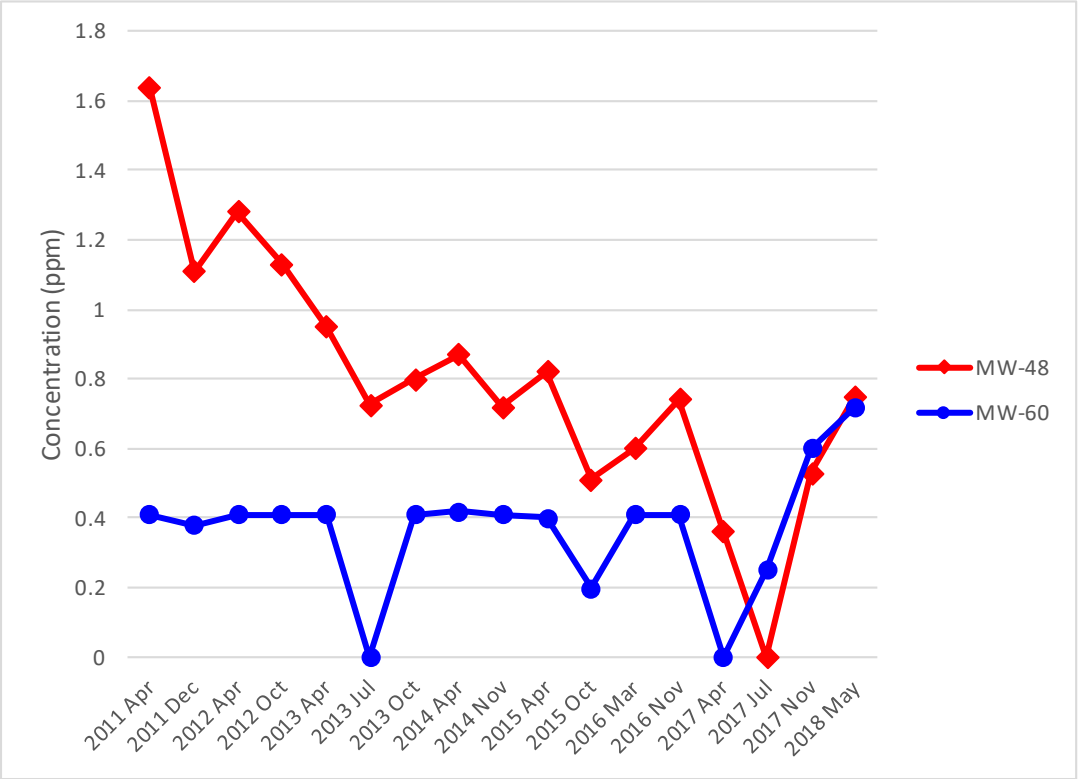


Figure 17: Area 9 TPH and Arsenic Concentrations

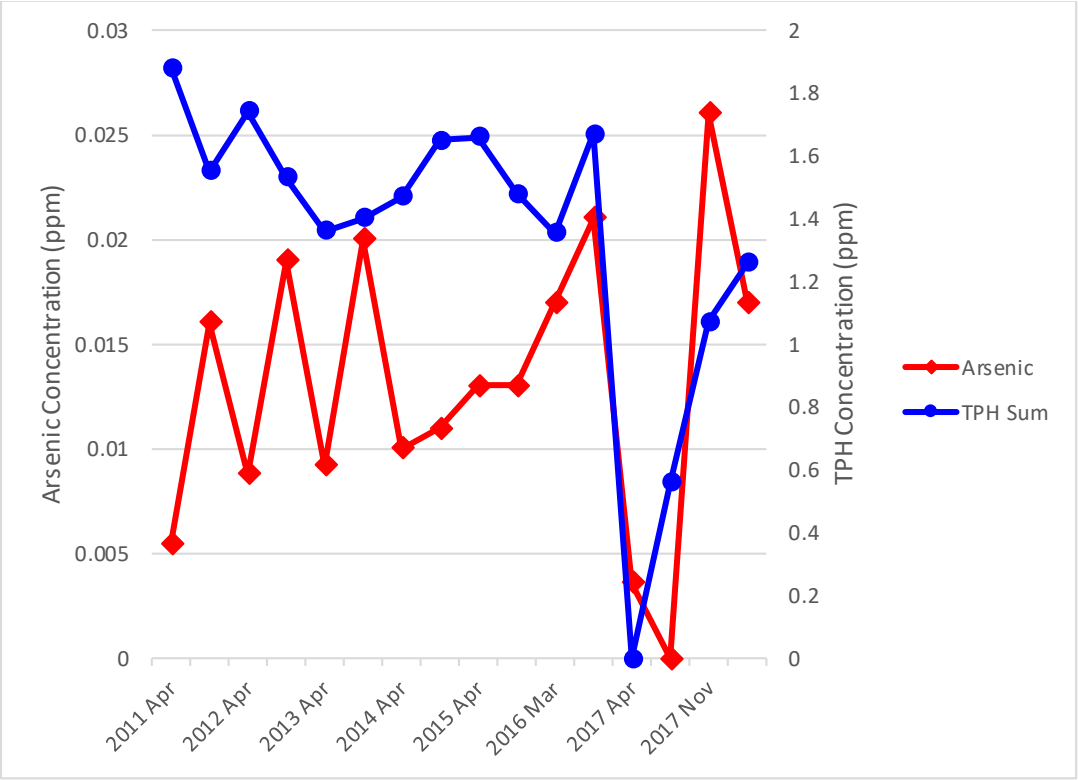
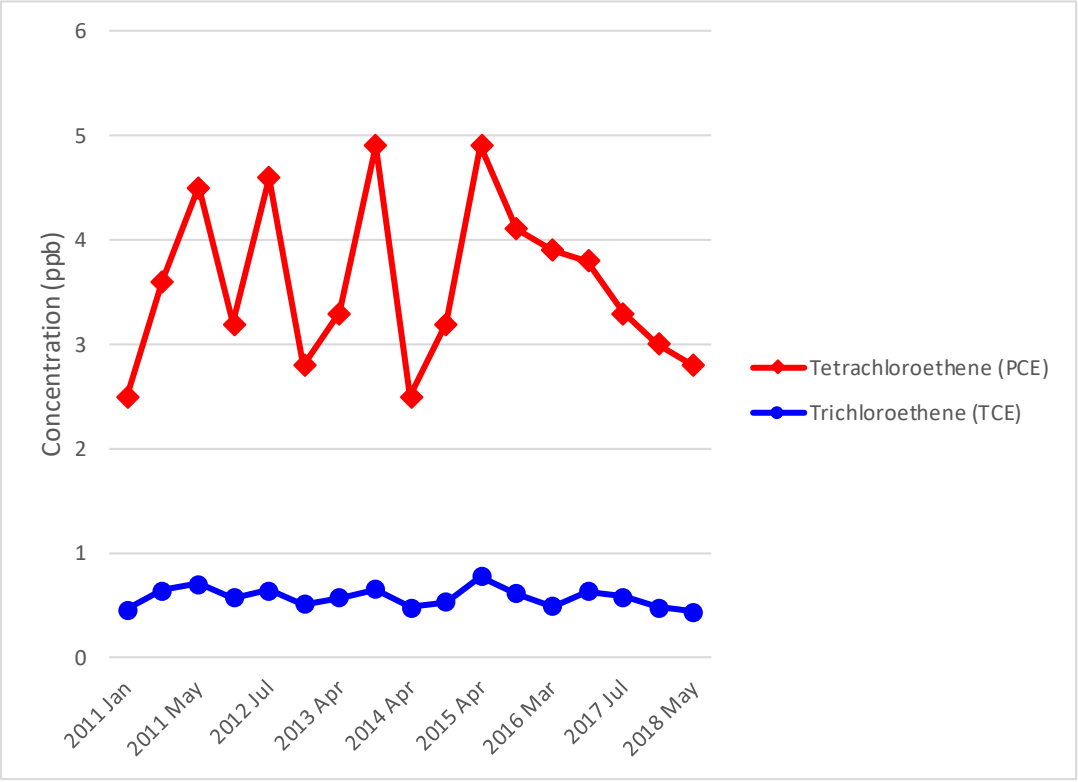


Figure 18: Oil/Water Separator VOC Concentrations



Tables

Table 1: Cleanup Levels

Indicator	Groundwater CUL (ppb)	Groundwater Basis	Soil CUL (ppm)	Soil Basis
EC 5-6			1	
EC>6-8			5	
EC>8-10			760	
EC>10-12			810	
EC>12-16			1876	
EC>16-21			1094	
Total aliphatic			4546	
EC>8-10			5	
EC>10-12			30	
EC>12-16			250	
EC>16-21			605	
EC>12-35			85	
Total aromatic			975	
TPH, TOTAL	1000	Method A	5521	Interim TPH Policy, Method C Commercial
VOCs				
benzene	5	MCL	0.0065	Interim TPH Policy, Method C Commercial
ethylbenzene	320	MCL (adjusted)	2	Interim TPH Policy, Method C Commercial
toluene	320	MCL	1.7	Interim TPH Policy, Method C Commercial
xylenes	4100	MCL (adjusted)	3	Interim TPH Policy. Method C Commercial
1,2-DCP	2	MCL		
chloroform	1	Method B, Carcinogen		
1,1-DCE	0.027	Method B, carcinogen		
1,2-DCA	0.3	Method B, carcinogen		
PCE	1.75	MCL (adjusted)	0.175	100xGW
TCE	2	MCL (adjusted)		
cis-1,2-DCE	53	MCL (adjusted)		
trans-1,2-DCE	100	MCL		
TOTAL METALS				
arsenic	10	PQL		
lead	10	PQL		
PAHs				
naphthalene	130		13	100xGW
cPAHs	0.1	Method A		

Table 2: Area 2 Contaminant Exceedances

Red or @ = exceeds CUL

Indicator	Arsenic	Arsenic	Arsenic	Arsenic	Benzene	Benzene	TPH	TPH	TPH	TPH
Well	MW-06	MW-12	MW-13	MW-63	MW-12	MW-63	MW-06	MW-12	MW-13	MW-63
CUL	0.01 ppm	0.01 ppm	0.01 ppm	0.01 ppm	5 ppb	5 ppb	1 ppm	1 ppm	1 ppm	1 ppm
Jan 2011		0.024	0.038	0.05	40	330		4.84	1.41	13.59
Mar 2011	0.044						0.867			
Apr 2011	0.051	0.024	0.029	0.034	35	170	1.14	4.64	1.64	4.49
Aug 2011	0.086	0.03		0.055	34	650	0.78	4.34		5.34
Nov 2011	0.083	0.036	0.046	0.11	33	330	0.95	4.54	1.21	10.87
Mar 2012				0.04		150				10.42
Apr 2012	0.053	0.032	0.04	0.041	28	200	3.13	6.18	1.59	10.89
Jun 2012								5.174		
Jul 2012	0.081	0.036		0.069	35	320	0.87	4.04		1.628
Sep 2012					28	290		4.54		1.38
Oct 2012	0.081	0.042	0.057	0.088	31	350	0.67	4.84	1.17	2.25
Apr 2013	0.063	0.043	0.05	0.061	44	180	0.59	3.84	1.09	1.32
May 2013	0.062						0.534			
Jul 2013	0.077	0.06		0.062	35	450	0.537	4.347		1.448
Oct 2013	0.088	0.048	0.051	0.078	35	290	3.1	4.94	1.6	2.58
Feb 2014	0.055	0.039		0.049	50	150	0.89	5.4		4.39
Apr 2014	0.074	0.044	0.05	0.061	48	170	1.48	5.55	1.93	3.55
Aug 2014	0.1	0.049	0.043	0.07	50	220	0.547	4.385	1.205	2.82
Nov 2014	0.077	0.045	0.036	0.068	81	330	1.31	5.01	1.62	4.12
Jan 2015			0.039	0.056		61			1.38	5.15
Apr 2015	0.06	0.039	0.042	0.049	48	160	0.71	4.74	1.45	2.04
Aug 2015						140			1.29	1.66
Sep 2015			0.046	0.074		180			1.054	2.87
Oct 2015	0.097	0.054	0.044	0.076	50	170	0.83	4.57	1.34	1.61
Nov 2015			0.041	0.073		160			1.38	2.75
Jan 2016			0.048	0.055		130			1.22	2.2
Feb 2016			0.041	0.053		140			1.13	2.13
Mar 2016	0.061	0.044	0.042	0.049	53	79	1.15	5.66	1.63	3.65
Nov 2016	0.079	0.057	0.046	0.085	68	200	1.06	5.6	1.64	2.71
Apr 2017	0.042	0.013	0.037	0.025	38	57	0.12	1.3	0.38	0.31
Nov 2017	0.09	0.051	0.043	0.08	30	110	0.56	2.95	1.17	1.69
May 2018	0.051	0.026	0.045	0.026	30	28	0.71	2.07	1.46	0.96

Table 3: Area 3 Contaminant Exceedances

Red or @ = exceeds CUL

Indicator	Arsenic	Arsenic	Arsenic	cPAH	cPAH	cPAH	TPH	TPH
Well	MW-10A	MW-17	MW-21R	MW-10A	MW-17	MW-21R	MW-17	MW-21R
CUL	0.01 ppm	0.01 ppm	0.01 ppm	0.1 ppb	0.1 ppb	0.1 ppb	1 ppm	1 ppm
Apr 2011	0.0061	0.01	0.001	0.026595	0.026595	0.026595	0.55	0.61
Aug 2011	0.0057	0.01						0.88
Nov 2011	0.012	0.012		0.017295	0.017295	0.017295	1.51	0.46
Apr 2012	0.0058	0.0079		0.017295	0.017295	0.017295	0.65	0.71
Jun 2012	0.0058	0.0078						0.63
Sep 2012		0.013					0.61	
Oct 2012	0.0092	0.013		0.017295	0.017295	0.017295	0.53	0.54
Apr 2013	0.01	0.0098		0.017295	0.017295	0.022995	0.481	0.407
Jul 2013	0.06	0.06					0.457	
Oct 2013	0.012	0.014	0.0041	0.079545	0.157495	0.017295	0.91	0.65
Feb 2014	0.0094	0.01					0.94	
Apr 2014	0.012	0.012		0.017295	0.01785	0.017295	1.2	0.738
Aug 2014			0.0043					0.837
Nov 2014	0.021	0.013		0.017295	0.017295	0.020195	0.78	0.548
Apr 2015	0.013	0.011	0.0018	0.017095	0.017095	0.017295	0.65	0.432
Oct 2015	0.013	0.014	0.0027	0.017095	0.017295	0.021795	1.04	0.354
Mar 2016	0.0078	0.011	0.0025	0.03439	0.3625	0.35145	1.42	2.35
Nov 2016	0.013	0.0088	0.0032	0.16245	0.16245	0.16245	1.17	0.614
Apr 2017	0.0097	0.0092	0.0031	0.78885	3.909	3.9795	0.21	0.25
Nov 2017	0.014	0.0094	0.0029	0.8441	0.8391	0.8391	0.69	0.445
May 2018	0.0072	0.007	0.0018	0.35195	34.44	34.44	0.69	0.614

Table 4: Area 4 Contaminant Exceedances

Red or @ = exceeds CUL

Indicator	1,1-DCE	1,1-DCE	Arsenic	Benzene	cPAH	cPAH	cPAH	PCE	PCE	TPH	TPH	TPH	TCE	TCE
Well	MW-46R	MW-47	MW-11A	MW-11A	MW-11A	MW-46R	MW-47	MW-46R	MW-47	MW-11A	MW-46R	MW-47	MW-46R	MW-47
CUL	0.027 ppb	0.027 ppb	0.01 ppm	5 ppb	0.1 ppb	0.1 ppb	0.1 ppb	1.75 ppb	1.75 ppb	1 ppm	1 ppm	1 ppm	2 ppb	2 ppb
Jan 2011			0.074	11						5.24				
Apr 2011			0.076	18					0.55	5.14	0.065		0.56	0.25
Aug 2011			0.087	16						5.03				
Nov 2011	0.022	0.016	0.14	8.4	0.017295	0.017295	0.03459		0.45	4.16				0.15
Apr 2012			0.042						0.58	3.83		3.02		
Jul 2012			0.074	2.4						4.84				
Sep 2012				2.9						4.64		0.029		
Oct 2012			0.094	2.2	0.017295	0.017295	0.017295	0.21	0.22	4.54			0.23	
Apr 2013			0.096	1.9				0.19	0.6	3.14			0.18	0.18
May 2013			0.092	2.1						4.04				
Jul 2013			0.077	1.9						3.067				
Oct 2013			0.099	2.5	0.017345	0.017295	0.01785		0.53	3.55		0.018		
Feb 2014			0.07	1						2.87				
Apr 2014			0.094	0.94					1.1	3.63	0.32	0.077		0.8
Aug 2014			0.11	0.36						2.3				
Nov 2014			0.1	3.1	0.017095	0.017345	0.017295		1	3.608	0.329			0.84
Apr 2015			0.077	2					1.8	2.769				2
Aug 2015		0.039							2.4					2.4
Oct 2015		0.072	0.1	1.2	0.017095	0.017095	0.017095		2.1	3.261	0.355	0.36		2.4
Feb 2016									1.7					2.3
Mar 2016			0.08	0.8					2	3.793	0.376			2.5
Nov 2016			0.092		0.16245	0.16245	0.16245			3.85	0.191			
Dec 2016		0.11		1.2					2.2					3.4
Apr 2017			0.068	0.58						1.8				
Jul 2017	0.067	0.082							1.9					3.6
Nov 2017			0.09	0.93	0.90965	0.8391	0.833		1.8	2.31	0.077		0.19	2.8
May 2018			0.087	0.47					1.6	2.95			0.12	2.6

Table 5: Area 6 Contaminant Exceedances

Red or @ = exceeds CUL

Indicator	Arsenic	Arsenic	Benzene	cPAH	cPAH	cPAH	TPH	TPH
Well	MW-08	MW-19	MW-08	MW-08	MW-18	MW-19	MW-08	MW-19
CUL	0.01 ppm	0.01 ppm	5 ppb	0.1 ppb	0.1 ppb	0.1 ppb	1 ppm	1 ppm
Jan 2011	0.01	0.071	20				4.34	2.24
Apr 2011	0.006	0.068	18				5.24	2.11
Aug 2011		0.087						1.76
Nov 2011	0.012	0.1	6.9	0.017295	0.017295	0.017295	2.3	1.62
Mar 2012	0.0084		5.2				2.57	
Apr 2012	0.0069	0.076	9.6				3.65	2.239
Jul 2012	0.01	0.092	6.1				2.98	1.6
Sep 2012		0.098	7.2				3.22	1.81
Oct 2012	0.011	0.1	7.1	0.017295	0.017295	0.017295	3.11	1.93
Apr 2013	0.0086	0.077	5.7				2.94	1.83
Jul 2013	0.06	0.091	3.8				3.078	1.537
Oct 2013	0.011	0.11	4.2	0.0181	0.017295	0.017295	3.34	1.3
Feb 2014	0.0067		3.6				5.55	
Apr 2014	0.0075	0.082	1.7				5.65	2.41
Aug 2014	0.011	0.095	0.48				3.35	1.57
Nov 2014	0.0095	0.097	2.8	0.019195	0.018995	0.018995	3.74	1.53
Apr 2015	0.0087	0.08	2				3.5	1.48
Aug 2015		0.084						1.602
Oct 2015	0.011	0.11	1.8	0.017095	0.017095	0.017295	3.47	1.94
Mar 2016	0.008	0.075	1.2				3.932	1.693
Nov 2016	0.014	0.11	0.5	0.16345	0.16245	0.16245	2.468	1.102
Apr 2017	0.0067	0.069					2	0.78
Nov 2017	0.0094	0.084	0.24	0.78885	0.79385	0.80035	2.54	1.57
May 2018	0.0079	0.074	3				3.93	1.64

Table 6: Area 7 Contaminant Exceedances

Red or @ = exceeds CUL

Indicator	1,1-DCE	1,1-DCE	1,1-DCE	1,1-DCE	Arsenic	Arsenic	cPAH	cPAH	cPAH	cPAH	cPAH	Lead	Naphtha-lene	Naphtha-lene
Well	MW-20	MW-31	MW-33	MW-34	MW-33	MW-34	MW-20	MW-31	MW-33	MW-34	MW-49	MW-31	MW-31	MW-33
CUL	0.027 ppb	0.027 ppb	0.027 ppb	0.027 ppb	0.01 ppm	0.01 ppm	0.1 ppb	0.1 ppb	0.1 ppb	0.1 ppb	0.1 ppb	0.01 ppm	130 ppb	130 ppb
Jan 2011	0.016			0.094	0.006	0.015								
Apr 2011				0.035	0.0032	0.011						0.0011		
Aug 2011	0.03	0.035	0.011	0.062	0.01	0.022								
Nov 2011	0.035	0.044	0.045	0.066	0.0073	0.027	0.0173	0.0173	0.0173	0.0173	0.0173	0.0012		170
Mar 2012														
Apr 2012	0.022	0.049	0.021	0.039	0.0081	0.018								
Jun 2012														
Jul 2012					0.0069	0.025								
Sep 2012														
Oct 2012		0.032			0.0098	0.031	0.0173	0.0173	0.0173	0.0173	0.0173	0.0022		130
Apr 2013					0.0085	0.02						0.0023		
Jul 2013														
Oct 2013					0.009	0.037	0.0795	0.07952	0.0181	0.0171	0.01785	0.0021	0.27	140
Feb 2014		0.063												
Apr 2014	0.041	0.045			0.013	0.019						0.0022		
Aug 2014		0.052			0.0093	0.035						0.0018		
Nov 2014	0.056			0.043	0.0097	0.03	0.019	0.0173	0.019	0.0192	0.0173	0.0013	0.26	30
Apr 2015					0.0082	0.017						0.0013		
Oct 2015	0.068	0.055			0.0093	0.036	0.0171	0.0173	0.0173	0.0173	0.0171	0.0012	0.36	30
Feb 2016	0.074													
Mar 2016	0.068				0.0068	0.02						0.017		
Nov 2016	0.085				0.0044	0.033	0.1624	0.1624	0.1624	0.1624	0.1625	0.0014		18
Dec 2016		0.11	0.099	0.081										
Apr 2017					0.005	0.015						0.0013		
Jul 2017														
Nov 2017					0.0047	0.021	0.7938	0.7938	0.7938	0.7888	0.7888		0.23	3.9
May 2018					0.0065	0.015								

Pasco Bulk Fuels Terminal Periodic Review

Indicator	Naphtha-lene	PCE	PCE	PCE	PCE	PCE	TPH	TPH	TPH	TPH	TCE	TCE	TCE	TCE	TCE
Well	MW-34	MW-20	MW-31	MW-33	MW-34	MW-49	MW-20	MW-31	MW-33	MW-34	MW-20	MW-31	MW-33	MW-34	MW-49
CUL	130 ppb	1.75 ppb	1.75 ppb	1.75 ppb	1.75 ppb	1.75 ppb	1 ppm	1 ppm	1 ppm	1 ppm	2 ppb	2 ppb	2 ppb	2 ppb	2 ppb
Jan 2011		0.37			8.2		0.95		17.64	2.75	0.21			2.6	
Apr 2011		2	0.61		2.8	0.69	0.9	1.64	13.74	2.45	0.46	0.7		1.6	0.4
Aug 2011		6.5	0.38		2.5		0.63	1.3	13.64	2.16	0.92	0.81		1.3	
Nov 2011	0.77	3.6	0.62	0.23	4.1	2.9	0.479	1.27	12.24	2.3	0.72	0.42	0.35	1.6	0.82
Mar 2012						2.5									1
Apr 2012		2.9	0.87		1.6	4	1.96	1.24	12.05	2.84	0.49	1.4		1.1	1.1
Jun 2012							1.13			2.71					
Jul 2012		4	2.5	0.64	1.7		0.67	1	11.34	2.25	0.6	2.1	0.48	0.84	
Sep 2012									10.54				0.33		
Oct 2012		2	2.3	0.15	4.9	4.5	0.55	1.24	11.14	2.536	0.56	1.9		1.8	1.1
Apr 2013		3.1	1.9		3.5	6.3	0.55	1.09	8.14	1.52	0.63	2.1		1.4	1.4
Jul 2013		3.7		0.64		7.4	0.279		11.69		0.72		0.56		1.7
Oct 2013	1.1	2.2	4.1		4.3	11	0.6	1.57	10.34	2.18	0.65	2.8		1.4	1.4
Feb 2014		1.5	3.7			8.7	1.01				0.83	1.9			1.8
Apr 2014		1.7	2.8		0.41	11	0.57	1.12	9.05	2.17	0.64	2.6	0.18	0.38	1.5
Aug 2014		0.64	4.4		1.3	14	0.388	0.835	8.28	1.653	0.16	4.2		0.92	2.3
Nov 2014	1.1	2.6	9.6		1.5	13	0.422	1.22	9.479	2.51	1.1	3.3		1.1	1.9
Apr 2015		3.7	2.6		1.6	18	0.7	0.93	7.53	1.99	2.2	1.3		1.4	2.7
Oct 2015		4.7	3.5		0.97	19	0.42	0.929	5.41	2.041	2.4	0.95		0.9	2.5
Feb 2016		7.4				22					3.7				2.7
Mar 2016		9.4	6		1.8	20	0.365	1.157	10.12	2.364	4.5	2.4		1.3	2.6
Nov 2016		7.6					0.254	1.104	8.248	2.73	3.6				
Dec 2016			6.5		1.1	18						3.1	0.4	1	2.6
Apr 2017		11	4.7			22	0.17	0.21	5.2		5.8	3.8	0.27		3.6
Jul 2017					0.71					1.1				0.58	
Nov 2017	1.1	4.7	3.3	0.2	0.41	18	0.429	0.83	6.15	1.62	2.3	1.4	0.17	0.44	2.5
May 2018		3.2	2.7	0.11	0.57	17	0.65	0.758	5.49	1.92	2	1.7		0.55	2.4

Table 7: Area 8 Contaminant Exceedances

Red or @ = exceeds CUL

Indicator	Arsenic	cPAH	cPAH	TPH
Well	MW-48	MW-48	MW-60	MW-48
CUL	0.01 ppm	0.1 ppb	0.1 ppb	1 ppm
Apr 2011	0.02			1.64
Dec 2011	0.026	0.03459	0.017295	1.11
Apr 2012	0.021			1.28
Oct 2012	0.022	0.017295	0.017295	1.13
Apr 2013	0.019			0.95
Jul 2013	0.06			0.727
Oct 2013	0.021	0.017279	0.017295	0.8
Apr 2014	0.019			0.87
Nov 2014	0.023	0.021795	0.018995	0.72
Apr 2015	0.019			0.82
Oct 2015	0.024	0.028395	0.017295	0.511
Mar 2016	0.02			0.6
Nov 2016	0.026	0.16245	0.16245	0.74
Apr 2017	0.017	0.80035	0.80035	0.36
Nov 2017	0.017	0.78885	0.79385	0.53
May 2018	0.012			0.75

Table 8: Area 9 Contaminant Exceedances

Red or @ = exceeds CUL

Indicator	Arsenic	TPH
CUL	0.01 ppm	1 ppm
Apr 2011	0.0055	1.88
Dec 2011	0.016	1.55
Apr 2012	0.0088	1.74
Oct 2012	0.019	1.53
Apr 2013	0.0092	1.36
Oct 2013	0.02	1.4
Apr 2014	0.01	1.47
Nov 2014	0.011	1.65
Apr 2015	0.013	1.66
Oct 2015	0.013	1.48
Mar 2016	0.017	1.353
Nov 2016	0.021	1.67
Apr 2017	0.0036	
Jul 2017		0.56
Nov 2017	0.026	1.07
May 2018	0.017	1.26

Table 9: Oil/Water Separator Contaminant Exceedances

Red or @ = exceeds

Indicator	cPAH	PCE	TPH	TCE
CUL	0.1 ppb	1.75 ppb	1 ppm	2 ppb
Jan 2011		2.5	0.41	0.46
Apr 2011		3.6	0.421	0.64
May 2011		4.5		0.7
Dec 2011		3.2	0.415	0.57
Jul 2012		4.6	0.6	0.64
Dec 2012	0.017295	2.8	0.41	0.51
Apr 2013	0.017295	3.3	0.427	0.57
Oct 2013	0.03513	4.9	0.57	0.65
Apr 2014	0.017295	2.5	0.437	0.48
Dec 2014	0.02161	3.2	0.42	0.53
Apr 2015	0.017295	4.9	0.394	0.77
Oct 2015	0.017095	4.1	0.414	0.61
Mar 2016	0.03439	3.9	0.407	0.49
Nov 2016	0.16245		0.42	
Dec 2016		3.8		0.63
Apr 2017	0.78885		0.056	
Jul 2017		3.3		0.58
Nov 2017	0.78885	3	0.406	0.48
May 2018	0.35195	2.8	0.72	0.44