

**SIXTH FIVE-YEAR REVIEW REPORT FOR
BRUIN LAGOON SUPERFUND SITE
BUTLER COUNTY, PENNSYLVANIA**



SEPTEMBER 2019

Prepared by

**U.S. Environmental Protection Agency
Region 3
Philadelphia, Pennsylvania**

A handwritten signature in blue ink, appearing to read "P. Leonard", written over a horizontal dashed line.

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SEP 9 2019

Date

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LIST OF ABBREVIATIONS AND ACRONYMS

AO	Administrative Order
ARAR	Applicable or Relevant and Appropriate Requirement
CCC	Criterion Continuous Concentration
CFR	Code of Federal Regulations
CH ₄	Methane
CMC	Criterion Maximum Concentration
COC	Contaminant of Concern
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
FYR	Five-Year Review
HHC	Human Health Criterion
IC	Institutional Control
LEL	Lower Explosive Limit
MSC	Medium Specific Concentration
µg/L	Micrograms Per Liter
mg/L	Milligrams Per Liter
ND	Not Detected
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PADEP	Pennsylvania Department of Environmental Protection
PCMP	Post-Closure Monitoring Plan
POC	Point of Compliance
ppm	Parts Per Million
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SMCL	Secondary Maximum Contaminant Level
SVOC	Semi-Volatile Organic Compound
VOC	Volatile Organic Compound
USACE	United States Army Corps of Engineers
UU/UE	Unlimited Use and Unrestricted Exposure

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings and conclusions of reviews are documented in FYR Reports such as this one. In addition, FYR Reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act Section 121, consistent with the National Contingency Plan (40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the sixth FYR for the Bruin Lagoon Superfund site (the Site). The triggering action for this statutory review is the completion date of the previous FYR. The FYR has been prepared because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of two operable units (OUs), both of which are addressed in this FYR. OU1 and OU2 both address the source waste materials at the Site. The OUs represent the same waste stream and reflect two separate remediation efforts.

The EPA remedial project manager (RPM) led the FYR. Participants included EPA's technical support personnel, representatives from Pennsylvania Department of Environmental Protection (PADEP) and representatives from EPA FYR support contractor Skeo. The review began on October 22, 2018.

Site Background

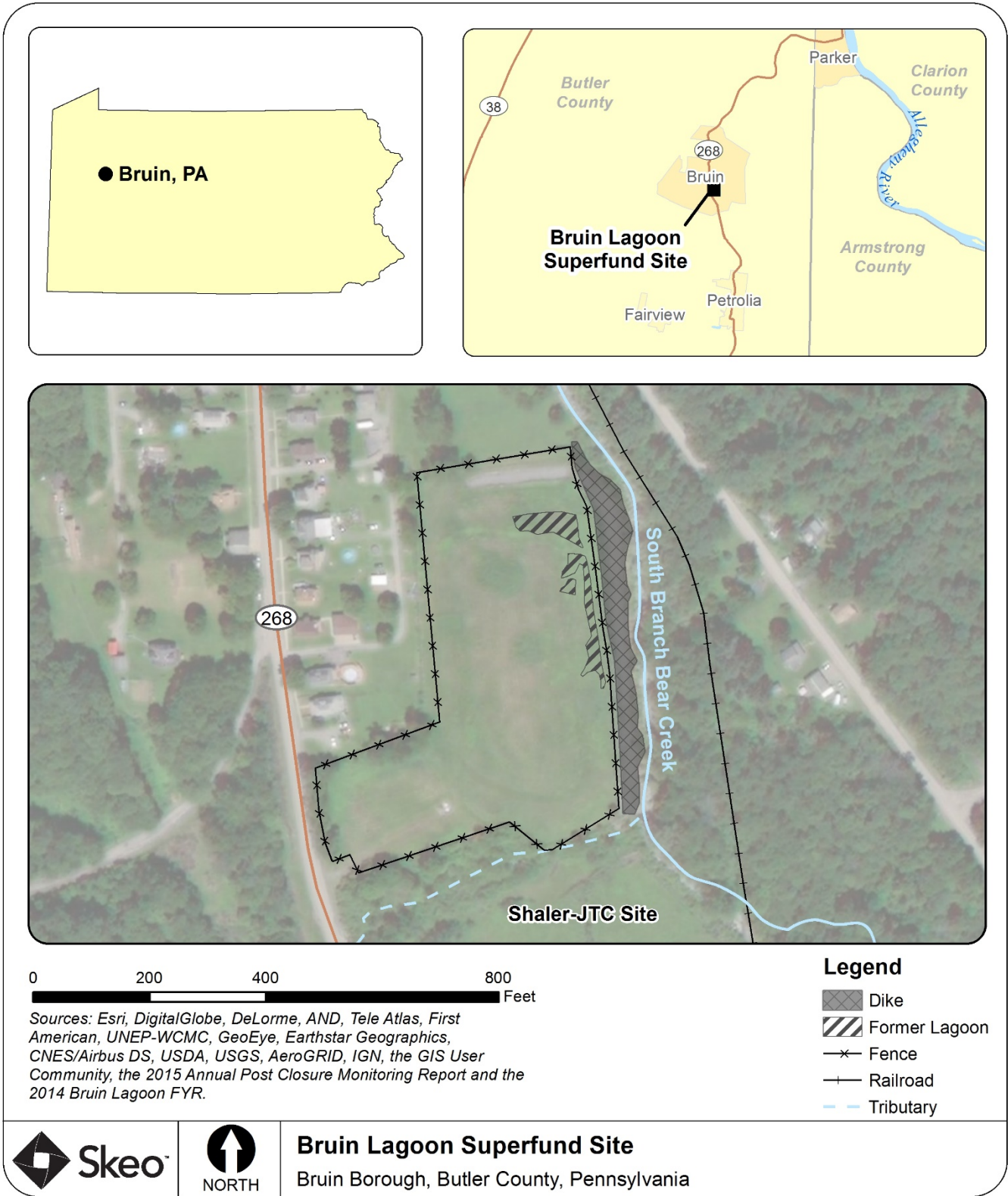
The 4-acre Site is located about 45 miles north of Pittsburgh, on Route 268 just south of Bruin-Fairview Road in Bruin Borough, Butler County, Pennsylvania (Figure 1). The Site is managed by PADEP under the terms of a December 14, 1988 State Superfund Contract (SSC).

The Site was formerly an earthen-diked lagoon that received acidic sludge wastes from the adjacent Bruin Oil Company. Sludge wastes consisted of white oil production wastes, residue from motor oil, coal fines and fly ash. The lagoon contained about 130,000 gallons of acidic liquid and 35,000 cubic yards of sludge.

The fenced and gated Site currently consists of the capped waste lagoon, groundwater monitoring wells and passive gas vents. The South Branch of Bear Creek (referred to as Bear Creek in this report) borders the Site to the east and northeast. Bear Creek eventually flows into the Allegheny River, located 7 miles from the Site. A small tributary to Bear Creek borders the Site to the south. Homes border the Site to the north and west. Directly south of the Site is the Shaler-JTC site, which was previously owned by Bruin Oil Company and was the source of sludge deposited on the Site; it has undergone a cleanup by PADEP, is currently vacant and is in the operation and maintenance (O&M) phase.

Groundwater at the Site occurs in a bedrock groundwater system located in fractured sandstone, which consists of shallow, intermediate and deep zones. A perched liquid zone is located above the bedrock system within the soil fill and sludge in the lagoon. In the immediate vicinity of the Site, the bedrock water table aquifer flows in a general northeasterly direction and discharges into the South Branch of Bear Creek. Due to past mining exploration activities in the area of the Site and neighboring contaminated properties, the groundwater underlying the Site has localized contamination with inorganic compounds. An abandoned underground coal mine is located about a half-mile northeast of the Site. Bear Creek is contaminated upstream of the Site; its water quality is highly variable on a day-to-day basis. All potable wells in Bruin Borough have been disconnected and residences are connected to a municipal supply system. Appendix A provides a list of the resources used in the preparation of this FYR. Appendix B provides the Site's chronology of events.

Figure 1: Site Vicinity Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Bruin Lagoon		
EPA ID: PAD980712855		
Region: 3	State: Pennsylvania	City/County: Bruin Borough / Butler County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	Has the Site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Jim Feeny, with additional support provided by Skeo		
Author affiliation: EPA Region 3		
Review period: 10/22/2018 – 9/17/2019		
Date of site inspection: 10/24/2018		
Type of review: Policy		
Review number: 6		
Triggering action date: 9/17/2014		
Due date (five years after triggering action date): 9/17/2019		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Between 1930 and 1970, a 1-acre lagoon was used for the disposal of wastes. In 1968, the lagoon dike breached and about 3,000 gallons of acidic waste sludge were released into Bear Creek. At the time of the breach, the American International Petroleum Company owned Bruin Lagoon. An estimated 4 million fish were killed in the Allegheny River as a result of the discharge and evidence of the spill was observed over 100 miles downstream from the Site. Downstream communities that used Bear Creek and the Allegheny River for potable water had to temporarily shut down their water supply systems and find alternate water supplies. The American International Petroleum Company reinforced the dike and sold the property to the AH&RS Coal Company a few years later.

The Site’s 1986 remedial investigation (RI) found contaminants in the lagoon at the Site that were a threat to human health and the environment. The acidic sludge, which contained organic contaminants, including acetone, benzene, toluene and xylenes, and metals posed a threat to humans and wildlife that could have dermal (direct) contact with it or could ingest it. In addition, the acidic sludge posed a serious threat to surface water due to proximity to the nearby river. The untreated acidic sludge also posed a serious threat of release as toxic gas. If the Site was disturbed by drilling or other invasive activities, there was the potential for a toxic gas release, which

would have been an air exposure risk to the community. The intermittent ponded water that collected at the Site also posed a potential threat to humans and wildlife because it was acidic.

Response Actions

In April 1979, PADEP notified EPA of potentially unstable dikes around the lagoon that could cause further releases of acidic sludge into Bear Creek. In May 1981, EPA and PADEP conducted a site inspection. In September 1981, EPA reinforced the lagoon dike and constructed a security fence around the property. EPA contractors began a combined remedial investigation/feasibility study (RI/FS) in July 1981 which was completed in February 1982.

In June 1982, EPA issued a Record of Decision (ROD) for OU1 at the Site, which required the removal and off-site disposal of scrap tanks and approximately 130,000 gallons of acidic liquid waste. In September 1983, EPA listed the Site on the National Priorities List (NPL). In 1984, during remedial activities, toxic gases were released during an accidental breach of a previously unidentified sludge layer in the lagoon. EPA ceased remedial activities and initiated an emergency response action that successfully mitigated the release. In September 1984, EPA initiated a new RI for the Site. The resulting 1986 RI concluded that the groundwater and bedrock under the Site were contaminated by releases of hazardous substances from the lagoon, and area groundwater had been contaminated by elevated metals due to past mining and oil/gas exploration activities. It also determined that residential wells were hydraulically upgradient of the Site and therefore not likely affected by the Site.

A 1986 Public Health Evaluation identified contaminants of concern (COCs) in soil, groundwater and surface water for human health and aquatic receptors. The COCs identified were cadmium, chromium, copper, lead, zinc and sulfate for human health; and aluminum, cadmium, chromium and copper for aquatic life. Acidity (low pH) was also identified as a COC due to the presence of highly acidic sludge in the lagoon, which posed a threat to human health and the environment. Volatile organic compounds (VOCs), including acetone, benzene, toluene and xylenes, were detected in the sludge but were generally not present in groundwater samples collected during the 1986 RI.

In September 1986, EPA issued a ROD for OU2 at the Site, which superseded the OU1 remedy. The remedial action objectives (RAOs) included:

- Containing, reducing and/or eliminating site contaminants identified as representing possible sources of exposure to human and other receptors.
- Reducing or eliminating exposure of site contaminants to potential receptors by controlling potential contaminant pathways.
- Ensuring technical feasibility, protecting public health and the environment and the cost-effectiveness of the remedial action.

The remedy selected for OU2 included:

- On-site stabilization/neutralization of sludge and perched liquid zone.
- In-situ treatment of bedrock underneath the former lagoon area.
- Completion of dike reinforcement.
- Capping of the former lagoon area with a Resource Conservation and Recovery Act (RCRA) multi-layer cap.
- Monitoring and maintenance of the site cap and groundwater.

The OU2 ROD acknowledged that regional groundwater quality was impacted and therefore did not propose treating the limited groundwater contamination underneath the lagoon. The performance of the implemented remedy was to be measured by RCRA landfill closure standards. These standards dictate that groundwater quality outside and downgradient of the capped area at points of compliance (POCs) were required to meet concentration

limits specified in 40 CFR § 264.94, or should be equivalent to the upgradient background groundwater quality, whichever is less stringent. COCs were not established for the Site in the OU2 ROD.

The OU2 selected remedy did not include a requirement for institutional controls. However, in September 2000, the Commonwealth of Pennsylvania issued an Administrative Order (AO) pursuant to Section 512 of the Hazardous Sites Cleanup Act to the Site's potentially responsible parties (PRPs), including AH-RS Coal Corporation, J.T.C. Industries, Inc., and Shaler Contracting and Development Corporation, prohibiting certain activities at the Site. In 2015, EPA issued an Explanation of Significant Differences (ESD) to include certain institutional controls from the 2000 AO as part of the selected remedy for the Site.

Status of Implementation

Under an Interagency Agreement, the U.S. Army Corps of Engineers (USACE) initiated the remedial design in January 1988 and completed it in July 1988. Remedial action for the OU2 ROD began in March 1989 and construction was completed in June 1991. Activities included:

- Excavating the waste in the lagoon down to bedrock and performing on-site neutralization and stabilization.
- Placing layers of lime over the bedrock surface to promote neutralization of acid in the bedrock.
- Returning the stabilized waste to the excavated lagoon.
- Constructing a final RCRA multi-layer cap on the stabilized waste.
- Installing gas vents.
- Constructing a surface water drainage system around the stabilized lagoon to prevent surface water from entering the capped area.

The RAOs were achieved at the Site and EPA issued a Close-Out Report in March 1992. EPA deleted the Site from the NPL in 1997.

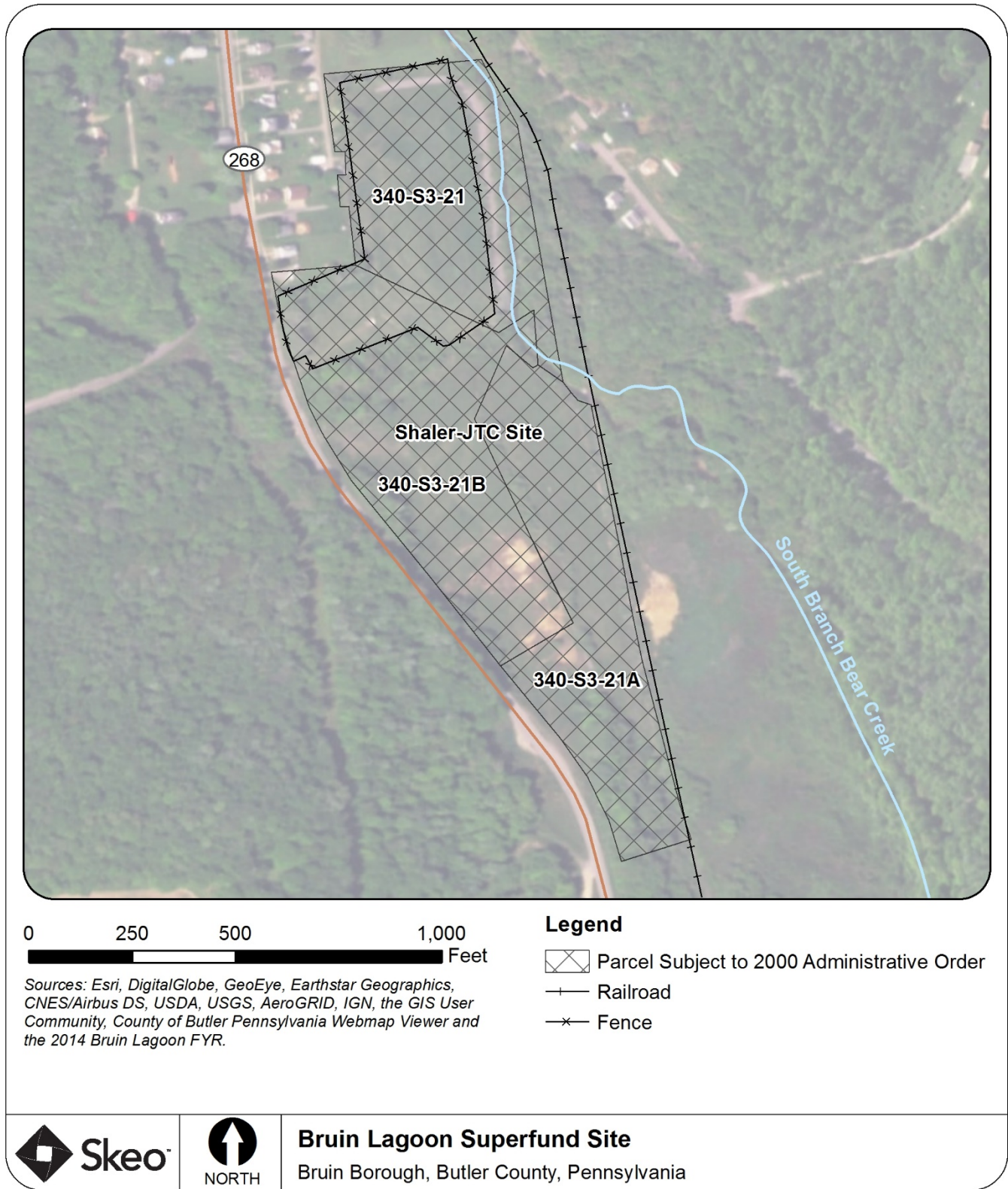
Institutional Control (IC) Review

On September 18, 2000, the commonwealth of Pennsylvania issued an AO pursuant to Section 512 of HSCA to the Site's PRPs, prohibiting some activities at the Site. The AO was filed with the Recorder of Deeds for Butler County in October 2000. The Site's 2015 ESD modified the site remedy to include the institutional controls that are in the 2000 AO in order to protect human health and the environment, maintain the integrity of the remedy, and prohibit activities that could interfere with the remedy. The specific restrictions in the 2000 AO include:

- Cease any activity that would disturb or be inconsistent with the remedial actions implemented at the Site at the time the AO was issued.
- Ensure that groundwater monitoring wells are not disturbed.
- Prohibit installation of additional groundwater wells without prior written approval of PADEP.
- Prevent any disturbance of the landfill cap that would cause underlying waste to be exposed or that could contribute to cap erosion.
- Require that the property deed for any future conveyance or transfers of parcels at the Site include a description of the remedial response actions taken on any parcel of property comprising the Site and an acknowledgement that hazardous substances have been disposed of there. The acknowledgement shall include, but not be limited to, the surface area, size and exact location of the disposed substances as well as a description of the types of hazardous substances contained there.

The institutional controls apply to three parcels, which include the Site and the Shaler-JTC site (Figure 2). The PRPs remain the owners of their respective parcels.

Figure 2: Institutional Control Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Table 1: Summary of Planned and/or Implemented Institutional Controls (ICs)

Media, Engineered Controls, and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil and Groundwater	Yes	Yes	340-S3-21, 340-S3-21B, 340-S3-21A	Prohibit the disturbance of the cap to maintain the integrity of the remedy, prohibit activities that could interfere with the selected remedy and prohibit installing wells	Administrative Order, September 2000

Systems Operations/Operation and Maintenance (O&M)

Pursuant to the SSC, PADEP performs annual O&M activities in accordance with the terms of an EPA-approved 1992 O&M Plan and Post-Closure Monitoring Plan (PCMP) Amendments from 2010 and 2017. These activities include inspecting and maintaining the lagoon cap, mowing overgrown vegetation; inspecting surface water drainage systems and areas of discharge of surface water into the South Branch of Bear Creek; and performing annual groundwater, surface water and gas vent monitoring. The current SSC terminates on October 30, 2020. The SSC period of performance should be extended to ensure that O&M is performed at the Site.

III. PROGRESS SINCE THE PREVIOUS REVIEW

This section includes the protectiveness determination and statement from the previous FYR Report as well as the recommendation from the previous FYR Report and the status of the recommendation.

Table 2: Protectiveness Determination/Statement from the 2014 FYR Report

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Short-term Protective	The selected remedy is protective of human health and the environment because the cap is intact and functioning as designed; therefore, no human or environmental receptors are currently exposed to the stabilized waste material. The formation of toxic gases was eliminated. In addition, the historic groundwater monitoring data indicate that a source stabilization and bedrock neutralization remedy is functioning as designed by significantly reducing the migration of contaminants to groundwater underneath the Site and preventing migration of contamination outside the site boundary. Institutional controls to protect the remedy were implemented through a 512 Order.

Table 3: Status of Recommendations from the 2014 FYR Report

OU #	Issue	Recommendation	Current Status	Current Implementation Status Description	Completion Date (if applicable)
2	None of RODs include documentation of already implemented institutional controls.	Issue an ESD documenting implementation of institutional controls as a remedy component.	Completed	EPA issued an ESD to require institutional controls on the Site and state that the 2000 AO is the appropriate institutional control for the Site.	9/28/2015

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

EPA placed an advertisement in the *Butler Eagle*, a local newspaper, on June 3, 2019 (Appendix C). The ad informed the community of the purpose of the FYR and the upcoming availability of the Report. EPA received no questions, comments or response from this advertisement. This FYR report will be made available online at <https://www.epa.gov/superfund/bruinlagoon>

Interviews

On June 14, 2019, EPA's Community Involvement Coordinator for the Site conducted a phone interview with the Director of Emergency Services for Butler County. The Director was familiar with the Site and expressed satisfaction with the effectiveness of the remedy. He stated there have not been any issues at the Site that have required emergency response or visits. He feels the community has knowledge of the Site but is not concerned about its status and it has had little impact on the community. He did not have any suggestions or recommendations for EPA moving forward.

On October 24, 2018, the RPM discussed the ongoing work and the FYR at the Site with representatives of PADEP. They reported that current interest in the Site is minimal with only few inquiries, and that no negative comments have been received from the general public in the last five years.

Data Review

PADEP conducted groundwater, surface water and gas vent sampling annually during this FYR period (2014 through 2018) in accordance with the 2010 and 2017 PCMPs. Groundwater and surface water samples were analyzed for VOCs, semi-volatile organic compounds (SVOCs), metals and general indicators of groundwater quality. Gas vent data are analyzed for gaseous emissions including the lower explosive limit, oxygen, hydrogen sulfide, methane, sulfur dioxide, VOCs, carbon dioxide and hydrochloric acid. A detailed analysis of data collected during this FYR period and reported in the annual reports is provided in Appendix G. A summary of the findings as they pertain to analyzing the protectiveness of the site remedy is included in this section.

Groundwater Monitoring

PADEP contractors monitor 14 wells at the Site, screened in the shallow, intermediate and deep bedrock (Figure 3). Wells are located upgradient of the Site, within the waste material at the Site (MW-05A and MW-06A) and downgradient of the Site. There are four POC wells, which are located downgradient of the Site (Table G-1 in Appendix G). Except for chromium in the downgradient deep bedrock, all COC concentrations in POC wells are less than the RCRA concentration limits (Table G-2 in Appendix G). Chromium was detected in deep POC well MW-16D at 72 micrograms per liter ($\mu\text{g/L}$) in 2018, which was an increase of an order of magnitude compared to previous years and exceeds the RCRA concentration limit of 50 $\mu\text{g/L}$. Upgradient deep bedrock well MW-14D experienced a similar increase with a 2018 chromium concentration of 47 $\mu\text{g/L}$, indicating the chromium at POC well MW-16D is likely coming from upgradient sources.

This FYR created trend charts for two sets of paired upgradient/POC wells. These pairs were selected based on historical groundwater flow directions and analyzed in accordance with the previous FYR. The results are summarized in Appendix G and the charts are provided in Appendix H. At both POC locations, metals concentrations were similar to or less than the corresponding upgradient well.

1,4-Dioxane continues to be detected in one well on site, MW-06A. This well is screened in the waste material. Concentrations have generally remained stable (Table G-3) and 1,4-dioxane will continue to be monitored at site wells.

See Appendix G and Table G-4 for discussion of additional groundwater contaminants at the Site and how they compare to PADEP criteria. Generally, the observed concentrations are consistent with historical groundwater concentrations. Concentrations are below PADEP criteria except for aluminum, iron and sulfate.

Surface Water Monitoring

The surface water monitoring network consists of three surface water sample locations located adjacent to the Site (SW-03, SW-04 and SW-05) and two samples from the Shaler-JTC site (SW-01 and SW-02) upstream of the Site (Figure 3). Concentrations of metals, VOCs and SVOCs were all within historic concentrations. Except for pH and 2-methylphenol, there were no exceedances of the PADEP criteria in any surface water sampling location (Table G-5). The pH levels are intermittently below the PADEP standard of 6 standard units. In 2014, SW-01 and SW-02 (both upgradient of the Site) were below 6 at 5.47 and 3.35 standard units, respectively. In 2017, SW-01 and SW-03 were both slightly below 6 (5.92 and 5.80 standard units, respectively). In 2015, SVOC 2-methylphenol slightly exceeded the recommended screening level of 13 µg/L at SW-1 (19 µg/L) and SW-2 (18 µg/L); both of these locations are upstream of the Site in an area that is side-gradient with respect to groundwater flow. The screening level recommended by the National Oceanic and Atmospheric Administration (NOAA) was used as the standard because there is no applicable state PADEP criteria. There is no indication that the Site is negatively impacting surface water quality, and the upgradient water quality issues are attributed to the region's history of mining activities.

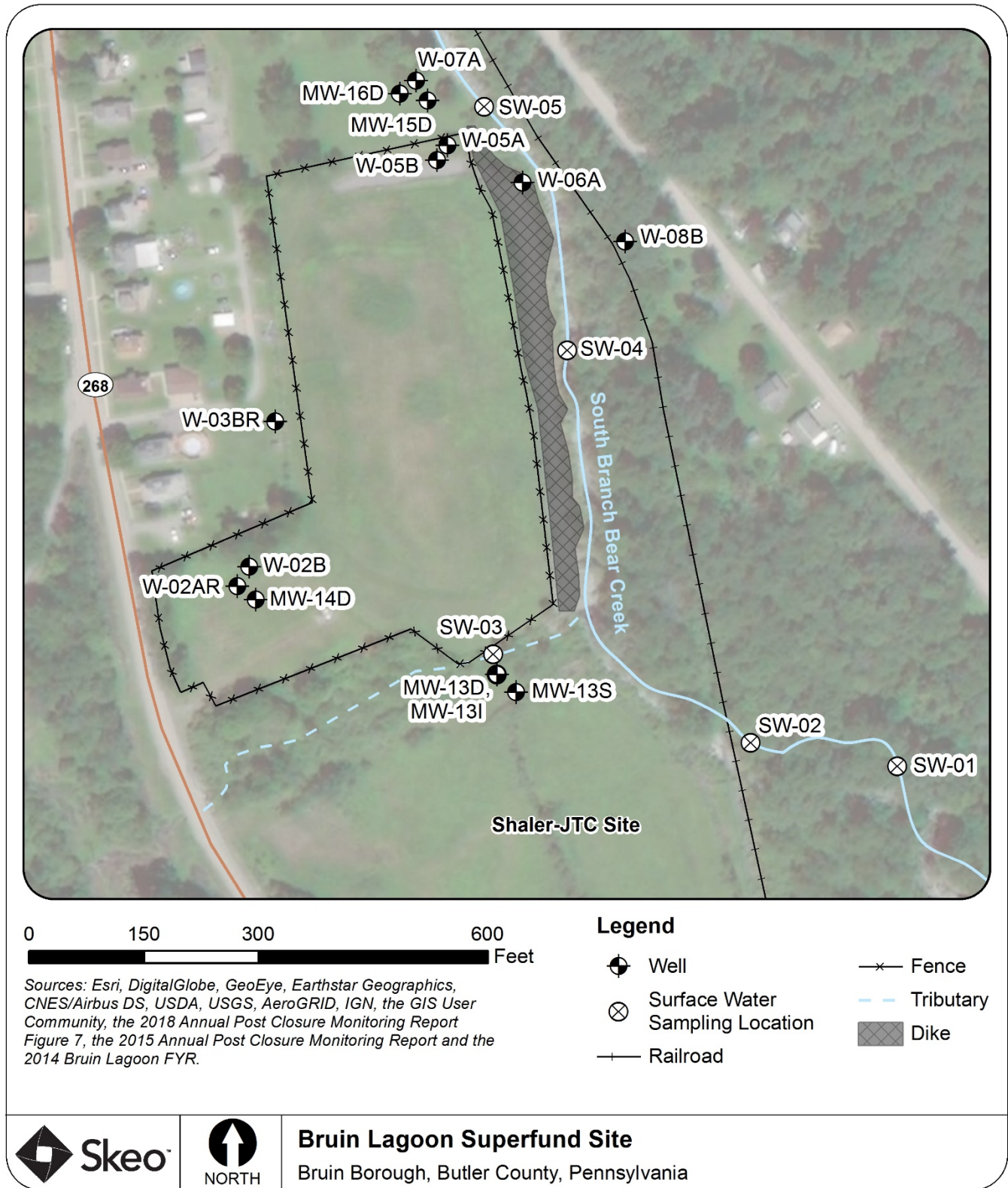
Gas Vent Monitoring

The 15 gas vents in the cap (V-1 through V-15) are screened annually for gaseous emissions. Five background locations are also screened (BG-1 through BG-5). Parameters include the lower explosive limit, oxygen, hydrogen sulfide, methane, sulfur dioxide, VOCs, carbon dioxide and hydrochloric acid. Low level VOCs and methane were detected in gas vents located on site during this FYR period (Table G-6 in Appendix G). Results indicate emissions are not a concern at the Site.

Site Inspection

The site inspection took place on October 24, 2018. Participants included EPA RPM Jim Feeney, Mariruth Hoffman and Chuck Tordella from PADEP, and Alison Cattani from EPA FYR support contractor Skeo. The purpose of the inspection was to assess the protectiveness of the remedy. Site inspection participants observed the cap, which was in excellent condition, well vegetated and had been recently mowed. The passive gas vents and the monitoring wells were also in good condition. During the site inspection, participants also observed the fence, which had no breaches or damage. There were no signs of trespassing or dumping, but PADEP representatives indicated that some dumping has occurred during this FYR period. The PADEP O&M contractor installed a No Dumping sign on the fence bordering the residences. The dike along Bear Creek was in good condition. The site inspection checklist and photographs are provided in Appendices E and F, respectively.

Figure 3: Detailed Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Yes, the remedy is functioning as intended by the decision documents. The remedial action included on-site stabilization and neutralization of sludge, a multi-layer cap over the stabilized sludge, and site maintenance and monitoring. The implemented remedy has achieved all RAOs, continues to control off-site contaminant migration, and prevents contact with and ingestion of waste materials. The cap is well-maintained and vegetated with no indication of any issues that would compromise its integrity.

Groundwater and surface water monitoring results indicate that the remedy is preventing contaminants from leaching out of the waste material and into groundwater and surface water. While some constituents such as aluminum and iron remain elevated in groundwater at the Site, these results are consistent with historic results as well as current upgradient water quality due to the region's historically poor water quality, a result of past mining activities in the region. The increase in chromium concentrations detected in 2018 in POC well MW-16D and upgradient well MW-14D can be attributed to upgradient sources. Periodic monitoring of gas vents over the cap indicates no appreciable concentrations of landfill gases present underneath the cap.

Institutional controls are in place and effective and have been recorded in the 2000 AO. Nearby residences as well as all homes in Bruin Borough have been connected to public water supply.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection still valid?

Yes, the exposure assumptions, cleanup levels and RAOs remain valid. The OU2 ROD identified the requirements for the RCRA-compliant closure of landfills as applicable or relevant and appropriate requirements (ARARs) for the Site. The OU2 ROD acknowledged that regional groundwater quality was poor and did not propose treating limited groundwater contamination under the lagoon. Performance of the implemented remedy was measured by RCRA landfill closure standards, which dictate that groundwater quality outside and downgradient of the capped area meet values given in 40 CFR §264.94, or upgradient background groundwater quality. These RCRA groundwater concentration limits for select compounds (including arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver) remain unchanged since the issuance of the ROD.

The RAOs in the OU2 ROD are still valid and have been met. Site contaminants are contained on site and do not pose an exposure risk to potential receptors. Regional groundwater quality remains poor and groundwater contamination under the Site remains localized within site boundaries and exhibits decreasing or steady trends. 1,4-Dioxane is now monitored at the Site but was not routinely monitored when the remedy was selected in 1986.

1,4-Dioxane has been detected consistently at on-site well W-06A, which is located on the east end of the cap near Bear Creek. At the time of the OU2 ROD issuance, this constituent was not part of routine analysis. During this FYR period, 1,4-dioxane has not been detected at any other wells besides W-06A, which indicates it is not present upgradient or downgradient of the Site. In addition, 1,4-dioxane was not detected in surface water samples collected from Bear Creek. 1,4-dioxane should continue to be monitored at the Site.

Based on the lack of VOC and SVOC detections upgradient and downgradient of the Site and the fact that residences are upgradient of the waste material, vapor intrusion is not a concern at the Site.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

Yes. The current SSC expires on October 30, 2020. The SSC period of performance should be extended to ensure that O&M continues to be performed at the Site.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations	
OUs without Issues/Recommendations Identified in the FYR:	
None	

Issues and Recommendations Identified in the FYR:				
OU: OU1 and OU2	Issue Category: Operations and Maintenance			
	Issue: The current SSC expires on October 30, 2020.			
	Recommendation: Extend the period of performance of the SSC to ensure that O&M is performed at the Site.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	EPA/State	EPA	10/30/2020

OTHER FINDINGS

Three other findings were identified during the FYR. These other findings do not affect current and/or future protectiveness.

- A local information repository is being reestablished near the Site, at the Foxburg Free Library in Foxburg, PA 16036.
- Monitoring for 1,4-dioxane should be continued at the Site.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statements	
<i>Operable Unit:</i> 1,2	<i>Protectiveness Determination:</i> Short-term Protective
<i>Protectiveness Statement:</i> The site remedy is protective of human health and the environment in the short term because the cap is in place and functioning as intended, the formation of toxic gases has been eliminated, groundwater and surface water monitoring indicate site-related contaminants are not migrating off site, and an institutional control is in place to protect the remedy. For the remedy to be protective in the long term, the period of performance of the SSC needs to be extended to ensure that O&M continues to be performed at the Site.	

Sitewide Protectiveness Statement

Protectiveness Determination:

Short-term Protective

Protectiveness Statement:

The site remedy is protective of human health and the environment in the short term because the cap is in place and functioning as intended, the formation of toxic gases has been eliminated, groundwater and surface water monitoring indicate site-related contaminants are not migrating off site, and an institutional control is in place to protect the remedy. For the remedy to be protective in the long term, the period of performance of the SSC needs to be extended to ensure that O&M continues to be performed at the Site.

VIII. GOVERNMENT PERFORMANCE AND RESULTS ACT MEASURES

As part of this FYR, the Government Performance and Results Act (GPRA) Measures have been reviewed. The GPRA Measures and their status are as follows:

Environmental Indicators

Human Health: Long-Term Human Health Protection Achieved (HEUC-HHPA)

Groundwater Migration: Contaminated Groundwater Migration Under Control (GMUC)

Sitewide Ready for Anticipated Use (SWRAU)

The Site has achieved SWRAU (10/5/2000)

IX. NEXT REVIEW

The next FYR Report for the Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

2017 Annual Post Closure Monitoring Report, Bruin Lagoon NPL Site, Borough of Bruin, Butler County, Pennsylvania. Prepared by AECOM E&C for Pennsylvania Department of Environmental Protection. August 2018.

2018 Annual Post Closure Monitoring Report, Bruin Lagoon NPL Site, Borough of Bruin, Butler County, Pennsylvania. Prepared by AECOM E&C for Pennsylvania Department of Environmental Protection. February 2019.

Addendum to the Five-Year Reviews, Dated July 2004 and August 2009, Bruin Lagoon Superfund Site. EPA Region 3. August 2010.

Administrative Order. The Commonwealth of Pennsylvania, Department of Environmental Protection. September 2000.

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Annual Post Closure Monitoring Report 2015, Bruin Lagoon, Bruin, Pennsylvania, Butler County. Prepared by Groundwater & Environmental Services, Inc for Commonwealth of Pennsylvania Department of Environmental Protection. March 2016.

Annual Post Closure Monitoring Report 2016. Bruin Lagoon, Bruin, Pennsylvania Butler County. Prepared by Groundwater & Environmental Services, Inc for Commonwealth of Pennsylvania Department of Environmental Protection. March 2017.

Bruin Lagoon, Cleanup Complete at Bruin Lagoon and Hranica Landfill Superfund Sites, Sites to be Removed from the National Priorities List. EPA Region 3. September 1997.

Bruin Lagoon Closeout Report. EPA Region 3. March 1992.

Bruin Lagoon – Implementation of Institutional Controls Comments. EPA Region 3. June 2005.

Deed Notice Comments, Bruin Lagoon Superfund Site. EPA Region 3. February 2004.

Explanation of Significant Differences for the Bruin Lagoon Superfund Site, Bruin Borough, Butler County, Pennsylvania. EPA Region 3. September 2015.

Fifth Five-Year Review Report for Bruin Lagoon Superfund Site, Bruin Borough, Butler County, Pennsylvania. EPA Region 3. September 2014.

Five Year Review for the Bruin Lagoon Site, Bruin Borough, Pennsylvania. Prepared by the U.S. Department of the Army Corps of Engineers, Omaha District, Omaha, Nebraska for EPA Region 3. December 1992.

Five Year Review Report, Bruin Lagoon Superfund Site Butler County, Bruin, Pennsylvania. EPA Region 3. July 1999.

Fourth Five-Year Review Report for Bruin Lagoon Superfund Site, Bruin Borough, Butler County, PA. EPA Region 3. September 2009.

Record of Decision: Bruin Lagoon, EPA ID: PAD980712855 OU1 Bruin Borough PA. EPA Region 3. June 1982.

Record of Decision, Remedial Alternative Selection, Bruin Lagoon Site, Bruin Borough, Pennsylvania. EPA Region 3. September 1986.

Third Five-Year Review Report for Bruin Lagoon Superfund Site, Bruin Borough, Butler County, PA. EPA Region 3. July 2004.

APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

Event	Date
Bruin Oil Company disposed of waste in 1-acre lagoon	1930-1970
Lagoon earthen dike was breached and estimated 3,000 gallons of acidic sludge spilled into South Branch of Bear Creek, killing about 4 million fish in Allegheny River	1968
EPA and PADEP conducted initial site inspection	September 1981
EPA conducted RI/FS for OU1	July 1981 - February 1982
EPA issued the OU1 ROD	July 1982
EPA proposed Site for listing on the NPL	December 30, 1982
EPA completed OU1 remedial design	March 1983
Remedial action on-site activities for OU1 began	August 1983
EPA listed Site on the NPL	September 8, 1983
EPA declared emergency at the Site because toxic gases containing high concentrations of carbon dioxide, sulfuric acid mist and hydrogen sulfide were released from the lagoon when a previously unidentified sludge layer was penetrated during remedial construction	May 1984
EPA discontinued remedial action and initiated new RI/FS	August 1984
EPA completed OU2 RI/FS Report	June 1986
EPA issued OU2 ROD	September 1986
USACE started remedial design for OU2	January 1988
EPA signed Superfund State Contract for OU2 remedial action	December 1988
USACE initiated OU2 on-site remedial action activities	March 1989
USACE completed OU2 on-site remedial action activities	July 1991
EPA transferred OU2 O&M responsibilities to PADEP	October 1991
EPA issued Site's Construction Close-Out Report	March 27, 1992
EPA completed Site's first FYR Report	April 7, 1993
EPA deleted the Site from the NPL	September 1997
EPA completed Site's second FYR Report	July 6, 1999
Commonwealth of Pennsylvania filed Administrative Order notice issued with the Recorder of Deeds for Butler County	September 18, 2000
EPA completed Site's third FYR Report	July 29, 2004
EPA completed Site's fourth FYR Report	September 17, 2009
EPA issued Addendum to FYR Reports	August 30, 2010
EPA completed Site's fifth FYR Report	September 17, 2014
EPA issued ESD to include a requirement for institutional controls	September 28, 2015

APPENDIX C – PRESS NOTICE

Published in the Butler Eagle June 3, 2019

EPA PUBLIC NOTICE

EPA REVIEWS CLEANUP BRUIN LAGOON SUPERFUND SITE

The U.S. Environmental Protection Agency (EPA) is reviewing the cleanup that was conducted at the Bruin Lagoon Superfund Site located in Bruin Borough, Pennsylvania. EPA inspects sites regularly to ensure that cleanups conducted protect public health and the environment. EPA's 2014 review of the site concluded that the cleanup was working as designed and is protective. Findings from the current review will be available in September 2019.

To access detailed site information, including the review report once finalized, visit:

<https://www.epa.gov/superfund/bruinlagoon>

For questions or to provide site-related information for the review, contact:

Gina Soscia, EPA Community Involvement Coordinator
215-814-5538 or soscia.gina@epa.gov

BE 44157

APPENDIX D – INTERVIEW FORMS

For this Five-Year Review, forms were not utilized. The interviews are summarized below:

On June 14, 2019, EPA’s Community Involvement Coordinator for the Site conducted a phone interview with the Director of Emergency Services for Butler County. The Director was familiar with the site and expressed satisfaction with the effectiveness of the remedy. He stated there has not been any issues at the site that have required emergency response or visits. He feels the community has knowledge of the site but is not concerned about its status and it has had little impact on the community. He did not have any suggestions or recommendations for EPA moving forward.

On October 24, 2018, the RPM discussed the ongoing work and the Five-Year Review at the Site with representatives of DEP. They reported that current interest in the Site is minimal with only few inquiries, and no negative comments received from the general public in the last five years.

APPENDIX E – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST																																																																			
I. SITE INFORMATION																																																																			
Site Name: Bruin Lagoon	Date of Inspection: <u>10/24/2018</u>																																																																		
Location and Region: Bruin Borough, Pennsylvania; Region 3	EPA ID: PAD980712855																																																																		
Agency, Office or Company Leading the Five-Year Review: <u>EPA</u>	Weather/Temperature: <u>Partly Cloudy, 40s</u>																																																																		
Remedy Includes: (Check all that apply) <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <input checked="" type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Access controls <input checked="" type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other: <u>In-situ stabilization</u> </td> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </td> </tr> </table>		<input checked="" type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Access controls <input checked="" type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other: <u>In-situ stabilization</u>	<input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls																																																																
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Attachments: <input checked="" type="checkbox"/> Inspection team roster attached <input checked="" type="checkbox"/> Site map attached																																																																			
II. INTERVIEWS (check all that apply)																																																																			
1. O&M Site Manager <table style="width: 100%; border: none; margin-top: 5px;"> <tr> <td style="width: 30%; text-align: center;">_____</td> <td style="width: 30%; text-align: center;">_____</td> <td style="width: 40%; text-align: center;">_____</td> </tr> <tr> <td style="text-align: center;">Name</td> <td style="text-align: center;">Title</td> <td style="text-align: center;">Date</td> </tr> <tr> <td colspan="3">Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone : _____</td> </tr> <tr> <td colspan="3">Problems, suggestions <input type="checkbox"/> Report attached: _____</td> </tr> </table>		_____	_____	_____	Name	Title	Date	Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone : _____			Problems, suggestions <input type="checkbox"/> Report attached: _____																																																								
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Problems, suggestions <input type="checkbox"/> Report attached: _____																																																																			
2. O&M Staff <table style="width: 100%; border: none; margin-top: 5px;"> <tr> <td style="width: 30%; text-align: center;">_____</td> <td style="width: 30%; text-align: center;">_____</td> <td style="width: 40%; text-align: center;">_____</td> </tr> <tr> <td style="text-align: center;">Name</td> <td style="text-align: center;">Title</td> <td style="text-align: center;">Date</td> </tr> <tr> <td colspan="3">Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone : _____</td> </tr> <tr> <td colspan="3">Problems/suggestions <input type="checkbox"/> Report attached: _____</td> </tr> </table>		_____	_____	_____	Name	Title	Date	Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone : _____			Problems/suggestions <input type="checkbox"/> Report attached: _____																																																								
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Problems/suggestions <input type="checkbox"/> Report attached: _____																																																																			
3. Local Regulatory Authorities and Response Agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply. <table style="width: 100%; border: none;"> <tr> <td style="width: 15%;">Agency _____</td> <td style="width: 35%;">Contact _____</td> <td style="width: 15%;">Name _____</td> <td style="width: 15%;">Title _____</td> <td style="width: 15%;">Date _____</td> <td style="width: 20%;">Phone No. _____</td> </tr> <tr> <td colspan="6">Problems/suggestions <input type="checkbox"/> Report attached: _____</td> </tr> <tr><td colspan="6"> </td></tr> <tr> <td>Agency _____</td> <td>Contact _____</td> <td>Name _____</td> <td>Title _____</td> <td>Date _____</td> <td>Phone No. _____</td> </tr> <tr> <td colspan="6">Problems/suggestions <input type="checkbox"/> Report attached: _____</td> </tr> <tr><td colspan="6"> </td></tr> <tr> <td>Agency _____</td> <td>Contact _____</td> <td>Name _____</td> <td>Title _____</td> <td>Date _____</td> <td>Phone No. _____</td> </tr> <tr> <td colspan="6">Problems/suggestions <input type="checkbox"/> Report attached: _____</td> </tr> <tr><td colspan="6"> </td></tr> <tr> <td>Agency _____</td> <td>Contact _____</td> <td>Name _____</td> <td>Title _____</td> <td>Date _____</td> <td>Phone No. _____</td> </tr> <tr> <td colspan="6">Problems/suggestions <input type="checkbox"/> Report attached: _____</td> </tr> </table>		Agency _____	Contact _____	Name _____	Title _____	Date _____	Phone No. _____	Problems/suggestions <input type="checkbox"/> Report attached: _____												Agency _____	Contact _____	Name _____	Title _____	Date _____	Phone No. _____	Problems/suggestions <input type="checkbox"/> Report attached: _____												Agency _____	Contact _____	Name _____	Title _____	Date _____	Phone No. _____	Problems/suggestions <input type="checkbox"/> Report attached: _____												Agency _____	Contact _____	Name _____	Title _____	Date _____	Phone No. _____	Problems/suggestions <input type="checkbox"/> Report attached: _____					
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Agency _____				
Contact _____	_____	_____	_____	_____
Name	Title	Date	Phone No.	
Problems/suggestions <input type="checkbox"/> Report attached: _____				
4. Other Interviews (optional) <input type="checkbox"/> Report attached: _____				
III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)				
1. O&M Documents				
<input type="checkbox"/> O&M manual	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
<input type="checkbox"/> As-built drawings	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
<input type="checkbox"/> Maintenance logs	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
Remarks: _____				
2. Site-Specific Health and Safety Plan				
	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
<input type="checkbox"/> Contingency plan/emergency response plan	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
Remarks: _____				
3. O&M and OSHA Training Records				
	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
Remarks: _____				
4. Permits and Service Agreements				
<input type="checkbox"/> Air discharge permit	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
<input type="checkbox"/> Effluent discharge	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
<input type="checkbox"/> Waste disposal, POTW	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
<input type="checkbox"/> Other permits: _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
Remarks: _____				
5. Gas Generation Records				
	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
Remarks: _____				
6. Settlement Monument Records				
	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
Remarks: _____				
7. Groundwater Monitoring Records				
	<input checked="" type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A	
Remarks: _____				
8. Leachate Extraction Records				
	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
Remarks: _____				
9. Discharge Compliance Records				
<input type="checkbox"/> Air	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
<input type="checkbox"/> Water (effluent)	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
Remarks: _____				

10.	Daily Access/Security Logs	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
Remarks: _____				
IV. O&M COSTS				
1.	O&M Organization	<input type="checkbox"/> State in-house	<input checked="" type="checkbox"/> Contractor for state	
		<input type="checkbox"/> PRP in-house	<input type="checkbox"/> Contractor for PRP	
		<input type="checkbox"/> Federal facility in-house	<input type="checkbox"/> Contractor for Federal facility	
		<input type="checkbox"/> _____		
2.	O&M Cost Records	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	
		<input checked="" type="checkbox"/> Funding mechanism/agreement in place	<input type="checkbox"/> Unavailable	
	Original O&M cost estimate: _____ <input type="checkbox"/> Breakdown attached			
	Total annual cost by year for review period if available			
	From: _____	To: _____	_____	<input type="checkbox"/> Breakdown attached
	Date	Date	Total cost	
	From: _____	To: _____	_____	<input type="checkbox"/> Breakdown attached
	Date	Date	Total cost	
	From: _____	To: _____	_____	<input type="checkbox"/> Breakdown attached
	Date	Date	Total cost	
	From: _____	To: _____	_____	<input type="checkbox"/> Breakdown attached
	Date	Date	Total cost	
	From: _____	To: _____	_____	<input type="checkbox"/> Breakdown attached
	Date	Date	Total cost	
3.	Unanticipated or Unusually High O&M Costs during Review Period			
	Describe costs and reasons: _____			
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A				
A. Fencing				
1.	Fencing Damaged	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Gates secured	<input type="checkbox"/> N/A
	Remarks: <u>No fence damage observed during site inspection</u>			
B. Other Access Restrictions				
1.	Signs and Other Security Measures	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A	
	Remarks: <u>No trespassing signs located at each gate</u>			
C. Institutional Controls (ICs)				

1. Implementation and Enforcement			
Site conditions imply ICs not properly implemented	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> N/A
Site conditions imply ICs not being fully enforced	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> N/A
Type of monitoring (e.g., self-reporting, drive by): <u>During monitoring event</u>			
Frequency: <u>Annual</u>			
Responsible party/agency: <u>State contractor</u>			
Contact	_____	_____	_____
Name	Title	Date	Phone no.
Reporting is up to date	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Reports are verified by the lead agency	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Specific requirements in deed or decision documents have been met	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Violations have been reported	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> N/A
Other problems or suggestions: <input type="checkbox"/> Report attached			
2. Adequacy <input checked="" type="checkbox"/> ICs are adequate <input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A			
Remarks: _____			
D. General			
1. Vandalism/Trespassing <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism evident			
Remarks: _____			
2. Land Use Changes On Site <input checked="" type="checkbox"/> N/A			
Remarks: _____			
3. Land Use Changes Off Site <input checked="" type="checkbox"/> N/A			
Remarks: _____			
VI. GENERAL SITE CONDITIONS			
A. Roads <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
1. Roads Damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A			
Remarks: _____			
B. Other Site Conditions			
Remarks: _____			
VII. LANDFILL COVERS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
A. Landfill Surface			
1. Settlement (low spots) <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Settlement not evident			
Area extent: _____		Depth: _____	
Remarks: _____			
2. Cracks <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Cracking not evident			
Lengths: _____		Depths: _____	
Widths: _____			
Remarks: _____			

3.	Erosion	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Erosion not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
4.	Holes	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Holes not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
5.	Vegetative Cover	<input checked="" type="checkbox"/> Grass	<input checked="" type="checkbox"/> Cover properly established
	<input checked="" type="checkbox"/> No signs of stress	<input type="checkbox"/> Trees/shrubs (indicate size and locations on a diagram)	
	Remarks: _____		
6.	Alternative Cover (e.g., armored rock, concrete)		<input checked="" type="checkbox"/> N/A
	Remarks: _____		
7.	Bulges	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Bulges not evident
	Area extent: _____		Height: _____
	Remarks: _____		
8.	Wet Areas/Water Damage	<input checked="" type="checkbox"/> Wet areas/water damage not evident	
	<input type="checkbox"/> Wet areas	<input type="checkbox"/> Location shown on site map	Area extent: _____
	<input type="checkbox"/> Ponding	<input type="checkbox"/> Location shown on site map	Area extent: _____
	<input type="checkbox"/> Seeps	<input type="checkbox"/> Location shown on site map	Area extent: _____
	<input type="checkbox"/> Soft subgrade	<input type="checkbox"/> Location shown on site map	Area extent: _____
	Remarks: _____		
9.	Slope Instability	<input type="checkbox"/> Slides	<input type="checkbox"/> Location shown on site map
	<input checked="" type="checkbox"/> No evidence of slope instability		
	Area extent: _____		
	Remarks: _____		
B. Benches <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)			
1.	Flows Bypass Bench	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A or okay
	Remarks: _____		
2.	Bench Breached	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A or okay
	Remarks: _____		
3.	Bench Overtopped	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A or okay
	Remarks: _____		
C. Letdown Channels <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
(Channel lined with erosion control mats, riprap, grout bags or gabions that descend the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)			

1.	Settlement (Low spots)	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> No evidence of settlement
	Area extent: _____		Depth: _____
	Remarks: _____		
2.	Material Degradation	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> No evidence of degradation
	Material type: _____		Area extent: _____
	Remarks: _____		
3.	Erosion	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> No evidence of erosion
	Area extent: _____		Depth: _____
	Remarks: _____		
4.	Undercutting	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> No evidence of undercutting
	Area extent: _____		Depth: _____
	Remarks: _____		
5.	Obstructions	Type: _____	<input checked="" type="checkbox"/> No obstructions
	<input type="checkbox"/> Location shown on site map	Area extent: _____	
	Size: _____		
	Remarks: _____		
6.	Excessive Vegetative Growth	Type: _____	
	<input checked="" type="checkbox"/> No evidence of excessive growth		
	<input type="checkbox"/> Vegetation in channels does not obstruct flow		
	<input type="checkbox"/> Location shown on site map	Area extent: _____	
	Remarks: _____		
D. Cover Penetrations <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
1.	Gas Vents	<input type="checkbox"/> Active	<input checked="" type="checkbox"/> Passive
	<input type="checkbox"/> Properly secured/locked	<input checked="" type="checkbox"/> Functioning	<input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs maintenance	<input type="checkbox"/> N/A
	Remarks: _____		
2.	Gas Monitoring Probes		
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs maintenance	<input checked="" type="checkbox"/> N/A
	Remarks: _____		
3.	Monitoring Wells (within surface area of landfill)		
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs maintenance	<input checked="" type="checkbox"/> N/A
	Remarks: _____		
4.	Extraction Wells Leachate		
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition

<input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs maintenance <input checked="" type="checkbox"/> N/A	
Remarks: _____	
5. Settlement Monuments	<input type="checkbox"/> Located <input type="checkbox"/> Routinely surveyed <input checked="" type="checkbox"/> N/A
Remarks: _____	
E. Gas Collection and Treatment	
<input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
1. Gas Treatment Facilities	
<input type="checkbox"/> Flaring <input type="checkbox"/> Thermal destruction <input type="checkbox"/> Collection for reuse	
<input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance	
Remarks: _____	
2. Gas Collection Wells, Manifolds and Piping	
<input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance	
Remarks: _____	
3. Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings)	
<input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance <input type="checkbox"/> N/A	
Remarks: _____	
F. Cover Drainage Layer	
<input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1. Outlet Pipes Inspected	<input checked="" type="checkbox"/> Functioning <input type="checkbox"/> N/A
Remarks: _____	
2. Outlet Rock Inspected	<input checked="" type="checkbox"/> Functioning <input type="checkbox"/> N/A
Remarks: _____	
G. Detention/Sedimentation Ponds	
<input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
1. Siltation	Area extent: _____ Depth: _____ <input type="checkbox"/> N/A
<input type="checkbox"/> Siltation not evident	
Remarks: _____	
2. Erosion	Area extent: _____ Depth: _____
<input type="checkbox"/> Erosion not evident	
Remarks: _____	
3. Outlet Works	<input type="checkbox"/> Functioning <input type="checkbox"/> N/A
Remarks: _____	
4. Dam	<input type="checkbox"/> Functioning <input type="checkbox"/> N/A
Remarks: _____	
H. Retaining Walls	
<input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
1. Deformations	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> Deformation not evident
Horizontal displacement: _____ Vertical displacement: _____	
Rotational displacement: _____	
Remarks: _____	

2.	Degradation	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Degradation not evident
Remarks: _____			
I. Perimeter Ditches/Off-Site Discharge		<input checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	Siltation	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Siltation not evident
Area extent: _____		Depth: _____	
Remarks: _____			
2.	Vegetative Growth	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Vegetation does not impede flow			
Area extent: _____		Type: _____	
Remarks: _____			
3.	Erosion	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Erosion not evident
Area extent: _____		Depth: _____	
Remarks: _____			
4.	Discharge Structure	<input type="checkbox"/> Functioning	<input checked="" type="checkbox"/> N/A
Remarks: _____			
VIII. VERTICAL BARRIER WALLS		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	Settlement	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Settlement not evident
Area extent: _____		Depth: _____	
Remarks: _____			
2.	Performance Monitoring	Type of monitoring: _____	
<input type="checkbox"/> Performance not monitored			
Frequency: _____		<input type="checkbox"/> Evidence of breaching	
Head differential: _____			
Remarks: _____			
IX. GROUNDWATER/SURFACE WATER REMEDIES		<input checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
A. Groundwater Extraction Wells, Pumps and Pipelines		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	Pumps, Wellhead Plumbing and Electrical		
<input type="checkbox"/> Good condition <input type="checkbox"/> All required wells properly operating <input type="checkbox"/> Needs maintenance <input type="checkbox"/> N/A			
Remarks: _____			
2.	Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances		
<input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance			
Remarks: _____			
3.	Spare Parts and Equipment		
<input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided			
Remarks: _____			
B. Surface Water Collection Structures, Pumps and Pipelines		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A

<p>1. Collection Structures, Pumps and Electrical</p> <p><input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance</p> <p>Remarks: _____</p>
<p>2. Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances</p> <p><input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance</p> <p>Remarks: _____</p>
<p>3. Spare Parts and Equipment</p> <p><input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided</p> <p>Remarks: _____</p>
<p>C. Treatment System <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A</p>
<p>1. Treatment Train (check components that apply)</p> <p><input type="checkbox"/> Metals removal <input type="checkbox"/> Oil/water separation <input type="checkbox"/> Bioremediation</p> <p><input type="checkbox"/> Air stripping <input type="checkbox"/> Carbon adsorbers</p> <p><input type="checkbox"/> Filters: _____</p> <p><input checked="" type="checkbox"/> Additive (e.g., chelation agent, flocculent): <u>Lime</u></p> <p><input type="checkbox"/> Others: _____</p> <p><input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance</p> <p><input type="checkbox"/> Sampling ports properly marked and functional</p> <p><input type="checkbox"/> Sampling/maintenance log displayed and up to date</p> <p><input type="checkbox"/> Equipment properly identified</p> <p><input type="checkbox"/> Quantity of groundwater treated annually: _____</p> <p><input type="checkbox"/> Quantity of surface water treated annually: _____</p> <p>Remarks: <u>Lime was added to surface of bedrock to neutralize acidity.</u></p>
<p>2. Electrical Enclosures and Panels (properly rated and functional)</p> <p><input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance</p> <p>Remarks: _____</p>
<p>3. Tanks, Vaults, Storage Vessels</p> <p><input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs maintenance</p> <p>Remarks: _____</p>
<p>4. Discharge Structure and Appurtenances</p> <p><input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance</p> <p>Remarks: _____</p>
<p>5. Treatment Building(s)</p> <p><input type="checkbox"/> N/A <input type="checkbox"/> Good condition (esp. roof and doorways) <input type="checkbox"/> Needs repair</p> <p><input type="checkbox"/> Chemicals and equipment properly stored</p> <p>Remarks: _____</p>
<p>6. Monitoring Wells (pump and treatment remedy)</p>

<input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs maintenance <input type="checkbox"/> N/A Remarks: _____
D. Monitoring Data
1. Monitoring Data <input checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality
2. Monitoring Data Suggests: <input checked="" type="checkbox"/> Groundwater plume is effectively contained <input type="checkbox"/> Contaminant concentrations are declining
E. Monitored Natural Attenuation
1. Monitoring Wells (natural attenuation remedy) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs maintenance <input type="checkbox"/> N/A Remarks: <u>The monitoring wells used for this site are inspected for integrity and usability by PADEP's contractor during sampling events. In 2018 no significant deficiencies were identified.</u>
X. OTHER REMEDIES
If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions). <u>The remedy is intended to contain site contaminants and reduce or eliminate exposure to potential receptors. The remedy, which includes a multi-layer cap and monitoring groundwater, is functioning as intended.</u>
B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <u>O&M is conducted annually in accordance with the O&M Plan. O&M activities are adequate for current and long-term protectiveness.</u>
C. Early Indicators of Potential Remedy Problems
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. <u>The SSC governing PADEP's conduct of O&M responsibilities expires October 30, 2020. Provisions must be made to revise and continue the O&M program.</u>
D. Opportunities for Optimization
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>None.</u>

Inspection Team Roster

Five-Year Review Site Inspection conducted October 24, 2018

In Attendance:

Jim Feeney, Remedial Project Manager, EPA
Mariruth Hoffman, Environmental Chemist, DEP
Charles Tordella, Environmental Group Manager, DEP
Alison Cattani, Associate, Skeo

APPENDIX F – SITE INSPECTION PHOTOS



Entrance gate to the Site



Upgradient monitoring wells and residence



Gas vent, looking toward site entrance



Gas vents and fence along the South Branch of Bear Creek



Dike along Eastern site boundary

APPENDIX G –DETAILED DATA REVIEW

Analytical data are presented as follows in this section:

- Groundwater analytical results are compared to RCRA concentration limits and comparison of upgradient and POC wells.
- Groundwater analytical results are compared to current Pennsylvania Act 2 Medium Specific Concentrations (MSCs).
- Groundwater analytical results are compared to baseline analytical results obtained in 1991 and 1992 to evaluate the effectiveness of the remedial action.
- Surface water analytical results are compared to PADEP Water Quality Criteria as contained in 25 Pennsylvania Code Chapter 93 to evaluate potential impacts to aquatic life.
- Gas vent direct reading measurement results are listed.

Groundwater Monitoring

PADEP monitors groundwater quality at 14 site wells (Figure 3). Wells are screened in the shallow, intermediate and deep bedrock and are grouped according to location (upgradient, downgradient, POC) (Table G-1).

Table G-1: Groundwater Monitoring Network

Well ID	Bedrock Zone	Monitoring Group
W-02AR	Shallow	Upgradient
MW-13S	Shallow	
W-02B	Intermediate	
W-03BR	Intermediate	
MW-13I	Intermediate	
MW-13D	Deep	
MW-14D	Deep	
W-05A	Shallow	Downgradient
W-05B	Intermediate	
W-06A	Shallow	
W-07A	Shallow	POC
W-08B	Intermediate	
MW-15D	Deep	
MW-16D	Deep	
<i>Notes:</i> W-05A and W-06A monitor the stabilized mass within the lagoon.		

Comparison to RCRA Concentration Limits

The 1986 OU2 ROD recognized that regional groundwater quality is poor and dictated that groundwater quality outside and downgradient of the capped area at POCs had to meet concentration limits specified in 40 CFR § 264.94, or should be equivalent to the upgradient background groundwater quality, whichever is less stringent. To assess compliance with these standards, Table G-2 compares POC groundwater concentrations against RCRA limits and against upgradient concentrations. Except for chromium, all POC wells are less than the RCRA limits. The POC maximum chromium result (72 µg/L) is similar to the maximum upgradient chromium result (47 µg/L).

Table G-2: Groundwater Results Summary (2014-2018)

Constituent	RCRA Concentration Limits	Maximum Concentrations (2014-2018)					
		Upgradient (Shallow)	POC (Shallow)	Upgradient (Intermediate)	POC (Intermediate)	Upgradient (Deep)	POC (Deep)
Arsenic	50	20 B	11 B	31 JB	4.2 J	16 B	19 B
Barium	1,000	72 J	43 J	110 J	33 J	290	62 J

Constituent	RCRA Concentration Limits	Maximum Concentrations (2014-2018)					
		Upgradient (Shallow)	POC (Shallow)	Upgradient (Intermediate)	POC (Intermediate)	Upgradient (Deep)	POC (Deep)
Cadmium	10	1.2 J	5 J	0.31 J	2.4 J	0.33 J	7.6
Chromium	50	43	8.9	30	3.7 J	47	72
Lead	50	19	5.3 J	48	9.7 J	17	15
Mercury	2	0.04 J	<0.2	0.091 J	<0.2	<0.2	<0.2
Selenium	10	5.4 J	<10	13 J	<10	2.7 J	4.7 J
Silver	50	1.1 J	<5	0.94 J	<5	<5	<5

Notes:
Source: 2018 Annual Post Closure Monitoring Report
All results are for total metals
Non-detects are excluded unless all years are non-detect
All values reported in µg/L
Bold = exceeds the RCRA limit
J = estimated concentration
B = compound was found in the blank and sample

To further assess whether groundwater quality upgradient and at POC wells is similar, trend charts were created for paired wells. Based on historical groundwater flow directions, paired upgradient and POC wells were selected for the shallow and intermediate zones in the 2014 FYR and trend analyses were conducted. The well pairs were POC well W-07A paired with upgradient well W-02AR and POC well W-08B paired with upgradient well W-02B. For this FYR, these well pairs were analyzed to determine if concentrations at the POC wells remain equal to or lower than corresponding background wells. Only total metals for which detections were observed are included in the analyses. The trend charts for the well pairs are included in Appendix H. At both POC locations, metals concentrations were similar to or less than the corresponding upgradient well.

PADEP Annual Monitoring Results

Monitoring results are reported to EPA annually and are compared to the MSCs for Used Residential and Used Non-Residential Aquifers. EPA requested that PADEP use the Non-Used Residential MSCs to evaluate groundwater data because groundwater is not used in the site area due to regionally poor water quality; however, because of a contracting error in 2017 and 2018 the Used Aquifer MSCs were used for comparison. That error was corrected for 2019. Several laboratory reporting limits were noted above the MSCs for VOCs, SVOCs and metals, which is a recurring issue due to matrix interference. A summary of the detected groundwater monitoring results by analyte type are provided below.

Comparison to Standards – VOCs and SVOCs

Historically, VOCs and SVOCs were not a concern in groundwater at the Site. Results observed during this FYR period confirm historical observations. There were no VOC exceedances of the MSCs during this FYR period. Except for 1,4-dioxane results at W-06A, there were no SVOC exceedances of the Non-Used Residential MSCs during this FYR period. The 1,4-dioxane exceedances at W-06A are shown in Table G-3. The 1,4-dioxane concentrations have remained consistent during this FYR period and continue to only occur in the waste area.

Table G-3: 1,4-Dioxane in Groundwater, 2014 to 2018

Well ID	1,4-Dioxane				
	2014	2015	2016	2017	2018
W-06A	92	120	150	59	84
W-06A (Duplicate)	120	190	180	97	NA

Notes:
All values reported in µg/L
NA = duplicate sample not collected
Bold = exceeds Pennsylvania Act 2 Used Residential Aquifer MSCs
Bold = exceeds Pennsylvania Act 2 Non-Used Residential Aquifer MSCs
Pennsylvania Act 2 MSCs: Used Residential Aquifer MSC = 6.4 µg/L; Used Non-Residential Aquifer MSC = 32 µg/L; Non-Used Residential Aquifer MSC = 64 µg/L

Comparison to Standards – Metals and General Chemistry

Consistent with historic results at the Site, all wells on site have low-level concentrations of total and dissolved metals. The most elevated metals concentrations were observed for aluminum and iron. The MSC standards for aluminum and iron are secondary maximum contaminant levels (SMCLs). The aluminum and iron exceedances occur both upgradient and downgradient of the Site. The concentration ranges for total aluminum, total iron and sulfate are shown in Table G-4.

Table G-4: Aluminum, Iron and Sulfate in Groundwater (2014-2018)

Well ID	Aluminum (Total) (µg/L)	Iron (Total) (µg/L)	Sulfate (mg/L)
SMCL	200	300	250
W-02AR ^a	450 – 3,300	4,300 – 150,000	320 B – 597
W-02B ^a	46 J – 2,300	76,000 – 93,000	305 – 520
W-03BR	47 J – 200	55 J – 730	25 – 34.5
W-05A	910^b – 1,600	8,500^b – 14,000	110 – 140
W-05B	180 J – 4,900	2,100 – 130,000	324 – 470
W-06A	14,000^b – 51,000	120,000 – 190,000	750 – 1,100
W-07A	240 – 420	23,000 – 29,000	58.5 F1 – 74
W-08B	140 J – 170 J	89,000 – 100,000	190 – 303
MW-13S ^a	340 – 5,000	54,000 – 92,000	443 – 500
MW-13D ^a	56 J	130,000 – 190,000	613 – 860
MW-13I ^a	96 J – 130 J	9,100 – 30,000	636 – 1,500 B
MW-14D ^a	44 J – 53 J	500 – 31,000	83.6 – 170
MW-15D	42 J – 170 J	57,000 – 190,000	333 – 680
MW-16D	60 J – 1,600	600 – 65,000	237 – 980
<p>Notes: µg/L = micrograms per liter mg/L = milligrams per liter Bold = exceeds applicable standard J = estimated concentration B = compound was found in the blank and sample ND = not detected F1 = matrix spike and/or matrix spike duplicate recovery is outside acceptance limits a. Upgradient well location b. Higher concentration between parent sample and duplicate sample presented</p>			

Comparison to 1991 Baseline Sampling

Annual monitoring reports compare the total metals analytical results for select wells to the corresponding historic results from 1991 and flag any results that exceed the observed historic results. Generally, current concentrations are less than or similar to historical concentrations. Detected results downgradient of the Site from this FYR period were less than or within the same order of magnitude as historical results.

Surface Water Monitoring

Surface water sampling during this FYR period found that all VOCs and SVOCs were below PADEP surface water quality criteria at all locations except for 2-methylphenol in 2015. 2-Methylphenol slightly exceeded the applicable standard at SW-1 and SW-2, both upgradient of the Site. Surface water samples all exhibited low levels of total and dissolved metals. However, historically and during the current FYR period, aluminum, iron and manganese were often detected at elevated concentrations, but were less than the current PADEP criteria (Table G-5). Mercury and thallium were detected in 2016 at concentrations above their respective human health criteria (HHC) of 0.05 µg/L and 0.24 µg/L. Total mercury was detected at SW-04 at an estimated concentration of 0.15

µg/L. Total and dissolved thallium was detected at SW-03 at estimated concentrations of 3.3 µg/L and 3.1 µg/L, respectively.

Table G-5: Surface Water Concentration Range for Select Metals (2014 to 2018)

Analyte	PADEP Criteria			SW-01	SW-02	SW-03	SW-04	SW-05
	CCC	CMC	HHC					
<i>Total</i>								
Aluminum	NA	750	NA	44 J – 170 J	57 J – 120 J	41 J – 130 J	78 J – 160 J	79 J – 180 J
Iron	1,500	NA	NA	290 – 560 B	290 – 450 B	190 – 430 B	410 ^a – 610 ^a	380 – 650
Manganese	1,000	NA	NA	72 – 200	83 – 170 B	61 – 110	100 – 210	110 – 210
<i>Notes:</i> All results reported in µg/L Only detections reported in this table J = estimated concentration B = compound was found in the blank and sample CCC = Criterion Continuous Concentration CMC = Criterion Maximum Concentration HHC = Human Health Criteria a. Higher concentration between parent sample and duplicate sample presented								

Surface water pH levels are intermittently below the PADEP standard of 6. In 2014, SW-01 and SW-02 (both upgradient of the Site) were below 6 at 5.47 and 3.35 standard units, respectively. In 2017, SW-01 and SW-03 were both slightly below 6 (5.92 and 5.80 standard units, respectively).

Gas Vent Screening

The 15 gas vents in the cap (V-1 through V-15) are screened annually for gaseous emissions. Five background locations are also screened (BG-1 through BG-5). Parameters include the lower explosive limit, oxygen, hydrogen sulfide, methane, sulfur dioxide, VOCs, carbon dioxide and hydrochloric acid. All oxygen results were within normal range (about 18-21 percent) at all monitoring locations during this FYR period. The lower explosive limit, hydrogen sulfide, sulfur dioxide and hydrochloric acid were not detected above zero during this FYR period at any monitoring location. Carbon dioxide was measured at concentrations ranging from 300 to 400 parts per millions (ppm) in 2014 at background and site gas vent locations but were not detected since then. Low-level VOCs were detected in 2014, 2016, 2017 and 2018 at some site gas vent locations. Methane was also detected in 2014 and 2018 but levels were not of concern. Detected results from this FYR period are shown in Table G-6.

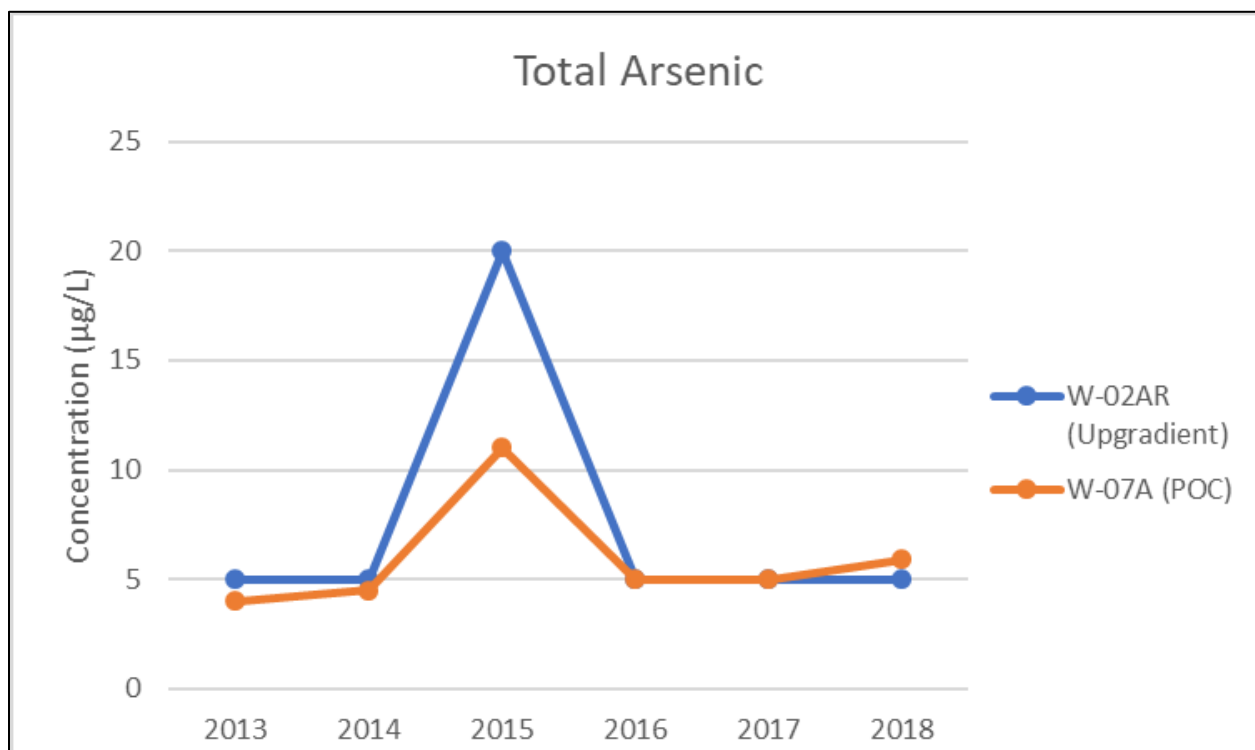
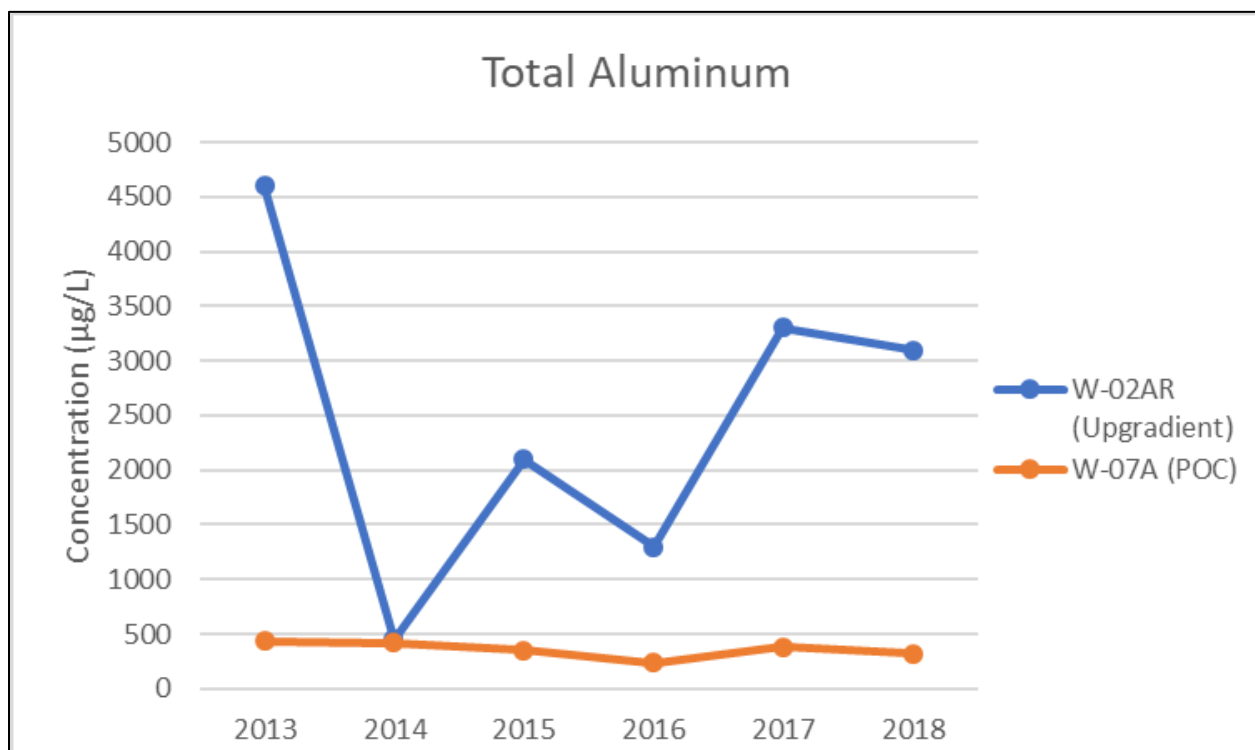
Table G-6: Maximum Levels Detected in Gaseous Emissions (2014-2018)

Monitoring Locations	VOC (ppm)	CH ₄ (% LEL)	CH ₄ (%)
V-1	0.2	15	0.75
V-2	0.3	15	0.75
V-3	0.1	15	0.75
V-4	0.4	15	0.75
V-5	0.2	15	0.75
V-6	1.5	20	1.0
V-7	0.4	35	1.75
V-8	0.4	20	1.0
V-9	0.1	15	0.75
V-10	0.2	20	1.0
V-11	ND	10	0.5
V-12	0.1	ND	0.2
V-13	ND	ND	ND
V-14	ND	ND	ND
V-15	0.4	ND	ND
BG-1	ND	ND	ND

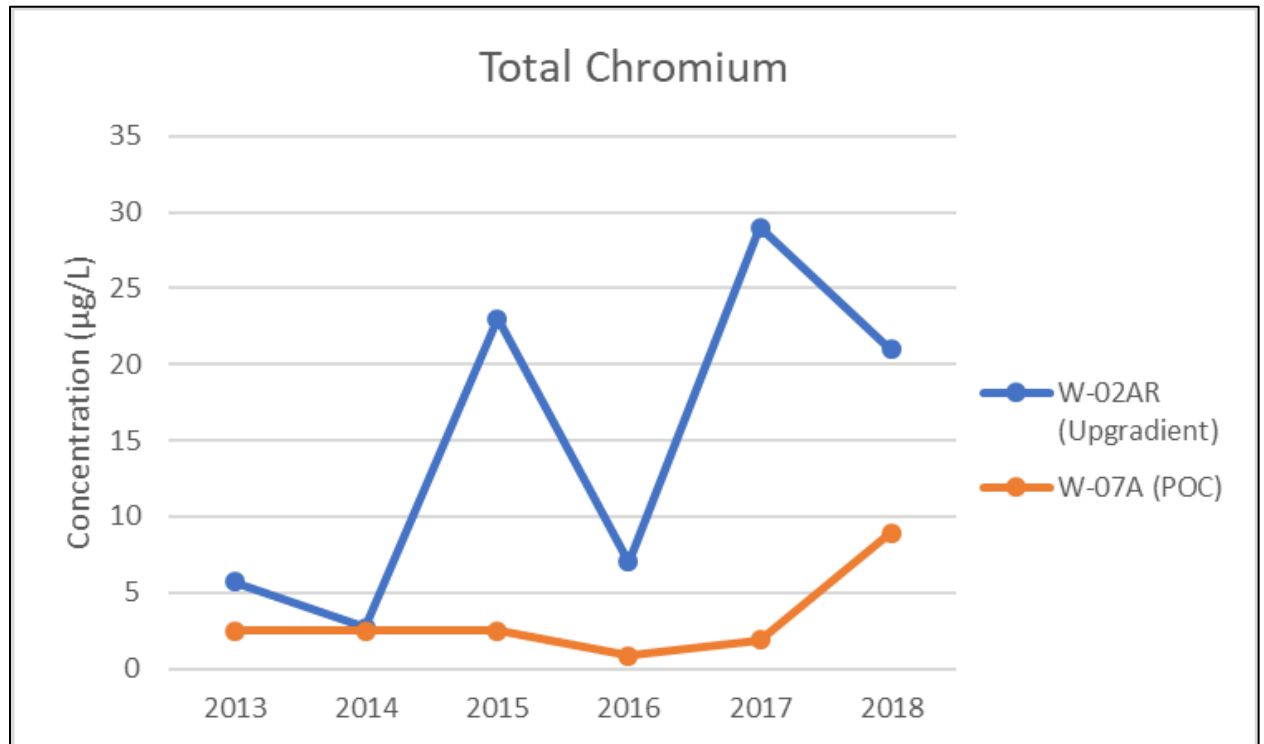
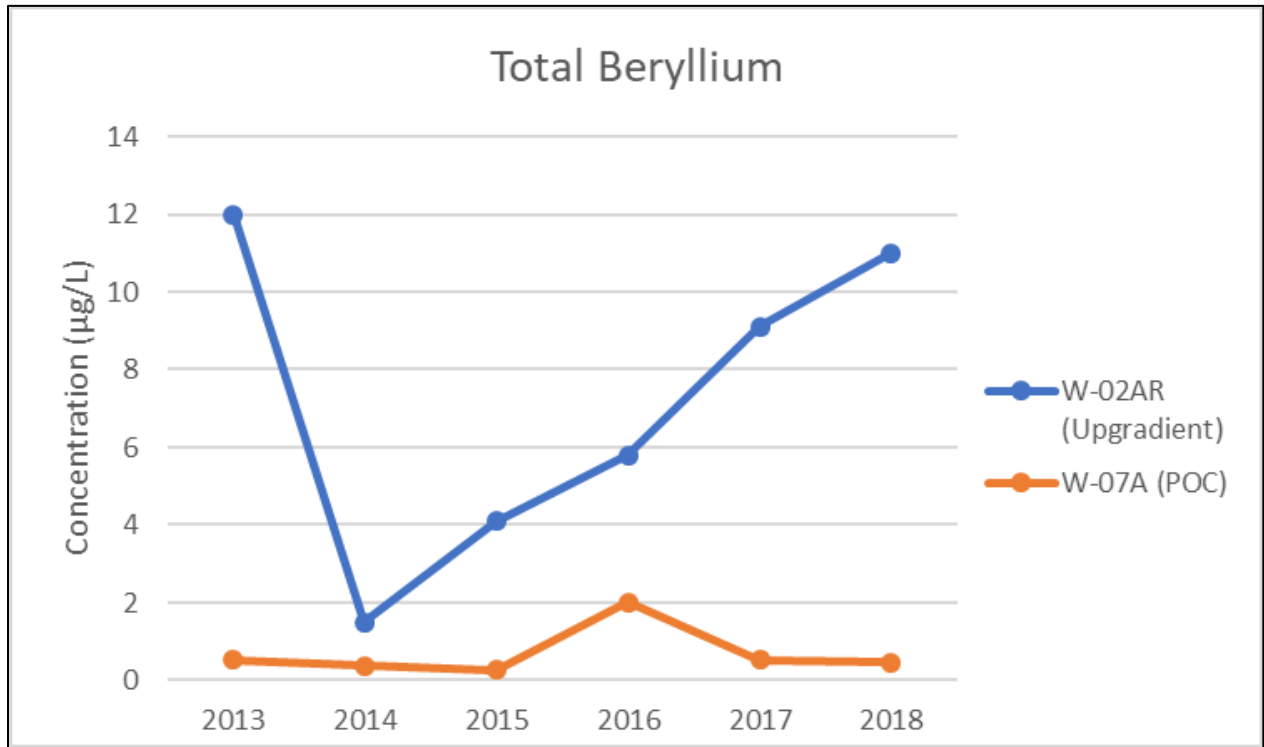
BG-2	0.2	ND	ND
BG-3	ND	ND	ND
BG-4	ND	ND	ND
Notes: CH ₄ = methane ppm = parts per million % = percentage LEL = lower explosive limit ND = not detected			

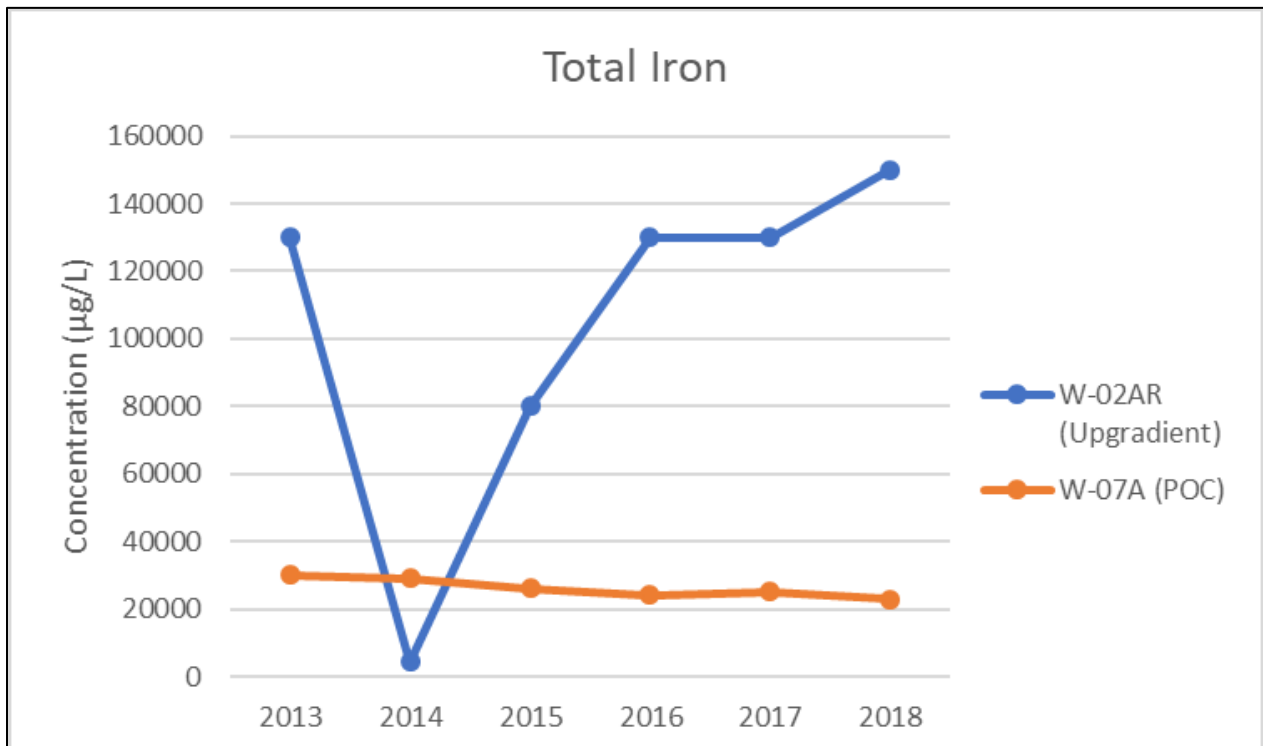
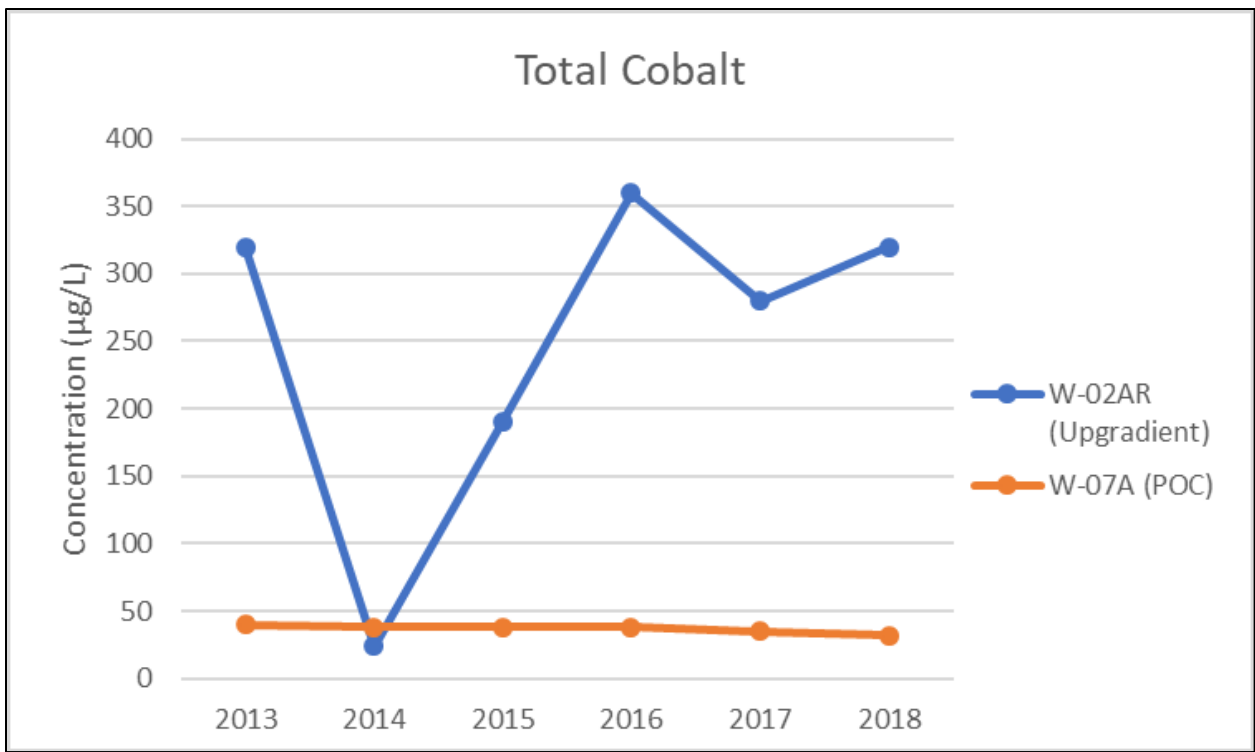
APPENDIX H – WELL PAIR CHARTS¹

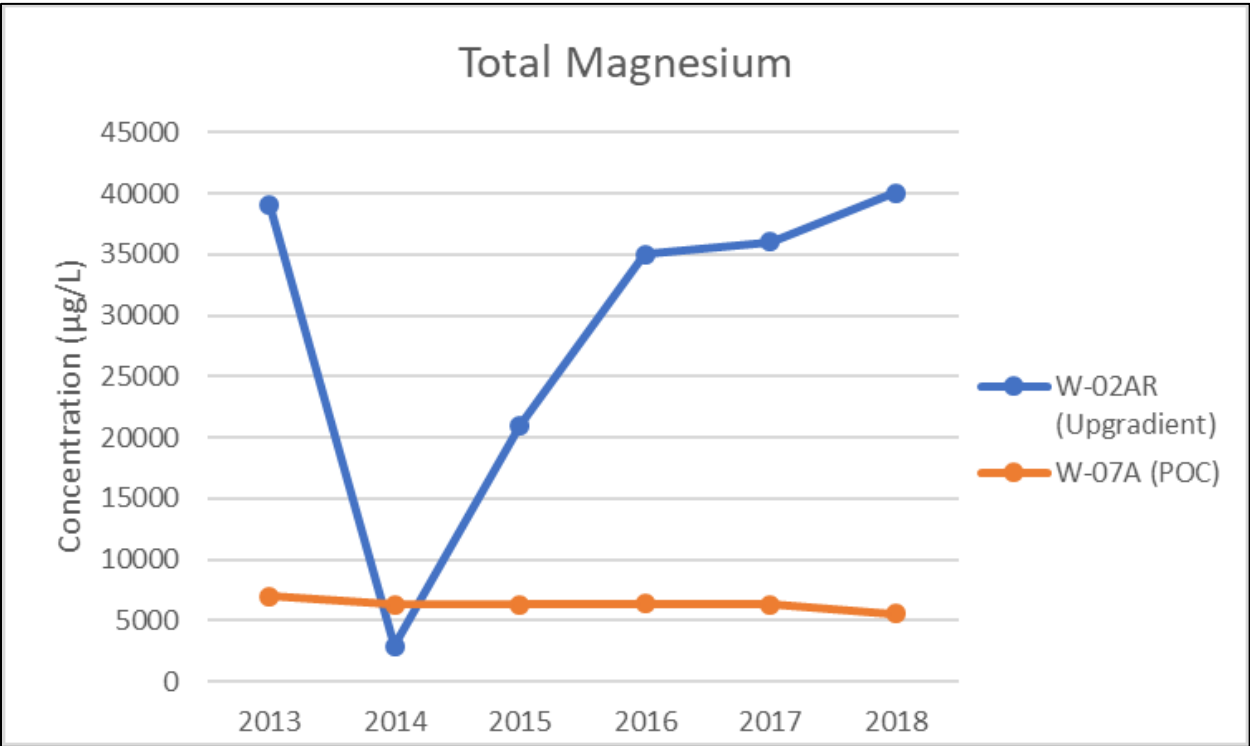
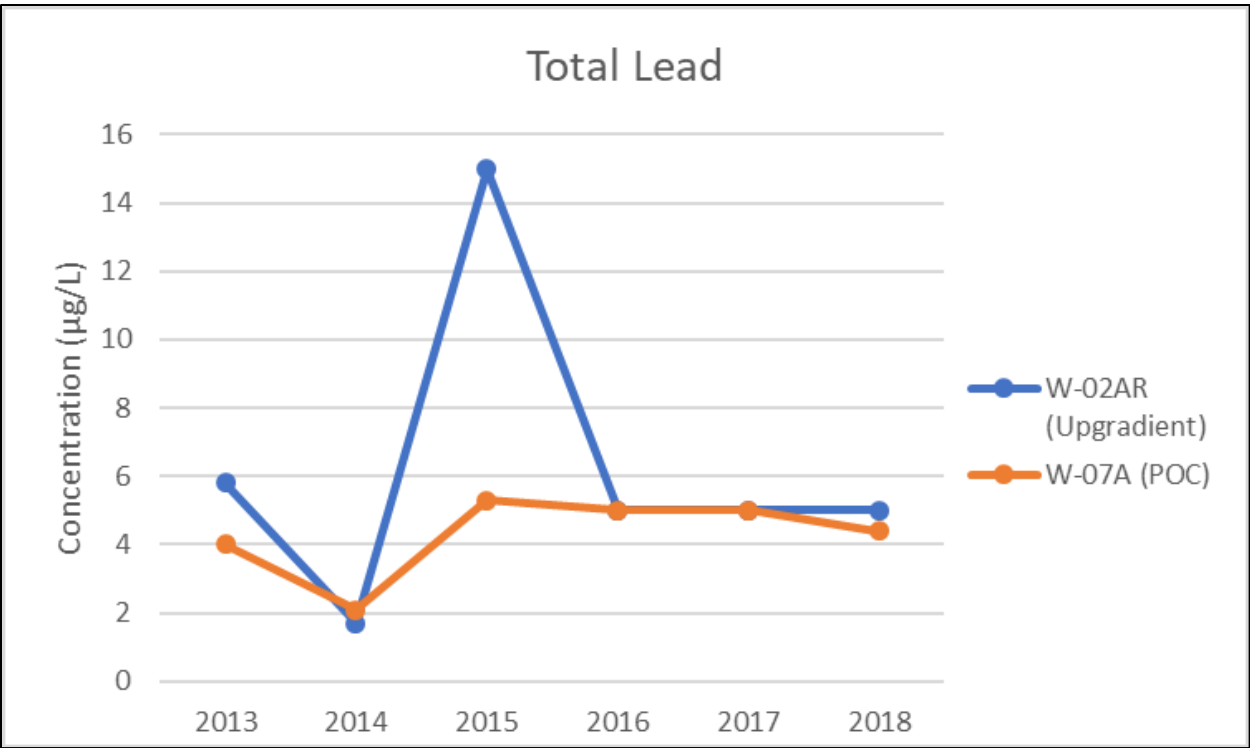
POC Well W-07A/Upgradient Well W-02AR Pair

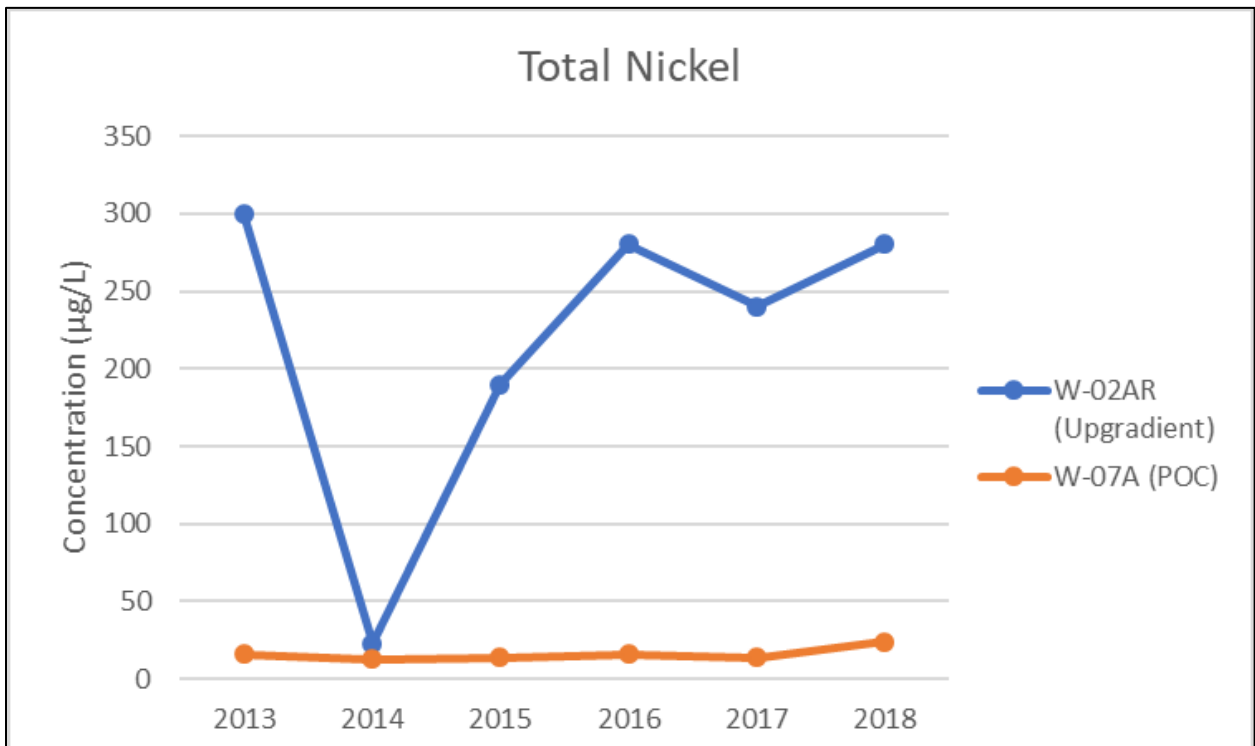
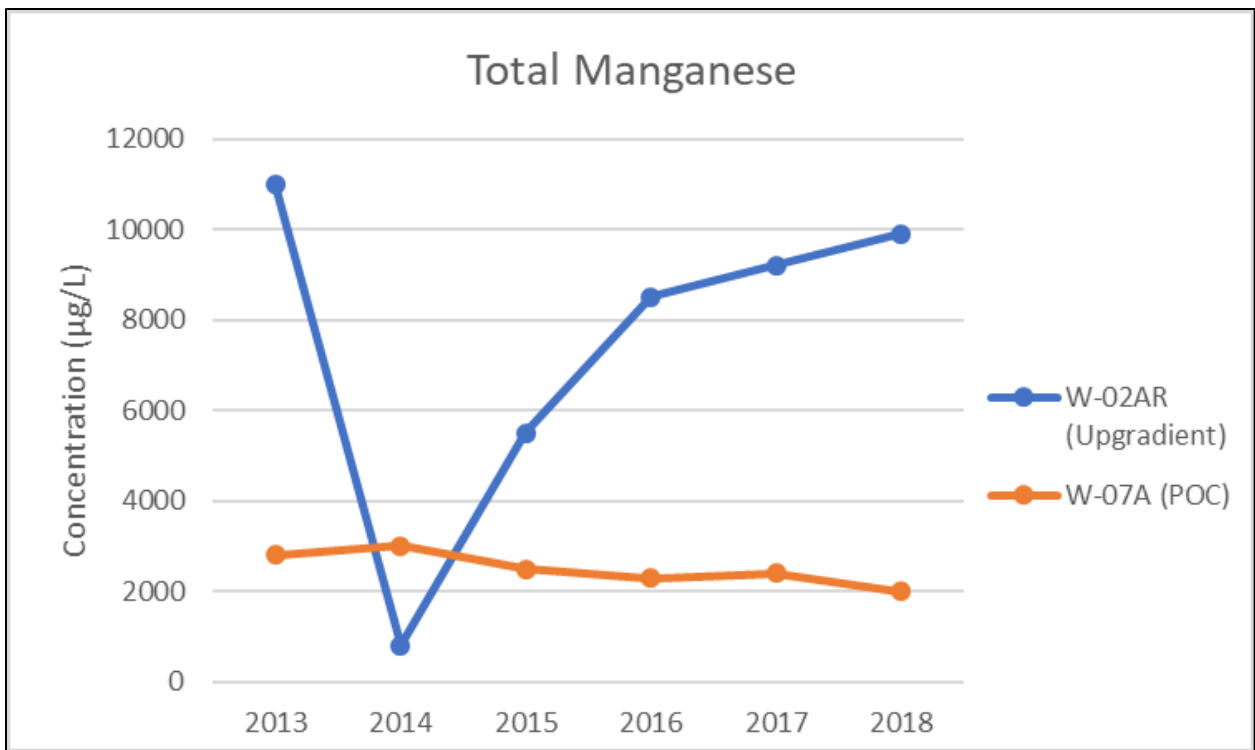


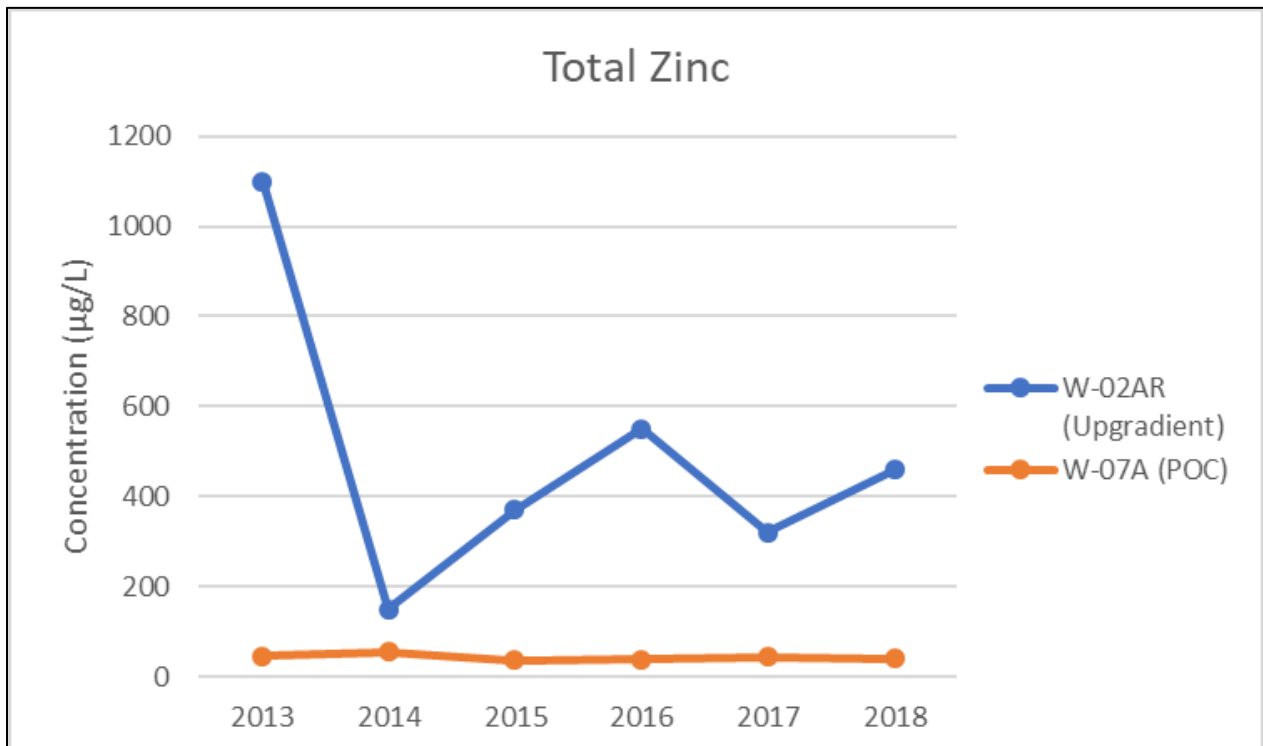
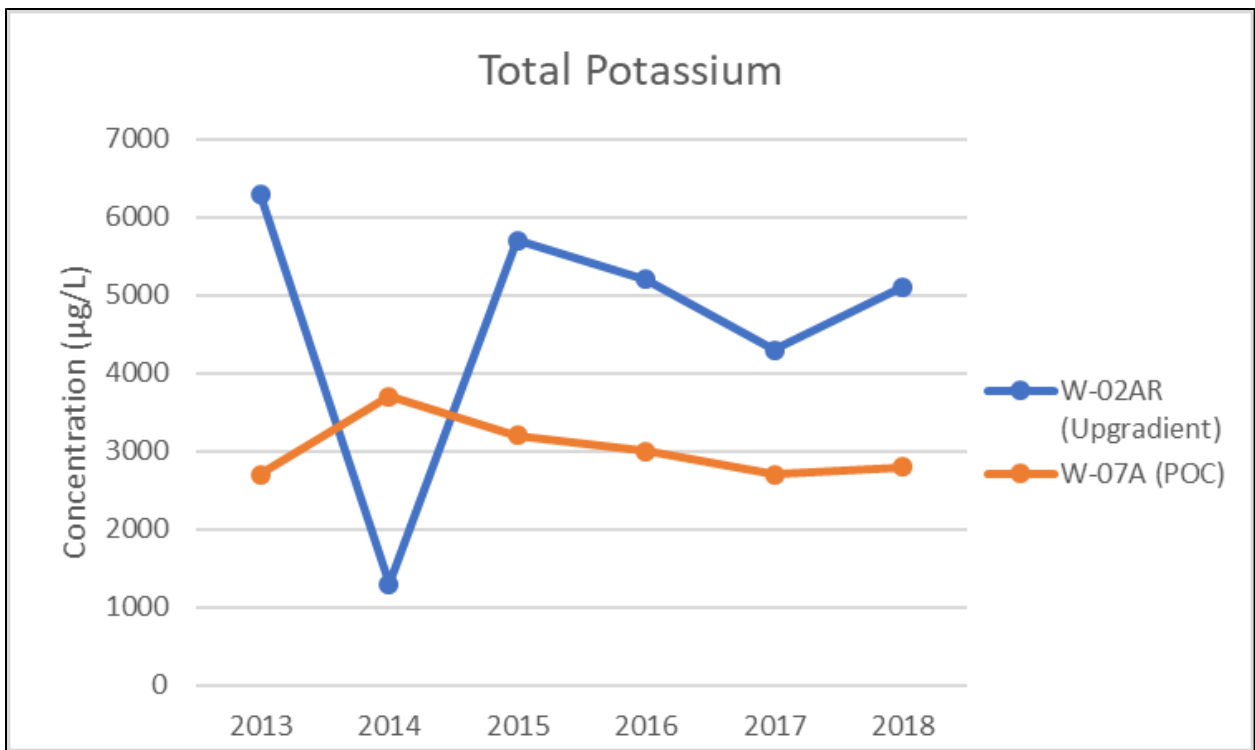
¹ Concentrations that were not detected are shown as ½ the detection limit.











POC Well W-08B/Upgradient Well W-02B Pair

